



Hydropower Sustainability Assessment Protocol

Official Assessment

Landsvirkjun

Hvammur

Iceland

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Final



10/05/2013

Client: Landsvirkjun

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Assessment Date: 21/05/2012 to 25/05/2012

Project stage: Preparation

Project size: 82 MW

Project type: Storage

Cover page photo: Computer-generated image of the anticipated view of the Hvammur dam and reservoir following construction.

Acronyms

Acronym	Full Text
ASÍ	Icelandic Confederation of Labour
CBA	Cost-Benefit Analysis
CEO	Chief Executive Officer
CSR	Corporate Social Responsibility
ECA	Export-Credit Agency
EEA	European Economic Area
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FIDIC	International Federation of Consulting Engineers
FSL	Full Supply Level
HSE	Health, Safety and Environment
HR	Human Resources
IHA	International Hydropower Association
IPCC	Inter-governmental Panel on Climate Change
IRR	Internal Rate of Return
ISO	International Organisation for Standardization
IWRM	Integrated Water Resources Management
LTIF	Lost Time Incident Frequency
NASF	North Atlantic Salmon Fund
NGO	Non-Governmental Organisation
NPA	National Planning Agency
NWL	Normal Water Level
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Assessment Series
PPA	Power-Purchase Agreement
SMS	Short Message Service (“text message” in every-day English)

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Executive Summary

This report presents an Official Assessment conducted in accordance with the Preparation Assessment Tool of the Hydropower Sustainability Assessment Protocol.

The assessment is conducted for the planned 82 MW Hvammur hydropower project (hereafter referred to as “Hvammur”, or “the project”), which is located in the south-western part of Iceland, on the river Þjórsá. The owner and developer of the project is Landsvirkjun, a 100% state-owned energy business and the largest generator of electricity in Iceland. Landsvirkjun already owns and operates five hydropower stations in the catchment area of Rivers Þjórsá and Tungnaá: Búrfell, Sultartangi, Hrauneyjafoss, Vatnsfell and Sigalda, with a total installed capacity of 850 MW. The sixth, Búðarháls with an installed capacity of 95 MW, is under construction, due to start delivering power in early 2014.

The Assessment Team recognises that responsibilities for part of some Protocol topics go beyond the control of Landsvirkjun, e.g. public health, water quality, some safety aspects and certain aspects of soil conservation. Iceland has a very stringent regulatory environment in which mainly state, but also municipal, authorities have requirements for multiple aspects of operations, performance, accident preparedness, governance and community relations, to mention but a few. Iceland is also a member state of the EEA (The European Economic Area), meaning that legislation similar to that of the EU is implemented in the country.

This assessment assesses the Hvammur project, and does not assess wider Landsvirkjun performance. Having said this, under several Protocol topics, the corporate-level performance of the owner/operator is highly relevant, but the assessment team has sought evidence that this extends to the Hvammur project preparations as such. In addition, since the plant is planned for construction on an already strongly modified river, the assessment team have tried to be clear in the detailed topic evaluations as to what extent Hvammur can be evaluated in isolation.

Hvammur meets at least basic good practice (a score of 3) for all but one of the 21 assessed topics. The exceptions is P-1, Communications and Consultations (score of 2), owing to an absence of processes or procedures which would prompt the development of satisfactory grievance mechanisms and communications and consultation plans for all project stages. Addressing this by building on the process started in 2011, and making sure of early attention to grievance procedures as well as communications and consultation plans in future projects, will guarantee that Landsvirkjun’s generally high level of sustainability performance will extend to all topics assessed under this Protocol.

Hvammur performs at level 3, basic good practice, on four topics: P-10, Project Benefits; P-13, Project-affected Communities; P-19, Biodiversity and Invasive Species; and P-23, Downstream Flow Regimes.

The project performs with one significant gap from proven best practice, a score of 4, on a further four topics: P-4, Siting and Design; P-5, Environmental and Social Impact Assessment and Management; P-8, Infrastructure Safety and P-11, Economic Viability.

Hvammur meets proven best practice, a score of 5, on twelve topics: P-2, Governance; P-3, Demonstrated Need and Strategic Fit; P-6, Integrated Project Management; P-7, Hydrological Resources; P-9, Financial Viability; P-12, Procurement; P-16, Labour and Working Conditions; P-17, Cultural Heritage; P-18, Public Health; P-20, Erosion and Sedimentation; P-21, Water Quality; and P-22, Reservoir Planning.

The significant gaps that were identified by the assessment, and which criteria these are associated with, are summarised on page 8 and below:

One gap against the Management criteria, level 3, basic good practice (topic P-1).

Five gaps against the Assessment criteria, level 5, proven best practice (topics P-5, P-10, P-11, P-13 and P-19).

Three gaps against the Management criteria, level 5, proven best practice (topics P-10, P-13 and P-19).

Three gaps against the Stakeholder Engagement criteria, level 5, proven best practice (topics P-4, P-10 and P-23).

No gaps against the Stakeholder Support criteria.

No gaps against the Conformance/Compliance criteria.

Two gaps against the Outcomes criteria, level 5, proven best practice (topics P-8 and P-23).

The spider diagram on the following page summarises the Hvammur assessment in numbers. Detailed comments for each assessed Topic follow in sections 1-13 and 16-23.

Sustainability Profile



Table of Significant Gaps

	Level 3: Significant Gaps against basic good practice	Level 5: Significant Gaps against proven best practice
Assessment	No significant gaps	<p>P5: EIA and ongoing assessment process does not take broad considerations, risks and opportunities into account.</p> <p>P10: Broad considerations not taken into account, no assessment to increase the development contribution.</p> <p>P11: Assessment process does not take broad considerations into account.</p> <p>P13: No assessment of broader considerations and risks.</p> <p>P19: No assessment of invasive species and water-level impacts on Viðey Island.</p>
Management	P1: The absence of processes or procedures which would prompt the development of satisfactory plans.	<p>P10: No process to anticipate and respond to emerging risks and opportunities regarding project benefits.</p> <p>P13: No processes in place to anticipate and respond to emerging risks and opportunities.</p> <p>P19: No re-assessment of risks and opportunities since the EIA</p>
Stakeholder Engagement	No significant gaps	<p>P4: Engagement of local residents specifically in siting and design.</p> <p>P10: Inclusion of stakeholder groups in the assessment and planning of project benefits.</p> <p>P23: No broad considerations in the downstream flow determination.</p>
Stakeholder Support	No significant gaps	No significant gaps
Conformance/ Compliance	No significant gaps	No significant gaps
Outcomes	No significant gaps	<p>P8: There are no plans for addressing infrastructure safety beyond those of the project itself.</p> <p>P23: Slow or no feedback on opinions / communication to/from stakeholders regarding the process.</p>

Introduction

This report presents the findings of an assessment of the Hvammur project, which is under preparation, using the Hydropower Sustainability Assessment Protocol. Hvammur is planned as a 84 MW facility, fully owned by Landsvirkjun, and located in southern Iceland.

The Hydropower Sustainability Assessment Protocol

The Hydropower Sustainability Assessment Protocol ('the Protocol') is a framework to assess the performance of hydropower projects according to a defined set of sustainability topics, encompassing environmental, social, technical, and financial issues.

Developed by the International Hydropower Association (IHA) in partnership with a range of government, civil society and private sector stakeholders, the Protocol is a product of intensive and transparent dialogue concerning the selection of sustainability topics and the definition of good and best practice in each of these topics. Important reference documents that informed the development of the Protocol include the World Bank safeguards policies, the Performance Standards of the International Finance Corporation, and the report of the World Commission on Dams. To reflect the different stages of hydropower development, the Protocol includes four assessment tools that are designed to be used separately, corresponding to the Early Stage, and Preparation, Implementation and Operation stages of a project.

Applying the Protocol delivers an evidence-based assessment of performance in each topic, with a set of scores providing an indication of performance in relation to basic good practice and proven best practice. The scoring system is as follows:

- 5 Meets basic good practice and proven best practice;
- 4 Meets basic good practice with one significant gap against proven best practice;
- 3 Meets basic good practice with more than one significant gap against proven best practice;
- 2 One significant gap against basic good practice;
- 1 More than one significant gap against basic good practice.

This means that if there is one or more gap(s) at the level of basic good practice, the topic cannot score higher than a 2 or a 1, respectively. Only if all criteria at the level of basic good practice are satisfied will the assessor move on to the criteria for the level of proven best practice.

