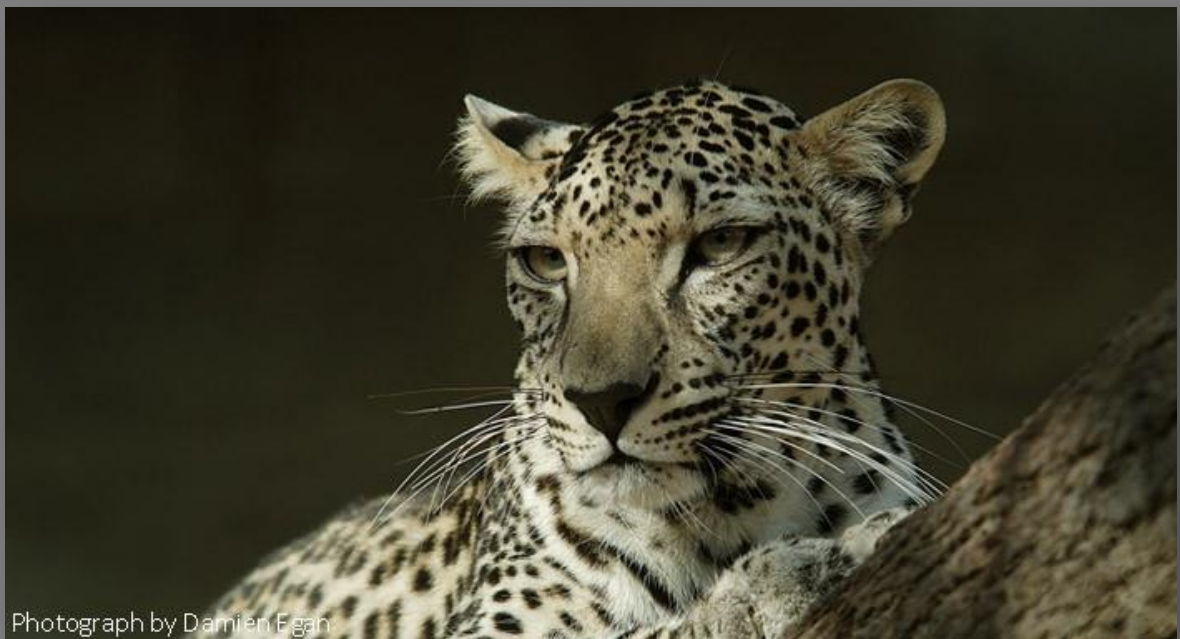




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Yemen Biodiversity and Tropical Forest: 118/119 Assessment Report



Photograph by Damien Egan

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MONITORING AND EVALUATION PROJECT

Yemen Biodiversity and Tropical Forest:

118/119 Assessment Report



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LIST OF ACRONYMS

ADS	Automated Directives System of USAID
AEWA	Agreement on the Conservation of the African-Eurasian Migratory Water birds
ARD	Republic Alliance for Democracy
AU	African Union
AWF	African Water Facility
BD	Biodiversity
CBD	Convention on Biological Diversity
CBJ	Congressional Budget Justification
CBOs	Community Based Organizations
CC	Climate Change
CCA	Climate Change Adaptation
CCM	Climate Change Mitigation
CD	Capacity Development
CGD	Convention on Biological Diversity
CI	Conservation International
CIA	Central Intelligence Agency
CIFOR	Center for International Forestry Research
CITES	Convention on International Trade in Endangered Species
CMS	Convention on Migratory Species
COMESA	Common Market for Eastern and Southern Africa
COPMACT	Community Management of Protected Areas Conservation
CPMT	Central Programme Management Team
CSOs	Civil Society Organizations
DEFRA	The Department for Environment, Food, and Rural Affairs
DG	Democracy and Governance
EGAT	Economic Growth, Agriculture, and Technology Bureau of USAID
ETOA	Environmental Threats and Opportunities Assessment
FAA	Foreign Assistance Act
FAO	Food and Agriculture Organization of the United Nations
FRUD	Front for the Restoration of Unity and Democracy
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEF FA/s	GEF Focal Area/s
GER	Gross Enrollment Rate
GHG	Green House Gases
GIS	Geographic Information System
GPS	Global Positioning System
ICCAs	Indigenous Community Conservation Areas
IGAD	Inter-Governmental Authority on Development
IJMR	Infant-juvenile Mortality Rate
IMF	International Monetary Fund
IMR	Infant Mortality Rate
INDS	National Initiative for Social Development
IR	Intermediate Result
IUCN	International Union for the Conservation of Nature/World Conservation Union
IW	International Waters
LDC	Least Developed Countries
LOE	Level of Effort
LS	Local Stakeholders
M&E	Monitoring & Evaluation
MA	Millennium Ecosystem Assessment
MFA	Multi Focal Areas
MHUEAT	Ministry of Home, Urbanism, Environment and Land Planning
MOA	Memorandum of Agreement
NAMA	Nationally Appropriate Mitigation Actions
NAP	National Action Programme
NBSAP	National Biodiversity Strategy and Action Plan
NC	National Coordinator
NCSA	National Capacity Self-Assessment

NFGs	National Focal Groups
NGO	Non-governmental Organization
NGSAP	National Biodiversity Strategy Action Plan
NIP	National Implementation Plan
NPFE	National Portfolio Formulation Exercise
NRM	Natural Resources Management
NSC	National Steering Committee
OP	Operational Phase
PA	Programme Assistant
PAs	Protected Areas
PERSGA	Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
PND	National Democratic Party
POPs	Persistent Organic Pollutants
PPSD	People's Social Democratic Party
PRSP	Poverty Reduction Strategy Paper
REDD	Reducing Emissions from Deforestation and Forest Degradation
ROYG	Republic of Yemen Government
RPP	People's Rally for Progress
SAP	Strategy and Action Plan
SC	Stockholm Convention
SFD	Social Fund for Development
SGP	Small Grants Programme
SO	Strategic Objective
SOW	Scope of Work, Statement of Work
TNC	The Nature Conservancy
UDJ	Union for Democracy and Justice
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Program
UNDP RR	UNDP Resident Representative
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations High Commissioner for Refugees
UNOPS	United Nations Office for Project Services
UPD	Union of Reform Partisans
USAID	US Agency for International Development
WCS	Wildlife Conservation Society
WHS	World Heritage Site

EXECUTIVE SUMMARY

Sections 118 and 119 of the Foreign Assistance Act, as amended, require the U.S. Agency for International Development (USAID) to prepare a country analysis regarding the status of conservation and sustainable use of tropical forests and biological diversity to be included in the preparation of the Agency's country level strategic plans, now referred to as Country Development Cooperation Strategies. The procedures for these assessments are contained in the Agency's Automated Directives 200 series which incorporate the FAA requirements to include:

Tropical Forestry (FAA 118) Analysis in all countries *at latitudes* between the Tropic of Cancer, approximately 23 degrees north latitude, and the Tropic of Capricorn, approximately 23 degrees south latitude; and

Biodiversity (FAA 119) Analysis in all countries, both tropical and non-tropical.

This report provides an analysis of the current status of Yemen's tropical forest and the biodiversity of the country based on a rapid assessment of readily available information and data. Based on that assessment, recommendations regarding:

- 1) action necessary for conservation and sustainable management of tropical forests and/or biodiversity, and
- 2) programming considerations for USAID to ensure any proposed actions supported by the USAID Mission in Yemen is consistent with the requirements of FAA Sections 118(e) and 119(d).

Background on Yemen's Forests and Bioresources

Located at the southern tip of the Arabian Peninsula, the Republic of Yemen is at the confluence of the Red Sea and the Indian Ocean (via the Gulf of Aden). The strait of Bab-el-Mandab between Seas is an active and strategic shipping channel for the transport of oil and other cargo from the region for world distribution. Yemen's coastline spans 1,906 kilometers along the Arabian Sea, the Gulf of Aden and the Red Sea.

The Gulf of Aden is rich with marine diversity stemming from its geographical location, stable meteorology and hydrodynamic factors. Seasonal upwelling in the Gulf promotes growth of macro-algae on most hard substrates increases ecosystems that support high biodiversity. The Red Sea is home to distinctive coral ecosystems supporting endemic fish and invertebrates. The Arabian Sea also hosts highly productive habitats.

The Country's mountainous interior is surrounded by narrow coastal plains to the west, south, and east and by upland desert to the north along the border with Saudi Arabia. The interior mountains have elevations ranging from a few hundred meters to the country's highest point at 3,760 m above sea level. The highland regions are interspersed with wadis, or river valleys, that are dry in the summer months.

While Yemen generally has a subtropical dry and hot desert climate, the highlands enjoy a temperate, rainy summer with an average high temperature of 21° C and a cool, moderately dry winter with temperatures occasionally dipping below 4° C. It is not uncommon for the northern and eastern sections of the country to receive no rain for five years or more. Yemen is subject to sandstorms and dust storms, resulting in soil erosion and crop damage. The country has very limited natural freshwater and consequently inadequate supplies of potable water.

The terrestrial ecosystem is separated into the mountainous region and the semi-arid lowlands. The majority of the land in Yemen is within the Ethiopian xeric grasslands and shrub lands ecoregion, arid, semi-desert area bordering the Red Sea and the Gulf of Oman. Yemen has no planned or planted forest and the present forest resources are only natural forests largely saved from destruction by their remote and inaccessible locations. With Yemen's differing microclimatic conditions, the natural woody vegetation of Yemen is quite diverse and includes savannah woodlands, acacia scrub woodlands, tree communities located on fans of major wadis and wadi bottoms in intermountain region; and mangroves in the coastal belt.

Ecology of Yemen

Scientists have identified over 3000 plant species in Yemen, 15% are endemic. The Islands of Socotra, one of only 188 UNESCO World Heritage sites designated for unique and important nature, contains more than 800 plant species, with

260 being endemic. According to the WWF Global 2000 analysis, Yemen hosts 4 globally important eco regions key to international global diversity: 1) Red Sea, 2) Gulf of Aden/ Arabian Sea, 3) Arabian woodlands and 4) Socotra.

Yemen has 7 amphibian species, 120 types of reptiles, 236 bird species, and over 85 categories of mammals. Loggerhead and green sea turtles remain under continuous threats from poachers who indiscriminately and illegally kill vast numbers each season. Taking range along the Yemeni coastal waters is the Dugong, a mammal closely related to elephants and manatee that weighs in up to 500 kg when full grown. In the high mountains, Arabian leopards, threatened with extinction, are of concern both in Yemen and Oman.

Yemeni waters have a great diversity of fishes largely because of the upwelling phenomena in the southern water Gulf of Aden/Arabian Sea. The Yemen Sea is home to 416 recorded species and 169 recorded species from Socotra Archipelago.

The Arabian Peninsula is an important “land bridge” between Africa, Asia and Europe for approximately three billion birds that annually migrate along north-south or east-west routes. The IUCN has established criteria regarding the relative endangerment of animal species in a country. The current IUCN Redbook on threatened and endangered species lists the status of threatened and endangered species in Yemen as follows:

IUCN Redbook REport for Yemen								
Extinct	Extinct in the Wild	Critically Endangered	Endangered	Vulnerable	Near Threatened	Lower Risk/ Conservation Dependent	Data Deficient	Least Concern
2	0	4	10	104	155	0	106	889

Yemeni Society

Yemen's estimated population is about 26.5 million persons with 72% living in rural areas. 46 % of the population is under age 15; slightly more than half are between 15 and 64; and less than 3% are 65 and older

Yemen’s citizens are almost exclusively Muslim with about 30 % belonging to the Zaydi sect of Shia, and about 70% following the Shafii school of Sunni. A few thousand Ismaili Muslims live in northern Yemen. While Yemen's constitution guarantees freedom of religion for Yemeni citizens, it is prohibited to try and convert Muslims or proselytize them; public schools provide instruction in Islam but not other religions; and only Muslims are allowed to seek public office.

Yemen’s health statistics are among the worst in the Middle East and at the lower spectrum of sub-Saharan African nations. According to the World Bank data survey, Yemen’s 2011 infant mortality rate was 58 deaths per 1,000 live births (50% higher than the world average and twice the average of the Middle East).. There is a significant gap in meeting the health care needs, especially for the poor. Inadequate health and social services are believed to be among the contributing factors to ongoing civil unrest and the secessionist movements.

In its 2012 Humanitarian Response Plan, the UN estimated the food-insecure population in Yemen to be 6.8 million people, of whom approximately three million are severely food-insecure. High food prices are among the major factors contributing to household food insecurity. Yemen is dependent on foreign imports for the majority of its dry staple foods. In 2012, the country imported 90% of its total wheat requirements and 100% of its total rice requirements.

Yemen has a relatively unskilled and uneducated workforce. Unemployment is estimated at 52.9% and 44.4% among the 15-24 and 25-59 age groups respectively. Unemployment is fairly broad, cutting across urban and rural areas and was exacerbated by the political unrest of 2011.

Water scarcity in Yemen is a serious problem and getting worse with per capita availability of water at only 2% of the world average. Yemen has been working with international donors and finance institutions for the last several years to find ways to better manage its water resources and increase access to water and sanitation services for both agricultural and potable uses. Roughly 42% of Yemen's rural population had access to safe water at the end of 2006. Urban water coverage in 2006 was just 58% of the population with only 32% of urban dwellers having sanitation services. The water shortage and rapidly depleting underground aquifers are major obstacles for agricultural and other development. Qat, a

major agricultural crop for Yemenis is a high water demanding plant and displaces more appropriate crop selection that would contribute to better management of this limited resource.

The poor education system of Yemen has resulted in a labor force that is largely unskilled. According to World Bank indicators, almost 60% of Yemeni adults do not read or write. With most of the labor force concentrated in the agricultural sector, few Yemenis ever develop advanced skills.

Yemen's ongoing political turmoil has severely challenged the country's ability to effectively manage its resources and as the most impoverished nation in the Middle East, it continues to struggle in meeting the needs of its people. Adding to this burden, Yemen is the only country in the West Asia region that provides refuge to people seeking asylum from conflict in their own countries. Consequently, Yemen currently hosts nearly a quarter million refugees from abroad.

Economy

Under Yemen's current economy, much of the country environmental quality is quickly deteriorating or coming under increasing risk of serious environmental problems. Threats to a sustainable future include deforestation; pervasive and coral reef destruction; massive pesticide poisonings; degradation and erosion of agricultural lands; pollutant intrusion into aquifers; irresponsible tourism activities; marsh and mangrove destruction; loss of forest and green cover associated with massive urbanization; industrial pollution; continued reliance on non-renewable energy sources; destructive fishing methods; and indiscriminate oil exploration and exploitation.

Yemen's principal natural resources are oil and natural gas, fisheries, rock salt, marble, and minor deposits of coal, gold, lead, nickel, and copper. Although the majority of Yemenis are agrarian, only 2.9% of Yemen is considered arable land with less than 0.3% of the country planted with permanent crops. About 5,500 km² of land are irrigated.

Agriculture has traditionally been the mainstay of Yemen's economy, reportedly generating more than 20% of GDP and employing more than half of the working population. Three quarters of the rural population depend on subsistence agriculture for meeting their food requirements. Agricultural development is limited by factors such as soil erosion, sand dune encroachment, and deforestation. Because the rainfall in the bulk of the country is only about 125mm per year, Yemen has relied heavily on the extraction of groundwater and many aquifers are quickly and severely being depleted, falling an average of about two meters a year. The use of irrigation has made fruit and vegetables Yemen's primary cash crops. Qat, a widely used narcotic in Yemen, has perverse social implications to its millions of users and is a water hungry crop consuming 40% of the entire nation's available water. Livestock production makes up about a quarter of Yemen's agricultural market with nearly 80% of farms raising some sort of livestock. Women are prominent workers in animal production activities.

Although Yemen's marine resources have the potential to produce 400,000 metric tons of fish each year, actual production is estimated at 290,000 metric tons. The fishing industry is largely artisanal as commercial fishing remains largely undeveloped. Recently, the ROYG lifted restrictions on fish exports, and production has increased. Although fish and fish products are Yemen's second largest export, this only contributes about 1.7% to Yemen's GDP.

Yemen is a small oil producing country and is not a member of the Organization of the Petroleum Exporting Countries (OPEC). Yemen relies on foreign oil companies with production-sharing agreements with the government to extract its oil. Income from oil production contributes 75% of ROYG revenue and about 85% of exports. Oil revenues have diminished annually and are not expected to last beyond 2020.

According to information compiled from the World Bank's meta data tables for development, member States of the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD) have contributed some \$322 million in direct bilateral assistance toward development programs in Yemen in 2010, a 230% increase over the level of support the DAC members provided in 2008

The leading donor organization for biodiversity and forestry issues in Yemen is the Global Environmental Facility (GEF) which is administered by through the United Nations Development Program (UNDP). Overall, GEF claims to have invested nearly \$10.5 million in biodiversity projects and leveraged an additional \$14 million investment.

Legal and institutional Structures in Yemen

Yemen has been active in environmental treaty efforts and often been among the first signatories of treaty initiatives. However, with regard to implementation of national legislation, Yemen has not had strong institutions that work to regulate sources of pollution or that directly address specific environmental problems unless encouraged and financially supported by the international community.

Most of the existing national legislation in the Republic of Yemen has evolved in an ad-hoc, fragmented and uncoordinated manner, leading to overlapping jurisdictions, and weak enforcement of the said laws. Moreover, there is shortage in national policies that support the conservation and protection of biological resources.

Yemen lacks clear and specific authorities to effectively regulate some aspects of the conservation and sustainable use of biological diversity. Existing laws on urban planning, land use and land registration are vastly lacking and inconsistently enforced. Islamic Shari'a law addresses some aspects of land use and ownership, and needs to be looked at for consistency with ROYG implementation of land requirements. The concept of NGOs is still new while there is legislation that govern citizen associations; the law is regarded as inadequate and is already somewhat out of date.

The Ministry of Agriculture and Land Reclamation (MALR) in Yemen is in charge of agricultural research and extension, land reclamation and of agricultural, fisheries and animal wealth development. The Ministry of Agriculture and Water Resources (MAWR) is responsible for formulating policies for water resources, food security and crops, livestock and forestry production, and coordinating public investment and services in the sector. The General Directorate of Water Resources is located within the Ministry with four general departments: water resources; irrigation and maintenance of water installations; farm mechanization and land reclamation; irrigation studies.

Yemen's Current Efforts on Biodiversity and Environment

Yemen formally designated six protected areas out of some 40 environmental sensitive places originally evaluated by the ROYG. These areas are:

Aden Wetlands Protected Area
Bura'a Protected Area
Hawf Protected Area

Kamaran Island Protected Area
Socotra Archipelago Protected Area
Utoma Protected Area

In the highlands regions, the basis for the listing is the relatively dense forest cover of Jabel Bura'a, Eraf forest, Ket Fah, Hawf and Socotra Island while in the coastal region sites were primarily identified to protect mangrove stands.

The National Biodiversity Strategy and Action Plan for Yemen (NBSAPY) outlines a sustainable development investment program. Some aspects of the NBSAPY were funded under the GEF administered by UNDP (Sana'a) and coordinated through the EPA with technical assistance from the IUCN. IUCN has supported this NBSAPY process.

Yemen also drafted a Sustainable Natural Resources Management Programme (SNRMP) to further support the country's efforts to reach its priority goals, build capacity, raise public awareness, and promote sustainable livelihood with actions taken at the national, regional, and local levels. Activities include on-the-job training and the establishment of strategic partnerships with national and regional centers of excellence (e.g. the University of Sana'a and the University of Aden). ROYG claims several major accomplishments in implementing its action plan including preparing reports, creating a web site, undertaking an awareness campaign, preparing baseline inventories of flora and fauna in proposed protected areas, declaring protected area zones and training key managers for those zones.

The Government's administrative, procurement and financial systems are weak and its ability to attract and retain highly qualified and skilled staff remains limited. ROYG recognizes that it lacks effective coordination between government agencies in the management of development cooperation.

Threats to Protected Areas

The two most serious threats to biodiversity are habitat destruction and non-native species invasion. In spite of the observed threats of exotic invasive plant species in Yemen, these plants continue to be largely unchecked and unmonitored. The primary means of introduction of invasive species are: a) release in nature, b) escape confinement, c) transport of contaminants, and d) corridor interconnection. Knowing the process of introduction will lead to the identification of prevention and remedial measures that can be taken to combat such invasive species.

The main threats to protected areas are uncontrolled human access, poor institutional management by the EPA, and the lack of a conservation ethic of the public. The EPA has apparently not developed any specific protected area management plans for the designated sites nor is there, apparently, any implementing policy statements. Other threats to protected areas are, therefore, similar to the general biodiversity threats discussed elsewhere in this assessment.

Management by the ROYG of the formal protected areas has been characterized in the literature and in discussions with outside experts as minimal and there is no evidence that management in informal protected areas is any different.

Action Needed To Conserve Biodiversity and Tropical Forests

Much work can be done to improve Yemen's effectiveness at conserving biodiversity and tropical forest management. ROYG needs to examine its current commitment, the performance of its designated institutions, and how to expand both public and private sector involvement in protecting resources.

Sustainable land-use practices and habitat protection require additional work. Inadequately defined and/or poorly enforced, such rights may not currently protect against issues like overgrazing of pastureland, poaching of wildlife, deforestation, ineffective watershed management, and poorly managed extractive industry practices. Strengthening these rights and enforcement capacity can help conserve biodiversity and assure the sustainable use of natural resources as well as improve livelihoods and local governance.

Yemen currently does not have a legal framework governing management of forest land and the sustainable use of forest resources. The ROYG needs to inventory its forest assets, identify community-based forest management opportunities, outreach to stakeholders for the preservation and proper use of forest resources and commercial opportunities, develop necessary policy and legal framework for forest management, and build institutional and financial capacity to sustainably implement such policies.

Specific management plans should be established for each protected area which include remedial strategies for enforcement of any violations. Management elements that should be included are: delimitation and zoning, patrolling and mitigation of anthropogenic and natural pressure, interventions required to restore or maintain desirable natural processes and habitats, infrastructure development and maintenance, personnel management, visitor management, and interpretation and education. For each plan, monitoring and evaluation approaches will be needed to evaluate the effectiveness of the management strategies and create data necessary for implementing adaptive management. In addition, monitoring will provide valuable lessons learned for successful biodiversity conservation approaches.

The ROYG should work to address the 3 basic elements required to effectively address the issue of invasive species: a) establishing effective mechanisms for the prevention of the introduction of such species, b) creating monitoring systems for detecting new infestations, and c) moving rapidly to eradicate newly detected invaders. The Government should prepare and implement an outreach campaign to engage Yemeni citizens in understanding the need to protect their natural resources and make conservation part of the culture for a modern society.

Infrastructure improvements will also help protect biodiversity and tropical forests. Yemen has prepared a US\$4.4 billion, 7-year water sector strategy and investment plan that included 80 new water supply systems and 15 new sewage treatment facilities. Over the last fourteen years, ROYG invested \$276 million in its fishery network and continues to seek additional investment to improve ports and support infrastructure to expand fishing industry outputs. Yemen should also look for ways to integrate new green energy concepts into its infrastructure program.

Yemen has developed a vision on food security to: a) cut food insecurity one-third by 2015, b) make 90% of the population food secure by 2020, and c) reduce child malnutrition 1% per year. The strategy sets out a 7-point plan to: 1) reform petroleum subsidies, 2) improve the business climate, 3) reduce qat production, 4) improve food security risk

management, 5) implement the water strategy, 6) target public investment and improve service provision, and 7) launch high level awareness campaigns.

Yemen needs to improve the environmental management approach of its existing institutions and the application of existing laws. EPA should take steps to: a) review laws for overlap, inconsistencies, and remedy any areas of conflicting authorities; b) develop decrees, regulations or policies needed to support the framework laws; c) develop improved authority to conduct effective environmental assessments; d) establish an environmental fund; e) develop a system to insure strict liability for enforcement, and e) develop community outreach and community participation practices.

Many actions to protect and sustain biodiversity and health of tropical forests must be integrated into the culture of the local community, particularly where a weak government fails to adequately manage resources vital both to the sustainability of the community and the community's natural environments. Yemen should embrace the concept of community-based natural resource management, the principals of which often address both problems of poverty and natural resource degradation simultaneously, even when some may believe such solutions appear to be in direct conflict. GEF's small grants program has supported dozens of natural resource poverty reduction approaches. Donors should continue to work with the ROYG to partner and train the NGO community on protection services and leverage the effectiveness of these groups in integrating their achievement of national protection goals.

Ecotourism may provide a vehicle to further promote sustainable use and conservation. The country should explore its options at various locals to attract tourist and insure that such attractions integrate protection schemes for the environment and minimize any potential impacts from this tourism scheme.

A. INTRODUCTION AND BACKGROUND

At the southern tip of the Arabian Peninsula, the Republic of Yemen is at the confluence of the Red Sea and the Indian Ocean (via the Gulf of Aden). The strait of Bab-el-Mandab between these bodies represents one of the most active and strategic shipping lanes in the world.

With 527,970 square kilometers of land area, including the islands of Perim at the southern end of the Red Sea and Socotra at the entrance to the Gulf of Aden, Yemen's land borders with Saudi Arabia and Oman total 1,746 kilometers. The Yemen coastline spans 1,906 kilometers along the Arabian Sea, the Gulf of Aden and the Red Sea. Yemen claims a territorial sea of 12 nautical miles, a contiguous zone of 24 nautical miles, an exclusive economic zone of 200 nautical miles, and a continental shelf of 200 nautical miles or to the edge of the continental margin.



In June 2000, Saudi Arabia and Yemen signed the Treaty of Jiddah to resolve issues of territorial lands ownership as well as with the maritime border. Disputed areas included a section in the eastern desert region of Yemen that potentially contains significant amounts of oil. Despite improvements to their border security, some friction on illegal border crossings still continues.

Another historic dispute of Yemen's territorial rights involved ownership of Hanish Islands and fishing rights in the Red Sea. Despite a 1999 international arbitration panel's award of the sovereignty of the islands to Yemen over Eritrea, tensions regarding the territory remain.

Topography: Yemen occupies the southern end of the Arabian Plateau. The country's mountainous interior is surrounded by narrow coastal plains to the west, south, and east and by upland desert to the north along the border with Saudi Arabia. The Tihamah is a nearly 419 kilometer-long, semi desert coastal plain that runs along the Red Sea. The interior mountains have elevations ranging from a few hundred meters to the country's highest point, Jabal and Nabi

Shuayb, which is 3,760 meters above sea level. The highland regions are interspersed with wadis, or river valleys, that are dry in the summer months. Most notable is the Wadi Hadhramaut in eastern Yemen, the upper portions of which contain alluvial soil and floodwaters and the lower portion of which is barren and largely uninhabited. Both the eastern plateau region and the desert in the north are hot and dry with little vegetation.

Principal Rivers: Yemen has no perennial rivers running through the country. There are, however, several major stream channels fall into what is called in Arabic, a wadi. A wadi is a valley, ravine, or channel that is dry except in the rainy season.

Climate: Yemen's climate is generally described as subtropical dry and hot desert with high temperatures and low rainfall throughout most of the country. However, in contrast to the desert environment, the highlands enjoy a temperate, rainy summer with an average high temperature of 21° C and a cool, moderately dry winter with temperatures occasionally dipping below 4° C. The highest mountainous areas of southern Yemen receive from 520 to 760 millimeters of rain a year.

The climate of the Tihamah (western coastal plain) is tropical; temperatures occasionally exceed 54° C with humidity ranging from 50 to 70%. Rainfall, which comes in irregular heavy torrents, averages 130 millimeters annually. In Aden the average temperature is 25° C in January and 32° C in June, but with highs often exceeding 37° C. Average annual rainfall is 127 millimeters. It is not uncommon for the northern and eastern sections of the country to receive no rain for five years or more. The Wadi Hadhramaut in the eastern part of Yemen is arid and hot, and the humidity ranges from 35% in June to 64% in January.

Natural Resources: Yemen's principal natural resources are oil and natural gas, fisheries, rock salt, marble, and minor deposits of coal, gold, lead, nickel, and copper.

Land Use: Only 2.9% of Yemen is considered to be arable land, and less than 0.3% of the land is planted with permanent crops. About 5,500 square kilometers of land are irrigated. According to the United Nations, Yemen has 19,550 square kilometers of forest and other wooded land, which constitutes almost 4% of total land area.

Environmental Factors: Yemen is subject to sandstorms and dust storms, resulting in soil erosion and crop damage. The country has very limited natural freshwater and consequently inadequate supplies of potable water. Desertification (land degradation caused by aridity) and overgrazing are also problems.

Time Zone: Yemen is three hours ahead of Greenwich Mean Time.

Yemen Biodiversity: Yemen has a rich collection of diverse plants and animals because of its varied and micro climate regions and differing types of ecosystems and habitats. Scientists have identified over 3000 plant species in Yemen, 15% are endemic. Socotra contains more than 800 plant species, with 260 being endemic. According to the World Wildlife Federation (WWF) Global 2000 analysis, Yemen hosts at least 4 globally important eco regions: (1) Red Sea, (2) Gulf of Aden/ Arabian Sea, (3) Arabian woodlands and (4) Socotra. These eco-regions are amongst the key areas for global biodiversity and need to be protected from human activities.

Yemen has 7 amphibian species, 120 types of reptiles, 236 bird species, and over 85 categories of mammals. Among the most interesting animals are the loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles. These turtles remain under continuous threats from poachers who indiscriminately and illegally kill vast numbers each season. Also taking range in along the warm Yemeni coastal waters is the Dugong, a mammal that is a close relative of the elephant and manatee and weighs in at up to 500 kilograms when full grown. In Yemen's high mountains, the Arabian leopard, threatened with extinction, is the subject of much effort both in Yemen and across the border in Oman.

SOCIETY

Yemen's population, according to latest census in 2004, was 19.72 million persons and reflected an average annual population growth rate of more than 3.5% (resulting estimate would put today's 2013 population at about 26.5 million persons). In 2005, the population was described as 27.3% urban and 73.7% rural.

Adding to the growth of the native population is the influx of refugees from Somalia. Yemen is the only country in the Arabian Peninsula that is a signatory to the 1951 Refugee Convention and its 1967 Protocol. The United Nations High Commissioner for Refugees' March 2013 report estimated 225,000 Somalis were currently granted refugee status and several thousand Ethiopians, Eritreans and Iraqis were also seeking political refuge in the country. According to the United Nations Refugee Agency, there were almost 96,000 African refugees in Yemen in 2006, including more than 91,000 Somalis. ROYG estimated 300,000 Somalis in Yemen in 2007. Recent reports also indicate that there is over 25,000 Syrian refugees in Yemen.

Yemen's population is predominantly young with a 2007 estimate of 46% under age 15; more than half between 15 and 64; and less than 3% were 65 and older. The population was almost equally divided between males and females. The 2007 birth and death rates were estimated to be 42.7 per 1,000 and 8.1 per 1,000, respectively. According to the World Bank data survey, Yemen's infant mortality rate is currently at 58 deaths per 1,000 live births. The rate was estimated to be higher for males than for females—more than 62 male deaths per 1,000 live births, as compared with about 53 female deaths per 1,000 live births. Despite an increase of 14 years in the last decade, life expectancy at birth in Yemen has remained low compared with other developing countries—60.6 years for males and 64.5 years for females, or 62.5 years overall. The country's fertility rate was almost 6.5 children per woman in 2007.

Yemen's population is predominantly Arab, but it also includes Afro-Arabs, South Asians, and Europeans. Arabic is the official language; English is also used in official and business circles. Virtually all of Yemen's citizens are Muslim, 30% belonging to the Zaydi sect of Shia and about 70% following the Shafii school of Sunna.

A1. Environmental and Natural Resource Management Context in Yemen

Yemen's principal natural resources are oil and natural gas as well as agriculturally productive land in the west. Other natural resources include fish and seafood, rock salt, marble, and minor deposits of coal, gold, lead, nickel, and copper. Each of the country's eco regions: the Red Sea, the Gulf of Aden - Arabian Sea, the Arabian woodlands and the Island of Socotra presents unique natural resource management challenges.

Under Yemen's current economy, environmental quality of much of the country is quickly deteriorating or coming under increasing risk from environmental problems. The slow economic growth in Yemen is further exacerbated by numerous factors including deforestation; pervasive and coral reef destruction; massive pesticide poisonings; degradation and erosion of agricultural lands; pollutant intrusion into aquifers; irresponsible tourism activities; marsh and mangrove destruction; loss of forest and green cover associated with massive urbanization; industrial pollution; continued reliance on non-renewable energy sources; destructive fishing methods; and indiscriminate oil exploration and exploitation.

