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Current state of biodiversity in Ghana

A literature review

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Abstract

This working paper summarizes the general state of biodiversity in Ghana, with a specific focus on wetlands. Herein, we illustrate research gaps in current literature for guiding future research. It was identified that current knowledge on biodiversity is scanty with inaccuracies and gaps as available research and according information and data is incomplete. Farming has been described as the main driver of biodiversity loss. In order to adequately protect the wetlands, several biodiversity plans and strategies were undertaken; however, the biodiversity of wetlands is still not accurately addressed. The summary illustrates that urban sprawl is reducing arable lands and resources that support ecosystem services such as green belts, wetlands and forests. Although biodiversity issues are captured in Ghana's National Development Agenda, the level of coordination within and among various actors has not been reflected. In recent times, wetlands have been degrading at a fast rate. Therefore, there is a need to understand the drivers that affect biodiversity and reflect the current state of wetlands.

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1 Introduction

Principle 14 on the New Urban Agenda promotes environmental sustainability by endorsing clean energy and sustainable use of land and resources in urban development. In doing so, this principle should give guidance in protecting ecosystems and biodiversity, for instance by adopting healthy lifestyles in harmony with nature, promoting sustainable consumption and production patterns, building urban resilience, reducing disaster risks and by mitigating and adapting to climate change (Habitat III Secretariat, 2017).

Ghana has abundant biological resources such as tropical high forests, savannahs, numerous coastal wetlands and a great variety of endemic butterflies and bird species. Approximately 3,600 species of flora represent three major taxonomic groups. The only gymnosperm that is found in Ghana, the West African cycad (*Encephalartos barteri*), is also indigenous to Ghana. Current records reveal that there could be as many as 221 species of amphibians and reptiles, 728 species of birds (15 species of waterbirds occur in internationally-important numbers) and 225 mammalian species (Ministry of Environment, Science, Technology, and Innovation, 2016). Many areas, particularly the wetlands, serve as important components of the flyways for migratory species and are recognized in the Agreement on the Conservation of African-Eurasian Migratory Waterbirds. Five wetlands are designated as Ramsar sites. Two of these wetlands are located in highly urbanized areas in Accra, the capital of Ghana. They represent a vital stopover site for migratory species. However, these urban wetlands also provide ecosystem services to the local communities that are innumerable and often undervalued today.

Urban areas will expand over the next decades. The extension of urban areas will lead to a conversion of natural areas into urban land-uses, which can cause a loss of biodiversity. Already now, studies show that biodiversity conservation suffers from weak land administration due to poor institutional capacity and insufficient cooperation. Thus, it is important to understand how weak land governance can limit the effectiveness of conservation actions aiming to prevent biodiversity loss from urban expansion (Huang, McDonald, & Seto, 2018).

The decline in biodiversity and the resulting impacts on nature's contributions to people threatens food, water, and energy and health security with negative impacts on livelihoods. Drivers of biodiversity loss also exacerbate climate-related risks, land degradation and desertification, loss of habitats for migratory species, loss of soil fertility and productivity. The various natural and human drivers that cause biodiversity loss and a decline in nature's contributions to people in Africa include the conversion of natural habitats into agricultural lands and urban settlements. Other factors include unregulated development of infrastructure and human settlements. Rapid and unplanned urbanization puts immense pressure on urban infrastructure and demand for services, including water supply, food supply, pollution control

and waste management (Archer, Dziba, Mulongoy K. J., Maoela, & Walters, 2018).

