



Addressing Transboundary Concerns in the Volta River Basin and its Downstream Coastal Area

Detailed review of the preliminary TDA

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Final report

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List of abbreviations and acronyms

Abbreviation	Definition
CBOs	Community Based Organisations
CCAs	Causal Chain Analyses
DTA	Transboundary Diagnostic Analysis
ECOWAS	Economic Community of West African States
GNP	Gross National Product
IBTs	Inter Basin Transfers
IWRM	Integrated Water Resource Management
MPPIs	Major Perceived Problems and Issues
NGOs	Non-Government Organisations
PADH	Physical Alteration and Destruction of Habitats
PAGEV	Projet d'Amélioration de la Gouvernance de l'Eau dans le Bassin de la Volta (Volta Water Governance Project)
PMU	Project Management Unit
SAP	Strategic Action Programme
Sida/Asdi	Swedish International Development Agency
UNEP-GEF	United Nations Environment Programme – Global Environment Facility
UNOPS	United Nations Office for Project Support
VRB	Volta River Basin
VBA	Volta Basin Authority
WIO-Lab	Western Indian Ocean – Land based activities

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Table 1 : Analysis of sectors and stakeholder groups causing (C) transboundary marine pollution problems as well as those impacted (I) by pollution.

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1. Introduction

1. The “Addressing Transboundary Concerns in the Volta River Basin and its downstream coastal areas” Project is a joint initiative of the Governments of Benin, Burkina Faso, Cote d’Ivoire, Ghana, Mali and Togo. The project is funded by the Global Environment Facility (GEF), implemented by the United Nations Environment Programme (UNEP) and executed by the United Nations Office for Project Support (UNOPS).
2. The project, which has been designed to facilitate the integrated management, sustainable development and protection of natural resources of the Volta River Basin, plans to achieve its objectives by addressing priority regional transboundary issues and problems as identified through a preliminary Transboundary Diagnostic Analysis (TDA) for the basin conducted in 2002. The project is expected to promote a more sectorally-coordinated management approach, based on Integrated Water Resource Management (IWRM) principles, both at the national and the regional levels, with a strong emphasis on an expanded role for all stakeholders.
3. The long-term goal of the project is to enhance the ability of the countries to plan and manage the Volta basin within their territories and its aquatic resources and ecosystems on a sustainable basis.
4. The project has three main components with associated objectives identified by the root cause analysis carried out during the project preparation process and updated during the inception phase as follows:
 - Specific Objective n° 1: Build capacity, improve knowledge, enhance stakeholders involvement to support the effective management of the VRB
 - Specific Objective n° 2: Develop river basin legal, regulatory and institutional frameworks and management instruments for addressing transboundary concerns in the Volta River Basin and its downstream coastal area
 - Specific Objective n° 3: Demonstrate national and regional measures to combat transboundary environmental degradation in the Volta Basin

1.1 Objective and Scope of the Analysis

5. A preliminary TDA for the Volta River Basin has been completed in 2002. The preliminary TDA serves as the basis for preparation of the project document and follow up inception report guiding the project implementation. The current GEF Volta Project is therefore expected to update and expand the TDA, and also develop a regionally agreed SAP, following clarification of some aspects of the environmental status of the region as well as building grounds for SAP implementation.
6. The preliminary TDA identifies a number of shortcomings, notably the lack of adequate data and information for several areas of assessment. Furthermore, changes in the legal and institutional landscape have occurred since 2002, both at basin as well as at national level.
7. This report constitutes a review of the preliminary TDA with a view to:
 - Assess the current scope and level of detail of information provided in the TDA
 - Identify currently existing data and information gaps
 - Assess the presentation of information (sequencing, logical flow, coherence)
 - Assess the adequacy of the depth of analysis and coherence of presentation in view of the requirements for SAP development
 - Provide recommendations for TDA gap filling

1.2 Methodology

8. In reviewing the preliminary TDA the following methodology was applied.
 - As a first step in reviewing the preliminary TDA key areas that need to be covered in a river basin TDA were identified. Whereas some degree of flexibility is required to take the conditions of the specific basin into account, there are a number of topic areas that are common in river basin TDAs that have been conducted internationally. These topic areas include: physical characteristics of the basin, hydrology, water quality, river ecosystems, socio-economic conditions and governance. Sub-categories to these topic areas will be identified to further refine the subsequent data analysis. The structure and content of the preliminary TDA was analysed against these criteria.
 - Using the level of analysis and depth of coverage of the topics in other TDAs conducted in Africa as well as other world regions as a benchmark, a detailed analysis of existing data and information as well as currently existing data gaps was compiled in a matrix format, allowing a country-by-country assessment of existing data and information and data/ information gaps. The country specific data analysis is complemented by an assessment of the information and data provided for basin-wide analysis.
 - In addition to the detailed review comments per chapter the reviewers have compiled a detailed set of overall recommendations for improving the content of the chapters, the structuring of chapters (within and between chapters) and the required level of cross-cutting analysis.
9. The review concludes with a summary of the main findings, which provides overall guidance for revising the document in line with the detailed review comments provided for in the matrix.

2. General Comments

10. The information provided in the preliminary TDA is somewhat skewed towards scientific-technical information and falls short of adequately covering aspects of governance, including the role of stakeholders. Whereas the TDA is a scientific baseline document that provides scientifically substantiated knowledge for the SAP development and implementation process, it is clear that governance aspects have to be a major component of the TDA (and subsequently SAP). The state of the environment and whether or not current or future stressors can be alleviated depends to large extent on political, administrative and planning decision-making. These decision-making processes take place in the given governance framework, often meaning that inefficiencies or inadequacies in the governance framework have negative implications for the state of the environment and the social and economic well-being of the basin population. Hence, interventions targeted at improving governance mechanisms (during the SAP implementation phase) are in many cases the key to improving the state of the environment itself. This needs to be adequately reflected in the governance section of the TDA and the respective chapters need to be developed accordingly.
11. The information in the preliminary TDA is not presented with a sufficient level of cross-cutting analysis. At present the linkages between the state of the environment, the socio economic conditions and the governance framework are not adequately brought out. The TDA needs to build a convincing case for governments and donors to agree on a SAP, which requires substantial reform and financial investments. This case can only be build if the TDA convincingly describes the causal linkages between the various factors. The final TDA should therefore clearly establish such causal linkages. One element of this needs to be a revision of the existing causal chain analysis (see detailed review comments below), but the linkages also need to be more clearly brought out in the narrative part of the TDA.
12. The TDAs developed (for other basins) so far have usually confined themselves to providing a (comprehensive) assessment of the current state of the basin – usually little future scenario development can be found. The question is raised here whether the PMU finds it desirable to move beyond the traditional approach to TDAs or views the TDA as a document that includes the modelling of future development scenarios¹. Whereas this possible element is admittedly costly (in time and money) and thus dependent on project resources it adds significant value to the SAP development.

