

Sectoral Evaluation of EIA Practice in the Sudan

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ABSTRACT :Environmental Impact Assessment (EIA) reports of projects in different development sectors in Sudan (Agriculture, Roads and highways, Power generation, Oil production, River engineering projects) were analyzed to investigate how these studies corresponded with the local, regional, international and good practice requirements. The results of the analysis illustrated some variations in the practice among the different sectors. Most of the practices failed in some major areas of EIA such as: timing of EIA in the project cycle, alternative analysis, limited tools applied which in most cases were insufficient for specific projects, EMP in most cases was not complete and was not considered in the cost-benefit analysis, monitoring plan, poor public participations and bad interaction with the decision making process. Generic EIA report review process devaluated the monitoring plan and sustainability of the EIA mitigations. Advantageously, EIA practice is becoming more popular in Sudanese development planning and there are lots of arguments about enhancing the legislation and regulations. However, common obstructions facing implementation of best EIA practices and compatibility with international norms are; the legal, institutional and administrative frameworks; shortcoming of expert agencies and specialists, and other difficulties related to the data collection and measurement.

Key words: EIA, Sudan, Environment, Policy, Management, Planning, Sustainability

INTRODUCTION

In 1980s, Environmental Impact Assessment (EIA) started in the developing countries (Canter, 1996 and UNECA, 2005). The United Nation and other international organizations and donor agencies played the major role of transferring the EIA applications. However this transformation concentrated on the applications and was not accompanied with the parallel evolution of regulations and legislations; so a huge gap appeared between the concept and practices in many developing countries (UNECA, 2005).

Sudan is one of these developing countries where EIA application faced such kind of challenges. Although there was an early environmental concern in the Sudanese law but there was not a real concern in real life activities, and despite the Sudanese Environmental Policy Act of 2001 (EPA-2001) provide for the conductance of EIA studies upon planning major developmental projects but EIA is still considered as a new concept and a number of obstacles prevent the required performance of EIA studies; this starts with legislations and stretch to the implementations (Ali, 2007; Elturabi, 2007).

Previous attempts to analyze and evaluate EIA country systems (Ahmad and Wood, 2002; Nadeem and Hameed, 2008) and EIA review methodologies developed earlier (Wood, 2003; Ahmad and Wood, 2002; and Fuller, 1999), has proven to be effective and especially in the case of the Sudan it can be combined to diagnose the EIA system significantly. In addition to that, diagnostic analysis can be used to improve EIA effectiveness for environmental protection (Ahmad and Wood, 2002; Sadler, 1996), whether by enabling the institutions, perfecting legislations, or by enhancing the capacity and data availability for EIA execution.

The EIA started late in 1980s in Sudan (Ali, 2002) and became a legal requirement in 2001 therefore, the Sudanese practices lacked the experiences in applied EIA procedures/tools (Ali, 2002). A few numbers of studies are done and the recording systems of EIA are not adequate (Ali, 2007). The reports are not available for the public, the environmental concern and knowledge in both civilian and governmental level is very weak. The baseline data are not available for many areas and most of the data are out of date. The EIA are not applied for most projects, and when applied are

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concentrated in some sectors, and generally not started with the planning stages. The implementation of the EIA studies recommendations are not guaranteed since the monitoring systems of EIA are not established in Sudan. On the other hand the legal work is in its early steps, where regulations or guidelines that state the monitoring and reporting procedures are not available or not clear. Few institutions and companies started to lead the EIA work; these institutions generally depend on international guidelines, nevertheless they play a great role in improving the EIA practices and research situations in Sudan (Elturabi, 2007).

In the Sudan, currently, there is a lack capacity, weak institutional, organizational, and legal framework, in the field of EIA (Ali, 2007). Plans are needed to upgrade the capacity, improve institutional, organizational, and legal framework, and furthermore to improve the current EIA legislation and produce guidelines, leading to better practice and environmental conservation and protection. Obviously, in the long term, this process will synergize, harmonize and link with legislation of countries sharing common environmental resources (such as the Nile basin countries), donors, and with the international community at large.

Many efforts attempted to analyze the institutional, legislative status of the Sudan with regard to the environmental management of various development projects (UNEP, 2007, 2006; Ali, 2007). A considerable portion of these studies was carried within NGOs and donors' capacity for various projects (UNEP, 2006, 2007). Although the role of regional, national and community level organizations and institutions in environmental protection and sustainability is critical, but this role is currently limited by weak capacities and weak linkages. The contribution of national institutions in developing policies, systems, and regulations for environmental management have been held back because of the political adjustments to achieve peace and address national and international issues and because of lack of capacity. Many institutional gaps have been attempted to be filled by the World Bank (WB), United Nations (UN), and other national and international Non-Governmental Organizations (NGOs). The experience of these agencies affords a resource that could be harnessed for the environmental management of development projects in the Sudan. Main findings of these studies are (Ali, 2007; Elturabi, 2007; UNEP, 2006, 2007):

- Lack of EIA guidelines to objectively assess the impacts of development projects.
- Lack of EIA review methodology to objectively assess the EIA report quality.

