

Hydropower Sustainability Assessment  
Protocol Section III Trail

ESKOM

Ingula Pumped Storage Scheme

November 2009

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A handwritten signature in black ink, appearing to be 'R. Griffin', written in a cursive style.

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## **1 INTRODUCTORY INFORMATION**

### **1.1 Company**

Eskom is a South African company and is the single largest supplier of electricity in Africa, providing approximately 45% of the continent's power needs. It is also one of the top 10 utilities in the world by generation capacity and supplies 95% of electricity consumed in South Africa.

The Generation Division has 24 power stations with a nominal capacity of over 44 000 megawatts. The division operates the largest dry-cooled coal-fired power station in the world as well as Africa's only nuclear power station.

The nuclear and coal-fired power stations provide base-load capacity for the national grid. The conventional hydroelectric, pumped storage, wind and gas turbine stations provide additional electricity during peak demand periods and when unforeseen shortages of capacity occur.

Eskom's current hydropower has a capacity of 2061MW and consists of two pumped storage power stations and six hydroelectric power stations

### **1.2 Project**

Eskom's R16,6-billion Ingula power station, which is a pumped storage scheme situated on the border between the Free State and KwaZulu-Natal (KZN) provinces, is currently on schedule to commission its first unit in September 2012.

The pumped storage scheme consists of an upper and a lower dam, each with a water capacity of approximately 22-million cubic metres. The dams, situated 4,6 km apart, are connected by underground waterways, through an underground powerhouse which will house four 333-MW pump turbines.

During times of peak energy consumption, water will be released from the upper dam through the pump turbines to the lower dam to generate electricity, while during low energy demand periods, the pump turbines are used to pump the water from the lower dam back to the upper dam.

Construction activities at Ingula started in February 2005 and after the first unit is commissioned, the remaining three units will be completed by November 2013.

Upcoming project milestones include the completion of 57 km of new tarred road on-site, and hydropower generation joint venture Voith Hydro and Voith Fuji beginning work on the turbines and generators for the project.

#### **Local Development**

Ingula has provided direct and indirect employment to about 4 000 local

people. Eskom through the Eskom Development Foundation has refurbished three schools in the KZN community and is currently refurbishing the Hamilberg Primary School in the Free State.

As part of the social development initiatives in the surrounding communities, Eskom will install electricity as well as provide access to water and roads for all the families who will be relocated.

Ingula has managed to formulate effective stakeholder forums in KZN and the Free State. Stakeholder Forums are used as interaction and engagement platforms, thus building mutually beneficial relations with all their stakeholders.

A skills development centre has been opened, where 1 000 locals were trained in different aspects of construction and basic life skills. The qualifications are certified by the relevant sector education and training authority.

Several local companies and small-, medium- and micro-enterprises have benefited from subcontract work with all the main contractors on-site.

The local taxi association has signed contracts with all main-contractors on-site for providing labourer transport.

### **Environment**

Environmental education forms an integral part of the project. Local people are constantly given information about their effects on the environment and about the fauna and flora on site as work is in progress. An environmental monitoring committee has been involved in the constant monitoring of the project.

A team of full-time professional environmentalists monitor all activities on site, ensuring all legal requirements are met, and that the project operates within the terms of the government authorisation.

Eskom has taken a decision to manage the area surrounding the dam and the construction sites as a conservation area, and with the cooperation of landowners in the district, may form the core of a larger conservancy including the moist high grasslands of the eastern Free State and northern KZN. The region is of significant value as a source of water for the Highveld, and serves as a habitat for a variety of species of flora and fauna.

A partnership launched in March 2004 between Eskom and conservation groups Birdlife South Africa and Middlepunt Wetland Trust is aimed at generating benefits at international, national, regional and local levels to offset the negative effects of the construction and operation of the pumped storage scheme.

More than 220 species of birds have already been sighted at Ingula, one of these being the Wattled Crane which is among the top five endangered birds

in terms of the National Biodiversity Act. Also recorded are the threatened Oribi, as well as grey Rhebok and Steenbok.

Historically, the site has been heavily used by livestock and large tracts of erosion can be seen. Livestock numbers have been reduced and eroded areas are being rehabilitated. The area has also been subject to high intensity poaching and illegal plant harvesting.

Through the development of a protected area, it is hoped to increase numbers of animals and establish viable populations in a secure environment. A reduction in unsustainable activities will improve general conditions.

Wetlands on the property serve as a continual water supply to the Wilge River, and springs flow throughout the year. The wetland system is host to a variety of species of flora and fauna, and is in need of protection following years of overgrazing and inappropriate burning.

