

*Norwegian Government Purchases of CDM/JI Quotas from  
Hydropower Projects of over 20 MW Installed Capacity*

**IHA Sustainability Protocol Audit Assessment  
of  
Dahuashui Hydropower Project**



**Draft Report**

**January 2008**

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## 1. SUMMARY AND CONCLUSIONS

Under agreement with the Ministry of Petroleum and Energy NVE has been asked by the Ministry of Finance to make an assessment and audit of the sustainability of the Dahuashui Hydropower Project in China according to the International Hydropower Associations Sustainability Protocol.

The Ministry of Finance requires this audit to assist them in their decision to purchase the CDM/JI Quota for the project.

The construction of the plant was delayed when the turbine delivery was on hold because the project owner could not pay for it, following lack of financing and refusal of banks to grant additional loans. This situation was reportedly solved only after an agreement for sale of the CDM/JI Quota for the project was achieved. The hydropower plant is now in operation.

The audit has been based on written documentation and verbal evidence received during a field trip to China and the project area, as well as on other documentation provided. Furthermore, it is understood that the Ministry of Finance have requested a Norwegian NGO to give their comments regarding any negative consequences of the project known to them. A search has also been made on the Internet (including Chinese sites) which did not reveal any negative references to the project.

The conclusion of the audit is that the aggregate IHA Sustainability Assessment score is 3.68<sup>1</sup>. This indicates that the project is “Satisfactory” according to the selected international guidelines for best practice in hydropower development. This implies that the project is deemed to (attributable to score 3.0):

- *Essentially meets the requirements of the Sustainability Guidelines (no major gaps).*
- *Generally compliant with regulations and commitments (minor exceptions only).*
- *Some non-critical gaps in planning and management systems.*
- *Some non-critical gaps in meeting objectives and measurable targets,*

***Based on the result of the IHA Sustainability Protocol Assessment, a score of 3.68 implies that from the point of view of internationally recognised best practice the project is found acceptable, based on the information available to NVE at the time of this audit.***

The main gaps as regards available evidence during the audit of the project were documentary details of how the power plant will be operated and of the releases from the power plant to the river. (These are important to verify the water level and flow variations that may be experienced downstream of the power station. Large variations in water flow and water level can in some cases represent danger for downstream users.) The audit also found that although some aspects may in fact merit a higher score, this could not be given based on the level of documentation available for the audit. Provision of further documentary evidence may increase the level of confidence of the report and increase the aggregate score given to the project.

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<sup>1</sup> This is the average score of the 19 aspects for which evidence was retrieved during the audit. Evidence on aspect C10 is still pending as per the date of this draft report.

## 2. AUDIT DETAILS

### *Location details:*

The Dahuashui Hydropower Project is located in Kaiyang county of Guizhou province in China and is connected to the South China Grid (26°49' 00.14" N and 107° 14' 59.93" E).

### *Date of assessment:*

28 November 2007, based on limited documentation, and updated 30 January 2008 based on results from a mission to China and the project site and further documentation received.

### *Name and position / organisation of person(s) carrying out assessment:*

NVE working group on sustainability audit of CDM hydropower projects: Mr David A. Wright, group leader  
Mr Torodd Jensen, group adviser  
Mr Knut Gakkestad, group adviser

### *Details of persons / organisations consulted during assessment:*

Guizhou Wujiang Qingshuihe Hydropower Development Corporation Ltd	Mr Luo Yong, Assistant General Manager Mr Fan Fuping, Head of the power plant
Environmental Protection Bureau	Mr He – Head of Bureau
National Development & Reform Commission (NDRC) Guizhou Branch:	Mr Wang – Head of Local Branch
Guizhou County Government General Affairs Office	Mr Li Dong, Director
Township Government Representatives:	Mr Song, Head of village Committee
Migration Office	Mr Lu Hong You
Ping Zhai Township Primary School:	Mr Wang, Dean of School Mr Liu, School President
Guiyang Hydropower Investigation Design & Research Institute, CHECC	Mr Wei Xiao Yun-President of CHECC Mr Luo Jian Xin – Deputy Chief Engineer, responsible for Environmental Impact Assessment Mr Ni Jian – President of sub-branch of CHECC, mainly responsible for resettlement issues. Mr Chen Guozhu – President of the environmental branch of the CHECC. Mr Chen Hong – Design Manager Ms Li Hua - Secretary
Guiyang Hydroelectric Investigation,	Mr Lee – Director

Design & Research Institute, CHECGC,	Ms Lee – Head of Section
Ministry of Water Resources, Rural Hydropower & Electrification Bureau, Beijing	Mr Xing Yanyue, Deputy Director-General Ms Xuejin Zhang (Muriel), Engineer, Grid Branch
Sindicatum Carbon Capital Limited; Beijing Representative Office; Beijing United Carbon Environment Investment Co., Ltd.	Mr Shaonan Pei, General Manager Ms Giulia Sartori, CDM Project Officer Mr Wang Dan, Director, CDM Technical Consultation of Guizhou Ms Amanda Wang, Secretary Ms Zhang Min, Environmental Expert
Mr Weijun Zhu (Joe)	Conference Translator
Royal Norwegian Embassy, Beijing:	Mr Per W. Schive, Environmental Counsellor Mrs Monika P. Thowsen, First Secretary, Development Cooperation Mr Jo Inge Bekkevold, First Secretary, Political Section
Ministry of Finance, Norway:	Mr Sigurd Klakeg, Deputy Director General, Mr Jon Kristian Pareliussen, Higher Executive Officer
Ministry of Petroleum and Energy, Norway:	Mr Øyvind Johansen, Deputy Director
International Hydropower Association:	Internet resources and documents

Signature of authorising officer:     DAW

## **Main Documentation Reviewed**

Project Idea Note for Dahuashui Hydropower Project dated 9 November 2007, elaborated by Sindicatum Carbon Capital Limited

Clean Development Mechanism Project Design Document Form (CDM-PDD) Version 03 for Dahuashui Hydropower Project, completed on 24 August 2007, version 1.0.

Feasibility Study Report of the Dahuashui Hydropower Project (in part translation from Chinese)

Outline EIA report of the Dahuashui Hydropower Project, (in part translation from Chinese)

Resettlement Supervisory Report, Supervisory Center on Project Construction of the Yangtze River Commission (Hubei Province), December, 2006, (in part translation from Chinese)

Summary Report on Cultural Heritage Protection, Guizhou Provincial Archaeological Research Institute, Cultural Heritage Protection and Research Centre of the Province of Guiyang, Page 4, Conclusion.

Letter of Approval by Guizhou Provincial Cultural Heritage Protection Bureau, Serial Number: (2005) No. 11

### 3. AUDIT METHODOLOGY

The audit and analysis has been based on received documentation and verbal evidence and references from interviews with involved authorities and stakeholders

#### **3.1 Assessment of the projects compliance with international best practices within hydropower development**

The hydropower sector has guidelines to follow for assessment of the sustainability of hydropower projects. One example of such is the International Hydropower Association's (IHA's) Sustainability Guidelines that attempt to capture relevant considerations to implement justifiable hydropower projects. The IHA guidelines are based on years of experience from a wide range of experts as well as stakeholder consultation. They also invoke relevant aspects of the work of the World Commission on Dams and as such are useful in the assessment of the sustainability of hydropower projects.

It should be noted that the IHA guidelines are currently under revision, and that the current audit must be seen as a pilot study in the use of the guidelines by NVE which will be used to arrive at suggestions for improving the guidelines.

For the purposes of this evaluation the IHA Sustainability Guidelines have been adopted as an interpretation of International Best Practise and the available documentation has been examined and scrutinised in order to determine its sustainability within the framework of these guidelines.

The IHA Sustainability Guidelines require that an audit be made of the project in question. The audit shall be based on objective evidence that:

- a) Exists and is retrievable or reproducible;
- b) Is not influenced by emotion or prejudice;
- c) Is qualitative or quantitative information, records or statements of fact;
- d) Pertains to the quality of an item or service or to the existence and implementation of a process;
- e) Is based on facts obtained through observation, measurement, test or other means;
- f) Is verifiable;
- g) Is used by an auditor to determine whether or not the audit criteria have been met;
- h) Is verbal or documented;
- i) Is reported using detailed notes taken during the audit of the specific reference to the audit objective evidence, whether it be documents, locations, etc.

There are three different modes for collecting audit objective evidence.

- a) Document review - This could include examining, plans, procedures, documents, and records.
- b) Interviews - These could be conducted with responsible staff, management, and contractors. Interviews should be pre-arranged and may consist of numerous separate discussions with individuals or groups.

- c) Direct observation - This could involve looking at physical locations and at other activities related to management of an activity or process.

In this assessment all three audit objective evidence modes have been applied. Furthermore, since the Dahuashui Hydropower Project is already commissioned, the IHA Sustainability Assessment Protocol - Section C - Assessing Operating Hydropower Facilities has been applied. It should be noted that, during the site inspection visit, parts of the Dahuashui project were still incomplete and therefore Section C of the guidelines is not tailored to such a situation. One could in fact have considered applying section B of the guidelines for projects under construction. Despite this, we do consider that the results arrived at do in reflect the sustainability of the project.

This sustainability assessment uses a scoring system from 5 to 0 for twenty fundamental aspects of economic, social, and environmental sustainability pertaining to operating hydropower facilities. These aspects have been drawn from the IHA's Sustainability Guidelines.

A score of 3 is considered satisfactory and essentially meets the requirements of the Sustainability Guidelines. Lower scores indicate significant gaps and/or poor sustainability performance.

A score of 4 indicates high standard performance, occasionally exceeding the requirements of the Sustainability Guidelines, with only very minor gaps.

A score of 5 exceeds the requirements of the Sustainability Guidelines and is at, or very near, international best practice as applied to the actual / local situation.

The document is designed to look at individual facilities, but for some circumstances, it may be necessary to use groups of facilities.

The table below explains the general intent of ratings from 5 through to 0.

The aggregate score for the project, i.e. the average of all twenty aspect scores is then calculated to arrive at the total average score. The NVE group has discussed whether or not this is a suitable way of arriving at the final score, or whether some of the aspects should be weighted higher than others. For this analysis it was decided to use the average score without aspect weighting, but it is suggested that this be considered further in any future use of the IHA Sustainability Protocol.

Further details of the methodology used in the assessment can be found in the IHA Sustainability Guidelines and Protocol are available at [www.hydropower.org](http://www.hydropower.org)



#### 4. BRIEF DESCRIPTION OF THE DAHUASHUI HYDROPOWER PROJECT

The Dahuashui Hydropower Project is developed by Guizhou Wujiang Qingshuihe Hydropower Development Co. Ltd., a medium sized hydropower developer. Most of the shares are owned by state, only a small number of shares are owned by a private company. They have the license to develop this project (Dahuashui, 180 MW) and a second project (Geli Bridge 150 MW) on the Qingshuihe River, a tributary of the Wujiang River in the People's Republic of China.

A double –arch concrete dam, with a crest height of 134.5 meters is built at Pingzhai village, Gaozhai Town in Kaiyang County. The turbine house is built and houses two 90 MW water turbine generator sets giving a total installed capacity of 180 MW. According to interpretations of the engineering drawings supplied together with the Feasibility Study Report, the normal full supply water level in the reservoir is 868.34 m and the tail water level is 717.3 m which gives a normal operating head of some 151 m. The minimum operating level of the reservoir is 845 m corresponding to a minimum operating head of 127.7 m. An area of some 7.6 km<sup>2</sup> is to be flooded, resulting in a power density of 23.58 W/m<sup>2</sup> and the project is expected to generate around 660 GWh of electricity per annum.

Construction of the Dahuashui Hydropower started in December 2003 and was commissioned in September 2007 after which the project operated until early January 2008 when it was closed for continuing construction work. The project was scheduled to be put back on line on 20 January 2008, in time for power production for the forthcoming Chinese New Year celebrations.

The project meets all the host countries requirements specified by the National Development and Reform Committee and is consistent with the Rural China Plan. Furthermore the project contributes to Sustainable Development in a variety of ways.

The project will reduce CO<sub>2</sub> emissions by replacing more carbon intensive grid electricity. The alternative is electricity produced by thermal power stations. The measures undertaken to achieve this are the planning, construction and the operation of the hydropower stations and the CDM project activity is to ensure that adequate equity finance is available to secure the economy of the project, raising the rate of economic return from 6% to 9%.

The available documentation for this review of the project is shown in the list above. Some sections of these documents were translated from Chinese into English for the purpose of the review. The feasibility study and the outline environmental impact assessment for the project included drawings of the project. Furthermore, a presentation of the scheme provided by the Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC was available for the reviewers. Furthermore, additional documentation was partly translated and reviewed including the Resettlement Supervisory Report on the Dahuashui Hydropower Project by the Supervisory Center on Project Construction of the Yangtze River Commission (Hubei Province), from December, 2006.

Further project details are given in the reference documents and the appendices to this report.

The following table of project data is duplicated from the translation of the Dahuashui Outline EIA Report.