This paper aims at diagnosing the practice of the EIA process enshrined in the Sudanese legal and insti-

tutional framework for environmental management of development projects.

MATERIALS & METHODS

The methodology adopted here is essentially EIA report review according to selected criteria. However, since the quality of the EIA is strongly dependent on the institutional and legal EIA framework strength, the legislation and institutional EIA framework in the Sudan was reviewed and supplemented with informal/unstructured interviews. Field surveys to acquire data on EIA reports were conducted at the Higher Council for Environment and Natural Resources (HCENR) of the Sudan and at consulting firms known to conduct EIAs mainly in the Sudanese capital Khartoum. Overall the evaluation methodology used here followed to a great extent the methodology developed by Wood (2003); Ahmad and Wood (2002); and Fuller (1999).

As there is an absence of Sudanese EIA guidance, the international and/or regional guidelines were used in this study (section 2.3 below); to verify the reliability, performance and effectiveness of the EIAs, further more the use of international guidelines can be viewed as a gap identification practice towards harmonized Sudanese EIA guidelines with regional and/or international guidelines.

Selected EIA reports (12 reports) covering the most important development sectors in Sudan which are also the most effective sectors on Sudanese development and environmental quality (Oil exploration, Agriculture, Power generation, Roads and Highways, and River Engineering sectors) were critically reviewed. EIA studies were collected from different areas which could be pointed as follows:

1. Statistics as well as some EIA reports were collected from the HCENR.
2. Some studies were collected from one of the members of the team work.
3. Some studies were available in specific web-sites.

It is evident that the quality of an EIA depends to a large extent on the existence of a strong institutional and legislative framework it is therefore, evident that review of the Sudanese legislative and institutional EIA framework is required for a clear understanding of the EIA review results. The role of international organizations and agreements is also investigated since, in many ways, they fill the gaps in the institutional and legislative environmental management framework. Since there an absence of local guidelines the EIA reports in each sector were analyzed based on the international guidelines and requirements these guidelines includes: WB (WB, 1999), European Union (EC, 1999), African Development Bank (ADB, 2001) and FAO Agricultural EIA guidelines (FAO, 1995). These guidelines

were selected because of their wide use; furthermore they have strong connection with Sudanese applications and funding relationships.

A checklist for reviewing the EIA reports has also been developed according to the current legislation and international practice. The checklist has been influenced by two other checklists (Nadeem and Hameed 2008; Lee and Colley 1990; EC 1994) and by principles of EIA best practice (Sadler, 1999). It consists of ten areas: (1) Regulations and Guidelines Adopted in EIA Report; (2) Timing of the EIA process in the project cycle; (3) Team of work; composition and qualifications and suitability for assigned tasks; (4) Report content; layout and readability; (5) Project description; i.e. planned project and alternatives; (6) Baseline conditions i.e. description of present activity and surrounding environment; (7) Impact assessment and evaluation; including effects on the environment, public health and management of natural resources and how the different effects are connected to how the surroundings may react; (8) Alternatives analysis and ranking; (9) Mitigation measures and environmental management plan (EMP); (10) Public participation; how public was dealt with throughout the EIA process.

Each EIA study was analyzed separately using the criteria above, and taking into consideration recommendations and best practices of international EIA guidelines mentioned above for specific guidance on the review criteria. The international guidelines considered were also selected for the following additional reasons:

1. Cover the gap between international/regional guideline and Sudanese practices.
2. Some EIA reports followed these guidelines.
3. These guidelines help out the formation of the evaluating parameters or criteria used in this study.

This section presents relevant environmental policies, legislative and administrative frameworks at state, federal and international level. Focus has been given to state level organizations that are responsible for preparation of environmental policy, technical guidelines, review and follow-up of implementation of environmental safeguard measures.

In the Sudan federal system there are three levels of authority: national level, state level and locality level. There are also concurrent powers where both federal (national) and state organs exercise power on education, health, environment, tourism, industry and meteorology. The 2005 Interim National Constitution (INC) of the Republic of the Sudan (Government of Sudan, 2005a, 2005b) was the first in the history of Sudan to formally recognize the subject of "Environmental Pollution and Ecology" and placed the subject on the

Concurrent Legislative List. Environment and social justice enjoy the protection of the INC wherein Chapter II: Guiding Principles and Directives, Section 11 on Environment and Natural Resources:

- Guarantees the right of the Sudanese's people to clean and diverse environment while imposing a duty on the citizens to preserve and promote the country's biodiversity;
- Precludes the State from pursuing any policy, or taking or permitting any action, which may adversely affect the existence of any special animals or vegetative life or their natural or adopted habitat; and
- Guarantees that the State shall promote, through legislation, sustainable utilization of natural resources and best practices with respect to their management.

Environment as a direct concern of the Government of Sudan dates back to the British colonial government. Until that time, environmental protection was the concern of weakly enforced indirect provisions in local, provincial, and federal laws. These provisions were mainly designed to improve civic and factory conditions and the management of irrigation canals, forests, and wildlife.