The formal conservation of the Wilge and associated wetlands will be explored in conjunction with the Free State Department of Tourism, Environmental and Economic Affairs. Rehabilitation begun in the past will be continued and the sustainable functioning of the wetlands ensured.

### 1.3 Status of Project, and Protocol Section Applied

Ingula is in the project implementation stage thus Section III of the Hydropower Sustainability Protocol has been applied.

### 1.4 Disclaimers and Confidentiality Agreements, if any

None

### 1.5 Schedule of the Assessment

Date	Time	Description
11 Nov	08h30	Initial meeting
	09h00	Assessment (6)
	12h30	Lunch
	13h00	Assessment (6)
	16h00	End of day one

12 Nov	08h00	Assessment (8)
	12h30	Lunch
	13h00	Assessment (6)
	15h30	Close out Meeting
	16h00	End

Representation:

- Eskom Peaking – Inula Power Station
- Eskom Divisional Client Office - Ingula
- Middelpunt Wetland Trust

## **2 ASSESSMENT RESULTS FROM THE DRAFT PROTOCOL TRIAL – GENERAL**

### **2.1 Objectivity and Replicability**

Pumped Storage Schemes are not necessarily located in a river basin, and their Reservoirs are relatively small compared to other Hydropower Stations. Therefore some aspects could be considered as not relevant.

It was felt that the rating descriptions and Guidance Notes need to be updated and expanded, once practically tested in a number of assessments to ensure some degree of replicability

### **2.2 Understandability**

The legal terminology of the document may make it more difficult to understand for those whose first language is not English and for supervisory technical staff to interpret and understand the protocol. However at the conclusion of the assessment the staff, having been assisted through the document, had a much better understanding.

The aspect “Social Management Plan” is named “Social Impact Assessment & Management” on page 6 of the Guidance notes.

The aspect “Environmental Management Plan” is named “Environmental Impact Assessment & Management”.

The word “plan” in the aspect names caused confusion and it gave the impression that a formal plan is necessary in order to be effective for that particular aspect. It is recommended to rather use the descriptions on page 6 of the Guidance notes.

While some hydropower facilities are independent entities, others are part of large corporates and assessment of certain aspects e.g. “Financial Viability” or “Governance” will need to be based on corporate policies, procedures and standards. This may impact the ability to use the protocol as a benchmarking / comparison tool for Hydropower Projects. E.g. Hydropower only makes up approximately 4,6% of Eskom’s installed capacity.

The terminology used is not consistent through out the Protocol; the aspects refer to four different terms namely “Project”, “Hydropower Station”, “Hydropower Facility” and “Hydropower Project”. This could lead to interpretation and therefore replicability issues.

### **2.3 Scope and Comprehensiveness**

It is suggested that stakeholder management and communication covered as aspects in their own right. Stakeholder management and internal and external communication have their own procedures, strategies and processes that can be assessed. Communication could be seen as a subset of

Stakeholder Management and assessed as such or could be seen as an aspect on its own. The management of specific issues, with specific stakeholders begins with the identification of a hydropower project, right to the end of its operating life. A data base and participation in local forums could be evidence of involvement with communities. There should be a smooth transition of stakeholder management from planning to operational phases. Commitments made in the early phases are often not carried over to construction and operating phases.

## **2.4 Ease of Use**

It will be very difficult to provide all the evidence to an auditor and a lot of timely preparation will be required prior to the assessment. It would also require considerable effort from the auditor(s) to give a fair rating.

On page 6 in the guidance notes, the aspects are all grouped in logical order according to different perspectives, but the aspects in the assessment itself are in a different order. It will be easier if the aspects in the assessment are also grouped per perspective. The assessment can then be scheduled according to the perspectives and only the relevant people have to attend the assessment when the specific perspective is addressed.

The attributes “Level of Compliance” and “Level of Conformance with Plans” are not consistent through out the document in the same sequence.

The Aspect Assessment Score Cards (e.g. Table 1) at the back of the Protocol refer regularly to the Attribute guidance notes that are at the front end of the Protocol. This causes a lot of paging through while doing the assessment. A recommendation will be to separate the assessment part from the guidance notes (pages 1 through 20) to enable users to have the two documents open at the relevant areas simultaneously.