## Main Data - Dahuashui Hydropower Station

Item	Unit	Quantity	Comments
<b><u>Hydrological regime</u></b>			
Drainage areas upper dam	km <sup>2</sup>	4328	
Fixed hydrological years	Year	49	
Average annual runoff	100million m <sup>3</sup>	24.1	
Annual average flow	m <sup>3</sup> /s	76.5	1951.5 ~ 2000.4
<b><u>Design Flows</u></b>			
Designed supply standard and flow	m <sup>3</sup> /s	4940	P=1%
Checked supply standard and flow	m <sup>3</sup> /s	6740	P=0.1%
Construction diversion flow	m <sup>3</sup> /s	529	P=20%
<b><u>Reservoir</u></b>			
Water level in reservoir			
Checked flood level	m	871.32	
Designed flood level	m	868.34	
Normal water level	m	868	
Level of dead water	m	845	
Reservoir area at normal water level	km <sup>2</sup>	7.9	
Backwater length			
a. Nanshuihe River reaches	km	22.8	
b. Dumuhe River reaches	km	19.5	
Reservoir capacity :			
Total reservoir capacity	10000 m <sup>3</sup>	27650	
Capacity in normal water level	10000 m <sup>3</sup>	25070	
Regulation storage capacity	10000 m <sup>3</sup>	13550	
Minimum capacity of reservoir	10000 m <sup>3</sup>	11520	
<b><u>Benefits of project</u></b>			
No. and capacity of installation	MW	2× 90.0	
Firm capacity	MW	40.5	
Average annual energy output	100 GWh/annum	7.23	
<b><u>Inundation loss and occupied land</u></b>			
a. Inundated farmland	hectares	190.34	
b. Inundated hydro station	Kw/1	400/1	
c. Permanent occupied land	hectares	6.79	
<b><u>Major buildings and facilities</u></b>			
<i>Water-retaining structure:</i>			

Dam type			RCC arch dam
Basic intensity of earthquake		6	
Dam height	m	873	
Crest elevation	m	134.5	
Crest length	m	306.12	
<i>Water release structure</i>			
Front length of discharge dam	m	63.68	
<i>Water- flow retarding structure</i>			
Type of water inlet			tower type by banks
Design water flow	m <sup>3</sup> /s	156.2	
Diversion Tunnel	m	5405	
Tube insert in sections	m	7	
Tube insert of main pressure pipeline	m	6	
Power House:			
Type			Ground
Power House size	m	55×35.5×58 .3	Length×width × height
<b><u>Major mechanical and electrical equipment:</u></b>			
Hydraulic turbine	Number	2	
Generator	Number	2	
<b><u>Construction quantities:</u></b>			
Excavation of earth and stone	10 thousand m <sup>3</sup>	161.46	
Curtain grouting	m	71320	
Wood	m <sup>3</sup>	3720	
Cement	t	246100	
Steel	t	15100	
Workers numbers at peak:	Person	1800	(planned)
Construction years	Year	4.2	
<b><u>Economical indicators</u></b>			
Total investment	10000 Yuan	137092.94	
Investment per kW	Yuan/kw	7137	

### Power Plant Operation Rules for Dahuashui Hydropower Plant

Rules of operation for the power plant were not available during the audit. However, the plant manager explained that the plant will be run as an energy provider to the grid, meaning that the plant will be run as much as possible and at as high a capacity as possible to supply maximum possible energy to the grid. In practise this means that the plant will be operated at full design flow during the wet season, and at as high a capacity as possible during the dry season. Further details of the plan of operation of the plant would increase the confidence level of the audit and could possibly result in a higher audit score.

## 5. SCORING FOR EACH SUSTAINABILITY ASSESSMENT ASPECT

Score	Performance	Description
5	Outstanding / Strong / Comprehensive	<ul style="list-style-type: none"> <li>• At or very near international best practice.</li> <li>• Suitable, adequate, and effective planning and management systems.</li> <li>• Meets or exceeds objectives and measurable targets.</li> </ul>
4	Good to Very Good	<ul style="list-style-type: none"> <li>• High standard performance.</li> <li>• Generally suitable, adequate, and effective (minor gaps only) planning and management systems.</li> <li>• Meets most objectives and measurable targets including all critical ones.</li> </ul>
3	Satisfactory	<ul style="list-style-type: none"> <li>• Essentially meets the requirements of the <i>Sustainability Guidelines</i> (no major gaps).</li> <li>• Generally compliant with regulations and commitments (minor exceptions only).</li> <li>• Some non-critical gaps in planning and management systems.</li> <li>• Some non-critical gaps in meeting objectives and measurable targets.</li> </ul>
2	Less than satisfactory	<ul style="list-style-type: none"> <li>• Gaps in meeting the requirements of the <i>Sustainability Guidelines</i></li> <li>• Some gaps in compliance with regulations and commitments.</li> <li>• Gaps in planning and management systems.</li> <li>• Gaps in meeting objectives and measurable targets.</li> </ul>
1	Poor / Very Limited	<ul style="list-style-type: none"> <li>• Poor performance.</li> <li>• Major gaps in compliance with regulations and commitments.</li> <li>• Major gaps in planning and management systems.</li> <li>• Major gaps in meeting objectives and measurable targets.</li> </ul>
0	Very Poor	<ul style="list-style-type: none"> <li>• No evidence of meeting the requirements of the <i>Sustainability Guidelines</i>.</li> <li>• Very poor performance or failure to address fundamental issues.</li> <li>• Little or no compliance with regulations and commitments.</li> <li>• Ineffective or absent planning or management systems.</li> <li>• Fails to meet objectives and measurable targets.</li> </ul>

## 6. SUMMARY OF ASPECTS AND SCORES FOR DAHUASHUI HYDROPOWER PLANT

(Operating Hydropower Facilities)

No.	Aspect	Score	No.	Aspect	Score
C1	Governance	4	C11	Suppliers and service providers	4
C2	Economic viability	3	C12	Cultural heritage	4
C3	Additional economic benefits	4	C13	Social commitments	4
C4	Markets, innovation, and research	4	C14	Directly affected stakeholders (including the local community)	4
C5	Operational efficiency	3	C15	Environmental commitments and management	3
C6	Operational short-term and long-term reliability	4	C16	Reservoir management	3
C7	Community acceptance	4	C17	Environmental flows	3
C8	Dam, power station, and associated infrastructure safety	4	C18	Biodiversity and pest species	3
C9	Employee safety, occupational health, and well-being	4	C19	Water quality	4
C10	Employee opportunity, equity, and diversity	-	C20	Sedimentation and erosion	4

The average score based on the 19 aspects for which evidence was available for the audit is 3.68.

It should be noted that no evidence was available for Aspect C10 and thus no score has been allocated for this aspect. A process has been started to gather such evidence.

Details of the assessment of each aspect audited are given in the following pages.

Assigned scores are indicated by a small red circle for each column. The average score for each aspect is indicated by a large red circle in the left-hand column. This is the lower of the two column assessment scores for each aspect.

It should also be mentioned that for several of the aspects considered it was felt that the project could merit a higher score but that full score could not be given without further written documentation of the aspects concerned. Details for each aspect are given in the following.

### C1 Aspect: Governance.

Looks at the governance of the business in terms of sustainability objectives.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Business Principles (Performance)	Systems, Structure, and Reporting (Process)
5	<ul style="list-style-type: none"> <li>Clearly defined vision, values, ethical standards, strategies, and business principles that have strongly embedded and comprehensive sustainability objectives.</li> <li>Meets and often exceeds regulatory requirements and other commitments, including relevant international obligations.</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive, independently certified management systems, including a commitment to continual improvement.</li> <li>An efficient and effective business structure. ○</li> <li>Transparent performance reporting process.</li> </ul>
4	<ul style="list-style-type: none"> <li>Significant incorporation of sustainability objectives in values, ethical standards, strategies, and business principles. ○</li> <li>Meets and occasionally exceeds regulatory requirements and other commitments, including relevant international obligations.</li> </ul>	<ul style="list-style-type: none"> <li>Good management systems, not necessarily independently certified, including a commitment to continual improvement.</li> <li>A largely efficient and effective business structure.</li> <li>A largely effective performance reporting process.</li> </ul>
3	<ul style="list-style-type: none"> <li>Adequate levels of incorporation of sustainability objectives in values, ethical standards, strategies, and business principles.</li> <li>Generally meets regulatory requirements, including relevant international obligations.</li> </ul>	Management systems, business structure, and performance reporting process functioning, but with some gaps or weaknesses in non-critical areas.
2	<ul style="list-style-type: none"> <li>Less than satisfactory levels of incorporation of sustainability objectives in values, ethical standards, strategies, and business principles.</li> <li>Sometimes fails to meet regulatory requirements, including relevant international obligations.</li> </ul>	Large gaps in management systems, and problems with the effectiveness of the business structure and the performance reporting process.
1	<ul style="list-style-type: none"> <li>Limited levels of incorporation of sustainability objectives in values, ethical standards, strategies, and business principles.</li> <li>Often fails to meet regulatory requirements, including relevant international obligations.</li> </ul>	Major gaps in management systems, and serious problems with the effectiveness of the business structure and the performance reporting process.
0	<ul style="list-style-type: none"> <li>No recognition of sustainability objectives in the business.</li> <li>Continually fails to meet regulatory requirements, including relevant international obligations.</li> </ul>	No systematic approach to management <b>OR</b> dysfunctional business structure <b>OR</b> no performance reporting process.

### Evidence:

Mostly verbal evidence from interviews with the management of the Guizhou Wujiang Qinggshuihe Hydropower Development Corporation Ltd, Mr Luo Yong, Assistant General Manager and Mr Fan Fuping, Head of the Power Plant.

Further details in appendix.

### Comments:

- The company was established in 2004 and has 5 shareholders.
- The Company's mandate is to develop hydropower in the Qingshuihe (or Clear Water) River. The company has been given the right to develop the hydropower resources in this river by from the Provincial Government
- The company is officially registered in Guiyang City and has the following departments:
  - Planning and Development Department* – responsible for contracts, bidding and tendering process, management and signing of contracts and payments according to contracts, also responsible for company strategy.

- *General Affairs Department* – responsible for day-to-day activities in the Qingshuihe (or Clear Water) River.
- *Business Department* – This comprehensive business department is responsible for obtaining project approvals and for coordination with local authorities.
- *Financial Department* – responsible for payment and collection of receivable and taxation affairs.
- Production Safety Department – responsible for these aspects.
- *Procurement Department* – responsible for all procurement
- Furthermore, at the project development sites they have the Dahuashui Development Company Office and the Geli Bridge Development Company Office. These branch companies provide services at the project sites and carry out coordination with head office.
- Principally there are 4 parties involved in projects and the main mandate is to coordinate these partners:
  - The Guiyang Hydropower Investigation Design & Research Institute, CHECC (and through them the local stakeholders)
  - Advisory bodies
  - Contractors/construction companies/suppliers
  - The power development company itself.
- According to Chinese corporate law the company has to have a Corporate Charter and each department has its own detailed charter which includes the respective departmental regulations.
- The engineering section have set up their own quality control system, the procurement department has set up its procurement procedures system, there is a financial system tailored to all legal and financial requirements in the financial department, there are procedures for state and official and regulatory requirements etc.
- In addition the major shareholder/owner of the company which is the Wujiang Hydropower Development Corporation Ltd. (a 30% shareholder) has procedures in place which the company has to follow.
- In the annual general meeting the shareholders also give guidance on major issues and set requirements/instructions which the company has to follow.
- Extraordinary general meetings are held in case of emergency issues.
- The engineering department holds meetings on technical issues to receive views and input from the other departments.
- There are Financial Statements and Project Progress Bulletins and Contract Reports to present items to shareholders and to the responsible authorities.
- In 2005 an independent external auditing company was hired to audit the Dahuashui project and contract execution – “Tracking Auditing” – which followed the project progress.
- The company is entrusted with the development of 3 tiers of hydropower resources in the Qingshuihe (or Clear Water) River, as well as hydropower development in another river which is in an earlier stage of development. Consequently hydropower development will remain the company’s main line of business.
- Hydropower projects have the good fortune of being sustainable and the company is in an important position in this respect and it develops projects in line with national policy.
- The company has established codes of conduct. They have department-wise codes of conduct for each department in formalised form.



- The company's vision statement is clearly stated in the company's charter document.
- Although they do not have an external independent management auditing system they are under the system of their parent/owner company HUADIAN, and they have implemented that system, adapted as necessary to the power company. The parent company's management system is in line with Chinese corporate legislation.



## C2 Aspect: Economic viability.

Operations are economically viable. A business plan is in place, and auditing / monitoring measures performance against agreed benchmarks and targets.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Process
5	<ul style="list-style-type: none"> <li>Strong economic performance.</li> <li>Satisfies shareholder expectations.</li> <li>Meets or exceeds agreed benchmarks and targets.</li> </ul>	Comprehensive business planning, including auditing, monitoring, and performance reporting.
4	<ul style="list-style-type: none"> <li>Good economic performance.</li> <li>Satisfies shareholder expectations.</li> <li>Meets and occasionally exceeds agreed benchmarks and targets.</li> </ul>	Good business planning, including auditing, monitoring, and performance reporting. ○
3	<ul style="list-style-type: none"> <li>Adequate economic performance. ○</li> <li>Mostly satisfies shareholder expectations.</li> <li>Generally meets agreed benchmarks and targets.</li> </ul>	Adequate business planning, including auditing, monitoring, and performance reporting <b>OR</b> good business planning with weaknesses in some elements.
2	<ul style="list-style-type: none"> <li>Less than satisfactory economic performance.</li> <li>Moderate level of shareholder dissatisfaction.</li> <li>Fails to meet some agreed benchmarks and targets.</li> </ul>	Weakness in overall business planning or gaps in some elements.
1	<ul style="list-style-type: none"> <li>Poor economic performance.</li> <li>Significant level of shareholder dissatisfaction.</li> <li>Fails to meet most agreed benchmarks and targets.</li> </ul>	Poor business planning with some significant elements missing.
0	<ul style="list-style-type: none"> <li>Very poor economic performance.</li> <li>Lack of shareholder confidence in management.</li> <li>Fails to meet any agreed benchmarks and targets.</li> </ul>	Major weaknesses or gaps in business planning.