2 Contextualizing biodiversity

2.1 Biodiversity as a concept

There is not one single way to define biodiversity. It can mean very different things depending on the discipline in which the concept is used. However, a general agreement on the meaning of biodiversity constitutes that it is an expression of variety (or variability) of life (Görg, 2004; Kevin J. Gaston, John I. Spicer, 2004). The primary objective of biodiversity conservation is to ensure that biological resources are used in ways that do not diminish the variety of genes or species or destroy important habitats and ecosystems (Attuquayefio & Fobil, 2005). However, many scientist view biodiversity rather as a field of study, together with botany, ecology and genetics, thus involving many different biological disciplines (Görg, 2004; Kevin J. Gaston, John I. Spicer, 2004). Subsequently, biodiversity might be defined “as the scientific study of the patterns in, and the determinants and consequences of, the variety of life” (Kevin J. Gaston, John I. Spicer, 2004). Yet, today, it is more connected to political problems which are strongly tied to questions dealing with environmental concern and economic interests (Görg, 2004). The conceptual definition of biodiversity is given through an international framework the Convention on Biological Diversity (CBD). The CBD consists of many different natural and socio-ecological (mainly economic) disciplines, thus emphasizing different objectives and different environmental problems, and socio-economic conflicts. The CBD is mainly concerned with three aims of equal importance:

- The protection of biodiversity
- The sustainable utilization of biodiversity
- The regulation of the profits emerging from this use.

Consequently, the term biodiversity becomes quite vague if we look at the constitution of the problem (biodiversity loss) and why and for whom we conserve biodiversity (Görg, 2004). For many researchers, the term biodiversity is value-laden. It usually conveys the message that it is worthy of protection and needs to be conserved, thus something should be done to maintain the current state of biodiversity. This position has especially been adopted in conservation biology, where it dominates the need to maintain the variety of life. Consequently, the definition of biodiversity was broadened and thus embraced everything that conservationists believed as important to conserve. However, critics have raised concern over the use and helpfulness of this definition, as biodiversity does not alone pertain to conservation (Kevin J. Gaston, John I. Spicer, 2004). Moreover, it is necessary to consider from what perspective the problem has been viewed, as the ecological dimensions of the problem will always be different than the economic or social ones (Görg, 2004).

2.2 IPBES: The new era of biodiversity

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), established in 2012, seeks to bridge gaps in two dimensions: a horizontal one between science and policy, and a vertical one between local and global scales (Montana & Borie, 2016). The main motivation of IPBES is to maintain the flow of nature's benefits to people in order to sustain their well-being. It is a joint global effort by governments, academia and civil society to assess and promote the knowledge of the Earth's biodiversity and ecosystems and their contribution to humans. It builds on the ecosystem services concept promoted by the Millennium Ecosystem Assessment (MEA) (Díaz et al., 2018). It provides the policy makers the necessary information about the state of knowledge regarding the planet's biodiversity, ecosystems and the benefits they provide to people, as well as tools and methods to protect and sustainably use the natural assets (Díaz et al., 2018). Moreover, by strengthening the science-policy interface for biodiversity and ecosystem services, it will contribute to conservation and sustainable use of biodiversity, long-term human well-being and sustainable development (Balvanera et al., 2014). IPBES tries to construct the "realities of everyone from everywhere", being inclusive of developed and developing countries, while encompassing a broad range of knowledges including 'place-based' knowledge systems and indigenous and local knowledges (Montana & Borie, 2016).

2.3 Ghana's approach to national and international biodiversity context

In March 1988, the government initiated a major effort to bring environmental issues to the forefront of national development efforts. A National Environmental Action Plan was developed to provide the foundation for national environmental policies. Volume 1 and 2 were compiled in 1991 and 1994 with the former proposing the establishment of a legal system including an Environmental Impact Assessment, various standards and regulations, and the development of guidelines and an information system. The latter outlines the status of biodiversity in environmental policies. The new Ministry of Environment, Science and Technology was established 1993 and in 1994, the Environmental Protection Agency was established. Roughly, at the same time, Ghana signed the Convention on Biological Diversity. In 2005, Ghana was a signatory to 35 conventions on biodiversity conservation. A National Biodiversity Commission has been established with the overall responsibility for the formulation, coordination, and execution of programs and policies on biodiversity, as well as by promoting the necessary international cooperation with donor agencies and neighboring countries. Efforts to implement biodiversity conservation programs through sound environmental practices and sustainable resource utilization have involved collaborative research projects between the Wildlife Division and counterpart departments at various universities, research institutes and some environmental NGO's, such as the Ghana Wildlife Society, Friends of the Earth, Green Earth Organization and Conservation International (Attuquayefio & Fobil, 2005). Today, there are 21

legally constituted wildlife conservation areas, six national parks, six resource reserves, three wildlife sanctuaries, and one strict nature reserve (representing the highest protection category). There are also two proposed wildlife conservation areas (one national park and one wildlife sanctuary), as well as six Ramsar sites under the management of the Wildlife Division of the Forestry Commission. Over 15% of the total land area of Ghana is under some form of protection. Another 20 to 30% or more of the total land area is under plantation of predominantly cash and food crops. Thus, Ghana contributes to the global target of at least 10% of total land area consisting of ecosystems and different habitats under conservation (Ministry of Environment, Science, Technology, and Innovation, 2016).