Several approaches were tested and discussed on how to give one score for attributes with more than one sub-attribute (e.g. Table 1 first attribute). A decision was made to take the lowest sub-attribute score. For example, if a score of 2 and 4 are attained for an attribute with two sub-attributes then 2 was taken as the attribute score. If the average score of 3 is used as the final score, it will mean that there are no critical gaps, but critical gaps have already been identified for one of the sub-attributes. Therefore the lowest score has to be taken. The same will apply when the two sub-attribute scores are 4 and 5, some non critical gaps have been identified which mean the final score can not be higher than 4.

The format of the Aspect Score Cards were found to be very busy table with too much duplication, a recommendation is made to simplify it (e.g. as in table 1).

	Attribute	5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor
Process Attributes	Assessment	<ul style="list-style-type: none"> <li>Quality of the process leading to understanding of the existing regional socio-economic baseline, regional economic activity and infrastructure, and related constraints and opportunities</li> <li>Quality of the Process leading to an Understanding of the opportunities to leverage regional development through the project to support broader economic development objectives</li> <li>Analysis of economic viability of the project through cost-benefit analysis which includes social, environmental and economic aspects</li> </ul>				
	Management Planning	<ul style="list-style-type: none"> <li>Quality of the planning process to optimize delivery of project benefits [see management guidance note]</li> </ul>				
	Consultation Process	<ul style="list-style-type: none"> <li>Quality of the consultation process [See consultation guidance note]</li> </ul>				
Performance Attributes	Stakeholder Support	<ul style="list-style-type: none"> <li>Level of stakeholder support for analysis and planning for additional benefits [see stakeholder support guidance note]</li> </ul>				
	Compliance	<ul style="list-style-type: none"> <li>Generally not relevant</li> </ul>				
	Conformance with Plans	<ul style="list-style-type: none"> <li>Conformance with plans for additional benefits [see conformance with plans guidance note]</li> </ul>				
	Effectiveness	<ul style="list-style-type: none"> <li>Optimisation of opportunities to deliver additional benefits to directly affected stakeholders and the broader community</li> <li>Success in achieving net project benefits based on cost benefit analysis factoring in social and environmental</li> </ul>	Fully optimised with no gaps	Close to fully optimised with very few non-critical gaps	Well optimised with a number of non-critical gaps	Somewhat optimised with critical gaps

Table 1: Aspect Score Card

## 2.5 Impact and Effectiveness

The more the learning points are shared between Projects the more the impact and benefit of the protocol will have for the Projects.

## 2.6 Applicability to Range of Scale and Regions

None

## 2.7 Adequacy of Implementation Guidance

The Implementation Guidance is duplicated in all four sections of the Protocol and makes up a large portion of the documents. The Protocol can be seen as overwhelming as it is a rather thick document. It also includes some information that is not relevant to all parties involved in the assessment. As suggested earlier, this could be alleviated by splitting the Guidance Notes from the assessment.

Other Issues:

- Table 3 appears after Table 4
- The order of the aspects on page 6 Table 1 of the guidance notes is not the same order as the aspects in the assessment.

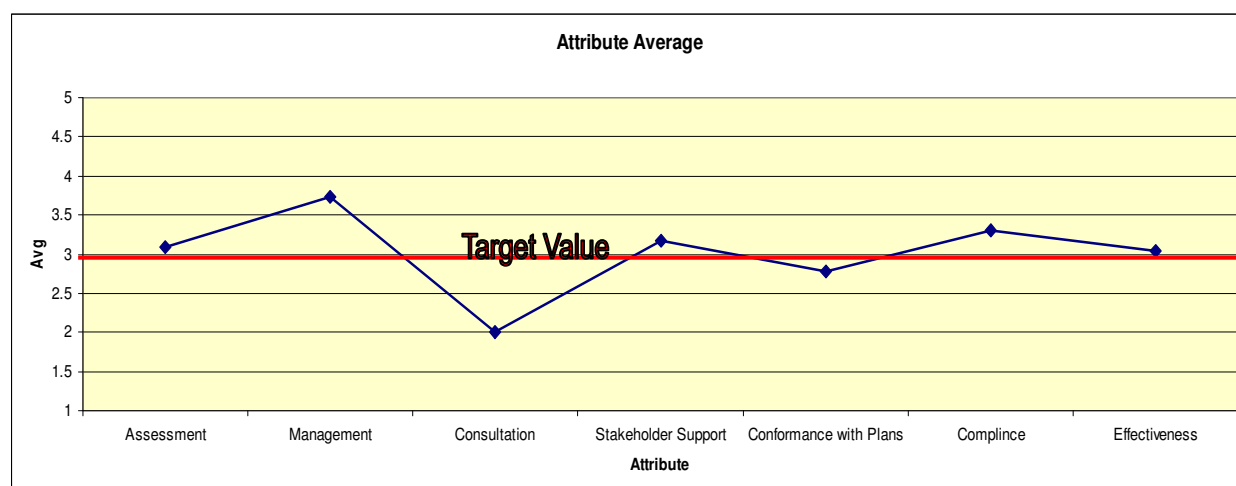
## 2.8 Presentation of Results

The reasons for scores of 5 should be documented and made available to all IHA members in order to share best practices. The reasons for scores of 1 and 2 should also be noted so that the project can create actions from these.