Assessments rely on objective evidence to support a score for each topic that is factual, reproducible, objective and verifiable. Key attributes of the Protocol are: (i) global applicability, i.e. it can be used on all types and sizes of hydropower projects, anywhere in the world; and (ii) consistency, i.e. the consistency of its application is carefully governed by a system of quality control encompassing accredited assessors, terms and conditions for use, and the Protocol Council.¹

Scoring is an essential feature of the Protocol, providing an easily communicated and replicable assessment of the project's strengths, weaknesses and opportunities. The scoring system has been devised to ensure that a Protocol Assessment cannot provide an overall 'pass' or 'fail' mark for a project, nor can it be used to 'certify' a project as sustainable. The Protocol provides an effective mechanism to continuously improve sustainability performance because results identify gaps that can be addressed, and the findings provide a consistent basis for dialogue with stakeholders.

Assessment Objectives

Landsvirkjun identified the following objectives for this assessment:

¹ Full details of the Protocol and its governance, are available on www.hydrosustainability.org.

1. To identify how appropriate the Protocol is for Landsvirkjun and Iceland;
2. Benchmark Landsvirkjun to international companies, (using the Hvammur project);
3. Demonstrate the sustainability performance of the project by preparing an Official Assessment;
4. Find improvement opportunities in the project and its preparation;
5. Ensure transparency of the project and engagement of stakeholders.

Project Description

The installed capacity of Hvammur Power Plant will be approximately 82 MW, and its energy generation about 665 GWh/year. The intake reservoir for the Hvammur Power Plant, Hagalón reservoir, will be formed by a dam over Þjórsá river, situated above Víðey island, and by dykes along the east banks of the river. Located near the north end of Skarðsfjall mountain, on the estate of Hvammur farm in the Landsveit area, the powerhouse will be mostly underground. A headrace tunnel some 400 m long will lead from the intake structures at Hagalón to the power station, from which the water will run through an underground tunnel and subsequently an open tailrace to Þjórsá river, below Ölmóðsey island.

In 2003, an environmental impact statement on power development in Þjórsá river at both Urriðafoss waterfall and Núpur mountain was submitted to the Icelandic Planning Agency for its ruling. Two alternative proposals were submitted for harnessing the Þjórsá river at Núpur: One was to harness a head of 56 m in one power station, Núpur Power Plant, while the other was to harness a head of 50-52 m in two power stations, Hvammur Power Plant (with a head of 32–34 m) and Holt Power Plant (with a head of 18 m). Landsvirkjun has now abandoned the idea of power development in a single step, and intends to build Hvammur Power Plant and Holt Power Plant, in addition to Urriðafoss Power Plant farther downstream.

A ruling by the Planning Agency on the hydropower development of the Þjórsá river at Núpur mountain was issued in 2003 with the conclusion of accepting the proposed project, based on the proposals presented in the environmental impact statement, as well as the modification of Búrfell Line 1 with conditions. The Minister for the Environment confirmed the Planning Agency ruling, with further conditions in 2004.

Assessment Process

It is important to note that this assessment addresses the Hvammur project only, although Landsvirkjun have planned three hydropower projects on the lower Þjórsá river as one development.

The assessment has been conducted using the Preparation assessment tool, which contains 23 individual topics addressing governance, technical, financial, social and environmental issues.

This assessment was carried out as part of the IHA – Landsvirkjun Sustainability Partnership. IHA provided a team of assessors to conduct the assessment. The on-site phase started with a site visit to the Hvammur project site during 21-22 May, and continued at Landsvirkjun's offices on 23-25 May. Interviews were conducted at both Landsvirkjun's offices and in the lower areas of the Þjórsá catchment. A draft report was delivered to Landsvirkjun in August 2012, and amended in response to comments received from Landsvirkjun in October 2012, after which Landsvirkjun disclosed the report, as an Unofficial Assessment, on their website.

The October 2012 report did not meet the requirements of an Official Assessment, as the assessors were not accredited by IHA at the time of the on-site assessment in May 2012. The Lead Assessor and the Co-assessors have since been accredited, and the Protocol's Governance Committee has given approval for this assessment to be made an Official Assessment, subject to a desk review by the now-accredited Lead Assessor. The second requirement of an Official Assessment, that the written support of the Project Sponsor has been provided, is met, and this written support from Landsvirkjun is included in Appendix A.

The Lead Assessor's desk review did not result in any substantive changes to the findings or scoring in the November 2012 report. The changes made are largely editorial, or bring any factual statements up-to-date. The Assessment Team has not revisited the project, conducted any additional interviews, or reviewed any additional documentary evidence.

The assessment was eminently supported by the Single Point of Contact, Ragnheiður Ólafsdóttir (Landsvirkjun's Environmental Manager), assisted by her Local Support Team consisting of: Helgi Bjarnarson, Project Manager, Landsvirkjun; Helgi Jóhannesson, Project Manager, Landsvirkjun; Huguún Gunnarsdóttir, Consultant, Verkis; Sigurður Óli Gudmunðsson, Landsvirkjun and; Sveinn Kári Valdimarsson, Fish Biologist, Landsvirkjun.

Observers were: Auður Ingimarsdóttir, MSc student, University of Iceland; Árni Óðinsson, project manager, Fljótsdalur; Guðmundur Stefánsson, Plant Manager, Blanda, Landsvirkjun; Barbara Fischer–Aupperle, Head of Sustainability, Voith; Andreas Hutzler, Senior Area Manager, Export and Project Finance, Voith; Pablo von Waldenfels, sustainability, Euler Hermes.

Assessment Experience

This section addresses limitations and reflections relevant to this particular assessment.

The assessment was very well-organised by the single point of contact and her local support team. The need for translation services was resolved in a highly efficient manner with the aid of a highly skilled interpreter, Ms Hulda Kristín Jónsdóttir, for those interviews where this service was needed.

A range of internal and external stakeholders were interviewed, and a wide range of documents was assembled by Landsvirkjun for the team's review. Some further evidence was added by Landsvirkjun-external interviewees.

Early translation of key documents to the assessment language facilitates the assessor's familiarisation with the project and the issues to be dealt with. This was done well for this assessment and in those cases where the Assessment Team identified the need for further evidence or clarifications, the Local Support Team responded in a timely fashion.

The experience of the Assessment Team regarding the assessment objectives are as follows:

1. This is something that Landsvirkjun will work out internally - their own analysis of the experience will determine the appropriateness of the Protocol for the company.
2. This will be possible at a later stage, when more assessments have been conducted using the Preparation Protocol.
3. The sustainability profile is good with high scores throughout, with one exception. This exception is commented on in the Summary and defined in detail under that specific Topic evaluation.
4. These have been clearly demonstrated in the gap identification under each topic. This assessment demonstrates that for the Preparation Protocol, the quality and methodological approach of the project's EIA and related processes, such as consultations, are very important.
5. The inclusion of the affected municipalities, local interest groups and NGOs, as well as Landsvirkjun's dedication to transparent communications guarantee that this objective will be realised.

The availability of assessment experience from the Hvammur assessment will greatly enhance future Protocol training processes and actual assessments. The report will serve as an important public example of the results of a Protocol assessment.

Layout of this Report

This report consists of twenty-three sections numbered in direct correspondence with the twenty-three topics of the Protocol's Preparation tool. Four appendices are provided, including the written letter of support of the project operator (required for an official Protocol assessment), and detailing the items of visual, verbal and documentary evidence referred to under each topic.

For each topic, findings are provided according to the criteria used in the Protocol's methodology: Assessment, Management, Stakeholder Engagement, Stakeholder Support, Conformance / Compliance, and Outcomes.

Findings are presented against a statement of 'basic good practice' and a statement of 'proven best practice' for each, with a 'Yes/No' indication of whether the scoring statement is met. A summary of the significant gaps against the scoring statement, the topic score and a brief summary are presented at the close of each topic section.

1 Communications and Consultation (P-1)

This topic addresses the identification and engagement with project stakeholders, both within the company as well as between the company and external stakeholders (e.g. affected communities, governments, key institutions, partners, contractors, catchment residents, etc.). The intent is that stakeholders are identified and engaged in the issues of interest to them, and communication and consultation processes establish a foundation for good stakeholder relations throughout the project life.

