MINISTRY OF ENVIRONMENT, SCIENCE, TECHNOLOGY & INNOVATION

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PART 1- AN UPDATE ON BIODIVERSITY STATUS, TRENDS, AND THREATS AND IMPLICATIONS FOR HUMAN WELL-BEING

1.1 Why is biodiversity important for your country?

Biodiversity represents the variety of living organisms and can be viewed from several perspectives including molecular and genetics, species assemblages and of the variety of ecosystems - deserts, forests, wetlands, rivers, lakes and agricultural landscapes that contribute to our living planet. Each landscape and waterscape is a productive ecological system that provides for humans and other living organisms.

The importance of biodiversity to Ghana may be considered along the lines of benefits that are derived. These lines are in agriculture - for food and nutrition, health, ecosystem services including climate mitigation, wealth, aesthetics and general human well-being.

Agricultural biodiversity provides humans with food and raw materials for goods - such as cotton for clothing, wood for shelter and fuel, plants and roots for medicines, and materials for bio fuels and with incomes and livelihoods, including those derived from subsistence farming.

In 2013, Agriculture in general (classified to include fisheries, forestry and logging) contributed 21.9% of Ghana's Gross Domestic Product (NDPC, 2014). It is projected that by 2017, forestry and fisheries sectors would grow at a rate of 1.2% and 5.7% respectively with associated sectorial contribution of 1.4% and 1.0% to GDP (NDPC, 2014).

Maintenance of this biodiversity is therefore essential for the sustainable production of food and other agricultural products and the benefits these provide to humanity, including food security, nutrition and livelihoods. It is widely acknowledged that biodiversity and agriculture are strongly interrelated because while biodiversity is critical for agriculture, agriculture can also contribute to conservation and sustainable use of biodiversity. Indeed, sustainable agriculture both promotes and is enhanced by biodiversity. It has enabled farming systems to evolve ever since.

Diets based on a diversity of food species promote human health, and can help to protect against disease by addressing the problem of micronutrient and vitamin deficiencies. Biodiversity is the basis of traditional medicine which contributes greatly to maintenance of health of majority of people who cannot afford orthodox medical services. Loss of agricultural biodiversity can therefore threaten health, livelihood sustainability and our future security of food and nutrition.

Forest and agricultural biodiversity also perform ecosystem services such as soil and water conservation, maintenance of soil fertility and biota, and pollination, all of which are essential to human survival. In addition, genetic diversity of agricultural biodiversity provides species with the ability to adapt to changing environment and evolve, by increasing their tolerance to frost,

high temperature, drought and water-logging, as well as their resistance to particular diseases, pests and parasites for example. This is particularly important regarding climate change. The evolution of biodiversity, and therefore both its and our survival, mainly depends on this genetic diversity.

Ghana is an agricultural country with about 70% of its people involved in cultivation of various crops for food and other products which include timber and cash crops. Besides food production to feed local population, Ghana also exports a variety of other products such as cocoa which generate more than 50% of the foreign earnings for the country.

Fisheries in Ghana contribute significantly to national economic development objectives related to food security, employment, poverty reduction, GDP and foreign exchange. The country produces around 440,000 tons of fish a year (worth in excess of US$1 billion annually) from its marine fisheries, inland waters and aquaculture. The fisheries sector contributes to 4.5% of GDP. Taxes from fishing licenses and market tolls represent less than 5% of local revenue (FAO, 2006). The sector also provides employment to the labour force and contributes to foreign exchange. Regarding foreign exchange earnings, Ghana's fish export is second to horticultural products both in value and quantity (Bank of Ghana, 2008; Sarpong et al., 2005). In 2008, fish trade was 421,515 tons valued at USD 172,872,000 (FAO, 2006).

The fishing industry provides employment to many rural people and urban dwellers, with one (1) in ten (10) Ghanaians dependent on fisheries (FAO, 2006). As many as 2.2 million people are dependent on the fisheries sector for their livelihoods, including 135,000 fishers in the marine sector, of which 92 percent are artisanal fishers. Moreover, the sector is significant for its gender distribution. Men are involved in fish harvesting, undertaking the main fishing activities in the artisanal, semi-industrial and industrial sectors, while women are the key players in on-shore post-harvest activities, undertaking fish processing, storage and trade activities (Berchie, 2012).

Fish is a very important food item in the Ghanaian diet. Average per capita fish consumption in Ghana is estimated at 20-25 kg higher than the world average of 13 kg (FAO, 2006). However, fish requirement in Ghana is estimated as 40 kg per head per year. In 2008, with a population of approximately 22.6 million the national fish requirement is over 900.000 MT annually. The ever increasing population is putting pressure on the demand for fish which wild fish capture alone is not able to meet. Thus, the national demand for fish is greater than the country can supply and the gap is widening year after year, necessitating fish imports from scarce foreign exchange to meet demand. It is noteworthy that Ghana's fish exports attract a higher price than the fish imports on average as a result of subsidies paid by the advanced countries (Osei and Dekuwmini, 2007).

Biodiversity also makes irreplaceable contribution to our aesthetics, imagination and creativity. It forms an integral part of tourism in the world and also in Ghana. People all over the world

including Ghana visit national parks, sanctuaries and resorts to recreate themselves. It not only helps them to de-stress but also helps them to feel at one with nature. Biodiversity therefore is the foundation for human health.