The national legal framework for protection of the environment in Sudan is acknowledged by all concerned to be weak (Ali, 2002, 2007; UNEP, 2007). There are 120 Sudanese environmental legislations over a wide range of topics (e.g. soils, pesticides, wildlife, etc.) and with authority spread among over 30 government bodies. Furthermore, there is no national coordination of environmental policy.

In an effort to remedy this situation, particularly in the light of obligations taken at the 1992 Rio Conference, the HCENR has taken the lead in drafting a new framework law for the environment. This is an "umbrella" law that clarifies the role of the Ministry of Environment and Physical Development as the competent Ministry responsible for coordinating all matters concerning the environment. However, the new law also acknowledges that other Government Ministries with particular competence in certain fields are responsible for developing environmental measures within their areas of competence, e.g. the Ministry of Transport as the appropriate Ministry to implement measures to prevent pollution from ships.

In 2000 the federal cabinet directed the drafting of "an overall legislation for environmental protection". In the same year, the Ministry of Environment and Physical Planning was established. The role of the Ministry or the concept of environment however, continued to be restricted to the living conditions and planning and housing sector. The most notable achievement in the 2001 was the enactment of the

Sudan Environmental Protection Act (EPA-2001). The EPA-2001 envisaged the HCENR as a policy making body and the environmental protection agency for implementation of the ordinance. Without executive powers and scantily staffed, the HCENR enjoyed considerable international exposure. The HCENR met irregularly, the establishment of state environment and natural resources councils was very slow, federal and state environmental conservation strategies and standards are yet to be developed.

The EPA-2001 provides an umbrella law and general principles to be considered in carrying out EIA studies. This law provides definitions and several clarifications regarding natural resources management, sources of pollution and pollutants and endorses the "polluter pays" principle. The act also make it the responsibility of the project proponents, before embarking on any development activity, to carryout an EIA study, to identify the positive and negative environmental impacts with suggestions to mitigate adverse impacts According to the Act, such studies must contain the following:

- Description of the existing environmental conditions as a baseline.

- Description of the project.
- Assessment of potential environmental impacts, both positive and negative throughout the project phases.
- Provision of recommendations to mitigate the negative environmental effects.

According to this Act all development projects outside environmentally protected areas and in environmentally sensitive areas require an EIA. Proponents of all projects are required to monitor their projects and submit reports to the HCENR. Sudan is a signatory to a number of international and regional treaties addressing environmental conservation (Table 1). Global and regional treaties are, in principle, binding in the first instance on national governments, which are obliged to implement such arrangements through national legislation. In fact, the ratified treaties subsequently become part of the National Laws and their provisions prevail in case of contradictions with the provisions of the National Laws.

Institutional arrangements for environmental management and their responsibilities in decision-

Table 1. List of International Conventions and Agreements to which Sudan is a Signatory

No.	CONVENTION/AGREEMENT
1	Agenda 21
2	The Rio Declaration
3	The Convention on Biological Diversity (CBD - 1992)
4	The Cartagena Protocol on Biosafety (2000)
5	The African-Eurasian Waterbird Agreement (AEWA - 1999)
6	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES - 1973)
7	The African Convention on the Conservation of Nature and Natural Resources (Africa Convention - 2003)
8	The Ramsar Convention on Wetlands (1971)
9	The Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO WHC - 1972)
10	The United Nations Framework Convention on Climate Change (UNFCCC - 1994)
11	The Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987)
12	The Kyoto Protocol
13	The United Nations Convention to Combat Desertification (UNCCD - 1994)
14	The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989)
15	The Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Wastes within Africa (1991)
16	The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998)
17	The Stockholm Convention on Persistent Organic Pollutants (POPs - 2001)
18	The United Nations Convention on the Law of the Seas (1982) and the Convention on the International Maritime Organization (1958)
19	The Regional Convention for the Conservation of the Environment of the Red Sea and the Gulf of Aden (PERSGA - 1982)

making are summarized in Table 2. Other government institutions with designated responsibility for natural resource management are spectrally organised, in line with the general arrangements for administration and development between the federal, state and local governments. Beside the government institutions responsible for environmental management, there are also local ethnic institutions that play important roles in environmental management at local level.

It is important to know that the responsibility for the formulation and execution of resettlement and compensation policies is assigned to the Commission for Environmental and Social Affairs of the Dam Implementation Unit (DIU).

RESULTS & DISCUSSION

As described in section 2, it is evident that there is a legal framework and regulations to enact the EIA process in the Sudan. However, this legal framework lacks guidelines and mechanisms of review and enforcement to assign responsibility and determine accountability. In addition, Sudanese standards have not

been updated for a long time, and subsequently this diminished their use, and this might affect the reliability of EIA recommendations for enhancing and protecting the environmental quality.