1.1 Background Information

There is a broad range of project stakeholders from local to national levels. Directly-affected stakeholders are defined in the Protocol as ‘those with substantial rights, risks and responsibilities’. On the basis of this definition, this assessment considers the following to be directly-affected stakeholders: (in the project locality) owners of land that will be used by the Hvammur project, residents in the area, owners of summer houses, local businesses including tourism businesses, potential employees during construction and operation, Þjórsá angling association, Sól á Suðurlandi (a local environmental NGO), the Tourist Association west of Þjórsá, Rangárþing ytra Municipality, Skeiða og Gnúpverjahreppur Municipality; (outside the project locality) Landsvirkjun, Landsnet, National Energy Authority, National Planning Agency, the Icelandic Road Administration, Environment Agency of Iceland, Archaeological Heritage Agency of Iceland, Institute of Freshwater Fisheries, and the Civil Protection Agency.

Directly-affected stakeholders within the project-development group include: Landsvirkjun’s departments involved in Hvammur (e.g. project managers, directors, communications manager, environmental and health and safety managers), designers (Mannvit, Almenna, Verkis) and contractors (e.g. ISTAK).

The following are also considered as important stakeholders, but are not directly-affected: Ministry of Industry, Energy and Tourism, Iceland Meteorological Office, the Archaeological Office (an independent research and service company), Landvernd - Icelandic Environment Association (NGO), Icelandic Labour Union (ASÍ), Náttúruverndarsamtök Suðurlands (NGO - Environmental Organisation for the south part of Iceland), and the North Atlantic Salmon Fund.

Landsvirkjun’s Corporate Communications department oversees internal and external communications, and is responsible for producing project newsletters, responding to stakeholders’ queries, organising public meetings, publishing studies and updating Landsvirkjun’s website and the Þjórsá Project’s dedicated website.

1.2 Detailed Topic Evaluation

1.2.1 Assessment

Analysis against basic good practice

Scoring statement: Stakeholder mapping has been undertaken to identify and analyse stakeholders, to establish those that are directly affected, and to establish communication requirements and priorities, with no significant gaps.

Stakeholders were identified in Chapter 12 of the EIA (2003) and classified into consultation bodies (national regulatory agencies and municipalities), organisations involved in public consultation, ‘special stakeholders’, and interest/industry associations. The special stakeholders are identified as: owners of registered farms in the proposed power plant area; residents on registered farms in the proposed power plant area; summer-house owners in the area of the proposed power plant; angling associations in the area, and ‘other stakeholders’. However, the EIA does not provide an analysis of stakeholders or establish communication requirements or priorities.

A better stakeholder-mapping exercise was undertaken in 2010, as a contribution to the development of a Communications and Stakeholder Engagement Plan for the lower Þjórsá power plants. In relation to Hvammur specifically, this is a weakness as some of the key stakeholder concerns regarding e.g. the Urriðafoss project are significantly less valid for Hvammur. This would mean different prioritisations if Hvammur were looked at in isolation. The mapping identifies a range of stakeholders and groups, and enables Landsvirkjun to focus on a target group of the residents in the affected municipalities. It also assesses their influence on or dependency on Landsvirkjun, but is incomplete, with no entries in a column entitled 'planned communications'. It also does not establish communications priorities for all directly-affected groups (including Landsvirkjun staff), and has been produced very late in the preparation stage. This is a gap against basic good practice, but it is not considered significant, as stakeholder engagement has been ongoing and has not led to significant communication issues to date (see Stakeholder Engagement below).

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the stakeholder mapping takes broad considerations into account.*

Not Assessed

1.2.2 Management

Analysis against basic good practice

Scoring statement: *Communications and consultation plans and processes, including an appropriate grievance mechanism, have been developed at an early stage applicable to project preparation, implementation and operation that outline communication and consultation needs and approaches for various stakeholder groups and topics.*

A range of consultation processes have been undertaken from an early stage during project preparation (see 'Stakeholder Engagement' below). Direct links with landowners that will lose land, the contact details provided through newsletters and the lower Þjórsá website can be considered a grievance mechanism for the preparation stage. The majority of stakeholders interviewed during this assessment, though not all, felt able to contact Landsvirkjun directly to raise any concerns (via the website, letter or telephone).

Landsvirkjun developed a Communication and Stakeholder Engagement Plan for the lower Þjórsá hydropower development in 2010-2011, which sets out a process and tasks for communicating and engaging with local residents, municipalities and other relevant stakeholders over a period of, initially, 6-11 weeks. The plan has been on hold, waiting for the parliamentary decision on the Energy Master Plan.

However, this plan has been developed at a very late stage and contains no analysis that outlines needs and approaches for the different stakeholder groups and topics for either the remainder of the preparation stage, or the implementation and operation stages.

In addition, Landsvirkjun has not yet developed satisfactory procedures to track and respond to grievances raised, or plans for appropriate grievance mechanisms, communications and consultations for the implementation or operation stages. Landsvirkjun will be able to develop these plans or processes for the later stages in a timely fashion, but it is not clear how any corporate or other process would prompt their development or at what stage (contrast this with P-5 and the corporate processes that will prompt an environmental management plan). Their absence, combined with the absence of a process or procedure which would prompt their development, is a **significant** gap against basic good practice.

Criteria met: No

Analysis against proven best practice

Scoring statement: *In addition, communication and consultation plans and processes show a high level of sensitivity to communication and consultation needs and approaches for various stakeholder groups and topics; and processes are in place to anticipate and respond to emerging risks and opportunities.*

Not Assessed

1.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The project preparation stage has involved appropriately timed communications and engagement, often two-way, with directly affected stakeholders on topics of interest and relevance to them; engagement is undertaken in good faith; ongoing processes are in place for stakeholders to raise issues and get feedback.*

The following public meetings have been held during the project preparation stage: in 2002, four meetings as part of the scoping of environmental and social impacts; 2003, four legally-mandatory meetings as part of the EIA process (Árnes, in Laugaland and Þjórsárver near the Urriðafoss site, and in Reykjavík); 2003, three meetings upon the finalisation of the EIA; 2006, meetings during the preparation of Project Planning report; 2009, a presentation on the findings of the risk assessment; and in 2010, a public meeting in Selfoss concerning the Master Plan for geothermal and hydropower development. Invitations to open meetings were distributed in the form of letters to local residents, and via press releases to newspapers, television and radio.

Planning meetings between Landsvirkjun and municipalities were held, and are minuted, as follows: 2000, municipalities; February 2006, with the Holta- og Landsveit municipality (now part of Rangárþing ytra); May 2007, west-bank municipality; July 2007, east-bank municipality; and August 2007, both municipalities. Interviewees described the frequency of meetings with municipalities (at the time of the EIA) as 'almost monthly'.

Landsvirkjun visited every landowner and summerhouse owners in the area between 2002-2003. Landowners were visited again in 2007. Meetings have been held regularly with landowners, firstly in 2000-2001, and from 2006 onwards (with minuted meetings in 2006-2007).

A total of 5 biannual newsletters concerning the lower Þjórsá developments were distributed to all homes in the affected municipalities over December 2006 to August 2008 and remain available at <http://www.thjorsa.is/category.aspx?catID=29>. The lower Þjórsá website is maintained and discloses project updates over October 2006 - September 2009 and October 2011 to January 2012. The last update is from March 2012 and describes the research undertaken on the impact on fish stocks in the lower Þjórsá.

In 2002, an opinion survey gathered opinions on the lower Þjórsá projects from 306 local residents and summerhouse owners (178 in the Núpur area, and the rest in Urriðafoss). A parallel survey was conducted in the same year among 387 tourists (220 in Núpur and the remainder in Urriðafoss). In 2003, press releases during the EIA resulted in articles in the local newspaper and on radio.

In 2007, a separate meeting was held with the angling club, and e-mail exchanges between Landsvirkjun and this club took place over 2010-12. In addition, the Þjórsá projects are referred to on the front page of Landsvirkjun's website, and have been commented on by Landsvirkjun's CEO in radio and press articles.

All of these engagement activities have been appropriately-timed, and many concern two-way negotiations which have been held in good faith. Most landowners and local government representatives consulted stated that they had the opportunity to negotiate and mutually make decisions. However it is noted that there is some frustration on the part of some local residents (not including landowners with direct contact with Landsvirkjun regarding purchase/rent of land) that it has been some time since the preceding consultation meetings, owing to the delay in project preparation. Ongoing processes remain in place in the form of direct

contact, the lower Þjórsá website, and new plans to re-engage with directly-affected stakeholders set out in the Communications and Stakeholder Engagement Plan. The majority of stakeholders interviewed felt that Landsvirkjun's willingness to communicate has improved in recent years. The EIA report and associated specialists' reports are available on the company website www.lv.is.