It will be beneficial to record the sub-attribute scores as well in order to have a comprehensive report for the Project.

The space provided in the evidence column of the auditor worksheet Table 3 on page 10 of Section IV is not enough to fill out all the evidence presented.

A suggestion is to add another graph (e.g. Figure 1) which shows the average score of the attributes with a target value. This will emphasise to the project which attributes need to get attention. For example Figure 1 indicates that the project needs to concentrate their consultation processes.



**Figure 1: Attribute Average**

A recommendation was made to send an electronic file of the assessment scores to the Power Stations, which will allow them to draw their own graphs and do their own analysis. A sample of such a spreadsheet is sent as a separate attachment to this report.

## 3 ASSESMENT RESULT FROM THE DRAFT PROTOCOL TRIAL – ASPECT BY ASPECT

### 3.1 River Basin & Transboundary Issues

The attribute “Compliance” is described as generally not relevant in the protocol (p24), in South Africa there are some legal requirements where compliance is needed with regards to the “Aspect River Basin & Transboundary Issues”.

### 3.2 Economic Viability Including Additional Benefits

The attribute “Compliance” is described as generally not relevant in the Protocol (p26). Eskom’s only shareholder is the government and they have to

comply to the Public Finance Management Act when they deal with “Economic Viability” and therefore the attribute “Compliance” was felt to be relevant.

### **3.3 Financial Viability**

No comment

### **3.4 Public Sector Governance**

The second sub-attribute (p29) of the attribute “Assessment’s” numbers who refer to the notes (p30) are incorrect.

### **3.5 Corporate Governance**

No comment

### **3.6 Regulatory Approvals**

The Protocol states that the attribute “Effectiveness” is not relevant at implementation stage. This was felt not to be the case as there needs to be compliance to the approvals during implementation / construction.

### **3.7 Integrated Project Management & Communications**

It was recommended that Communication should be a separate aspect (see above - 2.3).

### **3.8 Construction Management**

This aspect was not assessed as it was felt that this aspect is already covered by other aspects (e.g. “Social Management Plan”, “Labour and Working Conditions”, “Environmental Management Plan”).

### **3.9 Procurement**

No comment

### **3.10 Social Management Plan**

No comment

### **3.11 Project Affected Communities**

The sub-attribute of “Management” describes the difference between a score of four and five as “Formed for many...” and “Formed for most...”. It is difficult to distinguish between the words “most” and “many”. It will be recommended to replace the word “most” with the word “all”.

### **3.12 Indigenous People**

The definition of “Indigenous People” allows identification of various people that may not be deemed to be indigenous people as the definition does not state that they have to be economically disadvantaged. This aspect was not scored as it was felt that “Indigenous People” were already covered under the aspect “Project Affected Communities”.

### **3.13 Resettlement & Land Acquisition**

Perceptions may differ in terms of the improvement of standards of living for displaced persons (e.g. some may prefer to live in a less sophisticated manner).

### **3.14 Benefit Sharing**

No comment

### **3.15 Labour & Working Conditions**

Health and Safety are extremely important aspects on any site, the aspect deals with people's lives and has its own processes and compliance requirements. It is recommended to separate Health and Safety from the "Labour & Working Conditions" aspect and to add it as another aspect.

### **3.16 Cultural Heritage**

No comment

### **3.17 Public Health**

No comment

### **3.18 Asset & Community Safety**

No comment

### **3.19 Environmental Management Plan**

The first sub-attribute of "Assessment" mentions the "social baseline", the feeling was that it should be replaced by "environmental baseline".

### **3.20 Catchment Management**

No comment

### **3.21 Reservoir Management**

This aspect was not assessed, because it was felt that reservoirs of a pump storage scheme are relatively small and that all the characteristics of the aspect were covered by other aspects.