¹ This approach is used in the Okavango River Basin TDA currently under development, where a number of development scenarios are modelled and will inform the SAP development.

3. Detailed review comments on TDA chapters

3.1 Biogeophysical and socioeconomic setting of the Volta Basin: data gaps

13. It is evident that for most of the basin there is a general lack of data on biophysical characteristics. In some cases new studies, conducted since the development of the preliminary TDA, may provide additional data, while in others it may prove possible to track down some of the datasets needed from the basin state governments and research institutions during the final TDA. However, there are likely to remain serious gaps in our knowledge of the basin, with a variety of data-gathering and monitoring initiatives needed, possibly as part of the SAP, to correct this. Another important issue is to make sure that all assertions made in the TDA are referenced to a specific study or studies. Much of the preliminary TDA makes statements which are not substantiated through referenced citations. The TDA should represent the compilation of all accessible facts on the basin and should be substantiated to avoid contention of the final product.
14. In addition to the gaps in the existing data categories it is suggested that three new categories are incorporated in the final TDA in this section:
- *Aquatic invertebrates*: an overview of data on aquatic invertebrates and associated studies would be necessary for the development of a bio-monitoring system for the basin. Such a bio-monitoring system would form a crucial aid in managing the water quality objectives of the basin as a whole as well as alerting managers to possible “hot-spot” areas.
 - *Hydrological Models*: an overview of work already performed in the area of hydrological modelling will contribute to a better understanding of what types of management tools still need to be developed. Such models could deal with aspects such as streamflow, runoff, sediment transport and rainfall.
 - *Wetlands*: given the important role that wetlands play in streamflow regulation, flood protection, biodiversity support, habitats etc this should be a category on its own. At present there is not a systematic overview of the wetlands in the basin and the role they play in ecosystem functioning and livelihood support.
15. Following is an overview of some of the key areas where there are data gaps in the preliminary TDA. A matrix of gaps in the preliminary TDA has been developed and included in Annex
- A more detailed and descriptive narrative of the **Relief** of the basin needs to be developed. Such a narrative would describe the basin from the upper reaches, of its main tributaries, through the middle zone to the mouth. It would attempt to develop a “pen-picture” of the basin, providing the reader with the sense of traversing the basin longitudinally and making them aware of the landscapes they would encounter.
 - The section on **Geology and Soils** could be renamed “Geology” as there is a separate section on “Soils”. Generally, this section requires more detail on natural geological processes such as weathering, sedimentation, alluvial formations, mineral and biochemical precipitates. This would aid understanding of the impacts of anthropogenic actions on the geological features.
 - From the section on **Hydrogeology** is evident that although ground water capacity of the geology of the basin is low, it would nonetheless be an important resource due to the large size of the basin. More information on recharge rates as well as the interconnections between surface and ground water is needed. Another element to include is data on the quality of groundwater.
 - The section on **Soils** should contain a map of soil types for the basin, graphically depicting where agriculture and other activities may be expected and where issues such as erosion may be most acute. Needed is data on soil depth as well as any other data which determines the suitability of a soil body for a specific activity.
 - The main weather patterns are generally well described in the section on **Climate**. However, more rigorous studies on the changes in rainfall patterns, both quantity as well as timing, is needed.

Additionally, data on evaporation rates in the various parts of the basin should be included.

- Generally, the data in the **Hydrology** section focuses largely on Ghana – not surprising considering the large part of the basin on Ghanaian territory and the large contribution to annual runoff. Runoff rates for the whole river are needed, at present they only cover sub-basins. Annual flows data should be included - for the river as a whole as well as for the various tributaries. Sediment transport data is needed as this is a vital component of ecosystem functioning. This could be included either under the “hydrology” section or as a separate section.
- For some of the countries (Cote d’Ivoire and Togo) there is a lot of data on current dams in the **Dams and Reservoirs** section, whereas for others, very little. Data needed for the basin as a whole as well as at country level would include the total current storage capacity of the basin, the rate and degree of sedimentation of the dams, and how the flow hydrograph has been affected. Important for understanding future development issues, would be to include an overview of dams which are likely to be constructed in the next decade or two in the basin. Additionally, inter basin transfers (IBTs) - such as the one proposed on the Densu River in Ghana need to be incorporated. These, even if small in number as well as in quantity of water abstracted, could have serious impacts on the basin.
- The section on **Ecosystems** should provide information on some of the key features of the four eco-system types. What are the special or, perhaps, unique features of these ecosystems? Generally, the sections describing the various forest-type ecosystems are more detailed than the others are. Data should be provided on the various grass types and their suitability to and sensitivity to rangeland agriculture.
- There is large variation in the detail provided in the **Protected Areas** section. For some countries there are many protected areas listed along with an overview of some of the key species of fauna and flora found there – see the sections on Ghana and Togo specifically. For most of the other basin states far fewer protected areas are listed – possibly because no more exist; but this should be made explicit. An attempt should be made to provide an overview of some of the key species of flora and fauna in these areas.
- The Volta River basin is an area of important biodiversity, yet this is difficult to glean from the **Biodiversity** section, due in part to great variations in the level of detail for the various countries. Needed is some type of overview of endangered species of significance and endemic species for the whole basin, possibly presented as a table. It is also important to provide some motivation as to why a specific species of flora or fauna is considered important from a biodiversity perspective – are they a “keystone” species, supporting several other vital ecosystem processes or are they a litmus test for general ecosystem health. Specific data gaps in the respective countries are described in the matrix.

3.2 Socio-economic and development setting

16. **Level of coverage:** the coverage of topic areas in this sector appears to be adequate. However, there is a significant disparity in the level of depth of country specific data – very in-depth data for some countries, nearly no data for other countries. Whereas it is mentioned in the text that there is a shortage of economic data in some basin countries, it would be good if a similar level of coverage could be achieved. A thorough review of existing economic data (possibly generated after 2002) is recommended to improve on the level of depth of the data provided. One sector that arguably deserves more prominent coverage is the section on health issues. It is currently a mere paragraph in the demographics section and has very little information. It is recommended to treat it as a separate chapter under the overall “Socio-economic and development” chapter and provide substantially more detailed information on health issues, i.e. causes and (social and economic) impacts, particularly seeing that many health issues in the region relate back to water-borne diseases. See detailed review comments per information category in the review matrix
17. **Organisation of chapter:** it would be useful if more and clearer sub-section would be used, i.e. population growth and distribution, migration patters, literacy, life expectancy etc. to make the

logical flow of the chapter more apparent. The chapter would benefit from the inclusion of maps (e.g. of population distribution, migration patterns, distribution/ hot spots of water borne diseases etc.)