National-level directly-affected stakeholders were consulted during the EIA process. The EIA provides a list of statutory consultation bodies and other national associations that were consulted in 2002-2003 and had the opportunity to comment and raise any concerns on the project at open meetings held in Árnes in the Gnúpverjahreppur Municipality, in Laugaland in Holtum, in Þjórsárver in Villingaholtshreppur and at the Landsvirkjun headquarters in Reykjavík. The assessment report was presented in buildings open to the public, both in the power-plant area, and in Reykjavík. The stakeholder mapping indicates that meetings have been held as required with non-regulatory national-level affected stakeholders since the EIA process.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, engagement with directly affected stakeholders has been inclusive and participatory; negotiations are undertaken in good faith; and feedback on how issues raised have been taken into consideration has been thorough and timely.*

Not Assessed

1.2.4 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to communications and consultation have been and are on track to be met with no major non-compliances or non-conformances, and any communications related commitments have been or are on track to be met.*

Processes and objectives relating to communications and consultation during the preparation stage include those set out in the Communications and Stakeholder Engagement Plan of 2011 and Landsvirkjun's CSR strategy objectives including 'making every effort to co-operate positively with the community'. To date, this objective is met, and the former plan is on track. Legally-required consultation meetings have been held during the EIA process, and the new planning law will require the municipalities to hold two open information meetings prior to approvals. There is no evidence of any regulatory non-compliance.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

Not Assessed

1.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

The absence of appropriate grievance mechanisms and communications and consultations plans for the implementation and operation stages, and processes that would prompt their development in a timely fashion.

1 significant gap

Analysis of significant gaps against proven best practice

Due to an identified gap against basic good practice, the criteria at the level of proven best practice were not assessed.

1.3 Scoring Summary

Landsvirkjun have carried out extensive communication and consultation during the preparation stage. This has been in good faith and, in most cases in-depth and two-way, through the project preparation stage to date, and many stakeholders feel that Landsvirkjun's communication has improved in recent years. Identification of project stakeholders and engagement with them, both within the company as well as between the company and external stakeholders, has not been planned on the basis of a thorough analysis of needs and approaches for all stakeholder groups, and for all project stages, but this has not resulted in weaker Stakeholder Engagement to date.

However, there are no appropriate grievance mechanisms or communications and consultations plans for the implementation and operation stages, and no processes to prompt their development. This poses a risk to ongoing stakeholder relations, increases the risk of strongly divided opinions in the local community and creates political risk to the project.

There is one significant gap against the criteria of Basic Good Practice, resulting in a score of 2.

Topic Score: 2

1.4 Relevant Evidence

Interview:	128, 129, 130, 134, 135, 137, 141, 151, 157, 160, 161, 175, 181, 189
Document:	2, 4, 6, 8, 9, 10, 11, 12, 13, 14, 39, 40, 41, 111, 112
Photo:	1z, 1ad

2 Governance (P-2)

This topic addresses corporate and external governance considerations for the project. The intent is that the developer has sound corporate business structures, policies and practices; addresses transparency, integrity and accountability issues; can manage external governance issues (e.g. institutional capacity shortfalls, political risks including transboundary issues, public sector corruption risks); and can ensure compliance.

2.1 Background Information

Landsvirkjun is a state owned company that operates 15 power stations across Iceland, 13 hydropower stations and two geothermal power stations. In 2010 the total installed capacity operated by Landsvirkjun was 1 860 MW (1 797 MW of hydro, 63 MW of geothermal) and the electricity production amounted to 12 534 GWh (96% of which comes from hydropower). Landsvirkjun currently owns and operates five hydropower stations in the Þjórsá and Tungnaá rivers catchment area (Búrfell, Sultartangi, Hrauneyjafoss, Vatnsfell and Sigalda) with a combined installed capacity of 850 MW. A sixth hydropower station, Búðarháls (95 MW), is under construction and is expected to be operational in early 2014.

Landsvirkjun is currently looking at expanding its operations in the Þjórsá River through the development of three new hydropower plants, Hvammur, Holt and Urriðafoss. The Hvammur hydropower development is a medium-sized project for Landsvirkjun, that would add a total of 82 MW to the Þjórsá/Tungnaá cascade. Whilst the environmental impact assessment (EIA) for Hvammur was approved in August 2003 by the Icelandic Planning Agency and Ministry for the Environment, instigation and finalisation of the Master Plan for energy resources in Iceland has delayed finalisation of the preparation stage and commencement of construction.

As a state-owned company developing, managing and operating a range of power stations and assets, Landsvirkjun has a complex system of processes and procedures that provide the framework under which the company works and reports. Landsvirkjun is subject to regulation by multiple municipal and national government bodies, thus its regulatory and corporate governance systems are highly developed. Annual reporting is provided for key areas (general/financial, environment, carbon footprint and social responsibility) which are available on Landsvirkjun's external website.

2.2 Detailed Topic Evaluation

2.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Assessments have been undertaken of political and public sector governance issues, and corporate governance requirements and issues, through the project development cycle with no significant gaps.*

Assessment has been undertaken of potential political and public-sector requirements and issues at a corporate and project level. Landsvirkjun is well aware of policy and regulatory developments within Iceland that affect their operations, including how such changes affect individual projects. They are also aware of international requirements, including those associated with the European Union through their membership in the EEA. Throughout Hvammur's project-development cycle, assessment has been made of regulatory requirements and external governance issues.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no significant opportunities for improvement in the assessment of political and public sector governance issues and corporate governance requirements and issues.*

Landsvirkjun's corporate governance policies and procedures are comprehensive. Over the last five years, Landsvirkjun has invested considerable resources into improvement of its internal and external governance, and this is reflected in its current policies and processes. Proposed improvements which are underway include an enterprise-risk assessment and further development of their internal and external websites' content to reflect their corporate governance.

Criteria met: Yes

2.2.2 Management

Analysis against basic good practice

Scoring statement: *Processes are in place to manage corporate, political and public sector risks, compliance, social and environmental responsibility, grievance mechanisms, ethical business practices, and transparency; policies and processes are communicated internally and externally as appropriate; and independent review mechanisms are utilised to address sustainability issues in cases of project capacity shortfalls, high sensitivity of particular issues, or the need for enhanced credibility.*

Landsvirkjun has extensive policies and procedures to manage corporate, political and public risks and issues, including established policies regarding employees, equal rights, business ethics and social responsibility. These policies and procedures are communicated internally (e.g. intranet site, introductions) and externally (external web site, media releases) as appropriate. The company's integrated management system has been developed on the basis of, among others, ISO 9001, ISO 14001, ISO 27001 and OHSAS 18001 standards for quality management, environmental management, information security management and occupational health and safety management, respectively.

Landsvirkjun has a corporate-risk register which focuses on financial risk, but also considers other risks such as strategic, operational, legal, resources, construction. An enterprise risk assessment is currently being developed. Risk assessment for individual projects such as Hvammur is extensive and considers all aspects.

Landsvirkjun has both an environmental and social responsibility policy aimed at sustainable development and operation. Landsvirkjun produces annual, environmental and social responsibility reports which are available both internally and externally, as well as interim (six monthly) financial reports.

Landsvirkjun, together with Alcoa, launched the Sustainability Initiative in co-operation with East Icelandic communities where different stakeholders/representatives have agreed on indicators for sustainable development following the construction of the Fljótsdalur Hydropower Project and the aluminium plant in Reydarfjörður. This allowed independent identification of issues that may be associated with the projects.

The EIA for Hvammur, whilst prepared by external consultants and technical specialists (including other government agencies) who will not be involved in the long-term operation of the project, was not independently reviewed prior to submission. Whilst not significant at the time, the lack of independent review has been raised as an issue more recently in regards to mitigation of impacts to salmon and fishing rights. However, as the issue relates more to the proposed hydropower station at Urriðafoss rather than Hvammur, this is not seen as a significant gap. In addition, the salmon studies conducted since the EIA have been conducted by the Icelandic Institute of Freshwater Fisheries who have consulted with researchers from the Columbia River, USA. All relevant reports are available on the external web site

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, contractors are required to meet or have consistent policies as the developer; and processes are in place to anticipate and respond to emerging risks and opportunities.*

Contractors working for Landsvirkjun are required to work in accordance with Landsvirkjun's policies and procedures and this is clearly set out in the tender documentation.