The general administrative EIA process in the Sudan is presented in Fig. 1. It is composed of submission of the project brief containing an initial environmental evaluation after which initial permit is granted or the project is rejected. The next step is the preparation of an EIA by the project developer or proponent and its submission it to the HCENR for evaluation. Upon review recommendation and final acceptance of the EIA, the project proponent is given a permission to implement the project. Sometimes the initial environmental evaluation is skipped if the EIA is ready. There are no EIA guidelines throughout this review process but it is becoming a practice for the evaluation committee to conduct site visits during the EIA report review process.

Data collected from the HCENR, EIA consultants, and other sources revealed that about 18 EIA reports were prepared up to 2001 (the year the environmental

Table 2. Institutional Arrangements in Environmental Decision-making

Inst itution	Mandate
<u>A. At National Level</u>	
1. Ministry of Environment and Physical Development	- Minister chairs the Higher Council for Environment and Natural Resources - Environmental and physical development policies - Supervision
2. Higher Council for Environment and Natural Resources (HCENR)	- Environmental policies / plans - Guidelines - Approves EIAs - Sign international conventions - Monitoring
3. Line Ministries	- Implementation of environmental policies and plans - Implement sectoral laws - Coordinate with State Ministries
<u>B. At State Level</u>	
1. State Ministries	- Implement state policies
2. State Council for Environment and Natural Resources	- Implement sectoral laws (national or state laws) - Approval of development activities - coordinate and follow-up the state effort to ensure public participation in the decision making process, to play an active role in coordinating the formulation and implementation of conservation policies as well as to foster environmental monitoring, protection and regulation
<u>C. At Local Level</u>	
1. Localities	- Implement local orders on public health
2. Popular Communities, CBOs and NGOs	- Implement local orders on locality natural resources - Implement state laws - Approval of projects at Locality Level - Implement local orders - Mobilize local communities - Submit requests for development activities

Table 3. Description of EIA Reports Reviewed

No.	Project	Consultant/Year	Remarks
1	EIA for Bamboo –field oil production facility	Local consultant September 2002	WB Guidelines, (after project commencement)
2	EIA for Melut basin oil development project	Local consultant September 2004	WB Guidelines, (after project commencement)
3	EIA for Greater Diffra oil development project	Local consultant March 2003	WB Guidelines, The Sudanese Environment Protection Act 2001, (after project commencement)
4	Al-Lar agricultural project feasibility study	Local consultant 2006	The Sudanese Environment Protection Act 2001
5	New – Amri project feasibility study	Local consultant 2005	The Sudanese Environment Protection Act 2001
6	EIA for the proposed Khartoum 250 MW kilo-x independent thermal power plant project	International consultant with local individual consultants March 2001	Sudanese Transitional Decree- Environmental Protection Ordinance 2000.
7	Khartoum north thermal power station extension EIA	International consultant with local individual consultants February 2004	Sudanese Environmental policy act 2001
8	Elnuhoud-Elfashir road feasibility study	International consultant associated with local consultants may 1999	African Development Bank Guidelines, (After determination of route)
9	Elnuhoud –Rigle Alfula- Elmujeld – road project- feasibility study	Local consultant January 1999	Guidelines not referenced
10	EIA for the proposed Khartoum ring road	Local consultant 2005	Sudanese Environmental policy act 2001 (After determination of route)

ment planning field, therefore; the experiences are limited and there are not enough experts engaged in EIA process practice. Only few numbers of the EIA reports reviewed recorded members of team, and the major observations are (Table 4).

1. In the Oil sector the team of work consisted of the major members required by the World Bank guidelines (WB, 1999), but their qualifications were not clear and the team assistants were not included.
2. In the Power sector; the team contributions covered major requirements according to the WB and EU guidelines (WB, 1999; EC, 1999), but the team members' contributions were not clearly identified.
3. Consultation of experts in other organizations was not mentioned in any EIA. However, most of them mentioned the cooperation with the design experts of the specific project.
4. The multidisciplinary consultations of experts were clear in the river engineering sector and

have enhanced the EIA quality and went in line with required needs.

The report contents were similar in most of the reports reviewed and include project description, environmental setting, expected environmental impacts and recommendations. Important parts are missing and these are:

- Alternative analysis: was not included in all sectors (except for the power sector).
- The EMP was not presented properly, incomplete in most cases and totally ignored in the agricultural sector and prepared upon request of the project proponent only.
- The public participation/consultations records should be presented as a separate part in the EIA report and this was not evident.
- The scope of work was not stated adequately and the EIA team was not reported appropriately for many cases as discussed in section 3.3.
- The conclusion of the report was not clear.

The absence or weakness of this part strongly affects the whole assessment. Table 5 reveal that, EIA

Table 4. Review Results of Team Composition

EIA Team members required	Oil	Agriculture	Power	Road and Highway	River Engineering
Team leader	√	Not recorded	√ ¹	Not recorded	√ ²
Coordinator	√(1/3) ³		√		√
Hydrologist	√		√		√
(Specific project) engineer	√(1/3)		√		√
biologist /Ecologist	√		√		√
/environmental scientist					
Economist/ social scientist	√		√		√
Soil scientist					√
health scientist					√
Metrologies	√		√		√
Wildlife expert/botanist	√		√		√
Special experts in specific areas related to the project need (e.g. pesticide expert, fisheries expert, land use / re settlement experts archaeological...)	√(2/3)		√		√
Assistants (fieldwork, laboratory testing, library research, data processing, surveys and modeling.)			√		√

¹ One case did not record the TL.