18. **Contextualisation and analysis of information:** more cross-references should be built with other chapters, e.g. highlighting the impact of socio-economic factors on the state of the environment. The corresponding information in the scientific chapters is mostly there, but the linkages need to be brought out more succinctly, both in the Causal Chain Analyses (CCAs) as well as in the narrative. The information and data provided is currently not sufficiently put into context - an analysis of the economic relevance of the respective sectors needs to be provided and the economic information needs to be put in context with the state of the environment (current and future stressors) and the functioning of the governance system (e.g. land use management etc.) and to be cross-referenced with the relevant chapters

3.3 Legal and regulatory setting

3.3.1 Shortcomings and recommendations

19. The governance framework in the basin, consisting of laws, policies and institutions, has profound impact on the state of the environment as well as social and economic conditions in the basin. Political, administrative and planning decision concerning the use of water and other natural resources are made within the given governance framework. A thorough understanding of the governance framework is thus essential to inform the causal chain analyses for the identified transboundary problems as well as for the development of appropriate SAP interventions, as the key for the solution of many transboundary (environmental, social and economic) problems lies in the improving and strengthening governance mechanisms.
20. The chapter on the legal and regulatory setting does not provide a sufficient overview of the applicable governance framework for the above-mentioned purposes. Currently it provides only an overview of responsible national government institutions, with very limited information on the policy environment and institutions at all relevant levels (national, sub-national, non-governmental stakeholders etc.). Where an overview of legislation and institutions is provided it lacks a detailed demarcation of current institutional responsibilities. No analysis of existing legislation is provided in the context of international water law and the principles of IWRM.
21. It is recommended to substantially revise the chapter, including:
- renaming the chapter into “The governance framework”: the chapter should more comprehensively cover the entire resource governance framework, consisting of laws, policies (incl. IWRM plans, if any) and institutions. This will be brought out in a clearer manner if the chapter is titled accordingly.
 - restructuring the chapter: as the TDA provides a baseline analysis of transboundary problems and their causes and impacts, it is recommended to discuss the governance framework with the basin-wide policy, legal and institutional framework as a point of departure. This will subsequently allow for a focused analysis of the national governance frameworks, including to what extent they are integrated with the international sphere and whether or not the policy, legal and planning frameworks of the basin states are harmonised in a sufficient manner. A proposed detailed outline of the chapter is provided at the end of this section.
 - provide additional categories of information: the chapter needs to provide a comprehensive and cohesive overview of the relevant governance framework
22. Concerning the international sphere an overview of applicable international agreements and policies is required as well as of relevant institutions at international level. In the absence of a well defined treaty law regime for the basin an overview of applicable customary international law is required.
23. Furthermore, the section needs to be updated to take events since 2002 into account, i.e. most

importantly the agreement establishing the VBA. The chapter needs to provide an in-depth analysis of the mandate, functions and institutional set-up of the VBA. It is essential that this description sufficiently describes the legal relationship between the VBA and member states.

24. The description of the legal and institutional framework at international level also needs to cover, if applicable, any relevant bi-lateral cooperation agreements and institutions (or multi-lateral ones that do not include all basin states) and their legal and practical working relationship with the VBA and member states². Finally, this section of the chapter should undertake an analysis of the current cooperation mechanism at basin level and highlight opportunities for the strengthening thereof.
25. The description of the national governance framework needs to be more comprehensive. Each national analysis should be split into a description of applicable a) laws (incl. regulations), b) policies (incl. IWRM plans, if any), and c) institutional set-up.
26. The preliminary TDA lists numerous laws and the respective ministries in charge of implementation. This needs to be cross-checked and updated to take possible changes since 2002 into account. Furthermore, the description of the demarcation of institutional responsibilities between the different role-players (ministries and others) needs to be more succinct.
27. It is apparent from the preliminary TDA that land-use/ land degradation is already, and will increasingly be, a major environmental problem in the basin. It is further stated in the document that the land-use regime is largely governed by customary law. With a view to developing SAP activities in this area a more detailed description of the customary law framework governing land (and other natural resource use) is required³. Importantly, the description of the customary law and institutional framework needs to highlight if and how customary law is integrated with the legal and institutional framework provided by statutory law.
28. The preliminary TDA focused on laws governing water resources management and is nearly silent on the legal regime for water quality. An overview of the laws regulating water quality needs to form part of the governance analysis for each basin country.
29. Comparative analysis of policy, legal and institutional frameworks: with a view to developing SAP interventions addressing policy, legal and institutional reform it is essential to undertake a comparative analysis of the national governance frameworks from two angles:
 - assess to what extent each country's governance framework complies with international legal obligations (i.e. allows for the effective implementation of international obligations); to what extent the institutional set-up nationally is conducive to cooperation at basin-level (through VBA); to what extent is the countries policy, legal and institutional framework in line with IWRM principles
 - compare the governance frameworks of the basin states, thereby highlighting areas that call for harmonisation of policies, laws and/or institutional set-ups with a view to improved cooperation at basin level.
30. Assessment of implementation, monitoring and enforcement capacity: the preliminary TDA makes reference to weak implementation and monitoring structures and limited capacity for enforcement. Though difficult to quantify it would be desirable if the TDA can provide a more in-depth assessment of the current capacity in the member states. This assessment needs to move beyond the description of "weak" and provide a clearer analysis of where the bottlenecks are and

² The project inception report provides a more detailed overview of relevant institutions, which provides a useful starting point for the proposed analysis.

³ The authors are aware that comprehensive studies on the customary law regimes for natural resources management in the Volta basin have been conducted, which can be drawn on.

what the underlying causes are. The capacity assessment should be linked with other TDA sections in the final document, thereby highlighting the opportunity costs (in the form of environmental degradation) of not having sufficient implementation, monitoring and enforcement capacities.

3.3.2 *Proposed chapter outline*

- Governance framework at international level
 - Relevant applicable international law (incl. customary international law)
 - Relevant regional and basin policies
 - International institutional framework (i.e. VBA; bilateral cooperation structures etc.)
 - Highlight opportunities for the strengthening of basin-wide cooperation mechanisms
- Governance framework at national level (same structure for each country)
 - Applicable laws (water resources management, water quality, related natural resources, i.e. land, forests etc.)
 - statutory law
 - customary law (and linkages with statutory law)
 - Relevant national policies (incl. IWRM plan, if any)
 - National institutional framework
 - Analysis of national governance framework in the light of
 - international obligations (international cooperation)
 - compliance with IWRM principles
 - Assessment of implementation, monitoring and enforcement capacity
 - main areas of concern and underlying causes
 - impacts of insufficient capacity (link to causal chain analyses in other chapters)
- Comparison of national governance frameworks
 - Overview of requirements/ opportunities for harmonisation of laws
 - Overview of requirements/opportunities for better integration of national with international institutions

3.4 **Major perceived problems and issues**

31. For any set of coordinated interventions to have a positive impact on the ecology of the basin it is necessary to reach a thorough understanding of the major problems in the basin as well as their root causes and the stakeholders concerned. The significance of the perceived issues and problems should be substantiated on scientific, environmental, economic, social, and cultural grounds, incorporating inputs from government, the scientific community and appropriate civil society groups in the region. These major perceived problems and issues (MPPIs) should be decided on through gaining the input from the above groups; and then the primary, secondary and root causes isolated by performing a causal chain analysis.
32. Interventions, in the SAP, are focused on the root causes – as they are cross cutting, thus addressing one will have a positive impact on the status of several problems. For this causal chain analysis to be successful it is necessary that the root causes are at a sufficiently high level of aggregation; seeking to move away from focussing on proximate causes and towards their underlying drivers. The preliminary TDA has performed a set of causal chain analysis and identified a set of MPPIs; eight in total; as well as 20 root causes considered to be driving them. The selection of the MPPIs was based largely on the commissioned national reports and agreed on and prioritised by the national coordinators of each basin state.

