

# Lake Bosomtwe: Research & Transfer Outline



Figure 1: The project team discussing and preparing stakeholder and partner meetings

Identifying demands and needs for scientific research and transfer for the sustainable development of Lake Bosomtwe Biosphere Reserve.

Lake Bosomtwe, Ghana, July 2023



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## 1. Introduction to Lake Bosomtwe

Lake Bosomtwe Biosphere Reserve is one of three UNESCO Biosphere Reserves in Ghana. It is located in the Ashanti Region of Ghana, approx. one hour drive southeast of the city of Kumasi. Established in 2016, the Biosphere Reserve comprises a surface of almost 225,490 ha (Core area(s): 43,878 ha; Buffer zone(s): 73,400 ha; Transition zone(s): 108,212 ha) and provides livelihood for about 70,000 people in 30 communities.

Being the most recent Biosphere Reserve of Ghana, the reserve had not been included in regional and national planning for future development, and the local and regional population is hardly aware of the status as a biosphere reserve and the related regularities. As well, the acceptance as a model region is rather low. With increasing living standard in the region and the country, the reserve faces ever more challenges regarding carrying capacity, as ever more regional tourism occurs. Further, as Ghana's population is continuously growing, pressure of people living in, and utilizing the area will increase in the future.

For many years, local villages around the lake have been dwelling on fish resources of the lake, but this resource has been overused. In search for their daily income, fishers are forced to fish ever smaller fish, which leads to a tremendous overfishing. Much small-scale farming takes place around the lake, moreover, gold, diamonds, sand, clay, and stone deposits, as well as timber and other forest stock are seen as opportunities for the region's economic growth. However, their increased extraction would easily lead to overexploitation and degradation of the vulnerable ecosystem of the biosphere reserve. On top of all existing threats, climate change is likely to substantially increase the vulnerability of the ecosystem and local population.

Although ever more (mainly regional) tourists are visiting the area especially during weekends, there is few tourism infrastructure and facilities (with focus on accommodation) in the biosphere reserve. In that realm, the biggest challenges are the lack of strategic and long-term planning expressed in a strategy for sustainable tourism development as well as the uncontrolled construction of infrastructures in particular in the core and buffer zone as authorities do not effectively enforce their laws. Further, tourism offers are hardly available and visitor management is not existent. To that end, targeted, overarching sustainable tourism development and management strategies on how to handle these issues are strongly needed.

Based on a respective research and transfer outline, academia can, amongst others, help, to create solutions to tackle the challenges described above.

## 2. Brief description of the DAAD project

In a project titled 'Biosphere Learning Laboratory Lake Bosomtwe' (BL3B) (see also: [www.hnee.de/bl3b](http://www.hnee.de/bl3b)) financed by the German Academic Exchange Service, an academic partnership between different universities (see details below) aims to elaborate needs and demands for research, transfer and further action in the Biosphere Reserve, to foster a sustainable development of the Biosphere Reserve and its inhabitants.

The academic partnership is composed of one university in Germany and four universities/research institutes in Ghana (Ashanti Region):

- Eberswalde University for Sustainable Development (HNEE), Germany,
- Kwame Nkrumah University of Science and Technology (KNUST), Ghana,
- University of Energy and Natural Resources (UENR), Ghana,
- Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development (AAMUSTED), Ghana and the
- Forest Research Institute of Ghana (CSIR-FORIG),

as well as associated institutional partners.

### 3. Methodology & approach to identify needs and demands for future research and transfer

Aiming at the identification of future fields of research in the Biosphere Reserve, in a first step, existing research was collected, so these valuable results of investigation could be built upon. For that, available studies and publications related to relevant subjects, such as forestry, fishery, agriculture, among others, were assembled and analysed. Further, each partner university in Ghana was asked to present former and current research results related to Lake Bosomtwe, as well as future research topics that have already been identified. This material was then analysed to gain an understanding of the current status quo of research (see chapter “Research prior conducted”).

In a next step, a series of consultations at Lake Bosomtwe was conducted. This included open discussions with local people from two villages around the lake, which were documented and used for further analysis and the development of the research guideline. In combination with the gained knowledge from the analysis of former research and the consultations with the local population, an in-depth discussion with different stakeholders was conducted. Therewith, various fields for further research were identified and discussed. Finally, the identified topics were discussed with the Ghanaian partner universities (for a more detailed description of these activities see chapter “Consultations and workshops for planning”).