The conservation of biological diversity may be the focal point for what limited environment conservation efforts do occur in the country. Although Yemen has declared a number of sites as protected areas, essential efforts to manage and maintain these areas have fallen quite short of needed resources and policy commitments. The overall environmental community interested in Yemen recognizes the importance of community engagement with biology diversity issues and the key role of indigenous groups to integrate protection in their ways of life and traditions. Efforts toward sustainable agriculture, agro-forestry, and environmentally sound fishery practices have been initiated in some areas, but still require greater buy-in by communities proximate to the protected areas, ROYG officials, and the population as a whole.

The Red Sea is home to distinctive coral ecosystems forming a regional center of endemic fish and invertebrates. It hosts a unique flora and fauna, a number of marine turtles, several endemic birds and other unique species. Seventeen per cent of fish are endemic including 90% of dottybacks (Family *Pseudochromidae*) and triplefins (Family *Tripterygiidae*). The Arabian Sea hosts highly productive habitats that reflect biophysical regimes and endemism among algal communities. This rich marine environment has coral reefs with over 75% cover in selected areas and sea grass beds that provide important breeding and nursery habitat especially for mollusks. It hosts several endemic species of marine fauna, a wide variety of invertebrates and algae as well as characteristic fish species. Socotra hosts a distinctive insular biota with many endemism species. It has a more diverse and exuberant flora and fauna than any other region in Arabia. The island of Socotra is also important site of local endemism for reptiles, plants, and birds. The islands have more the 250 endemic

species of plants, 85 of which are nearly extinct. Socotra houses many unusual plants, including its aloes and the endemic dragon tree (*Dracaena cinnabari*) known for "dragon's blood", a brilliant red resin extracted from this plant.

The island is also home several endemic plant genera, some animals and endemic bird species, including the Isla cisticola (*Cisticola haesitatus*) and the Socotra bunting (*Emberiza socotrana*). Yemen highlands woodlands and shrub-lands sustain high levels of biodiversity and provide an important stopover site for migrating birds.

The highlands support the majority of endemic or near-endemic species of plants and animals like the Arabian Tahr (*Hemitrag jayakari*), the Arabian gazelle (*Gazella gazella*), the Nubian ibex (*Capra ibex nubiana*), the strip hyena (*Hyaena hyaena*), the wild cat (*Felis sylvestrus*), and the Arabian leopard (*Panthera pardus*). Although Arabian oryx (*Oryx leucoryx*) became extinct in the wild, recent efforts to reintroduce this antelope back to its natural habitat in Oman have been successful and should be duplicated in Yemen.

Representative bird species include yellow-vented bulbul (*Pycnonotus xanthopygo*) graceful warbler (*Prinia gracilis*), brown woodland warbler (*Phylloscopus umbrovirens*) Yemen linnet (*Carduelis yemenensis*), gambage dusky flycatcher (*Muscicapa gambaga*) Arabian partridge (*Alectoris melanocephalia*) and black kite (*Milvus migrans*).

While much of the traditional medicinal flora of Yemen has not been scientifically studied, these traditional herbal treatments still play an important role in the lives of many Yemenis who rely on them for their health. Such plants continue to be used also for cosmetics, condiments, coloring and flavoring agents for hygiene and diets of many Yemenis. In 1995, group of national experts compiled a list of 224 medicinal and aromatic plants in wide use in the country. Among the most common plants listed were *cassia senna* whose leaves are used as a laxative; *ziziphus spina-christi* as an antiseptic, *lowsonia inermis* as an antiseptic and cosmetic; *mentha longifolia* for abdominal disorder, *withania somnifera* and *solanum incanum* as a dental analgesic; and *anisotes trisulcus* for kidney stone treatment.

The Arabian Woodlands

Rangelands, forests and other woodland areas comprise about 4% of the land area. More than 8 million sheep, goats and cows graze the land. The remaining land in the country is mostly desert.

Forest resources are used in industry, construction, and as a fuel source. Species most common utilized for fuel wood include *Acacia spp.*, *Ficus spp.*, *Tamarix spp.*, *Acalypha fructosa*, *Cad purpurea*, *Rumex nervosus* and others. Timber for construction includes *Acacia spp.*, *Fic spp.*, *Cordia africana*, *Terminida brownii*, *Trichlia emetica* and *Ziziphus spina-christi*.

Ref. 4.,5.,8., 22., 24.28., 30., 32., 42., 44.

A1a. Political Profile

Yemen is a republic with a bicameral legislature. Under the constitution, power is shared by an elected president, an elected 301-seat House of Representatives, and an appointed 111-member Shura Council. The president is head of state and the prime minister is head of government. The constitution provides the president be elected by popular vote from at least two candidates endorsed by Parliament; the prime minister is appointed by the president. The presidential term of office is 7 years, and the parliamentary term of elected office is 8 years. Suffrage is universal over 18. The constitution calls for an independent judiciary. The legal system includes separate commercial courts and a Supreme Court based in Sana'a. The former northern and southern legal codes have been unified.

After decades of hostilities, North Yemen and South Yemen formally unified as the Republic of Yemen in 1990. A brief civil war in 1994 resulted from the South attempting to withdraw from the Republic. This was quickly quelled and the Republic remained intact. In 2000, Saudi Arabia and Yemen agreed to a delimitation of their border. ROYG forces and Huthi rebels, a group seeking a return to traditional Zaydi Islam, began a series of six rounds of fighting from 2004 through 2010 when a ceasefire was finally reached. The southern secessionist movement again became popular in 2011. Public rallies in Sana'a against then President Salih – inspired by similar demonstrations in Tunisia and Egypt - slowly built momentum starting in late January 2011 fueled by complaints over high unemployment, poor economic conditions, and corruption. Violent demonstrations flowed to other major cities in the following months. By March the opposition had hardened its demands and was unifying behind calls for Salih's immediate ouster.

In April 2011, the Gulf Cooperation Council (GCC) began efforts to mediate the crisis in Yemen, proposing that the president would step down in exchange for immunity from prosecution. Salih's refusal to sign any agreement resulted in more street fighting. Salih' was severely injured in an explosion in June 2011. By October 2011, the UN Security Council passed Resolution 2014 directing both sides to end the violence and work toward a power transfer deal. Salih signed a GCC-brokered agreement in November 2011 for his resignation as president and the transfer of presidential authority to Vice President Abd Rabuh Mansur Hadi which was complete after the elections in February 2012. In March 2013 GCC continued support of Yemen's national dialogue on key constitutional, political, and social issues.

Rank	Commodity	Production (Int \$1000)	Production (MT)
1	Mangoes, mangosteens, guavas	282534	471544
2	Indigenous Cattle Meat	267212	98917
3	Indigenous Chicken Meat	212678	149310
4	Grapes	95360	166825
5	Cow milk, whole, fresh	94024	301300
6	Tomatoes	93650	253407
7	Sorghum	90411	602963
8	Indigenous Goat Meat	81467	34000
9	Indigenous Sheep Meat	79751	29290
10	Potatoes	57303	368242
11	Hen eggs, in shell	50261	60600
12	Onions, dry	49695	236606
13	Wheat	41946	278490
14	Bananas	38262	135857
15	Tobacco, unmanufactured	31808	19970
16	Dates	30452	59627
17	Chick peas	27375	56553
18	Oranges	24568	127125
19	Millet	22995	130508
20	Coffee, green	21487	20000

Source: FAO Statistical Yearbook, 2012

Ref: 1,2,3,37,62

A1b. Economic Profile

Agriculture. Agriculture has traditionally been the mainstay of Yemen's economy, reportedly generating more than 20 % of gross domestic product (GDP) {20.4 % in 2005 according to the Central Bank of Yemen} and employing more than half (54.2 % in 2003) of the working population. Three quarters of the rural population depend on subsistence agriculture for meeting their food requirements. However, U.S. Government (USG) and World Bank estimates suggest that the sector accounted for only about 8 % of GDP since 2008. Of the total land area only 1,142,000 ha (2.2%) is under permanent cultivation, of which 53 % is rain fed and 47 % is irrigated land (12 % spate, 30 % tube-well, and 5 % spring). Cereal areas have declined since the nineteen-seventies but they remain the major crop, covering about 600,000 hectares in 2000, (about 54 % of the cultivated area). Areas of rain-fed cereals are highly variable between seasons. Cereal yields are fairly low, between 0.6 and 1.6 tons/ha averaging 1.2 tons/ha. Sorghum is the most common crop).

Agricultural development is limited by factors such as soil erosion, sand dune encroachment, deforestation and water scarcity. Yemen's overall water crisis threatens entire regions and represents the country's most critical issue. Yemen's annual rainfall is only about 125 millimeters (about 5 inches) per year, consequently, agriculture in Yemen relies heavily on the extraction of groundwater and many aquifers are quickly and severely being depleted, falling an average of about two meters a year. The use of irrigation has made fruit and vegetables Yemen's primary cash crops. With the rise in the output of irrigated crops, the production of traditional rain-fed crops such as cereals has declined. According to the Central Bank of Yemen, the 2005 production of qat, a mild narcotic heavily used by Yemenis, rose 6.7 % and accounted for 5.8 % of GDP. According to the World Bank and other economists, cultivation of this plant plays a dominant role in Yemen's agricultural economy, now constituting 10 % of GDP and employing an estimated 150,000 persons, consuming an estimated 30 % of all irrigation water and displacing land areas that would otherwise be used for exportable coffee, fruits, and vegetables.

Livestock. Livestock production makes up about a quarter of Yemen's agricultural market with nearly 80% of farms raising some sort of livestock. Women are prominent workers in animal production activities.

Livestock in Yemen are mainly cattle, sheep, goats and camels. There are several breeds of sheep and goats in Yemen and the cattle are predominantly horned, small bodied Zebu (*Bos indicus*) with a thoracic hump. All cattle, sheep and goats are small. The average adult weight of cattle is 250 kg. Sheep and goats are 25 and 22 kg respectively.

Camels are kept mainly in coastal areas and in the eastern desert. They feed on salty and thorny trees, shrubs and dwarf [*Acacia, Ziziphus, Suaeda, Salvadora, Lycium*]. Their productivity is not well documented, but they contribute significantly to plowing and transport in remote areas.

Donkeys are kept in rural areas and are usually left to graze freely. They are used for transport of fuel, water, crop, fodder, and goods. Farm animals are kept for meat, milk, sour milk [laban], butter [ghee] and draught power, together with wool, skin and manure.

Fishing. Although Yemen's territorial waters and marine resources reportedly have the potential to produce 400,000 metric tons of fish each year, actual production is estimated at 290,000 metric tons. The fishing industry consists largely of artisanal fishing (individual fishermen in small boats) as commercial fishing remains largely undeveloped. About 10 years ago, ROYG lifted restrictions on fish exports, and production has increased, yielding 2005 revenues of US\$256 million. Although fish and fish products are Yemen's second largest export, this only contributes about 1.7 % to Yemen's GDP. The World Bank's recent credit for fisheries management and conservation along the Red Sea and the Gulf of Aden is expected to improve landing and auction facilities and overall fisheries management.

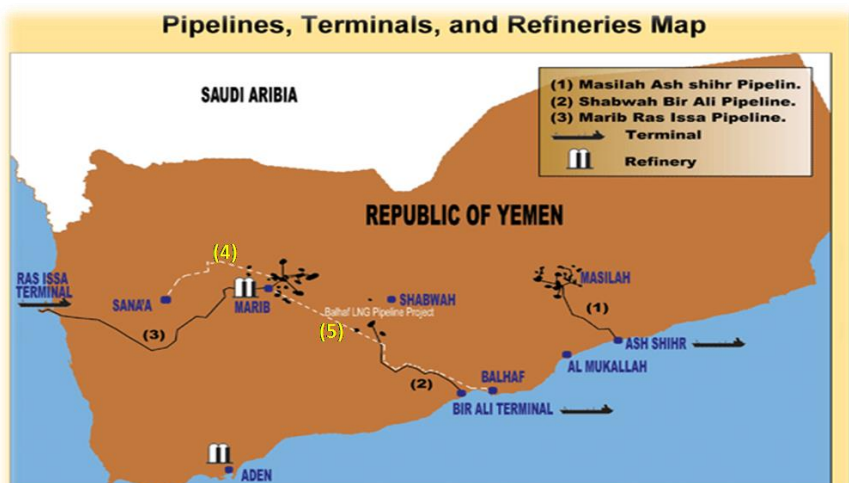
Oil. Yemen is a small oil producing country and is not a member of the Organization of the Petroleum Exporting Countries (OPEC). Yemen relies on foreign oil companies with production-sharing agreements with the government to extract its oil. Income from oil production contributes 75 % of ROYG revenue and about 85 % of exports. Yemen's proven crude oil reserves were more than 3 billion barrels in 2007, down from 4 billion in 2006. Oil revenues have diminished annually and are not expected to last beyond 2020. According to statistics published by the U.S. Energy Information Administration, crude oil output averaged 380,000 barrels per day (bbl/d) in 2006, down from 400,000 bbl/d in 2005. The report anticipates further reductions each year.

According to the *Oil and Gas Journal*, Yemen had 16.9 trillion cubic feet of proven natural gas reserves in 2007, 9 trillion cubic feet of which have been designated for the export of liquefied natural gas by Yemen LNG (YLNG), a joint company formed in 1997 by Yemen Gas Company and international partners. In July 2005, after years of delay, the government approved three LNG supply agreements enabling YLNG to award a US\$2.6 billion contract to build the country's first liquefaction plant at Balhaf on the Arabian Sea coast. The plant is expected to deliver a total of 6.8 million tons of LNG per year; initial shipments were marked with two-thirds exported to the United States and the remainder to Asia.

For 2007, USG estimated Yemen's industrial sector constituted 40.9 % of GDP. Combined, services, construction, and commerce, and industry account for less than 25 % of the labor force. Manufacturing provided approximately 9.9 % of Yemen's GDP in 2006. Almost all (95 %) of the establishments are small businesses (one to four employees). Almost half of all industrial

Animal Populations in Yemen		
Animal	2010	2011
Chickens	60000	60000
Asses	500000	500000
Camels	403000	405000
Cattle	1605000	1610000
Goats	9016000	9050000
Horses	1760	1800
Sheep	9206000	9250000
Beehives	170000	170000

Source: FAO Stat Data Base



Yemen Biodiversity and Tropical Forest Assessment, J Source: Yemen Ministry of Oil and Minerals

establishments are involved in processing food products and beverages. Approximately 10 % of industrial establishments are classified as manufacturing mixed metal products such as water-storage tanks, doors, and windows.

Ref. 1, 3, 37,62, 68

A1c. Religious Profile

Yemen's citizens are almost exclusively Muslim, about 30 % of the population belong to the Zaydi sect of Shia and about 70 % follow the Shafii school of Sunna . A few thousand Ismaili Muslims, who adhere to Shia sect, live in northern Yemen. Fewer than 500 Jews (a fraction of the former population) also live in the northern part of the country.

Yemen's constitution declares that Islam is the state religion and that the president of the republic must "practice his Islamic duties." The constitution also guarantees freedom of religion for Yemeni citizens. ROYG generally respects this freedom with some limitations. For example, it is prohibited to try and convert Muslims or proselytize them. Permission from the ROYG is required prior to the construction of new places of worship. Public schools provide instruction in Islam but not other religions. Muslim citizens are allowed to attend private schools that do not teach Islam, but the ROYG only allows public or private school to teach courses in religion that fall within an officially approved curriculum. Because the ROYG has concerns that unlicensed religious schools might deviate from formal educational requirements and promote militant ideology, it has closed more than 4,500 of these institutions and deported any foreign students studying there. The Yemeni constitution gives non-Muslim citizens the right to vote, but not to hold any elected office.

The free practice of religion has met with some ROYG opposition. In 2004 the ROYG used military force to quell an armed insurgency led by a Shia cleric in the northern governorate of Sa'ada. In March 2007, the ROYG abolished the Al-Haq political party, whose members were linked to this insurgency movement. In early 2007, for the third year, the ROYG banned the observance of a religious holiday that is celebrated there by some Shia Muslims and reportedly limited the hours that mosques were allowed to remain open, reassigned imams thought to espouse radical doctrine, and increased surveillance and detention of members of the insurgent group. According to the U.S. Department of State, ROYG, in an effort to curb extremism and increase tolerance, monitors mosques for inflammatory sermons and threatening political statements and uses police and intelligence agencies to screen the activities of Islamic organizations tied to international organizations. (*Library of Congress 2008*)

Ref 1, 3, 37, 62

A1d. Yemen's Current Efforts on Biodiversity

Yemen has signed and ratified the International Convention on Biological Diversity which was launched at the Earth Summit conference in 1992. In so doing, Yemen acknowledged the value of biological resources as an integral part of its natural heritage. ROYG has formally recognized a link between the well being of its present and future communities and the need for conservation of the diversity and abundance of its biological resources. ROYG's focus on environmental and conservation issues is relatively new with the Environment Protection Council only established in 1990 and expanded into a Ministry in 2001. Yemen has been active in the signing and ratification of international instruments for the protection of biodiversity like the UN Convention for Combating Desertification, the Climate Change Convention and the International Trade in Endangered Species of Fauna and Flora. It has also developed numerous action plans related to biodiversity conservation and sustainable development including a National Water Strategy and Watershed Policy, a National Environmental Action Plan and a National Action Plan for Combating Desertification.

The National Biodiversity Strategy and Action Plan for Yemen (NBSAPY) outlines a sustainable development investment program for 2003-2008. Some aspects of the NBSAPY were funded under the Global Environment Facility administered by the United Nations Development Programme (Sana'a) and coordinated through the EPA with technical assistance from the International Union for Conservation of Nature (IUCN). IUCN has supported the planning process through technical back-stopping, advice on the development of work place organizational structures, terms of reference for national and international technical working groups and assisting in editing and finalizing the NBSAPY.

Yemen also drafted a Sustainable Natural Resources Management Programme (SNRMP) to further support the country's efforts to reach its priority goals, build capacity, raise public awareness, and promote sustainable livelihood with actions
Yemen Biodiversity and Tropical Forest Assessment, July2013

taken at the national, regional, and local levels. Activities include on-the-job training and the establishment of strategic partnerships with national and regional centers of excellence (e.g. the University of Sana'a and the University of Aden).

ROYG claims several major accomplishments in implementing its action plan including preparing reports, creating a web site, undertaking an awareness campaign, preparing baseline inventories of flora and fauna in proposed protected areas, declaring protected area zones and training key managers for sites in Gabal Bura, the Aden Wetlands, and Hwaf.

Ref 5, 29, 34, 39, 40, 43, 48, 49, 51, 56, 66, 70,

A2. Current U.S. Government Programming Efforts in Yemen

State and USAID: U.S. national interest in Yemen is to facilitate a quick and effective political transition in the country. Following on the GCC-developed political transition plan, the US is assisting the Yemen's efforts to establish a more inclusive democratic process. Among the specific measures being taken, the US is helping to reorganize the military and security sector to promote and reinforce Yemen's stability rather than have this sector be a potentially destabilizing force.

U.S. development assistance targets the political transition and recovery of Yemen from near economic collapse by promoting policies, regulations and programs designed to generate employment and enable private sector development. The United States Agency for International Development (USAID) works with the ROYG to deliver services, include citizens in decision making, develop the capacities of civil society, empower youth and women toward a more effective political processes and robust economy, and eliminate the underlying causes of instability that make Yemen vulnerable to threats.

Examples of key ROYG and local government institutions getting assistance for more effective operations include the Supreme Commission for Elections and Referenda, the Supreme National Authority for Combating Corruption, Parliament, and line and economic planning ministries. ROYG ministries, departments, and local government bodies, are working with USG assistance to enhance inclusive policy formulation and implementation capacities, and improve accountability, transparency and anti-corruption efforts.

Civil society organizations (CSOs) play a major role in public policy advocacy and monitoring. USG supports the collaboration between private sector, non-governmental partners, and ROYG and local government agencies to improve standards of living, reduce poverty and unemployment, expand infrastructure and access to services, and enhance the business investment and operational climate. Focus areas for local development include agriculture, enterprise development, health, education, and local governance.

The Mission currently has only one partner activity which has discretion, subject to environmental review, to propose for USAID support of local development projects. Agricultural actions in particular may be subject to biodiversity concerns regarding food safety and sound agricultural practices.

Ref 23, draft cdcs

A3. CDCS-USAID Funded Programs and Possible Impact on Biodiversity/Tropical Forests

A3 a. Background

USAID/Yemen is neither implementing nor proposing programs under a strictly environmental objective. Hence, USAID/Yemen does not expect the CDCS related activities to have any adverse impact on biodiversity/tropical forests. Nonetheless, the Mission prepares an Initial Environmental Examination (IEE) for all the Mission's development projects. These IEEs are reviewed by the Mission, concurred by the Regional Environmental Advisor and approved by the Bureau Environmental Officer.

The Mission estimates that some 80-90% of USAID funded activities are of a technical assistance nature and most likely eligible for categorical exclusion and Negative Determination with Conditions, USAID/Yemen has established a review process for the activities most likely to fall within the 10-20% of needing further assessment via an Environmental

Review Form (ERF) process. If, after the review, the activities can be classified with a negative determination, USAID may fund the activity with any appropriate conditions required.

A3 b. Environmental Mitigations Related to The Draft 2013-2017 Country Development And Cooperation Strategy (CDCS).

A3 b 1. Investing in People:

HEALTH:

USAID/Yemen's current health portfolio works at the national, governorate and district-levels of service delivery to help strengthen the capacity of the MOPHP to deliver critical health services, including conducting a demographic and health survey, provision of primary health care, outbreak response and supply chain systems development and management. USAID/Yemen four ongoing health program areas/implementation mechanisms that will contribute to a reduction in maternal and newborn mortality, improve nutrition status and an increase in contraceptive prevalence are as follows;

- **MCHIP /Yemen** which is designed to introduce and scale up life saving MCH and nutrition approaches. Under the initial MCHIP/Yemen activity with a field support funding a needs assessment and gap analysis were conducted and a series of "Quick Start" MNCH/NUT/FP activities have taken place to strengthen the maternal, newborn and child health (MNCH)/ nutrition (NUT) and family planning (FP) services of the MOPHP.

Under the Associate Award (AA), Y- MCHIP will work with the MoPHP to assist in strengthening MoPHP capacity to deliver high-impact, evidence-based interventions to reduce (MNCH) mortality and morbidity, improve nutrition status and increase FP use. This award will focus on responding to the following USAID Yemen priorities:

- Support quality and timely Maternal Health Services by:
 - reducing Post-partum hemorrhage (PPH)
 - Develop and implement a strategy in Post Partum Family Planning (PPFP) including long acting reversible contraceptive methods (LARCS: particularly for Long Acting IUD, and implants), Post-Natal Care (PNC) including EBF, Post Abortive Care (PAC) as identified in the EmONC approach;
 - Incorporate rights-based approach and respectful maternity care as foundation for reproductive health (RH);
- Contribute to key National Nutrition and Food Security strategies, assessments, guidelines, and tools (including providing ongoing technical assistance to the MOPIC Nutrition Secretariat to implement its GOYR's Scale-UP-Nutrition (SUN) in next three years;
- Support the Scale-up Essential Newborn (NB) Care.
 - Emergency Obstetric Neonatal Care (EmONC), implement newborn care and resuscitation program at health facilities and with community provider services
- Strengthen Family Planning Services and utilization.
 - Improve MOPHP's enabling environment to provide voluntary FP services and increasing demand for voluntary FP/RH services, and improve access to, and quality of FP services.
- **DELIVER/Yemen** works with the MOPHP to improve the health commodities supply chain system. A central component of this is the establishment of a national supply chain management system, including procedures for quantification and forecasting of needed commodities, ordering, storing including funding physical renovation for warehouses in need for repair, transporting, and tracking the commodities in order to ensure that adequate levels of stock are maintained at each service delivery point to meet the population's needs. Other donors have committed to purchasing contraceptive supplies, and USAID will contribute the required technical expertise.

- **MEASURE Phase III:** MACRO International: is supporting the ongoing 2014/15 Yemen Demographic and Health Survey (YDHS) in partnership with MOPHP and with support from a range of donor partners. MACRO will provide technical assistance to the MOPHP in conducting a national level health survey. This includes providing leadership in ensuring that sampling, questionnaires, field work, and data analysis are conducted with the highest standards in order to provide statistically-accurate results.
- **USAID's Global Grant to WHO** is being implemented by WHO/Yemen with the purpose of supporting polio vaccinations in Yemen.
- **ICF MACRO Inc.:** supports the 2013/14 Yemen Demographic and Health Survey in partnership with MOPHP and with support from a range of donor partners. MACRO provides technical assistance to MOPHP to lead the national demographic health survey. This includes providing leadership to ensure sampling; questionnaires; field work and data analysis are performed with the highest standards in order to provide statistically-accurate results. Further activities will include secondary analysis of collected data to provide policy working papers to the MoPHP and other stakeholders.
- **TBD Policy and Governance Technical Assistance to the MoPHP, this project will support the national level policy makers at the MoPHP in various areas of Health Policy and governance issues that will feed and support the above programs**

EDUCATION:

Through the Community Livelihood Project (CLP) USAID/Yemen **education** activities consists of the following: :

- Technical/vocational training for youth appropriate to existing labor market needs
- Renovation, repair or equipping local clinics and classrooms
- Increase the capacity of local and district education offices to support educational improvements and learning needs in and out of schools
- Assist the Ministry of Education (MOE) in specific reforms, such as devolving responsibilities to governorate and district levels and improving the delivery of teacher training programs.
- Train youth and youth groups in leadership skills and engage them in community service projects
- Support parent councils to engage with schools and district/governorate Education Ministry offices
- Support student councils and empower them to play advocacy and advisory roles in their schools

Categorical Exclusion is recommended for most activities under the Yemen Maternal and Child Health Integrated Program (Y-MCHIP) and **the Community Livelihood Project (CLP)**, except for activities that directly affect the environment. No funding is being provided for any other activity that has a significant, negative impact on the environment. USAID funding for the Y-MCHIP phase I and **CLP** will be used to support technical assistance. Activities planned will not include construction or any other activities with a negative environmental impact. Therefore, these activities have no direct impact on the physical and natural environment, and the program qualifies for a **categorical exclusion** pursuant to 22 CFR Part 216.2(c)(2)(i): “*Education, technical assistance, or training programs except to the extent such programs include activities directly affecting the environment (such as construction of facilities).*”

Negative Determination with Conditions is recommended for some activities under Y-MCHIP and CLP. Activities will support health and education service delivery, specifically deliveries, newborn resuscitation and immunization against vaccine-preventable diseases. USAID funding may also include small scale renovation/ rehabilitation of some health and education facilities.

Physical renovations may include small-scale construction of inner walls, leveling of floors, painting, tiling, replacing windows and doors, equipping with medical furniture, etc. No new construction or expansion of facilities is anticipated. These renovations are not anticipated to have significant adverse direct or indirect impact to the natural or physical environment. Thus, the service delivery and renovation components of this program merit a Negative Determination with Conditions.

A3 b 2. Economic Growth and Agriculture

USAID Yemen will support ROYG efforts to promote sustainable economic development and increase incomes of the poor under the 2013-2017 USG Country Development and Cooperation Strategy (CDCS). To achieve this development objective, USAID Yemen will support improved private sector enabling environment, increased productivity, and a more competitive work force. Agriculture, a critical focus of these activities, will promote food security and mitigate water scarcity (agriculture uses 90 percent of water resources in Yemen). In order to address food insecurity and water access issues, USAID Yemen economic development activities will support high value markets for Yemeni agriculture products that have the economic potential of competing with qat production, are adaptable to production under high efficiency irrigation systems using traditional and non-traditional rainwater harvesting systems, involve or employ the rural poor producing products that can be supplied through small scale farmer production. In doing so, the program will create sustainable production and marketing systems which promote rural livelihoods, increase family purchasing power, and improve food security.

Categorical Exclusion is recommended for activities under the SASSY Program. Primary activities under SASSY Program consist of provision of technical assistance, training and small scale renovation of value chain infrastructure. Therefore, these activities have no direct impact on the physical and natural environment, and the program qualifies for a **categorical exclusion** pursuant to 22 CFR Part 216.2(c)(2)(i): “*Education, technical assistance, or training programs except to the extent such programs include activities directly affecting the environment (such as construction of facilities).*” Planned funding for activities that qualify for Categorical Exclusion is \$18.8 million. It represents 75% of the total funding.

Negative Determination with Conditions is recommended for some activities under proposed renovation activities that will support strengthened value chains. It is anticipated that renovation activities will be limited to farmer organization packing facilities, market facilities, post-harvest processing equipment and facilities, and other types of value chain infrastructure.).”

Physical renovations may include construction of inner walls, leveling of floors, painting, tiling, replacing windows and doors, equipping with facility with equipment to sort, grade and clean fruits, vegetables, coffee, etc. No new construction or expansion of facilities is anticipated. These renovations are not anticipated to have significant adverse direct or indirect impact to the natural or physical environment. Thus the service delivery and renovation components of this program merit a Negative Determination with Conditions. Planned funding for activities that qualify for Negative Determination with Conditions is \$6.2 million. It represents 25% of the total funding

A3 b 3. Additional Conditions are recommended, and include: (1) adequate monitoring and reporting by the contractor to ensure compliance; (2) ensuring contractors have the human capacity and budget for compliance with this IEE, and provision of capacity development as needed in the application of the environmental screening and review process, and in best management practices; and (3) budgeting and providing for adequate follow-up to ensure that mitigation measures have been or are being implemented.

Small-scale rehabilitation, renovation and construction should follow Environmental Guidelines for Small-Scale Activities in Africa. Activities must observe best management practices (BMP), as specified, monitored, and evaluated by qualified professionals. Potential environmental impacts must be monitored and mitigation measures put into effect, if needed.

Any grants or other fund transfers (e.g., sub-grants) made to organizations/contractors receiving USAID funds to support this program's activities must incorporate provisions that the activities to be undertaken will be within the envelope of the environmental determinations and recommendations of this IEE. This includes assurance that the activities conducted via those transfers fit within the description of activities described in an approved IEE or IEE amendment covering this program, and that any mitigating measures required for those activities be followed.

Grants to Yemeni non-governmental organizations (NGOs) or other organization should be carefully monitored, particularly those which fund small-scale construction activities which have an impact on the physical and natural environment. USAID will have substantial involvement in the establishment of grant criteria and the COR/AOR shall have authority to approve the grants.

Pursuant to 22CFR216.3(a)(9), if new information becomes available which indicates that activities to be funded by the project might be "major" and the project's effect "significant," or if additional activities are proposed that might be considered "major" and their effects significant, this categorical exclusion will be reviewed and revised by the originator of the project and submitted to the Bureau Environmental Officer (BEO) for approval and, if appropriate, an environmental assessment will be prepared. It is the responsibility of the USAID Agreement Officer's Representative (AOR) to keep the Mission Environmental Officer and the BEO informed of any new information or changes in the activity that might require revision of the IEE.

DEMOCRACY AND GOVERNANCE

USAID's democracy and governance program targets the national, subnational and local levels of government, as well the Yemeni people including traditionally marginalized groups like women and youth. USAID/Yemen provides mainly technical assistance through the Consortium for Elections and Parliamentary Processes (CEPPS) mechanism, which encompasses the National Democratic Institute (NDI) and the International Foundation for Electoral Systems (IFES). USAID/Yemen also partners with the American-MidEast Educational and Training Institute (AMIDEAST) and Mercy Corps. Last, our Responsive Governance Project (RGP) is through our partnership with Counterpart International.

CEPPS (NDI and IFES)

Through the CEPPS mechanism, USAID/Yemen namely provides technical assistance and capacity building to Yemen's Transitional Democratic Process (YTDP). This program supports an inclusive, transparent, and participatory National Dialogue along the GCC-driven transition initiative, working at the local and national level. The following objectives apply - Objective 1 (NDI): Increase citizen engagement in and understanding of processes related to Yemen's political transition; Objective 2 (NDI): Enhance the transparency, inclusivity and accountability of Yemen's electoral process; and, Objective 3 (IFES): Increase the professionalism and transparency of government institutions with elections-related responsibilities through technical advice and support.