33. For the full TDA this selection of MPPIs should be verified with a broader set of stakeholders from the basin, preferably through a structured series of meetings. For this set of MPPIs the root causes should be identified – at a higher level of aggregation than they currently are, with the implication that there would be fewer than the 20 currently chosen. These would form a set of high impact interventions; to be investigated further and then possibly addressed in the SAP.
34. Following are some more detailed comments on each of the MPPIs currently identified – identifying gaps in data and analysis as they currently stand :
- **LAND DEGRADATION:** It is stated that soil erosion is leading to sediment increase – but this needs to be substantiated with facts. As written now it is largely an overview of land use and tenure systems. There is little information on the amount of soil lost to erosion annually, and rates of deforestation and desertification. Nor has a quantification of the loss of productivity of lands been provided for all countries. Two questions, which need to be addressed, are, what is the rate of erosion currently; and what future demand for land is there likely to be - from which sectors? Additionally, there is again little mention on the state and role of wetlands.
 - **WATER SCARCITY:** While information on projected demand for water is quite extensive in the TDA, data on currently available surface and groundwater resources are not as comprehensive. For several of the countries (Benin, Cote d’Ivoire, Ghana and Mali) there is no data on the per capita availability of water provided. In particular, the final TDA will need to include additional data on groundwater resources and more extensive data on which areas are experiencing shortages. It should also be made clear what role the decrease in precipitation, previously mentioned in the preliminary TDA, has in relation to increased use of water. Data on the evaporative losses due to reservoirs should be sought.
 - **LOSS OF BIODIVERSITY:** Most emphasis is currently placed on the loss of species, with not much on the physical alteration and destruction of habitats (PADH) in the basin. This would be an important factor when assessing the role of wetlands supporting migratory birds, being encroached on by human activities. There is also an emphasis on terrestrial species loss, with few data on aquatic species. Wetlands and aquatic habitats were either not discussed or were not elaborated on.
 - **FLOODING:** Data that is more complete is needed on the frequency, severity, locations, causes, and consequences (both human and economic losses) of floods. At present, based on the data provided, flooding does not emerge as a major issue in most of the basin.
 - **WATER-BORNE DISEASES:** Additional data should be provided on the geographic extent and the number of inhabitants infected by various diseases, in order to assess and address this issue. At present only Ghana has anything approaching a good overview of data on this issue; and even in this case only presence or absence of diseases and vectors is presented, with no data on human incidence or impacts.
 - **GROWTH OF AQUATIC WEEDS:** Little data is provided on the extent of the problem. The one exception was that information was given on the Oti River and the threats to Akosombo Dam. Further information on other areas should be given and the impacts on biodiversity assessed.
 - **COASTAL EROSION:** According to the limited data provided, the Volta River affects only Ghana’s coasts. Additional information will need to be provided on the relationship between the Volta River and coastal erosion occurring in countries other than Ghana in order to establish this as a priority issue for the basin. Does comparable baseline data on rates of accretion prior to the construction of the Akosombo dam exist? This can then be compared with current rates and the impact of the dam assessed.
 - **WATER QUALITY DEGRADATION:** In the causal chain analysis, "industry" is listed as a source of pollution - yet in the description of the problem, it is stated, "industrial effluents are not significantly present in the basin". Which is correct? Establish the linkages between the reported drop in water quantity and the impact of the reduced dilution capacity on water quality degradation. Sufficient data to assess accurately the status of water quality in the basin are not provided. Limited data are given for Ghana and Togo on the effects of industry on water quality,

but additional information needs to be included from all countries on the faecal coliform levels and degradation resulting from agriculture. More information should also be given on potential contaminant loads, such as the amount of fertilisers and pesticides used in the basin. Additionally, eutrophication needs to be examined.

- **EMERGING ISSUES:** Two emerging issues, which should be considered, are the impacts of global climate change and the impacts of internal migration across borders in the region. Provide data to support the assertions that activities such as urbanisation and mining are in fact increasing.

3.5 Stakeholder analysis

35. The stakeholder section of the preliminary TDA in its current state requires substantial update and improvement to provide meaningful analysis for the TDA. It is currently only providing a list of some relevant stakeholders, without providing any analysis or putting it sufficiently into the context of the other TDA chapters describing the main transboundary problems.
36. More so, in most instances only national government ministries are listed, with sub-national institutions and parastatals mentioned occasionally. What is almost entirely lacking is an overview of relevant stakeholder causing and/ or being impacted by the identified problem areas for which the stakeholder overview is compiled. It is critical that a detailed overview of non-government stakeholders (NGOs, CBOs, private sector etc.) complements the overview of government agencies currently listed.

3.5.1 Overview of stakeholders in relation to transboundary problems

37. A detailed stakeholder analysis needs to be conducted in relation to each major transboundary problem identified. This stakeholder analysis should provide an appropriate break-down of stakeholder groups and indicate whether the respective stakeholder are causing the problem in question, are impacted by it, or both.
38. Such stakeholder analysis will inform the causal chain analyses developed in the other TDA chapters and provide a more accurate, informed basis for the development of intervention options during the SAP development phase. In addition to a narrative description of stakeholder groups and how they are related to the respective transboundary problem, the findings should be provided in an overview table for easier reference (see below table produced for the UNEP/GEF WIO-Lab Project as an example). The stakeholder analysis should be conducted on a basin-wide scale rather than on a per country basis. Only where the cause of a transboundary problem (but not the impact) is restricted to a small geographic area, this should be indicated.

3.5.2 Assessment of stakeholder influence/ importance/ power relations

39. The overview of stakeholder groups and how they relate to the transboundary problem in question would be meaningfully complemented by a qualitative analysis of the influence and importance of each stakeholder group in relation to the specific transboundary problem as well as an analysis of power relations between stakeholders. An example of a stakeholder analysis matrix is provided below.
40. Whereas it is acknowledged that undertaking a thorough stakeholder analysis in this format can be both costly and time-consuming, it allows for a structured analysis of stakeholders in relation to a specific transboundary problem and helps in developing targeted interventions during the SAP development phase. Since there is work on stakeholder analysis and involvement ongoing in the basin (PAGEV etc.) the reviewers recommend that on the basis of work already undertaken a detailed stakeholder analysis is conducted, using the above as a possible analysis tool.