## 4. Research prior conducted

### 4.1. Literature review

Aiming at the identification of relevant topics for further research, it was important to get an overview of all the studies which have already been conducted regarding Lake Bosomtwe, its environment and communities, besides others. To assemble all publications, a search in the online database Google Scholar was undertaken by entering the keywords “Lake Bosomtwe” and “Lake Bosomtwi”. Thereby, 68 publications were found, of which almost three quarter (73%) are journal articles followed by thesis (8%) and books (3%, see Figure 2). The remaining other documents (14%) regarding Lake Bosomtwe are comprised of leaflets, monitoring frameworks or management plans, among others.

Moreover, further information was shared by UENR, containing a list of 38 studies related to Lake Bosomtwe, which resulted from a search on the Scopus database using again the keywords “Lake Bosomtwe” and “Lake Bosomtwi” (see Figure 3).

In addition to the search in the online database, the library at the AAMUSTED campus, one of the three Ghanaian university partners, was contacted to find publications that have not been digitized yet. One more study was found.

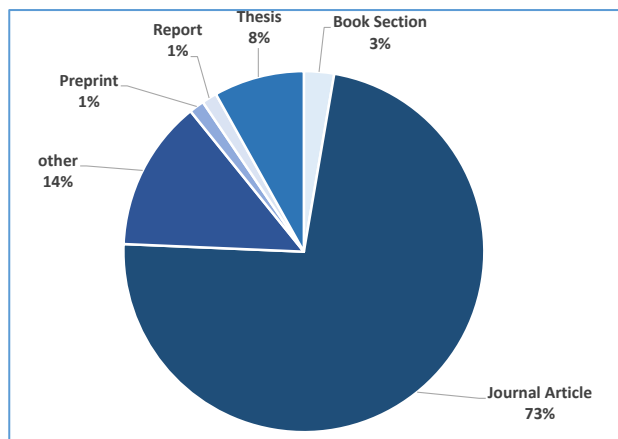


Figure 2: Type of publication of 68 reviewed studies regarding Lake Bosomtwe. Source: own data, based on Zotero list, 2022

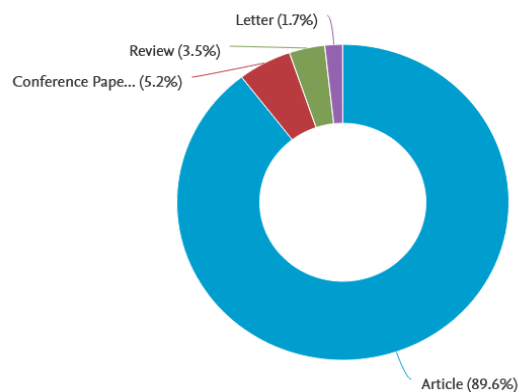


Figure 3: Type of publication of studies found in Scopus database. Source: Agyeman 2022.

Based on the results, a Zotero group<sup>1</sup> was created to combine and to provide the gathered information to all project partners. This extensive list of literature is available to all partners of the project and can easily be used to get a comprehensive overview on the research being done in the Biosphere Reserve Lake Bosomtwe in the last years. New ideas for research can be easily proven against former research results and the identification of connecting factors to other research activities is facilitated.

<sup>1</sup> Zotero is an online tool on collaborative research projects. Zotero's Groups allow users to share references with other Zotero users online.

#### 4.2. Quantitative & qualitative analysis

In Zotero, each study was labelled with different keywords describing the respective research area (Table 1).