Increase citizen engagement in and understanding of processes related to Yemen's political transition:

- Citizen Engagement on core national dialogue issues to generate recommendation on issues core to Yemen's including national reconciliation, state-building, judiciary reform and local governance.
- Electoral and voter education activity which leverages a train the trainer concept to build awareness and support Yemen's upcoming new voter registration process.
- Promotion of peaceful, non-violent political participants through their "Dialogue Messengers" program consisting of a group of Yemeni cultural leaders to promote peaceful participation with marginalized groups on national dialogue issues.

Enhance the transparency, inclusivity and accountability of Yemen's electoral process:

- Citizen monitoring of Yemen's electoral and constitutional reform process which is designed to foster transparency of the dialogue process and monitoring.
- Technical assistance to the national dialogue conference and delegates in the form of dialogue delegation orientations on report writing, public speaking and practicing effective communication. The workshops targeted dialogue chairpersons, deputies, women and youth.
- The women's political participation program promotes participation of women in the upcoming voter registration and constitutional referendum. The program also provides training on preparing women to run for office that includes communication and outreach strategy training and cross-party women coalition building.
- Public Opinion monitoring through focus groups and survey research.

Increase the professionalism and transparency of government institutions with elections-related responsibilities through technical advice and support:

- Voter registry system design, planning and support activities support procurement and implementation of Yemen's biometric-based voter registry (BVR) system and process.
- Election security activities include development of a national risk assessment implementation plan and the development of indicators for measuring potential electoral violence risks across Yemen's 21 governorates.
- Public outreach and media relations focus on supporting Yemen's national media strategy around the BVR. Equipment, print material and other resources were provided.

RGP

The Responsive Governance Project in Yemen advances the relevant role of civil society. RGP's most important work is serving as a catalytic bridge for Yemeni civil society, government and the community. By providing targeted training, grants, and short-term technical assistance to build capacity, RGP seeks to advance transformative change in how the Yemeni government, civil society and communities perceive and depend on each other's input and collaboration in service to a peaceful transition process and beyond. Activities supported by RGP include:

Gender Equality:

- RGP maintains a focus on building a framework and environment for gender equality in Yemen by continuing to build non-partisan mechanisms for women's engagement into the policy process.

Youth Empowerment:

- RGP's supports the creation of an independent youth forum to serve as a non-partisan space to discuss and frame out youth-related positions on public policy issues, as well as positioning youth at the forefront to promote the transition through advocacy and awareness activities.

Civil Society Organization (CSO) Networks:

- The CSO Network, supported by grants, builds awareness of political processes and consensus building, particularly targeting remote regions, which may or may not feel represented in the transitional process.

AMIDEAST Promoting Youth Civic Engagement (PYCE) Project supports USAID/Yemen's objective of increasing Yemen's stability through targeted interventions in vulnerable areas by (1) improving community-based institutions and mechanisms to ensure active participation in governance and locally driven solutions strengthened; and (2) improving access to and delivery of quality services. To support this USAID objective, the PYCE Project objectives have sought: to strengthen the role of moderate religious actors in positively influencing Yemeni youth; and to establish and support youth sports and recreational programs in selected governorates. To channel, strengthen and sustain youth participation in their communities at this critical juncture in Yemen's political development, PYCE has promoted civic engagement.

Mercy Corps

Mercy Corps has implemented Engaging Youth for a Stable Yemen Program (EYSY), funded by USAID's Conflict Management and Mitigation office with an objective of strengthening positive connections between young people and their communities to create a foundation for youth achievement. Through this program, Mercy Corps directly addresses the drivers—both tangible and intangible—that lead youth to opt for violent solutions to their problems by: 1) creating livelihood opportunities that generate useful economic relationships and reduce the financial pull of violent groups; 2) leveraging social initiatives to promote collective action for community improvement and a greater stake in stability; 3) facilitating youth leaders of divided group to resolve the tensions which impede joint action for political progress. Related activities include:

Build the capacity of Youth Organizations:

- Assess the capacity of the mapped youth organizations in dealing with conflicts and situation arising from disputes.

Upgrading safe, non-political space for youth organizing through Youth Action Centers:

- Provide support to the selected youth organizations to upgrade their organizations capacity and upgrade their existing youth centres, one in each location. They will be outfitted with modest furniture and computer lab, mediation room, training room and management rooms. Community leaders from the private and public sector are invited to conduct regular skill-building sessions based on the youth-identified interests.

Critical Leadership, Conflict Management and Civic Engagement skills for 300 youth:

- Select 300 youth from selected governorates to participate in a series of interactive and advanced training on leadership and communication, conflict resolution, civic engagement, facilitation skills, and advocacy using peaceful means.

B. LEGISLATIVE AND INSTITUTIONAL STRUCTURES AFFECTING BIODIVERSITY AND FORESTRY

Yemen signed the convention on Biological Diversity (CBD) in June 1992, and ratified it on 24 February 1996. Yemen has also ratified the UN Framework Convention on Climate Change, and the Convention to Combat Desertification. In addition, Yemen is a party to number of relevant international conventions and regional protocols (listed in B1b. of this report) which make some provision for meeting global environmental objectives. ROYG is party to the Agreement of the Cooperation for the Strategic Action Plan for the Red Sea and Gulf of Aden. The main objectives of this agreement include strengthening regional coordination and cooperation, reducing navigation risks from pollution, sustainability of marine resources, managing a regional network of marine protected areas, promoting integrated coastal zone management, and public awareness and participation in overall environmental matters.

B1. Environmental Policies, Legislation, and Treaties

Yemen has been active in environmental treaty efforts and often been among the first signatories of treaty initiatives. However, with regard to implementation of national legislation, Yemen has not had strong institutions that work to regulate sources of pollution or that directly address specific environmental problems unless encouraged and financially supported by the international community.

B1a. Legislation

Most of the existing national legislations in the Republic of Yemen have evolved in an ad-hoc fragmented and uncoordinated manner, leading to overlapping jurisdictions, and weak enforcement of the said laws. Moreover, there is a shortage of national policies that support the conservation and protection of biological resources.

Yemen lacks clear and specific authorities to effectively regulate some aspects of the conservation and sustainable use of biological diversity. Yemen has not yet enacted legislation to specifically address the CBD or legislation for management of protected areas. Additional gaps identified by RGOY in its NBSPPY include: a) standards on safe importation of genetically modified organisms, b) procedures on technology transfer of emerging biotechnology, c) enforcement authority for institution responsible for regulation; d) coordination of requirements related to environmental affairs and tourism, and e) the protection of intellectual property rights relevant to the CBD.

Existing laws on urban planning, land use, and on land registration are vastly lacking and inconsistently enforced. Islamic Shari'a law addresses some aspects of land use and ownership and needs to be looked at for consistency with ROYG implementation of land requirements. The concept of NGOs is still new and while there is legislation that governs citizen associations, the law is regarded as inadequate and somewhat out of date.

Inadequate legislation puts an estimated 200 - 300 endemic birds, mammals, plants, reefs and other wildlife at severe risks of endangerment and possible extinction. A main obstacle to implementing measures to conserve biodiversity and sustainably use biological resources is scarcity of financial resources. Environmental advocates believe there is an urgent need to establish an Environment Protection Fund for activities needed to attain the objectives of the Environmental Protection Law.

The laws governing biological resources (e.g., the law on protection and use of living marine resources) are not consistently enforced and offenders often are not prosecuted. Neither the Attorney General nor other governmental authorities have yet used Yemen's existing environmental laws to enforce conservation and sustainable use of biological resources.

A legislative framework for sustainable development exists in Yemen, the main elements include the Environmental Protection Law No 26 of 1995, the Water Law of 2001, and the Local Council Authority law of 2000. However, many of existing laws are outdated or not relevant to current environmental problems. Developed in the absence of a coordinated and integrated process, they contain conflicting and overlapping provisions which likely contribute to the weak enforcement of environmental laws.

Legislative tools for biodiversity conservation and sustainable development in Yemen pre-date the ratification of CBD and include:

Law 26 of 1995: By far the most comprehensive environmental legislation to date. It defines the scope and responsibilities of Environmental Protection Authority (EPA), requires protection of water and soil and the establishment of Protected Areas, defines the legal framework for control and use of pesticides, outlines a framework for the control of pollution and the conservation of natural resources and the protection of wildlife and marine organisms (especially those endangered and threatened with extinction), authorizes EPA and relevant agencies to prepare and enforce environmental standards, criteria and specifications, establishes a requirement for environmental impact assessments for development projects, describes the legal framework for handling hazardous wastes and materials, creates an environmental monitoring network, and forbids the discharge of ships pollution into the sea water. The law authorizes remedies, including penalties for violations of any of its terms.

Law No. 20 of 1995: Aims to deal with procedures for urban planning including best usage of land, protection of agricultural land and sites for natural resources from infringement by construction and building works, protection of the environment from pollution, protection of streams and floodplains, underground water and the coastline.

Presidential Decree on Law No. 43 of 1997: Regulates fishing exploitation and protection of live aquatic resources.

Yemeni Law No. 11 of 1993 concerning the Protection of Marine Environment from Pollution. The law aims to protect the sea from pollution, mainly from pollution by oil and passing ships. The law determines procedures for prosecuting, penalizing and requesting compensation from ships that violate the law. It gives the Public Corporation for Maritime Affairs legislative power to deal with oil pollution at sea and prohibits any form of discharge of pollutants from any source into the sea without prior treatment. The Law prohibits disposal or discharge of waste materials that may cause pollution of the beaches. This law prohibits building on the seacoast or near it unless proper wastes treatment can be demonstrated.

Law No. 15 of 1994: Established the legal requirements of ships registration, monitoring and supervision, specified procedures regarding marine accidents/incidents and required ship documents that certify safeguards for the prevention of pollution and the release of oils. Under this law, fishing boats must demonstrate they have permission to fish. The Law prohibits any foreign ship from leaving Yemeni ports or through territorial waters unless all safety requirements are satisfied.

Law No. 25 of 1999 regulating the handling of pesticides: This Law deals with the handling of herbicides, and procedures for registry, monitoring and inspecting herbicides in an effort to avoid the danger posed by them and their toxic effects on the health of humans, animals and the environment. The Law requires all armed forces, security, excise and duty; supply & commerce, seaport & airport facilities to comply with its provisions.

Law No.1 of 1995: This law 1) allows ministries, corporations, authorities, and public establishments, when necessity arises, to repossess land for the common benefit against fair compensation for the sake of executing projects for the common benefit, and 2) defines “necessary projects” are those of common benefit and which have no other alternative, such as sewage reticulation networks, location of sites of mineral resources, oil, gas, airports, seaports, dams, and irrigation and potable water projects.

Law No. 37 of 1991: defines the territorial waters and the exclusive economic zones of 200 nautical miles, the boundaries of the islands. It also regulates free passage in the Strait of Bab al-Mandab. It prohibits dumping any wastes into these zones.

Law No. 32 of 1999 on Agricultural and Veterinary Quarantine regulations: It regulates the introduction of plants and agricultural products into Yemen and the issuing of health certificates for any importation.

Law No. 20 of 1999 on Agricultural Seeds and fertilizer uses: Regulates handling and use of fertilizers and seeds species, including monitoring and inspection and recording of their use.

Law No. 39 of 1999: The goal of this law is to protect the environment and public health from the improper treatment and/or disposal of wastes. The legislation promotes recycling and up-to-date treatment technology. The Law prohibits disposal of wastes on seacoast, agricultural land, storm water courses and also wadis valleys. The Law also prohibits burying waste, improper burning, or disposal in areas without proper designation. Provisions of the Law prohibit the manufacture and import of plastic bags that do not breakdown and disintegrate with time.

Forest Law: The primary objectives of the Draft Forest Law include: 1) forest protection and preservation; 2) forest development; 3) management and regulation of forest formations; 4) erosion and desertification control; and 5) contribution to the national economy.

Water and Irrigation Law: Adopted by the Cabinet in 1999, this law promotes sustainable use of water, protects water resources from overexploitation, and balances the water needs of communities and sectors. The law places more emphasis on conservation and sustainability than on water resources development. The Irrigation part of the law seeks to improve irrigation efficiency, optimize its use, and establish a central entity to oversee irrigation issues in the country.

B1b. Treaties

Yemen is party to quite a number of international treaties on environmental issues. The following table lists the international treaties that Yemen has ratified and/or is a signatory to.

Official Title	Date Entry
International Coffee Agreement 2007	28/09/2007 signature
Ramsar Convention on Wetlands 1971	08/02/2008 signature
Agreement to maintain the ecological character of Wetlands of International Importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories.	
Convention on the Rights of Persons with Disabilities	13/12/2006 signature
United Nations Convention against Corruption	31/10/2003 signature

WHO Framework Convention on Tobacco Control	21/05/2003 signature
International Treaty on Plant Genetic Resources for Food and Agriculture	06/06/2002 signature
Protocol Against the Smuggling of Migrants by Land, Sea and Air, supplementing the United Nations Convention Against Transnational Organised Crime	12/12/2000 signature
Protocol to Prevent, Suppress and Punish Trafficking in Persons, Especially Women and Children, supplementing the United Nations Convention against Transnational Organized Crime	12/12/2000 signature
United Nations Convention Against Transnational Organised Crime	15/11/2000 signature
International Plant Protection Convention - New revised text approved by Resolution 12/97 of the 29th Session of the FAO Conference in November 1997 - Declaration	07/11/1997 signature
United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances	20/12/1988 signature
International Convention on the Harmonised Commodity Description and Coding System	14/06/1983 signature
United Nations Convention on the Law of the Sea (UNCLOS)	10/12/1982 signature
<i>Convention establishes traditional rules for the uses of the oceans and introduced new concepts on protecting and regulating the Sea</i>	
Agreement establishing the Common Fund for Commodities	27/06/1980 signature
Constitution of the Food and Agriculture Organisation of the United Nations (FAO)	16/10/1945 signature
Vienna Convention for the Protection of the Ozone Layer. Vienna, 22 March 1985	21 Feb 1996 Accession
Montreal Protocol on Substances that Deplete the Ozone Layer. Montreal, 16 September 1987	21 Feb 1996 Accession
Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer. London, 29 June 1990	23 Apr 2001 Accession
Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer. Copenhagen, 25 November 1992	23 Apr 2001 Accession
Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer adopted by the Ninth Meeting of the Parties. Montreal, 17 September 1997	23 Apr 2001 Accession
Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer. Beijing, 3 December 1999	13 Oct 2009 Accession
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Basel, 22 March 1989	21 Feb 1996 Accession
Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal. Basel, 10 December 1999	25 Aug 2009 Accession a
United Nations Framework Convention on Climate Change. New York, 9 May 1992	12 Jun 1992 21 Feb 1996 Ratified
<i>Establishes a framework for actions needed to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.</i>	
Kyoto Protocol to the United Nations Framework Convention on Climate Change. Kyoto, 11 December 1997	15 Sep 2004 Accession
<i>Established goals for reducing greenhouse gas emisaiona and guidance mechanisms for managing specific reductions. Authorized GEF to support the Climate Change objectives.</i>	
Convention on Biological Diversity. Rio de Janeiro, 5 June 1992	12 Jun 1992 21 Feb 1996 Ratified
<i>The Convention's goals are: 1.) conservation of biodiversity, 2) sustainable use of biodiversity, and 3) sharing benefits arising from commercial and other utilization of genetic resources fairly and equitably. Contains many reporting requirements.</i>	
Cartagena Protocol on Biosafety to the Convention on Biological Diversity. Montreal, 29 January 2000	1 Dec 2005 Accession
<i>Establishes protocol for safe handling, transport and use of living modified organisms (LMOs) resulting from modern biotechnology that may have adverse effects on biological diversity or human health</i>	

Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity. Nagoya, 29 October 2010	2 Feb 2011
<i>Agreement to share information and research on genetic materials and potential impacts on biodiversity.</i>	
United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa. Paris, 14 October 1994	14 Jan 1997 Accession
<i>The objectives of the Convention are to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements</i>	
Convention on the Law of the Non-Navigational Uses of International Watercourses. New York, 21 May 1997	17 May 2000
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. Rotterdam, 10 September 1998	4 Feb 2006 Accession
Stockholm Convention on Persistent Organic Pollutants. Stockholm, 22 May 2001	5 Dec 2001

Source: European Treaties Office Database (<http://ec.europa.eu/world/agreements/default.home.do>)

UN Treaty Database (<http://treaties.un.org/Pages/Treaties.aspx?id=27&subid=A&lang=en>)

Additional Important International Agreements	
Chapter 17 of Agenda 21 1992	
<i>A plan for the protection of the oceans, seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources</i>	
The GEF/UNDP/IMO Global Ballast Water Management Program (GloBallast)	
<i>Assists developing countries in reducing the transfer of harmful aquatic organisms and pathogens in ship's ballast water.</i>	
UNEP's Global Plan of Action for the Protection of the Environment from Land-Based Activities (GPA, 1995)	
<i>The GPA is guidance for implementing sustained action to prevent, reduce, control and/or eliminate marine degradation from land-based activities.</i>	
Cancun Declaration on Responsible Fishing (1992)	
The FAO Code of Conduct for Responsible Fisheries (1995)	
<i>The Code of Conduct is an important instrument order to achieve the goals of the Biodiversity Convention in the fisheries context. More</i>	

B2. Principal Institutions of Yemen Involved with the Environment

Following is a list of the principal ROYG institutions which have responsibilities and/direct interest in biodiversity, forestry, and or other environmental related issues in Yemen:

Agency/Organization	Main area of concern
Environment Protection Authority	Oversight of Yemen environmental matters, natural resources management, pollution control
National Water Resources Authority	Water resources and policy
High Council of Economy and Investment	Mineral resources and policy
National Population Council	Carrying of natural resources policy
High Committee for Socotra Development	Sustainable development policy development and implementation for island
Ministry of Agriculture & Irrigation www.agriculture.gov.ye	Land resources, wild life, vegetation, pesticide handling, desertification control, research
Ministry of Water & Environment mwe.gov.ye	Domestic liquid waste, water supply
Ministry of Transport www.mot.gov.ye	Marine pollution, climate recording
Ministry of Fisheries	Marine resources
Ministry of Petroleum and Minerals www.mom.gov.ye	Mineral resources
Ministry of Health	Health impact, industrial waste
Ministry of Industry and Trade http://www.moit.gov.ye	Industrial impact, industrial waste
Ministry of Local Administration	Environmental. assessment, pollution control
Support Agencies	

Ministry of Planning and Development	Sustainable development, donor & external cooperation
Ministry of Information	Environmental awareness
Ministry of Foreign Affairs www.mofa.gov.ye/	External relations
General Investment Authority	Environmental impact assessment
Ministry of Tourism www.yementourism.com	
Ministry of Education	Environmental trade
Minister of Public Works and Highways www.mpwh-ye.net	
Minister of Electricity and Energy http://www.pec.com.ye/indexe.htm	
Ministry of Commerce	Environmental trade
Ministry of Interior Affairs	Pollution and degradation control
Ministry of Justice www.moj-yemen.net	Environmental arbitration

Yemen is a member state of the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA). PERSGA is an intergovernmental body that is dedicated to the conservation of the coastal and marine environments found in the Red Sea, Gulf of Aqaba, Gulf of Suez, Suez Canal, and Gulf of Aden. Other member states include Egypt, Jordan, the Kingdom of Saudi Arabia, Somalia, Sudan, and Yemen. PERSGA falls under the umbrella of the Arab League and its legal basis stems from Article XVI of the Regional Convention for the Conservation of the Red Sea and Gulf of Aden, known as the Jeddah Convention (PERSGA 2012).

B3. The Local and International NGO Community

Identification of principal local nongovernmental organizations (NGOs) with environmental or biodiversity issues were found in listings at 3 separate sources as follows:

NGO NAME	Organizational Objectives	Field of Interest
Foundation for the Protection of the Arabian Leopard in Yemen David B. Stanton , Executive Director http://www.yemenileopard.org/	Ensure sustainably managed wild population of Arabian leopards living in harmony with local communities.	Conservation of endangered Yemeni wildlife.
Helping Hand Org http://www.hhngo.com/ Abdullah Seger Chairman Riyadh, Saudi Arabi	1) Gain financial sustainability and donors' satisfaction/trust, 2) effective use of mass communication, 3) assist people in need, 4) develop responsive/professional leadership, staff, and volunteers, 5) develop effective disaster and emergency response	Restoration of historical sites, agricultural aid, development, orphans, support of youth, job assistance, social services, self improvement for youth & adult, community improvement, educational support, train & educate farmers in water use & irrigation systems.
Sheba Center for Strategic Studies http://www.shebacss.com/en/	1) Pose right questions about strategic, political and socio-economic issues in Yemen, 2) utilize scientific methodology, 3) review western theories and concepts wrongly applied to Arab communities, and 4) come up with theories and concepts appropriate to region.	The center's interest are restricted to: (A) Topical mandate: strategic, political, socio-economic and energy research issues. (B) Geographic mandate: Yemen and its vital sphere including the littoral states of the Red Sea, GCC countries, Iran and Iraq, and the Middle East and North Africa.
Social Fund for Development http://sfd.sfd-yemen.org/	SFD established by the ROYG to help meet the goals of national social and economic development plans for poverty reduction.	SFD supports development opportunities.
<u>Allageal Foundation For Development - Yemen</u> No contact information listed	1) create culture of political will, 2) youth development. 3) deepen national loyalty/rejection of extremism/terrorism, 4) support voluntary work, 5) promote tolerance and dialogue, 6) advance democracy and human rights, 7) raise awareness of marginalized.	Youth Foundation-voluntary-development-human rights

NGOs with Environmental Interests as Identified In the Yemen NGO Directory	
Public Cooperative Association for Irrigation and Water Projects, Sana'a	Al-Ehsan Social Environmental Society for Sustainable Development, Marib
Al Ekhwa Cooperative Agriculture Multi Purpose Association, Capital Secretariate	The Environmental Supporters Society - Mahwait
The Al-Wafa a (Faithfulness) Cooperative Agricultural Multi Purpose Society - Mahwait	The Yemeni Society for Protecting Environment - Hodeidah
AL-BARAKA Agricultural Cooperative Multi Purpose Society - Mahwait	The Environmental Friends Society - Dhamar
Nogom Social Environmental Society – Capital Secretariate	The Yemeni Society for Environment and Sustainable Development – Aden
Belquis Cooperative Vocational Society - Marib	The Abrad Society for Environmental Protection - Marib
<i>Source: Human Rights Training Center http://hritc.info/en/</i>	

Non-governmental agencies Listed in Yemen's First Report on the Convention on Biodiversity	
Yemen Environmental Protection Society (<i>environment</i>)	Environment Communication Society (<i>environmental awareness</i>)
Environment & Coastline Protection Society (<i>environment</i>)	Utma'a Protected Area Society (<i>protected areas Utoma</i>)
Friends Of The Environment (<i>environment</i>)	Taiz Environment Protection Society (<i>environment, Taiz</i>)
Yemen Geological Society (<i>land resources</i>)	Yemeni Ornithological Society (<i>birds</i>)
Union Of Environment Supports, Mahweet (<i>environment</i>)	Fishermen's Union (<i>fish wealth, coastal line</i>)
Annahl Environment Protection Society (<i>environment</i>)	Yemeni Women Society (<i>women & environment issues</i>)
Hauf Society (<i>environment, Hauf area, Mahra province</i>)	Yemeni Women Committee (<i>women & environment issues</i>)
Yemeni Geographic Society (<i>land resources</i>)	Chamber Of Commerce & Industry (<i>environment & industry</i>)
Attakaful Environment Society (<i>environment</i>)	Farmer's Union & Agricultural Cooperatives (<i>land/vegetation</i>)
Yemen Water Protection Society (<i>water resources</i>)	Save Yemen Flora and Fauna, (<i>plants and animals</i>)

The UN has identified these International NGOs as currently the most active in Yemen:

International NGOs Identified as Most Active in Yemen	
Action Center la Faim (ACF)	INTERCOS
Agency for Technical Cooperation and Development (ACTED)	International Rescue Committee (IRC)
Advantist Development and Relief Agency (ADRA)	International Relief and Development (IRD)
Agency Francaise de Development (AFD)	Islamic Relief Yemen (IRY)
Aide Medicale Internationale (AMI)	Mercy Corps (MC)
AMIDEAST	Medecines du Monde (MDM)
Cooperative for Assistance and Relief Everywhere (CARE)	The Mentor Initiative (MENTOR)
Cooperative Housing Foundation (CHF)	The Mixed Migration Task Force (MMTF)
Development Assistance Research Association (DARA)	Millenium Relief & Development Services (MRDS)
Danish Demining Group (DDG)	Medecins san Frontieres – Belgium (MSF-B)
DIA – Social Justice in Development (DIA)	Medecins san Frontieres – France (MSF-F)
Danish Refugee Council (DRC)	Medecins san Frontieres – Spain (MSF-S)
Equal Access (EA)	Marie Stopes International (MSI)
Education Development Center (EDC)	Norweigan Refugee Council (NRC)
Friedrich Ebert Stiftung Foundation (FES)	Oxfam Committee for Famine Relief – GB (Oxfam GB)
Global Care	Partner Aid International (PAI)
German Leprosy and TB Relief Association (GLTBRA)	Pogressio
Grassroots Up (Gr-U)	Relief Internaional (RI)
Humanitarian Forum Yemen (HFY)	Save the Children (SC)
International Community Services (ICS)	Triangle Generation Humanitaire (TRIANGLE)
International Medical Corsp (IMC)	Vision Hope Intenational (VHI)
<i>Source: UN OCHA List of Intenational NGOs in Yemen 2013</i>	

B4. Donor Organizations

According to information compiled by the World Bank and maintained in the Bank's meta data tables for development, member States of the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD) have contributed some \$322 million in direct bilateral assistance toward development programs in

Yemen in 2010, a 230% increase over the level of support the DAC members provided in 2008. Appendix DD lists the specific contributions of various donor countries and international public organizations.

The leading donor organization for biodiversity and forestry issues in Yemen is the Global Environmental Facility (GEF) which is administered by through the United Nations Development Program (UNDP).

GEF uses the term “replenishment cycle” to refer to its strategic planning and implementation program. Replenishment 5 runs from June 2010 through June 2014. During this period, GEF plans to provide \$4,270,000 in biodiversity projects. As of November 2012, GEF has obligated some \$2.7 million in existing projects. This includes a significant number of community based small grant programs.

Overall, GEF claims to have invested nearly \$10.5 million in biodiversity projects and leveraged an additional \$14 million of other investments related to Yemen over the course of its last 5 rounds.

Focal Area	GEF Grant	Co financing Total	Number of Projects
Climate Change	26,814,932	104,403,240	10
Biodiversity	10,438,700	14,001,200	9
International Waters	2,800,000	0	1
Multi Focal Area	2,228,620	9,680,000	2
POPs	470,000	30,000	1
Total	42,752,252	128,114,440	23

GEF also relies on bilateral contributions in its reporting. Examples of such bilateral investments include the French Agency for Development’s April 2010 donation of some €1 million to support the biodiversity activities in the Socotra Archipelago.

GEF's field activities are largely contained in the Small Grants Program administered by UNDP in Sana'a Annex 8 illustrates the types of projects supported.

The Deutsche Gesellschaft Für Internationale Zusammenarbeit (GIZ) [formerly known as GTZ], has a 5 year program (2011-2016) for biodiversity protection in Yemen. The objective of the project is to promote sustainable management of natural resources working through local economic development and biodiversity conservation efforts. Pilot activities focus on the Island of Socotra and target poor and vulnerable populations who live near protected areas. GIZ works closely with the Ministry of Water and Environment in and the Environmental Protection Authority (EPA). Security issues in Yemen have significantly slowed the projects activities and implementation of the pilots and leveraging lessons learned for additional impact. GIZ has also sponsored work on solid waste management in Yemen and the larger Middle East Region.

C. STATUS AND MANAGEMENT OF NATURAL RESOURCES

Yemen hosts a variety of habitats which range from coastal mangroves, shrub lands and dunes along the coastal plains to the eastern deserts and an array of mountain habitats that reach elevations of up to 3,760 meters at Jabel Al-NabiShauib, the highest point on the Arabian Peninsula. These habitats harbor a great number of unique species of plants. Rapid degradation of the environment, a direct result of desertification and droughts are drastically reducing the country's vegetation cover and posing severe threats to wildlife.

Over the last several decades, the total area of natural habitat has decreased or been degraded. Causes of such degradation include over-exploitation of range resources, land conversion, poor agricultural practices and the pressures of a rapidly expanding population (current growth rate is 3.5% per annum, one of the highest rate in the region). Plant populations are thought to have declined considerably, and agricultural production has undergone dramatic changes due to the expansion of Qat plantations at the expense of other crops.

The unique geographical position between the Arabian Peninsula and Africa and at the junction point of the Red sea and Arabian Sea has given Yemen different climatic and topographical features favorable to a high level of biodiversity within 7 physiographic areas: the coastal plains; low altitude mountains; medium altitude mountains; high altitude mountains; highland plains, eastern/ northeast mountains; eastern desert and Socotra Island. (see map on page 1 for reference about these areas).

References: 3, 14, 37

C1. Yemen's Natural Resources

Although the country is over 90% desert, Yemen is also home to several different types of ecosystems. The terrestrial ecosystem is separated into the mountainous region and the semi-arid lowlands. The majority of the land in Yemen is included within the Ethiopian xeric grasslands and shrub lands ecoregion, arid, semi-desert area bordering the Red Sea and the Gulf of Oman. With Yemen's differing microclimatic conditions, the natural woody vegetation of Yemen is quite diverse and include savannah woodlands in the foothills of the Tihama plain, Acacia scrub woodlands in the foothills and highlands, tree communities located on the larger fans of the major wadis that flow onto the Tihama, tree cover in wadi bottoms in the intermountain region and mangroves in the coastal belt from Hodeidah to the Saudi Arabian border.

Yemen's forest occur in four areas as follows:

Tihama woodlands: The coastal plains along the Red Sea and those between the Gulf of Aden and the southern highlands around Toaz are at altitudes from sea level up to 400 m, have mean annual temperatures of about 30° C, and an annual rainfall rate of 200 mm as well as relatively high humidity.

Steep slope and western mountains woodlands: Mountains of less than 1000 m up to more than 2000 m in altitude include Jabal Malhan, J. Bura and J. Rima and west as a narrow strip from Toaz to the Loder steeps. The region experiences mean annual temperatures of about 26° C. and the annual precipitation varying between 200 and 600 mm with the higher rates on the western slopes.

Middle escarpment and valley woodlands: Located east of the highlands' mountain slopes, the area includes Wadi Hadramout and plains south to Loder steeps.

Al-Khowf forest (Mahra): Located in Mahra province, the annual precipitation in the mountain region is about 500 mm.

In the flat intermountain basins of the middle escarpment, where runoff from the higher slopes is available, evergreen woodlands are dominated by *Dobera glabra* and mixed with *Ziziphus spina-christi*, *Balanites aegyptiaca*, *Salvadora persica* and *Gadaba rotundifolia*.

In the wadis of the middle escarpment, two main forest communities can be differentiated: A lowland riverine plant formation, dominated by *Tamarix nilotica* and *Ziziphus spina-christi*. Sometimes *Acacia nilotica* and *Delonix elata* occur; and in the narrow valleys of the higher slopes, at altitudes ranging between 600 and 1600 m above the sea level, a higher riverine forest where the most common species are: *Tamarindus indica*, *Mimosopsis schimperii*, *Terminalia brownii*, *Combretum Molle*, *Trichilia emetica*, *Breonardia salicina* and *Ficus populifolia*.

On the wetter western slopes of the highlands and higher escarpment, the vegetation community is an evergreen broadleaved woodland having as dominant species *Cordia abyssinica*, *Ficus vasta* and *Olea chrysophylla* associated with *Acacia abyssinica* and *A. gerrardi*. In the arid eastern slopes a xerophyllous community dominated by *Acacia negrii* and *A. gerrardi* occurs, associated with shrubs like *Carissa edulis*, *Lycium shawii* and *Myrsine africana*.

On the highland plain, a few relict woodlands are still surviving, especially between Huth and Saads where low population density allowed the preservation of nearly natural woodland communities. *Acacia negrii* and *A. gerrardi* are the dominant species. *Acacia ehrebergiana*, *Cordia abyssinica*, *Ziziphus spina-christi* and *Ficus salicifolia* are found where more runoff water is available.

The small gorges and valleys of the dissected hills of the higher escarpment have a denser plant cover, where some species of the lower altitudes such as *Acacia Asak*, *A. Mellifera*, *A. Abyssinica*, *Trichilia emetic* and *Terminalia brownii* are present.