Matrix classification of stakeholders according to relative influence on and importance for addressing a specific transboundary problem (an example)⁴

High importance

↑	A	B	STAKEHOLDERS Secondary 1 National Department of Water 2 Sida/Asdi 3 Interconsult Primary 4 Large-scale commercial farmers 5 Small-scale commercial farmers 6 Communal farmers 7 Nature Reserve 8 Rural population External 9 Traditional healers 10 Politicians
	*5 *6 *8	*5 *4 *1 *3 *2	
	D	C	
	*9	*10	

Low importance

Low influence → High influence

⁴ Adapted from Tapela B. (2006): Tools and Techniques of Stakeholder Participation. Course Manual: Stakeholder Participation. Produced for African Centre for Water Research

Table 1 : Analysis of sectors and stakeholder groups causing (C) transboundary marine pollution problems as well as those impacted (I) by pollution.

SECTOR	STAKEHOLDER	TRANSBOUNDARY PROBLEM					
		Micro-biological contaminants	Eutrophication (algal blooms)	Marine Litter (solid waste)	Suspended solids	Chemical pollution	
Fisheries and Aquaculture	Artisanal fishers		I				I
	Industrial fishers		I				I
	Seaweed farmers		I				I
	Industrial prawn farmers		C	I		C	I
	Fish and shellfish farmers	I	C	I		C	I
Agriculture and Forestry	Charcoal makers		C			C	
	Small-scale loggers		C			C	
	Industrial loggers		C			C	
	Small-scale farmers		C			C	C
	Large-scale farmers		C			C	C
	Pastoralists	C	C				
	Ranchers		C				
	Poultry farmers	C	C				
	Dairy farmers	C	C				
Beekeepers							
Tourism	Tourists		I	I	C	I	I
	Hotel owners/operators		I	C	I	C	I
	Small-scale traders				C		
	Tourist boat/SCUBA operator		I	I	C	I	I
Mining	Coral/lime miners					C	
	Sand miners					C	
	Small-scale salt producers		I	I			I
	Industrial salt works		I	I			I
	Small-scale miners					C	C
	Industrial mining companies					C	C
	Fuel suppliers and stations						C
	Oil and gas production						C
Industry	Heavy manufacturing				C	C	C
	Light manufacturing				C	C	C
	Agro-processing industries	C	C		I	I	I
	Oil refining						C
Transportation	Ports	C		I	C	I	C
	Dredging companies					C	C
	Clearing and forwarding						
	Railway						
	Roads (incl. traffic)						C
	Airports						
	Airlines						
Shipping				I		C	
Energy production	Hydro-dam operators						
	Power station operators						
	Renewable energy producers						
	Fossil fuel users		C			C	C

SECTOR	STAKEHOLDER	TRANSBOUNDARY PROBLEM									
		Micro-biological contaminants		Eutrophication (algal blooms)		Marine Litter (solid waste)		Suspended solids		Chemical pollution	
Urbanisation	Solid waste operators	C		C		C		C		C	
	Sewage managers	C		C				C		C	
	Property developers	C	I	C	I		I		I		I
	Town planners										
	Coastal communities	C	I		I	C	I		I		I

3.6 Environmental quality objectives

41. The chapter on environmental quality objectives gives rise to two concerns,

- the placing of the chapter in the TDA itself, and
- the content of the chapter.

42. It is uncommon to include a chapter on environmental quality objectives in the TDA. The TDA is a scientific baseline document that identifies the key transboundary problems and places them in the context of the applicable governance framework. The identification of objectives and commensurate definition of activities and investments to achieve these objectives is reserved for the SAP. Defining environmental quality objectives in the TDA is of concern as it pre-empts government decision-making and interferes with the mandate of the basin state’s governments to determine the development trajectory for the basin. The reason why the TDA and the SAP (an activities and investment programme negotiated by governments) are separated is that the ultimate decision of the objectives, targets and activities lies with government (reached through a consultative process with non-government stakeholders) – this should not be pre-empted in the TDA.

43. Environmental quality objectives should only be mentioned in the TDA if they are already part of official government policy (as documented in official policy or strategy papers). The environmental quality objectives and related targets and activities in the preliminary TDA appear to have been developed on the basis of findings of the preliminary TDA, not as government decision-making following a consultative process.

44. It is strongly recommended to refer to environmental quality objectives only as far as they are already official government policy (in that case they should be included in the technical sections of the TDA and not a separate chapter) and otherwise reserve the determination of environmental quality objectives, targets and activities for the SAP (which will be informed by the TDA findings).

45. Based on the above recommendation a detailed review of the environmental quality objectives, targets and activities is not undertaken at this stage. From a cursory review it is, however, clear that a substantial review and streamlining of each of the categories (i.e. objectives, targets, and activities) is required. A key aspect of the SAP is to attract funding for the activities planned therein. This requires that the targets and activities outline in the SAP and the objectives they are meant to achieve need to be defined in a well-structured, comprehensive and cohesive manner – ideally in a way that they can be developed as funding proposal (to GEF and other donors). At present the matrix lacks sufficient structure and cohesiveness and does not meet the standard required for a SAP. It is also noteworthy that the timelines suggested in the tables seem unrealistic and should be re-visited.

46. In summary, it is recommended to remove the chapter on environmental quality objectives from the TDA and use the objectives/ targets/ activity list as a reference document when developing the final SAP in a more structured and cohesive manner.

4. Annex: Review matrix

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
BIOGEOPHYSICAL AND SOCIO-ECONOMIC SETTING								
2.1 BIOGEOPHYSICAL CHARACTERISTICS								Add: aquatic invertebrates study, overview of hydrological models on the basin, wetlands
<i>2.1.1 Relief</i>								Include a more detailed narrative description of the various parts of the basin from upstream to downstream.
<i>2.1.2 Geology and Soils</i>								More detail on natural geological processes such as weathering, sedimentation, alluvial formations, mineral and biochemical precipitates etc is needed. This would aid understanding the impacts of anthropogenic actions on the geological features.

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
<i>2.1.3 Hydrogeology</i>								Although ground water capacity of the geology of the basin is low, it would nonetheless be an important resource due to the large size of the basin. More information on recharge rates as well as the interconnections between surface and ground water is needed. Another element to include is data on the quality of groundwater.
<i>2.1.4 Soils</i>								Locations of the various soil types should be described or shown on a map. Data on soil depths and other data on suitability for agricultural activities to be included.
<i>2.1.5 Climate</i>								Data on evaporation rates in various parts of the basin needed.



Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
2.1.6 Hydrology								Runoff rates for the whole river are needed. Annual flows data should be included - for the river as a whole as well as for the various tributaries. Sediment transport data needed. Data very focused on Ghana - little from other countries.
2.1.7 Dams and Reservoirs								IBTs - such as the one proposed on the Densu River in Ghana. What is the total current storage capacity of the basin? What is the rate and degree of sedimentation of the dams? How has the flow hydrograph been affected? Include an overview of dams which are likely to be constructed in the next decade or two.
2.2 ECOSYSTEMS								What are some of the key features of these ecosystems?