Table 1: Keywords used for labelling the studies

<b>Agriculture</b>	<b>Land use patterns</b>	<b>Freshwater</b>
Crop rotation	Land use land cover	Heavy metals
Erosion	Topology	Hydrology
Irrigation	<b>Livelihood</b>	Sediments
Pesticides	Restoration	Shoreline
Agriculture	Livelihoods	
Soil	Tourism	<b>Cross cutting topics</b>
<b>Biodiversity</b>	<b>Water quality</b>	Climate change
Biodiversity	Eutrophication	Malaria
<b>Fisheries</b>	Limnology	Ecosystem service
Aquaculture	Nutrients	Environmental impact
Fish	Phytoplankton	Env. sustainability
<b>Forestry</b>	Pollution	Food security
Deforestation	Water quality	Human health
	Zooplankton	Infrastructure

Source: own elaboration, 2023

In a second step and based on these keywords, the studies were summarized and assigned to at least one of the following research topics: **Agriculture; Biodiversity; Fisheries; Forestry; Land use patterns; Livelihood; Water quality as well as cross cutting topics**. In Figure 4, the number of studies per research area are shown. Until now, most of the research was conducted in the fields of water quality and livelihood issues. As well, cross cutting topics played a relevant role in the research conducted in the past. On the other side, hardly any research has been done in the fields of forestry, biodiversity and land use patterns, although a lot of expertise and knowledge in these fields are available at the project's partner universities. Further, agriculture and fisheries, as additional important and relevant forms of land use to generate food and income, play only a subordinate role in the past research activities.

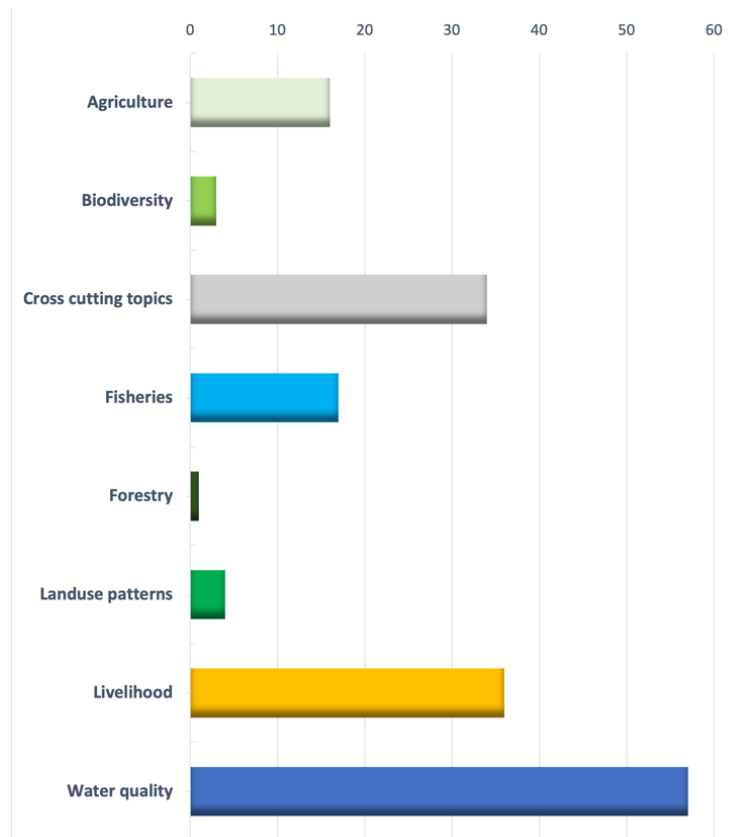


Figure 4: Main research areas of studies (n = 68) and related frequency (x-axis: number of studies found); Source: own data based on Zotero list, 2022

Following this first categorization, the abstracts of all 68 studies were further analysed using the software MaxQDA, a tool for IT-based qualitative data and text analysis. The results of the word frequencies in the analysed abstracts can be found in table 2.

*Table 2: Word frequencies in analysed abstracts*

Word	Word length	Frequency	Rank
Lake	4	110	1
Bosomtwe	8	94	2
water	5	87	3
study	5	75	4
Ghana	5	56	5
tourism	7	45	6
fish	4	41	7
area	4	39	8
health	6	37	9
basin	5	36	10
data	4	34	11
depth	5	30	12
community	9	26	13
mercury	7	24	14
species	7	24	14
climate	7	23	16
crater	6	23	16
use	3	23	16
development	11	22	19
land	4	22	19
levels	6	22	19
samples	7	22	19
biomass	7	21	23
communities	11	21	23
cover	5	21	23
local	5	21	23
phytoplankton	13	21	23
sources	7	21	23
facilities	10	20	29
fishing	7	20	29
livelihood	10	20	29
survey	6	20	29

Source: own elaboration, 2023

It becomes clear that most studies have been conducted related to the topics of “tourism” and “fisheries”, a present and a potential future source of food/ income for communities around the lake, as well as “mercury”, one important heavy metal frequently found in the lake. Vice versa, as it can be seen, topics related to agriculture, forestry or governance issues have played a very subordinated role in research activities around the lake.