Risks are identified at a corporate and project level, with risk owners identified. Regular meetings are held at the corporate and project level (ranging from every week, to quarterly) to review risks and identify potential new risks.

Criteria met: Yes

2.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The business interacts with a range of directly affected stakeholders to understand issues of interest to them; and the business makes significant project reports publicly available, and publicly reports on project performance, in some sustainability areas.*

Landsvirkjun has a corporate communication strategy that focuses on transparent communication with stakeholders from landowners and local communities to state government. More recently (2010) a communication plan has been developed for the Hvammur project. A range of corporate and project-related reports and media releases are available via Landsvirkjun's external website, including annual reports relating to environmental and social responsibility.

Landsvirkjun provides updates on its projects to the public via its web site and media releases. It has a separate web page dedicated to the power projects associated with the Þjórsá River.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the business makes significant project reports publicly available and publicly reports on project performance in sustainability areas of high interest to its stakeholders.*

Key documentation relating to the Hvammur project is available on the external website. In addition, there is a special web page dedicated to fish issues associated with the three lower Þjórsá projects, for which all reports are made available.

Reports associated with the environment, sustainability and social responsibility are also made available via the external website, in both Icelandic and English.

Criteria met: Yes

2.2.4 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *The project has no significant non-compliances.*

Landsvirkjun has a compliance register for the Hvammur project and no significant non-compliances have been identified for the project. Landsvirkjun has processes for identifying, actioning and following up stakeholder issues, conformance requirements and non-compliances.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *The project has no non-compliances.*

The Hvammur project has no non-compliances.

Criteria met: Yes

2.2.5 Outcomes

Analysis against basic good practice

Scoring statement: *There are no significant unresolved corporate and external governance issues identified.*

Whilst the external political environment has changed since the EIA was approved, with the advent of the Master Plan, Landsvirkjun focuses/prioritizes on monitoring the external political situation and interacts with government officials.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no unresolved corporate and external governance issues identified.*

No unresolved corporate and external governance issues were identified during the assessment. Whilst there are issues around salmon mitigation and fishing rights, Landsvirkjun has a plan/processes in place which are being used to resolve these issues. This is seen as an ongoing part of the preparation phase, as the issues have developed in the last few years and as such are not considered to be a significant gap against this criteria.

Criteria met: Yes

2.2.6 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

2.3 Scoring Summary

Landsvirkjun has well developed and comprehensive governance policies and process which have been and are currently being applied to the preparation of the Hvammur Hydropower Project. Over the last five years, Landsvirkjun has invested considerable resources to improving its internal and external governance and this is reflected in its current policies and processes.

There are no significant gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

2.4 Relevant Evidence

Interview:	147, 156, , 167, 171, 173, 174, 175, 186, 188
Document:	2, 3, 6, 7, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33
Photo:	None

3 Demonstrated need and Strategic Fit (P-3)

This topic addresses the contribution of the project in meeting demonstrated needs for water and energy services, as identified through broadly agreed local, national and regional development objectives and in national and regional policies and plans. The intent is that the project can demonstrate its strategic fit with development objectives and relevant policies and plans can be demonstrated, and that the project is a priority option to meet identified needs for water and energy services.

3.1 Background Information

Iceland's power sector is quite different from those of most western countries. It is not primarily driven by general consumption, but rather by energy-intensive industries who in 2010 were responsible for approximately 80% of the electricity consumption. This development started a long time ago, but accelerated in the mid-1990s. At about the same time, some opposition to this development path started in earnest, with questions being raised about the appropriateness of this approach. Opponents wanted to consider also other priorities such as regional development, land use, employment generation and even the make-up and priorities of Iceland as a nation.

This resulted in a situation where most new planned projects gave rise to protests and lengthy debates over feasibility and socio-environmental suitability and acceptability. To avoid this and also to align the planning with future SEA legislation, a national process of project ranking was started towards the end of the 1990s. Phase I was called "Man-Utilisation-Nature" and ran between 1999 and 2003. Phase II, "Master Plan for Protection and Development of Energy Resources" built on Phase I, and ran between 2004 and 2012. As can be seen from these dates, the process has not been rushed and has been very comprehensive. It will be followed by a Phase III with a re-evaluation of previously addressed projects plus introduction of possible new projects. The Final Report of Phase II was presented in August of 2011. The report ranks project concepts into three different classes: a utilisation class (prioritised for development); a waiting class (further studies needed before development can go ahead) and; a preservation class (area/resource to be protected against development). As a recent step of this process, the ministers for environment and industry presented their own ranking, in which Hvammur was moved to the "waiting class". The stated reason for this is that the potential impact of the Hvammur project on fish (salmonids) needs further studies, a concern mainly based on the treatment of the three planned hydropower projects on the lower Þjórsá as one unified development. This change in ranking was confirmed by Parliament in January 2013.

An important fact about river utilisation in Iceland is that there is no or little need for water use for domestic and/or agricultural purposes. Domestic water needs are satisfied through groundwater sources (cold water) and geothermal-based district-heating systems (hot water) and there is little or no irrigated agriculture.

3.2 Detailed Topic Evaluation

3.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment has been undertaken of needs for water and energy services, of options to meet water and energy needs; and of national and regional policies and plans relevant to those needs, with no significant gaps.*

The national Master Plan study has been a comprehensive process. It has weighted different development factors against each other and a ranking has been made based on widely-drawn expert opinion, incorporating public opinions. The study's recommendations have been discussed in Parliament, resulting in some changes to the ranking of projects.

In Landsvirkjun's role as owner/developer of Hvammur, it is engaged in a methodical and comprehensive planning for future growth, looking at continuing to attract energy-intensive industries while encouraging a diversification of users. The option of a sea cable to either the UK or mainland Europe is also being investigated. While limited in its capacity, the connection would mean a significant change to the Icelandic electricity market since it would be subjected to the competition for both base and, primarily, peak-load electricity in the rest of Europe.

A study (commissioned by Landsvirkjun but implemented by independent consultants) has concluded that a strong continued development of Iceland's renewable energy potential would have a strong positive impact on the nation's economy.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment is based on dialogue with government planners, policy makers and key stakeholder groups; and the assessment shows a strong emphasis on social and environmental related needs, policies and plans including the need for sustainable development of the river basin and integrated water resource management.*

The Master Planning exercise, through its working groups on environmental and socio-economic factors, combined with the macro-economic and technical groups, constitute a comprehensive evaluation of all aspects of sustainability by appropriate expertise. Government at national and municipal level has been involved and the process has been open to public review and opinion. The Hvammur project is included in the municipal plans of both communities directly affected by its potential development. This is a significant fact, given that municipalities can decline or prevent development initiatives in their respective area.

A standard approach to the IWRM criterion does not apply in the Icelandic context, given the lack of major alternative utilisation of the water resource (other than conservation, fishing and non-consumptive uses such as tourism, which are all included in the Master Plan work, see above).

Criteria met: Yes

3.2.2 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The results of the assessment of strategic fit are publicly disclosed.*

The Master Plan is publicly available and subjected to the open democratic processes in the country.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *No addition to basic good practice.*

3.2.3 Outcomes

Analysis against basic good practice

Scoring statement: *The strategic fit of the project with needs for water and energy services, and relevant policies and plans can be demonstrated.*

Iceland's situation, with a power-intensive industry being encouraged to site their operations in the country based on cheaper electricity than elsewhere (the 2011 offer for 12-year delivery contracts was 43 \$US/MWh, significantly lower than in other European countries) constitutes a demonstrated need and is regarded as a strategic fit.

However, it is clear that there are voices of dissent to a continued strong growth of the energy sector in Iceland. Many environmental NGOs favour a very limited development programme, with much stronger focus on local and regional development from “green” industries and other businesses, pointing out that there is no need for more electricity or other energy in the country, and that potential demand-side management gains is a largely untapped source of so called “nega-watts” in Iceland. A group of 13 environmental NGOs published a joint statement regarding the findings of the Master-Planning exercise in which they advocated for moving the Hvammur project into the “open” category – projects for further study. The stated bases for this were wider-ranging than just salmonid migration and also included concerns regarding loss of agricultural land, wind-blown dust and a lack of satisfactory attention to certain social aspects. They also site “great controversy amongst local residents and others”.