Mangrove Forest. In the protected tidal range, near the seashore of the Red Sea, the mangrove *Avicenna marina* is most common. It grows in seawater and is present on scattered areas along the coast, especially near Al Khawbah and Al Luhayyah. Decomposition of mangrove leaves provide habitat for detritus and bacteria that are the basic food source for meiofauna, mollusks and crustaceans, including commercial shrimps. They also provide nesting sites for shore and sea birds.

Two species of mangroves occur in the Yemen Red Sea coastal area; *Avicenna marina* (Black Mangrove), and *Rhizophora mucronata* (Red Mangrove). The total area of *A. marina* in Yemen Red Sea form 12% of the coastal strip with 100-200m wide and up to 5m high. The majority of mangrove stands occur to the north of Al-Urj with some large stands around the Oreste point of the Yemen/Saudi border and Al-Luhayyah/Bahr Ibn Abbas area. *R. Mucronata* was recorded from a small island of one hectare area in Khor Kathib near Al-Hudydah.

Conditions along the Gulf of Aden coast are much less suitable for growing mangroves. The upswelling phenomena of the Gulf which brings deeper cold water rich in nutrients to the surface and higher turbidity causes massive macro algae blooms which choke out the mangroves from taking root. Only one small (less than 1 ha) has been identified in the Gulf region near Bir-ali about 4 km north of Khor Showran has been identified. There is also a crater lake fringed with mangrove (species *A. marina*, the same found in the Socotra Archipelago).

Near the foothills of Tihama, especially in the belt lying to the west of the first mountains, from Wadi Zabid to Wadi Nawr, the most significant tree formation consists of a deciduous woodland of *Dobera Glabra* and *Balanites Aegyptiaca*, associated with *Acacia ehrenbergiana*, *A. oerfota* and *A. tortilis*.

Evergreen Alluvial Forests. Along the wadi beds in Tihama some evergreen alluvial forests grow. *Tamarix nilotica* is the dominant species, accompanied by *Salvadora persica* and *Hyphaene thebaica*.

Drought-Deciduous Woodland. On the undulated pediments of the middle escarpment there is a drought-deciduous woodland dominated by scattered *Acacia tortilis* and accompanied by *Commiphora myrrha*, *C. kataf* and *Berchemia discolor*.

The Wadis. The natural vegetation on the wadis of the highlands consists mainly of riverine formations of *Tamarix Aphylla*, sometimes mixed with *Acacia negrii*. In the wadis of the semi-desert region, important relicts of riparian woodland still exist. *Tamarix Niloti* is frequently present, together with *Calligonum comosum*, *Salvadora persica*, *Acacia tortilis* and *A. hamulosa*. Grasses like *Desmostachya bipinnata*, *Juncus acutus* and *Suaeda aegyptiaca* are also found.

Coniferous. On the north-facing slopes of Jabal Sabir, J. Isbil and J. Laws, *Juniperus procera* is present in few relict stands at altitudes ranging between 2600 and 3000 m. *Acacia negrii* may also be found, mixed with *Juniperus* up to 2800 m, while the most common shrubs are *Rosa abyssinica*, *Myrsine africana* and *Olea chrysophylla*.

Shrubs and Bushlands. After a strip of sterile soil two to five km wide behind the mangrove forests is a salt bush community dominated by *Sueda fruticosa* and *Salsola spinescens*. On mobile sand dunes, grasses such as *Panicum turgidum* and *Odyssaea mucronata* and shrubs like *Leptadenia pyrotecnica* have an important role as sand binders. In the Tihama region, south of Wadi Zabid, an *Acacia-Commiphora* bushland is frequently present, dominated by small trees of *Acacia hamulosa*, *A. ehrenbergiana*, *Commiphora myrrha* and *C. gileadensis*.

On the steep slopes, especially the rocky and stony soils of the lower regions of the escarpment, the hillsides are covered by a bushland where *Acacia mellifera*, *A. asak* and *commiphora* spp. are the dominant species. A shrub layer consisting mainly of *Acalypha fruticosa*, *Adenium obesum*, *Anisotes trisulchus* and *Graewia tembensis* is also found and succulents like *Cissus quadrangularis*, *Caralluma russelliana* and *Aloe* spp. are common.

On the stony and rocky high mountain slopes, the dominant plant formations are alpine pastures rich in forbs and grasses where *Pennisetum setaceum* and *Dianthus uniflorus* are common.

The most important plant formation on the very dry stony and rocky slopes of the eastern mountains is a semi-desert drought-deciduous open shrubland with a few evergreen plants and succulents such as *Caralluma petraea*, *Farsetia longisiliqua*, *Lycium shawii* and *Euphorbia balsamifera*. Some isolated trees of *Acacia tortilis*, *A. hamulosa* and *Commiphora* spp. grow where more runoff is available.

Sea grass. Sea grasses are rooted plants found on soft substrata, with leaves above ground and interconnected stems, or rhizoms and roots below ground. Seagrass also includes flowering plants able to live under water in marine environments. Sea grass beds support the growth of epiphyters and provide a diverse environment for many species to habitate. Decaying materials enter the detritus food chain aid in stabilization of the seabed and prevent erosion from wave action. The grasses promote sedimentation and accumulation of organic and inorganic matter that are a direct food source for some invertebrates, fish, dugongs and turtles. An important nursery area for many species, the grassy areas harbor juveniles of various commercial fish and crustaceans.

Of nine species of sea grasses recorded in the Red Sea sub tidal area, only one, *Halophila ovalis*, occurs in Yemen. This is also the only sea grass species reportedly in Socotra Archipelago waters. Four species have been identified in Yemen's Gulf of Aden coastal area: *Halodula uninervis*, *Halophila ovalis*, *Cymodocea serrulata* and *C. rotundota*. Waters greater than 1m depth are dominated by *Cymodocea* (70% cover) and water less than 1m have a mix of mostly *Halodule uninervis* and *Halophila ovalis*.

Algae. In the Red Sea there are about 485 species of algae, with 39 species recorded in the Yemen coast in the intertidal area between Dhubab - Yakhtul and Al-Salif – Al-Urj. North of Hudydah substrates are generally dominated by *Sargassum spp.*. The dominant intertidal species were *Padina* and *Turbinaria* except for a notable area of reef flat in the north of Dhubab where dominant algal species are green *Caulerpa mexicana* and brown macro *Dectyota liturata*.

Upwelling in the Gulf of Aden enhances the growth of algae where 53 species have been identified from Mukalla to Qusaiyer. Twenty four species were reported in the sub tidal area of Socotra Archipelago.

Fresh Water Vegetation. Fresh water vegetation includes plants which have a low salinity tolerance and require a near continuous supply of fresh water. Shallow aquifers at Al-Khawkhah, Yakhtul, Al-Urj and Wadi Al-Mulk (North of Al-Mukha) are suitable areas for growing this type of vegetation along the Red Sea coast. Around the Gulf of Aden, fresh water vegetation is found in Ahwar, Al-Hiswa as well as just outside the Gulf on Socotra.

Four species of fresh water vegetation have been identified in Yemen's Red Sea coast and in the Gulf of Aden. *Phoenix Dactylifera* (date palm) covers most of the area between Al-Hudydah and Yakhtul in the Red Sea region and Ahwar in the Gulf of Aden. *Hypaene thebaica* (dom palm) is prominent between Al-Urj and Al-Jabanah north of Al-Hudydah. Palm like trees *Pandanus odoratissimus* are unique to the area between Al-Mujaylis and al-Fassah in the Red Sea coast. *Salvadora persica* trees (A'arak) dominate the coast between Al-Mukha and Dhubab as well as between Ras Qawa'a and Khor Umirah.

Phytoplankton. There are 283 species of phytoplankton recorded in the Yemen Red Sea and Gulf of Aden waters. A total of 206 species of diatoms and dinoflagellates have been found in Yemen waters. Thirty two species are restricted to the southern section of the Red Sea and Gulf of Aden. Fifty six species were recorded from Ras Isa Peninsula off shore water. Another 21 species were also recorded from Khalij Kamaran. A total of 130 species were recorded from the Gulf of Aden in February and May 1985. The plankton community of the Yemen Red Sea/Gulf of Aden waters shows that the majority of species are of Indo-Pacific origin.

Zooplankton. There are 139 species of zooplankton in Yemeni waters representing 9 groups as follows:

Group	Species	Group	Species
Protozoan tintinnids	55	Decapoda	1
Chondrophora and Siphonophora	12	Chaetognatha	11
Scyphomedusa	10	Echinodermata	2
Ostracoda and Cladocera	7	Tunicates	7
Copepods	34		

Eggs and larvae of benthic fauna, polychaets, molluscs, copepods, cirripeds, decapods, echinoderms and fish are distributed throughout the shallow waters of Khalij Kamaran and sub tidal zone of Ras Isa. Gulf of Aden species distribution is at its maximum near the southern part of the Red Sea and the Hanish Sill.

Halophytes. Halophytic vegetation usually occurs where a fresh ground water supply is limited or absent and where saline intrusion is rare. This type of flora stabilizes beaches and allows other less saline tolerant species to also germinate. Halophytic vegetation provides habitat to insects and birds as well as grazing grounds for goats and camels. Five species of halophytes have been identified along Yemen's Red Sea coast and 16 species are found in the Socotra Archipelago coastal area.

Polychaeta. Four species are identified in Yemeni sea waters including *Spirobranchus giganteus*, *Sabellastarte sanctijosephi*, *Diopatra* sp. (Gulf of Aden and Arabian Sea only) and *Pamatoeios kraussii*.

Echinodermata. Echinoderm animals are bottom dwellers that usually thrive in shallow warm water. They are also found at all depths and latitudes. The 72 species of echinoderms found in Yemen's waters are of Indo-Pacific origins. Among the Yemeni echinoid community, *Diadema setosum* seems to be the most common.

Molluscs. A total of 625 species in four classes are identified in the Red Sea. One study found 117 species from Al-Salif, Ras Isa, Al-Urj and north and south of Al-Mukha. Some 17 species were associated with mangrove habitat, 17 species with sea grass, 32 species with sandy shores 37 species, and rocky and reef flats 72 species.

In the Yemeni Gulf of Aden region and Socotra, some 729 species in four classes have been recorded. This includes 146 species of Gastropods, 63 species of Bivalve and 13 species of Polyplacophora.

Crustacea. Fifty three species of crustacea belonging to 6 families were recorded from the Yemen Red Sea coastal area and a total of 24 species were recorded from the Gulf of Aden/Arabian Sea. A total of 45 species of crustacea were recorded from Socotra Archipelago.

Fish. Yemeni waters have a great diversity of fishes, in part, because of the upwelling phenomena in the southern water Gulf of Aden/Arabian Sea. A total of 416 species were recorded from the Yemeni Red Sea water including 401 species of bony fish and 21 species of cartilaginous fishes (Rays =5 species & Sharks = 16 species). A total of 169 species were recorded from Socotra Archipelago.

Birds. The Arabian Peninsula is an important "land bridge" between Africa, Asia and Europe for approximately three billion birds that annually migrate along north-south or east-west routes. About 82 species of sea and shore birds were recorded from the coastal area of Yemen along the Red Sea, of which 14 species are endemic. Fifteen species are found in the southern coastal region of Yemen. A total of 70 bird species are found in the Socotra Archipelago. Yemen is a wintering area and breeding ground for a small population of the Bald Ibis (*Geronticus eremita*). The retention of grazing marshes, especially in the Taiz area is critically important. The White-eyed Gull (*Larus leucophthalmus*) is found throughout the year on the coast and may well breed on Yemen's off-shore islands.

Mammals. Yemen has 71 recorded land mammal species representing eight orders including bats. About one third of the mammals are relatively large species which are rare in other parts of Arab lands such as the Idmi or Arabian Mountain Gazelle (*Gazella gazella*), Ibex (*Capra ibex Nubian Baboon* (*Papio hamadryas*), Arabian Red Fox (*Vulpes vulpes arabicus*), Sand Fox (*Vulp ruppelli*), Blanford's Fox (*Vulpes cana*), Striped Hyena (*Hyaena hyaena*), Arabian W (*Canis lupus arabs*), Jackal (*Canis aureus*), Arabian Leopard (*Panthera pardus nimr*), and possibly the Cheetah (*Acinonyx jubatus*).

References: 4, 5, 6, 8, 14, 17, 18, 19, 22, 24, 25, 28, 29, 30, 31, 32, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 48, 51, 54, 55, 56, 61, 62, 66, 70

C1a. Major Ecosystem and Transboundary Areas in Yemen

There are six designated major transboundary eco-regions which cross Yemen territory and waters. These are:

Arabian Desert and East Sahero-Arabian Xeric Shrublands:

<http://www.globalspecies.org/ecoregions/display/PA1303>

The largest eco-region is on the Arabian Peninsula, it is a vast desert wilderness stretching from Yemen to the Arabian Gulf and from Oman to Jordan and Iraq. At 500,000 square kilometers, it is one of the biggest continuous bodies of sand in the world. Gazelles, oryx, sand cats, and spiny-tailed lizards are some of the desert-species adapted to survive in this extreme environment of red dunes and deadly quicksand.

Arabian Peninsula Coastal Fog Desert

<http://www.globalspecies.org/ecoregions/display/AT1302>

A remarkable habitat for many rare Arabian creatures including oryx and gazelles, this area is often in a dense fog with visibility for humans limited to only about 10 m.

Red Sea Nubo-Sindian Tropical Desert and Semi-Desert

<http://www.globalspecies.org/ecoregions/display/PA1325>

This area begins near the coast of Oman across its central plains to the Dhofar mountains, then cross into Yemen and across the deserts of Saudi Arabia and Jordan into Iraq. Much of this region is flat expanses of sand, gravel, or lava plains and home to endangered Arabian white oryx, rare plants, sand cats, and monitor lizards.

Socotra Island Xeric Shrublands

<http://www.globalspecies.org/ecoregions/display/AT1318>

The Socotran archipelago has been called the "Galápagos of the Indian Ocean" and even the "Arabian Eden" because of the unique plant and animal communities that live there. The Islands host about 250 species of plants, 21 species of reptiles, and 6 species of birds found nowhere else on Earth

Southwestern Arabian Foothills Savanna

<http://www.globalspecies.org/ecoregions/display/AT1320>

The Hadramaut and Mahra region of eastern Yemen lies within the Southwestern Arabian Foothills Savannah eco-region, is the least-known area of the Arabian Peninsula and possibly the least explored region in southwest Asia. Scientists suspect that Arabian leopards and other large, threatened mammals may still prowl in this foothill habitat.

Southwestern Arabian Montane Woodlands

<http://www.globalspecies.org/ecoregions/display/AT1321>

This highland region overlooking the Red Sea is home to rare Arabian leopards, Hamadrayas baboons, and many other amazing species. The highlands contain sparkling mountain streams, forests shrouded in mist, and at incredible high-altitude there are terraced farms that have been cultivated for more than 2,000 years.

References: 13, 20, 26, 31, 39, 41, 42, 43, 48, 54, 55, 56, 57, 66, 69, 70

C1b. Status and Management of Protected Areas

Yemen formally designated six protected areas out of some 40 environmental sensitive places originally evaluated by the ROYG in accordance with the "Environment Protection Law" No. 26 (1995), and article 11 of the bylaw No. 148 (2000) which provide that: "A protected area may be established, in natural habitats, by a Prime Ministerial decree upon the recommendation of EPA or any specialized body".

These areas are:

Aden wetlands Protected Area	Kamaran Island Protected Area
Bura'a Protected Area	Socotra Archipelago Protected Area
Hawf Protected Area	Utoma Protected Area (referred to as Autma on the Yemen EPA List of Protected Areas)

Dhobba, Ras Isa/Kamaran Island, Khor Umaira, Bab-al-Mandab & Perim Island, Luhayah and Hannish Archipelago) were identified for protecting mangroves.

Aden Wetlands Protected Area

The Aden Coastal Wetlands are considered to be one of the most important sites for migratory birds and regularly host three globally threatened and 12 regionally important species populations. The site meets the conditions of the International Ramsar site and Bonn Conventions. Among the most significant species found in the area is the Lesser Flamingo (*Phoenicopterus minor*) with 9200 birds counted on the last census (in 1996), the largest concentration anywhere in the Middle East. Other important species include Great Spotted Eagle (*Aquila clanga*), Imperial Eagle (*Aquila heliaca*), and Crab Plover (*Dromas ardeola*). The wetlands surrounding Aden city consist of: a) marshland covering an area of 50 ha which receives the run-off a nearby sewage treatment plant, b) an artificial sewage treatment lagoon, c) four large lagoons on the west side of the Aden peninsula, d) large intertidal flats; and e) sandy beaches and rocky cliffs.

Bura'a Protected Area

The Name Bura'a Natural Protected Area (BNPA) is taken from that of the granite massif, Jabal Bura'a on which it is located. Administratively, BNPA is located in Al Hudaidah Governorate, about 50 km north of Al Hudaidah city. It has an area of 4,278 ha. Jabal Bura'a ranges in altitude between 300 to 2,200 meters and is intersected by a number of valleys, the most important of which are "Wadi Rijaf" "Wadi Al Aswad" and "Wadi Al Bussal".

Bura'a forest represents a relic of the tropical forests that were once predominant in the Arabian Peninsula. About 300 plant species belonging to 83 families have been recorded from BNPA. A total of 63 species are considered rare; 35 as vulnerable and 8 as endemic. Among animals, 9 terrestrial vertebrate, including the hamadryas baboon, the white tailed mongoose, the porcupine and the hyena have been recorded in the desert. About 93 bird species have been recorded in BNPA. Of these, 32 are resident species, 17 migrant, 5 summer visitors, 2 endemic and 2 threatened species. Reptiles are represented by 13 species including fresh water turtles and the Yemeni monitor lizard. There are also frogs and toads in addition to many species of invertebrates. The main vegetation communities are: a) *Antsotes trisulcus*, b) *Maytenus* sp., c) *Acalypha fruticosa*, d) *Abrus bottae*, e) *Acacia asak*, f) *Commiphora kataf*, and g) *Combretum molle*.

Hawf Protected Area

This protected area is located in Al Mahra Governorate near the borders with the Sultanate of Oman and contains the largest forested area in the Arabian Peninsula. It covers an area of 30,000 hectares ascending gradually from the sea level to an altitude of 1400 meters. There are several valleys intersecting the mountains. Hawf normally receives very little rain, but mist/fog covers the entire region from June to September. Hawf has a coastline of some 18 km

Forests are dominated by *Anogeissus dhofarica*, *Dodonaea angustifolia* and *Jatropha dhofarica*. The site is rich in species endemic to the Huf and Dhufar regions. Among the important endemic plant species are: *Maytenus dhofarensis*, *Euphorbia smithii*, *Jatropha dhofarica*, *Anogeissus dhofarica*, *Commiphora faliacea*.

A few large mammals such as the Arabian leopard, the ibex, gazelles, wolves, hyenas, foxes wild cats and porcupines are native to the area. Other animals recorded here include 65 bird species six of which are rare species.

Kamaran Island Protected Area

Kamaran island is a marine protected area located in the Red Sea, 5 Kilometers from Al-Hodidah. Mangrove cover the north part of the island. An April 10, 2010 Yemen Post article referred to the Island as "Yemen's Neglected Island" and detailed the state of disrepair of the island infrastructure and the deplorable conditions in which the island inhabitants currently exist.

Socotra Archipelago Protected Area

Socotra Archipelago is comprised of four islands located in the Indian Ocean. The largest, Socotra, has an area of 3600 km² and a mountainous interior rising to more than 1500 m. Three islands lie at about 50 km to the south-west: Samha (41 km² in area), Darsa (17 km²), and Abd al Kuri (133 km²). The Islands lay at the margins of the sub-equatorial and northern tropical climate belts averaging temperatures of 17 and 37°C in winter and summer, respectively. From May to September the islands experience the summer monsoons with strong south-westerly winds that often impair maritime activity.

Isolated from the mainland, Socotra has unique biocommunities and a high rate of endemism. Of 850 plant species known on the islands, about 293 are endemic. About 80% of invertebrate species are endemic as well as 90% (27 of 30) of reptiles. Of the 32 species of birds on the islands, 6 (19%) are endemic. According to Yemen's website on the Convention on Biodiversity, a management plan for this area been prepared and it is in effect. However, the extent of this plan has not yet been confirmed.

Utoma Protected Area

The Utoma Protected Area was the first to be declared as protected area. Located in Dhamar province, it lies at elevations ranging from 920 to 2800 meters above sea level and covers an area of 460 km². It is characterized by a volcanic series of mountains with granite cliffs. This series is intersected by deep valleys and springs that hold water throughout the year.

Over 130 plant species have so far been recorded. Utomah also has been reported as a major ecosystem for wild trees, including acacias and cactus-like shrubs, which grow side by side or intermingle with a variety of domestic crops such as sorghum and coffee in what appears to be a mutually beneficial situation. Several wild mammals species, including wolves, hyenas, foxes, hares and hedgehogs, and birds such as Palestine Sunbird (*Nectarinia Osea*), Palm Dove (*Streptopelia Senegalensi*), and Arabian Golden (Sparrow *Passer Euchloru*) nest here. A pair of Kestrel *Falco Tinnunculus* were discovered nesting in an island resident's house and reportedly produced two large offspring.

Ref.: 4., 5., 6., 8., 22., 35., 39., 42., 49., 54., 55., 56., 62., 63.,

C1c. Threats to Protected Areas

The main threat to protected areas is uncontrolled human access from poor institutional management by the EPA and a lack of conservation ethic among the public. The EPA has apparently not developed any specific protected area management plans for the designated sites nor is there, apparently, any implementing policy statements. Other threats to protected areas are, therefore, similar to the general biodiversity threats discussed elsewhere in this assessment.

C2. Status and Protection of Endangered Species

The IUCN has established criteria regarding the relative endangerment of animal species in a country. The chart below identifies the number of species in Yemen reported against this scale in the most recent reporting year:

Extinct EX	Extinct in the Wild EW	Critically Endangered CR	Endangered EN	Vulnerable VU	Near Threatened NT	Lower Risk/ conservation dependent LR	Data Deficient DD	Least Concern LC
2	0	4	10	104	155		106	889

Source: IUCN Red List of Threatened Species. Version 2012.2., www.iucnredlist.org,

Specific information available on IUCN's comprehensive data base, is currently limited to the following species for which the threat data base currently contains data:

Queen of Sheba's Gazelle, Yemen Gazelle - EX
The population was described as very common in 1951, but there have been no records since the 1950s and the species is now believed extinct.
Pinheyschna Yemenensis, Yemen Hawker - VU
<i>Aeshna yemenensis</i> is a poorly known species thought only to be in SW Yemen, in the central high plateau range (>

2,000 m), over an extent of about 11,000 km². The number of known reproductive localities is no more than six.

Arabian Accentor, Yemen Accentor - NT

Prunella Fagani is endemic to the high-altitude western mountains of Yemen, where it known from only six localities during the breeding season: Kawkaban; Manakhah; head of Wadi Bana; Sumara pass; near Ibb; and Jabal Sabir (Redman 1987). Its small breeding range lies in a high-rainfall zone that has been densely settled and heavily cultivated for millennia. Records from slightly south of its breeding range suggest that a small number of birds may move to lower altitudes in winter.

Arabian Tit-Warbler, Yemen Warbler - VU

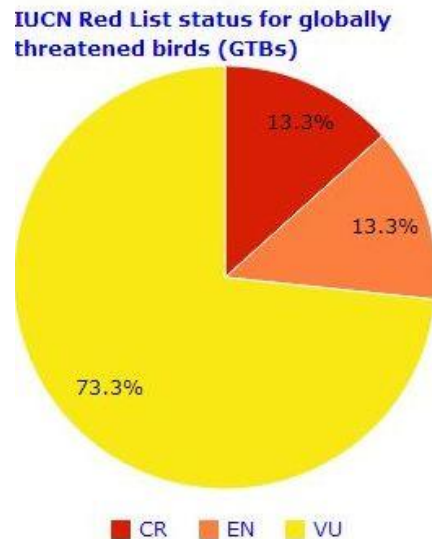
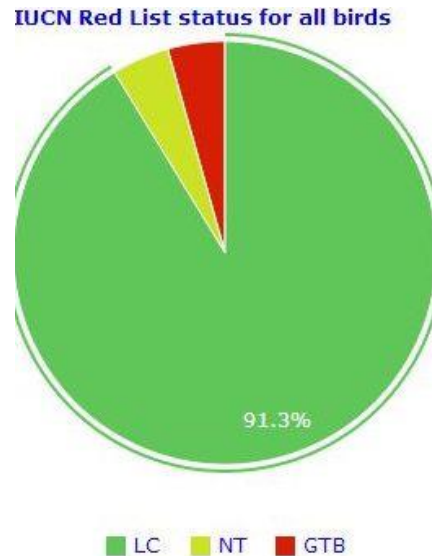
The population is estimated to number 2,500-9,999 mature individuals based on records of abundance and range.

Turdus menachensis Yemen Thrush - VU

The population is estimated to number 2,500-9,999 mature individuals based on records of abundance and range.

BirdLife International, a consortium of groups working to conserve birds and their habitats, has identified the following list of Yemeni birds which have been classified using the IUCN criteria:

Scientific name	Common name	Red List Category
<i>Geronticus Eremita</i>	Northern Bald Ibis	CR
<i>Numenius tenuirostris</i>	Slender-billed Curlew	CR
<i>Falco cherrug</i>	Saker Falcon	EN
<i>Neophron percnopterus</i>	Egyptian Vulture	EN
<i>Aquila clanga</i>	Greater Spotted Eagle	VU
<i>Aquila heliaca</i>	Eastern Imperial Eagle	VU
<i>Buteo socotraensis</i>	Socotra Buzzard	VU
<i>Chlamydotis undulata</i>	Houbara Bustard	VU
<i>Dendrocopos dora</i>	Arabian Woodpecker	VU
<i>Emberiza socotrana</i>	Socotra Bunting	VU
<i>Passer hemileucus</i>	Abd Al Kuri Sparrow	VU
<i>Phalacrocorax nigrogularis</i>	Socotra Cormorant	VU
<i>Sylvia buryi</i>	Yemen Warbler	VU
<i>Torgos tracheliotos</i>	Lappet-faced Vulture	VU
<i>Turdus menachensis</i>	Yemen Thrush	VU
<i>Ardeotis arabs</i>	Arabian Bustard	NT
<i>Aythya nyroca</i>	Ferruginous Duck	NT
<i>Bulweria fallax</i>	Jouanin's Petrel	NT
<i>Circus macrourus</i>	Pallid Harrier	NT
<i>Cisticola haesitatus</i>	Island Cisticola	NT
<i>Coracias garrulus</i>	European Roller	NT
<i>Emberiza cineracea</i>	Cinereous Bunting	NT
<i>Falco concolor</i>	Sooty Falcon	NT
<i>Larus leucophthalmus</i>	White-eyed Gull	NT
<i>Limosa limosa</i>	Black-tailed Godwit	NT
<i>Numenius arquata</i>	Eurasian Curlew	NT
<i>Phoeniconaias minor</i>	Lesser Flamingo	NT
<i>Prunella fagani</i>	Yemen Accentor	NT
<i>Rhynchostruthus percivali</i>	Arabian Grosbeak	NT
<i>Terathopius ecaudatus</i>	Bateleur	NT



Source: [Birdlife DataZone](#)

C3. Status and Protection of Forest Resources

Yemen has no planned or planted forest and the present forest resources are only natural forests that are saved from destruction because of their location in the remote inaccessible areas. Until 1990 the country had no intention to declare

any protected area/land. With assistance from many international donors and organizations it was possible to raise the awareness of many stakeholders and decision makers about these vital issue. With the significant population growth, the country planners need to decide on the type and the extent of land to be used as forests, the species to be grown, the management system and most of all to protect the existing forests. The protection of present forests is crucial because it protects the soil against erosion factors (water and wind), improves humidity, slightly lowering the temperatures, increases soil fertility with the fallen leaves, and acts as safe habitat for wildlife.

Ref.4, 5, 8, 14, 18, 19, 24, 30

C4. Conservation Outside of Protected Areas

Management of the formal protected areas has been characterized in the literature and in discussions with outside experts as minimal by government authorities and there is limited evidence that management in the informal protected areas described in C.2.above is any better.

In addition to the areas cited previously, a number of additional important areas have been identified for endemic species of birds by BirdLife. For purposes of its resource work, BirdLife defines an area as Endemic Bird Area for those species whose range is within an area smaller than 50,000 km² and thus they are deemed endemic to the area. BirdLife has identified some 2,500 areas internationally including two in Yemen as follows:

- Socotra
- South-west Arabian mountains

Believed critical to the long-term viability of naturally occurring bird populations, BirdLife has also identified Important Bird Areas (IBAs). IBAs are: a) places of international significance for the conservation of birds and other biodiversity; b) recognized world-wide as practical tools for conservation; c) distinct areas amenable to practical conservation action; d) identified using standardized, agreed criteria; and e) sites that together form part of a wider, integrated approach to the conservation and sustainable use of the natural environment. Yemen IBAs are:

Important Bird Area in Yemen		
Abd al-Kuri	Haraz mountains	Noged plain, Socotra
Abdullah Gharib lagoons	High mountains of Ibb	Nukhaylah - Ghulayfiqah
Aden	Hiswat al-Hugayma	Qalansiya lagoon, Socotra
Airport dunes, Socotra	Islands north of Al-Hudaydah	Qishn beach
Al-'Urj	Islands off Bir Ali	Ra's Fartak
Al-Fazzah	Jabal al-Nabi Shu'ayb	Ra's Hebaq, Socotra
Al-Ikhwan	Jabal Bura	Ra's Momi and Fikhah, Socotra
Al-Kadan area	Jabal Iraf	Rewgid and Regid plateaus, Socotra
Al-Mukha - Al-Khawkhah	Jabal Jef, Socotra	Rookib hills, Socotra
Al-Murah	Jabal Ma'lih escarpment/Badiya	Sabuniya and Ka'l Fir'awn
Bab al-Mandab - Mawza	Qalansiya, Socotra	Shidahah, Socotra
Bahr Ibn Abbas - Ra's Isa	Jabal Sumarah	Ta'izz wadis
Coast of Bindar Di-Sha'b, Socotra	Jaza'ir al-Hanish	The wooded Mahra
Desert west of Al-Ghayda	Jaza'ir al-Zubayr	Wadi al-Birayn
Di-Ishal foothills, Socotra	Kawkaban - Shibam	Wadi Ayhaft, Socotra
Diksam, Socotra	Ma'rib - Naqil Fardah - Baraqish	Wadi Hajar
Firjih/Central Socotra	Mafraq al-Mukha	Wadi Jahr
Firmihin near Jabal Keseslah, Socotra	Mahwit	Wadi Mawr - Al-Zuhrah
Hajhir mountains, Socotra	Midi - Al-Luhayyah	
Hamaderoh plateau and scarp, Socotra	Muqadrihon pass, Socotra	

Source: Birdlife

The sandy coasts to the saline mud flats, mangrove swamps, coral reefs and sea grass beds patch, fringing and bottom reefs are known to contain at least 90 species of corals which have thus far been recorded. There is likewise a great diversity of fish (416 species), 82 species sea and shore birds, 625 species of mollusks, algae (485 species), phytoplankton (2 species), as well as four species of marine turtles, including the most important nesting beach for green turtles in the entire Arabian Region at Ras Sharma. Compared to other parts of the Red Sea, the shallow nutrient rich waters above the wide continental shelf of Yemen are rich fishing grounds. Fish supply a great amount of protein in the diet of Yemenis, and with the improved road communications systems, people in the populated mountainous areas also enjoy a more diverse diet with seafood. An array of threats from pollution to coast reclamation and bottom trawling currently threatens Yemen's coastal and marine environment. It is important to limit these threats and initiate and implement sound integrated coastal zone management for the sustainable use of Yemen's marine and coastal environment including the identification and management of protected areas.

Yemen has five main agro-ecological zones: The Coastal Plain, Western Mountains, Highland Plain, Eastern Mountains and Eastern Desert Plain [Scholte et al. 1991]. Rainfall amount and seasons, temperature and humidity are variable between these zones. This has led to great botanical diversity, as well as variation in growing seasons and quality of grazing lands. The mountainous area and the Highland Plain are Yemen's main rain fed agricultural areas. Most of the cereals and pulses are grown there and there are some vegetable and fruit orchards. In addition, the most productive pastures with terrace systems form the main part of the highlands that make it the most important area for cattle and sheep production. Terraced agriculture is an old Yemeni method of soil conservation and water harvesting. The terraces were built along the mountain slopes and have been farmed ever since. The cropping pattern is based on cereals (barley, wheat, sorghum) and pulses in the rainy season June-August when livestock are kept away from cultivated terraces and fodder is harvested to be fed either green or made into hay to be fed during dry seasons (winter period).