1.2 What major changes have taken place in the status and trends of biodiversity in your country?

No major assessment of biodiversity has been carried out since the European Union funded Protected Area Development Programme (PADP) (1997-2000 and 2004-2010) designed to enhance conservation of biodiversity heritage in two high forest areas namely Ankasa and Bia Conservation areas in the Western Region and that of Ghana Man and Biosphere (MAB) studies. Recent spate of uncontrolled socio-economic activities such as illegal strip mining, logging and poaching have left in their trail massive degradation of Ghana's forests which provide habitat for significant communities of biodiversity. Over the last decade, important biodiversity hotspots have been devastated by severe illegal activities including encroachments. Massive spate of illegal small scale mining within the last eight to ten years has led to unprecedented devastation of the country's forests in both the high forest and transition forest zones. The rate of decline of the country's forest was estimated at 2.24% between 2005 and 2010. The total forest cover in Ghana has thus reduced from 32.7% of total land area as at 1990 to 21.7% in 2010 (NDPC 2014).

Surveys conducted in 2013 by the MAB Committee in the Bia Biosphere Reserve did not confirm the sightings nor the calls of critically endangered primates such as the red colobus (*Procolobus badius waldroni*) and black and white colobus monkey *(Colobus vellerrosus)* (EPA 2014). This study confirmed earlier studies carried out by the MAB Committee in 1997 which demonstrated no trace of the Diana monkey (*Cercopithecus diana roloway*) and the collared mangabey *(Cercocebus torquatus torquatus*) (EPA, 1997). These studies probably confirm that the species might have gone extinct in the Bia biosphere reserve and the adjoining Kroksua Hills Forest reserve.

In the marine environment, there is a report of influx of sea weeds suspected to have come from the North Atlantic Ocean into the Gulf of Guinea and this has led to the introduction of two hitherto species of pelagic Sargassum, namely, *S. fluitans* and *S. natans*, which are new to the Ghanaian waters (EPA March 2015). The influx of these two species in the Ghanaian waters have serious implications on fishery and tourism industries.

1.3 Main threats to biodiversity

The main threats to Ghana's biodiversity come from direct and indirect drivers. The direct drivers which operate both on terrestrial and aquatic environments include overexploitation of

resources, invasive alien species, climate change, habitat changes and pollution. The indirect drivers which also operate in all environments include population growth and governance.

1.3.1 General Direct Drivers:

1.3.1.1 Overexploitation of resources

Unsustainable logging practices threaten the forestry sector's contribution to the sustainable development of the country. In 2002, there were 3.7 million cubic meters' worth of logs extracted which represents about four times the annual allowable harvest. These contribute to irreversible changes that illegal logging causes to the forest ecosystem and which directly impacts on both fauna and flora.

Reports indicate that more than 80 percent of agricultural expansion in Ghana between 1980 and 2000 came at the expense of forests (Butler, September 02, 2010). This is a reflection of how far agricultural encroachment has also posed great threat to biodiversity.

Exploratory activities for Ghana's oil and gas are scheduled in the short-term, to be undertaken onshore in the Voltaian Basin, covering about 40% of the country's land mass and stretches from the south through the middle belt to the north. Albeit the impact of exploratory activities on biodiversity may be minimal, development of finds for production activities could impact significantly on biodiversity.

Bushmeat is an important source of protein for Ghanaians. Uncontrolled harvesting of wildlife for bushmeat has reduced substantially the faunal diversity. Growing urban demand, sophisticated hunting methods and weak law enforcement on hunting have created a huge commercialized trading system for it both nationally and internationally. Numerous studies have indicated that the bush-meat trade in Ghana is enormous and estimates of its value ran as high as US$350 million per year. Ntiamoa-Baidu (1998)

Overfishing is one of the many factors that affect life in the sea. Fishing has caused the largest changes and is the major current agent of biodiversity disturbance in the Ghanaian coastal waters. For example, Ghana's small pelagic fishes notably the sardinellas (*Sardinella aurita* (round sardine) and *Sardinella maderensis* (flat sardine), anchovy (*Engraulis encrasicolus*) and chub mackerels (*Scomber japonicus*) are on the edge of collapse. The total landings of the small pelagics in Ghana have decreased from a high of 277,000 MT in 1996 to 92,000 MT in 2011 (USAID/Ghana ICFG Project, 2015). In addition, the number of active semi-industrial vessels has doubled since 1990s, and the number of canoes has increased by 50% since 1997. Weak governance, overcapacity and an open-access fishery that allows overfishing from an increasing number of boats and fishers have contributed to this change.

By-catch also called by-kill is in reference to every fishery that catches unintended and or unwanted creatures. By-catch from Ghanaian coastal waters includes non-target and juvenile fishes, seabirds, marine mammals and any other creature that the fishers are not trying to catch. By-catch in Ghana, currently threatens several species of dolphins or cetaceans. There are reports that by-catch of dolphins are turning into targeted fishing particularly by drift gill nets (DGN) (Ofori-Danson et al. 2003). There is a clear and longstanding need for fishery agencies and managers at all levels to incorporate by-catch monitoring and by-catch reduction measures into management regimes.

There is evidence that the demand for shark-fins for the growing shark-fin trade for export to the Asian countries and other international markets is driving direct exploitation of small cetaceans which are used as bait for catching sharks. Without controls of some sort, the growing demand for products can have effect on cetacean biodiversity in Ghanaian waters.

Oil exploration and production activities in the marine environment is set to increase over the next five to ten years where about ten fields will come on line. The exploration and production platforms are known to attract some species of fish into their exclusive and safety zones, thereby keeping them safe from catch.