It is evident to the assessors that the planned hydropower projects on the lower Þjórsá are treated by many stakeholders, even local residents, as one and the same project. The significant resistance to the Urriðafoss plant, where salmon is caught in relatively large amounts and where fish can migrate up and down the falls naturally, rubs off on the plants planned for upstream on the river, such as Hvammur.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition the project is one of the priority options to address demonstrated needs.*

Phase II, the ranking exercise, of the Master Plan study listed the Hvammur project as well inside the “utilisation” class. Only six hydropower projects, out of the 28 studied, were listed in that group.

The reason for the change in ranking, calling for more studies before project approval, resulting from the parliamentary process appears to focus on a treatment of the three planned hydropower projects on the lower Þjórsá as one project. This means that the significant issues related to salmonid migration past Urriðafoss also affect the ranking for the Holt and Hvammur projects.

This assessment concerns only the Hvammur project, and as such focusses on issues relevant specifically to that project. This means that the change in ranking of the lower Þjórsá projects cannot be considered a gap against the scoring criteria for the Hvammur assessment.

Criteria met: Yes

3.2.4 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

3.3 Scoring Summary

Energy development is a highly contentious issue in Iceland. Different opinions on which general development path that is the correct one for the country abound, and the debate has been intense. In order to avoid debate at the project level and in order to align energy planning with the SEA legislation in the country, a master-planning exercise has been conducted. Through thorough analyses of a wide variety of aspects (through 4 expert working groups), the 2nd phase of this exercise came up with a ranking in which the Hvammur project was listed in the utilisation group, as appropriate for development. This inclusive and open process is the main

basis for satisfying the criteria at both level 3 and level 5 on this topic, but it is also supported by other information documenting the strong potential a continued development of Iceland’s renewable energy sources would have on the country’s economy.

The fact that the democratic process in Iceland has resulted in a change of ranking of the project to the category requiring further studies seems focussed on fish-migration issues mainly relevant to the Urriðafoss project, and does not affect the scoring for Hvammur.

There are no significant gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

3.4 Relevant Evidence

Interview:	141, 142, 144, 148, 152, 162, 163, 165, 178
Document:	2, 3, 5, 6, 7, 17, 22, 29, 30, 31, 32, 33, 36, 37, 38, 39, 40, 42, 50, 51, 53, 54, 75, 82, 85, 88, 89, 91, 104, 106, 107
Photo:	1v

4 Siting and Design (P-4)

This topic addresses the evaluation and determination of project siting and design options, including the dam, power house, reservoir and associated infrastructure. The intent is that siting and design are optimised as a result of an iterative and consultative process that has taken into account technical, economic, financial, environmental and social considerations.

4.1 Background Information

The siting and design of the Hvammur project, as part of potential hydropower developments on the lower Þjórsá River, also including the Núpur, Holta and Urriðafoss projects, have been subject to study by Landsvirkjun from as early as 1981 and most intensively through the 2000's. Historically, proposals for the development of the Þjórsá were made as early as 1918.

4.2 Detailed Topic Evaluation

4.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Technical information has been analysed at an early stage alongside social, environmental, economic, financial, and regulatory considerations in order to develop a preliminary project design and some options around this.*

A series of analyses were carried out at an early stage, in 1981 with a 'Preliminary Report on Possible Projects on the lower Þjórsá and in 2000 with a 'Conceptual Study'. The scoping report presented to the Planning Agency in 2001 referred to four options at this location. Environmental and social considerations were addressed in the 2003 Environmental Impact Assessment and technical considerations in the 2004 'Power Production Capacity of Power Stations in the lower Þjórsá Region'. This culminated in the Project Planning Report of 2006, which also includes a brief assessment of financial considerations in the costs section.

Technical considerations have included optimum energy production, geological constraints, river flows, climate, ice conditions and sediment transport, with implications for the location of the power plant and tailrace, length of the tailrace, the reservoir level and dyke construction. Environmental and social issues, and regulatory considerations related to them, are referred to under topic P-5.

The early studies led to two options at the Hvammur site: Núpur, with a head of 56 m and reservoir area of 4.6 km² at a single site; and Hvammur with a head of 32-34 m and reservoir area of 4.6 km² (normal level) as the upper scheme of the two-step development with the lower one being Holta, located at Búði.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, options take into consideration sustainable river basin design and integrated water resource management.*

The upper Þjórsá is a highly modified and regulated river, and sustainable river-basin design is not relevant in this context. 'Integrated water resource management', in this project context, concerns balancing other water uses, which are angling, tourism and recreation, and visual amenity. Options have taken into account these other uses, for example by the inclusion of a fish ladder to enable fish passage (see P19), and reduction of the reservoir area to reduce visual impact.

Criteria met: Yes

4.2.2 Management

Analysis against basic good practice

Scoring statement: *An optimisation process has been undertaken to assess the project siting and design options.*

Assessment of the project design as discussed above, discussions with stakeholders as described below, and additional studies on geological, seismicity and ice-jam considerations (see P-8) together constitute an optimisation process for project design. In addition, the EIA process concerned the two options identified above. Landsvirkjun are also studying the latest climate-change predictions which may call for an increase in the installed capacity. There will be further optimisation of the design at the detailed tender-design phase.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *No addition to basic good practice.*

4.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The siting and design optimisation process has involved appropriately timed, and often two-way, engagement with directly affected stakeholders; ongoing processes are in place for stakeholders to raise issues and get feedback.*

Stakeholder engagement under this topic concerns only siting and design optimisation.

Engagement of directly-affected stakeholders during the siting and design optimisation process has included the public meetings held during the EIA process (described under P-1) at which a Preliminary Project Planning Report was presented, iterative discussions with owners of land that will be used by the project, and meetings with regulatory agencies, including the range of 'consultation bodies' referred to in the EIA report, geological research meetings (2006-2008), Archaeological Heritage Agency (2007, 2009, 2010), and the Institute of Freshwater Fisheries (2007-2008).

This engagement has been appropriately timed and two-way, to the extent that the final project detailed design allowed for changes as proposed by affected landowners to minimise land take (e.g. changes in the tailrace canal, construction camp sites and reservoir surface area).

Ongoing processes are in place as follows: continuing engagement with affected landowners (with direct, regular telephone communications), and the resumption of the Communications and Stakeholder Engagement Plan with local municipalities and residents following any parliamentary decision on the master plan.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, engagement with directly affected stakeholders has been inclusive, and participatory; and feedback on how issues raised have been taken into consideration has been thorough and timely.*

With respect to siting and design, engagement has been inclusive and participatory for some directly-affected stakeholder groups, but not all.

Directly-affected landowners who will lose land to the project have been engaged in design, to the extent that some are active participants, and local municipalities have been included in numerous planning meetings. In addition, directly-affected stakeholders amongst national regulatory authorities have been engaged through direct meetings and public meetings. However, engagement – specifically in siting and design rather than on

the project as a whole – has not been inclusive of local residents other than the above-mentioned landowners. Landsvirkjun have not enabled this stakeholder group to engage in siting and design.

The opinions survey undertaken in 2002 for the lower Þjórsá hydropower development EIA gathered the opinions of local residents, tourists (national and foreigners), women, men and summer-house owners, but the survey did not concern siting and design. Separate stakeholder groups (for example women, youth, the elderly, and summer-house owners) have not been separately targeted to enable their participation. However, the key gap is the lack of inclusion of local residents other than the above landowners - this is a **significant gap** against proven best practice.

Feedback on how issues raised by landowners have been dealt with appears timely, and in some cases thorough (for example where design proposals are being considered). There is some frustration on the part of local residents (not including landowners with direct contact with Landsvirkjun regarding purchase/rent of land) that it has been some time since the preceding consultation meetings, owing to the delay in project preparation (see P-5).