² The team was not recorded, but the consultants and the consultation areas (the lead agency play the coordination role).

³ 1/3 means the member was applicable in one case out of the three cases analyzed.

reports reviewed showed adequate project descriptions (agriculture and river engineering sectors were satisfied by the feasibility description, as they were part of it). The oil and power sector presented a full description of the projects including all requirements by the WB and EU guidelines (WB, 1999; EC, 1999). The road sector provided a huge variation in practices where some cases gave no description, others presented very good ones.

The review of the adequacy of the baseline a complete list of affected environment attributes and possible indicators have been prepared for each project (Elturabi, 2007). The baseline data section demonstrated the wide variation between the EIA reports reviewed. With the exception of road sector, most of the EIAs in same sector showed similar practice in baseline data, but still each EIA report showed lack of important parameters. The weakness that appeared in baseline data analysis was, indeed, reflected in the overall quality of EIA report.

According to the WB and EU guidelines (WB, 1999; EC, 1999), the following points should be considered in the baseline data:

- All the environmental features which could be affected due to the project activities or the features that are interacting pathways of the impacts.

- All sensitive areas and receptors of the impacts as well as sources of pollutions and general mitigations.
- The major parameters that could threat the global environment such as greenhouse gases emissions. (WB, 1999)
- The data should be supported by officially documented data; public consultations, sampling survey and present photography (EC, 1999). All these points were applicable for Oil and Power sectors, but not for Agriculture, Road and River Engineering sectors.

Oil and power sectors showed very good practices and matched, to a great extent, WB and EU guidelines (WB, 1999; EC, 1999); all parameters required or related to the project were considered and the methodology used were selected precisely to match with data targeted such as:

- Local community consultations ⇒ social data,
- Laboratory investigations ⇒ soil and water quality,
- Models and on-site sampling ⇒ air quality and noise level,
- Official data and records ⇒ wildlife, vegetations and metrological or geological data.

Agriculture and Road sectors showed poor practices both in data considered or methodology used were obtained; most of the major data strongly related

Table 5. Review Results of Project Description (WB, 1999)

Sector \ Parameters required	Oil	Agriculture	Power	Roads and Highways	River Engineering
Location/maps	√	n/a	√	√ ¹	√ ²
Layout	√		√		√
Size /Capacity	√		√		√
Pre construction activities	√		√		√
Construction activities	√		√		√
Operation and maintenance	√		√		√
Effluent and discharge protections and treatment applied	√		√		√
Timing schedule/ Life span	√		√		√
Facilities and services	√		√		√
Staffing and support			√		√
Required of fsite investment	√		√		√

¹ Based on the feasibility study, other cases didn't show any description except the location.

² Based on the feasibility study, the EIA report shows the areas covered.

to the project activities were not considered at all such as: soil investigations and water quality in agriculture sector, air quality, noise level and topographical data in road sector (excluding one case where the data were almost complete but methodology was not mentioned). Besides; the methodology was restricted to literature review plus observation and/or local interviews, no measurement had been taken for the specific parameters.

In the River Engineering sector methodology was not mentioned at all and baseline data was very poor. Some major data were not considered at all (water quality, air quality and socio-economic data). The second case showed good baseline data but the bad timing of the report decreased the usefulness of the data; where the negative impacts had already taken place. The inadequate baseline data which appeared in some sectors could be attributed to the following:

1. Unavailability of data due to confidentiality, back-dated data or lack of records, and lack of local Sudanese standards.
2. Lack of monitoring or reviewing of the EIA practices by the leader agency or governmental authorities.
3. Limited team work, specialists, assistants and experience, and experts whom could decide the data that should be measured or the areas that contribute with project activities.
4. Unavailability of some main measurement devices and trained technicians.
5. Bad timing of the EIA.
6. Poor role of local communities in the data collection, and weak public participation.
7. Low EIA budget.

The evaluation of impacts on the environment and assessment tools used vary according to the nature of impacts (project and affected environment), and availability of data and resources. Sudanese practices were limited to experts' opinion methods and check lists methods. There was a notable shortage in parameters evaluated, as in the Agriculture Sector. Improper tools were used such as in the Oil Sector. Furthermore, the assessments did not take the cumulative or interaction of impacts in consideration. Investigations of magnitudes and effluents or discharged pollutants were poor and the related activities were not clear in most of the EIA reports (see Table 6). In addition most of the cases were prepared after the implementation stages of the projects, so the evaluation was an analysis of the existing situations rather than an estimation of the future impacts. Specific comments by sector are presented below:

In oil sector the evaluation of the impacts demonstrated the intensity of impacts, causes, affected areas and status of the impacts. Tools used were mainly simple matrices, although the matrices could be one of the most effective tools but the matrices used were not comprehensive for such projects. The interrelationship between the impacts was not clear; also the cumulative and indirect impacts, sensitive receptors and sources were not discussed.