1.3.1.2 Invasive Alien Species

Invasive alien species in Ghana have devastating impacts on native biota, causing extinctions and affecting terrestrial, natural and cultivated ecosystems. The most common invasive alien plant species in Ghana include *Calopogonium mucunoides*, *Broussonetia papyrifera* (Yorke), *Cedrella odorata*, *Chromolaena odorata*, *Leucaena leucocephala* and *Eichhornia crassipes* (water hyacinth). The proliferation of these invasive alien species has led to significant loss of native biodiversity resulting in the degradation of local ecosystems and decline in associated ecological services. For example the evaluation of the extent of coverage of fresh water weeds in the Lower Volta and Tano River is in excess of 5000 ha of water surface (EPA 2010). The rate of spread on the Tano River is estimated at 12 ha per annum (EPA 2000). It is noteworthy that water hyacinth which was until 2010 absent in the Lower Volta has currently occupied large areas of the water surface.

The spread of invasive alien species particularly plants, is one of the greatest threats to the ecological and economic well-being of Ghana. In the recent past, the rate and risk associated with alien species introductions have increased significantly because human population growth and human activities altering the environment have escalated rapidly, combined with the higher likelihood of species being spread as a result of increased travel, trade, tourism and agriculture. The presence of invasive alien species has affected the distribution and abundance of endemic species in Ghana. Recent surveys by EPA (2015) show that the beaches have been fouled by the

floating *Sargassum spp* from the West to the East coast of Ghana. Additionally, the near shore waters of the Western Region continue to experience a recurrent bloom of the alga, *Enteromorpha flexuosa*.

1.3.1.3 Climate Change

Climate change can have significant negative impacts on the natural environment including the loss of biodiversity and changes in ecosystems. In Ghana, time series of temperature and precipitation data from 1960-2001 analyzed for all six eco-climatic zones showed significant increase in mean annual daily temperatures (0.5^oC) and reduction in total annual rainfall (27.7%) (EPA, 2009). Forecasts for the ensuing 20 years (i.e. 2020) showed the increasing trend in air temperature and declining precipitation would continue. An earlier study over 30 year period (1961 -1991) showed mean annual daily temperature rose by 0.9^oC and total precipitation declined by 20%. (EPA, 2000)

Similarly, sea surface temperature along the Ghana coast showed high variability with more frequent and high inter-annual changes (EPA, 2009). Monthly mean sea surface temperature measured 100m off Tema showed consistently increasing temperatures the warm season after the major upwelling (Koranteng and McGlade, 2002). The study also showed the intensification of the minor upwelling and slight increases in temperatures during the major upwelling, an indication of the weakening of the major upwelling.

The high climatic variability has affected the ecological health of both terrestrial and aquatic ecosystems. Climate change impacts such as rising temperatures and declining rainfall in combination with other stresses are gradually shifting the country's ecological zones, loss of flora and fauna and an overall reduction in ecological productivity. It is reported that about 295 species of indigenous crop varieties have become endangered or potentially nearing extinction as famers resort more and more to improved varieties as a way of adapting to the challenges imposed by changing climatic conditions (EPA, 2009). In a study by the Northern Savannah Biodiversity Propect in 2000 in the Upper East Region, it was found that 6 out of the 30 species of wildlife encountered were severely endangered (NSBC, 2000).

The variability in sea surface temperatures as well as changes in the strength and duration of coastal upwelling affects recruitment of pelagic fish stocks (Demarcq and Aman, 2002; Koranteng and McGlade, 2002). A low or high upwelling index correlates with a higher or lower fish landings along the coast of Ghana. Reports indicate that the upwelling index which (UI = SST- 25^0C). From 2005 to 2008 the UI which used to be above 24 declined below 20.

The erosion rates along the entire coast is about 2.5m (±0.9m) per annum.

Quickly vanishing forests of Ghana are still home to one of the most magnificent members of the beetle order – the Goliath beetle (*Goliathus regius*). Despite their bulky appearance, Goliath

beetles are excellent fliers – frequenting flowers blooming up in the forest canopy. These insects tend to habit the canopies of trees but with increasing temperatures from climate change and dwindling forests, most of these beetles (70%) have been forced out of the forest and only few remain within the undergrowth. (This has resulted in the shrinking of the cocoa production belts, plant diseases etc.

Marine resources hold important potential for the promotion of ecotourism in the Gulf of Guinea. These resources of obvious consideration include marine turtles, cetaceans (dolphins, whales and porpoises) and ornamental fishes. For instance, nesting activities of marine turtles in Ghana was first reported by Irvine in 1947 when he documented the loggerhead turtle, *Caretta caretta*, Green turtle, *Chelonia mydas*, hawksbill turtle, *Eretmochelys imbricata*, olive ridley, *Lepidochelys olivacea*, and the leatherback turtle, *Dermochelys coriacea* as the five main species that nest in Ghana (Irvine, 1947). However, three of these species; the olive ridley, the Green turtle and the leatherback have been found to nest in appreciable numbers along the coast of Ghana in recent times with the olive ridley known to show the highest relative abundance. The loggerhead and the hawksbill only forage in Ghanaian waters. However, the increasing coastal sea erosion is gradually reducing the surface area for nesting marine turtles.

Cocoa is highly sensitive to changes in climate - from hours of sun, to rainfall and application of water, soil conditions and particularly to temperature due to effects on evapotranspiration. As a tropical crop, cocoa can only be profitably grown under temperatures varying between 30^0C-32^0C (EPA, 2009). Climate change could also alter stages and rates of development of cocoa pests and pathogens, modify host resistance and result in changes in the physiology of host-pathogen/pests interaction. The most likely consequences are shifts in the geographical distribution of host and pathogen/pests, altered crop yields and crop losses which, will impact socio-economic variables such as farm income, livelihood and farm-level decision making. Recent changes in rainfall and temperature patterns have resulted in shift in the cocoa production frontiers in Ghana.