Criteria met: No

4.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *The final project siting and design has responded to many sustainability considerations for siting and design.*

Environmental and social, dam safety, technical and cost considerations, raised in consultation with directly-affected regulatory and institutional stakeholders, as well as the suggestions of the affected landowners, have informed design options. Siting and design is not yet final, and the detailed tender-design stage will include further optimisation, but the siting of most project components and their design is almost final. Specific changes made to optimise the design, subsequent to the EIA of the initial Hvammur design, include the reduction of the reservoir area by the use of a dike, relocation of the spillway, and the relocation of power house, spoil areas, intake, tailrace tunnel and canal, and roads. These changes have responded to, in varying combinations, environmental, dam safety, generation, cost, and stakeholder proposals.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *The final project siting and design is optimal with respect to sustainability considerations for siting and design.*

The Protocol defines ‘optimal’ as ‘best fit once all identified sustainability considerations have been factored in, on the basis of a consultative process’. Although there remain some design considerations that are not yet finalised (a proposal to extend the tailrace tunnel, for which geological considerations are currently being investigated) and there will be further optimisation of the design at the detailed tender-design phase, it is likely that all the siting and design will be optimal, particularly as the most major considerations (the limitation of reservoir area by the dike, and relocation of the spillway, avoidance of seismic faults, and reduction in the need for core material and quarrying) have been factored in. The proposal raised in the EIA public meetings to reduce the reservoir level to 114 m, is not feasible due to the need for efficiency, reservoir lifetime (the larger the reservoir the more sediment it can accumulate), and the need to avoid ice jams.

Landsvirkjun’s ability to reach an optimal design may be limited by the lack of fully inclusive stakeholder engagement in design, and a lack of effective communication with some directly affected stakeholders, but these are addressed under ‘stakeholder engagement’ above and under topic P-1.

Criteria met: Yes

4.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

The lack of engagement of local residents (other than landowners who will lose land to the project) specifically in the planning of siting and design (rather than on the project as a whole).

1 significant gap

4.3 Scoring Summary

Landsvirkjun has undertaken a series of analyses at an early stage to incorporate a range of sustainability considerations in the siting and design of Hvammur, including analysis of two main alternative options. This, along with the engagement of directly affected landowners, technical experts and regulatory agencies in design, as well as ongoing processes of consultation and the detailed tender-design phase, constitute an optimisation process, likely to result in a design that is the best fit, factoring in all sustainability considerations. However, engagement in design has not been inclusive of all directly-affected local residents and Landsvirkjun's ability to reach a fully optimal design may be compromised by this.

There is 1 significant gap at the level of proven best practice, resulting in a score of 4.

Topic Score: 4

4.4 Relevant Evidence

Interview:	128, 129, 135, 150, 151, 157, 158, 161, 179, 180, 181, 189
Document:	2, 4, 6, 7, 8, 38, 39, 40, 41, 54, 55, 59, 101, 102, 103, 111
Photo:	1f, 1i, 1j, 1p, 1t, 1aa, 1ab, 1ac

5 Environmental and Social Impact Assessment and Management (P-5)

This topic addresses the assessment and planning processes for environmental and social impacts associated with project implementation and operation throughout the area of impact of the project. The intent is that environmental and social impacts are identified and assessed, and avoidance, minimisation, mitigation, compensation and enhancement measures designed and implemented.

5.1 Background Information

Many of the environmental and social impacts associated with the Hvammur project are considered to be moderate or easily mitigated as the river flow is already regulated by a number of upstream hydropower facilities and very little storage is designed. The impacts of greatest concern to stakeholders are visual impacts of the reservoir, impacts on salmonid fish passage, wind erosion of the river channel in the dewatered stretch of the Þjórsá, impact on the vegetation of the protected Viðey island, and noise and increased traffic during construction. During operation, social issues related to nuisance caused by wind-blown dust from the dewatered stretch are predicted.

5.2 Detailed Topic Evaluation

5.2.1 Assessment

Analysis against basic good practice

Scoring statement: *Assessments of project environmental and social impacts have been undertaken for project implementation and operation, including evaluation of associated facilities, scoping of cumulative impacts, role and capacity of third parties, and impacts associated with primary suppliers, using appropriate expertise and with no significant gaps; and a baseline has been established and well-documented for the pre-project condition against which post-project changes can be compared.*

Assessments of project environmental and social impacts were undertaken for two alternatives, the Núpur Power Plant and the two-plant scheme of Hvammur and Holt Power Plants, beginning with a scoping of impacts between 2000 and 2001, the EIA during 2002 and 2003, and as part of the project planning report issued in 2006. Both environmental and social impacts were assessed in these processes, including visual impact, hydrology, river biota, sites of natural interest, vegetation, birdlife, archaeological remains, land use, transportation, the acoustic environment, tourism and outdoor recreation, and population trends and employment. The EIA assessed impacts during both implementation and operation. Note that there is no regulatory requirement to assess social impacts in Iceland.

If the project does not commence within a 10-year period from the date of the National Planning Agency's ruling the Agency shall determine whether a new EIA is required. This decision will depend on whether changes have been made to the project which might result in different, usually more extensive, negative impacts. The environmental and social impacts of the project have largely been reduced owing to changes in design since the EIA, or remain unchanged.

The EIA and Project Planning Report cover the evaluation of associated facilities such as access roads, and the transmission line connecting it to Búrfell Line 1, but it does not cover the proposed new bridge at Hofsheiði. This is a gap but it is not considered a significant gap at this stage.

The cumulative impacts of the Hvammur and Holt projects are briefly assessed in the EIA, (Section 11.2 'Combined Effects'), but it does not assess the cumulative impact with upstream plants or with the third

planned project on the lower Þjórsá, Urriðafoss. No assessment has been made of the role and capacity of third parties, but this is not considered to be a significant gap, because risks from the capacity of government agencies or suppliers are low in this context.

Appropriate expertise was used throughout the EIA with contributions by experts from nine bodies, specifically Fornleifafræðistofan (archaeological remains, Hönnun hf. (grid connections), Landslag ehf. (planning affairs), Náttúrufræðistofnun Íslands (vegetation, bird life), Orkustofnun (geology, ground water), Rannsóknir og ráðgjöf ferðaþjónustunnar (tourism and outdoor recreation), Raunvísindastofnun Háskólans (earthquakes), SWECO VBB VIAK (international requirements) , and Veiðimálastofnun (aquatic life). This range of expertise is almost all environmental, which was appropriate for this project at the level of basic good practice; the lack of any use of social or economic expertise is discussed at the level of proven best practice below.

The EIA establishes a project baseline, in a 'Geography and Current Conditions' section which documents the pre-project condition against which post-project changes can be compared.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition the assessment takes broad considerations into account, and both risks and opportunities; and the social impact assessment incorporates assessment of human rights.*

The EIA and the process of assessment conducted through meetings held since the EIA do not take broad considerations into account: broad considerations in the context of the Hvammur project would include livelihoods or living standards other than employment, decrease in the value of summer houses (as raised as a concern in the public survey and in the EIA's public consultation meetings), and a detailed analysis of cumulative impacts. Section 7 of the EIA covers project threats and dangers to the project (such as natural disasters and seismic risks) but does not address environmental and social risks, risks that re-vegetation activities (a widely proposed mitigation measure) will be ineffective, and the risk of negative impacts on property prices. An opportunity, to enhance the plant's positive impact on tourism through offering tours, was identified in the EIA, but has not been developed further.

The absence of the assessment of these broader risks and opportunities, despite their identification as issues through public consultation and mention in the EIA, is a **significant gap** against proven best practice.

The social impact assessment does not incorporate an assessment of human rights although this is not relevant in this context.

Criteria met: No

5.2.2 Management

Analysis against basic good practice

Scoring statement: *Environmental and social issues management plans and processes have been developed with appropriate expertise (internal and external) for project implementation and operation with no significant gaps; in addition to key social and environmental issues relating to the hydropower project, plans address construction related waste, noise, air quality, land disturbance and rehabilitation; the environmental and social impact assessment and key associated management plans are publicly disclosed.*

An initial indication of plans for the management of environmental and social issues is provided by the mitigation measures in the EIA report and the measures set out in the Project Planning Report that have responded to potential impacts, and in the ruling by the National Planning Agency. In addition, there are further plans, for example to reduce the visual impact of the power house by lowering its elevation. Together these plans address the key social and environmental issues, and construction-related waste, noise, air quality, and land disturbance and associated rehabilitation.

The project has not yet completed its preparation phase, so detailed management plans specific to this project have not been developed yet. However, Landsvirkjun's corporate environmental management system will be used to manage the project when operational. Environmental management plans and processes for the Búðarháls project, which is currently under construction, were reviewed to build an understanding of the likely management measures that will be put in place at Hvammur. The Búðarháls environmental management plan was written to conform to the Búðarháls EIA. The plan was then built into the tender documents and now forms the basis of the environmental obligations of the contractor. The plan covers: waste, noise, air quality, land disturbance and rehabilitation. All are controlled by municipal councils who follow national regulations. Day-to-day management of all project risks, including environmental and social, is undertaken using a risk-management matrix. This is a comprehensive, active, working document which is used on a daily basis.