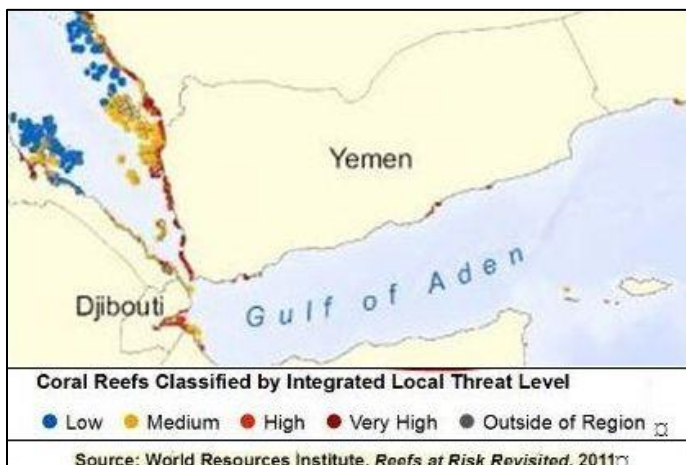
Source: Yemen Country Pasture/Forage Resource Profiles – FAO (sic 2002)

Yemen's wetlands can be divided into natural and man-managed systems. The former include four subdivisions:

- Marshes and lagoons, around Aden, which form a suitable refuge for several species of birds.
- Mangrove sites in the Tehama “west coast of Yemen” and Bir Ali mangrove site on the southern coast.
- Valleys and permanent streams all over the country which support all kinds of freshwater biodiversity, including microorganisms, various invertebrates, fish, amphibians, birds, and many plant species.
- The swamps of Taiz, the only known site in Yemen for the globally threatened Bald Ibis *Geronticus eremicus*.

Ref 13, 16, 17, 18, 22, 32, 35, 42, 43, 48, 49, 55, 63, 70

C5. Status of Coral Reefs



Southern Yemen is in the Gulf of Aden and Arabian Sea Region with reefs extending from the narrow strait of Bab Al Mandab at the southern entrance to the Red Sea to the Omani border in the East. The Gulf of Aden is characterized by rich marine diversity stemming from its geographical location, stable meteorology and variable hydrodynamic factors. A seasonal upwelling in the Gulf of Aden promotes the growth of macro-algae on most hard substrates, especially to the East and increases primary productivity that supports high biodiversity.

An almost continuous band of coral reefs fringes the shorelines of the northern and central Red Sea, including the Gulf of Aqaba. Red Sea corals colonize a series of narrow banks about 3-10 km offshore, forming a large barrier reef running parallel to the coastline. Further south, the shelf becomes broader and shallower, soft bottom substrates prevail and turbidity increases, resulting in a decrease in the extent and complexity of coral reefs in that portion of the Red Sea near Yemen. However, the Gulf of Aden still supports surprisingly rich and complex reefs, and the corals surrounding the Socotra islands are particularly diverse.

Over 120 islands lie in the seawater of Yemen with distinct climatic and natural characteristics. More than 115 of these islands are in the Red Sea region. Among those located in this region, Kamaran Island is the largest, and Mayoan Island, located in the Bab El Mandab Strait, has strategic importance. Most corals and coral habitats exist around the Yemeni islands, but with different diversity of communities and number.

Although the Yemeni coast of the Gulf of Aden remains poorly described, recent studies have found a number of interesting and important coral communities and some true reefs around Al Mukalla, Bir Ali and Shuqra. Some of these communities include wide areas of mono-specific coral stands, notably of Pocillopora and Montipora. Until the 1990s, few significant coral communities were believed to exist off the coast of Socotra. However, recent surveys have shown extensive areas of high live coral cover in the northern reaches of both Socotra and the neighboring islands. Some 240 hard coral species have been recorded, making Socotra as the area with perhaps the most diverse reefs in the Indian Ocean region.

Oil terminals are located in Hudaydah and Mukha. Oil exported, shipping traffic, oil pollution, sewage and industrial development have had localized impacts on the Gulf coral habitats. Corals have been mined for construction purposes in several countries including Sudan and Saudi Arabia, broken into manageable sizes or crushed for the manufacture of cement and lime. Corals are also collected for use in the ornamental trade as curios, souvenirs, or as jewelry.

In 2008, IUCN entered into a 3-year agreement with the Yemen LNG Company to establish an independent third party review of the Company's strategy for marine biodiversity protection as implemented through its Biodiversity Action Plan (BAP) which listed 25 biodiversity actions for the construction and design phases of the project. These actions focused on the protection of the coral reef ecosystem at Balhaf on the south coast of Yemen, the site of the Company's gas liquefaction plant and shipping facilities. They also focused on support for sustainable fisheries in the communities near Balhaf.

The IUCN panel reported in its 2012 annual report that LNG had had positive results in its efforts to protect the corals at the site through the use of silt curtains during the construction phase. Additionally, the company successfully transplanted about 1000 corals, about 4 tons in weight and hundreds of years old, to make room for the jetty for the LNG tankers, a pier for supply boats and harbor management, and the piping of seawater used in the gas liquefaction process.

Protection of the Balhaf area from fishing and other uses through the port exclusion zone has resulted in the establishment of a de facto strictly protected marine protected area. This is acting as a fish sanctuary which is not only good for local fish stocks but also for the health of the corals.

Coral reefs support complex food and energy webs that are inter-linked with nutrient inputs from outside sources and from the reef itself. These complex webs mean that any effect on one group of individuals will ultimately impact another, and single disturbances can have multiple effects on reef inhabitants.

Destructive fishing practices like blast fishing target schooling fish such as sweet lips and fusiliers which aggregate in groups in the open or hide under large coral beds. Bombs are usually dropped into the center area of the school and the fishermen then use dip nets to collect the stunned and dying fish. Blast fishing damages corals pock-marking craters and, in some cases creates a band of coral rubble instead of a reef crest and upper reef slope. The blasts change the three-dimensional structure of reefs, and blasted areas often are no longer able to provide food or shelter to reef inhabitants. Once the reef structure has been weakened or destroyed by blast fishing it is much more susceptible to wave action and the reef is unable to maintain its role in coastline protection. Larvae do not settle on rubble and thus replenishment and rehabilitation is minimal. The recovery of such areas has been measured in decades, and only with complete protection and cessation of fishery pressure of any kind.

Another destructive fishing method involves the use of sodium cyanide or other chemicals squirted at fish to stun them, after which they are collected and sold to the live-fish trade. In the process, corals and other small fish and invertebrates are adversely impacted. Solutions that are narcotizing to large fish can be lethal to smaller ones. Trawl and purse fishing operations done close to or over reefs can also cause severe damage to reefs.

A significant shark fin fishery has been reported in the southern Red Sea and Gulf of Aden, with many fishers coming from Yemen operating illegally in the waters of neighboring countries. Apart from driving a rapid decline in shark stocks there is reported to be a considerable by-catch, including turtles and dolphins.

The area is a major shipping corridor and the international MARPOL convention designated the Red Sea and the Gulf of Aden as ‘special areas’. Oil is exported through Yemen and further distresses the coral and the fishery.

Reef fishing is widespread around Socotra including an artisanal lobster fishery. Along the Red Sea coastline of Yemen, where reefs are already under considerable human-induced stress, effects of coral bleaching have been severe, but little quantitative data have been developed. Many areas of the Gulf of Aden were affected by bleaching. In Yemen, many corals along the shoreline died, and more than half of the corals of the Socotra Archipelago were affected by the bleaching.

Ref: 10, 42., 47., 49., 53., 58., 65.

D. MAJOR THREATS TO BIODIVERSITY AND TROPICAL FOREST CONSERVATION

Major threats to biodiversity in Yemen include the occurrence of the following circumstances:

Habitat destruction	Overuse and depletion of limited fresh water.	Destruction of coral reefs and underwater habitats.
Degradation and conversion of natural habitat.	Degradation of wetland ecosystems.	Deterioration of native genetic resources.
Desertification, including wind erosion and sand dune encroachment	Contamination of ecosystems with sewage, industrial waste and other pollutants.	Desertification, terraces and rangeland degradation associated with rapid urbanization.
Agricultural expansion and poor agricultural practices.	Smuggling and uncontrolled exporting of indigenous livestock and native genetic species.	Increased water depletion.
Wood cutting for firewood, timber and charcoal production.	Marine and coastal habitat degradation.	Declining agricultural production.
Loss of rangelands including loss of sustainable	Over-exploitation, pollution and mismanagement of fishing in oceans and territorial seas	Over-grazing and over-cutting of trees.
Unsound rangeland management by local people.	Degradation of coastal and marine habitats.	Loss of natural habitats as a result of deforestation, desertification and land conversion.
Over-hunting and indiscriminate killing of wildlife species, especially ungulates and carnivores.	Sharp decline in important marine resources	Destruction of sensitive natural habitats

D1. Direct Threats

Direct threats are those that “are the proximate (human) activities or processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of biodiversity targets (e.g., trawling or logging)” (IUCN-CMP 2006, 1).

Threats to terrestrial fauna in Yemen and common to many countries in the regions include: a) destruction, degradation and loss of natural habitats; b) over-hunting and proliferation of firearms; and c) road construction opening up avenues into the hinterland.

Similarly, the quantity and quality of freshwater are threatened by numerous factors including overuse of water sources, degradation of wetland ecosystems, excessive use of pesticide, misuse of fertilizers, untreated wastewater and increased industrial waste.

The coastline of Yemen is over 1900 km long in the three differing coastal regions of the Red Sea, Gulf of Aden and Arabian Sea. The Red Sea region represents about a third of this coastline, with the remainder bordering the Gulf of Aden region. The Red Sea and Gulf of Aden region represent a complex and unique tropical marine ecosystem with extraordinary biological diversity and a remarkably high degree of endemism. It is an important shipping lane linking the world's major oceans. For example, about 100 million tons of oil transits the Red Sea annually. The Eastern Gulf of Aden and Arabian Sea region have highly productive fisheries because a tropical upwelling phenomenon supports a rich and diverse food web.

Coastal and marine resources are threatened by over fishing, spear-fishing, aquarium fishing and dynamite fishing. These factors also represent major disturbances to the coral reefs of Yemen. Oil exploration and transport have resulted in several oil spills. Sewage discharged agro-chemicals flushed by floods, and sedimentation from urban development pose further threats to the Red Sea's coral reefs. Industrial and urban development, as well as extensive coastal development, land filling, and coastal engineering are dramatically altering certain coastal areas. Recreation and tourism also contribute to eutrophication and reef degradation. Coastal and marine biodiversity, including the Socotra Island, is threatened by the cutting of mangroves for wood and the use of mangroves for feeding animals, fuel-wood supply, and new development projects.

Other threats to the coastal and marine environment of Yemen include: a) uncontrolled use of coastal zones; b) destruction of marine and coastal habitats and ecosystems; c) various conflicts amongst users, d) coastal reclamation problems; e) destruction of benthic habitats; f) bottom trawling; and g) destruction of endangered species because of high risk equipment used.

Ref 7, 10, 13, 17, 18, 21, 31, 32, 33, 34, 35, 39, 40, 42, 43, 45, 46, 47, 48, 49, 53, 54, 55, 56, 57, 58, 63, 66, 69, 70, 71, 74, 75, 80, 81, 84

D1a. Habitat degradation

Over the last several decades, the area of natural habitat has decreased or been degraded, through over-exploitation of range resources, land conversion, poor agricultural practices and the pressures of an ever expanding population. Plant populations are thought to have declined considerably, and agricultural production has undergone dramatic changes due to the expansion of Qat plantations at the expense of other crops.

In 2001, around 72% of cultivable land was being farmed and a further 0.8 million ha was covered by pasture and grazing lands. The conversion of land for agriculture has resulted in degradation, and loss of certain natural habitats. Poor waste management practices have resulted in ongoing pollution threats. In recent years, Yemen has increased its use of mechanized farming techniques, fertilizers and pesticides and suffered from bad soil management; poor plant nutrition practices; and overgrazing. Soil loss through wind and water erosion give way to decreased fertility and a subsequent decline in crop yields. Pressure is applied to putting marginal lands into cultivation, even during years with rainfall deficits. These practices also threaten sustainable habitat of Yemen's valued native animal and plant bio-resources. As these lands become less productive they may be abandoned resulting in desertification of widened areas and the full destruction of wildlife habitat.

In the coastal plains and in Ma'arib, wind erosion is accelerating on dunes causing encroachment of the desertification phenomenon on productive lands and infrastructures. Elsewhere in Yemen, this effect is also being seen from water drainage erosion on poorly managed lands with more widespread impacts on downstream areas.

D1b. Drought and desertification

The country's vegetation cover is being drastically reduced resulting in expanding desertification in some areas. The issues include both droughts other root causes such as: a) inadequate cultivation and poor agricultural practices; b) wood cutting for firewood, timber and charcoal; c) over grazing; d) soil salinization; e) water and wind erosion and sand dune encroachment; and f) encroachment due to housing and infrastructure development around cities and villages.

With a per capita water share at 10% of UNDP's water poverty line of 1000 cubic meters per year, Yemen is the most water-stressed country in the Middle East. According to the United Nations Development Program's Water Governance Yemen Biodiversity and Tropical Forest Assessment, July2013

Program for Arab States, desertification now threatens much of Yemen's agricultural land, and the capital, Sana'a, may run dry within a few decades.

Surface water in Yemen is estimated to be about 1500 Mm³/year. Around 50 diversion weirs and main distribution canals have been built by the government and dikes are built on many main wadis for the purpose of directing spate waters into branches of the wadis to earth canal spate irrigation systems, which irrigate around 120,000-150,000 hectares in the low lands of the country. There are also around of 800 medium & small dams for rainfall water harvesting in the highlands.

Groundwater resources are vital for Yemen's agriculture. For their recharge they depend mainly on spate running water and rainfall. Runoffs and springs in catchment's areas are the main sources of groundwater recharges. In Yemen, the estimated groundwater is around 1000Mm³, which makes the total renewable water resource sum 2.5 MM³, while the total demand is estimated to be 3,400Mm³ with 900Mm³ deficit, which is covered from deep aquifers.

Ground water aquifers decline 1-7 meters annually with very rare recharge. This raises the cost of pumping and causes a deterioration of ground water quality including sea (salt) water intrusion in the coastal plain areas. Some basins have become very dry and some cultivation has been uprooted due to the depletion of the ground water which is highest, up to 6m per year, in the north side of the country (Sa'adah basin). The drillings then went deeper, up to 800 m in depth.

Yemen experienced drought in the first half of 2011 and the summer rains came two months late, further exacerbating already inadequate food production and rural livelihoods.

Agricultural land in different areas of Yemen is subjected to land deterioration due to numerous factors, of which the most important are the rapid runoff of water in the valley (wadies), sand storms, the increasing use of fertilizers and the excessive pumping of underground water, in addition to the long successive periods of drought. Desertification of agricultural land ranges from 3 to 5% per annum, where the area of deteriorated land due to soil erosion is estimated to be 12 million hectares and another 3.8 million hectares due to salinity. Additionally, desertification is further exacerbated by sand dune encroachment. The dependence of rural communities on land for their livelihoods means the adverse effects of the deterioration of land resources and the desertification affect rural populations more than urban populations.

With increasing evidence of climatic variability, environmental issues in Yemen could become even more significant. Periods of extreme rainfall or drought could have serious adverse effects on the country's sustainability in terms of food, and on industry, notably tourism. Over the past decade, Yemen has faced frequent flash floods, resulting in wide spread loss of agricultural land and great volumes of topsoil in the vicinities of wadis and in Socotra island. The drought has occurred for many years causing severe impacts on locally cultivated crops. Climate records produced by meteorological authority over the last decade indicate that Yemen has been experiencing less rainfall than in the earlier decade. Anticipated impacts of global climate change such as sea-level rise and the increase in the incidence and intensity of flood rains will also exacerbate coastal erosion and degradation and lead to the increasing build-up of destructive sediments and nutrients.

D1c. Climate change

Global warming resulting from the Greenhouse effect and the build-up of carbon dioxide in the atmosphere has the potential for wide range harm throughout the environment. Extensive coral-beaching that was particularly severe in the Indian Ocean region is largely attributed to rising sea water temperatures. Bleaching of coral colonies occurs through the expulsion of zooxanthellae as coral polyps become stressed by adverse thermal gradients. A rising sea level (predicted to be 25 cm by the year 2050) further aggravates this matter as submerged corals formations may not receive the levels of sunlight required for photosynthesis by the zooxanthellae. Additionally, the ability of coral reefs to protect coastlines from erosion will be lost if the waves are able to wash over the newly submerged reefs.

Other climate change impacts noted are increased frequency and duration of drought episodes, El-Nino induced coral bleaching in the southern parts of the Red Sea and dry-up of several mangrove stands in the Gulf of Aden and southern parts of the Red Sea coast. Additional threats of concern are: a) **Sea-level rise** and the inundation of low-land inhabited areas, wetlands, coral reef areas and low-lying islands along the coast; b) **Warmer seawater temperatures** causing changes distribution patterns of marine organisms, increased coral bleaching, changes to water chemistry, alteration of current patters, and major fluctuations in evaporation rates; c) **increased carbon dioxide concentrations in seawater**

further altering water chemistry, promoting acidification and making it difficult for calcitic organisms such as corals to grow and function; d) **change in run-off reaching the coastal and marine system** associated with the likely changes in climate over land; e) **alteration in patterns of coastal currents, winds and waves**; and f) **changes in major fisheries and aquaculture** resulting from changes to the ecosystem such as important breeding, nursery and feeding habitats.

The gradual increase of temperature could have a significant impact on agricultural production and bring about plant and livestock diseases that raise the risk to agriculture. A predicted hotter and dryer climate could also result in gradual shift of climate zones even displacement of the dry tropical climate or effect on the climatic features of the western and southern slopes. This displacement could bring about rainfall and push the climate towards the arid desert climate, or the humid tropical region could extend northward which will increase the amount of torrential rain that falls on these slopes and other areas, a thus increase the probability of flooding towards the west, while increasing rainfall a improving the climate in the plateaus, highlands and western regions. Climate change specialists predict that a more arid climate would be likely to result in further desertification, with increases in semi-desert and desert areas, along with significant decline in wetland areas. Such changes are likely to have important consequences for plants and animals with specific or restricted distributions, and such species may face increased risks extinction.

Yemen's current level of wood harvest poses serious threats to nearly 19 species of common trees and shrubs. Reliance on fuel wood results drastic deterioration of rangelands and wood resources. Clearing the land further contributes to accelerated wind erosion, sand encroachment, and subsequently desertification associated with a notable decline in agricultural productive lands in addition to the loss of habitat for mammals, reptiles and birds inhabiting harvested areas. Beside environmental problems, the remove and burning of trees leads to the loss of carbon sinks and to increased emissions of greenhouse gases (GHG).

GHG emissions from agriculture are dominated by non-CO₂ gases methane (CH₄) and nitrous oxide (N₂O) from crop and livestock production and management activities. Sources of carbon dioxide (CO₂) emissions are mainly those from cultivated organic soils. From 1990 to 2010, agricultural emissions have increased by 0.7 % annually, accelerating to 1.2 %/year in the most recent decade of 2000-2010.

Information on the vulnerability of watersheds to climate change is still lacking and climate change is not currently a national development priority for the Republic of Yemen. Nevertheless, there is growing government endeavor to integrate climate change issues in national development planning through the development of the National Adaptation Programme of Action (NAPA). NAPA is still in its early stages of formulation and expected to enhance policy dialogue among stakeholders. It should also facilitate the participation of NGOs, the private sector, community organizations and government agencies whose role is expected to minimize the costs and enhance the efficiency of climate change adaptation.

D1d. Pollution

Waste Water. There are 12 treatment stations in Yemen that function and the total actual flow of the treated wastewater is around 125,000m³ per day, or 45.5MM³ per year. The amount produced is considered approximately 55% of the total design capacity for these wastewater treatment stations. It is expected to reach the production at design capacity in the next ten years.

There are 3 treatment stations (stabilization Ponds) in Aden (new), Yarim, and Amran with design capacity of 60,000, 3,500, 6,000 M³/day respectively. These stations started functioning in December year 2002. There are also, 6 stations under planning phase in Beit Al-Faqih, Bagel, Zabid, Al-Shaher, Zungbar, and Jiblah towns (districts).

Wastewater Quality. The quality of the outflow varies from one area to another, while it is very good quality in Hajjah, it is very bad in Taiz, depending on the method of treatment as well as the capacity of the station and the operational circumstances. The quality is affecting the acceptance of farmers to use such water for their cultivations.

Ref 37, 56, 61

D1e. Invasive species

The two most serious threats to biodiversity are habitat destruction and non-native (alien) species invasion in any ecosystem. In spite of the observed threats of exotic invasive plant species in Yemen, these plants continue to be unchecked and unmonitored. Pilot survey of these plant species were carried out mainly in mountainous areas which are the most fragile ecosystems.

Although very abundant nowadays, *Parthenium hysterophorus* was first recorded in hillsides of Hajah. *Parthenium hysterophorus* is a sensitizer that causes many health problems to human and animals: it is also strong allelopathic weed. This weed, in addition to the unpalatable and allelopathic *Tagetes minuta*, has replaced native grazing vegetation in escarpment and the last has also invested the wastelands, roadsides, grazing lands, and abandoned fields even at above elevation of 3000 m. *Tagetes minuta* has led to reduction in population of Acacia asak trees and other species in the invasion areas. *Opuntia dillenii* was found at Bura Mountains at the core of the protected area, it's very serious threat to biodiversity and it causes blindness to animals and humans who get in contact with it.

Another example of invasive species are mesquites plants known as *Prosopis juliflora* which were intentionally introduced into Hadarmout four decades ago as a planting scheme along roads, farms and public garden. This plant invaded many agriculture lands, irrigation canals, drainages lines and downstream beaches of wadies. Another example of mesquite problems is evident in around the Say'un and Tarim areas where it was introduced to provide wood, firewood, charcoal and animal fodder, but continued to spread and has become a nuisance weed chocking out other native plants.

Other species were moving from the valleys upward in way to Bura Mountains like *Prosopis* sp., on the other hand, a new invasive species of *Nicotiana glauca* was recorded in mountains surrounding Sana'a city.

Crops such as wheat, lentil and millet are examples of crops with deteriorating yield and quality as the result of the introduction new seed varieties. The introduction of alien genera of honeybee and an infestation of varroa mites were major factors in reduction of the Yemeni honeybee race *Apis mellifera jemenitica*. Such undesirable introduction has had major environmental economic impacts. Recent examples include citrus nurseries, which introduced diseases and armyworms. (Source: Preliminary Survey of Exotic Invasive Plants in Some Western and High Plateau Mountains in Yemen 2010 and the Invasive Species Compendium at www.cabi.org/isc/default.aspx?site=144&page=4066)

Invasive species arrive via very different vectors and types of activities. Identifying and managing key pathways of introduction is crucial to prevent invasions. The following chart identifies the primary potential paths of introduction:

Release in Nature	Escape confinement or Transport-contaminant	Transport as stowaway
Acclimatized societies	Agriculture	Container/bulk, (sea freight, airfreight,
Release for use	Botanical garden/zoo/aquaria	Hitchhikers on planes
Biological control	Farm animals including free roaming animals	Hitchhikers on boats
Erosion control/dune stabilization	Forestry	Machinery/equipment
Fisheries	Fur farms	Fishing equipment
Hunting	Horticulture	Military
Landscape/flora/fauna improvement	Ornamental purpose	People and their luggage/equipment
Conservation introduction	Pet/aquarium trade	Ship ballast water
bioremediation	Research (in facilities)	Ship/boat hull fouling
reintroduction	Other escape	Vehicles (car, trains)
as part of waste management	Contaminant nursery material	Other means of transport
	Contaminated bait	
	Food contaminant	
	Live food	
	Contaminant on plants	
	Organic packing material	
	Parasites on animals (
	Parasites on plants	
	Seed contaminant	
	Timber trade	
	Transportation	

Pathways can be addressed through regulatory as well as voluntary measures

D1f. Threats to Marine Turtles

Threats to marine turtles are summarized in the following table.

Specific Threat	Cause of Such Threat
Fibropapilloma Tumors	Lobe-shaped tumors that can infect all soft portions of a turtle's body. Ongoing research suggests that this is caused by a herpes type virus aggravated by stress
Nesting Threats	
Increased Human Presence	The most serious threat is caused by increased human presence on beaches, especially at night. The introduction of recreational equipment such as lounge chairs, umbrellas, small boats, and beach cycles (to name a few) can further reduce the usefulness of a beach for nesting, and can seriously damage or destroy any existing nests.
	Commercial Fishing: <i>Longline & Trawl</i>
	Commercial Fisheries
	Ingestion of Marine Debris
	Human-Caused Threats
	Harvest for Consumption
	Illegal Sea Turtle Shell Trade
	Marine Debris - Ingestion & Entanglement
Poaching	
Artificial Lighting	Artificial lighting from buildings, streetlights, and beachfront properties can disorient little turtles who navigate the sea by light reflected off the ocean.
Beach Armoring	Beach armoring (e.g., building sea walls, jetties and sandbagging) may alter or eliminate dry nesting areas needed by the turtles
Beach Nourishment & Dredging	Beach nourishment (restoring sand eroded from a beach) can bury or disturb nests
Beach Erosion	Human interference has hastened erosion in many places resulting in loss of nesting habitat
Beach Cleaning	Human use of nesting beaches sometimes prompts beach cleaning activity, such as raking and the use of mechanical equipment. Not only can existing nests be disturbed by beach cleaning, it can also result in compacted beaches that are difficult or impossible to use for nesting.
Predators	Turtle eggs are particularly vulnerable to predators. Many animals seem to be aware of the nesting cycle of marine turtles, and eagerly gather to ravish nests once the turtles have made them. For example, raccoons have been known to destroy as much as 90% of all nests on a beach. Hatchlings must escape the clutches of animals such as foxes and gulls as they try to reach the water, and even when they reach the ocean, predators such as sharks await them.
Pollution	
Legislative Attacks on Protecting Laws and Regulations	
Marine Pollution	
Climate Change	Because sea turtles use both marine and terrestrial habits during their life cycles, the effects of climate change are likely to have a devastating impact on these endangered species. Climate change affects nesting beaches. With melting polar ice caps and rising sea levels, beaches are starting to disappear. As the water level begins to rise, the size of nesting beaches decrease. Stronger storms, predicted as a result of increasing temperatures, will continue to erode coastal habitats. Higher temperatures can adversely affect sea turtle gender ratio. Increasing incubation temperatures could result in more female sea turtles, which reduces reproductive opportunities and decreases genetic diversity.
Invasive Species Predation	Sea turtles and hatchlings are vulnerable to natural predators. Crabs, raccoons, boars, birds, fish and sharks all play their role in the natural food chain. However, urban development along coast lines has introduced many non-native species that have become invasive predators for sea turtles and other coastal wildlife. Domesticated animals are known to devour eggs and hatchlings and attack nesting turtles. In many areas, trash left behind by humans encourages inland animals to migrate to beaches for food, further increasing sea turtle predators.
Oil and Gas Exploration Oil Spills	Activities associated with developing offshore oil and gas resources can destroy or seriously disrupt foraging habitat and nesting habitat. Dredging not only destroys habitat, it also results in the incidental injuring or killing of sea turtles. The presence of offshore structures alters the characteristics of nesting areas. The exploitation of offshore oil and gas reserves also leads to oil spills and the presence of tar in the water posing serious effects on marine turtles. Oil on the skin and shell of a marine turtle can affect respiration and salt gland functions, as well as the turtle's blood chemistry. The ingestion of tar pellets is also a major concern.

<http://www.conserveturtles.org/seaturtleinformation.php?page=pollution>

<http://www.turtles.org/>

D2. Indirect Threats

As indicated by IUCN-CMP, indirect threats are “factors with a negative effect usually social, economic, political, institutional, or cultural in nature that enable or otherwise contribute to the occurrence and/or persistence of direct threats. There is typically a chain of underlying causes behind any given direct threat” (IUCN-CMP 2006, 1).

Under current accelerating growth of the economy, environmental quality is fast deteriorating, as dramatized by the increased occurrence of environmental problems. Specifically, the gains of economic growth are being diminished and /or even negated by numerous problems.

D2a. Political Instability

Political instability in Yemen has severely undermined the country's focus on the protection of its natural resources and biodiversity and as well as moving forward on a social agenda to raise the quality of living for this impoverished nation. If instability should relapse in the country, it is very likely that biodiversity and resource management would continue to suffer.

Ref 1, 2, 3, 12, 16, 36, 37, 73, 77,

D2b. Health Issues and Lack of Healthcare

Yemen's health statistics are amongst the worst in the Middle East and at the lower spectrum of sub-Saharan African nations. The following graphs illustrate this point:

There is a significant gap in meeting the health care needs of Yemen, especially for poor people in rural districts where 71% of the population lives. Maternal, infant and child mortality rates are amongst the highest in the world (366/100,000 and 69/1000, 102/1000 respectively), and there are high rates of many preventable diseases. There are significant levels of dissatisfaction among patients and providers with health services and systems, relating to access and quality. Poor health services have often been believed to be among the contributing factors to ongoing civil unrest and the secessionist movements.

Only about 67% of the population and just 35% for the rural population have access to the country's Health Care Systems. Approximately 42% of physicians work in four governorates. There is an inadequate Health Information System. The growing private sector network of health providers is growing with only limited government oversight and regulation. Poorly equipped facilities, shortages of drug and supplies, inadequate budgets to cover need operations operational costs, staffing, and incentives for health services of government facilities, deficiencies in health management skills and systems, Most public health programs, including child health, infectious diseases, nutrition and other programs are provided as vertical programmes, available in less than 40% of health facilities (MoPHP, 2000).

Secondary impacts from climate change may also include stress on public health resulting from heat waves, outbreak of water-borne and thalassogenic diseases, changes in distribution of vectors and epidemiology of transmitted diseases, and stresses from disasters and severe incidences (such as storms and floods); and social stresses such as change to infrastructure and social system, income generation and distribution in rural and urban communities in the coastal zone; as consequences of land and heritage loss, decline in ecosystem services, property rights concerns, and change in general socioeconomic patterns in the coastal zone.

D2c. Population Growth and Urban Development

Yemen has a rapidly growing population and very young age structure. From 1980 to 2005, Yemen nearly tripled its population driven largely by a very high fertility rate of six children per woman. Currently, Yemen's population is growing at about three percent annually; a pace that would double its population again in fewer than 25 years. With three-quarters of its population under the age of 30 and 46 percent under age 15, Yemen has the most youthful age structure in the world outside of sub-Saharan Africa. Per capita income remains suppressed at less than \$900 a year and more than one-third of adults in Yemen are unemployed. Nearly half of the population lives in poverty

Much of the country continues to live under tribal rule and out of the reach of the government services. Worsening natural resource shortages, particularly water scarcity, demonstrate some of the most obvious current implications of Yemen's population growth, with the country already dedicating tremendous funding to desalination plants.

A 2007 study by Population Action International (PAI) found that countries with very young and youthful age structures—those in which 60 percent or more of the population is younger than age 30—are the most likely to face outbreaks of civil conflict and autocratic governance.

A Brookings Institution study ranks Yemen 30th among the 141 weakest states in the developing world. Yemen is rated as a mixed authority state, or “anocracy,” (based on measures of political participation and executive power) by the Center for Systemic Peace. It is rated as “partly free” (based on measures of civil liberties and political rights) by Freedom House. Yemen also ranks in the bottom fifth of all countries in The World Bank's evaluation of accountability, government effectiveness, political stability and the rule of law. The limited capacity of the government to provide for its own citizens is also weakened by the constant stream of refugees fleeing from Ethiopia and Somalia to Yemen by sea.

Corruption and mismanagement have been widespread in all levels of government, and the security situation is rapidly deteriorating; on the economic front, the oil resources that the government has relied upon are declining while employment prospects in the manufacturing and agricultural sectors are limited. Indeed, one analysis suggests that the fertility decline that has occurred in Yemen is due to the country's deteriorating economic conditions, which make the costs of raising children more difficult to bear. The UN recommends that Yemen could reverse its stagnant progress toward achieving the Millennium Development Goals by “harnessing the energy of its youth,” focusing particularly on improving the status of women, increasing access to health and education, raising economic growth rates with a focus on employment levels, and making water use sustainable and efficient. With the labor force currently growing at a rate about one percent a year higher than that of available jobs, unemployment levels among young people could reach 40 percent in the next decade. As the World Bank has noted, making broad gains in Yemen's demographic picture is a long-term goal; in the short term, prioritization of specific initiatives is necessary. The Bank recommends that these include girls' education, increased funding from the government, and family planning campaigns in the media, schools and religious settings. UNFPA recommends that “the least that needs to be done is to cover the unmet need for family planning.”