### 4.3. Recommendations for further research from reviewed studies

Based on the analysis of the 68 studies, the main findings and recommendations were extracted and assembled in separate documents that can be received upon request from the authors.

In the following, the major topics that were recommended for further research in the analysed studies are outlined. As most of the studies were done in the field of hydrology and fisheries, the major part of the recommendations shown below is dealing with these topics as well.

#### **Agriculture**

- Conducting a study on Mercury (Hg) bioavailability in Bosumtwi Lake sediments (Amankwaa, G. et al., 2021)

#### **Hydrology**

- Conducting a study to examine parameters influencing water quality like temperature, pH, TDS, SAR, SSP, RSC, KR and other trace elements (Asamoah, E. et al., 2015)
- Pooling together an integrative research strategy to undertake studies on the lake. Candidate areas may include limnology and sediment budget and alternative livelihood strategies for resident (Adu-Boahen 2017)
- Monitoring of the association between TP and TDS, since a strong positive correlation between them was found (Adams 2016)
- Analysing the colour, turbidity, faecal coliform, *Escherichia coli* count, chlorophyll-a, and algal growth in the lake (Adams 2016)

#### **Fish**

- Conducting studies to include growth and recruitment of *Sarotherodon galilaeus multifasciatus* to enhance future production of the species under culture conditions (Amisah, S. and Agbo, N.W. 2010)
- Estimation of the total intake of DDTs, PCDD/Fs and dl-PCBs, and assessment of the health risks for the general population of Ghana (Adu-Kumi, S. et al. 2010)
- Conducting comprehensive studies on the possible detrimental interactions of introduced species with native species, and on changes to ecosystem function (Obirikorang, K. et al 2020)

#### **Tourism**

- Implementation of appropriate measures to monitor parameters to ensure sustainable use of the water resource as a recreation facility (Nketia et al 2016)



## 5. Consultations and workshops for planning of research and transfer

An essential element for the development of the research and transfer outline was to conduct consultations and workshops with all partner institutions, as well as with representatives from the Lake, with regional stakeholders from different levels, and with the local communities. These activities were realized during a visit at Lake Bosomtwe from 3<sup>rd</sup> to 7<sup>th</sup> October 2022.

Throughout the visit, project partners (professors as well as students from the four participating universities), institutions and authorities from around BR Lake Bosomtwe, several local communities in Ghana and project partners from Germany took part.

In detail, the research planning visit was composed of the following elements:

- An initial meeting among the research partners of the project aiming at identifying already conducted research and research interests of the partners,
- Meetings with local people from two local communities: Nkawi & Amakom. These two villages were chosen as they present different, but typical living conditions around the lake. Further, they are located in two different administrative entities responsible for the lake's basin. In the due of the meetings, semi-structured, qualitative interviews were conducted,
- A meeting with focus group discussions among the Community Resources Management Area (CREMA), and representatives of different commissions,
- Meetings at the partner universities: UENR, AAMUSTED and CSIR-FORIG
- Internal meetings of the project partners to compile the findings of the various meetings.

## 6. Priority research and transfer subjects identified

Based on the pre-work (see chapter 4), as well as on the meetings, consultations, and workshops (see chapter 5), a list of research areas was collected by the project team. The identified priority research and transfer subjects are listed below in the order of their relevance:

- Livelihoods
- Agriculture
- Forestry
- Fisheries and biodiversity
- Communication
- Sustainable Tourism
- Public Health

In addition, some cross-cutting issues were identified that require further research but cannot be related to any of the mentioned above.

## 7. Research and transfer topic by topic

In the following section, the identified priority research and transfer subjects are presented in more detail theme by theme, and precise ideas for future research are outlined. These ideas are a combination of the outcomes of the literature review (chapter 4.3.) and the consultations and workshop for the planning of research and transfer (chapter 6.). These are categorized according to the three dimensions of sustainability complemented by “Management/Governance” and “cross-sectional”.