### Evidence:

Mostly verbal evidence from interviews with the management of the Guizhou Wujiang Qingshuihe Hydropower Development Corporation Ltd, Mr Luo Yong, Assistant General Manager and Mr Fan Fuping, Head of the Power Plant.

Further updated details of the economic rate of return of the project before and after CER were made available by Sindicatum Carbon Capital, Beijing Representative Office by Ms Zhang Min.

Further details in appendices.

### Comments:

- The management of the Hydropower Development Corporation informed that, according to original estimates the economic rate of return of the project was 8%. However, because of changes in Government policies and requirements (e.g. compensation and environmental requirements and related costs) they are now below this level. For example, housing compensation was originally Yuan 1400 and was raised to Yuan 7600 per person. Loan interest has gone up from 5.5% to 7%.

- According to information and calculations received in spreadsheet form from Sindicatum Carbon Capital, Beijing Representative Office by Ms Zhang Min, the internal economic rate of return of the Dahuashui hydropower project was 6% without CDM contributions and 9% including CDM contributions.
- The company has a separate business plan for each project. In addition they have an overall Business Charter.

*Do they use benchmarks and Targets in management?*

- They have no formal corporate targets but they are currently discussing this in management and shareholder meetings.
- They do, however, have one benchmark/target of achieving the highest national award for their project- the Luban award.
- The parent company has auditing instruments with several hundred questions and a comprehensive audit is made by them of each project covering 1. Economic Performance and 2. Investment Control.
- If these benchmark targets are reached they are allowed to continue with the project. If not then penalties are applied to the company.
- The parent company audits are carried out at each stage of the project, e.g. during construction, and also audits the working environment. After commissioning the parent company carries out further audits in a continuous process. For example they will return for a new audit some 1.5 years after commissioning and will give the final answer yes or no as to whether they accept the project. If the answer is no the company will be given a certain length of time to make improvements which have to be finally approved.
- After 1 to 1.5 years under such control they will be awarded certification of acceptance. The process of auditing does not stop here, however, and yearly inspections will be made to make sure that standards are maintained. If it is found that standards have been lowered a warning will be given and corrective measures must be taken.
- The company issues an annual report each year with balance sheet etc.
- The company has credit rating under various categories (normal in China) including:
  - Credit rating with the Grid company as a reliable supplier
  - Credit rating with the Electricity Industry Regulatory Commission
  - Credit rating with their Bank
  - Performance credit rating with the Bureau of Industry and commerce.
  - 1<sup>st</sup> Class credit rating from the local taxation bureau.

### C3 Aspect: Additional economic benefits.

Distribution of additional benefits to directly affected stakeholders and the broader community. These benefits can include:

- a) direct and indirect employment;
- b) education, transfer of knowledge, and capacity building;
- c) improved health care (new facilities, improved water supplies, provision of electricity);
- d) national development and additional economic activities, e.g., new industries;
- e) additional amenities, e.g., recreation and infrastructure (roads, electricity supply).

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Assessment Process
5	Opportunity for additional benefits has been maximised (quantum, types, and distribution).	Thorough assessment / understanding of effectiveness of additional benefits.
4	Opportunity for additional benefits has been significantly taken (quantum, types, and distribution).	Good assessment / understanding of effectiveness of additional benefits.
3	Opportunity for additional benefits not fully taken, but good level of additional benefits (quantum, types, and distribution).	Some assessment / understanding of effectiveness of additional benefits.
2	Moderate gap between opportunity and actual, but some additional benefits.	Limited assessment / understanding of effectiveness of additional benefits.
1	Substantial gap between opportunity and actual, with limited additional benefits.	Very limited assessment / understanding of effectiveness of additional benefits.
0	No opportunities taken.	No assessment of additional benefits.

### Evidence:

Mostly verbal evidence from interviews with:

Mr Li Dong, Director of County Government General Affairs Office;

Mr Wang- National Development & Reform Commission(NDRC) Local Branch;

Mr Luo Yong, Assistant General Manager, Guizhou Wujiang Qingshuihe Hydropower Development Corporation Ltd;

Mr Fan Fuping, Head of the Dahuashui Hydropower Plant

In addition visual evidence from audit team observations of local and minority unskilled workers at the construction site of the Dahuashui Hydropower Plant during the audit visit on 18 January 2008.

Further details in appendix.

### Comments:

Mr Li Dong, Director of County Government General Affairs Office:

We feel that there are 3 kinds of benefits:

- **ECONOMIC BENEFITS:** The creation of the reservoir has given us a large body of water which gives new opportunities for agriculture and tourism. This gives a huge thrust to poverty alleviation, not least for the minority groups in the area. For example farmers can now go into fisheries. Taxation revenues have increased by 6 million RMB annually.

The water capacity of the reservoir of 270 Mm<sup>3</sup> represents a great attraction for tourists. The local government is now considering how to get the most out of using this resource

- **SOCIAL BENEFITS:** The project gives both electricity and flood protection -the ability to use the storage to alleviate or lesson flooding downstream. Many villages have resolved their water supply issues from using water from the reservoir. The Government is to build a new road linking the project to various townships. The resettlement work and follow-up carried out for the project means much better living conditions for the local people. *(Auditors note: the statements in this paragraph have not been verified by documentary evidence-provision of this would increase the confidence level of the audit and possibly increase the aspect score).*

Mr Wang- National Development & Reform Commission(NDRC) Local Branch:

- During construction of the project some 2000 to 3000 local people were given work opportunities each year. *(Auditors note: No details were given regarding situation during plant operation phase -provision of this would increase the confidence level of the audit and possibly increase the aspect score).*
- Improvement of the transportation system has given more opportunities to local people and more income. *(Auditors note: the statements in this paragraph have not been verified by documentary evidence-provision of this would increase the confidence level of the audit and possibly increase the aspect score).*
- New crops and vegetables can be grown and fisheries started are good examples of new local industries as a result of the project. *(Auditors note: the statements in this paragraph have not been verified by documentary evidence-provision of this would increase the confidence level of the audit and possibly increase the aspect score).*
- In addition, the project is in line with the spirit of the Kyoto Protocol in that it reduces greenhouse gases by replacing thermal power production with clean hydropower. (In China 80% of electricity is generated from thermal plant and 20% from hydropower).

*Regarding Opportunities:*

Mr Li Dong, Director of County Government General Affairs Office:

- Kuyang County is very rich in phosphates and there are phosphate plants and coal processing plants that require much energy. They now have sufficient supplies from the hydropower plant.

*Regarding Involvement of Indigenous People:*

Mr Wang- National Development & Reform Commission(NDRC) Local Branch:

- Preference was given to the local people to ensure a good relationship between the power plant and the neighbouring communities. This was in fact a “win-win” situation since it meant better economy for the construction activities by avoiding the expenses of bringing in labour from outside the area.

- No special policies were used for the minority groups – they were treated equally with the other workers from the local area. However, the national laws of China which protect such minority groups and give them special benefits have been followed.

*Auditors note: Some of the verbal evidence quoted under this aspect suggests that the aspect merits a higher score than given. The provision of further relevant written documentation may increase the confidence level of the audit and the aspect score.*

#### C4 Aspect: Markets and innovation

Understanding of short and long-term market conditions, and ability to respond to potential changes in market conditions.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Process
5	<ul style="list-style-type: none"> <li>• Thorough understanding of present and likely future market conditions.</li> <li>• Very high confidence in ability to respond to medium and long-term market variability.</li> <li>• Frequent identification and application of new solutions to improve performance.</li> <li>• Where required, introduction of new initiatives in response to market demands.</li> </ul>	Comprehensive assessment of market conditions and influences.
4	<ul style="list-style-type: none"> <li>• Good understanding of present and likely future market conditions.</li> <li>• High confidence in ability to respond to medium and long-term market variability.</li> <li>• Some identification and application of new solutions to improve performance.</li> <li>• Where required, only rare examples where new initiatives have not been introduced to respond to market demands.</li> </ul>	Good assessment of market conditions and influences.
3	<ul style="list-style-type: none"> <li>• Moderate understanding of present and likely future market conditions.</li> <li>• Some minor uncertainty in ability to respond to medium and long-term market variability.</li> <li>• Occasional identification and application of new solutions to improve performance.</li> <li>• Where required, a few examples where new initiatives have not been introduced to respond to market demands.</li> </ul>	Moderate assessment of market conditions and influences, with minor gaps only.
2	<ul style="list-style-type: none"> <li>• Moderate understanding of present and likely future market conditions.</li> <li>• Uncertainty in ability to respond to medium and long-term market variability.</li> <li>• Limited identification and application of new solutions to improve performance.</li> <li>• Where required, a number of examples where new initiatives have not been introduced to respond to market demands.</li> </ul>	Limited assessment of market conditions and influences.
1	<ul style="list-style-type: none"> <li>• Moderate understanding of present and likely future market conditions.</li> <li>• Little confidence in ability to respond to medium and long-term market variability.</li> <li>• Very limited identification and application of new solutions to improve performance.</li> <li>• Where required, many examples where new initiatives have not been introduced to respond to market demands.</li> </ul>	Major gaps in assessment of market conditions and influences.
0	<ul style="list-style-type: none"> <li>• No understanding of present and likely future market conditions.</li> <li>• No confidence in ability to respond to medium and long-term market variability.</li> <li>• No identification and application of new solutions to improve performance.</li> <li>• Where required, no introduction of new initiatives in response to market demands.</li> </ul>	No assessment of market conditions and influences.

#### Evidence:

Mostly verbal evidence from interviews with:

- Mr Luo Yong, Assistant General Manager, Guizhou Wujiang Qingshuihe Hydropower Development Corporation Ltd;
- Mr Fan Fuping, Head of the Dahuashui Hydropower Plant

In addition visual evidence from audit team observations of state-of-the-art innovative solutions employed at the power station of the Dahuashui Hydropower Plant during the audit visit on 18 January 2008.

Further details in appendix.



**Comments:**

*Mr Fan Fuping, Head of the Dahuashui Hydropower Plant:*

- As a corporate company they also pursue maximised profits and during the project design stage they try to optimise the design to save costs. They frequently contact the CHECC design institute and experts in Beijing to obtain expert assistance in this optimisation work.  
Some examples are:
  - the spillway design which was modelled and optimised in order to save costs,
  - Dam design where the ratio between fly ash and cement was optimised using technical innovations to reduce the dam construction costs
  - Use of composite steel/concrete designs in columns in power station
  - Selling of CDM carbon credits to increase the economic viability of the project
- The company has a special team of experts who follow changes in the markets: steel, cement, fly ash price fluctuations are followed so that bids can be made at the optimum time.
- The State Grid Company is the sole purchaser of their electricity output. However, they have staff that have a close dialogue with the Grid company to find out new requirements. Many important developments emerge from this dialogue. For example the “black start up” system in which the Grid company uses the Dahuashui power plant to start up the grid system after a grid fall-out during crisis situations. *(Auditors note: no information on the effect of this on the river flow was available).*
- Another example of the benefits from close dialog with the Grid company is that in the next project they are developing (Geli Bridge), they have accepted an offer to connect to a local area close to that project which means lower transmission costs.
- The ultimate result of such close dialogue and cooperation is that the Grid Company will charge them higher priority in despatching power.
- Another example of benefits from this is that during the prefeasibility study they were considering an ordinary hydropower project with a 110 kV transmission line which is in the low tariff range in China. However, after frequent communication they actively responded to the National Strategy of providing power transfer from the west to the east of the country and were then upgraded to the 220 kV range with a higher tariff.
- The company also tries to make the best possible use of the water storage by using national policy of prioritising hydropower supply instead of thermal power production.  
*Auditors note: No details of the actual power production and its effect on the river/reservoir were available.*
- Unlike many other state companies they also have innovation in their management systems. For example they could carry out supervision/maintenance themselves but they see the risks involved in this so they have selected professional operators to come in and do the work (outsourcing). This gives them better efficiency, better results and it is contract based.

*Mr Luo Yong, Assistant General Manager, Guizhou Wujiang Qingshuihe Hydropower Development Corporation Ltd:*

- Long-term corporate objectives:
  - Up to the end of 2007 during the construction phase of the Dahuashui project the corporate objectives were mainly regarding minimising of construction costs etc.
  - Now, after commissioning they will have other objectives: They have planned new hydropower projects. They have production management as a management business objectives, safety, electricity production targets, etc.
  - Normal targets for Chinese industry is 90% smooth operation, they have a target of 98%.
  - They have safety targets and business plans, Electricity Sales Plans, Accelerated Loan Repayment Plans, Plans for higher capital returns in order to build up capital for investment in new projects.

They also have long-term business plans: Projects in the Duliujiang River where they will develop the hydropower resources in the future, as well as pumped storage project.

*Auditors note: Some of the verbal evidence quoted under this aspect suggests that the aspect merits a higher score than given. The provision of further relevant written documentation may increase the confidence level of the audit and the aspect score.*



**C5 Aspect: Operational efficiency.**

Assesses the operational efficiency of an individual power station or group of power stations in the context of the broader system and relevant market arrangements. The assessment looks at three specific areas:

1. management of the hydrological resource;
2. efficiency of the power station assets (e.g., turbines); and
3. efficiency of the network assets.