### **3.22 Environmental Flows & Downstream Sustainability**

The Protocol indicates that the attribute "Compliance" is not generally relevant at this stage however the trial participants indicated that it should be relevant and it was therefore rated.

### **3.23 Biodiversity & Invasive Species**

It was recommended to split Biodiversity and Invasive Species into two aspects. The comment made was that Invasive Species have an economic impact while Biodiversity has an environmental impact. Biodiversity is a very broad field covering a large amount of issues. Invasive species have major resource and economic impacts.

**3.24 Erosion & Sedimentation**

No comment

**3.25 Water Quality**

The one sub-attribute of “Effectiveness” asks a question about the operation stage which is not possible to answer at this stage of the project.

**3.26 Waste, Noise & Air Quality**

No comment

**3.27 Hydrological Resource Availability & Management**

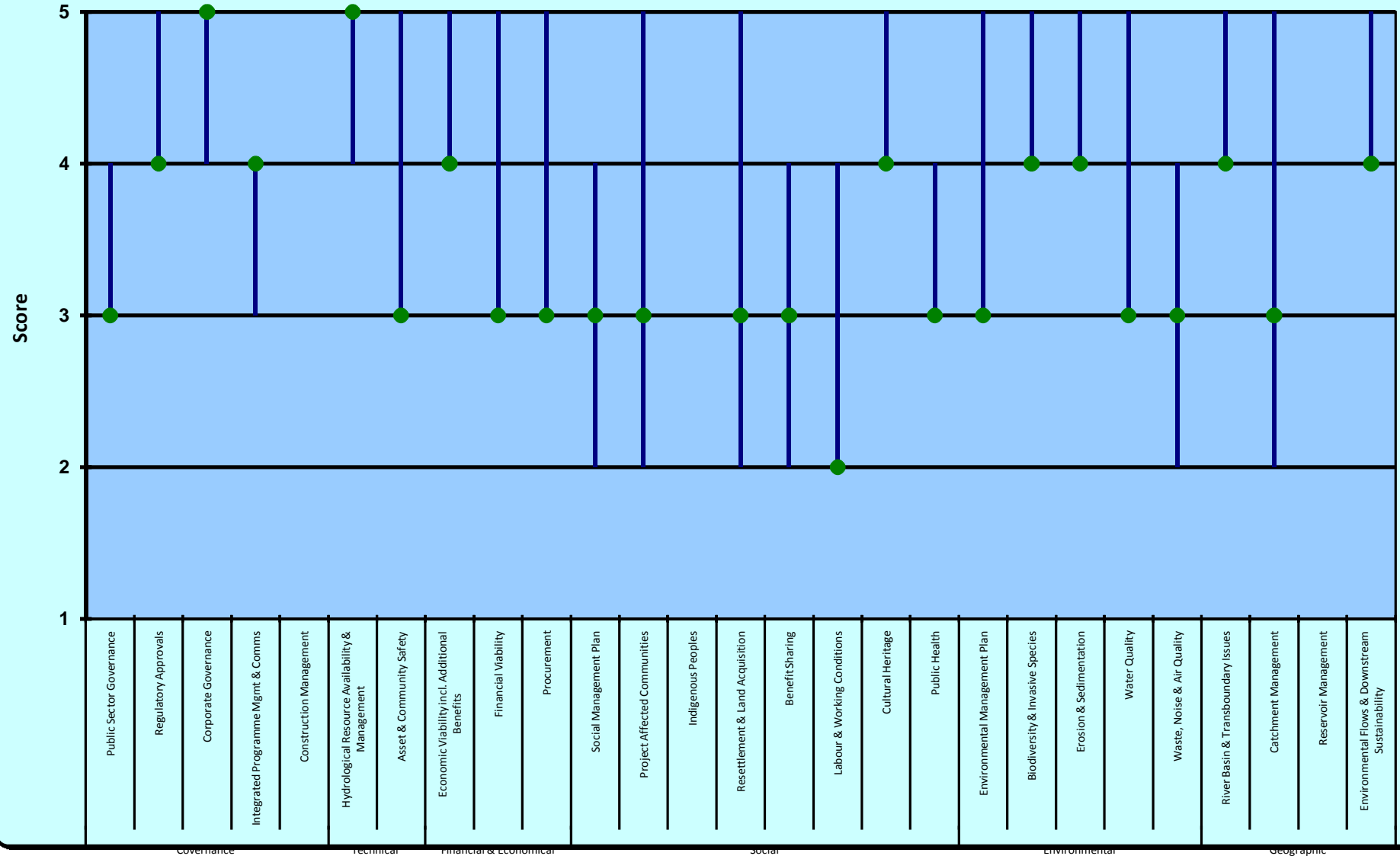
This aspect is indicated on p6 of the Guidance Notes to be part of the assessment for Section III but it does not appear in the assessment.