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
2.2.1 The Short Grass (Steppe) Vegetation								What types of grasses are prevalent? Are they extensively grazed?
2.2.2 Woody and Shrub Savannah, Open Forest of Dry Type								
2.2.3 Woody and Shrub Savannah, Open Forest of Humid Type								
2.2.4 Dense Forest								
2.2.5 Coastal Ecosystem								
2.2.6 Protected Areas	<i>Only 1 protected area mentioned</i>	<i>3 reserves mentioned</i>	<i>2 classified forests and 1 national park</i>	<i>Many reserves and species mentioned</i>	<i>3 Ramsar sites mentioned</i>	<i>Several reserves mentioned</i>		
2.3 BIODIVERSITY	Which species are important in terms of biodiversity and why	Which species are important in terms of biodiversity and why	Which species are important in terms of biodiversity and why	Which species are important in terms of biodiversity and why	Which species are important in terms of biodiversity and why	Which species are important in terms of biodiversity and why		Endangered species of significance and endemic species need to be listed for the whole basin.
			Data on flora needed	Flora data are sparse. Which of the species of fauna are endemic?	No data on current preservation status of species			

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
3.0 SOCIO-ECONOMIC AND DEVELOPMENT SETTING								General: more cross-references can be build with other chapters, e.g. highlighting the impact of socio-economic factors on the state of the environment etc. The corresponding information in the other scientific chapters is mostly there, but the linkages need to be brought our more clearly - in the CCAs but also in the narrative
3.1 POPULATION AND DEMOGRAPHIC PATTERNS	type and level of depth of information adequate - but should be cross-checked to see if newer data has emerged since 2002	type and level of depth of information adequate - but should be cross-checked to see if newer data has emerged since 2002	type and level of depth of information adequate - but should be cross-checked to see if newer data has emerged since 2002	type and level of depth of information adequate - but should be cross-checked to see if newer data has emerged since 2002	type and level of depth of information adequate - but should be cross-checked to see if newer data has emerged since 2002	type and level of depth of information adequate - but should be cross-checked to see if newer data has emerged since 2002		some maps of population distribution, migration patters etc. would be a useful addition
								more and clearer sub-section could be used, i.e. population growth and distribution, migration patters, literacy , life expectancy

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
	provide more detailed national data on health (water related diseases, HIV/Aids though apparently still low)	provide more detailed national data on health (water related diseases, HIV/Aids though apparently still low)	provide more detailed national data on health (water related diseases, HIV/Aids though apparently still low)	provide more detailed national data on health (water related diseases, HIV/Aids though apparently still low)	provide more detailed national data on health (water related diseases, HIV/Aids though apparently still low)	provide more detailed national data on health (water related diseases, HIV/Aids though apparently still low)		the section on health issues has very little information; it is recommended to treat it as a separate chapter under the overall Socio-economic an development chapter and provide substantially more detailed information on health issues, i.e. causes and impacts (social and economic), maps to show distribution and/ or hot-spots of water related diseases etc.
3.2 REGIONAL ECONOMIC CHARACTERISTICS							information on GNP and debt levels should be cross-checked and updated (e.g. debt release?) etc.	general comment: there is a disparity of level of depth of data, a lot for some countries, nearly nothing for the others, it would be good if a similar level of coverage could be achieved (depending on availability of data in the other countries)
<i>3.2.1 Agriculture</i>	nearly no data on agricultural production	nearly no data on agricultural production				nearly no data on agricultural production		the information and data provided is currently not sufficiently put into

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
3.2.2 Livestock	nearly no data on livestock production; this is critical as livestock arguably is an important user of natural resources in the country with impacts on the environment in the basin	nearly no data on livestock production; this is critical as livestock arguably is an important user of natural resources in the country with impacts on the environment in the basin			nearly no data on livestock production; this is critical as livestock arguably is an important user of natural resources in the country with impacts on the environment in the basin			context; an analysis of the economic relevance of the respective sectors needs to be provided and the economic information needs to be put in context with the state of the environment (current and future stressors) and the functioning of the governance system (e.g. land use management etc.)
3.2.3 Fisheries	need more country specific information on fisheries and its economic relevance (or not)	need more country specific information on fisheries and its economic relevance (or not)	need more country specific information on fisheries and its economic relevance (or not)	need more country specific information on fisheries and its economic relevance (or not)	need more country specific information on fisheries and its economic relevance (or not)	need more country specific information on fisheries and its economic relevance (or not)		
3.2.4 Forestry	need more country specific information on forestry and its economic relevance (or not)	need more country specific information on forestry and its economic relevance (or not)	need more country specific information on forestry and its economic relevance (or not)	need more country specific information on forestry and its economic relevance (or not)	need more country specific information on forestry and its economic relevance (or not)	need more country specific information on forestry and its economic relevance (or not)		
3.2.5 Industry	nearly no data on industries		nearly no data on industries		nearly no data on industries	nearly no data on industries	nearly no data on industries	
3.2.6 Mining	nearly no data on mining		nearly no data on mining		nearly no data on mining			

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
<i>3.2.7 Tourism</i>	need more information on existing tourism and tourism potential	need more information on existing tourism and tourism potential	need more information on existing tourism and tourism potential	need more information on existing tourism and tourism potential	need more information on existing tourism and tourism potential	need more information on existing tourism and tourism potential	need more information on existing tourism and tourism potential	
3.3 ANALYSIS OF USE OF LAND AND WATER RESOURCES AND FUTURE TRENDS								

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments	
3.3.1 Regional Land and Water Resource Availability	country specific rainfall data, particularly changes over longer period of time (indication fo climate change?) should be included where available - or at least cross-referenced to the chapter on bio-geophysical characteristics	country specific rainfall data, particularly changes over longer period of time (indication fo climate change?) should be included where available - or at least cross-referenced to the chapter on bio-geophysical characteristics	country specific rainfall data, particularly changes over longer period of time (indication fo climate change?) should be included where available - or at least cross-referenced to the chapter on bio-geophysical characteristics	country specific rainfall data, particularly changes over longer period of time (indication fo climate change?) should be included where available - or at least cross-referenced to the chapter on bio-geophysical characteristics	country specific rainfall data, particularly changes over longer period of time (indication fo climate change?) should be included where available - or at least cross-referenced to the chapter on bio-geophysical characteristics	country specific rainfall data, particularly changes over longer period of time (indication fo climate change?) should be included where available - or at least cross-referenced to the chapter on bio-geophysical characteristics	The distinction between precipitation, streamflow and groundwater is unusual. The hydrological distinction is usually made between surface and groundwater resources only, as all freshwater comes down as precipitation		
	detailes information on land use, level of degradation should be provided (or cross-referenced to chapter of bio-geophysical characteristics) for each country	detailes information on land use, level of degradation should be provided (or cross-referenced to chapter of bio-geophysical characteristics) for each country	detailes information on land use, level of degradation should be provided (or cross-referenced to chapter of bio-geophysical characteristics) for each country	detailes information on land use, level of degradation should be provided (or cross-referenced to chapter of bio-geophysical characteristics) for each country	detailes information on land use, level of degradation should be provided (or cross-referenced to chapter of bio-geophysical characteristics) for each country	detailes information on land use, level of degradation should be provided (or cross-referenced to chapter of bio-geophysical characteristics) for each country	detailes information on land use, level of degradation should be provided (or cross-referenced to chapter of bio-geophysical characteristics) for each country	some analysis is provided of the linkages between water resources, land management practices and the state of the environment - this analysis should be more detailed and the linkages be brought out more succintly	
									the description of the (traditional) land ownership and management framework should be in the governance section and then cross-referenced to this chapter