1.3.1.4 Habitat Change

Agriculture is a major economic activity and land use in Ghana. Land preparation practices (slash and burn) and farming along water bodies have posed great threat to biodiversity at landscape level. The practice of clearing the land for cultivation exposes the fields to soil erosion, plant nutrients and habitat losses. The excessive use of agro-pesticides has contributed to the destruction of useful insects such as pollinators. The threat from agriculture was made worse by increasing demand for food and raw materials thereby putting pressure on remaining forests and protected areas.

Large and small-scale mining for minerals, surface mining in particular have led to considerable loss or changes in habitats. Mined out areas have been turned into deep pits and tailing dumps which do not support the original biodiversity.

The construction of the new Bui hydroelectric dam in 2009 has led to loss of habitat for White collared mangabey (*Cercocebus torquatus torquatus)* prompting rescue operations for these and others.

The problem of habitat loss and degradation has also become very serious issues for the marine ecosystem of Ghana. Developments at estuaries especially coastal protection infrastructure continue to affect marine organisms. For example, in recent studies, both fish and avifauna in the Keta lagoon have been reported to have declined mainly due to irrigated farming activities (Lamptey, 2014) over the past decade in comparison with the report from the Save the Seashore Birds Project Ghana (1998) and Ghana Coastal Wetlands Management Project (1999) respectively.

1.3.1.5 Pollution from Industrial and Urban Wastes

There is growing concern that exposure of marine organisms to chemical contaminants can increase susceptibility to disease and affect reproductive performance. The main sources of organic pollution of coastal wetlands in Ghana are domestic and industrial wastes, as well as those from agriculture. This increases the organic loading of the coastal waters and the biochemical oxygen demand (BOD) leading to inadequate oxygen supply to support plant and animal life. Increased absorbance of carbon dioxide from the atmosphere has led to the changing of the chemistry of the oceans leading to ocean acidification. Studies have shown that ocean acidification is currently taking place in Ghana coastal waters. (Quansah, 2014).

1.3.2 General Indirect Drivers

1.3.2.1 Population Growth

In Ghana, the twin pressures of population and poverty are resulting in substantial fragmentation of forests, increasing the probability of extinction for many species. There is evidence to suggest that increased population growth through birth and internal migration has resulted among others on associated land use conflicts

1.3.2.2 Governance

Ghana's current pattern of development is heavily dependent on the natural capital. Although biodiversity issues are captured in the National Development Agenda, the level of coordination within and among the various actors (public, private and civil society) is generally poor. For, instance, the link between research and practice is fairly weak. Additionally, many of the institutions involved in biodiversity governance, at both the national and sub-national levels, have weak capacity (NDPC, 2014).

1.3.2.3 Infrastructure Development

The last decade has seen a huge increase in infrastructural development, especially within and around the cities and municipal areas. As a result of this, avifaunal species who use avenue trees planted along the major streets in Accra and other major cities in the country have recorded a decline in population (Gbogbo & Awotwe-Pratt, 2008; Roberts, 2013). A recent study by Gbogbo et al (2015) have recorded a decline in the numbers of hooded vulture (*Necrosyrtes monachus*) in the Greater Accra Metropolis which is known to hold a viable population of vultures in the country.

1.4 The impacts of the changes in biodiversity for ecosystem services and the socio-economic and cultural implications of these impacts?

1.4.1 The changes in biodiversity

1.4.1.1 The General changes in land use with its concomitant issues

a) Forest landscapes in both protected and off- reserve areas have reduced as a result of encroachment.
b) Urban sprawl is reducing arable lands and resources that support ecosystem services such as green belts, urban lakes and urban forests.
c) Excessive harvesting of wildlife resources from forests and other land habitats put pressure on species population dynamics including recoveries, fecundities, survival.

Land use changes inadvertently create situations for huge and accelerated run offs and storm surges from rains increasing soil erosion, siltation and sedimentation of rivers and important inland water bodies.

Reduction in fertility of soils of farm lands as a result of bad cropping system and inadequate extension system.

To boost horticultural industry, some invasive alien species are inadvertently introduced into the local environments which eventually spread and create huge economic problems to farmers.

The indiscriminate use of agro-chemicals as fertilizers and pest control agents have led to loss of pollinator services, soil degradation and reduced ecosystem resilience.

Draining and filling of wetlands for other purposes including farming and other infrastructural purposes lead to loss of services such as flood buffer and water supply.

1.4.1.2 The General Changes in Fresh and Marine Water Resources

Fresh water sources are dwindling as a result of channelization of water courses, clearing of watersheds and inappropriate irrigation systems. For example, the volumes of water in the Volta

Lake at Kpando Torkor and Yeji and Lake Bosomtwi have reduced significantly in the past two decades as a result of removal of vegetation from the watershed and siltation.

The overexploitation of freshwater and marine resources put pressure on species population dynamics including recoveries, fecundities, survival rates and life cycles and the integrity of the food web.

Inadvertent introduction of invasive alien plant species into water bodies, blocking water channels for fishing, quickly forming sediments in the ponds, rivers, reducing volume of water, eventually leading to drying up of water sources and deterioration of water quality. The presence of large swathe of floating invasive weeds has led to significant reduction in the population of the Volta clam, (*Galatea paradoxa*).

The water bodies have become receptacles for human waste, both liquid and solid, creating health hazards and destroying aquatic life e.g. Odaw River and Korle Lagoon in the Greater Accra Region and the Subin River in the Ashanti Region.

1.4.2 The Socio-Economic and Cultural Implications of these Changes

General decline in Non Timber Forest Products (NTFPs), fishery resources and agricultural productivity leading to reduction in livelihood benefits and support such as cash incomes, food and nutritional security.

Timber resources decline leading to shortage in lumber and other timber products for domestic markets. This has led to the loss of livelihoods and employment for actors on the value chain.