Also assesses efficiency in present context and progress towards the practicable removal of constraints that prevent optimum efficiency.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Process
5	Optimum practicable efficiency in management of the hydrological resource, the power station assets, and the network assets.	<ul style="list-style-type: none"> <li>• Comprehensive assessment of power station and network asset efficiency and hydrological management systems.</li> <li>• Benchmarking against optimum standards of efficiency in all three areas.</li> <li>• Comprehensive analysis of hydrological resource.</li> </ul>
4	<ul style="list-style-type: none"> <li>• Operating to near maximum efficiency.</li> <li>• Identification of practicable constraints with some progress towards removing constraints.</li> </ul>	<ul style="list-style-type: none"> <li>• Good assessment of power station and network asset efficiency and hydrological management systems (needs to be within the last two years).</li> <li>• Benchmarking against optimum standards of efficiency in all three areas.</li> <li>• Good analysis of hydrological resource.</li> </ul>
3	<ul style="list-style-type: none"> <li>• Operating to near maximum efficiency.</li> <li>• Identification of practicable constraints with little or no progress towards removing constraints.</li> </ul>	<ul style="list-style-type: none"> <li>• Assessment of power station and network asset efficiency and hydrological management systems (not necessarily comprehensive or recent).</li> <li>• Some benchmarking against optimum standards of efficiency in all three areas.</li> <li>• Good analysis of hydrological resource.</li> </ul>
2	<ul style="list-style-type: none"> <li>• Gaps in the efficiency of operations with some progress towards closing those gaps.</li> <li>• Limited progress in either identifying or addressing constraints that prevent optimal performance.</li> </ul>	<ul style="list-style-type: none"> <li>• Occasional assessment of asset efficiency and hydrological management systems.</li> <li>• Limited or no benchmarking against optimum standards of efficiency in all three areas.</li> <li>• Moderate analysis of hydrological resource.</li> </ul>
1	<ul style="list-style-type: none"> <li>• Significant gaps in efficiency of operations with limited progress towards closing those gaps.</li> <li>• Little progress in either identifying or addressing constraints that prevent optimal performance.</li> </ul>	<ul style="list-style-type: none"> <li>• Limited assessment of asset efficiency and hydrological management systems.</li> <li>• Limited or no benchmarking against optimum standards of efficiency in all three areas.</li> <li>• Limited analysis of hydrological resource.</li> </ul>
0	Significantly inefficient operations in all three areas <b>OR</b> no assessment of operational efficiencies issues.	Absence or major weaknesses in assessments and analysis.

**Evidence:**

Documentary evidence from the feasibility study report of the Dahuashui Hydropower project:

Chapter 2 - Hydrological Conditions

Chapter 4 – Tasks and Scale of the Project

Verbal evidence from interviews with:

- Mr Luo Yong, Assistant General Manager, Guizhou Wujiang Qingshuihe Hydropower Development Corporation Ltd;
- Mr Fan Fuping, Head of the Dahuashui Hydropower Plant
- Mr Xing Yanyue, Deputy Director General, Ministry of Water Resources, Rural Hydropower & Electrification Bureau.

Further details in appendix.

### Comments:

#### *Regarding the first area - management of the hydrological resource:*

The utilisation of the hydropower resource in the Qingshuihe River is planned by the Yangtze River Conservancy Commission, taking into account the available water resources in the basin as well as the possible users with respect to hydropower production, floods and other water uses such as irrigation and water supply etc. The river is being developed in a cascade manner in which optimum use is made of the hydrological resource and is the result of a comprehensive river basin planning exercise by the Yangtze River Conservancy Commission. More details of this are given in the Environmental Outline EIA Report.

*Auditors note: No operation plan for the power station and associated river flows and reservoir levels was available to the audit team. Such a plan would help confirm the effect of the operation of the plant on the river environment.*

#### *Regarding the second area - efficiency of the power station assets:*

All electro-mechanical equipment installed in the Dahuashui plant is of Chinese production. The dam is equipped with various built-in instrumentation including flow meters, anti-leakage pressure meters, tension sensors, temperature sensors, movement and position sensors, at 3 m spacing along the dam which can be read manually in the instrument galleries. In addition the plant water flow and reservoir levels are transmitted by fibre optic cable to the power station control room.

Dam gates can be controlled both from the gatehouse on the dam and from the power station control room.

There is a 1-year guarantee period on all equipment. They also have established planned maintenance schemes for all equipment, including agreement with the grid company for downtime coordination/despaching. They therefore coordinate low-flow demands with maintenance on the units.

#### *Regarding the third area – efficiency of the network assets:*

The grid company is the Southern Grid Company of China – Guizhou Grid Company.

The power station has emergency preparedness plans including an emergency power supply to the dam control from another site in the case of outages from the plant. The grid company is also placing an emergency diesel generator here at the power plant for plant start-up supply and for grid recovery in the case of a total power outage.

This fact demonstrates the importance which the separate grid company places on this “hub” power plant as regards grid operation – it is a “backbone” hydropower project for “black” system start-up.

*Auditors note: Some of the verbal evidence quoted under this aspect suggests that the aspect merits a higher score than given. The provision of further relevant written documentation may increase the confidence level of the audit and the aspect score.*

**C6 Aspect: Operational short-term and long-term reliability.**

Assesses the operational reliability of an individual power station or group of power stations in the context of the broader system.

This includes short-term and long-term reliability of the hydrological resource, power station assets (e.g., turbines and generators), and network assets.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Process
5	Outstanding reliability performance, and a high level of confidence in future reliability of the assets and hydrological resource on both a short-term and long-term basis.	<ul style="list-style-type: none"> <li>Comprehensive asset and hydrological resource management strategies / systems.</li> <li>Comprehensive emergency preparedness program for events such as severe droughts and equipment failure.</li> <li>High standard analysis of future reliability of hydrological resource.</li> </ul>
4	Good reliability performance and only minor uncertainties in relation this continuing into the future	<ul style="list-style-type: none"> <li>More than satisfactory asset and hydrological resource management strategies / systems.</li> <li>Good emergency preparedness program.</li> <li>Some analysis of future reliability of hydrological resource.</li> </ul>
3	Satisfactory reliability performance and some uncertainties in relation to this continuing or being improved into the future.	<ul style="list-style-type: none"> <li>Asset and hydrological resource management strategies / systems with some gaps.</li> <li>Emergency preparedness program with some gaps.</li> <li>Limited analysis of future reliability of hydrological resource.</li> </ul>
2	Less than satisfactory reliability performance and some uncertainties in relation to this continuing or being improved in the future.	<ul style="list-style-type: none"> <li>Asset and hydrological resource management strategies / systems with significant gaps.</li> <li>Emergency preparedness program with significant gaps.</li> <li>Limited or no analysis of future reliability of hydrological resource.</li> </ul>
1	Less than satisfactory reliability performance and likelihood that this would continue or worsen in the future.	<ul style="list-style-type: none"> <li>Poor asset and hydrological resource management strategies / systems.</li> <li>Poor emergency preparedness program.</li> <li>Limited or no analysis of future reliability of hydrological resource.</li> </ul>
0	Near worst practice for reliability performance and likelihood that this would continue in the future.	<ul style="list-style-type: none"> <li>Absence of asset and hydrological resource management strategies / systems and/or emergency preparedness program.</li> <li>No analysis of future reliability of hydrological resource.</li> </ul>

**Evidence:**

Documentary evidence from the feasibility study report of the Dahuashui Hydropower project:

Chapter 2 - Hydrological Conditions

Chapter 4 – Tasks and Scale of the Project

Verbal evidence from interviews with:

- Mr Luo Yong, Assistant General Manager, Guizhou Wujiang Qingshuihe Hydropower Development Corporation Ltd;
- Mr Fan Fuping, Head of the Dahuashui Hydropower Plant
- Mr Xing Yanyue, Deputy Director General, Ministry of Water Resources, Rural Hydropower & Electrification Bureau.

Further details in appendix.

**Comments:**

***The auditors experience this aspect and the previous aspect C5 to be very similar and it was difficult to distinguish between the two as regards the audit. In future evaluations and use of the IHA guidelines and sustainability protocol it should be considered whether these two aspects should perhaps be considered as one aspect.***

*Regarding the first area - management of the hydrological resource:*

The utilisation of the hydropower resource in the Qingshuihe River is planned by the Yangtze River Conservancy Commission, taking into account the available water resources in the basin as well as the possible users with respect to hydropower production, floods and other water uses such as irrigation and water supply etc. The river is being developed in a cascade manner in which optimum use is made of the hydrological resource and is the result of a comprehensive river basin planning exercise by the Yangtze River Conservancy Commission. More details of this are given in the Environmental Outline EIA Report.

*Auditors note: No operation plan for the power station and associated river flows and reservoir levels was available to the audit team. Such a plan would help confirm the effect of the operation of the plant on the river environment.*

*Regarding the second area - efficiency of the power station assets:*

There is a 1-year guarantee period on all equipment. They also have established planned maintenance schemes for all equipment, including agreement with the grid company for downtime coordination/despaching. They therefore coordinate low-flow demands with maintenance on the units.

*Regarding the third area – efficiency of the network assets:*

The grid company is the Southern Grid Company of China – Guizhou Grid Company.

The power station has emergency preparedness plans including an emergency power supply to the dam control from another site in the case of outages from the plant. The grid company is also placing an emergency diesel generator here at the power plant for plant start-up supply and for grid recovery in the case of a total power outage.

This fact demonstrates the importance which the separate grid company places on this “hub” power plant as regards grid operation – it is a “backbone” hydropower project for “black” system start-up.

*Auditors note: Some of the verbal evidence quoted under this aspect suggests that the aspect merits a higher score than given. The provision of further relevant written documentation may increase the confidence level of the audit and the aspect score.*

**C7 Aspect: Community acceptance.**

Assesses the ongoing degree of community support for the scheme and the processes used to maintain that support.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Degree of community acceptance (Performance)	Stakeholder consultation process
5	Strong community support <b>OR</b> no significant community opposition.	Comprehensive stakeholder consultation process.
4	Good level of community support <b>OR</b> minor community opposition.	Good stakeholder consultation process with very few gaps in suitability, adequacy, or effectiveness.
3	Reasonable level of community support <b>OR</b> some community opposition.	Adequate stakeholder consultation process with some gaps in suitability, adequacy, or effectiveness.
2	Limited community support <b>OR</b> moderate level of community opposition.	Significant gaps in consultation process suitability, adequacy, or effectiveness.
1	Low level of community support <b>OR</b> high level of community opposition that is not broad-based.	Weak consultation process program, largely unsuitable, inadequate, or ineffective.
0	High level of broad-based community opposition.	No stakeholder consultation process.

**Evidence:**

Documentary evidence from the feasibility study report of the Dahuashui Hydropower project:

Chapter 9 - Inundation by the reservoir and land permanently taken over by constructions  
Chapter 10 – Design for environmental protection purpose

Documentary evidence from the Resettlement Supervisory Report elaborated by the Supervisory Centre on Project Construction of the Yangtze River Commission (Hubei Province), December, 2006

Documentary evidence from the Outline Environmental Impacts Assessment Report for the Dahuashui Hydropower Project.

Verbal evidence from interviews with:

- Mr Li Dong, Director of County Government General Affairs Office:
- Mr Wang- National Development & Reform Commission (NDRC) Local Branch:
- Representatives of the local community present in meeting at hydropower plant headquarters on 17<sup>th</sup> January 2008, including Mr Song - Township Government Representative-Head of village Committee
- Ping Zhai Township Primary School, meeting with the Dean Mr Wang and the President of the school, Mr Liu on 17 January 2008.
- Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant

Further details in appendix.



**Comments:**

*Mr Li Dong, Director of County Government General Affairs Office:*

During project construction it was the local stakeholders who received the most benefit from employment. After completion they have better livelihoods and living conditions so this is why the local community has not raised any objection to the project.

*Mr Wang- National Development & Reform Commission (NDRC) Local Branch:*

- This project is designated as a priority project of the entire province and has great county-level importance. The County Government has in fact set up special teams to coordinate and promote the project of the project. Support teams have also been established at village level.
- Because of this project there is a Provincial Government budget to build a 500 km long highway linking two townships to the project area.
- The local branch of the NDRC made regulations for the safekeeping of explosives.
- Safety and Environment inspections have also been made on site to prevent accidents and ensure there are no negative impacts to the local environment.

*Mr Li Dong, Director of County Government General Affairs Office:*

There are future plans for developing tourism from the reservoir – more people will come to the area which will allow improvements to the local service sectors and give better opportunities for the local community.

*Representatives of the Local Community Present in Meeting:*

*Mr Song - a Township Government Representative-Head of village Committee:*

- We have gained benefits from the project construction period 2004-2007.
- People in our village are very cooperative. We are very active in providing our services. Sometimes we even provide services free of charge (at our own will) to help the project.
- During peak employment times we have trained local villagers to work on the project.
- The Village Committee has been actively involved in any disputes which arose and has provided timely mediation.
- We see a betterment of incomes, better housing etc. – many people have renovated their houses.

*Regarding stakeholder consultation process & documentation:*

*Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant*

- Before 2004 during the design stage and when the prefeasibility study and feasibility study period, it was mainly the Design Institute which consulted the local stakeholders
- Mainly local office for displaced people
- Local Environmental Protection Bureau
- The consultation process was carried out according to Chinese national requirements for such processes which are very detailed.
- Now after construction the power company has direct contact with the stakeholders
- Details of the process are given in the feasibility study report.

*The Resettlement Supervisory Report concludes:*

“Resettlement work of the displaced in Kaiyang County, Fuquan County, Longli County, and Guiding County where the reservoir of the Dahuashui Hydropower Station is located was very smooth. Farming land compensated to the displaced was basically materialized. The resettlement result is fairly satisfactory. Housing conditions for the displaced have been improved as a result. Cash compensation has been transferred into the hands of the displaced. Reconstruction work on special buildings has started, and some of the buildings have already been reconstructed. The financial management is stringent, and funds have been put to use in a normal way. Files and records are being managed in accordance with the relevant requirements. The communities around the reservoir area are stable. Final inspection on the reservoir base has been carried through as required. Conditions have been met to open the water gate to fill the reservoir with water.”