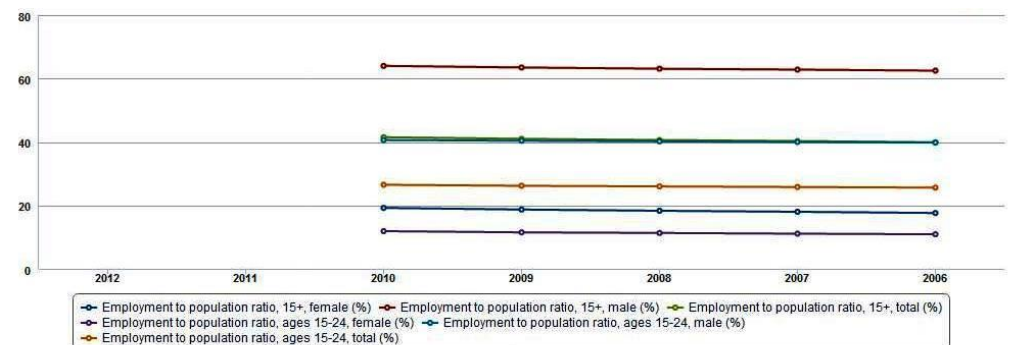
Ref 1, 2, 3, 14, 16, 36, 37, 62, 68, 73, 76

D2d. Poverty, Unemployment, and Lack of Skilled Workforce

More than half of the population is below 15 years of age. Based on a recent UNDP poverty update, the proportion of the poor increased according to the 2010 food poverty line (extreme poverty) from 12.46% to 16.15% or about 30% compared to UNDP/World Bank/ROYG, Poverty Assessment for 2005-2006. Both the poverty gap and severity also increased by a more accelerated rate than that of the proportion of the poor. While people living below the lower poverty line has slightly decline from 40.09% (2005/06) to 38.59% (2010), the poverty update indicated that prices of basic commodities and services increases to 15% as was the case in 2011 due to political unrest in Yemen, the lower poverty line can get worse to level beyond that of 1998, which is 42.5%.

Unemployment is estimated at 52.9% and 44.4% among the 15-24 and 25-59 age groups respectively. Unemployment is fairly broad, cutting across urban and rural areas and was much exacerbated by the political unrest of 2011. According to the preliminary results of WFP Comprehensive Food Insecurity Survey, approximately 5 million of the population is food insecure.

Although population growth rate has slightly decline 2.9 % (2010), it is still considered to be among the highest in the



Source: Millennium Development Goals

World and any annually adds additional new mouths to feed and new labor force seeking for employment opportunities, which does not match with economic growth estimated at negative as much as 20% in 2011

Ref 1, 2, 3, 14, 16, 36, 37, 62, 68, 73, 76

D2e. Refugees

Yemen remains in the midst of a complex emergency and humanitarian needs continue to grow at an alarming rate. Yemen has been receiving an unprecedented influx of people fleeing from the Horn of Africa across the Gulf of Aden and the Red Sea in search of safety, protection and better economic opportunities. However, with the worsening economic situation and insecurity in Yemen, many refugees who were once self-reliant have become increasingly vulnerable.

Yemen also has been experiencing internal displacement. Several rounds of fighting in and around Sa'ada Governorate since 2004 have caused repeated and protracted large-scale internal displacement. Moreover, fighting that began in May 2011 in Abyan Governorate resulted in significant internal displacement; however, since July 2012, as hostilities subsided and security began to improve, over 140,000 IDPs have returned to Abyan. For all IDPs in Yemen, UNHCR, with other humanitarian organizations, is promoting durable solutions, including supporting IDPs who decide to return by providing them with life-saving assistance and monitoring their protection. UNHCR also is providing technical assistance to the ROYG to develop a national policy for addressing and resolving internal displacement throughout the country.

Ref: UNHCR Yemen Factsheet, March 2013

D2f. Lack of Human and Financial capacity

Yemen has a relatively unskilled and uneducated workforce. Furthermore, there are little financial resources available or dedicated to conservation and protection of natural resources. This results in difficulty in data collection and monitoring of the country's natural resources in addition to limited funding for conservation programs.

D2g. Limited Governmental, Institutional, and Legal Capacity

According to the Ministry of Planning and International Cooperation's July 2012 paper "A Partnership to Improve the Flow and Absorption of External Assistance to Yemen", the ROYG continues to suffer from capacity problems: The administrative, procurement and financial systems within Government are weak and its ability to attract and retain highly qualified and skilled staff remains limited. ROYG recognizes it lacks effective coordination between government agencies in the management of development cooperation. In some cases, the lack of clear processes leads to line ministries and decentralized entities directly negotiating assistance with development partners, thus undermining the effectiveness of assistance offered. The same holds true for the capacity of the ROYG to deliver services to its population.

The limited governmental, institutional, and legal capacity unfortunately results in weak management and oversight, and in weak enforcement of Yemen's environmental laws.

D2h. Limited Number of Protected Areas

The fact that the ROYG has only has limited formal protected areas and that even these are regarded as poorly managed only serves to emphasize the need for institutional improvements by the ROYG authorities and the need to partner with community based organizations to assist in expanding management to the areas which should be added for protected status.

D2i. Food and Water Insecurity

In its 2012 Yemen Humanitarian Response Plan, the UN estimated the food-insecure population across Yemen to be 6.8 million people, of whom approximately three million are severely food-insecure. The report estimates that 97% of poor rural households are net food buyers. High food prices are among the major factors contributing to this household food insecurity.

Prevalence of undernourishment and progress towards the World Food Summit (WFS)¹ and the Millennium Development Goal (MDG)² targets in developing countries

World Region/Subregion/country	Number of people undernourished						Proportion of undernourished in total population							
	1990-1992	1999-2001	2004-2006	2007-2009	2010-2012	Change so far	1990-1992	1999-2001	2004-2006	2007-2009	2010-2012	Change so far		
	(millions)					(%)	(%)					(%)		
Yemen	4	5	7	7	8	124.3	▲	28.6	30.4	31.7	30.6	32.4	13.3	■

Source: The State of Food Insecurity in the World, FAO 2012

Food security is worse in rural areas, with the most affected groups identified as rural children, female-heads of households and the internally displaced who have returned home. The highest levels of food-insecure households are in located in Raymah, Hajjah, Ibb, Al-Dhale, Amran, Al-Baida, Al-

Mawhit, Taiz and Abyan. It is anticipated that food security will continue to worsen in Yemen’s economically depressed and politically insecure environment.

Yemen is dependent on foreign goods for the majority of its dry staple foods, importing 90% of its total wheat requirements and 100% of its total rice requirements. Consequently, Yemen food security is particularly vulnerable to price shocks in the international market. According to the Human Response Plan, the price of main staples has increased nationwide by an average of 46% and is 7% higher in rural over urban areas since January 2011.

With the country facing a growing water shortage and rapidly depleting underground aquifers, agricultural development confronts a major obstacle for its expansion. Already, Qat, a major agricultural crop for Yemenis is a high water demand plant. Effort is need to assure that appropriate crop selection is made to better manage the limited water resources available to the country.

Table 1: Use of Water for a Period of 30 Years (1990-2010) in Different Water Use Sectors (Million cu. Meters/Year)

Water Use	1990	2000	2005*	2010*
Agriculture/Irrigation	2,600	3145	3,235	3,328
Domestic/Urban/Rural	168	210	265	552
Industrial & Mining	31	45	65	90
Total	2,799	3,400	3,565	3,970

*Estimated.

Source: Adapted from: TNO Institute of Applied Geo-science Report, (1995).

Surface water in Yemen is estimated to be about 1,500 Mm³/year. Around 50 diversion weirs and main distribution canals have been built by the government and dikes are built on many main wadis for the purpose of directing spate waters into branches of the wadis to earth canal spate irrigation systems, which irrigate around 120,000-150,000 hectares in the low lands of the country. There are also

around of 800 medium & small dams for rainfall water harvesting in the highlands.

Yemen experienced drought in the first half of 2011 and the summer rains came two months late, further exacerbating already inadequate food production and rural livelihoods.

Ref 14, 36, 37, 40, 57, 64, 67, 68, 73, 77

E. ACTIONS NECESSARY TO CONSERVE BIODIVERSITY AND TROPICAL FORESTS

Much work can be done to improve Yemen's effectiveness at conserving biodiversity and tropical forest management. ROYG needs to examine its current institutional commitment, the performance of its designated institutions in meeting the challenges of conservation, and how to expand both public and private sector involvement with the protection of its resources. More specific measures are discussed in the subsections that follow.

E1. Political Stability

Political stability in Yemen is complicated by the mix of national government and tribal governments working toward reconciliation and long term collaboration. The GCC has resumed its national dialogue process which will hopefully increase the overall security of the Yemeni population to go about their daily lives. It is not clear if and when such dialogue might include overall protection of the country's natural resources and biodiversity and who other than the national government and community-based organizations might be key players in making progress in these areas.

If NGOs are allowed to operate freely, they could become of greater significance over the next few years in the management of natural resources.

Budget information for 2013 is presented at <http://www.mof.gov.ye/files/budget/2013/c.html> and has not been reviewed to determine if there is any trend reflecting Yemen's commitment toward environment

E2. Sustainable Land-Use Practices and Habitat Improvement Projects

Secure land tenure and resource rights are key to the protection of biodiversity and sustainable use of natural resources. Inadequately defined and/or poorly enforced, such rights may not protect against issues like overgrazing of pastureland, poaching of wildlife, deforestation, ineffective watershed management, and poorly managed extractive industry practices. Strengthening land and resource rights and enforcement capacity can help conserve biodiversity and assure the sustainable use of natural resources as well as improve livelihoods and local governance.

Both urban and rural landowners have property rights that are enforceable under either civil or customary Islamic laws. However, with no reliable system for authenticating land deeds and land documents nor a national cadastre to demarcate them, land disputes are common in Yemen. Access to water is tied to land rights and is cause for a significant portion of property disputes.

Yemen's formal courts function poorly and are often inaccessible to the rural poor and women. As part of its decentralization efforts, Yemen has assimilated the roles of some traditional leaders into the government system. In doing so, it has weakened the effectiveness of what had been an informal dispute resolution process used in many areas

There is need to review existing laws on urban planning, land use, and on land registration to conduct a gap analysis on what is contained in the law and how it needs to be modified. Sustainable land requires a balance of environmental preservation, commerce and livability criteria. This necessitates the identification (and possible zoning) of areas or regions for their best use including protecting farmland; setting guidelines for critical areas such as wetlands, fish and wildlife conservation areas; mapping and restricting development of frequently flooded and geologically hazardous areas; establishing codes to guide environmentally compatible development in coastal communities; legislating the use of market-based mechanisms regarding the transfer of property and development rights; and ensuring the effective establishment of financial incentives to protect, preserve and maintain natural assets

Forest Land. Yemen currently does not have a legal framework governing management of forest land and the sustainable use of forest resources. The ROYG needs assistance in inventorying its forest assets, identifying community-based forest management opportunities, outreaching to stakeholders to the preservation and proper use of forest resources and commercial opportunities, developing necessary policy and legal framework for forest management, and building institutional and financial capacity to sustainably implement such policies..

E3. Increase Size and Number of Protected Areas

With only 6 formally protected areas out of a much larger inventory of potential sites, Yemen has much work to do to improve national commitment and policy approach toward conservation. Anecdotal evidence that the current sites lack monitoring and remain subject to poaching, resource harvesting, and other misuses suggests that simply designating the site as protected does not reduce the vulnerability of the bio-resources of the country.

The ROYG needs to establish specific management plans for each of its protected area sites and prepare remedial strategies for enforcement of any violations of such plans. Management elements that should be included in the plan include delimitation and zoning, patrolling and mitigation of anthropogenic and natural pressure, interventions required to restore or maintain desirable natural processes and habitats, infrastructure development and maintenance, personnel management, visitor management, and interpretation and education. For each of the plans, monitoring and evaluation approaches will be needed to evaluate the effectiveness of the management strategies and create data necessary for implementing adaptive management. In addition to remediating direct threats, monitoring should include identification of successful biodiversity conservation approaches to meet conservation targets and objectives.

Because of the importance of sustainability of protected area management, financial plans that articulate the area's funding requirements need be included. Financial planning should identify budget needs for current and any necessary future

management activities. A business plan element is also recommended to help identify alternative approaches to secure needed revenue streams.

The Government should prepare and implement an outreach campaign to engage Yemeni citizens in understanding the need to protect their natural resources and make conservation part of the culture for a modern society.

E4. Climate Change Adaptation and Mitigation Measures

Yemen has been working on its National Adaptation Program of Action for the last several years; in a March 2009 workshop, the EPA presented the following priority adaptation projects which it intended to shepherd through:

- Develop and Implement Integrated Coastal Zone Management (ICZM) plan
- Promote water conservation through reuse of treated waste water and grey waters and improved irrigation techniques
- Develop and implement an awareness program to educate the public on potential impacts of climate change and need for adaptation
- Establish and maintain a database for climate change and adaptation
- Create clear management strategies for mangrove and palm planting to protect areas from projected sea level rises
- Identify and undertake measures that improve Yemen's preparedness to cope with extreme weather events
- Facilitate rainwater harvesting practices using various technologies and traditional methods
- Rehabilitate and maintain mountain terraces
- Promote research on drought resistant and heat and salinity tolerant crops
- Design and implement sustainable land management strategies to combat desertification and land degradation
- Articulate the requirements for the sustainable management of fisheries
- Incorporate climate change and adaptation to school education

Yemen has prepared an October 2011 Strategic Program for Climate Resilience which was prepared with World Bank Funding under the Pilot Program for Climate Resilience seeking \$110 million (\$50 million in grants and the rest in loans) for the implantation of a number of these activities. As of the date of this report, no information could be obtained as to the status of this program request. The proposal indicates a proposed start date of September 2013 for many of the activities.

E5. Infrastructure Development and Improvement

Roads, electricity, clean water, and irrigation are integral parts of development and poverty reduction. Some infrastructure investments are directly linked to the Millennium Development Goals (MDGs). Provision of clean water, for instance, is an integral part of target 10 (in the environmental goal) and is critical to achieving target 5 (reduction of child mortality).

Water scarcity in Yemen is serious and getting worse. Per capita availability of water in Yemen is only 2 % of the world average. Yemen has been working with international donors and finance institutions for the last several years to find ways to better manage its water resources and increase access to water and sanitation services for both agricultural and potable uses for the under-served population. Only about 42% of Yemen's rural population had access to safe water at the end of 2006. Urban water coverage in 2006 was just 58% of the population with only 32% of urban dwellers having sanitation services.

In 2005, Yemen prepared a US\$4.4 billion, seven-year National Water Sector Strategy and Investment Plan (NWSSIP) that included 80 new water supply systems and 15 new sewage treatment facilities. ROYG received assistance from the World Bank, Germany, DFID, and the Netherlands in preparing to seek financing for this project.

Over the last fourteen years, ROYG has invested about \$276 million in its fishery network and continues to seek additional investment in improving ports and support infrastructure to expand fishing industry output for the country. Such infrastructure includes the creation of fishing harbors, ice plants, workshops, cold storage facilities, shelters, research, training, fish quality control centers and canning plants. Funding of these projects have been through IDA, the Yemen Biodiversity and Tropical Forest Assessment, July2013

World Bank, the European Community and IFAD, as well as under cooperation agreements between Yemen and other countries and organizations such as the former Soviet Union, Japan and the Islamic Bank.

E6. Combat Invasive Species

Three basic elements are required to effectively address the issue of invasive species:

- Establishing effective mechanisms for the prevention of the introduction of such species in the first place,
- Creating monitoring systems for detecting new infestations, and
- Moving rapidly to eradicate newly detected invaders.

The primary means of introduction of invasive species are: a) Release in Nature, b) Escape confinement, c) Transport-contaminant, d) Transport as stowaway, and e) Corridor Interconnection. Knowing the process of introduction will lead to the identification of prevention and remedial measures that can be taken to combat such invasive species.

There is a clear need to prepare a national policy which addresses the problems of alien invasive species. The policy should establish the basis for an integrated risk-based approach to controlling and managing intentional and unintentional introductions of these organisms. Important pathways for introduction should be identified and appropriate legal and institutional measures should be applied on a pathway-by-pathway basis. The policy should also address measures for control and eradication of these organisms, including liability. Specific shortcomings in the country's ability to develop: a) adequate information of the type, numbers, status and structure of alien species; b) institutional capacity for evaluating and managing alien species; c) a monitoring system for invasive species; d) legislative tools to control introductions of invasive species; and e) implement preventive and remediation measures.

E7. Improvement of Governmental, Institutional, and Legal Capacity

Yemen needs to improve the environmental management approach of its existing institutions and the application of existing laws. EPA should take steps to: a) review laws for overlap, inconsistencies, and remedy any areas of conflicting authorities; b) develop decrees, regulations or policies needed to support the framework laws; c) develop improved authority to conduct effective environmental assessments; d) establish an environmental fund; e) develop a system to insure strict liability for enforcement, and e) develop community outreach and community participation practices.

The Ministry has previously stated the need for the follow up on the preparation, adoption and enforcement of legislation on: a) land tenure law, agricultural land holdings registration; b) fertilizers and feeding stuffs; c) coastal zone management law; d) application decree for the law EIA; e) framework law for protected areas; and d) decrees and by-laws to the establishment of EPA.

E8. Education

There remains a great need for a variety of educational programs in order to conserve biodiversity and tropical forests. First and foremost, the nation as a whole appears to have a need to better understand the importance of environmental conservation. In general, the population is not well educated and a basic understanding of ecosystems, climate change, and the importance of biodiversity would go a long way. Secondly, there is little opportunity for Yemenis to receive higher education in the country and even less of an opportunity to learn extensively about natural resources. The development of a university level natural resources program would enable Yemenis to learn how to be environmental managers and consequently increase the capacity of the country to conserve their natural resources. Additionally visitor management guidelines and educational materials could be developed for sensitive but well used areas to help better protect them.

E9. Incorporate and Increase Opportunities for Trans-Boundary and Cross-Border Ecosystem-Wide Approaches

The Critical Ecosystem Partnership Fund (CEPF) is working on activities related to the Eastern Afromontane biodiversity hotspot which encompasses several widely scattered, but biogeographically similar mountain ranges in eastern Africa, from Saudi Arabia and Yemen in the north to Zimbabwe in the south and includes the highlands of Yemen, and the Chimanimani Highlands of eastern Zimbabwe. CEPF is a joint program of l'Agence Française de Développement Yemen Biodiversity and Tropical Forest Assessment, July2013

Conservation International, the European Union, the Global Environment Facility, the Government of Japan, the MacArthur Foundation and the World Bank. The Arabian Peninsula project will support civil society organizations working in Yemen for a) mainstreaming biodiversity into wider development policies, plans and projects while supporting local livelihoods and economic development, b) improving the protection and management of key biodiversity areas in the hotspot, and c) emphasize sustainable financing of actions to conserve ecological corridors.

E10. Increased NGO Presence and Assistance

Many of the actions needed to protect and sustain biodiversity and the health of tropical forests must be fully supported and integrated into the culture of the local community. This is particularly true where a weak government fail to adequately manage or protect resources vital both to the sustainability of the community and of the natural environment in which these communities live.

Many developing countries facing a crisis of resources to adequately address their stewardship role in protecting biodiversity and the sustainable management of forests, wildlife, and fish habitat have turned to the concept of community-based natural resource management (CBNRM). Executing the principles of CBNRM often addresses both the problems of poverty and natural resource degradation simultaneously, even when many might first think their solutions appear to be in direct conflict.

The enabling conditions for CBNRM include: a) clear requirements and sound process regarding land tenure, b) local community commitment and capacity , c) quality NGO and government partners, d) targeted technical assistance, e) , regional resource management plans, setting limits of acceptable use, f) environmental monitoring and mitigation plans, g) access to markets and credit, h) social cohesion in communities adopting CBNRM practices, i) resource monitoring and policing , and j) genuine economic benefits to the community.

Much of the work on biodiversity sponsored by donors thus far is based on these principles. GEF's small grants program has already supported dozens of natural resource poverty reduction approaches. Donors should also continue to work with the ROYG to partner and train the NGO community on critical biodiversity and habitat protection services and leverage the effectiveness of these groups in integrating their achievement of national protection goals.

E11. Enhance Food and Water Security

Yemen's Ministry of Planning and International Cooperation has developed vision on food security to ensure all Yemeni people have access to sufficient and nutritious food at all times and live an active, productive, and healthy life. To translate this vision into action, the National Food Security Committee set goals to:

- Cut food insecurity by one-third by 2015.
- Make 90 percent of the population food secure by 2020.
- Reduce child malnutrition by at least one percentage point per year.

To reach these goals, the National Food Security Strategy sets out a 7-Point Action Plan to:

1. **Reform Petroleum Subsidies** and use savings to finance a combination of direct transfers to the poor and productivity-enhancing investments. Such investments may include infrastructure (related to utilities, transport, trade, and construction) that fosters food security and sustainable economic growth.

2. **Improve the Business Climate** for both domestic and international investors to attract investors in non-hydrocarbon sectors because these sectors link with more parts of the economy, create more jobs, and employ more food-insecure people.

3. **Reduce Qat Production and Consumption** to stabilize the demand for water in agriculture. Qat emerges as the major culprit in wasting water consuming more than 40 percent of Yemen's total water supply. The vision anticipates imposition of a Qat tax to discourage people from excessive consumption, allow Yemen to use its water supply more effectively, and

generate additional revenue for the government. The vision anticipates use of the tax revenue for investment in agriculture, water infrastructure and the promotion of alternative crops like cereals and coffee production.

4. Improve Food Security Risk Management by developing risk management systems that make the import market more competitive and not dependent on the current small number of importers. This might include elements such as national grain reserves, regional grain reserves, or hedging in international markets.

5. Implement The Water-Sector Strategy to (1) strengthening capacity for and implementation of integrated water resources management, including groundwater monitoring and control and improved water quality; (2) managing environmental impacts, including promoting environmental protection and building partnerships with the private sector on effluent and waste water; (3) developing water-resource and water-use efficiency by protecting user rights; (4) delivering efficient, low-cost projects on a demand-driven basis by enhancing the efficiency of project implementation, improving coordination, and decentralizing; (5) strengthening institutions to allow them to play their role in promoting efficient water use; and (6) enhancing resource sustainability and quality through improved watershed management.

6. Target Public Investment and Improve Service Provision to better align public investments with Yemen's development objectives in general and its food security strategy in particular across sectors and governorates.

7. Launch High Level Awareness Campaigns on 1) family planning activities integrated with primary healthcare; 2) improving nutrition and health knowledge among Yemenis on dietary diversity and micronutrient malnutrition; and 3) acceleration of women's empowerment in recognition that gender inequality goes hand in hand with malnutrition.

F. IDEAS FOR SUSTAINABLE DEVELOPMENT

F1. Ecotourism

Yemen has the potential to draw ecotourism in a number of areas within the country. UNESCO has declared three ancient Yemeni cities (Sana'a, Zabid and Shibam) World Cultural Heritage sites. Yemen's unique biodiversity, particularly in Socotra, can attract eco-tourists interested in the unique landscape, animals, and forestry resources. The National Environmental Action Plan emphasized the importance of ecotourism, especially in the Socotra Archipelago and along the coastal areas of the Red Sea, Gulf of Aden, and the Arabian Sea. Attractions to this area include possibilities for diving and snorkeling in the coral reefs of the seas as well as the Socotra Archipelago.

However, much work is needed to better define criteria for ecotourism development with low-level impact on the environment and local cultural values which will help sustain local economies and the conservation of the natural heritage. Yemen's Environmental Protection Law addresses ecotourism only in broad terms. Yemen needs to evaluate the impact of preservation of historic and cultural properties policy on tourism. In 2002, historic preservation responsibility was shifted to the Ministry of Culture and Tourism and a draft law on ecotourism remains incomplete.

In addition to legislation, there is a need for a comprehensive national tourism policy, which should set goals for the sector, establish coordination mechanisms among all institutions involved in the sector, establish standards to be followed when developing tourism projects, define the concept of ecotourism in the Yemeni context, determine areas most suitable for ecotourism, etc. Key issues needing to be addressed include: a) lack of knowledge on eco-tourism attractions; b) insufficient level of professionalism and training in the tourism sector, including eco-tourism; c) poor environmental awareness and ecological education amongst populations; d) generally deficient ecotourism facilities; e) inadequate legislative framework and weak enforcement of ecotourism legislation; and f) weak local communities and private sector participation in tourism management and investment in this sector.

F2. Renewable Energy Production

Yemen also struggles to reliably provide energy and electricity. Domestic energy demand has risen steadily over the past ten years while oil production has declined sharply, leaving the ROYG with less revenue from petroleum exports. Natural gas exploration is helping to meet domestic demand and close the revenue gap. However, the ROYG still provides billions of dollars per year in energy subsidies so that citizens can purchase diesel and other imported petroleum products.

According to the public/private Renewable Energy and Efficiency Partnership, only about 53 % of the population has access to electricity, while in rural regions, less than half as many do.

Yemen's state-owned Public Corporation for Electricity (PEC) operates an estimated 80 % of the country's electricity generating capacity (1 gigawatt) as well as the national power grid. Over the past 10 years, ROYG has considered various ways to alleviate the country's significant electricity shortage, including restructuring the PEC, integrating the power sector through small-scale privatization of power stations, creating independent power projects (IPPs), and introducing gas-generated power plants. In March 2005, Siemens signed a \$160 million contract to build a 340-megawatt gas-fueled power plant at Marib. In November 2007, the Saudi Arabian government agreed to provide a \$101 million grant for this project. In May 2006, the World Bank approved a \$50 million loan to help finance a five-year power sector project designed to relieve critical power-sector supply constraints, enhance electricity supply efficiency and quality, and improve the efficiency of the PEC. In 2007, Agence Française de Développement (AFD) gave Yemen a \$37 million concessional loan to help build capacity in the electricity sector. In 2005 Yemen's diesel power plants generated 4.1 billion kilowatt-hours of electricity, a level insufficient to maintain a consistent supply of electricity.

The US Department of Energy's National Energy Research Laboratory puts Yemen's solar potential at 1,655 billion kilowatt hours per year. According to the Renewable Energy Policy Network, Yemen is one of the regions in the world that has high levels of solar radiation, with an average of 6.8-5.2 kW/m² per day. In an article, "Clearing the Hurdles: Renewable Energy in Yemen," the Director of Yemen's energy company stated that the country has one of the world's highest levels of solar radiation. "It is both technically and economically feasible for Yemen to produce 34 gigawatts of electricity"

Fuel-wood constitutes a major source of energy, particularly for rural households. With the shortage of electricity, many Yemenis are dependent on fuel wood. Fuel-wood consumption is estimated to be 3.24 million metric tons annually (2.8 million tons firewood, 260,000 tons commerce charcoal and 173,000 tons household charcoal). This level of wood harvest poses serious threats to nearly 19 species of common trees and shrubs, causing further deterioration of rangelands and wood resources. Loss of the wooded areas accelerates wind erosion, sand encroachment, and subsequent desertification associated with a decline in agricultural production, loss of habitat for mammals, reptiles and birds, and the loss of carbon sinks related to greenhouse gas emission levels.

In 1995 GHG emission from fuel-wood burning was estimated to be 355 Gg of CO², which came through burning of 324 Kt of dry wood mainly consumed by households. Given that Yemen enjoys a very diverse natural environment and diverse climate, this level of emission can be reduced and the country stock of wood can be conserved substantially by shifting towards cleaner energy sources fuel available in Yemen such as solar and wind energy and natural gas. Recently, Yemen has seen an increase of natural gas for cooking, reducing some of the pressure on wood harvesting.

F4. Increase Livestock Production

Yemen has been producing, importing, and trading livestock for hundreds of years and this trade is the only source of income for many of the rural poor. Today's livestock market is almost completely fragmented with no formal or organized marketing structure. Day-to-day responsibility of the livestock, including both cutting fodder and hand feeding the animals, is done primarily by women. Over the last 25 years this trade in artisanal livestock husbandry has seen a decline in numbers and quality of animals brought to market. Among the issues being confronted by these traders are poor breeding practices, poor nutrition, contamination of feed and water, and parasites and rampant disease that threaten the health of both the children and adults who tend to their animals.

Interventions have been piloted to increase productivity by:

- Providing access to improved feed, minerals, vaccinations, and improved genetics (e.g., artificial insemination).
- Developing quality, disease-free livestock that represents a good value for the Yemeni consumer, and creates demand for the regional export market.
- Implementing animal management practices that lead to increased weight gain in sheep, goats, and cattle as well as milk production in cows.

- Improving access to veterinarian services for vaccinations, medical supplies, artificial insemination, and distribution of feed supplements and mineral blocks.

G. CONCLUSIONS

While Yemen overall geography and climate are characterized as a hot, dry, harsh desert, there are highlands and the western mountains with a much more moderate temperate climate that provide the country with significant biodiversity and unique forested areas that support a range of habitat and animals. With a coastline that spans nearly 2,000 kilometers along the distinctly different eco-regions of the Red Sea, the Gulf of Aden, and the Arabian Sea, Yemen is rich in marine resources that host significant natural coral regions and fishes.

Yemen exhibits a high rate of endemism in both its flora and fauna and is a major migratory zone for a number of important bird species. The islands of Socotra have been designated by UNESCO as one of only 188 World Heritage sites designated as such for their natural resources.

Yemen's ongoing political turmoil has severely challenged the country's ability to effectively manage its resources and as the most impoverished nation in the Middle East, it continues to struggle in meeting the needs of its people. Adding to this burden, Yemen is the only country in the West Asia region that provides refuge to people seeking asylum from conflict in their own countries. Consequently, Yemen currently hosts nearly a quarter million refugees from abroad.

Yemen relies heavily on international donor assistance which makes up a significant portion of its per capita GDP. With minimal oil and gas reserves, Yemen has seen dwindling production of its most significant trade commodity and is anticipated to essentially run out of oil in the next 10-15 years. Sana'a, the capital is rapidly depleting its aquifer and is said to likely be the first major city to "run out of water," perhaps in the next decade.

Although the ROYG is aggressive in becoming signatory to international conventions including those related to the protection of the environment, implementation of programs to meet the objectives of those agreements is slow and lacking in institutional capacity, articulated policy and law, and resource commitments needed. Yemen has designated 6 protected natural resource areas but management and enforcement of rules regarding use of those areas is lax. These formally designated areas are a small fraction of the nearly 60 sites which have been considered for formal designation and additional sites identified as important bird protection areas.

Poaching of marine protected species like sharks and turtles is rampant and there is no indication that the ROYG is prepared to address these concerns with any effective strategies. Most forested areas have seen limited threat from human impact because of their remoteness and general inaccessibility. However, with the development of new roads this may quickly change, raising the urgency of a stronger management approach by the ROYG.

As with many developing countries, for that matter even developed countries, the effective management of natural resources requires the engagement of local community-based organizations whose direct interest lie in the sustainable management of their natural environments. Donors and, hopefully soon, the ROYG will partner with CBOs to improve the management, oversight, and critical protection of Yemen's natural resources.

USAID Yemen's development portfolio will require the Mission to examine many of the development grants for potential concerns, particularly those related to agriculture and food safety. Recommendations as to approaches that might be needed to conserve biodiversity are contained in sections E and F of this report and should assist in this examination.

Consideration might also be given as to what efforts are needed to assure that policy development along the community based approaches used by the Mission's developing CDCS are consistent with the responsible institutions that are in critical need of capacity building and reform. Other DAC donors are assisting these institutions in some aspect of operation.

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ANNEX 2 – FOREIGN ASSISTANCE ACT - 118/119 ASSESSMENT REQUIREMENTS

Foreign Assistance Act, Part I, Section

118 – Tropical Forests

Sec. 118.[*] Tropical Forests.