There are incidences of abandonment of farm lands, primarily from poor soils, invasion of *Chromolaena odorata* weeds and poor crop yields leading to local migration particularly to the urban centers.

Many off-reserves having previously been converted into cash crops (mainly cocoa and oil palm) and food crop farms have become grasslands leading to decline in the local economy.

Dependence on the cultivation of cash crops which has a long gestation period often affect the food security and income of the locals.

At the blind side of forestry officials, and sometimes with their perceived connivance, many gazetted forest reserves are ‘empty’ and without the prominent biodiversity components which have been lost through poaching and illegal felling of trees. This deprives the local communities of valuable economic resources.

There are disruptions in the functions of socio-ecological productive landscapes, with noticeable changes in the balance between beneficial and non- beneficial organisms, resulting in hardships

to farmers. Poverty, disease, deprivation are now rampant in these communities that were previously vigorous and self-sufficient. Additionally, the youth have tended to skip school for risky and illegal ventures such as mining and chain saw operation for money.

Increases in slum developments promoting all kinds of social vices including thefts, armed robberies, sodomy, rape and prostitution.

Breakdown of traditional norms, practices and uses leading to disrespect for the elderly and local authority.

1.5 What kind of plausible future scenarios for biodiversity in terms of underlying causes, pressures, impacts on biodiversity and implications for human well-being can be expected under a change of the status quo?

The following future scenarios are plausible when the status quo changes:

Biodiversity will be seen as a national pride, providing goods and services for livelihoods and inspiration for successful living among the people as well as giving a source of hope for the future. This is because there would have been greater investment in biodiversity and ecosystem services.

This will be when new and effective policies of mainstreaming biodiversity are in place and the basis of underlying causes are tackled and pressures that are brought to bear on biodiversity are either reduced or completely removed. In this kind of scenario, the conceivable impacts on biodiversity and its implications for human well-being would be curtailed. This will be the period when biodiversity's goods and services will be properly accounted for and sustainably utilized and cherished.

PART 2 – THE NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN (NBSAP), ITS IMPLEMENTATION, AND THE MAINSTREAMING OF BIODIVERSITY

2.1 What are the biodiversity targets set by your country?

Working under 9 themes in a previous draft NBSAP, the following targets were assembled to reflect and bring to attention, the several needs and desires for biodiversity conservation, sustainable use and equity and benefit sharing decisions in Ghana

2.1.1 *In-Situ* Conservation Targets

- Guidelines for selection, establishment and management of protected areas developed.
- Key Biodiversity Areas mainstreamed into national, regional and district budgeting and planning processes.
- Protected area systems that incorporate natural habitats and viable populations of species established.
- Management and utilization of biological resources within protected areas enhanced.
- Threats on biodiversity from new and emerging oil/gas and other extractive industries analyzed and mitigation measures including those for climate change put in place.
- Effects of desertification on biodiversity analyzed and mitigation measures, including those for climate change put in place.
- Risks associated with the use and release of Genetically Modified Organisms (GMOs) resulting from bio-technology managed or controlled.
- Capacity for research, planning, monitoring and evaluation enhanced.
- Support for the conservation of biological resources at political and social levels enhanced.

2.1.2 *Ex-Situ* Conservation Targets

- Appropriate measures for the ex-situ conservation of Ghana Biological heritage including non-native species adopted.
- Facilities and plans for ex-situ conservation of the component of Ghana's biodiversity including research on plants, animals and micro-organisms established, maintained and improved.
- Public awareness, appreciation and support created.
- Biological resources collected from natural habitat for ex-situ conservation purposes regulated and managed.
- Representative specimens of biological resources including non-native species kept and maintained.

2.1.3 Invasive Alien Species (IAS) Targets

- Systems to enhance IAS management developed or strengthened.
- Partnerships for effective IAS management promoted.
- Capacities for effective IAS management enhanced.
- Resources for IAS management mobilized.
- Integrated control of invasive water weeds on important water bodies e.g. Volta, Tano, Ankobra rivers and Owabi and Barekese reservoirs promoted.

2.1.4 Agricultural Biodiversity Targets

- Biodiversity related initiatives such as the Pollinator Initiative on smallholder agriculture assessed.
- Sustainable agricultural practices and programs for small to large scale farmers that enhance biodiversity conservation and ecosystem services enhanced.
- A technical committee with representatives from relevant agencies and institutions to promote synergy between policy development and implementation established.
- The Clearing House Mechanism (CHM) section for agricultural biodiversity information collection and dissemination utilized.
- A communication strategy for raising public awareness on biodiversity conservation and ecosystem services developed and implemented.
- Capacities in the management of soil fertility, productivity and agro-biodiversity resilience improved.
- Appropriate technologies for agro-biodiversity conservation for climate change adaptation and mitigation identified and adopted.
- Research gaps for improving agricultural biodiversity conservation identified and addressed.
- Traditional practices that enhance agricultural biodiversity conservation documented.

- Research and extension linkages on agricultural biodiversity conservation and agricultural productivity promoted.

2.1.5 Socio-Economic Targets

- A fundraising strategy for the operations of the National Biodiversity Committee (NBC) developed and implemented.
- Potential funding sources and conditions for accessing national and international funds determined.
- Opportunities for utilization of biodiversity and ecosystems services identified and transformed into viable economic ventures.
- Opportunities in biodiversity conservation and sustainable use for private sector investment packaged and promoted.
- Strategies/mechanisms for transforming biological resources (value addition) into economic ventures developed.