*Auditors note: Some of the evidence quoted under this aspect suggests that the aspect merits a higher score than given. The provision of further relevant written documentation may increase the confidence level of the audit and the aspect score.*

**C8 Aspect: Dam, power station, and associated infrastructure safety.**

Asset safety is demonstrated as a first priority for dam and power stations.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Asset Safety Performance	Asset Safety Process
5	Outstanding dam, power station, and associated infrastructure safety performance.	Comprehensive dam, power station, and associated infrastructure safety program and plan consistent with relevant international and/or national standards.
4	Good dam, power station, and associated infrastructure safety performance.	Good dam, power station, and associated infrastructure safety program with very few gaps, and plan does not quite meet relevant international and/or national standards.
3	Satisfactory dam, power station, and associated infrastructure safety performance.	Adequate dam, power station, and associated infrastructure safety program with some gaps.
2	Less than satisfactory dam, power station, and associated infrastructure safety performance.	Significant gaps in dam, power station, and associated infrastructure safety program.
1	Poor dam, power station, and associated infrastructure safety performance.	Weak dam, power station, and associated infrastructure safety program, largely unsuitable, inadequate, or ineffective.
0	Very poor dam, power station, and associated infrastructure safety performance.	Absence of dam, power station, and associated infrastructure safety program.

**Evidence:**

Documentary evidence from the feasibility study report of the Dahuashui Hydropower project:

- Various chapters including design and safety issues.
- Chapter 7 – Fire Control

Verbal evidence from interviews with:

- Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant

Visual evidence – observations made during visit to hydropower plant on 17 January 2008.

Further details in appendix.

**Comments:**

*Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant*

*Geological safety measures taken during construction for tunnels and dam:*

- The headrace tunnel is lined throughout with 0.5 to 1.0 m thick concrete lining.
- In areas of insufficient rock quality, grouting was performed at intervals of 2m along the tunnel and some 50,000 to 60,000 tonnes of grout was used at a grouting pressure of 1.4Mpa.



- The dam foundation is also lined and grouted and has a deep grouting curtain.

*Operational safety measures:*

- The power company has a safety committee and full-time personnel responsible for employee safety and occupational health.
- They have an Emergency Preparedness System. The most important plans are those for tackling flood security in the wet season which is from 15 April to 15 October.
- The dam is equipped with various built-in instrumentation including flow meters, anti-leakage pressure meters, tension sensors, temperature sensors, movement and position sensors, at 3 m spacing along the dam which can be read manually in the instrument galleries. In addition the plant water flow and reservoir levels are transmitted by fibre optic cable to the power station control room.
- Dam gates can be controlled both from the gatehouse on the dam and from the power station control room.
- They also have emergency preparedness plans including an emergency power supply to the dam control from another site in the case of outages from the plant. The grid company is also placing an emergency diesel generator here at the power plant for plant start-up supply and for grid recovery in the case of a total power outage.
- During the audit team's visit to the power plant on 17 January 2008, a general observation could be made that road cuttings and embankments had adequate slope stabilisation and protection works already in place or under construction.
- The design of the flood gates in the dam are according to Chinese national standards with a flood design capacity at least corresponding to a flood of 1000-years return period. In some countries a larger "Probable maximum flood" would be applied instead of the 1000-year flood. Furthermore, the dam does not have a free overflow spillway – the flood is to be evacuated through the manoeuvrable upper and lower flood gates. This means that in the case of failure of the gates the dam could risk overtopping. If this was an earth fill dam this would be unacceptable from a dam safety point of view. The Dahuashui project has a concrete dam which will survive overtopping. Although not optimal, this arrangement is acceptable.

*At the time of the audit, no information was available to NVE regarding the following aspects:*

- *Use of the flood gates and consequential danger to downstream activities*
- *Securing of intake and flood gates from upstream (stop logs etc.)*
- *Danger of blocking of flood gates from upstream (although a trash boom was observed)*
- *Flood warning system and possible lowering of water level in advance of a flood situation*
- *Security of the electrical supply and control system, especially under emergency conditions*
- *Public access to the facility, securing of steep slopes/openings, prevention of hazards etc.*

**C9 Aspect: Employee safety, occupational health, and well-being.**

A comprehensive employee safety, occupational health, and well-being program is in place and its effectiveness can be demonstrated. This system identifies and measures the status of employee safety, occupational health, and well-being issues and hazards. The system also details management measures to reduce or eliminate hazards and enhance occupational health and well-being.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Employee Safety, Occupational Health, and Well-Being Performance	Employee Safety, Occupational Health, and Well-Being Process
5	Outstanding employee safety, occupational health, and well-being performance.	Comprehensive safety, occupational health, and well-being employee program.
4	Good employee safety, occupational health, and well-being performance.	Good employee safety, occupational health, and well-being program with very few gaps.
3	Satisfactory employee safety, occupational health, and well-being performance.	Adequate employee safety, occupational health, and well-being program with some gaps.
2	Less than satisfactory employee safety, occupational health, and well-being performance.	Significant gaps in employee safety, occupational health, and well-being program.
1	Poor employee safety, occupational health, and well-being performance.	Weak employee safety, occupational health, and well-being program, largely unsuitable, inadequate, or ineffective.
0	Very poor employee safety, occupational health, and well-being performance.	Absence of employee safety, occupational health, and well-being program.

**Evidence:**

Documentary evidence from the feasibility study report of the Dahuashui Hydropower project:

- Chapter 12 – Employee Safety and Occupational Health

Verbal evidence from interviews with:

- Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant

Visual evidence – observations made during visit to hydropower plant on 17 January 2008. Workers were observed to be wearing required safety apparel such as helmets.

**Comments:**

*Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant:*

1. Occupational Health – the Feasibility Study report covers this and the requirements were included in the Tender Documents. The system is subject to approval from the Provincial Bureau of Public Health. The Diseases and Epidemics Preventative Station has also approved the scheme.
2. Employee Safety – The power company has a dedicated department taking care of this and has its own set of standards which they practise and monitor. In addition they have a

full-time safety inspection officer. The power company also evaluates the suitability/adequacy of the suppliers/contractors safety routines:

- If an accident occurs, in case of injury, it is the contractor's responsibility and he must cover medical expenses for the injured persons. If a fatality, the employee's family will be given compensation according to the highest national standard range for this.
- The local government has an occupational safety department who audits accidents to see who, if anyone has liability. If liability is found then they will investigate the accident further to establish who is responsible and must pay compensation to the affected parties.
- Construction contractors are required to take out liability insurance for such compensation.
- The results of the local authorities' investigation of accidents are used to make requirements and improvements to prevent similar accidents happening in the future and to make relevant follow-up and corrective measures.
- The power company has a safety committee and full-time personnel responsible for employee safety and occupational health.

*The score given here would have been higher if more documentary evidence was available. Also the audit team deemed it very early in the life of the plant to assess these aspects properly.*

**C10 Aspect: Employee opportunity, equity, and diversity.**

Employee training, development, equity, and diversity programs are in place and viewed positively by the recipients.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Standard and acceptance of employee opportunity and equity program (Performance)	Program evaluation (Process)
5	<ul style="list-style-type: none"> <li>Comprehensive employee opportunity, equity, and diversity programs, and significant training and development opportunities for employees.</li> <li>Largely positive employee feedback or minimal opposition to programs.</li> </ul>	Comprehensive employee feedback program.
4	<ul style="list-style-type: none"> <li>Good employee opportunity, equity, and diversity programs, with minor weaknesses in either equity or training and development programs.</li> <li>Generally positive employee feedback or minor opposition to programs.</li> </ul>	Good employee feedback program.
3	<ul style="list-style-type: none"> <li>Satisfactory employee opportunity, equity, and diversity programs, with some weaknesses in either equity or training and development programs.</li> <li>Moderate levels of employee opposition to programs</li> </ul>	Satisfactory employee feedback program with some gaps.
2	<ul style="list-style-type: none"> <li>Less than satisfactory employee opportunity, equity, and diversity programs, with significant weaknesses in equity, diversity, or training and development programs.</li> <li>Significant levels of employee opposition to programs.</li> </ul>	Less than satisfactory employee feedback program with significant gaps.
1	<ul style="list-style-type: none"> <li>Poor employee opportunity, equity, and diversity programs, with major weaknesses in equity, diversity, and/or training / development programs.</li> <li>Major levels of employee opposition to programs.</li> </ul>	Poor employee feedback program with major gaps.
0	<ul style="list-style-type: none"> <li>No employee opportunity, equity, and diversity programs.</li> <li>Significant levels of employee dissatisfaction.</li> </ul>	No employee feedback program.

**Evidence:**

This aspect was not addressed during the interviews held during the audit visit to the Dahuashui hydropower plant. Consequently, the score for this aspect is not included in the assessment.

**Comments:**

Information on this aspect to be requested from the Guizhou Wujiang Qingshuihe Hydropower Development Corporation Ltd.

**C11 Aspect: Suppliers and service providers.**

Measures the organisation's consideration of sustainability issues when purchasing goods and services. Also assesses the organisation's relationships with major suppliers and service providers (e.g., network service provider).

NOTE: Sustainability performance of a supplier or service provider should be assessed on the basis of the potential risk of associating with that business. For example, reputational risk or likelihood of non-compliance with sustainability objectives. Considerations should include things such as, environmental performance, the adoption of internationally recognised labour practices, human rights, and support for local employment.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Requirements and Relationships (Performance)	Analysis, Assessment, and Selection (Process)
5	<ul style="list-style-type: none"> <li>Suppliers and service providers have comprehensive sustainability performance.</li> <li>Organisation has strong relationships with major suppliers and service providers.</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive understanding of sustainability issues in purchasing goods and services.</li> <li>Comprehensive goods and service provider assessment and selection process.</li> </ul>
4	<ul style="list-style-type: none"> <li>Most suppliers and service providers have comprehensive to good sustainability performance.</li> <li>Organisation has generally good relationships with major suppliers and service providers.</li> </ul>	<ul style="list-style-type: none"> <li>Good understanding of sustainability issues in purchasing goods and services.</li> <li>Good goods and service provider assessment and selection process.</li> </ul>
3	<ul style="list-style-type: none"> <li>Some variability in sustainability performance among suppliers and service providers.</li> <li>Organisation has good relationships with most major suppliers and service providers.</li> </ul>	<ul style="list-style-type: none"> <li>Some gaps in understanding of sustainability issues in purchasing goods and services.</li> <li>Some gaps in goods and service provider assessment and selection process.</li> </ul>
2	<ul style="list-style-type: none"> <li>Variability and some poor sustainability performance among suppliers and service providers.</li> <li>Organisation has variable relationships with major suppliers and service providers.</li> </ul>	<ul style="list-style-type: none"> <li>Significant gaps in understanding of sustainability issues in purchasing goods and services.</li> <li>Significant gaps in goods and service provider assessment and selection process.</li> </ul>
1	<ul style="list-style-type: none"> <li>Dominantly poor sustainability performance among suppliers and service providers.</li> <li>Organisation has poor relationships with most major suppliers and service providers.</li> </ul>	<ul style="list-style-type: none"> <li>Major gaps in understanding of sustainability issues in purchasing goods and services.</li> <li>Major gaps in goods and service provider assessment and selection process.</li> </ul>
0	<ul style="list-style-type: none"> <li>Very poor sustainability performance across most suppliers and service providers.</li> <li>Organisation has poor relationships with nearly all major suppliers and service providers.</li> </ul>	<ul style="list-style-type: none"> <li>No understanding of sustainability issues in purchasing goods and services <b>OR</b></li> <li>No sustainability considerations in the goods and service provider assessment and selection process.</li> </ul>

**Evidence:**

Verbal evidence from interviews with:

- Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant

### **Comments:**

The project used the mandatory Chinese system of open Tendering Process for procurement works, services and supplies for the project. This is done under the Ministry of Construction rules – they use an open tendering website for announcements of tenders and have strict rules as to tender regulations etc.:

- 10 days before the tender is opened on this website, eligible companies can express their interest in being put on the list of tenderers – they have to fulfil many requirements as regards safety, employee health etc. to get this far.
- On the day of opening of the tenders a Public Notary Officer is in charge of the procedure which is done in the presence of all bidders and a panel of experts is appointed who will review the bids (1-2 months time is allowed prior to this for preparation of bids).
- The panel of experts is made up of people from the various relevant fields for the supply in question, and they usually take 1-2 days to assess the bids depending on their complexity.
- All equipment procured has a 1-year guarantee period.
- The same government tendering procedures will be applied to any new procurement during plant operation and maintenance period.
- An “Eligible” company means that they hold the relevant licenses according to the Chinese system.
- The Design Institute prepared the tender documents and the power company put them out on the government website.
- The power company has its own procurement staff responsible for this.
- They have a clause in the Tender documents asking questions about the suppliers scores in environmental provisions, also asking for info on salaries of skilled and non-skilled workers etc. (*Auditors note: no documentation of this point was available*).