The first National Biodiversity Strategy was developed in 2002. The 2016 National Biodiversity Strategy and Action Plan for Ghana was mainly participatory involving all the stakeholders in the environmental sector. The National Biodiversity Committee, with the strategic guidance of the Ministry of Environment Science, Technology and Innovation (MESTI), led the revision. Several workshops and meetings followed including diverse stakeholders: Ministry of Lands and Natural Resources and its Agencies (Forestry Commission), Ministry of Food and Agriculture and its Agencies, Ministry of Fisheries and Aquaculture Development, Fisheries Commission, the Council for Scientific Industrial Research (CSIR), Universities as well as the Civil Society Organizations (NGOs Traditional Authorities and faith-based groups). Although biodiversity issues are captured in the National Development Agenda, the level of coordination within and among various actors (public, private and civil society) is generally very poor. For, instance, the link between research and practice is almost non-existing. Additionally, many of the institutions involved in biodiversity governance, at both national and sub-national levels, have weak capacities (Ministry of Environment, Science, Technology, and Innovation, 2016). The consequences have been, among others, overlaps, duplications, conflicts, unhealthy competitions, disharmony (Ministry of Environment and Science, 2002).

2.4 State of biodiversity in Ghana: General status quo

Ghana lacks location and landscape-scale ecological data. Currently available biodiversity information has been described as scanty with inaccuracies and gaps, and lacking up-to date knowledge. However, Ghana has lost almost all forests outside the protected areas. Agriculture is the biggest and most important sector of the country and has been the main driver of deforestation and land-use intensification since the beginning of the 19th century. Cocoa cultivation is the dominant agricultural activity in terms of land coverage; however, it is problematic to biodiversity conservation mainly due to its associated farming practices such as insecticide spraying (Kwame, 2014).

2.5 Wetland biodiversity in Ghana

The in-between land and water ecosystem makes the wetlands one of the most complex ecosystems on earth. Commercially and economically exploitable wetland services will only be available if the biological processes, which produce them, are maintained. Loss of any link in the web of biodiversity will reduce the goods, functions and attributes of a wetland. The variability, geographic dispersion and biological richness of wetlands globally mean that they contain a tremendous pool of genetic resources. Loss of wetland habitats, which contain so much of the world's plant and animal biodiversity thus endangers the genetic resources on which many ecosystem services depend (Hails, 1996).

Serious wetland conservation efforts in Ghana started in 1991 with the publication of a management strategy document for Ghana's coastal wetlands. In 1994 the Ghana Coastal Wetlands Management Project was commissioned with the objective of restoring and maintaining the ecological integrity of five coastal Ramsar sites in Ghana. A national wetland strategy was also initiated with the ultimate goal of conservation and sustainable use of the country's wetland resources through documenting strategies for incorporating wetland management into activities of government, organizations, traditional authorities, communities and individuals within the broader context of environmental management (Attuquayefio & Fobil, 2005).