### 7.1. Livelihoods (lead: KNUST)

Local communities within the Lake Bosomtwe basin in Ghana mainly depend on fishing and farming as livelihoods. Due to increasing local human population, these livelihood activities are under severe pressure and believed to be dwindling and affecting local livelihood needs and demands. Therefore, a sound knowledge, how the framework conditions at Lake Bosomtwe will change in the future as well as new income sources and approaches to earn income for the local population are urgently needed.

#### *Demand and topics for research and transfer*

Economic dimension	Socio-cultural dimension	Ecological dimension	Management / Governance	Cross-sectional
Examination of current livelihoods opportunities	Implementation of a population trend analysis	Analysis of land use/ land cover change	Development of strategies to foster private sector in the marketing of NTFPs (exporting and processing companies) *	Survey of present utilization of NTFPs at Lake Bosomtwe
Assessment of livelihood coping strategies employed by communities to meet changing livelihood needs.		Assessment of human-wildlife conflicts		Analysis of market potentials of NTFPs on local/regional markets,
Development of alternative livelihood approaches such as piggery, soap making or bee keeping				Pooling together an integrative research strategy to undertake studies on the lake. Candidate areas may include limnology and sediment budget and alternative livelihood strategies for resident (Adu-Boahen 2017)

\*Potentially focused on a few species with high potential such as *Iringia gabonensis*, *Aframomum melegueta*, or *Myristica fragrans* (in cooperation and through interviews with cocoa research institute /CSIR edible plants garden Bunso / A Rocha or other NGO)

## 7.2. Agriculture (lead: AAMUSTED)

Farming is one of the major livelihoods for community members around the lake. In the last decades, an increase of farmland and usage of chemical pesticides and fertilizer was noticed. Chemicals end up in the lake through run-off which pollute the lake and have negative effects on biodiversity in and around the lake. The NGO “A Rocha Ghana” as an active player in the region, has already trained farmers to adapt organic farming practices<sup>2</sup>. Still, the general awareness of how agricultural practices influence the lake, and the related ecosystem is low.

### *Demand and topics for research and transfer*

Economic dimension	Socio-cultural dimension	Ecological dimension	Management / Governance	Cross-sectional
SWOT analysis of installing boreholes for irrigation as well as for harvesting of rainwater for irrigation	Analysis of indigenous farming practices being used around the lake	Analysis of present land use and land use/ land cover change	Assessment if (organic) farming practices are improving at the lake	Assessment of chances to develop the medicinal plant garden (in terms of growing and selling the plants in addition to being just a tourist site)
	Analysis on farmers perceptions on integration of shade trees into cocoa farming and indigenous knowledge regarding this	Analysis of the influence of pesticides usage on soil, fauna and flora and development of approaches to reduce the use of chemical pesticides	Development of innovative approaches for farming on slopes	Development of climate smart agriculture approaches, including the identification of crops adapted to topology (also based on soil samples)
	Impact assessment of agricultural interventions of NGOs	Analysis of the effect of farming distance and slope from the Lake Bosomtwe on the leaching of chemicals into the lake	Development of approaches to improve the productivity of conservation agriculture	Development of a GIS Study on the extent of cocoa farms and shade trees around the lake
Potential analysis on making Abono known for a particular crop		Analysis of possibilities for agroforestry systems for the improvement of the vegetation cover and the increase of landscape tree cover	Development of approaches to reduce the impact of agriculture related practices	Assessment of practices for improving soil fertility and pest management and
		Conducting a study on Mercury (Hg) bioavailability in Bosumtwi Lake sediments (Amankwaa, G. et al., 2021)		

<sup>2</sup> Project: Climate Change Resilience for Farmers at Lake Bosumtwi and Collaborative Ecosystems Conservation of Lake Bosumtwi

### 7.3. Forestry (lead: CSIR FORIG)

Around Lake Bosomtwe, illegal logging and the resulting deforestation is one of the most severe problems. Erosion increases, biodiversity is negatively impacted, and the resource base and livelihood are heavily reduced.