(a) Importance of Forests and Tree Cover.—

In enacting section 103(b)(3) of this Act the Congress recognized the importance of forests and tree cover to the developing countries. The Congress is particularly concerned about the continuing and accelerating alteration, destruction, and loss of tropical forests in developing countries, which pose a serious threat to development and the environment. Tropical forest destruction and loss—

(1) result in shortages of wood, especially wood for fuel; loss of biologically productive wetlands; siltation of lakes, reservoirs, and irrigation systems; floods; destruction of indigenous peoples; extinction of plant and animal species; reduced capacity for food production; and loss of genetic resources; and

(2) can result in desertification and destabilization of the earth's climate. Properly managed tropical forests provide a sustained flow of resources essential to the economic growth of developing countries, as well as genetic resources of value to developed and developing countries alike.

(b) **Priorities.**—The concerns expressed in subsection (a) and the recommendations of the United States Interagency Task Force on Tropical Forests shall be given high priority by the President—

(1) in formulating and carrying out programs and policies with respect to developing countries, including those relating to bilateral and multilateral assistance and those relating to private sector activities; and

(2) in seeking opportunities to coordinate public and private development and investment activities which affect forests in developing countries.

(c) **Assistance to Developing Countries.**—In providing assistance to developing countries, the President shall do the following:

(1) Place a high priority on conservation and sustainable management of tropical forests.

(2) To the fullest extent feasible, engage in dialogues and exchanges of information with recipient countries—

(A) which stress the importance of conserving and sustainably managing forest resources for the long-term economic benefit of those countries, as well as the irreversible losses associated with forest destruction, and

(B) which identify and focus on policies of those countries which directly or indirectly contribute to deforestation.

(3) To the fullest extent feasible, support projects and activities—

(A) which offer employment and income alternatives to those who otherwise would cause destruction and loss of forests, and

(B) which help developing countries identify and implement alternatives to colonizing forested areas.

(4) To the fullest extent feasible, support training programs, educational efforts, and the establishment or strengthening of institutions which increase the capacity of developing countries to formulate forest policies, engage in relevant land-use planning, and otherwise improve the management of their forests.

(5) To the fullest extent feasible, help end destructive slash-and-burn agriculture by supporting stable and productive farming practices in areas already cleared or degraded and on lands which inevitably will be settled, with special emphasis on demonstrating the feasibility of agroforestry and other techniques which use technologies and methods suited to the local environment and traditional agricultural techniques and feature close consultation with and involvement of local people.

(6) To the fullest extent feasible, help conserve forests which have not yet been degraded, by helping to increase production on lands already cleared or degraded through support of reforestation, fuelwood, and other sustainable forestry projects and practices, making sure that local people are involved at all stages of project design and implementation.

(7) To the fullest extent feasible, support projects and other activities to conserve forested watersheds and rehabilitate those which have been deforested, making sure that local people are involved at all stages of project design and implementation.

(8) To the fullest extent feasible, support training, research, and other actions which lead to sustainable and more environmentally sound practices for timber harvesting, removal, and processing, including reforestation, soil conservation, and other activities to rehabilitate degraded forest lands.

(9) To the fullest extent feasible, support research to expand knowledge of tropical forests and identify alternatives which will prevent forest destruction, loss, or degradation, including research in agroforestry, sustainable management of natural forests, small-scale farms and gardens, small-scale animal husbandry, wider application of adopted traditional practices, and suitable crops and crop combinations.

(10) To the fullest extent feasible, conserve biological diversity in forest areas by—

(A) supporting and cooperating with United States Government agencies, other donors (both bilateral and multilateral), and other appropriate governmental, intergovernmental, and nongovernmental organizations in efforts to identify, establish, and maintain a representative network of protected tropical forest ecosystems on a worldwide basis;

(B) whenever appropriate, making the establishment of protected areas a condition of support for activities involving forest clearance of degradation; and

(C) helping developing countries identify tropical forest ecosystems and species in need of protection and establish and maintain appropriate protected areas.

(11) To the fullest extent feasible, engage in efforts to increase the awareness of United States Government agencies and other donors, both bilateral and multilateral, of the immediate and longterm value of tropical forests.

(12) To the fullest extent feasible, utilize the resources and abilities of all relevant United States Government agencies.

(13) Require that any program or project under this chapter significantly affecting tropical forests (including projects involving the planting of exotic plant species)—

(A) be based upon careful analysis of the alternatives available to achieve the best sustainable use of the land, and

(B) take full account of the environmental impacts of the proposed activities on biological diversity, as provided for in the environmental procedures of the Agency for International Development.

(14) Deny assistance under this chapter for—

(A) the procurement or use of logging equipment, unless an environmental assessment indicates that all timber harvesting operations involved will be conducted in an environmentally sound manner which minimizes forest destruction and that the proposed activity will produce positive economic benefits and sustainable forest management systems; and

(B) actions which significantly degrade national parks or similar protected areas which contain tropical forests or introduce exotic plants or animals into such areas.

(15) Deny assistance under this chapter for the following activities unless an environmental assessment indicates that the proposed activity will contribute significantly and directly to improving the livelihood of the rural poor and will be conducted in an environmentally sound manner which supports sustainable development:

(A) Activities which would result in the conversion of forest lands to the rearing of livestock.

(B) The construction, upgrading, or maintenance of roads (including temporary haul roads for logging or other extractive industries) which pass through relatively undegraded forest lands.

(C) The colonization of forest lands.

(D) The construction of dams or other water control structures which flood relatively undegraded forest lands.

(d) **PVOs and Other Nongovernmental Organizations.**—Whenever feasible, the President shall accomplish the objectives of this section through projects managed by private and voluntary organizations or international, regional, or national nongovernmental organizations which are active in the region or country where the project is located.

(e) **Country Analysis Requirements.**—Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of—

(1) the actions necessary in that country to achieve conservation and sustainable management of tropical forests, and (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified.

(f) **Annual Report.**—Each annual report required by section 634(a) of this Act shall include a report on the implementation of this section.

*[*Footnotes omitted]*

Foreign Assistance Act, Part I, Section

119 - Endangered Species

Sec. 119.[*] Endangered Species—

(a) The Congress finds the survival of many animal and plant species is endangered by over hunting, by the presence of toxic chemicals in water, air and soil, and by the destruction of habitats. The Congress further finds that the extinction of animal and plant species is an irreparable loss with potentially serious environmental and economic consequences for developing and developed countries alike. Accordingly, the preservation of animal and plant species through the regulation of the hunting and trade in endangered species, through limitations on the pollution of natural ecosystems, and through the protection of wildlife habitats should be an important objective of the United States development assistance.

(b)[*] In order to preserve biological diversity, the President is authorized to furnish assistance under this part, notwithstanding section 660, [*] to assist countries in protecting and maintaining wildlife habitats and in developing sound wildlife management and plant conservation programs.

Special efforts should be made to establish and maintain wildlife sanctuaries, reserves, and parks; to enact and enforce anti-poaching measures; and to identify, study, and catalog animal and plant species, especially in tropical environments.

(c)[*] **Funding Level.**—For fiscal year 1987, not less than \$2,500,000 of the funds available to carry out this part (excluding funds made available to carry out section 104(c)(2), relating to the Child Survival Fund) shall be allocated for assistance pursuant to subsection (b) for activities which were not funded prior to fiscal year 1987. In addition, the Agency for International Development shall, to the fullest extent possible, continue and increase assistance pursuant to subsection (b) for activities for which assistance was provided in fiscal years prior to fiscal year 1987.

(d)[*] **Country Analysis Requirements.**—Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of—

(1) the actions necessary in that country to conserve biological diversity, and

(2) the extent to which the actions proposed for support by the Agency meet the needs thus identified.

(e)[*] **Local Involvement.**—To the fullest extent possible, projects supported under this section shall include close consultation with and involvement of local people at all stages of design and implementation.

(f)[*] **PVOs and Other Nongovernmental Organizations.**—Whenever feasible, the objectives of this section shall be accomplished through projects managed by appropriate private and voluntary organizations, or international, regional, or national nongovernmental organizations, which are active in the region or country where the project is located.

(g)[*] **Actions by AID.**—The Administrator of the Agency for International Development shall—

(1) cooperate with appropriate international organizations, both governmental and nongovernmental;

(2) look to the World Conservation Strategy as an overall guide for actions to conserve biological diversity;

(3) engage in dialogues and exchanges of information with recipient countries which stress the importance of conserving biological diversity for the long-term economic benefit of those countries and which identify and focus on policies of those countries which directly or indirectly contribute to loss of biological diversity;

(4) support training and education efforts which improve the capacity of recipient countries to prevent loss of biological diversity;

(5) whenever possible, enter into long-term agreements in which the recipient country agrees to protect ecosystems or other wildlife habitats recommended for protection by relevant governmental or nongovernmental organizations or as a result of

activities undertaken pursuant to paragraph, and the United States agrees to provide, subject to obtaining the necessary appropriations, additional assistance necessary for the establishment and maintenance of such protected areas;

(6) support, as necessary and in cooperation with the appropriate governmental and nongovernmental organizations, efforts to identify and survey ecosystems in recipient countries worthy of protection;

(7) cooperate with and support the relevant efforts of other agencies of the United States Government, including the United States Fish and Wildlife Service, the National Park Service, the Forest Service, and the Peace Corps;

(8) review the Agency's environmental regulations and revise them as necessary to ensure that ongoing and proposed actions by the Agency do not inadvertently endanger wildlife species or their critical habitats, harm protected areas, or have other adverse impacts on biological diversity (and shall report to the Congress within a year after the date of enactment of this paragraph on the actions taken pursuant to this paragraph); (9) ensure that environmental profiles sponsored by the Agency include information needed for conservation of biological diversity; and

(10) deny any direct or indirect assistance under this chapter for actions which significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas.

(h)[*] **Annual Reports.**—Each annual report required by section 634(a) of this Act shall include, in a separate volume, a report on the implementation of this section.

*[*Footnotes omitted]*

ANNEX 3 - DONOR CONTRIBUTIONS TO REPUBLIC OF YEMEN

Donor	2002	2006	2009	2010
Australia	\$0	\$0	\$990,000	\$1,850,000
Austria	\$30,000	\$40,000	\$30,000	\$20,000
Belgium	\$0	\$70,000	\$1,390,000	\$340,000
Canada	\$460,000	\$1,500,000	\$2,540,000	\$2,550,000
European Union institutions	\$17,310,000	\$22,710,000	\$23,600,000	\$40,730,000
Switzerland	\$0	\$0	\$3,860,000	\$4,080,000
Germany	\$28,360,000	\$41,400,000	\$82,920,000	\$82,140,000
Denmark	\$0	\$2,470,000	\$3,260,000	\$3,490,000
Spain	\$4,530,000	\$0	\$3,860,000	\$1,110,000
Finland	\$0	\$10,000	\$550,000	\$3,640,000
France	\$4,200,000	\$6,100,000	\$5,860,000	\$6,950,000
United Kingdom	\$7,770,000	\$15,030,000	\$35,880,000	\$63,920,000
Greece	\$50,000	\$50,000	\$230,000	\$20,000
Ireland	\$0	\$250,000	\$280,000	\$90,000
Italy	\$2,360,000	\$1,060,000	\$9,190,000	\$4,280,000
Japan	\$5,980,000	\$5,550,000	\$37,210,000	\$26,740,000
Korea, Rep.	\$170,000	\$7,880,000	\$630,000	\$450,000
Luxembourg	\$0	\$0	\$350,000	\$530,000
Netherlands	\$40,780,000	\$28,670,000	\$30,850,000	\$26,520,000
Norway	\$350,000	\$260,000	\$720,000	\$370,000
New Zealand	\$0	\$0	\$0	\$360,000
Sweden	\$420,000	\$590,000	\$5,550,000	\$7,230,000
United States	\$24,080,000	\$31,790,000	\$26,240,000	\$45,410,000
Total DAC Countries	\$136,850,000	\$165,430,000	\$275,990,000	\$322,820,000
IAEA		\$640,000	\$490,000	\$570,000
IFAD	\$1,050,000	\$1,070,000	\$7,680,000	\$9,270,000
IMF concessional (NFL, current US\$)	\$0	-\$47,085,000	-\$40,953,000	\$26,002,000
IMF non- concessional (NFL, current US\$)	-\$17,602,000	-\$12,997,000	-\$2,827,000	\$0
IDA (NFL, current US\$)	\$63,946,000	\$129,241,000	\$58,844,000	\$28,203,000
Net financial flows, multilateral (NFL, current US\$)	\$62,710,000	\$200,470,000	\$127,629,000	\$148,586,000
Net financial flows, others (NFL, current US\$)	-\$1,236,000	\$71,229,000	\$68,785,000	\$120,383,000
UNAIDS		\$100,000	\$110,000	\$250,000
UNICEF	\$2,960,000	\$5,180,000	\$9,180,000	\$7,160,000
UNHCR	\$3,230,000	\$1,830,000	\$4,430,000	\$2,710,000
UNDP	\$5,140,000	\$4,170,000	\$4,220,000	\$7,640,000
UNFPA	\$2,790,000	\$1,930,000	\$2,600,000	\$2,250,000
WFP	\$3,490,000	\$6,560,000	\$7,680,000	\$8,550,000
Net official development assistance and official aid received (current US\$)	\$216,750,000	\$287,410,000	\$557,850,000	\$664,230,000

Source: World Bank 2011 Yemen Meta Data Set

ANNEX 4 - THREATENED BIRDS FOUND IN YEMEN

Scientific name	Common name	Red List Category
<i>Geronticus eremita</i>	Northern Bald Ibis	CR
<i>Numenius tenuirostris</i>	Slender-billed Curlew	CR
<i>Falco cherrug</i>	Saker Falcon	EN
<i>Neophron percnopterus</i>	Egyptian Vulture	EN
<i>Aquila clanga</i>	Greater Spotted Eagle	VU
<i>Aquila heliaca</i>	Eastern Imperial Eagle	VU
<i>Buteo socotraensis</i>	Socotra Buzzard	VU
<i>Chlamydotis undulata</i>	Houbara Bustard	VU
<i>Dendrocopos dora</i>	Arabian Woodpecker	VU
<i>Emberiza socotrana</i>	Socotra Bunting	VU
<i>Passer hemileucus</i>	Abd Al Kuri Sparrow	VU
<i>Phalacrocorax nigrogularis</i>	Socotra Cormorant	VU
<i>Sylvia buryi</i>	Yemen Warbler	VU
<i>Torgos tracheliotos</i>	Lappet-faced Vulture	VU
<i>Turdus menachensis</i>	<u>Yemen Thrush</u>	<u>VU</u>
<i>Ardeotis arabs</i>	<u>Arabian Bustard</u>	<u>NT</u>
<i>Aythya nyroca</i>	<u>Ferruginous Duck</u>	<u>NT</u>
<i>Bulweria fallax</i>	<u>Jouanin's Petrel</u>	<u>NT</u>
<i>Circus macrourus</i>	<u>Pallid Harrier</u>	<u>NT</u>
<i>Cisticola haesitatus</i>	<u>Island Cisticola</u>	<u>NT</u>
<i>Coracias garrulus</i>	<u>European Roller</u>	<u>NT</u>
<i>Emberiza cineracea</i>	<u>Cinereous Bunting</u>	<u>NT</u>
<i>Falco concolor</i>	<u>Sooty Falcon</u>	<u>NT</u>
<i>Larus leucophthalmus</i>	<u>White-eyed Gull</u>	<u>NT</u>
<i>Limosa limosa</i>	<u>Black-tailed Godwit</u>	<u>NT</u>
<i>Numenius arquata</i>	<u>Eurasian Curlew</u>	<u>NT</u>
<i>Phoeniconaias minor</i>	<u>Lesser Flamingo</u>	<u>NT</u>
<i>Prunella fagani</i>	<u>Yemen Accentor</u>	<u>NT</u>
<i>Rhynchostruthus percivali</i>	<u>Arabian Grosbeak</u>	<u>NT</u>
<i>Terathopius ecaudatus</i>	<u>Bateleur</u>	<u>NT</u>

Source: BirdLife

CR - Critically Endangered EN - Endangered VU - Vulnerable NT - Near Threatened

4. Alien Invasive Species

Invasive plants or animals, as non-native species, are among the high threats to the native species especially the threatened and/or endangered species. They create permanent impacts on ecosystems and ultimately contribute to the loss of biodiversity. For example, invasive plants compete with native species for resources because they have no natural predators or pests, thereby becoming dominant. They out compete native plants that are for supplies for animals in the ecosystem and alter the invaded ecosystem and soil composition to such an extent that they threaten native flora and fauna.

Non-indigenous plant species are spreading rapidly in Yemen and had invaded a wide range of habitats. Moreover, the number exotic species is not precisely known and not yet studied. As the number of these invasive species increases, more native plants will come in direct competition with and be threatened by the non-native species and become endangered and possibly extinct.

Yemen is characterized by a large diversity of native species, varieties and soil types adapted different agro-ecological zones. Uncontrolled introduction of invasive plants, see microorganisms and animals has caused the degradation, decline and extinction of some native and/or endemic species. Crops such as wheat, lentil and millet have declining yields and overall quality which resulted from the introduction of homogenous high yielding seeds rather than native varieties. Similarly, the introduction of alien genera of honeybee has resulted reduction of the Yemeni honeybee race *Apis mellifera jemenitica* by spreading the varroa mite pest. Such undesirable introduction has had major environmental and economic impacts. Recent examples include citrus nurseries, which introduced diseases, and the armyworm.

ANNEX 5 - YEMEN FLORA

Recent study (Al Khulaidi, 2012) identified the total plant number of plant species to be about 2836 (within 1065 general and 179 family designations). These were further described as 2679 naturalized, 126 cultivated and 109 introduced. Some 455 plants are listed as endemic (307 in Socotra) with another 149 listed as near-endemic. Approximately 16% of the flora is unique to Yemen.

The flora of Yemen is a mixture of the tropical African, Sudanian plant geographical region (Paleotropical origin) and the Saharo-Sindian or Saharo-Arabian region (Holarctic origin) with very few of Irano-Turanian and Mediterranean regions. Most of Yemen's flora belongs to Sudanian region (Eritreo-Arabian province of Sudanian region, Zohary, 1973) or (Somalia-Masai region center of endemism, white, 1983). The Sudanian element dominates the western mountains and parts of the high land plains which is characteristic by relatively high rain fall. The Saharo-Arabian element dominates in the coastal plains, eastern mountain and the eastern and northern desert plains.

The most important families of plant species in based on their frequency of occurrence in nature are:

Family	Number	Family	Number	Family	Number
Poaceae (Graminea)	322	Apocynaceae	131	Asteraceae (Compositae)	216
Euphorbiaceae	106	Fabaceae (Papilionaceae)	205	Acanthaceae	100
Apocynaceae	46	Rubiaceae	16	Asteraceae (Compositae)	45
Scrophulariaceae	16	Euphorbiaceae	30	Poaceae (Graminea)	15
Acanthaceae	28	Caryophyllaceae	13	Boraginaceae	24
Malvaceae	12	Fabaceae (Papilionaceae)	24	Burseraceae	11
Lamiaceae (Labiatae)	23	Convolvulaceae	11	Aloeaceae	17

Source: Clearing House Mechanism of Biodiversity in Yemen (<http://ye.chm-cbd.net/>)

The most important families of endemic plants include (number between brackets endemic to Socotra):

Family	Species	Family	Species	Family	Species
1. Acanthaceae	100	61. Dipsacaceae	3	121. Ophioglossaceae	3
2. Actiniopteridaceae	2	62. Dirachmaceae	1	122. Orchidaceae	25
3. Adiantaceae	17	63. Dracaenaceae	5	123. Orobanchaceae	6
4. Agavaceae	1	64. Dryopteridaceae	5	124. Oxalidaceae	3
5. Aizoaceae	20	65. Ebenaceae	3	125. Pandanaceae	1
6. Aloeaceae	33	66. Elaeagnaceae	1	126. Papaveraceae	4
7. Amaranthaceae	32	67. Ephedraceae	4	127. Parkeriaceae	1
8. Amarylidaceae	9	68. Equisetaceae	1	128. Passifloraceae	2
9. Anacardiaceae	16	69. Ericaceae	1	129. Pedaliaceae	2
10. Annonaceae	1	70. Erythroxylaceae	1	130. Piperaceae	5
11. Anthericaceae	4	71. Euphorbiaceae	106	131. Pittosporaceae	1
12. Apiaceae (umbelliferae)	35	72. Fabaceae (papilionaceae)	205	132. Plantaginaceae	7
13. Apocynaceae	131	73. Flacourtiaceae	2	133. Plumbaginaceae	11
14. Araceae	5	74. Frankeniaceae	1	134. Poaceae (graminea)	322
15. Araliaceae	1	75. Fumariaceae	2	135. Polygalaceae	11
16. Areaceae (palmae)	11	76. Gentianaceae	11	136. Polygonaceae	22
17. Aristolochiaceae	2	77. Geraniaceae	14	137. Polypodiaceae	3
18. Asparagaceae	5	78. Globulariaceae	1	138. Portulacaceae	10
19. Asphodelaceae	1	79. Goodeniaceae	1	139. Potamogetonaceae	6
20. Aspleniaceae	11	80. Haloragaceae	1	140. Primulaceae	8
21. Asteraceae (compositae)	216	81. Hyacinthaceae	10	141. Proteaceae	1
22. Avicenniaceae	1	82. Hydnoraceae	1	142. Psilotaceae	1
23. Baisaminaceae	1	83. Hydrocharitaceae	5	143. Pteridaceae	4

Family	Species	Family	Species	Family	Species
24. Barbeyaceae	1	84. Hypericaceae	7	144. Punicaceae	2
25. Balanitaceae	2	85. Hypoxidaceae	2	145. Ranunculaceae	8
26. Basellaceae	2	86. Iridaceae	5	146. Resedaceae	13
27. Begoniaceae	2	87. Juglandaceae	1	147. Rhamnaceae	11
28. Berberidaceae	1	88. Juncaceae	9	148. Rhizophoraceae	1
29. Bignoniaceae	6	89. Lamiaceae (labiatae)	89	149. Rosaceae	17
30. Bombaceae	2	90. Lauraceae	1	150. Rubiaceae	46
31. Boraginaceae	82	91. Lemnaceae	3	151. Ruppiaceae	1
32. Brassicaceae	55	92. Lentibulariaceae	2	152. Rutaceae	16
33. Burseraceae	23	93. Liliaceae	13	153. Salicaceae	5
34. Buxaceae	1	94. Linaceae	4	154. Salvadoraceae	3
35. Cactaceae	2	95. Loasaceae	1	155. Santalaceae	3
36. Campanulacea	6	96. Loganiaceae	4	156. Sapindaceae	7
37. Cannabaceae	1	97. Loranthaceae	7	157. Sapotaceae	7
38. Cannaceae	1	98. Lythraceae	7	158. Scrophulariaceae	73
39. Caesalpiniaceae	33	99. Magnoliaceae	1	159. Selaginellaceae	4
40. Capparaceae	21	100. Malpighiaceae	2	160. Simaroubaceae	1
41. Caryophyllaceae	61	101. Malvaceae	69	161. Solanaceae	39
42. Casuarinaceae	3	102. Marsileaceae	2	162. Sterculiaceae	15
43. Celastraceae	7	103. Meliaceae	6	163. Tamaricaceae	7
44. Ceratophyllaceae	1	104. Melianthaceae	1	164. Thelypteridaceae	1
45. Chenopodiaceae	37	105. Menispermaceae	5	165. Thymeliaceae	2
46. Cistaceae	3	106. Mimosaceae	38	166. Tiliaceae	15
47. Cleomaceae	19	107. Moraceae	17	167. Typhaceae	2
48. Colchicaceae	3	108. Moringaceae	2	168. Ulmaceae	3
49. Combretaceae	7	109. Musaceae	1	169. Urticaceae	17
50. Commelinaceae	18	110. Myricaceae	1	170. Valerianaceae	1
51. Convolvulaceae	50	111. Myrsinaceae	2	171. Velloziaceae	1
52. Crassulaceae	18	112. Myrtaceae	12	172. Verbenaceae	23
53. Cucurbitaceae	33	113. Najadaceae	2	173. Violaceae	2
54. Cupressaceae	4	114. Neuradaceae	1	174. Viscaceae	1
55. Cuscutaceae	3	115. Nyctaginaceae	20	175. Vitaceae (vitidaceae)	11
56. Cyclocheilaceae	2	116. Nymphaeaceae	1	176. Woodsiaceae	1
57. Cymodoceaceae	5	117. Ochnaceae	1	177. Zannichelliaceae	1
58. Cyperaceae	74	118. Oleaceae	6	178. Zingiberaceae	2
59. Dennstaedtiaceae	1	119. Oleandraceae	2	179. Zygophyllaceae	34
60. Dioscoreaceae	1	120. Onagraceae	3		
Total					2836

Source: Clearing House Mechanism of Biodiversity in Yemen (<http://ye.chm-cbd.net/>)

While much of the traditional medicinal flora of Yemen has not been scientifically studied, these traditional herbal treatments still play an important role in the lives of many Yemenis who rely on them for their health. Such plants continue also to be used for cosmetics, condiments, coloring and flavoring agents for hygiene and diets of many Yemenis. In 1995, group of national experts compiled a list of 224 medicinal and aromatic plants in wide use in the country. Among the most common plants listed were *cassia senna* whose leaves are used as a laxative; *ziziphus spina-christi* as an antiseptic, *lowsonia inermis* as an antiseptic and cosmetic; *mentha longifolia* for abdominal disorder, *withania somnifera* and *solanum incanum* as a dental analgesic; and *anisotes trisulcus* for kidney stone treatment.

ANNEX 6 - FAUNA

List of Species of Mammals in Yemen

Yemen has a rich and diverse terrestrial fauna because of the wide range of habitats in the country and due to its position at the juncture of three major bio-geographic regions, the Pale-arctic, Afro-tropical and oriental regions. Yemen has 71 recorded land mammal species representing eight orders including bats. About one third of the mammals are relatively large species which are rare in other parts of Arabia such as the Idmi or Arabian Mountain Gazelle (*Gazella gazella*), Ibex (*Capra ibex nubiana*), Baboon (*Papio hamadryas*), Arabian Red Fox (*Vulpes vulpes arabicus*), Sand Fox (*Vulpes ruppelli*), Blanford's Fox (*Vulpes cana*), Striped Hyena (*Hyaena hyaena*), Arabian Wolf (*Canis lupus arabs*), Jackal (*Canis aureus*), Arabian Leopard (*Panthera pardus nimr*), and possibly the Cheetah (*Acinonyx jubatus*)

Yemen, including the Island of Socotra, has recorded over 360 species of birds. Among these are seventeen species (thirteen on the mainland and four on Socotra) which are found nowhere else in the world except sometimes its Arab Peninsula neighbors. With its high mountains in northern Yemen, the Red and Arabian Seas on two sides and the sands of the desert, Yemen represents a critical habitat for these bird species. Yemen is also home to three major faunal regions: the Palearctic, Orient and Afro-tropical. Adding to Yemen's importance to birds is that the country is at the foot of Arabia where migratory birds gather together for their long flight between their breeding grounds in Asia and their wintering areas in Africa.

Endemic species mostly favor the highlands in places like the cliffs of Kawkaban, an hour's drive north of Sana'a which holds concentrations of the Philby's Rock Partridge and the Arabian Partridge. Beyond the rocky cliffs are the Yemen Serins - tiny, active, drab birds with tinkling calls. Where acacia trees start to appear so will species like the Yemen Linnets, Arabian Serins, and the Yemen Warbler. Other important endemic species include the Arabian Woodpecker, the Yemen Thrush, the Arabian Accentor, the South Arabian Wheatear, the Arabian Waxhill, Golden-winged Grosbeak, and the Arabian Golden Sparrow.

Although not exclusive to Yemen, other important bird species include the Bald Ibis, one of the world's rarest birds with a rapidly declining population that now numbers less than 200. The Arabian Bustard, Yemen's largest bird standing a meter high with a huge wingspan, appears alongside farmers in irrigated agricultural land or grassy savanna amongst acacia trees.

Important seabirds in Yemen include Brown Boobies, Swift Terns, and White-eyed Gulls. Along the shores are Pink-backed Pelicans, Reef Herons, Spoonbills and a host of wading birds - mostly migrants from their Arctic breeding grounds.

Terrestrial arthropods are represented by 5 classes, 38 orders, 313 families, 1,833 general, and 3,372 species.

A total of 103 species of Reptiles and 8 species of Amphibians have been recorded in Yemen. The reptiles of Yemen include 71 species of lizards, 28 snakes and 3 amphibians, all belonging to the Order Squamata which comprises the largest reptilian group. Turtles (Order Testudinata) are represented in Yemen by 7 species, one terrestrial species (*Geochelone sulcata*), one freshwater species (*Pelomadora subrufa*) and four species of marine turtles. The amphibians include 8 species belonging to 3.

Reptiles:

Order	Family	Species
Artiodactyla	Bovidae	<i>Capra ibex</i>
		<i>Gazella Arabica</i>
		<i>Gazella erlangeri</i>
		<i>Gazella gazelle</i>
		<i>Gazella saudiya</i>

	Canidae	<i>Oryx leucoryx</i>
		<i>Tragelaphus imberis</i>
		<i>Canis aureus</i>
		<i>Canis lupus</i>
		<i>Vulpes cana</i>

Carnivora		Vulpes rueppellii			Eptesicus nasutus		
		Vulpes vulpes			Pipistrellus kuhlii		
	Herpestidae	Bdeogale crassicauda			Pipistrellus bodenheimeri		
		Ichneumia albicauda			Nycticeinops schlieffeni		
	Hyaenidae	Hyaena hyaena			Scotophilus leucogaster		
	Felidae	Acinonyx jubatus			Miniopterus schreibersii		
		Caracal caracal					
		Felis silvestris					
		Felis margarita					
	Panthera pardus						
	Viverridae	Genetta feline					
		Viverricula indica					
Mustelidae	Mellivora capensis						
Chiroptera	Pteropodidae	Eidolon helvum		Hyracoidea	Procaviidae	Procavia capensis	
		Rousettus aegyptiacus		Insectivora	Erinaceidae	Paraechinus aethiopicus	
	Rhinopomatidae	Rhinopoma hardwickei				Paraechinus hypomelas	
		Emballonuridae	Coleura afra		Soricidae	Suncus murinus	
	Taphozous nudiventris			Suncus etruscus			
	Taphozous perforatus						
Chiroptera	Rhinolophidae	Rhinolophus clivosus		Lagomorpha	Leporidae	Lepus capensis	
		Rhinolophus blasii		Primates	Cercopithecidae	Papio hamadryas	
Chiroptera	Hipposideridae	Hipposideros caffer		Rodentia	Cretidae	Gerbillus cheesmani	
		Asellia tridens				Gerbillus dasyurus	
Chiroptera	Molossidae	Tadarida aegyptica				Gerbillus famulus	
		Tadarida pumila				Gerbillus henleyi	
		Otomops martiensseni				Gerbillus nanus	
						Gerbillus poecilops	
Chiroptera	Vespertilionidae	Myotis bocagii				Meriones rex	
		Eptesicus bottae				Dipodidae	Jaculus jaculus
						Hystricidae	Hystrix indica
						Muridae	Acomys cahirinus
				Acomys russatus			
				Arvicanthis niloticus			
				Mus musculus			
				Myomys Yemeni			
					Rattus rattus		

Source: Clearing House Mechanism of Biodiversity in Yemen (<http://ye.chm-cbd.net/>)

List of some species of Amphibians in Yemen.

Anura	Bufonidae	Bufo arabicus
		Bufo dhufarensis
		Bufo hadramutinus
		Bufo scortecii
		Bufo tihamicus
	Hylidae	Hyla savignyi
	Hylidae	Hyla savignyi

Reptiles in Yemen:

Yemen has a total of 103 species of Reptiles that have been recorded in the country including 71 species of lizards and 28 kinds of snakes, all belonging to the Order Squamata which comprises the largest reptilian group. Turtles (Order Testudinata) are represented in Yemen by 7 species, one terrestrial species (*Geochelone sulcata*), one freshwater species (*Pelomedusa subrufa*) and four species of marine turtles.