**South Africa - Eskom- Ingula Pumped Storage Scheme - November 2009**  
**Draft Hydropower Sustainability Assessment Protocol Section III Results**

Perspectives	ASPECT NAME	Process Attribute Scores						Performance Attribute Scores						Low	High		
		Assessment		Management		Consultation		Stakeholder Support		Compliance		Conformance with Plans				Effectiveness	
		Attribute	Sub-Attributes	Attribute	Sub-Attributes	Attribute	Sub-Attributes	Attribute	Sub-Attributes	Attribute	Sub-Attributes	Attribute	Sub-Attributes			Attribute	Sub-Attributes
		4		3.75		3.83		3.58		4.71		3.67		3.46			
Governance	Public Sector Governance	4	4 4	3	3	4	4	3	3	N/A		3	3 3	3	4 3 3	3	4
	Regulatory Approvals	5	5	5	5	4	4	4	4	5	5	4	4	4	4	4	5
	Corporate Governance	5	5 5	4	5 4 4 5	5	5 5	4	4 4	5	5	5	5 5	5	5 5	4	5
	Integrated Programme Mgmt & Comms	4	4 4	3	3 3	3	4 3	4	4	N/A		3	3 3	4	4	3	4
	Construction Management	N/A		N/A		N/A		N/A		N/A		N/A		N/A		0	0
Technical	Hydrological Resource Availability & Management	4	4 4 5	4	4 4	5	5	4	4	4	4	5	5	5	5 5	4	5
	Asset & Community Safety	4	4	4	4	3	3	4	4	5	5	4	4	3	3 3	3	5
Financial & Economical	Economic Viability incl. Additional Benefits	4	4 4 4	4	4	4	4	4	4	5	5	4	4	4	4 4	4	5
	Financial Viability	4	5 5 4 5	4	4 5	4	4	4	4	5	5	3	3	3	3 3 4	3	5
	Procurement	4	5 4 5 4	3	4 4 3	4	4	4	4	5	5	3	3	3	4 3 3	3	5
Social	Social Management Plan	3	3 3	3	3	4	4	2	2	4	4	3	3	3	3 4	2	4
	Project Affected Communities	3	3 4	3	3 5 4	3	4 3 4	2	2	5	5	3	3	3	3 4 3	2	5
	Indigenous Peoples	N/A		N/A		N/A		N/A		N/A		N/A		N/A		0	0
	Resettlement & Land Acquisition	4	4 5	3	3 3	3	4 3 4	2	2	4	4	3	3	3	4 3	2	5
	Benefit Sharing	3	3 3	2	2	3	3	4	4	N/A		3	3	3	3	2	4
	Labour & Working Conditions	4	4 4	4	4	4	4	3	3 3	4	4	3	3	2	3 2 2 4	2	4
	Cultural Heritage	4	4 4	4	4	4	4	4	4	5	5	5	5	4	4 4 4	4	5
	Public Health	3	3 3	3	4 3	3	3	3	3	4	4	4	4	3	3 4 4	3	4
Environmental	Environmental Management Plan	4	4 4	4	4	5	5	3	3	5	5	4	4	3	4 3	3	5
	Biodiversity & Invasive Species	5	5	5	5	5	5	4	4	5	5	4	4	4	4 5 4	4	5
	Erosion & Sedimentation	4	4	4	4	4	4	4	4	5	5	4	4	4	4 4	4	5
	Water Quality	5	5	5	5	5	5	4	4	5	5	3	3	3	3 3	3	5
	Waste, Noise & Air Quality	2	2	3	3	3	3	3	3	4	4	4	4	3	3 3	2	4
Geographic	River Basin & Transboundary Issues	5	5 5	5	5 n/a	4	4	5	5	5	5	4	4	4	4	4	5
	Catchment Management	5	5	3	3	2	2	4	4	5	5	3	3	3	3 3	2	5
	Reservoir Management	N/A		N/A		N/A		N/A		N/A		N/A		N/A		0	0
	Environmental Flows & Downstream Sustainability	4	4 5	5	5 5	4	4 5	4	4	5	5	4	4	4	4	4	5

# Aspect Range -2009

● Effectiveness



Governance

Technical

Financial & Economical

Social

Environmental

Geographic