### ***Information not available for the NVE audit team at the time of the audit which would increase the confidence of the audit result:***

- *Statistics on accidents and mortalities*
- *Mortalities during the construction phase*
- *Serious accidents*
- *Other events of note in this respect*



**C12 Aspect: Cultural heritage.**

Looks at the protection and conservation of historic and indigenous heritage values.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Planning (Process)
5	<ul style="list-style-type: none"> <li>Comprehensive understanding of values and issues.</li> <li>Nearly all protection and conservation requirements / targets met.</li> <li>Strong agreement on program with regulators and other stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive plans, consistent with relevant legislation and international standards.</li> </ul>
4	<ul style="list-style-type: none"> <li>Good understanding of values and issues.</li> <li>Most protection and conservation requirements / targets met.</li> <li>Good agreement on program with regulators and other stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>Good plans, generally consistent with relevant legislation and international standards.</li> </ul>
3	<ul style="list-style-type: none"> <li>Some gaps in understanding of values and issues or early phase of identifying values and issues.</li> <li>Early stage in meeting protection and conservation requirements / targets <b>OR</b> variable progress.</li> <li>Generally compliant with legislative obligations.</li> <li>Variable level of agreement on program with regulators and other stakeholders and/or some minor opposition.</li> </ul>	<ul style="list-style-type: none"> <li>Plans, generally consistent with relevant legislation and international standards, with some gaps or in early phase of development.</li> </ul>
2	<ul style="list-style-type: none"> <li>Significant gaps in understanding of values and issues.</li> <li>Significant gaps in meeting protection and conservation requirements / targets.</li> <li>Some gaps in complying with legislative obligations.</li> <li>Low level of agreement on program with regulators and other stakeholders and/or significant opposition.</li> </ul>	<ul style="list-style-type: none"> <li>Plans, with gaps in either coverage or consistency with relevant legislation and international standards.</li> </ul>
1	<ul style="list-style-type: none"> <li>Major gaps in understanding of values and issues.</li> <li>Major gaps in meeting protection and conservation requirements / targets.</li> <li>Significant gaps in complying with legislative obligations.</li> <li>Limited agreement on program with regulators and other stakeholders and/or major opposition.</li> </ul>	<ul style="list-style-type: none"> <li>Plans, with significant gaps in either coverage or consistency with relevant legislation and international standards.</li> </ul>
0	<ul style="list-style-type: none"> <li>Limited understanding of values and issues.</li> <li>Major gaps in complying with legislative obligations.</li> </ul>	<ul style="list-style-type: none"> <li>No plans in place.</li> </ul>

**Evidence:**

Documentary evidence:

- Environmental Impacts Assessment Outlines Report for the Dahuashui Hydropower Project, Chapter 3.1.6.8. Cultural Sites.
- Further documentary evidence from Letter of Approval by Guizhou Provincial Cultural Heritage Protection Bureau - Serial Number: (2005) No. 11

Verbal evidence from meeting at the Dahuashui Hydropower Plant headquarters in which representatives of local authorities and stakeholders were present (17 January 2008), including comments given by:

- Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant

**Comments:**

According to the Environmental Impacts Assessment Outlines Report, a survey of the project area by the Cultural Relics and Archaeology Institute of Guizhou and ratified by Guizhou Cultural Relics Bureau revealed 9 cultural heritage sites in the reservoir areas and 5 sites in other construction areas (see Table 3-1-2 in that report).

*Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant:*

- The Feasibility Study includes a special report “Environmental Impact Report” with the assessment made by the Cultural Heritage Protection Bureau.
- Among the sites identified was one very important one – a fresco or mural near the power house which was considered worthy of special protection and the Cultural Heritage Protection Bureau have been invited to check that no damage has been done to it. The developer has invested 300000Yuan in its protection.
- All the recommendations from the special report have to be implemented and the Cultural Heritage Protection Bureau makes inspections to ensure that this is done both during and after construction.

The Letter of Approval by Guizhou Provincial Cultural Heritage Protection Bureau - Serial Number: (2005) No. 11 reads:

*“Concerning cultural heritage protection in the affected area of Dahuashui Hydropower Station, we , Guizhou Provincial Cultural Heritage Protection Bureau, appointed Guizhou Provincial Archaeological Research Institute to be responsible for underground archaeological discovery and excavation, whereas the Cultural Heritage Protection and Research Centre of the Province together with the county-level bureau for cultural, sports, radio and TV broadcast affairs of Longli County, Kaiyang County, Guiding County, and Fuquan City were appointed to be responsible for above-ground cultural heritage protection. They have respectively done their work. Guizhou Provincial Archaeological Research Institute and the Cultural Heritage Protection and Research Centre of the Province have submitted to us their Summary Report on Archaeological Discovery and Excavation in the Construction and Inundation Areas of Dahuashui Hydropower Station and Summary Report on Above-Ground Cultural Heritage Protection at the Dahuashui Hydropower Station Affected Area. After a reviewing process, we hereby give our approval in principle to these reports.”*



**C13 Aspect: Social commitments.**

Comprehensive social management program and performance in relation to original social commitments made when the scheme was approved **AND** to current social commitments.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Planning (Process)
5	<ul style="list-style-type: none"> <li>Comprehensive identification of relevant social issues and incorporation into commitments.</li> <li>Comprehensive compliance with original and current social commitments.</li> <li>Meets or exceeds any regulatory requirements or stakeholder agreements.</li> </ul>	Comprehensive social management planning that is independently endorsed.
4	<ul style="list-style-type: none"> <li>Good identification of relevant social issues and incorporation into commitments.</li> <li>Good compliance with original and current social commitments.</li> <li>Meets or exceeds any regulatory requirements or stakeholder agreements.</li> </ul>	Comprehensive social management planning that is not independently endorsed.
3	<ul style="list-style-type: none"> <li>Adequate identification of relevant social issues and incorporation into commitments.</li> <li>Minor gaps in compliance with original and current social commitments.</li> <li>Minor gaps in meeting any regulatory requirements or stakeholder agreements.</li> </ul>	Minor gaps in social management planning.
2	<ul style="list-style-type: none"> <li>Gaps in identification of relevant social issues and incorporation into commitments.</li> <li>Gaps in compliance with original and current social commitments.</li> <li>Minor gaps in meeting any regulatory requirements or stakeholder agreements.</li> </ul>	Gaps in social management planning.
1	<ul style="list-style-type: none"> <li>Significant gaps in identification of relevant social issues and incorporation into commitments.</li> <li>Significant gaps in compliance with original and current social commitments.</li> <li>Significant gaps in meeting any regulatory requirements or stakeholder agreements.</li> </ul>	Significant gaps in social management planning.
0	<ul style="list-style-type: none"> <li>Major gaps in identification of relevant social issues and/or no incorporation into commitments.</li> <li>Major gaps in compliance with original and current social commitments.</li> <li>Major gaps in meeting any regulatory requirements or stakeholder agreements.</li> </ul>	Absence of social management planning.

**Evidence:**

Documentary evidence from the Environmental Impacts Assessment Outlines Report for the Dahuashui Hydropower Project and the Feasibility Study of the Dahuashui Hydropower Project.

Verbal evidence from meeting at the Dahuashui Hydropower Plant headquarters in which representatives of local authorities and stakeholders were present (17 January 2008), including comments given by:

- Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant
- Mr Lu Hong You – Migration Office:
- Mr Li Dong, Director of County Government General Affairs Office:

### Comments:

*Mr Lu Hong You – Migration Office:*

- All our work has been done in accordance with the plan from the Provincial Government which determines how much compensation each affected person is entitled to.
- According to this plan there were 542 persons who needed to be resettled in our county. Compensation was given for such items as fields, woods, and inundated houses.
- The compensation process was completed in 2006 and the Acceptance Procedure of the Municipal and Provincial Governments was followed.
- Initially a public bulletin system was used to inform all affected peoples of the status of each inundated property and lands in order to ensure a transparent and fair and correct process and result.
- After the villagers had fingerprinted (signed) the agreed compensation details for their property and land, the compensation was provided from the township department.
- Most reallocated people experienced an improvement in their livelihoods.
- Support to the affected persons does not finish with the compensation received. There is also a continued support of 600 Yuan per person per year for a period of 20 years paid out in cash or in the form of production support or employment opportunities. According to the state council, as much as possible of this long-term support is to be paid out in the form of cash, alternatively as job opportunities. Crop support such as ginger seeds, garlic seeds etc. have also been given to these people free of charge so that they can cultivate these crops.
- They also have plans to improve roads, transportation, water supply and electricity supply.

### *How do you manage the success of the social commitments?*

*Mr Li Dong, Director of County Government General Affairs Office:*

- The local government collects information on the various parameters, for example statistics on per capita income, roads constructed, etc. on an annual basis for all townships, counties, cities - so this is managed at governmental level.
- The various departments look after monitoring of each indication/statistic which the government establishes.

*Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant:*

- The Social Management Plan has several stakeholders including the Office of Displaced Peoples, the Provincial Environment Bureau, the Hydrological and Water Resources Bureau, the Public Hygiene and Health Department, the Cultural Heritage Bureau and the Mineral Resources Bureau. During the Prefeasibility Study period the Hydroelectric Investigation, Design & Research Institute, (CHECGC) was in charge of the work. The Institute had to approach the various parties to obtain approval for the project in the different aspects. One collective/comprehensive approval for the feasibility stage was finally given which includes all different aspects.
- No major problems were encountered during this work with respect to social management except for the resettlement issues. In order to manage the resettlement issues the Design

Institute followed comprehensive procedures. The Design Institute visited each village affected; all the houses to be inundated by the reservoir were surveyed; consultation was made with the relevant villages who had the farmland which was to be inundated by the reservoir. The consent and fingerprint (read signature) of each of these stakeholders was obtained. Next the Design Institute went to the County level administration that considered the project and gave their opinions. Next they approached the Provincial authorities for approval. Finally they took the project to the National Development & Reform Commission (NDRC). The compensation given to displaced persons was in accordance to the approved results of this process.

- Despite the comprehensive process described above, the best testimony of the community commitment and of the communities' acceptance of the process and results is that of the villagers themselves who are very happy with the outcome.

***Information not available for the NVE audit team at the time of the audit which would increase the confidence of the audit result:***

- *Information and details of fisheries opportunities in the new reservoir including new equipment/training of fishermen.*

**C14 Aspect: Directly affected stakeholders (including the local community).**

Measures the success of avoidance, mitigation, compensation, and enhancement programs addressing social impacts on directly affected stakeholders (including vulnerable social groups). Also measures community support for those programs.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Planning (Process)
5	<ul style="list-style-type: none"> <li>Directly affected stakeholders (including vulnerable social groups) have not been socially or culturally disadvantaged.</li> <li>Significant social and cultural enhancements have resulted from the project.</li> <li>No significant opposition, <b>OR</b> strong local community support for compensation and enhancement programs.</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive analysis of the social and cultural effects on directly affected stakeholders (including vulnerable social groups).</li> <li>Comprehensive social and cultural compensation and/or enhancement programs.</li> <li>Comprehensive involvement of the local community and other directly affected stakeholders.</li> </ul>
4	<ul style="list-style-type: none"> <li>Directly affected stakeholders (including vulnerable social groups) have not been socially or culturally disadvantaged.</li> <li>Moderate social and cultural enhancements have resulted from the project.</li> <li>Minor opposition, <b>OR</b> good local community support for compensation and enhancement programs.</li> </ul>	<ul style="list-style-type: none"> <li>Good analysis of the social and cultural effects on directly affected stakeholders (including vulnerable social groups).</li> <li>Good social and cultural compensation and/or enhancement programs.</li> <li>Significant involvement of the local community and other directly affected stakeholders.</li> </ul>
3	<ul style="list-style-type: none"> <li>Directly affected stakeholders (including vulnerable social groups) have not been socially or culturally disadvantaged when considering the net result of compensation and enhancement programs.</li> <li>Some opposition, <b>OR</b> reasonable level of local community support for compensation and enhancement programs.</li> </ul>	<ul style="list-style-type: none"> <li>Minor gaps in the analysis of the social and cultural effects on directly affected stakeholders (including vulnerable social groups).</li> <li>Largely satisfactory social and cultural compensation and/or enhancement programs.</li> <li>Moderate involvement of the local community and other directly affected stakeholders.</li> </ul>
2	<ul style="list-style-type: none"> <li>Directly affected stakeholders (including vulnerable social groups) have experienced minor levels of social or cultural disadvantage when considering the net result of compensation and enhancement programs.</li> <li>Moderate level of opposition, <b>OR</b> limited local community support for compensation and enhancement programs.</li> </ul>	<ul style="list-style-type: none"> <li>Gaps in the analysis of the social and cultural effects on directly affected stakeholders (including vulnerable social groups).</li> <li>Some gaps in the social and cultural compensation and/or enhancement programs.</li> <li>Limited involvement of the local community and other directly affected stakeholders.</li> </ul>
1	<ul style="list-style-type: none"> <li>Directly affected stakeholders (including vulnerable social groups) have experienced significant levels of social or cultural disadvantage when considering the net result of compensation and enhancement programs.</li> <li>High level of opposition, <b>OR</b> low level of local community support for compensation and enhancement programs.</li> </ul>	<ul style="list-style-type: none"> <li>Major gaps in the analysis of the social and cultural effects on directly affected stakeholders (including vulnerable social groups).</li> <li>Major gaps in the social and cultural compensation and/or enhancement programs.</li> <li>Very limited involvement of the local community and other directly affected stakeholders.</li> </ul>
0	<ul style="list-style-type: none"> <li>Directly affected stakeholders (including vulnerable social groups) have experienced major levels of social or cultural disadvantage when considering the net result of compensation and enhancement programs.</li> <li>Very high level of opposition, <b>OR</b> no local community support for compensation and enhancement programs.</li> </ul>	<ul style="list-style-type: none"> <li>No analysis of the social and cultural effects on directly affected stakeholders (including vulnerable social groups).</li> <li>No social and cultural compensation and/or enhancement programs.</li> <li>No involvement of the local community and other directly affected stakeholders.</li> </ul>

**Evidence:**

Documentary evidence from the Environmental Impacts Assessment Outlines Report for the Dahuashui Hydropower Project and the Feasibility Study of the Dahuashui Hydropower Project.

Verbal evidence from meeting at office of Guiyang Hydropower Investigation Design & Research Institute, CHECC: (17 January 2008), including comments given by:

- Mr Ni Jian – President of sub-branch of CHECC, mainly responsible for resettlement issues.