2.1.6 Taxonomic Targets

- A directory of taxonomists in Ghana and their expertise created.
- Communication between the Ghanaian Government and the taxonomic community on policy needs identified in Global Taxonomy Initiative (GTI) and other thematic areas and cross-cutting initiatives, strengthened and implemented.
- Communication between different sectors with responsibility for biodiversity conservation and sustainable use and the public improved.
- Provision of training resources for taxonomy to educational establishments increased.
- A consortium of experts within the country and the sub-region of West Africa is established.
- Refresher courses on taxonomy and taxonomic tools, aimed at practicing taxonomists and those that teach taxonomy are created and delivered.
- A National Biological Collection Centre to maintain specimens/materials for reference purposes created.
- Capacity within collection-holding and other relevant organizations in data and information management built and enhanced.
- Identification system within Ghana, integrating local and scientific knowledge built.
- A check-list of all Ghanaian species of plants, animals and microorganisms developed and maintained.
- A sustainable resource for sharing distributional and ecological information developed.

2.1.7 Traditional Knowledge Targets

- Traditional knowledge and formal science in biodiversity conservation integrated.

- National forestry and agricultural policies used to sustain ethno-forestry and agro-silvo-pastoral arrangements at the local level.
- Traditional knowledge systems on biodiversity documented for the present and future generations.
- The capacity of state institutions to recognize and effectively integrate and promote traditional conservation practices enhanced.
- The recognition, integration and promotion of traditional biodiversity conservation knowledge of local communities by state institutions enhanced.
- A Sui generis system for traditional knowledge is developed as part of Ghana's legislation

2.1.8 Legal and Policy Framework Targets

- A National Biodiversity Policy formulated.
- Appropriate legislation to support the policy enacted.
- The objectives, articles and programmes of work of biodiversity conventions implemented.

2.1.9 Access and Benefit Sharing (ABS) Targets

- The relevant legal instrument and guidelines for ABS created.
- Capacities in all institutions (both ex-situ and in-situ) that deal with issues that relate to the provision, documentation and management of services for ex-situ conservation practices developed.
- Article 15 of CBD (Access to genetic resources and technology transfer) implemented.

2.2 How has your national biodiversity strategy and action plan been updated to incorporate these targets and to serve as an effective instrument to mainstream biodiversity?

- A draft NBSAP was developed in 2012 but the process to get it approved at the national level is pending. Despite this shortcoming, several activities have been carried out to mainstream biodiversity targets. For example, the Ghana Shared Growth and Development Agenda (GSGDA) 2014-2017 has listed 11 biodiversity related policy objectives already identified in the draft NBSAP for the period (NDPC, 2014).
- The Forestry Commission has complete sections of forest reserve management plans specifically dedicated to biodiversity issues. This is to ensure that biodiversity conservation is prioritized and accorded the necessary importance.

Mainstreaming of Biodiversity into food and agriculture sector development policy (FASDEP II) has begun with the policy objective 4 V (Sustainable Management of Land and Environment) of

FASDEP II serving as entry point in addressing the interaction between agriculture and climate change and biodiversity loss.

2.3 What actions has your country taken to implement the Convention since the fourth report and what have been the outcomes of these actions?

From the over 160 actions that were penciled since the fourth report, just about 13% of these were undertaken.

From this small percentage, the following can be considered as major outcomes:

- Law enforcement having received a major boost with the setting up of the prosecution department of the Forestry Commission.
- Awareness creation activities having also been undertaken across the country through the REDD+ Roadshow, the Forestry Week and similar sector activities aimed at mass awareness creation on biodiversity.
- The Forestry Commission and Newmont Golden Ridge Resources (gold mining company) implementing an offset project to help quantify the residual impacts of a gold mine.
- The Government of Ghana published a new Forest and Wildlife Policy which aims among others at *"the conservation and sustainable development of forest and wildlife resources for the maintenance of environmental stability and continuous flow of optimum benefits from the socio cultural and economic goods and services the forest environment provides to the present and future generations* "
- Ghana is also implementing a Sustainable Land and Water Management Project to demonstrate improved sustainable land and water management practices aimed at reducing land degradation and enhancing maintenance of biodiversity in selected micro-watersheds in the Northern Savanna region of Ghana.
- The Forestry Commission has also established a Rapid Response Team to identify and deal with illegal activities in protected areas
- A new wildlife conservation legislation is currently before Parliament

2.4 How effective has biodiversity been mainstreamed into relevant sectoral and cross-sectoral strategies, plans and programmes?

The effectiveness has been sparse. However, there are some key achievements in mainstreaming. These include the following:

- Linkages with ongoing initiatives such as Reduction of Deforestation and Degradation (REDD+) and Forest Law Enforcement, Governance and Trade (FLEGT) are critical for ensuring conservation of biodiversity in a synergistic way.
- The Emission Reduction Programme under the REDD+ mechanism.
- The Forest Investment Programme.
- The maintenance of the Globally Significant Biodiversity Areas (GSBAs).
- Akoben Initiative of EPA aimed at compliance monitoring for environmental standards in the extractive industry, particularly mining.

2.5 How fully has your national biodiversity strategy and action plan been implemented?

- A number of initiatives have been implemented, although these together represent only a very small fraction of the actions proposed in the Strategy and Action Plan. Among the implemented initiatives are the following:
- An inventory of close to two hundred sacred groves carried out by the EPA. These are yet to be mapped for detailed study.
- A number of Community Resource Management Areas (CREMAs) have been established in some reserves and off reserves including the Bosumtwi area.
- One (1) Community Resource Management Areas (CREMA) established within the western wildlife corridor and three (3) others are in various stages of development which are expected to be completed by 2017, under Sustainable Land and Water Management Project (SLWP)
- Under the same project, CREMA education materials (manual) have been produced to facilitate CREMA formation and education.
- Management Committee establishment for Songhor Ramsar site and Biosphere Reserve, with the Management plan under review.
- Natural forest regeneration in degraded areas in some communities in the northern savanna areas as part of the Canadian funded GEMP project and the GEF funded Sustainable Land and Water Management Project.
- Action plan for addressing the depletion of living marine resources and habitat degradation prepared but not implemented.
- National Action Plan to Combat Drought and Desertification implemented; the NAP is being revised to align it with the 10 year UNCCD strategic plan.