3 Methods & Results

3.1 Literature search

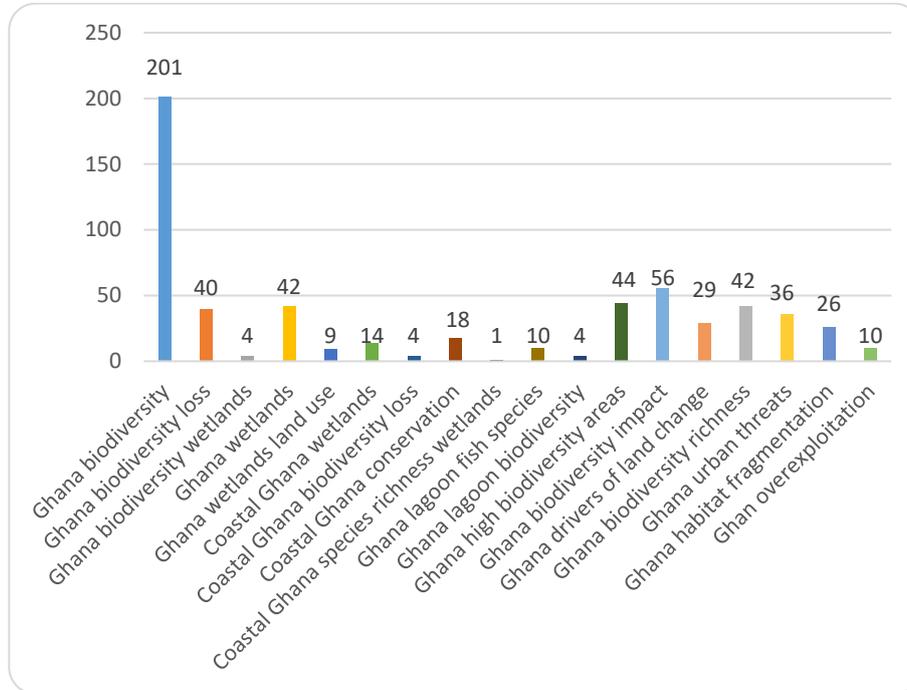
In order to get a broad overview of the state of the art of biodiversity research in Ghana and Accra specifically, a literature search was conducted using the "Web of Science" database. For each search term, each publication was reviewed carefully by looking at the author, key words and abstract. Only peer-reviewed articles were taken into consideration. The time restriction for the publication period was from 2002 onwards, which is automatically set by the database.

3.1.1 General literature search

The strategy for the general literature review was to identify articles that dealt with biodiversity but also with a specific focus on wetlands in Ghana. Keywords like: "Ghana biodiversity", "Ghana biodiversity loss", "Ghana biodiversity wetlands", "Ghana wetlands", "Ghana wetlands land use", "Coastal Ghana wetlands", "Coastal Ghana biodiversity loss", "Coastal Ghana conservation", "Coastal Ghana species richness", "Ghana lagoon fish species", "Ghana lagoon biodiversity", "Ghana high biodiversity areas", "Ghana biodiversity impact". "Ghana drivers of land change", "Ghana biodiversity rich-

ness”, “Ghana urban threats”, “Ghana habitat fragmentation”, “Ghana over-exploitation” were used to get a first general idea on the state of existing literature.

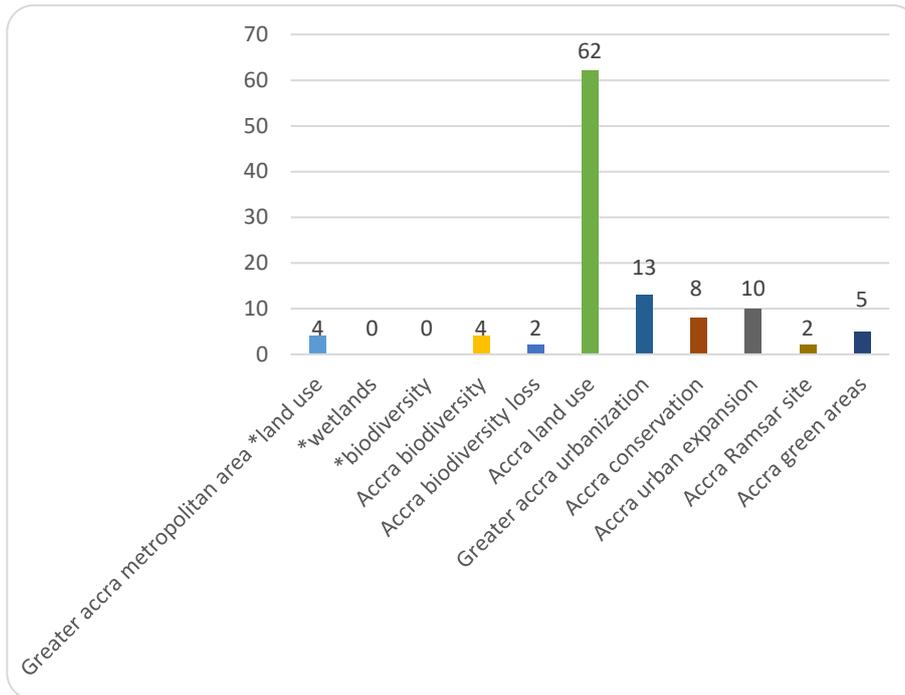
In this first literature phase, papers were reviewed if they had a general assessment of biodiversity or a specific focus on wetland biodiversity.