Cases reviewed in agriculture sector listed main parameters impacted and the major sources of impacts as well as the degree of impacts. The combination between the checklist method and matrix method in the assessment promoted the evaluation and made it more effective, but cumulative and interacting of impacts and indirect impacts due to related activities were not

Table 6. Review Results of Impact Assessment and Evaluation (WB, 1999 and EU, 1999)

Sector	Oil			Agricul	Power		Roads and High ways			River Engineering	
	1	2	3	1	1	2	1	2	3	1	2
Activities.	√	√	√	√	√	√	√	√	√		√
Related activities.					√	√		√	√		
Source of impacts and pollutants.	√	√	√		√	√			√	√	√
Type of impacts.	√		√	√	√	√			√	√	√
Type of pollutants.			√		√	√			√		
Durations of impacts	√	√		√		√		√	√		
Project phase.	√	√	√		√	√	√	√	√	√	
How and way of effects (chain of pollution way)			√		√						
Magnitude of each impact.					√				√		
Significance or severity of each impact.	√	√	√			√		√	√	√	√
Probability of impacts.				√	√			√			
Hazardous substances			√			√					
Sensitive areas			√				√	√	√		
Affected areas	√	√	√	√	√	√	√	√	√	√	
Natural resource and non renewable resource				√		√					
Natural hazard and geologic effects											
Residual impacts									√		
Energy supply and discharge areas						√	√				
Indirect impacts.									√		
Cumulative/interacting of impacts											

so clear. Socio-economic impacts were not evaluated, though it was considered as one of the major areas in such projects which needed resettlements of communities. In this sector the tools used were sufficient enough for impacts assessment but application was not successful.

Power sector proposed the finest practices of impact assessment among all sectors discussed in this study. All activities related to the project were almost covered, the sensitive receptors and sources were clearly identified, furthermore the wide-rang of tools used included matrices, overlays, expert opinion, comparison with similar projects, mathematical models and software. The impact evaluation of this sector was harmonized with international practices (WB, 1999; EC, 1999); nonetheless the cumulative impacts were not discussed.

In road and highway sector some of the direct and indirect impacts were presented and discussed appropriately and parameters considered were sufficient but the simple matrix tool use was a poor decision. One case illustrated the opposite; where the

tool was suitable (checklist, magnitude) but the discussion of impacts was very poor as the basic parameters were not discussed. In addition there was an ambiguity in the proposal of the impacts evaluation. Another case demonstrated good practices; the parameters discussed were fitted with international guidelines (WB, 1999), the activities related to the project were clearly presented, also the magnitude of impacts, duration, receptors and sources were all presented.

In river engineering sector, the first EIA showed the impacted areas and the degree of impact was stated but impact evaluation was very poor and the activities were not clear, the tools used for the assessment were not mentioned at all, the discussion of impacts was very weak in whole. The dam EIA showed the impacts anticipated and their significance.

Alternative analysis is considered as one of the major parts which could enhance reliability of the EIA study as it considers the cost and time factors affecting the project sustainability and provide valuable help to decision makers. This part was missed in a great

portion of EIA reports reviewed. Sudanese practices did not show analysis of alternatives except in the power sector as shown in Table 7. This poor consideration of alternative analysis in might increase the efforts and cost of the mitigation measures and this introduces financial problems in the long term of the project implementation and threaten its sustainability. Moreover, it weakens the decision making process. The weakness of Sudanese practices in this part is due to many reasons:

1. The weak EIA review process.
2. The power of the project's owners and unacceptability of no action option.
3. In most cases the EIA started after the implementation stage of the projects.

Mitigation and EMP did not exist in some cases in the agriculture and river engineering sector (Table 8). In oil sector there was some variation on practices since in one case very poor EMP was done, while the other two cases showed good work, this was repeated in the road sector. In this part, most of the EIAs mentioned the main parameters that should be mitigated. The EIAs gave a brief guidance to the areas impacted or sources of pollutants along with the mitigations that should be taken. Generally the mitigations were not complete in most of the EIAs considered in this study. When comparing the mitigations in each EIA with the impacts mentioned a notable difference appears in some sectors such as in the Road Sector (Elturabi, 2007); some mitigations were recommended for impacts never mentioned at the report, and this could be referred to: either these impacts were there but not considered which make a doubt about the reliability of the whole assessment -and that is the most probable-, or these impacts were not released from the project or surrounding so the mitigations would be not more than time/cost waste. Also unclear description of mitigation measures was observed in Road and Oil Sector (Elturabi, 2007).

Other important issues were missing and are summarized as follows:

1. Enhancing measures recommended for positive impacts (excluding agriculture sector).
2. The cost estimation of mitigation measures.
3. The monitoring schedule of parameters and reporting times. (Power and some oil and road cases included this with EMP chapters)
4. Further prediction work of impacts after mitigations, comparing with impacts without mitigations, and of other alternatives' impacts, including the "no action option".