- Invasive species policy has been revised and being subjected to Strategic Environmental Assessment.

PART 3 – PROGRESS TOWARDS THE 2015 AND 2020 AICHI BIODIVERSITY TARGETS AND CONTRIBUTIONS TO THE RELEVANT 2015 TARGETS OF THE MILLENNIUM DEVELOPMENT GOALS.

3.1 What progress has been made by your country towards the implementation of the Strategic Plan for Biodiversity 2011-2020 and its Aichi Biodiversity Targets?

There has been some progress made in spite of a number of challenges towards the implementation of the Strategic Plan for Biodiversity 2011-2020 and its Aichi Biodiversity Targets. For instance targets 1, 2, 7, 9 and 15 have been very well focused to be achieved.

The various economic sectors in the country however have operated as normal with the respective ministries, departments and agencies undertaking their own internal budgeted programmes and plans. Though many of these programmes and plans seek to enhance sustainability and promote some aspects of the three objectives of the convention, there is no direct mainstreaming of biodiversity into them.

Noting that the NBSAP development in Ghana is still in progress and considering that the current NBSAP is a working draft, it is only possible to undertake this reporting on the AICHI targets as follows:

Aichi Target 1. By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Achievements

i. Road shows on REDD+ activities has been undertaken across the country.
ii. Celebration of the Forestry and Wildlife week, National biodiversity day and other similar sector activities aimed at mass awareness creation on biodiversity
iii. Clearing house mechanism (2013) for fauna in terrestrial ecosystems established and assessed (http://gh.chm-cbd.net/biodiversity/status-ghanas-biodiversity/biodiversity-terrestrial-ecosysterms-ghana/flora-ghana/fauna-ghana)

Aichi Target 2 By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Achievements

i. Biodiversity issues are captured in the National Development Agenda, *(Ghana Shared Growth and Development Agenda (GSGDA) II, 2014-2017*).
ii. Linkages with ongoing initiatives such as REDD+ and FLEGT are critical for ensuring conservation of biodiversity in a synergistic way.
iii. The Emission Reduction Programme under the REDD+ mechanism.
iv. The Forest Investment Programme.
v. The maintenance of the (GSBAs).
vi. Introduction of Akoben Initiative of EPA aimed at compliance monitoring for environmental standards in the extractive industry, particularly mining.

Aichi Target 3 By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Aichi Target 4 By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustain able production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Achievements

i. the Government of Ghana published a new Forest and Wildlife Policy which aims among others at "*the conservation and sustainable development of forest and wildlife resources for the maintenance of environmental stability and continuous flow of optimum benefits from the socio cultural and economic goods and services the forest environment provides to the present and future generations* "

Strategic Goal B: Reduce the Direct Pressures on Biodiversity and Promote Sustainable Use

Aichi Target 5 By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Achievements

i. The Forestry Commission and Newmont Golden Ridge Resources (gold mining company) implementing an offset project to help quantify the residual impacts of a gold mine.
ii. Ghana is also implementing a Sustainable Land and Water Management Project to demonstrate improved sustainable land and water management practices aimed at reducing land degradation and enhancing maintenance of biodiversity in selected micro-watersheds in the Northern Savanna region of Ghana.

Aichi Target 6 By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Achievements

i. USAID/Ghana IFCG Project. 2015. Issue Brief: Ghana's small pelagic fishery in crisis, National and Regional food security at risk. The USAID/Ghana Sustainable Fisheries Management Project (SFMP), Fisheries Commission, Accra, Ghana.

Aichi Target 7 By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Achievements

i. Implementation of Food and Agriculture Sector Development Policy (FASDEPII) aimed at mainstreaming biodiversity into food and agriculture sector through sustainable land and management practices. Thus serving as the entry point in addressing the interaction between agriculture climate change and biodiversity loss.

Aichi Target 8 By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Aichi Target 9

By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Achievements

i. EPA(2015) Survey of Marine Sea Weed, *Sargassum*, Infestation of the Coastal Waters of Ghana
ii. Invasive species policy has been revised and being subjected to Strategic Environmental Assessment.

Aichi Target 10

By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Strategic Goal C: Improve the Status of Biodiversity by Safeguarding Ecosystems, Species and Genetic Diversity

Aichi Target 11

By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes.

Achievements

i. The Voluntary Partnership Agreement (VPA) between the European Union and Ghana on Forest Law Enforcement, Governance and Trade implemented.
ii. An inventory of close to two hundred sacred groves carried out by the EPA. These are yet to be mapped for detailed study.
iii. A number of Community Resource Management Areas (CREMAs) have been established in some reserves and off reserves including the Bosumtwi area.
iv. One (1) Community Resource Management Areas (CREMA) established within the western wildlife corridor and three (3) others are in various stages of development which are expected to be completed by 2017, under Sustainable Land and Water Management Project (SLWP)

v. Natural forest regeneration in degraded areas in some communities in the northern savanna areas as part of the Canadian funded GEMP project and the GEF funded Sustainable land and water management project
vi. Action plan for addressing the depletion of living marine resources and habitat degradation prepared but not implemented.
vii. National Action Plan to Combat Drought and Desertification implemented; the NAP is being revised to align it with the 10 year UNCCD strategic plan
viii. The implementation of investment plan for the *Forest Investment Project* (FIP) with the goal to Reduce GHG emissions from deforestation and forest degradation, while reducing poverty and conserving biodiversity.