**Comments:**

*Mr Ni Jian – President of sub-branch of CHECC, mainly responsible for resettlement issues.*

- A proposal for a dam of this size always involves resettlement in a country like China and opinions in China regarding how best to handle resettlement are always quite varied.
- Also, when a dam is to be built in a drainage plain (flat area), there will often be conflicts with directly affected people.
- However, people living on high plateau areas such as for this project with deep valleys and at high elevations have quite a different lifestyle to those living down on the plains.
- Before the 1970s such “highland” people mainly relied on the terraced fields on mountain slopes, on cutting down trees on highland land, and were barely subsisting on this meagre basis.
- Since China made reforms, betterment of people’s livelihoods was achieved and transportation was improved with new roads etc., all of which lead to increases in income. However, the people living in upper areas did not benefit from this and to do so they had to move away from their villages to the plain areas and towns. Consequently, the resettlement plan for the project had to take account of this and not try to force the people to stay in the areas if their livelihood was to be improved.
- Even if the Dahuashui hydropower project had not been built, the Government does in fact have a separate “Resettlement for Ecological Considerations” Plan and a Poverty Alleviation Resettlement Plan.
- Due to low economic activity, development in the project area has however traditionally been slow. Thus construction of the hydropower station has been a very good opportunity to actually carry out this economic resettlement and thus improve the living standards of the affected people. In other words the hydropower project has accelerated the governments plans for increasing the livelihoods of the affected people.
- The resettlement plan for the Dahuashui Hydropower Project is thus in accordance with these land management laws and regulations. Certain local residents were moved away from the local area which could not support them.
- Residences inundated by the reservoir involved 116 people
- Total resettlement was 1159 people.
- The resettlement procedure was as follows:
  - Each and every household was visited and assessed regarding their assets/resources and in order to inform them of the plans and to get their consent and signature.
  - They were then given choices to select from and when in agreement they signed a document to confirm agreement.
- According to Chinese Government laws a hydropower developer must undertake many social responsibilities including:
  - Displaced people’s standard of living must be higher than before they were affected by the project.
  - Comparisons are made between old and new living standards at the old and new locations.
- With regards to the Dahuashui project directly affected local residents, their living standards were very low before the project – living in sheds and huts made of wood, straw

or mud. The education level was also very poor due to low accessibility, as were the local medical and health facilities.

- After resettlement almost all of the people are now living in brick houses with more floor space and with improved accessibility to schools and better medical care.
- The plan is reviewed by Government authorities and approved. There is also independent monitoring to check that the plan has been carried out. In addition there is further monitoring later on to check that it is successful on a long-term basis.
- This monitoring consists of two steps:
  - Mobilisation of social experts from different departments who make a comprehensive supervision of the efforts;
  - Government authorities also carry out monitoring of the lower level activities;
- The acceptance procedure has the same steps with environmental authorities and independent experts from society who review the acceptance.

***What about cultural enhancement measures for vulnerable groups?***

- The Miao People are widespread in the Province and they survive in all kinds of local conditions. In the project area the local Miao People have been mingled with the other people for hundreds of years. Therefore they have very little different requirements from the rest of the people.
- The resettlement of the Miao people was, like all people affected by the project, done according to their own choice (will), and no special requirements were heard from them and thus no special project-based cultural enhancement measures were found relevant.
- Furthermore, the minorities in the area do in fact receive some preferential treatment from national government policies – outside of the project. For example minorities have priorities at University. They are also allowed to have two children instead of one, amongst other things.



**C15 Aspect: Environmental commitments and management.**

Performance in relation to original environmental commitments made when the scheme was approved **AND** to current environmental commitments (including environmental management systems).

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Process
5	<ul style="list-style-type: none"> <li>Comprehensive compliance with original and current environmental commitments.</li> <li>Exceeds regulatory requirements in several areas.</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive environmental management system that is independently certified to a relevant international standard.</li> <li>Comprehensive auditing that demonstrates compliance with original and current environmental commitments.</li> </ul>
4	<ul style="list-style-type: none"> <li>Good compliance with original and current environmental commitments.</li> <li>Exceeds regulatory requirements in some areas.</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive environmental management system (conforming to a relevant international standard) that is not independently certified.</li> <li>Comprehensive auditing that demonstrates compliance with original and current environmental commitments.</li> </ul>
3	<ul style="list-style-type: none"> <li>Largely complies with original and current environmental commitments.</li> <li>Essentially meets regulatory requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Good environmental management system (minor gaps only when measured against a relevant international standard).</li> <li>Evidence of essential compliance with original and current environmental commitments.</li> </ul>
2	<ul style="list-style-type: none"> <li>Gaps in compliance with original and current environmental commitments.</li> <li>Minor gaps in meeting regulatory requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Gaps in environmental management system.</li> <li>Evidence of only partial compliance with original and current environmental commitments.</li> </ul>
1	<ul style="list-style-type: none"> <li>Significant gaps in compliance with original and current environmental commitments.</li> <li>Significant gaps in meeting regulatory requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Significant gaps in environmental management system.</li> <li>Evidence of limited compliance with original and current environmental commitments.</li> </ul>
0	<ul style="list-style-type: none"> <li>Major gaps in compliance with original and current environmental commitments.</li> <li>Major gaps in meeting regulatory requirements.</li> </ul>	<p>Absence of management system, and absence of evidence of compliance with original and current environmental commitments.</p>

**Evidence:**

Verbal evidence from meeting with the Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC:

- Mr Chen Guozhu – President of the environmental branch of the CHECC

Further verbal evidence from meeting at the Dahuashui Hydropower Plant headquarters in which representatives of local authorities and stakeholders were present (17 January 2008), including comments given by:

- Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant



**Comments:**

*Mr Chen Guozhu – President of the environmental branch of the CHECC:*

- According to Chinese EIA regulations, after a hydropower plant has been in operation for 3 to 5 years, the Environmental Management Plan must be re-evaluated and updated.
- Details of the Environmental Management Plan can be found in the Feasibility Report. There is also a separate Environmental Management Plan and Environmental Monitoring Programme which has been made at the beginning of the construction period.
- Monitoring and follow-up of the Environmental Management and Monitoring Programs is made as follows:
  - The Environmental Management Plan is executed by the Power Company
  - Monitoring is done by a Government Department
  - Water Quality Monitoring is done by a supervisory body (design institute)
  - Migration Monitoring is done by a supervisory body (this design institute has a contract with the power company to do the monitoring)
  - Relevant bodies for this are the Provincial Environmental Monitoring Station; the Provincial Water Quality Monitoring Station, and the Environmental Protection Bureau of the Provincial Government.

*Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant:*

- The environmental commitments and management plans have not yet been finally approved pending finalisation of the environmental works such as the weir and landscaping and greenification etc.

***Note from NVE audit team:***

*The aspect score would have been higher had the landscaping and greenification process been completed and the results could be seen.*

**C16 Aspect: Reservoir management.**

Measures the effectiveness of the reservoir management regime to meet agreed environmental, social, and economic outcomes.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Process
5	<ul style="list-style-type: none"> <li>All environmental, social, and economic objectives for the reservoir management regime have been met or exceeded.</li> <li>Strong community and regulator support (or no significant opposition) for reservoir management regime.</li> </ul>	<ul style="list-style-type: none"> <li>Thoroughly researched and defined environmental (including biodiversity), social, and economic objectives for reservoir management regime.</li> <li>Comprehensive process for identifying stakeholder concerns.</li> </ul>
4	<ul style="list-style-type: none"> <li>All environmental, social, and economic objectives for the reservoir management regime have been met or are on target to be met.</li> <li>Good community and regulator support (or very minor opposition) for reservoir management regime.</li> </ul>	<ul style="list-style-type: none"> <li>Well researched with most environmental (including biodiversity), social, and economic objectives defined for reservoir management regime.</li> <li>Good process for identifying stakeholder concerns.</li> </ul>
3	<ul style="list-style-type: none"> <li>All major environmental, social, and economic objectives for the reservoir management regime have been met or are on target to be met.</li> <li>General community and regulator support (or minor opposition) for reservoir management regime.</li> </ul>	<ul style="list-style-type: none"> <li>Minor gaps in research or program only partially completed. Objectives only partially defined with plans in place to complete.</li> <li>Satisfactory process for identifying stakeholder concerns.</li> </ul>
2	<ul style="list-style-type: none"> <li>Gaps in meeting environmental, social, and economic objectives for the reservoir management regime and/or gaps in the plans to meet objectives.</li> <li>Partial community and regulator support (or moderate levels of opposition) for reservoir management regime.</li> </ul>	<ul style="list-style-type: none"> <li>Less than satisfactory level of research. Gaps in program or plans to complete.</li> <li>Less than satisfactory process for identifying stakeholder concerns.</li> </ul>
1	<ul style="list-style-type: none"> <li>Major gaps in meeting environmental, social, and economic objectives for the reservoir management regime and/or major gaps in the plans to meet objectives.</li> <li>Limited community and regulator support (or significant opposition) for reservoir management regime.</li> </ul>	<ul style="list-style-type: none"> <li>Limited research with major gaps.</li> <li>Weak process for identifying stakeholder concerns.</li> </ul>
0	<ul style="list-style-type: none"> <li>No environmental, social, and economic objectives for the reservoir management regime have been met.</li> <li>No community and regulator support (or major opposition) for reservoir management regime.</li> </ul>	<ul style="list-style-type: none"> <li>No research or absence of program or plans or no process to understand concerns.</li> </ul>

**Evidence:**

Verbal evidence from meeting at the Dahuashui Hydropower Plant headquarters in which representatives of local authorities and stakeholders were present (17 January 2008), including comments given by:

- Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant

**Comments:**

*Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant:*

- *OPERATIONAL MANAGEMENT* of the plant: water level adjustment, water quality management, e.g. trash bar.
- Migration of displaced people resettlement report and measures.
- Displaced Persons Resettlement Report – All measures in the report have been followed and accomplished. Acceptance check-up has been completed and every indicator has been met and audited by the Resettlement Department.
- Refer to the report: “Report of Supervisory Centre on Construction Project of the Yangtze River Hydraulic Commission. This is a report from an independent assessment of the resettlement measures. The report explains how they have carried out supervision of the resettlement in the hydro project and considers different indicators such as compensation levels, infrastructure construction and recovery of social framework. The audits carried out seminars with local villages and investigated the security of the society.

A copy of the conclusions of the report was obtained.

***Note from NVE audit team:***

*The aspect score may have been higher had the audit team had more information and insight into the reservoir management process and plans.*

**C17 Aspect: Environmental flows.**

Measures the effectiveness of the environmental flow regime to meet agreed environmental, social, and economic outcomes.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Process
5	<ul style="list-style-type: none"> <li>All environmental, social, and economic objectives for the reservoir management regime have been met or exceeded.</li> <li>Strong community and regulator support (or no significant opposition) for environmental flow regime.</li> </ul>	<ul style="list-style-type: none"> <li>Thoroughly researched and defined environmental (including biodiversity), social, and economic objectives for environmental flow regime.</li> <li>Comprehensive process for identifying stakeholder concerns.</li> </ul>
4	<ul style="list-style-type: none"> <li>All environmental, social, and economic objectives for the environmental flow regime have been met or are on target to be met.</li> <li>Good community and regulator support (or very minor opposition) for environmental flow regime.</li> </ul>	<ul style="list-style-type: none"> <li>Well researched with most environmental (including biodiversity), social, and economic objectives defined for environmental flow regime.</li> <li>Good process for identifying stakeholder concerns.</li> </ul>
3	<ul style="list-style-type: none"> <li>All major environmental, social, and economic objectives for the environmental flow regime have been met or are on target to be met.</li> <li>General community and regulator support (or minor opposition) for environmental flow regime.</li> </ul>	<ul style="list-style-type: none"> <li>Minor gaps in research or program only partially completed. Objectives only partially defined with plans in place to complete.</li> <li>Satisfactory process for identifying stakeholder concerns.</li> </ul>
2	<ul style="list-style-type: none"> <li>Gaps in meeting environmental, social, and economic objectives for the environmental flow regime and/or gaps in the plans to meet objectives.</li> <li>Partial community and regulator support (or moderate levels of opposition) for environmental flow regime.</li> </ul>	<ul style="list-style-type: none"> <li>Less than satisfactory level of research. Gaps in program or plans to complete.</li> <li>Less than satisfactory process for identifying stakeholder concerns.</li> </ul>
1	<ul style="list-style-type: none"> <li>Major gaps in meeting environmental, social, and economic objectives for the environmental flow regime and/or major gaps in the plans to meet objectives.</li> <li>Limited community and regulator support (or significant opposition) for environmental flow regime.</li> </ul>	<ul style="list-style-type: none"> <li>Limited research with major gaps.</li> <li>Weak process for identifying stakeholder concerns.</li> </ul>
0	<ul style="list-style-type: none"> <li>No environmental, social, and economic objectives for the environmental flow regime have been met.</li> <li>No community and regulator support (or major opposition) for environmental flow regime.</li> </ul>	<ul style="list-style-type: none"> <li>No research or absence of program or plans or no process to understand concerns.</li> </ul>

**Evidence:**

- Documentary evidence – Feasibility Study Report and Environmental Impact Analysis Outline report.
- Verbal evidence from discussions with:
  - Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant
  - Mr Chen Guozhu – President of the environmental branch of the CHECC:

- Visual evidence from site inspection and photographs of the river and the construction site of the weir.