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
3.3.2 Regional Land and Water Resource Demand for the Present and Future								<p>very useful section - should be cross-checked if data is still accurate or newer information has been generated since 2002</p> <p>data on demand predictions for land use is scarce (as pointed out in the report); if new information has not been produced since 2002 this should be flagged in the TDA and possibly be included as a SAP activity</p>
4.0 LEGAL AND REGULATORY SETTING								the chapter should be renamed into "The governance framework" - the legal and regulatory setting are only one component of the governance framework (see comments on content of the chapter)

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
								the chapter should be restructured, describing the international sphere first and then the national settings
4.7 OVERVIEW OF NATIONAL INSTITUTIONAL AND LEGAL FRAMEWORK FOR INTEGRATED MANAGEMENT	info on applicable laws and responsible institutions needs to be cross-checked and update where changes have occurred since 2002	info on applicable laws and responsible institutions needs to be cross-checked and update where changes have occurred since 2002	info on applicable laws and responsible institutions needs to be cross-checked and update where changes have occurred since 2002	info on applicable laws and responsible institutions needs to be cross-checked and update where changes have occurred since 2002	info on applicable laws and responsible institutions needs to be cross-checked and update where changes have occurred since 2002	info on applicable laws and responsible institutions needs to be cross-checked and update where changes have occurred since 2002	info on applicable laws and responsible institutions needs to be cross-checked and update where changes have occurred since 2002	each country section needs a clear structure, describing a) the legal framework, b) the policy framework and c) the institutional framework
	needs more comprehensive description of statutory law framework (including legislation regulating water quality)	needs more comprehensive description of statutory law framework (including legislation regulating water quality)	needs more comprehensive description of statutory law framework (including legislation regulating water quality)	needs more comprehensive description of statutory law framework (including legislation regulating water quality)	needs more comprehensive description of statutory law framework (including legislation regulating water quality)	needs more comprehensive description of statutory law framework (including legislation regulating water quality)	needs more comprehensive description of statutory law framework (including legislation regulating water quality)	A comparative analysis of the national legal laws is required, identifying current level of harmonisation and future harmonisation needs

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
	needs description of customary law applicable to natural resources management (if any) and how it is linked with statutory law	needs description of customary law applicable to natural resources management (if any) and how it is linked with statutory law	needs description of customary law applicable to natural resources management (if any) and how it is linked with statutory law	needs description of customary law applicable to natural resources management (if any) and how it is linked with statutory law	needs description of customary law applicable to natural resources management (if any) and how it is linked with statutory law	needs description of customary law applicable to natural resources management (if any) and how it is linked with statutory law	needs description of customary law applicable to natural resources management (if any) and how it is linked with statutory law	
	needs overview of relevant national policies	A comparative analysis of the national institutional set-ups is required, identifying possible mechanism for improved cooperation at basin level						
	needs comprehensive overview of institutional landscape							
	should include description of institutional aspects of traditional land management regime and how it is linked with statutory institutions	should include description of institutional aspects of traditional land management regime and how it is linked with statutory institutions	should include description of institutional aspects of traditional land management regime and how it is linked with statutory institutions	should include description of institutional aspects of traditional land management regime and how it is linked with statutory institutions	should include description of institutional aspects of traditional land management regime and how it is linked with statutory institutions	should include description of institutional aspects of traditional land management regime and how it is linked with statutory institutions	should include description of institutional aspects of traditional land management regime and how it is linked with statutory institutions	

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
	needs analysis of national laws in the light of a) compliance with international obligations, and b) compatibility with IWRM principles	needs analysis of national laws in the light of a) compliance with international obligations, and b) compatibility with IWRM principles	needs analysis of national laws in the light of a) compliance with international obligations, and b) compatibility with IWRM principles	needs analysis of national laws in the light of a) compliance with international obligations, and b) compatibility with IWRM principles	needs analysis of national laws in the light of a) compliance with international obligations, and b) compatibility with IWRM principles	needs analysis of national laws in the light of a) compliance with international obligations, and b) compatibility with IWRM principles	needs analysis of national laws in the light of a) compliance with international obligations, and b) compatibility with IWRM principles	
	needs analysis of national institutional landscape in terms of conduciveness for international cooperation	needs analysis of national institutional landscape in terms of conduciveness for international cooperation	needs analysis of national institutional landscape in terms of conduciveness for international cooperation	needs analysis of national institutional landscape in terms of conduciveness for international cooperation	needs analysis of national institutional landscape in terms of conduciveness for international cooperation	needs analysis of national institutional landscape in terms of conduciveness for international cooperation	needs analysis of national institutional landscape in terms of conduciveness for international cooperation	
	needs analysis of current implementation, monitoring and enforcement capacity, identifying bottlenecks and underlying causes	needs analysis of current implementation, monitoring and enforcement capacity, identifying bottlenecks and underlying causes	needs analysis of current implementation, monitoring and enforcement capacity, identifying bottlenecks and underlying causes	needs analysis of current implementation, monitoring and enforcement capacity, identifying bottlenecks and underlying causes	needs analysis of current implementation, monitoring and enforcement capacity, identifying bottlenecks and underlying causes	needs analysis of current implementation, monitoring and enforcement capacity, identifying bottlenecks and underlying causes	needs analysis of current implementation, monitoring and enforcement capacity, identifying bottlenecks and underlying causes	

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
4.7.1 Regional Coordination							<p>An update of the regional legal and institutional framework is required, i.e. establishment of VBA, its composition, organisational set-up, functions, mandate, how it is linked to member states, how it interacts (or not) with stakeholders (i.e. are there direct stakeholder involvement structures or not?)</p> <p>needs description of bilateral cooperation agreements (or multi-lateral but not between all basin states) if applicable</p> <p>needs analysis of current cooperation mechanism at basin level and identify opportunities for the strengthening thereof</p>	

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
4.7.2 International Cooperation								Should be integrated with section on regional coordination
5.0 MAJOR PERCEIVED PROBLEMS AND ISSUES								Overview of main issues. Root causes are actually proximate - what is lying behind these?
5.1 LAND DEGRADATION	More data needed on key issues such as rates of erosion, deforestation and desertification	More data needed on key issues such as rates of erosion, deforestation and desertification	More data needed on key issues such as rates of erosion, deforestation and desertification	More data needed on key issues such as rates of erosion, deforestation and desertification	More data needed on key issues such as rates of erosion, deforestation and desertification	More data needed on key issues such as rates of erosion, deforestation and desertification		soil erosion leading to sediment increase - substantiate with facts. What is the rate of erosion? Largely an overview of landuse and tenure systems. Little information on the amount of soil lost to erosion annually, and rates of deforestation and desertification. Nor has a quantification of the loss of productivity of lands been provided for all countries. What future demand for land is there likely to be - from which sectors? Very little mention on the state and role of wetlands.