These shortages and deficiencies that appeared in the EMP practices in Sudanese applications could be referred to many issues such as:

1. Most of the mitigations measures suggested and monitoring plans recommended were done after the implementation of the project, so it weren't integrated with the planning or design stage; this produced financial troubles as well as technical and managing problems.
2. Some times major mitigations and monitoring points (time, source, quantities) were missing due to the weakness in the impact parameters' analysis.
3. Shortage of public involvement and governmental and/or leader agency monitoring which could guarantee the implementation of the monitoring plan.
4. Shortage of consultations and cooperation work which can assist in providing a good plan of monitoring systems and responsibilities distributions.
5. The ambivalence of the governmental environment authorities; where the ministry of the environment was always in charge of other issues such as physical development or tourism.

Table 7. Review Results of the Analysis of the Alternative Options

Sector	Oil	Agriculture	Power	Roads and Highways	River Engineering
Parameters required					
Identify alternative technologies/ sources management strategies	n/a	n/a	√		Based on the feasibility study
Identify alternative locations			√	√	
Screen alternative locations					
Evaluate select alternatives			√		
Comparatively assess alternatives			√		
Proceed with preferred alternatives			√		

Table 8. Review Results of EMP

Requirements according to WB guidelines	River Engineering	Roads and Highways	Power	Agriculture	Oil
Identification of the parameters should be monitored.	Y	n/a	Y	Y	n/a
Establishing (define a program) location and time frame for monitoring of anticipated impacts. And Evaluating the success of mitigation applied and impacts occur.	Y		Y	Y	
Reporting consequences/procedures of monitoring results.	Y		Y	Y	
Establishing the responsibilities and responsible personnel, associations, governor for monitoring and managing of the EIA applications.	Y		Y	Y	
Clear identification of the relations between the official, individuals, social, financial and administrative links among public agencies and related institutional.	N		N	N	
Establishing the cost analysis and comparisons after and before mitigations applications (proposing economic considerations)	Y		N	N	
Emphasize to provide neat and clear proposal of the final recommendation for the decision maker	N		Y	Y	
Flexible plan to ensure the future changes that might need to be introduced in the project.	N		N	N	

The result of public participation shows that the contribution of local communities and relevant personnel is very weak in Sudanese practices (Table 9). where these groups (excluding the power sector) had no role in mitigations recommendation or decision making, their role was restricted mainly on baseline data collection, and never extended to other stages of project development or ex-post planning. In most cases the local communities knew about the projects, most public participations included officials or leaders of the communities. The perception of locals around the project was not considered in most cases. The deficiencies in public participation produced serious problems (socially, economically and politically) in the implementation of the specific projects that had been discussed in this study.

- In oil sectors; interviews with local communities and officials, in addition to meetings with relevant personnel took place.
- In road sector; questionnaire, group discussion and interviews were used.
- In the river engineering sector the two cases showed a huge variation; where, the first case did not show any public participation. The Merowe dam EIA showed remarkable public participation. In this case, the EIA was done af-

ter the implementation of the project was started, the lack of public consultations caused serious problems. The Merowe dam EIA could be considered as mitigation measure, to cover the lack of community participation. The whole study is a descriptive study more than it is an environmental assessment.

The tools used in public participation were also limited (Table 9). although most of them were suitable to the group focused but they were not sufficient to cover the whole majority of the communities and/or institutions interacting with the specific project. The role of media always appeared after the project construction or after conflicts flew up. No tools were used to involve the minority groups in most cases, as a result; the narrowing of tools lead to narrow down the participants and their contributions, and vice versa. According to the international guidelines (WB, 1999; EC, 1999; FAO, 1995) the public participation should be started with the scoping stage of the EIA, where governmental and related personnel such as local businessmen, expert scientists and related NGOs should be aware and involved in the scoping stage of the EIA report. But this was not mentioned in most of cases reviewed. Some elected personnel and authorities were involved in preparing of EIA stage (mainly in baseline

Table 9. Review Results of Public Participation by Sector

Sector	Public consulted	Tools	Contribution
Oil	Trial leaders , local government, NGOs Local inhabitants	Focused group discussion Rapid appraisal discussion	Socio economic (baseline data) Land use and nomadic life way (baseline data)
	Official, army personnel, herds men stakeholders	Oral records Discussion and interviews	Wildlife and fish (baseline data) Chemicals (baseline data)
	Agriculture	Residents Agricultural Engineers and locals Meetings	Baseline data
Power	NGOs, Government(HCENR, land use authority, Electrical ministry, Ministry of Science, Ministry of Health) and local leaders Residents of work camp	meetings	Consultation and mitigation recommendations
Roads and highways		Questionnaire questionnaire, group discussion and interviews	
River Engineering (MDPEIA)	Experts of the project engineer (civil, geologist, hydrologist, limnologist...) Institutional consultant.	Questioner	Contributed in the project description related issues.
	Local committee by joint higher committee members, Particular stakeholder and vulnerable group and youth.	Questioner Negotiations committees	Socio economic
	NGOs (Red Crescent, Help Age)	Negotiations committees	Socio economic
	Governmental of the state and rural councils.	Meetings	Socio economic

data collection), then absence of public participation in the other parts of the draft report stages was noted. Even though all these stages were required in the international guidelines followed by EIAs (WB, 1999), the public participations weren't clear in most of cases studied or not existed at all in the report. It is important to note that public participation activities should often be reported as a separate section of the final EIA report (FAO, 1995). All guidelines stressed on considerable public involvement in environmental management rather than consultation only, and this wasn't achieved in most sectors studied, except for the power sector.