**Comments:**

*Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant:*

- A weir is being built some 2.7 km downstream of the main dam to capture water from a tributary (the Gebang stream) on the right bank to keep water level in the main river downstream of the Dahuashui Dam.
- In this way no environmental releases are deemed necessary from the main dam itself. The stream has a dry-season flow of some 1 m<sup>3</sup>/s and a wet-season flow of some 7 m<sup>3</sup>/s. This is 9.15% of the average annual flow in the main river.

*Mr Chen Guozhu – President of the environmental branch of the CHECC:*

- They have consulted the local villagers on the aspect of the environmental flow demand and they are very positive to it. Also the Provincial Government experts are consulted and approval has been sought.

(See also comments on fish species under Aspect C18).

***Note from NVE audit team:***

*Although the weir being built downstream of the main dam may ensure that there is water in the river bed downstream of the dam from water diverted from a side stream, there is still no environmental flow released from the main dam itself and therefore the flow in the river stretch between the tributary intake weir and the power station will be limited to the flow from the tributary. It may well be that this is sufficient for water uses in this stretch of the river. Documentation of this fact would increase this aspect score.*

*Furthermore, documentation of the conditions in the river during the dry season including the planned production releases from the power plant and a comparison of these flows with the water uses and ecological uses in the downstream river reach would increase the confidence of this evaluation.*

**C18 Aspect: Biodiversity and pest species.**

Looks at agreed ecosystem values, habitat, and specific issues such as threatened species, fish passage, and pest species in the catchment, reservoir, and downstream areas.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Agreement and Performance	Knowledge and Planning
5	<ul style="list-style-type: none"> <li>Achievement of all objectives and targets.</li> <li>Comprehensive agreement with regulators and other stakeholders on ecosystem values.</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive understanding of relevant catchment, in-reservoir, and downstream biodiversity issues.</li> <li>Comprehensive program with clear objectives and targets in place.</li> </ul>
4	<ul style="list-style-type: none"> <li>Significant progress in meeting objectives and targets.</li> <li>Agreement with regulators and other stakeholders covering most issues with only minor gaps on ecosystem values.</li> </ul>	<ul style="list-style-type: none"> <li>Good understanding of issues.</li> <li>Program with good coverage.</li> </ul>
3	<ul style="list-style-type: none"> <li>Early phase of progress towards meeting objectives and targets <b>OR</b> variable progress.</li> <li>Agreement with regulators and other stakeholders on some issues with progress towards closing gaps.</li> </ul>	<ul style="list-style-type: none"> <li>Some gaps in understanding of issues.</li> <li>Program with satisfactory coverage.</li> </ul>
2	<ul style="list-style-type: none"> <li>Limited progress towards meeting objectives and targets.</li> <li>Agreement with regulators and other stakeholders on few issues.</li> </ul>	<ul style="list-style-type: none"> <li>Significant gaps in understanding of issues.</li> <li>Program with significant gaps.</li> </ul>
1	<ul style="list-style-type: none"> <li>Little progress towards meeting objectives and targets.</li> <li>Limited agreement with regulators and other stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>Major gaps in understanding of issues.</li> <li>Program with major gaps.</li> </ul>
0	<ul style="list-style-type: none"> <li>No progress towards meeting objectives and targets.</li> <li>No agreement with regulators and other stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>Limited understanding of issues.</li> <li>No program.</li> </ul>

**Evidence:**

- Documentary evidence – Feasibility Study Report and Environmental Impact Analysis Outline report.
- Verbal evidence from meeting at office of Guiyang Hydropower Investigation Design & Research Institute, CHECC in Guiyang on 18 January 2008.

**Comments:**

*Mr Chen Guozhu – President of the environmental branch of the CHECC:*

- Very detailed investigations were made into biodiversity and threatened species in the Environmental Impact Assessment studies.
- According to the results of these studies, the project construction area was so much changed by human activity from before that there were no red-listed species to be found in the project affected area.

- Detailed investigation of fish populations in the river/reservoir area are given in the EIA report. The main conclusions are that the mainstream river has very poor water quality and due to this fish populations are poor. Consequently, measures have been designed and are being implemented to improve the aquatic environment.
- The main proposal is the construction of the weir between the main Dahuashui dam and the power station, in the part of the river which is affected by the project. This will lead the water from the Gebeng side stream back up to the dam and ensure aquatic conditions in this dry reach of the main river and in the tributary.
- They have consulted the local villagers on this aspect as well as the Provincial Government experts and approval has been sought.



**C19 Aspect: Water quality.**

Management of water quality in the reservoir and downstream of the power station.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Process
5	<ul style="list-style-type: none"> <li>Comprehensive understanding of water quality issues.</li> <li>Scheme operations either enhance or do not cause deterioration to reservoir or downstream water quality.</li> <li>Strong operator influence, where practicable, on the behaviour of other water users to protect water quality.</li> <li>The scheme meets or exceeds regulatory requirements and commitments in the area of water quality.</li> </ul>	Comprehensive water quality management program, by either the scheme owner or other organisation, e.g., government organisation.
4	<ul style="list-style-type: none"> <li>Good understanding of water quality issues.</li> <li>Scheme operations either enhance or do not cause deterioration to reservoir or downstream water quality.</li> <li>Some operator influence, where practicable, the behaviour or other water users to protect water quality.</li> <li>The scheme meets or occasionally exceeds regulatory requirements and commitments in the area of water quality.</li> </ul>	Good water quality management program, by either the scheme owner or other organisation, e.g., government organisation.
3	<ul style="list-style-type: none"> <li>Adequate understanding of water quality issues.</li> <li>Scheme operations cause only occasional and minor deterioration to reservoir or downstream water quality.</li> <li>Limited operator influence, where practicable, the behaviour or other water users to protect water quality.</li> <li>The scheme essentially meets regulatory requirements in the area of water quality.</li> </ul>	Adequate water quality management program, by either the scheme owner or other organisation, e.g., government organisation.
2	<ul style="list-style-type: none"> <li>Gaps in understanding of water quality issues.</li> <li>Scheme operations cause some occasional and moderate deterioration to reservoir or downstream water quality.</li> <li>The scheme sometimes fails to meet regulatory requirements in the area of water quality.</li> </ul>	Gaps in water quality management program, by either the scheme owner or other organisation, e.g., government organisation.
1	<ul style="list-style-type: none"> <li>Poor understanding of water quality issues.</li> <li>Scheme operations cause ongoing deterioration to reservoir or downstream water quality.</li> <li>The scheme often fails to meet regulatory requirements in the area of water quality.</li> </ul>	Major gaps in water quality management program, by either the scheme owner or other organisation, e.g., government organisation.
0	<ul style="list-style-type: none"> <li>Limited or no understanding of water quality issues.</li> <li>Scheme operations cause major ongoing deterioration to reservoir or downstream water quality.</li> <li>The scheme continuously fails to meet regulatory requirements in the area of water quality.</li> </ul>	Absence of water quality management program, by either the scheme owner or other organisation, e.g., government organisation.

**Evidence:**

- Documentary evidence – Feasibility Study Report and Environmental Impact Analysis Outline report.
- Verbal evidence from meeting at office of Guiyang Hydropower Investigation Design & Research Institute, CHECC in Guiyang on 18 January 2008.

**Comments:**

*Mr Chen Guozhu – President of the environmental branch of the CHECC:*

- The project is approved by the Provincial Environmental Protection Bureau.
- The CHECC design institute is the only one in China certified for making designs for such a hydro project – certification number of the design institute is A3301.
- Water quality in the river is not good from before; barely “4<sup>th</sup>-grade” according to the Chinese water quality classification system.
- According to the Provincial Planning of water use, this section of the water resources in the catchment is 4<sup>th</sup> grade – mainly used for agricultural purposes.
- According to the Water Quality Control Plan for the Guiyang area, the water quality is low because of human activity and domestic releases.
- They the project construction period a comprehensive water quality control programme was applied including flocculation of water waste discharges from the construction activities. Domestic wastewater from construction workers camps was treated and used for agricultural purposes.
- The “First Class B” standard was used for monitoring this water quality programme. The monitoring was carried out by a third-party arranged by the power company and the local environment bureau.
- There is a phosphate mining company downstream of the project and the project is designed so that their water requirements are satisfied. In addition the water resources authorities have a water allocation plan for the entire area and hence no individual agreement was needed with this mine for the project itself – these things are coordinated and planned by the government.
- The phosphate mine’s water supply situation has in fact been improved as a result of constructing the project.

**C20 Aspect: Sedimentation and erosion.**

Understanding the risks associated with reservoir and downstream sedimentation and erosion. Measures the effectiveness of programs to manage these risks. These programs could include, for example, specific operational rules, capital works, and catchment management programs.

**Sustainability Scoring:** Assess both columns. If a column has more than one point, all criteria must be met for a score to be awarded. The aspect score is the lower of the two column assessments.

Score	Performance	Process
5	<ul style="list-style-type: none"> <li>Comprehensive understanding of reservoir and downstream sedimentation and erosion issues and risks.</li> <li>Comprehensive understanding of stakeholder concerns.</li> <li>Maximum, practicable participation in catchment management planning and implementation.</li> <li>Strategies are supported by external stakeholders, including regulators.</li> <li>All objectives have been met or exceeded.</li> </ul>	Comprehensive risk management programs, by either the operator and/or other organisation, e.g., government agencies.
4	<ul style="list-style-type: none"> <li>Good understanding of reservoir and downstream sedimentation and erosion issues and risks.</li> <li>Good understanding of stakeholder concerns.</li> <li>High level, practicable participation in catchment management planning and implementation</li> <li>Program of strategy implementation is largely supported by external stakeholders, including regulators.</li> <li>All objectives have been met or are on target to be met.</li> </ul>	Good risk management programs, by either the operator and/or other organisation, e.g., government agencies.
3	<ul style="list-style-type: none"> <li>Adequate understanding of reservoir and downstream sedimentation and erosion issues and risks.</li> <li>Adequate understanding of stakeholder concerns.</li> <li>Adequate level, practicable participation in catchment management planning and implementation <b>OR</b> an inability to participate due to issues beyond the control of the scheme operator.</li> <li>Program of strategy implementation is only partially supported by external stakeholders, including regulators, or has minor levels of opposition.</li> <li>All major objectives have been met or are on target to be met.</li> </ul>	Adequate risk management programs, by either the operator and/or other organisation, e.g., government agencies.
2	<ul style="list-style-type: none"> <li>Gaps in understanding of reservoir and downstream sedimentation and erosion issues and risks.</li> <li>Gaps in understanding of stakeholder concerns.</li> <li>Low level, practicable participation in catchment management planning and implementation.</li> <li>Low level of support for program of strategy implementation by external stakeholders, including regulators, or moderate level of opposition.</li> <li>Gaps in meeting objectives and/or gaps in the plans to meet objectives.</li> </ul>	Gaps in risk management programs, by either the operator and/or other organisation, e.g., government agencies.
1	<ul style="list-style-type: none"> <li>Poor understanding of reservoir and downstream sedimentation and erosion issues and risks.</li> <li>Poor understanding of stakeholder concerns.</li> <li>Very limited, practicable participation in catchment management planning and implementation.</li> <li>Very low level of support for program of strategy implementation by external stakeholders, including regulators, or significant levels of opposition.</li> <li>Major gaps in meeting objectives and/or major gaps in the plans to meet objectives.</li> </ul>	Major gaps in risk management programs, by either the operator and/or other organisation, e.g., government agencies.
0	<ul style="list-style-type: none"> <li>Very limited or no understanding of reservoir and downstream sedimentation and erosion issues and risks.</li> <li>Very limited or no understanding of stakeholder concerns.</li> <li>No practicable participation in catchment management planning and implementation.</li> <li>Major opposition to the scheme operations on the basis of its sedimentation and erosion performance.</li> <li>No objectives have been met.</li> </ul>	Absence of risk management programs, by either the operator and/or other organisation, e.g., government agencies.

**Evidence:**

- Documentary evidence – Feasibility Study Report and Environmental Impact Analysis Outline report.
- Visual evidence – sightings and photographs of bank stability works from audit visit to power plant site.

- Verbal evidence from meeting at office of Guiyang Hydropower Investigation Design & Research Institute, CHECC in Guiyang on 18 January 2008.
- Verbal evidence from comments by Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant during stakeholder meeting at the Dahuashui Hydropower Plant headquarters on 17 January 2008.

**Comments:**

*Mr Chen Guozhu – President of the environmental branch of the CHECC:*

- This hydropower plant is a project approved by the Provincial Government.
- The dam is only the third in a series of dams on the river and generally the residual sediment transport in the regulated river is very slight.
- There is already a Catchment Management Plan in place in the upstream reaches of the river due to the existing dam, as well as an erosion prevention plan.
- For the Dahuashui project we also have an erosion prevention plan which is approved by the Chinese erosion prevention law.
- The CHECC is an “A-Class 83” certified institute and has prepared the investigations, studies and plans.

*Mr Fan Fuping, Guiyang Hydroelectric Investigation, Design & Research Institute, CHECGC, and Head of the power plant:*

- The Qingshuihe (or Clear Water) River, a tributary of two other rivers. The sedimentation in the rivers is very slight and will be contained within the reservoir (i.e. little turbine wear is to be expected).
- As regards downstream erosion, since the water was already “lean” of sediments from before, no major changes are foreseen. However, there is an erosion management plan for downstream of the dam in the Feasibility Study and this is being implemented. This includes bank stability measures, vegetation recovery, etc. The plan was made by the Design Institute on erosion prevention.
- They are now in the tendering process for this recommended protection work which will be monitored by the provincial authorities.

***Note from NVE audit team:***

*This aspect score would have been higher if more information on the following aspects had been available to the audit team:*

- *Analysis of danger of landslides and water level fluctuation induced slides in the reservoir regulation zone and information on how this is to be followed up during the operation period.*