Aichi Target 12

By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Achievements

i. Law enforcement having received a major boost with the setting up of the prosecution department of the Forestry Commission
ii. The Forestry Commission has also established a Rapid Response Team to identify and deal with illegal activities in protected areas
iii. A new wildlife conservation legislation is currently before Parliament

Aichi Target 13

By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Strategic Goal D: Enhance the Benefits to All From Biodiversity and Ecosystem Services.

Aichi Target 14

By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Aichi Target 15

By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Achievement:

i. Ghana's economy is heavily dependent on climate-sensitive sectors such as agriculture, forestry and water resources. The National Climate Change Policy Framework (NCCPF) has been developed through a consultative process, and the policy framework has three main objectives:
    1. Adaptation and reduced vulnerability to impact of climate change;
    2. Mitigating the impact of climate change; and
    3. Low carbon growth

Aichi Target 16

By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Strategic Goal E: Enhance Implementation through Participatory Planning, Knowledge Management and Capacity Building

Aichi Target 17

By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

Aichi Target 18

By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Aichi Target 19

By 2020, knowledge, the science base and technologies relating to biodiversity, its values functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Aichi Target 20

By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan 2011-2020 from all sources and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resources needs assessments to be developed and reported by Parties.

3.2 What has been the contribution of actions to implement the Convention towards the achievement of the relevant 2015 targets of the Millennium Development Goals in your country?

There is evidence that some of the Millennium Development Goals (MDGs) have been enhanced in Ghana. For example food and nutritional security to promote reduction in child/infant mortality and improvement in maternal health (MDG Goals 2 and 3 respectively).

A number of livelihood programs were undertaken as activities towards the achievements of CBD objectives. These have contributed towards achievement of MDG Goal 1 (Poverty Alleviation).

Additionally, 20.66% of the land area of Ghana is under some form of protection (MDG Goal 7).

3.3 What lessons have been learned from the implementation of the Convention in your country?

3.3.1 Conservation of Biodiversity

- Recognition has been made of traditional conservation practices e.g. regard for taboos, festivals and customs that are related to conservation.
- All sectors in the Ghanaian economy must be involved in conservation issues.
- Recognition of the role of local communities and District Assemblies in the conservation of biodiversity is critical.

3.3.2 Sustainable management of components of biodiversity

- The need to strengthen the compilation of scientific knowledge and information on biodiversity.
- The need to strengthen the environmental assessments for biodiversity in development plans and investments.

3.3.3 Fair and equitable sharing of benefits

- Sensitization and public awareness to their rights and responsibilities for the conservation and sustainable use of components of biodiversity.
- Inclusion of benefit sharing strategies in the management plans of Protected Areas.
- Development focus appears to have crept into the mindset of policy makers, thus reducing concerns on the environment to the lowest level of consideration. With these observations, there is a feeling that the concept of Natural Capital, Gross Domestic Product (GDP) and The Economics of Ecosystems and Biodiversity (TEEB) must be made to feature a lot more prominently in discussions at both the Conference of Parties (COPs) and at the national and local planning levels.

3.3.4 Scientific and Traditional Knowledge

In the search for information to complete this report, all kinds of knowledge about the Ghanaian biodiversity were sought. All of the science of biodiversity reported here were obtained from published and unpublished experiences of scientists on the field. The published materials have duly been cited. For the unpublished, many of which being field notes, they have been classified as grey literature, and as and when appropriate, the sources have been declared within the text. There is so much information about Ghanaian biodiversity that have not been reported because they have not been studied. A lot of species remain unstudied, several changes in the ecosystems are happening without being noticed, and several habitats are not able to sustain their carrying capacities. These are some of the gaps that need to be filled. There is a litany of research needs that are gaping for answers and it will take the effort of trained and dedicated scientists to bring these out. That time is being awaited and all Ghanaian training institutions are put on notice to make an effort to contribute.

The biggest challenge in the search for information was in the use of traditional knowledge. There is a dearth of this knowledge in the public domain. Of those in the public domain, some of these are published accounts that have been obtained from the knowledge holders in the local communities and there was no way to authenticate the source and the knowledge. However, wherever evidence emerged of corroboration between and among different traditional knowledge (TK) writers on any particular information, the veracity was established and that information was considered as valid. Every effort will have to be made to document as much local and indigenous

knowledge about Ghanaian biodiversity before the knowledge holders depart this world, otherwise such knowledge would be completely lost to mankind forever.

3.3.5 Funding

Report of a Country Environmental Analysis conducted in 2006 show that the cost of destruction of biodiversity in Ghana as a result of economic activity amounted to US$520 million per annum (World Bank, 2006). The existing rate of biodiversity degradation will lead to food insecurity, poverty in rural areas, erosion of genetic resources, and loss of the capacity of the natural environment to cope with man-made and natural changes (Euronet Consotium, 2012).

Initiatives to address problems of biodiversity degradation in Ghana have been largely funded from donor support. The fragmented and uncoordinated funding sources render it difficult to establish the full range of funding committed to biodiversity. In order to address challenges associated with tracking expenditures designed to produce environmental outcomes when multiplicity of funding sources from development partners could obscure the situation, development partners have migrated from sectoral funding to Multi Donor Budget Support (MDBS) which ensures that most donor-funded projects are now reflected in the national budget (Euronet Consotium, 2012). MDBS is directed at addressing degradation of biodiversity joining the Forestry, Law Enforcement, Governance and Trade (FLEGT) initiative and participating in the Voluntary Partnership Agreement (VPA) to reduce illegal logging. The European Commission Cooperation, The World bank, Canada, DFID, AFD and the Netherlands have variously provided support for biodiversity activities in the country.

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