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
5.2 WATER SCARCITY	No water use data. What is the basin per capita availability of water? No water quality data.	No water use or water quality data	No water use data. What is the basin per capita availability of water? No water quality data.	No water use data. What is the basin per capita availability of water? No water quality data.	No water use data. What is the basin per capita availability of water? No water quality data.			through inc use or drop in precipitation? What are the evaporative losses due to reservoirs? While information on projected demand for water is quite extensive, data on currently available surface and groundwater resources are not as comprehensive. In particular, the Final TDA will need to include additional data on groundwater resources and more extensive data on which areas are experiencing shortages.

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
5.3 LOSS OF BIODIVERSITY	Nothing on PADH and its impact on species		Nothing on PADH and its impact on species. Data on drivers of drop in fauna numbers needed	Very little data on biodiversity loss. Is data not available on biodiversity in the national parks?	Little data	Little data		Most emphasis placed on loss of species - not much on PADH. Mainly on terrestrial species loss - little on aquatic. Wetlands supporting migratory birds? Wetlands and aquatic habitats were either not discussed or were not elaborated upon
5.4 FLOODING	No information on the impact of flooding.	What is driving this floding? Which factors exacerbate it? What are the typical magnitudes of the floods, in terms of flow volume increase?	Nothing on Cote d'Ivoire	No information on the impact of flooding. What is driving this floding? Which factors exacerbate it? What are the typical magnitudes of the floods, in terms of flow volume increase?	Little data	Little data		More complete data on the frequency, severity, locations, causes, and consequences (both humanand economic losses) of floods will need to be included.. At present, based on the data provided, flooding does not emerge as a major issue in most of the basin.

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
5.5 WATER-BORNE DISEASES	No data	No data on the incidence or impacts of water-borne diseases		Only presence or absence of diseases and vectors presented - no data on human incidence or impacts	Little data	No data		Additional data should be provided on the geographic extent and the number of inhabitants infected in order to assess and address this issue
5.6 GROWTH OF AQUATIC WEEDS								Little data was given on the extent of the problem. The one exception was that information was given on the Oti River and the threats to Akosombo Dam. Further information on other areas should be given and the impacts on biodiversity assessed.

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
5.7 COASTAL EROSION								According to the limited data provided, only Ghana's coasts are affected by the Volta River. Additional information will need to be provided on the relationship between the Volta River and coastal erosion occurring in countries other than Ghana in order to establish this as a priority issue. Does comparable baseline data on rates of accretion prior to the construction of the Akosombo dam exist?
5.8 WATER QUALITY DEGRADATION	No data to back-up the statements made.	Establish whether the reported high acidity levels in groundwater have anthropogenic origins. Several references are made to air pollution emitted by factories - has this been tied to water quality problems?	No data	A link should be made between the water quality data presented and the permissible ranges for the country.	Little data	Particulate matter from the old cars used in the basin area leads to particulate matter washing into waterways - can this be backed up by studies and data? Is it only a problem in Togo?		In the causal chain analysis "industry" is listed as a source of pollution - yet in the description of the problem it is stated that "industrial effluents are not significantly present in the basin". Which is it? Establish the linkages between the reported drop in water quantity and the impact of the

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
								<p>reduced dilution capacity on water quality degradation. Sufficient data to accurately assess the status of water quality in the basin were not provided. Limited data were given by Ghana and Togo on the effects of industry on water quality, but additional information needs to be included from all countries on the fecal coliform levels and degradation resulting from agriculture. More information should also be given on potential contaminant loads, such as the amount fertilizers and pesticides used in the basin. Additionally, eutrophication needs to be examined.</p>

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
5.9 EMERGING ISSUES								Two emerging issues which may also be considered are the impacts of global climate change and the impacts of internal migration across borders in the region. Provide data to support the assertions that activities such as urbanisation and mining are in fact increasing.
6.0 STAKEHOLDER ANALYSIS	overview of responsible ministries needs cross-checking for changes since 2002 and update where changes occurred	overview of responsible ministries needs cross-checking for changes since 2002 and update where changes occurred	overview of responsible ministries needs cross-checking for changes since 2002 and update where changes occurred	overview of responsible ministries needs cross-checking for changes since 2002 and update where changes occurred	overview of responsible ministries needs cross-checking for changes since 2002 and update where changes occurred	overview of responsible ministries needs cross-checking for changes since 2002 and update where changes occurred	an overview of regional stakeholders (e.g. VBA, ECOWAS etc.) needs to be provided - can be in form of cross-referencing to the governance section	a stakeholder analysis needs to be conducted in relation to each transboundary problem (see example in narrative part of review report

Category	Data gaps Benin	Data gaps Burkina Faso	Data gaps Cote d'Ivoire	Data gaps Ghana	Data gaps Mali	Data gaps Togo	Data gaps - basin wide	Comments
	a comprehensive overview of non-government stakeholders needs to be added, incl. relevant NGOs, CBOs, private sector, economic groups - e.g. subsistence farmers, lake fishermen etc.	a comprehensive overview of non-government stakeholders needs to be added, incl. relevant NGOs, CBOs, private sector, economic groups - e.g. subsistence farmers, lake fishermen etc.	a comprehensive overview of non-government stakeholders needs to be added, incl. relevant NGOs, CBOs, private sector, economic groups - e.g. subsistence farmers, lake fishermen etc.	a comprehensive overview of non-government stakeholders needs to be added, incl. relevant NGOs, CBOs, private sector, economic groups - e.g. subsistence farmers, lake fishermen etc.	a comprehensive overview of non-government stakeholders needs to be added, incl. relevant NGOs, CBOs, private sector, economic groups - e.g. subsistence farmers, lake fishermen etc.	a comprehensive overview of non-government stakeholders needs to be added, incl. relevant NGOs, CBOs, private sector, economic groups - e.g. subsistence farmers, lake fishermen etc.		A qualitative analysis of stakeholder influence and importance as well as power relations between stakeholders is recommended
7.0 ENVIRONMENTAL QUALITY OBJECTIVES								Environmental quality objectives should only be referred to if already official government policy - otherwise the section should be removed and reserved for the SAP