3.1.2 State of literature on wetland biodiversity

Wetlands in Ghana are unique ecosystems that provide valuable products and services to satisfy social, economic and ecological needs at the local, national and international levels. Ghana’s wetlands support fisheries, play an important role in flood assimilation and provide a source of food, medicines, fuel and building materials for local people and are therefore important. From 1990-2010 wetlands gained 2,000 km or 13% of total land (Ministry of Environment, Science, Technology, and Innovation, 2016). 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 absorpency of carbon dioxide from the atmosphere has led to the change of the chemistry of the oceans leading to ocean acidification. The indirect causes are population growth, resource governance and infrastructural development.

In the following diagram, the keywords which were used in the search engine and the respective results of the search are displayed. In this search, we wanted to look at the search results with a specific focus on wetlands, biodiversity and land use change.



4 Loss of biodiversity due to urbanization in Ghana

In spite of the rich biological resources, Ghana suffers from rapid deforestation and destruction of biodiversity. Between 1900 and 1990, Ghana lost 80% of its forest cover (from 8m ha – 1.6m ha), mainly due to logging, which is usually followed by slash and burn agriculture (Ministry of Environment, Science, Technology, and Innovation, 2016).

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 weak. Additionally, many of the institutions involved in biodiversity governance, at both the national and sub-national levels, have weak capacity (NDPC, 2013). Urban sprawl is reducing arable lands and resources that support ecosystem services such as green belts, urban lakes and urban forests. 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. (Ministry of Environment, Science, Technology, and Innovation, 2016). Ghana's current pattern of development is heavily dependent on natural capital. However, the amount of information available on the terrestrial ecosystems is greater and more complete than that of the marine and other aquatic systems. In contrast, information on plants and animals of the marine and aquatic world and the processes that determine the resilience of such organisms is barely available. Currently, very little is known about the entire microbial diversity of terrestrial, marine and aquatic ecosystems in the country. The coastline of Ghana is endowed with about 90 lagoons, several estuaries and rocky shore habitats that exhibit distinct array of biological diversities. Information on faunal, microbial and floral diversity

is sparse, except for the five Ramsar sites, namely the lagoons of Keta, Songor, Sakumo, Densu delta and Muni-Pomadze where an appreciable amount of knowledge is available. The sixth Ramsar site, the Owabi Wildlife Sanctuary, is the only protected aquatic ecosystem. The site protects the source of drinking water for Kumasi and its environs. In the other lagoons access to, use and exploitation of biodiversity is therefore free and uncontrolled. The consequence is over-exploitation, pollution, weed invasions, habitat destruction, and eventual loss of biodiversity and possible extinction.

Biodiversity of Ghana is under enormous pressure due to the quest for socio-economic development, especially urbanization, industrialization and tourism. A critical look at the impact of these development-oriented activities on the fragile ecosystem is required. 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 achieved (Ministry of Environment, Science, Technology, and Innovation, 2016). However, a major area of concern still remains the lack of integration of biodiversity issues into development planning (Ministry of Environment, Science, Technology, and Innovation, 2016).

5 Conclusion

The broad character of the term biodiversity implies that biodiversity can mean almost anything drawing on a certain kind of knowledge. Since biodiversity involves a complementarity of social and biological elements, a trans-disciplinary approach is needed to address biodiversity agendas. This research has to address and understand what shapes societal relations with nature. Beyond that, we need to understand which strategies are currently employed at maintaining biological diversity and what might be possible alternatives. We need to go beyond a simple description of what biodiversity is, but rather look more deeply into the practical approaches.

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