#### *Demand and topics for research and transfer*

<b>Economic dimension</b>	<b>Socio-cultural dimension</b>	<b>Ecological dimension</b>	<b>Management / Governance</b>	<b>Cross-sectional</b>
Development of approaches to increase the attractiveness of lesser used timber species	Analysis of firewood utilization patterns of communities around the lake and development of alternative fuel sources	Development of approaches for the use of bamboo as erosion control	Development of strategies to decrease illegal logging	Assessment of carbon stock of trees
Analysis of possibilities to make efficient use of byproducts of wood, such as bark	Collection of indigenous people's knowledge regarding forest management at Lake Bosomtwe	Analysis of biodiversity and ecosystem services of forest area around the lake	Development of strategies to foster reforestation activities	

### 7.4. Fisheries and biodiversity (lead: UENR/ KNUST)

Rapid decline of biodiversity and the fragmentation of the lake's ecosystem (terrestrial and aquatic) have become obvious. Climate change and unsustainable forms of human activities, such as farming, contribute to biodiversity and ecosystem changes and degradation. For instance, decline of fish in variety and quantity is a common experience of the 24 communities within the biosphere. Studies by Dassah and Agbo (2003) have shown that pressure from fishermen in fringe communities surrounding Lake Bosomtwe has led to a drastic reduction of fish stocks. Also, the sizes of fish being caught presently are becoming increasingly smaller (Konadu, 2004). Increasing misuse of natural resources, mismanagement of waste disposal, and uncontrolled infrastructure development may also produce negative impacts on soils, vegetation, and water resources.

Further, little is understood about the policy and management interventions required to slow biodiversity degradation, about fish decline and the recovery of the lake ecosystem. Such interventions are based on scientific data gathered from studies involving GIS and other applications, traditional ecological knowledge, governance and institutions, biodiversity-based livelihood development, stakeholder participation and private/public partnerships in biosphere management.

*Demand and topics for research and transfer*

Economic dimension	Socio-cultural dimension	Ecological dimension	Management / Governance	Cross-sectional
<p>Conducting studies to include growth and recruitment of <i>Sarotherodon galilaeus multifasciatus</i> to enhance future production of the species under culture conditions (Amisah, S. and Agbo, N.W. 2010)</p>	<p>Assessment of local knowledge on how biodiversity can be preserved</p>	<p>Assessment of the status of fish stocks in the area</p>	<p>Determination of threats to biodiversity and devise strategies to mitigate them</p>	<p>Development of strategies for (re)establishing fish nursing grounds</p>
		<p>Conducting detailed studies on quality of soils, forest and water resources (follow-up RELAB activities)</p>		<p>Long term monitoring of flora &amp; fauna, with special focus on invasive species</p>
		<p>Review of existing literature on biodiversity (flora and fauna) of the Lake Bosumtwi catchment area</p>		<p>Conducting comprehensive studies on the possible detrimental interactions of introduced species with native species, and on changes to ecosystem function (Obirikorang, K. et al 2020)</p>
		<p>Conducting a detailed biodiversity survey to detect vulnerable species of conservation interest.</p>		<p>Analysing the colour, turbidity, faecal coliform, Escherichia coli count, chlorophyll-a, and algal growth in the lake (Adams 2016)</p>
		<p>Conducting a study to examine parameters influencing water quality like temperature, pH, TDS, SAR, SSP, RSC, KR and other trace elements (Asamoah, E. et al., 2015)</p>		<p>Monitoring of the association between TP and TDS, since a strong positive correlation between them was found (Adams 2016)</p>

### 7.5. Communication (lead: WRC/ CREMA/ BR management)

As in other areas and sectors, communication is key for a successful cooperation and development of certain topics. It could be seen that communication amongst stakeholders around the Lake, but also between universities and local communities can still be improved. People don't always understand research and they are research fatigue, as the results of research are not always clearly communicated to the local communities.

#### *Demand and topics for research and transfer*

Management / Governance	Cross-sectional
Analysis on how communication and exchange of information between stakeholders can be improved e.g., by setting up regular meetings and consultations	Analysis on how the transfer of research results into the BR, to the local communities can be improved, institutionalized, and perpetuated (science communication)
Development of a concept for communication in the BR	Development of concepts to collect issues for research (e.g collaborative research planning workshops, where farmers present problems, which are then translated into research questions for e.g., BSc/MSc students. *
Development of communication and dissemination concepts regarding "Ambassadors of the BR" (including a respective certification)	Development of approaches to help local people understand the concept/ and specificities of the BR as well as possible profits and advantages they might gain from living in a BR.