Order	Family	Species
Testudinata	Chelonidae	Caretta caretta
		Chelonia mydas
		Dermodochelys coriacea
		Ertmochelys imbricata

Order	Family	Species
		Lepidochelys olivacea
	Pelomedusidae	Pelomedusa subrufa
	Testudinidae	Geochelone sulcata
Squamata	Agamidae	Agama adramitana

Order	Family	Species	
		Agama sinaita	
		Agama adramitana	
		Uromastyx benti	
		Uromastyx ocellatus philbyi	
		Uromastyx thomasi	
	Chamaeleonidae	Chamaeleo arabicus	
		Chamaeleo calyptatus calcarifer	
		Chamaeleo calyptatus calyptatus	
		Chamaeleo chamaeleon	
	Gekkonidae	Bunopus spatulurus spatulurus	
		Hemidactylus homoeolepis	
		Hemidactylus sinaitus	
		Hemidactylus turcicus	
		Hemidactylus yerburii	
		Pristurus carteri	
		Pristurus collaris	
		Pristurus crucifer	
		Pristurus flavipunctatus	
		Pristurus ornithocephalus	
		Pristurus popovi	
		Pristurus saada	
		Stenodactylus leptocymbotes	
		Stenodactylus pulcher	
		Stenodactylus slevini	
		Stenodactylus yemenensis	
		Tropicolotes scorteccii	
		Lacertidae	Acanthodactylus arabicus
			Acanthodactylus felicitis
	Acanthodactylus yemenicus		
	Latastia longicaudata andersonii		
	Mesalina adramitana		
	Mesalina guttulata		
Mesalina martini			
Philochortus neumanni			
Scincidae	Ablepharus pannonicus		
	Chalcides ocellatus		

Order	Family	Species
		Eumeces Taeniolatus
		Mabuya brevicollis
		Mabuya tessellata
		Scincus hemprichii
		Scincus mitranus mitranus
		Scincus scincus conirostris
	Varanidae	Varanus griseus
		Varanus yemenensis
	Trogonophidae	Agamadon arabicus
	Typhlopidae	Typhlops socotranus
	Leptotyphlopidae	Leptotyphlops burii
		Leptotyphlops blanfordii nursii
		Leptotyphlops filiformis
	Boidae	Eryx jayakari
	Colubridae	Coluber rhodorachis
		Coluber socotrae
		Coluber thomasi
		Coluber variabilis manseri
		Dasypeltis scabra
		Dityopphis vivax
		Lamprophis fuliginosus
		Lytrothynchus diadema
		Malpolon moilensis
		Psammophis schokari
		Rhynchocalamus arabicus
		Spalerosophis diadema cliffordi
		Telescopus dhara dhara
		Atractaspididae
	Elapidae	Naja haje arabica
Viperidae	Bitis arietans	
	Cerastes cerastes	
	Cerastes gasperettii	
	Echis coloratus	
	Echis pyramidum	
Hydrophiidae	Pelamis platurus	

Yemen has more than 363 species thus far recorded representing 18 orders, 61 families and 177 genera. It is a home to a large number of species that are endemic to southwest Arab Area- Asia. as follows:

Endemic and Near-Endemic Bird Species in Yemen

Species	Endemic to Yemen	Semi Endemic
Alectoris melanocephala (Red-legge Partridge)	●	
Alectoris philbyi (Philby's Rock Partridge)	●	
Carduelis yemenensis (Yemen Linnet)	●	

Cisticola haesitata (Socotra cisticola)	●	
Dendrocopos doraе (Arabian woodpecker)	●	
Emberiza socotrane (Soqotra Bunting)	●	
Estrilda rufibarba (Arabian Waxbill)	●	
Incan incant (Socotra Warbler)	●	
Nectarinia Belfour (Balfour Sunbird)	●	
Oenanthe lumens lugentoides (Mourning Wheatear)	●	
Onychognathus frater (Socotra Starling)	●	
Otus senegalensis socotranus (Socotra Owl)		●
Parisoma buryi (Yemen Warbler)	●	
Passer euchlorus (Golden Sparrow)	●	
Passer insularis (Socotra Sparrow)	●	
Prunella fagani (Arabian Accentor)	●	
Rhynchostruthus s. socotranus (Golden-winged Grosbeak)	●	
Serinus menachensis (Yemen Serin)	●	
Serinus rothschildi (Arabian Serin)	●	
Turdus menachensis (Yemen Thrush)	●	
Source: Clearing House Mechanism of Biodiversity in Yemen (http://ye.chm-cbd.net/)		

Table of some endemic and near-endemic bird species in Yemen:

Species	Endemic to Yemen	Semi Endemic
Alectoris melanocephala (Red-legge Partridge)	●	
Alectoris philbyi (Philby's Rock Partridge)	●	
Carduelis yemenensis (Yemen Linnet)	●	
Cisticola haesitata (Socotra cisticola)	●	
Dendrocopos doraе (Arabian woodpecker)	●	
Emberiza socotrane (Soqotra Bunting)	●	
Estrilda rufibarba (Arabian Waxbill)	●	
Incana incana (Socotra Warbler)	●	
Nectarinia balfouri (Balfour Sunbird)	●	
Oenanthe lugens lugentoides (Mourning Wheatear)	●	
Onychognathus frater (Socotra Starling)	●	
Otus senegalensis socotranus (Socotra Owl)		●
Parisoma buryi (Yemen Warbler)	●	
Passer euchlorus (Golden Sparrow)	●	
Passer insularis (Socotra Sparrow)	●	
Prunella fagani (Arabian Accentor)	●	
Rhynchostruthus s. socotranus (Golden-winged Grosbeak)	●	
Serinus menachensis (Yemen Serin)	●	
Serinus rothschildi (Arabian Serin)	●	
Turdus menachensis (Yemen Thrush)	●	
Source: Clearing House Mechanism of Biodiversity in Yemen (http://ye.chm-cbd.net/)		

ANNEX 7 - MAIN MANAGEMENT SYSTEMS FOR MAJOR FISHERIES

The Gulf of Aden and the Red Sea waters are characterized by high bio-productivity, due to the southwest monsoon winds during the summer and solar radiation. They represent a unique and large ecosystem that deserves a high degree of scientific attention.

The coastal waters of Yemen are also characterized by their high level of primary and secondary production, making them an important feeding and nursery ground for marine species, where more than 600 species of fish and marine organisms have recently been recorded.

Large Pelagic Fisheries

There are different species of pelagic fish in Yemen waters including yellow fin tuna, Bonita tuna, skipjack tuna, kata kawa, king and Spanish mackerel, trevallies, swordfish and marlin. These pelagics are mainly caught by the artisan fisheries.

The estimated total catch in 1998 was 126 063 tons. In order to catch the large pelagic, fixed gill nets are used as well as long-lines, hand-lines, purse seines and trolls. There are no regulations controlling the harvesting of these fish, as the fishing season lasts the entire year.

Small Pelagic Fisheries

The main small pelagic fish are sardines, Indian mackerel, chub mackerel and anchovies. These fish are caught by the artisan fisheries using purse seines, beach seines and coast nets. Industrial fishery vessels mainly caught chub mackerel by using trawls. In 1989, the catch of chub mackerel by industrial fleets amounted to approximately 24 000 tons, but no industrial fisheries have caught this fish since that year.

The estimated catch of small pelagic in 1998 was approximately 30 000 tons. Specific regulations are in force today for controlling the harvesting of sardines in certain ROYG districts such as Hadramout such as the prohibition against the use of purse seines in certain months, or at night.

Demersal Fisheries. The most important demersal fishes in Yemen waters are: groupers, emperors, scavengers, snappers, sea breams, barracuda, sharks and rays. Demersal fish are caught by both traditional and industrial vessels. The total catch of these fish in 1998 was estimated at 63 700 tons, including 79% from artisan fishery and 21% from industrial fishery. Artisan fishermen use gill nets, hand lines and traps to catch demersals, while industrial fishing vessels use trawls to catch them.

The management measures with regard to industrial fisheries include: a) fishing vessels must operate beyond five miles from the coast in the Gulf of Aden and the Arabian Sea, and beyond six miles from the coast in the Red Sea, b) no discarding of fish is allowed, c) two or more supervisors must be deployed on board each of the fishing vessels, and d) the mesh size for the cod end should measure not less than 75 mm, and nets must be single layered.

Crustacean and Mollusk Fisheries. Two commercial species of lobster inhabit Yemen waters, namely, rock lobsters (*Panulirus hamarus*) and deep sea lobsters (*Puerulus sewelli*).

The total catch of rock lobster for the year 2000 was 200 tons. The traditional fishermen catch rock lobsters using traps. The principal lobster regions are in the Almahra and Hadramout Governorates in East Yemen. Due to the decline in catch after 1992, and as a management measure, a closed season is now in force during the breeding and reproduction period from 30 March to 31 October of each year. Other management measures include: a) only traps can be used for harvesting rock lobster. Nets or any other fishing gear are prohibited, b) egg-bearing females must be returned to the sea, c) rock lobster less than 19 cm. long cannot be harvested, d) no more than 60 traps can be used by a single boat, and e) the mesh size of traps must measure less than 6 cm.

Deep sea lobsters were caught by industrial fishing vessels offshore from 1975-1989 at depths ranging from 300-700 m. The total catch in 1989 amounted to approximately 200 tons. No industrial fishing for deep sea lobsters has been carried out since 1990

Shrimp Fisheries. Two commercially-fished coast shrimp species are found in Yemen waters, namely, *Peneus indicus* and *Peneus semisulcatus*. The major catches are in the Red Sea, when the shrimp are present in large schools. The shrimp are mainly caught by artisan fishermen using nets such as trawls, which are pulled by small boats (8-10 m long). The shrimp catch in the Red Sea in 1988 was estimated at 600 tons. In the Arabian Sea, there is only one narrow area about 30 km long in the Almahara Governate where commercial schools of shrimp can be found. The shrimp catch in this area in the year 2000 year was 130 tons.

The regulations controlling shrimp harvesting are: a) the fishing season for coast shrimp runs from 1 September to 30 April each year and b). coast shrimp can only be caught by artisan fishermen, and not by industrial fishing vessels.

Deep Sea Shrimps. About nine species of deep sea shrimp are found in Yemen waters, offshore along the coast in the Gulf of Aden. The total catch in 1989 was approximately 400 tons. No fishing vessels harvested deep sea shrimp after 1989.

Cuttlefish Fishery. There are two commercial species in Yemen waters, namely, *Sepia pharaonis* and *Sepia prashadi*, with *Sepia pharaonis* representing more than 80% of the catch.

Both the artisan and industrial fishing craft catch cuttlefish. The total catch in 1998 was 4 000 tons, increasing to 10 000 tons in 2000 (8 000 from industrial fishery and 2 000 from artisan fishery). Industrial fishery uses large trawls, while artisan fishery uses traps and bottom lines.

The fishing season runs 1 June to 15 August, and closes until 30 September (during the spawning season). The fishing season then continues until 30 April. Implementing the cuttlefish survey program in May, in order to ascertain stock assessment, the allowable yearly catch and fishing activities.

Shark and Ray Fishery. More than 80 species of sharks and 40 species of rays and skates can be found in Yemen waters, particularly around Socotra Island. Most of the large catches are made by artisan fishermen using bottom lines and gill nets. The dried fins of sharks are exported to East Asian countries. The flesh of sharks and rays is a delicacy for many people in Yemen, particularly in the East Governorates. The total catch for these species amounted to 3 965 tons in 1998.

Other Fisheries. This includes a small traditional fishery for sea cucumbers, which are caught by hand. The entire catch is then dried and exported. The sea cucumber is fished in commercial quantities in the west of Aden, in the Khor Umera and Ras Alara areas. The total catch in 1997 was estimated at five tons of dried sea cucumber. The entire catch was exported to Japan and East Asian countries

Government Strategy

The main goals of the ROYG's strategy for fisheries include: a) Rational and sustainable use of marine resources achieved through the maintenance and development of fishery coast management, fishery research and fisheries extension; b) Increased fisheries contribution to national income by the development of fish exports, technology transfer and infrastructure completion; c) Enhanced private sector role in fisheries development and expanding its activities in infrastructure completion; d) Increased contribution of fisheries to food security achieved by enhanced annual catch and improved fish distribution in the country; e) Construction of new coast fishing facilities in those regions which were not included in previous projects; f) Improved supervision and marine surveillance utilizing modern equipment and more effective implementation of fisheries regulations; and g) Consideration of taxes or fees to be imposed on the fisheries sector. Currently the Yemen requires a 2% fee for the health certificate regarding fish quality based on the total value of the fish exported. Fees are also required for fishing licenses as a fee based upon the quantity of fish caught by the vessels.

Institutional Arrangements

Enforcement

The enforcement of fisheries legislation is carried out by the Ministry of Fish Wealth, with the assistance of the Coast Guard (Ministry of the Interior) and the Ministry of Defense. The Ministry of Fish Wealth, as the country's primary fisheries development and management organization, collaborates with other ministries such as the Ministry of Tourism and Environment, the Ministry of Transport and Marine Affairs, the Ministry of Planning and Development, as well as with the Sana'a, Aden, Hudeida and Hadramout Universities.

The constraints present in fisheries management include its weakness in key fisheries information gathering, processing and utilization, as well as a serious weakness in enforcing fisheries laws and regulations.

Fishing Regulations

The activities carried out by the fisheries sector are organized and governed by Aquatic Law No. 42 issued in 1991, which regulates the fishing and exploitation organisms and their protection. This law includes the following sections: fishing, licenses, fishing regulations, processing and marketing, aquaculture, protection, violations and penalties and general provisions. The regulations also deal with the different kinds of licenses, fishing gear, and fish processing and quality control.

In addition, ministerial decisions are issued every year regarding the opening and closing of the fishing seasons for the important commercial fish such as rock lobster, coast shrimp and cuttlefish.

UNDP and FAO collaborated in fishery extension by means of small programs and TCPs to improve the level of fishing cooperatives and individuals. The Agriculture - Fisheries Encouragement Production Fund supports certain fisheries projects in regions along the coast, in order to upgrade the economic, social and technical standards of the traditional fishermen and their families, and to guarantee the optimal utilization of fish products. This has had a significant impact on the modernization of the traditional inshore fishing fleet. Aware of the importance of research in fisheries development, ROYG provided the financing for a new research vessel. In addition, the Agriculture - Fisheries Encouragement Production Fund provided the financing (31 million YR) for upgrading the Aquaculture Research Centre.

Supply and Demand Projections

Yemen is considered to be completely self-sufficient in fish and fish products, with a surplus of not less than 20% of its minimum level. The annual per caput consumption of fish in 1998 was 7.4 kg. Approximately one-fifth of its fish production is exported, mainly to Europe, Japan, Jordan and other countries.

Fisheries product exports for 1998 were estimated at 29 858 tons, valued at \$40 000 million. A small amount of canned and smoked fish was imported for supermarkets and hotels.

Source: Modified directly from FAO

ANNEX 8 - GEF YEMEN BIODIVERSITY PROJECTS MANAGED BY UNDP

Project Title	Area Of Work	Started	Amount (\$)	Oper Phase
Bee-resources and Vegetation Cover Conservation on Socotra	Biodiversity	2011	50,000.00	Phase 5
Project Number: YEM/SGP/OP5/Y1/CORE/BD/11/01				
The only Bee Species found on Socotra Api Yemenitca is endemic species to the Island. Ad hoc honey harvest could damage wild bee population				
Improving rural trek roads for pedestrians and animal	Biodiversity	2011	12,846.00	Phase 5
Project Number: YEM/SGP/OP5/Y1/CORE/BD/11/02				
Al-Maghareb group of villages of Bani Suleiman near Bura protected area. The villages important area for coffee plantation in the small terrace planting				
Rain-water harvest for Biodiversity Conservation and...	Biodiversity	2011	49,953.00	Phase 5
Project Number: YEM/SGP/OP5/Y1/CORE/BD/11/04				
Kabhaten region is an intermountain plain located some 50 Km west of Hadibu. The majority of the population are herders with few working in the fishing				
Rain-water Harvest for Biodiversity Conservation in...	Biodiversity	2011	50,000.00	Phase 5
Project Number: YEM/SGP/OP5/Y1/CORE/BD/11/05				
Momi region constitutes the higher plateau of the eastern part of Socotra. The region is rich in biodiversity with high endemism.				
Rain-water Harvest for improving community livelihood in...	Multifocal Area	2010	36,808.00	Phase 4
Project Number: YEM/GEF/SGP/OP4/Y3/CORE/10/7				
Mayhah region, Qalancia District known to be the driest part of Socotra Island with no water springs or underground water				
Rain-water harvest for rangeland improvement in Damqoot.	Multifocal Area	2010	23,873.00	Phase 4
Project Number: YEM/GEF/SGP/OP4/Y3/CORE/10/6				
The area of "Mahshakat" is located north-east of Damqoot town, adjacent to the Hawf protected area				
Rain-water Harvest for the conservation of threatened...	Multifocal Area	2010	30,787.00	Phase 4
Project Number: YEM/GEF/SGP/OP4/Y3/CORE/10/8				
Momi region, Hadibo District is located in eastern Socotra overlooking the ocean. The landscape is rocky intersected with plains are rich in grass and bush land.				
Baseline Study and Design of Water Harvest Tank in Katen...	Multifocal Area	2009	1,400.00	Phase 4
Project Number: YEM/GEF/SGP/OP4/CORE/Y3/09/03				
A planning grant project aimed at securing professional design of a water tank for the community				
Conserving Agro biodiversity in Al-Seek agriculture area,	Biodiversity	2009	49,992.00	Phase 4
Project Number: YEM/GEF/SGP/OP4/CORE/Y2/09/02				
Aldis Al-Sharkiah is located some 100 Km from Mukalla, on the Mukalla-Al-Ghyadah near the Gathmoun Coastal Protected Area (main turtle breeding beach)				
Pasture and vegetation Cover Development in Addis...	Multifocal Area	2009	42,547.00	Phase 4
Project Number: YEM/GEF/SGP/OP4/CORE/Y2/09/05				
Al-diss Al-Sharkia is located some 100 km east of Mukalla, Hadramout Governorate and nearest populated area from Sharma-Gathmoun Protected Area				
Pottery craft improvement project, Rahn, Hawf, Al-Mahrah...	Biodiversity	2009	10,814.00	Phase 4
Project Number: YEM/GEF/SGP/OP4/CORE/Y2/09/07				
Rahn Village is one of three main settlements in Hawf protected Area, Al-Mahara Governorate. Pottery industry helps old generation in that part of Yemen to use pottery in their livelihood. Few years ago, the Hawf forest was declared as protected				
Water Resources Improvement in Wadi Makik, Al-Ghaileen	Biodiversity/Land Degradation	2009	13,420.00	Phase 4
Project Number: YEM/GEF/SGP/OP4/CORE/Y2/09/08				
Village located in the Mountain of Bura is characterized by difficult land topography, extensive terrace system, water harvest and coffee plantation. Water is scarce resource				
Eco-tourism management in Rouche Marine Protected Area	Biodiversity/Climate Change Mitigation	2008	23,320.00	Phase 4
Project Number: YEM/SGP/OP4/Y1/Core/2008/2				
Area located 400 m off shore in Halah region, north-eastern Socotra. Communities in two nearby villages will establish basic infrastructure and capacity to host eco-tourism				
Galelhon water supply and women home gardens development in	Climate Change Mitigation	2008	12,624.00	Phase 4

Project Number: YEM/SGP/OP4/Y1/Core/2008/1				
Project supports 20 families for domestic supply water and to develop a 200m2 home garden for each family.				
Invasive Species Control on Socotra Island	Biodiversity	2008	13,510.00	Phase 4
Project Number: YEM/GEF/SGP/OP4/CORE/Y1/08/06				
Socotra Island rich biodiversity in fauna and flora with a high rate of endemism, Socotra biodiversity are prone to the impact of invasive species.				
The use of renewable energy in water supply in Rokeeb...	Climate Change Mitigation	2007	12,291.00	Phase 3
Project Number: YEM/OP3/2/7/9				
Village is east of Hadibo capital city of Socotra with 63 families in 41 homesteads. Water source is far away and require women to bring it home on their backs.				
Women capacity building for improved livelihood and natural	Multifocal Area	2007	22,354.00	Phase 3
Project Number: YEM/OP3/2/07/10				
Kamaran Islands located in the Red Sea some 22 km away from shore at Assalif port (N 15o 33466 E 42o 60861). The population is 3000 inhabitants. Women are educated and aware of the value of their traditional crafts and its raw materials on the				
Community-based Eco-tourism development for conservation	Climate Change Mitigation	2006	15,844.00	Phase 3
Project Number: YEM/OP3/2/06/05				
Amahk Beach located 20 km north of Bedhola Village consists of sand dunes interacted with date palm trees forming a half moon shape.				
Feasibility study for processing and packing dates on...	Biodiversity	2006	2,000.00	Phase 3
Project Number: YEM/OP3/1/06/02				
Date palm is sole export agriculture activity on Socotra, Yemen. The estimated number of trees is 1.5 million producing				
Home gardens for growing vegetables and the traditional...	Biodiversity	2006	4,557.00	Phase 3
Project Number: YEM/OP3/2/06/07				
Supports 14 families (150 inhabitants) returning to village of "Hazalanou" abandoned 15 years ago.				
Sustainable Environmental Management and Eco-tourism for.	Biodiversity	2006	49,999.40	Phase 3
Project Number: YEM/OP3/1/06/04				
Scund is highest mountain on Socotra consists of nature sanctuary and adjacent national park. The area is the main source of water for Socotra				
Use of solar energy in water supply for Shu'eb village,	Climate Change Mitigation	2006	18,480.60	Phase 3
Project Number: YEM/OP3/1/06/03				
Shu'eb village located in Qalanciah district, Socotra Island., Water supply is from two sources				
Using solar energy for water supply in six villages in.	Climate Change Mitigation	2006	45,824.00	Phase 3
Project Number: YEM/OP3/2/06/06				
The six villages (Bedhola, Stero, Mahatta, Mharef, Arshani and Amahk Beach) in the Nojid plain close to Sea shore.				
Using Solar System for Providing Drinking Water and...	Climate Change Mitigation	2006	8,702.26	Phase 3
Project Number: YEM/OP3/1/06/01				
Afsar village, located half way between Homhill and Dehameri Protected Areas (less than 5 km) and within Momi national park on Socotra.				
Using solar system for water provision-Al-Yaman Village,	Climate Change Mitigation	2006	12,700.00	Phase 3
Project Number: YEM/OP3/2/06/02				
Project will enable Al-Yaman Village to install a solar water pumping system to provide water from a well located 5 km at Sea shore				
Water Supply and Home Gardens for women in three villages	Biodiversity	2006	38,092.00	Phase 3
Project Number: YEM/GEF/SGP/OP3/CORE/Y2/06/04				
Villages (Qashaihen, Kadha and Adoona) are on Deneghen wadi run off system at the suburb of Hadibu city the capital of Socotra.				

ANNEX 9 - LIST OF INVASIVE SPECIES RECOGNIZED IN YEMEN

I. Alien Species

1. The house crow (*Corvus splendens*) has established itself in at least 25 countries. It proliferates in human settlements and disturbed habitats and is especially suited to coastal settlements. It can even penetrate harsh desert environments once man has become established there. The house crow causes problems across a range of areas, including crop and livestock sustainability and poses a risk to native avifauna. It also carries a range of human pathogens but a link with human disease is yet to be established.
2. *Equus asinus* (donkeys). These animals have deleterious and potentially irreversible impacts on native flora and fauna. Damage has been documented in plant communities, soils, wildlife and water quality. Management and cultural pressures prevent lethal methods of management from being used. Typical management techniques involve removing the species from their natural habitat and placing them in reserves where they will not pose a threat. The growing number of feral donkeys, roaming free and causes extensive hybridization with their wild relative *Equus africanus*, thus contribute to the extinction of the *E. africanus*.
3. Native to Asia, cogon grass (*Imperata cylindrica*) is common in humid tropics and has spread to warmer temperate zones worldwide. Cogon grass is considered to be one of the top ten worst weeds in the world. Its extensive rhizome system, adaptation to poor soils, drought tolerance, genetic plasticity and fire adaptability make it a formidable invasive grass. Increases in cogon grass concern ecologists and conservationists because of the fact that this species displaces native plant and animal species and alters fire regimes.
4. Bitter lettuce (*Launaea intybacea*) is native of Africa and has adapted to dry conditions.
5. *Opuntia stricta* is a cactus originating in Central America that can grow up to 2 meters in height. This spiny shrub favors rocky slopes, river banks and urban areas. *Opuntia stricta* was considered to be Australia's worst ever weed. *Opuntia stricta* is also invasive in South Africa, where biological options are currently being explored to control the problem.
6. *Paratrechina longicornis* (the crazy ant) is a tramp ant, which, by definition, is an ant that is widely dispersed through commerce and other human-assisted avenues. It is extremely easy to identify by observing its rapid and erratic movements. *Paratrechina longicornis* is highly adaptable to various environments and can be a major pest. It occurs in large numbers in homes or outdoors and is capable of displacing other ants and possibly other invertebrates. *Paratrechina longicornis* forages over long distances away from its nest making the nest hard to find and the ants difficult to control.
7. *Psittacula krameri*, is native to central Africa and Asia and is a colorful, distinctive-looking bird. It is known as one of the most successful avian invaders in the world with established populations in over 35 countries outside its native range. *P. krameri* has been shown to have adverse impacts on native bird species and carry diseases.
8. *Suncus murinus* (the Indian musk shrew) is a commensal and adaptable mammal. It rapidly colonizes and threatens many plant and animal through predation and competition. Through human agents transport, it has a large and expanding range. To date, very little work has been done on how to effectively manage the species.
9. *Tapinoma melanocephalum* is known as a tramp ant as its spread around the globe has been assisted by human activities. It is highly flexible in the habitats it occupies, providing there is some form of disturbance allowing it to establish ahead of more dominant ant species. It nests readily outdoors or indoors. As well as disturbing greenhouse environments, these ants can transport pathogenic microbes in hospitals.
10. *Technomyrmex albipes*, known as the white-footed ant are often found on cut flowers and other imported plants and have a penchant for invading houses and nesting in wall cavities. The ants reproduce rapidly, especially in warm weather.
11. *Trogoderma granarium* are considered a pest of considerable impact to stored foodstuffs. It maintains its presence in food storage in very low numbers and is able to survive long periods of time in an inactive state.

12. *Viverricula indica* (mammal), small Indian civet

13. *Acanthophora spicifera* is a red algae found in most tropical or subtropical seas of the world. Its plastic morphology allows it to adapt to a variety of environmental conditions, and hence it can invade a diverse range of habitats. It is amongst the most successful alien algal species in this region and may modify or compete with native communities of algae.

14. *Candidatus Liberibacter africanus* (micro-organism) causes huanglongbing (HLB) or citrus greening disease, a destructive disorder of citrus caused by gram-negative phloem-restricted bacteria belonging to the genus *Candidatus Liberibacter*. The genus comprises three known species: *Candidatus Liberibacter asiaticus*, occurring in Asian countries and, to a lesser extent, in Brazil and the USA (Florida), *Candidatus Liberibacter africanus*, recorded from African countries, and *Candidatus Liberibacter americanus* present in Brazil and Florida. It is thought that each *Liberibacter* species evolved in the continent after which it is named. HLB is transmitted between trees by the psyllids *Trioza erytreae* in Africa and *Diaphorina citri* in Asia and America. HLB affects all commercial citrus varieties, causing mottling of leaves, stunting of growth and formation of small, deformed fruit which fail to color properly. HLB can destroy citrus groves within 5 to 8 years.

15. *Diaphorina citri* or Asian citrus psyllid (insect) is one of the most serious pests of citrus in the world. It causes damage through direct feeding and its toxic saliva, leading to leaf distortion and curling in young tender growth. In addition the copious amounts of honeydew it excretes causes sooty molds to grow which blemish leaves and reduce photosynthesis. However it is the ability of *D. citri* to vector the Asian and American forms of the huanglongbing (HLB) disease which makes this so damaging. HLB is caused by phloem-restricted bacteria in the genus *Candidatus Liberibacter*. HLB causes chlorosis resembling zinc deficiency, twig dieback, stunting of growth and reduced fruit size and quality. Trees usually die after several years and entire orchards may be devastated. HLB seriously threatens citrus industries worldwide. At present there are no curative methods for trees infected with the bacteria.

16. *Gracilaria salicornia* (algae) threatens coral reefs and native benthic communities, may reduce marine species diversity, and/or alter marine community structure.

17. *Xanthomonas axonopodis* pv. *citri* is a bacterium affecting citrus trees that thrives in areas with high temperatures, heavy rainfall, and high winds. In areas with these characteristics, *X. axonopodis* pv. *citri* causes citrus canker, which imparts heavy economic losses on citrus industries. It spreads through inadvertent translocation of infected citrus fruits and seedlings to uninfected areas. Locally, *X. axonopodis* pv. *citri* is spread with the help of the Asian citrus leaf miner, which exposes the bacteria for spread by wind and rainfall.

18. *Yersinia pestis* is a gram-negative bacterium that causes plague. It is a zoonotic disease and exists in natural cycles involving transmission between rodent hosts and flea vectors. Humans are usually infected through bites from rodent fleas that carry the disease. Modern antibiotics are effective against *Y. pestis*, but if treatment is delayed or inadequate then the disease can cause severe illness or death.

II. Native Species

1. The mallard (*Anas platyrhynchos*) is the most common and widely distributed dabbling duck, having a widespread global distribution throughout the northern hemisphere. This migratory species is a highly valued game bird. Introductions and range expansions of *A. platyrhynchos* for game purposes pose a threat of competition and hybridization to native waterfowl. Also, recent studies hold the mallard as a likely vector for the highly pathogenic avian influenza virus (HPAIV) (H5N1).

2. *Cenchrus macrourus* (*Pennisetum macrourum*) is a 1 to 1.8 metre erect perennial grass native to South Africa. It is known to replace desirable stock grass with grass of low palatability in pastoral areas.

3. *Genetta genetta* (mammal) - Interim profile, incomplete information

4. *Lotus corniculatus* (bird's foot trefoil) is a low growing perennial legume that has long been valued as an agricultural crop. *Lotus corniculatus* is native to much of Europe, Asia and parts of Africa, but now has a near global distribution. Over most of its range, *Lotus corniculatus* is not considered invasive, although in a few areas it has out-competed native vegetation.
5. *Lutjanus kasmira* is a commercially important reef-associated tropical fish into some fisheries. It may out compete native fish for space, crowding them out of important refuge areas.
6. *Maconellicoccus hirsutus* or the pink hibiscus mealy bug, is a polyphagous pest on a wide range of ornamental and agricultural plant species. Native to tropical and subtropical Asia and Africa, *M. hirsutus* forms colonies covered by a white waxy, elastic ovisac material. Feeding causes plant deformation and lowered aesthetics, which can result in heavy economic losses. The annual cost of control and damages to the US economy from *M. hirsutus* is estimated at US\$ 700 million, the global estimate is US\$ 5 billion.
7. *Panicum repens* is a perennial grass that frequently forms dense colonies and has long, creeping rhizomes. It grows in moist, sandy soils and its rhizomes extend several feet out into the water. Dense floating mats that impede water flow in ditches and canals and restrict recreational use of shoreline areas of lakes and ponds.
8. *Pittosporum viridiflorum* is a shrub/tree that has become naturalized in Hawai'i and Saint Helena. Originally cultivated in Europe as early as the 17th Century, the Dutch took the species to Saint Helena where it has now naturalized as an early colonizer in the currently regenerating shrub land. In Hawaii, *P. viridiflorum* is typically found at altitudes less than 1000m at forest edges and abandoned pasture.
9. *Salsola tragus* is an annual weed that begins life as a multiple branched bush but then takes on a spherical form that breaks at the soil line and becomes a tumbleweed spreading thousands of seeds. It is abundant in semi-desert regions and salty soils, where rainfall is not abundant. It infests range and semi-arid pasture lands as well as cropland, railroad, and highway rights of way, as well as vacant agricultural, residential and industrial areas. *Salsola tragus* is a road hazard, as tumbling plants can surprise drivers and cause traffic accidents. It is also responsible for allergic sensitization in Europe and North America and is poisonous to sheep.
10. *Tamarix aphylla* (L.) Karst., shrub is native to Africa and tropical and temperate Asia. It is an evergreen tree that grows to 15 m, and has been introduced around the world, mainly as shelter and for erosion control. Seedlings of *T. aphylla* develop readily once established, and grow woody root systems that can reach as deep as 50 m into soil and rock. It can extract salts from soil and water and excrete them through their branches and leaves. *T. aphylla* can have the following effects on ecological systems: dry up viable water sources; increase surface soil salinity; modification of hydrology; decrease native biodiversity of plants, invertebrates, birds, fish and reptiles; and increase fire risk.

<http://www.issg.org/database/species/search.asp?sts=sss&st=sss&fr=1&x=13&y=11&sn=&rn=yemen&hci=-1&ei=-1&lang=EN>