Some exceptions should be mentioned in this particular section such as; in the oil sector the media played the major role of informing the populations about the projects, rather than the EIA team. Also as such projects had lots of political implications; the local communities were usually involved in the projects planning.

River engineering sector required most extensive public participation (FAO, 1995) due to the need of resettlement or displacement of local communities, but the EIA practices showed high ignorance of public participations and consultations in the early stage of the report/project preparation. This lack of participation produced serious troubles (socially, economically and politically) in the implementation of the specific projects that had been discussed in this study.

In conclusion the power sector showed the most awareness of all local levels (Table 10). The oil sector obtained a good public participation in general, but this was not really due to the EIA practices only. However the deficiencies in public participation could lead to lots of problems socially and/or politically and this would affect the acceptance and progress of the projects. These deficiencies are referred to the following points:

1. Unawareness of the residents or local society around the project area and weak interacting of the local NGOs.

Table 10. Rating Public Participation in Various Sectors According to the World Bank Requirements

Public participant required ¹	Oil	Agriculture	Power	Roads and High ways	River Engineering
Public representatives: state and provincial government representatives, local officials, village councils and other elected leaders	√		√		√
Traditional authorities: village headmen, tribal elders, religious leaders and other clergy.	√		√		√
Local organizations: NGOs, local community development or users' groups, kinship societies, recreational groups, neighborhood associations, labor unions, gender groups, ethnic organizations, cooperatives.					√
Private sector representative: private business interest groups, trade associations, or professional societies.					
Interested Groups: environmental NGOs, universities, research, or training programs scientists and experts					√

¹ According to the World Bank (WB, 1999)

Table 11. Overall Rating of EIA Practice by Sector

Sector \ Parameter	oil	Agriculture	power	Roads and high ways	River engineering
Team of work	B	N/R	B	N/R	A-N/R *
Project description	A	D	A	A-D	A
Alternative analysis	D	D	A	C	C
Public participation	B	D	B	C	A-D
Timing	C	C	C	C	C
Report content	B	C	A	C	C
Baseline data	A	C	A	B-C	B
Impact assessment	B	C	B	B	C
EMP	B	D	B	B	D
Total	B	C-D	A-B	C	C

*x-y means: some cases discussed in the sector obtain the x evaluation other obtain y, N/R: not recorded, A: good application, B: moderate/ acceptable application, C: bad application, D: unconsidered.

2. Poor understanding of environmental endanger among the communities and local authorities.
3. Absence of the Sudanese guidelines which could provide the suitable tools and ways for special local habitants.
4. Untrained teams and lack of high communication skills to contact with people.
5. Aggressiveness and uncooperative attitude of some local habitants for new projects.
6. Illiteracy and fear of sharing in such negotiations.
7. Technical and foreign language use in the EIA limited the wide range of participation.
8. No contributions with other firms or specialist were conducted in EIA process.

Most of the major projects were governmental; this caused a strong feeling of broad authority and needlessness to local consultation or other authorities' contributions. Most of the EIA reports refer to the Sudanese environmental act and regulations. As there were no local guidelines to be followed, most of the reports were based on the international guidelines and best practices. The use of international have contributed positively to the quality of EIA reports reviewed when used and this is, in many ways, associated with foreign consultants who brought best practice along with extensive EIA experience. The oil and power sector EIA reports were of superior quality since the oil and power companies allocate reasonably higher amount of funds for the EIA. It was also observed that the EIA reports that came in a feasibility study context were of lower quality than the stand alone EIAs, however, feasibility study ensure proper EIA timing and facilitate the integration of EIA recommendations in the project design. According to the above discussion Table 11 shows the overall rating of the authors of the Sudanese practices in each sector.

CONCLUSION

In general, the performance of the EIA reports in Sudan is relatively good, taking in mind these assessments were done in an absolute absence of any guidelines. Although there were some notable variations between the different sector practices, the EIAs performances in each sector were generally close. These variations in sectors practices were mainly due to the financing and facilities provided to the team or agency leading the work; this was absolutely obvious when comparing the oil and power practices with road or agricultural practices. Advantageously, EIA practice is becoming more popular in Sudanese development planning.

According to the findings of this paper, the following can be recommended to enhance the Sudanese EIA practice and effectiveness:

- Come up with sectoral Sudanese guidelines, establish monitoring system and strengthen environmental authorities and NGOs to play a role in enforcement.
- Build capacity in EIA and promote the use of various impact assessment tools.
- Support public participations and integrate in the decision making process.

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