\*The Tanzanian NGO Sustainable Agriculture Tanzania is doing this for many years now very successfully and can serve as an example for implementation

### 7.6. Sustainable Tourism (lead: UENR)

Sustainable tourism development is at the forefront of many contemporary public and policy debates. The causes of inequalities, and the effect they have on the environment, and communities and local people's chances in tourism and hospitality sector is not well understood within Lake Bosomtwe Biosphere Reserve. Little knowledge is available on tourism in general, and on sustainable / eco-tourism in particular.

Further, the carrying capacity at Lake Bosomtwe Biosphere Reserve is not yet well analysed, and the disregard of established biosphere zones for tourism use and unplanned (illegal and uncontrolled) infrastructure development is a severe challenge. Tourism development is in its infancy and presents neither a relevant source of income for the local population nor a vehicle for sustainable development.

*Demand and topics for research and transfer*

<b>Economic dimension</b>	<b>Socio-cultural dimension</b>	<b>Ecological dimension</b>	<b>Management / Governance</b>	<b>Cross-sectional</b>
Conducting a value chain analysis with focus on tourism (direct/indirect value creation)	Identification of required qualifications for employees (guides, hospitality, marketing)	Development of environmental management guidelines for hotels	Analysis of potentials regarding an institutionalization of tourism stakeholders	Conducting a feasibility study and potential analysis for tourism development
Conducting a competitor analysis			Development of concepts for guided tours and maps with touristic attraction	Developing concepts to set up ecovillages
Assessment of local economic impacts of tourism (employment, value chains ...)			Development of a management plan for the BR: zoning, transport, construction, tourism, ...	Implementation of appropriate measures to monitor parameters to ensure sustainable use of the water resource as a recreation facility (Nketia et al 2016)
Development of approaches for tourism product diversification to encourage overnight stays			Further (participatory) development and enforcement of rules and governance structures	

7.7. Public Health (lead: AAMUSTED)

Some of the communities around the lake depend on the lake as their source of drinking water. However, the water is not safe due to poor sanitary condition around the lake as a result of bathing, washing and cleaning oneself or any equipment in the lake with soap and detergent as well as of littering by visitors. This has led to frequent water related diseases in the study area (Fosu 2010). As well, pollution and general decline of water quality has been observed in the recent past (Adu et al. 2014, Adjei et al 2017, etc.). The research therefore has the capacity of making known the prevalent diseases in the communities surrounding the lake. As such the right antidotes could be proposed.



*Demand and topics for research and transfer*

Economic dimension	Socio-cultural dimension	Ecological dimension	Management / Governance	Cross-sectional
	Analysis on disease prevalence, incidence and severity/ burden	Analysis of microplastic contamination of water and fish as well as of potential threats to people eating contaminated fish	Develop strategies to improve the sanitation problem of Lake Bosomtwe (at Aboho e.g.)	
		Estimation of the total intake of DDTs, PCDD/Fs and dl-PCBs, and assessment of the health risks for the general population of Ghana (Adu-Kumi, S. et al. 2010)		

7.8. Cross-cutting issues (lead: UENR)

During the workshop, additional topics were discussed that could not be allocated to one of the main fields mentioned above. They were mainly related to overarching issues such as the economic value of the Biosphere Reserve in general, but also tackled educational issues and questions of women and gender. As an example, there is anecdotal evidence from studies in tourism and fishing in the Biosphere Reserve that indicate disparities and disempowerment of women. Also, the studies show that women are affected the most by the harsh conditions due to the changing climate and its effects.

*Demand and topics for research and transfer*

Economic dimension	Socio-cultural dimension	Ecological dimension	Management / Governance	Cross-sectional
Analysis of the economic values of BR and the national accounting of BR (measuring contribution to green GDP)	Development of strategies to decrease youth migration and for empowerment of young people		Development of strategies for a better enforcement of wildlife laws	Investigation of an effective adaptation and skills/training requirements for women inclusion in e.g. tourism and fisheries.
	Development of strategies to foster education for sustainable development in schools and for educational trainings for the locals			Development of strategies for women's empowerment and constraints in participating in fishing and tourism in the BR

## Imprint

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