The lack of plans cannot be considered a significant gap given the time available for plans to be put in place before the project construction commences, and Landsvirkjun's corporate processes that prompt them.

The EIA, including mitigation measures, has been publically disclosed (and remains available to view on the dedicated web site for the lower Þjórsá projects), whilst management plans are yet to be developed. The absence of management plans at this point is not considered a significant gap at this stage. As an indication, the Búðarháls environmental management plan is available to the public on request, and its contents are given in tender documents.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities; plans are embedded within an internationally recognised environmental management system which is third party verified, such as ISO 14001; and independent review mechanisms are utilised.*

There are processes in place to anticipate and respond to emerging environmental risks and opportunities within Landsvirkjun's corporate environmental management system. In addition, the following processes would enable the project in the implementation and operation stages to respond to emerging environmental risks and opportunities: surveillance visits to the construction site by the Environment Agency; monitoring visits by municipal-level departments; a QMS procedure for handing over management from the construction to operation phase addressing 20 significant environmental factors; comment cards, as used at the Búðarháls site, which staff fill out to identify emerging environmental or OHS risks and make suggestions, which are reviewed at daily safety meetings; and a comprehensive risk management matrix, also used at Búðarháls, to identify new and emerging risks and which is reviewed regularly.

However there are no processes in place to address emerging social risks and opportunities. Although Landsvirkjun has operated hydropower stations in populated areas for decades, there is a perception amongst some local stakeholders that Landsvirkjun have little experience in populated areas and in managing social risks. At this stage, this gap is not significant: addressing it in time for the implementation of the project will provide Landsvirkjun with an opportunity to engage local stakeholders on an ongoing manner through implementation and operation.

It is too early to have developed the Hvammur Environmental Management Plan. However, evidence from our review of Landsvirkjun's corporate environmental management system and the Búðarháls EMP suggest that it would be embedded in the environmental management system, which is third-party verified to meet ISO 14001 requirements. An independent review mechanism for the EIA has been provided by the legally-required review of the scoping document and EIA by the National Planning Agency and Environment Agency, and by the final advisory function that the National Planning Agency will provide prior to the municipalities' decision on project approval.

Criteria met: Yes

5.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The environmental and social impact assessment and management planning process has involved appropriately timed, and often two-way, engagement with directly affected stakeholders; ongoing processes are in place for stakeholders to raise issues and get feedback.*

Stakeholder engagement on all project preparation is described under topic P-1. This part of the assessment concerns engagement on the environmental and social impacts assessment and management process.

Landsvirkjun worked closely with the National Planning Agency to engage directly affected stakeholders in the environmental and social impact assessment. Landsvirkjun visited every landowner and summer-house owners in the area between 2002-2003. If members of the community raised issues then Landsvirkjun staff re-visited with lawyers to explain rights regarding the project. All landowners were also visited again in 2007. Directly affected stakeholders interviewed had read the EIA and had the opportunity to comment on it; they also received feedback on the majority of post-EIA queries.

Four open public meetings were held in lower Þjórsá during the scoping phase, four during the EIA itself, and three after the EIA, although some interviewees state that attendance to these consultation meetings was low. At the time of the EIA, comments were invited for a period of six weeks through announcements in all local and national newspapers.

Engagement activities undertaken for environmental and social issues assessment have been appropriately-timed, and have been two-way with owners of land that will be lost to the project, with municipalities and with the National Environment Agency and National Planning Agency. There is a feeling of strong engagement between Landsvirkjun and these stakeholders.

National-level directly affected stakeholders that were consulted during environmental and social issues assessment are listed in Chapter 12 of the EIA. For example, national agencies referred to as 'consultation bodies' are: the Icelandic Tourist Board; Public Health Authority for southern Iceland; Minister of Industry Energy and Tourism; Ministry of Economic Affairs; Soil Conservation Service of Iceland; Nature Conservation Association of Iceland; National Energy Authority; Icelandic Road Association; Institute of Freshwater Fisheries; National Museum of Iceland; and the Archaeological Heritage Agency of Iceland.

Ongoing processes remain in place in the form of direct contact, the lower Þjórsá website, and new plans to re-engage with directly-affected stakeholders set out in the Communications and Stakeholder Engagement Plan.

There does not appear to be any specific process to ensure stakeholder engagement in the preparation of the Environmental Management Plan, though the engagement described above applies to the development of mitigation measures included in the EIA, and the measures to mitigate social impacts (see P-13) and enhance project benefits (see P-10). This is a gap, but is not significant at this stage, as there is time to develop the detailed management plans for environmental and social issues.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, engagement with directly affected stakeholders has been inclusive and participatory; and feedback on how issues raised have been taken into consideration has been thorough and timely.*

Details on stakeholder engagement are set out under topic P-1, and most engagement has concerned environmental and social issues. Stakeholder engagement through the EIA process has been participatory and inclusive with numerous open meetings held in the local area and in Reykjavík. Information on the project has been provided through newsletters and websites and people who wanted to be involved have generally been able to. The Protocol asks that engagement is inclusive, which means that people who may find it difficult to

get involved are enabled to do so. Typically, stakeholders living in isolated locations with no transport of their own and no internet connection would find it difficult to be involved, but none of our interviews suggested there are any such stakeholders in the case of Hvammur.

There is some frustration amongst local residents that they have not received feedback on issues raised during the consultation period in a thorough and timely manner. In addition, concerns over social impacts have increased and some local people feel they have not been sufficiently engaged in recent years. Neither of these gaps are considered to be significant at this stage, as there remains considerable opportunity to provide feedback and re-engage with directly-affected stakeholders. Landsvirkjun have definite plans in place, set out in their Stakeholder Engagement Plan, which will be implemented immediately following an affirmative parliamentary decision on the project.

Criteria met: Yes

5.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Environmental and social plans avoid, minimise and mitigate negative impacts with no significant gaps.*

The EIA sets out a series of mitigation and design measures intended to reduce the project's impact on visual aspects, hydrology, river biota, vegetation, bird life, archaeology, land use, transportation, and the acoustic environment. These measures include: reducing the level of the power house, installing a fish ladder, reinstatement of land lost, replanting vegetation, construction of dykes to reduce the reservoir area, monitoring of archaeological sites, and fencing to prevent the spread of sheep disease. These measures will mitigate the most significant negative impacts identified in the EIA - visual impact and archaeological impacts during construction, and visual impacts, impacts on salmonid biota and natural heritage sites during operation. Specific management plans are yet to be developed, so their effectiveness in managing negative impacts cannot yet be assessed.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, environmental and social plans avoid, minimise, mitigate and compensate negative project impacts with no identified gaps; and plans provide for enhancements to pre-project environmental or social conditions or contribute to addressing issues beyond those impacts caused by the project.*

Plans will avoid, minimise or mitigate all significant impacts, but there are not yet plans in place for the mitigation or compensation of all identified impacts. However, the residual impacts (e.g. some visual and noise impacts) are not significant, and would not require compensation to meet proven best practice.

There are plans for enhancements to some aspects of pre-project environmental or social conditions, such as new roads and a bridge, a larger area of wetland created than is lost to the project, and an area of new flat farm land. The new bridge over the Þjórsá, and plans to extend tree-planting on the east side of the river beyond the project's boundary are examples of plans to contribute to addressing issues beyond those impacts caused by the project.

Criteria met: Yes

5.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

The EIA and ongoing assessment process does not take broad considerations, risks and opportunities into account.

1 significant gap

5.3 Scoring Summary

The identification of environmental and social impacts has been an extensive and thorough process, involving the EIA, the Project Planning Report and extensive stakeholder engagement. Mitigation measures in the EIA report and the Project Planning Report provide an initial indication of management plans, and Landsvirkjun's corporate ISO 14001 certified environmental management system will be used to prompt Hvammur-specific environmental management plans.

However, the assessment process has not taken certain broad considerations, risks and opportunities into account, such as cumulative impacts and the risk of devaluing local property prices. There are corporate risk management processes in place which will apply to Hvammur, but these would not necessarily identify these particular risks. The plans for environmental and social impact management will avoid, minimise, mitigate or compensate all significant impacts.

There is one significant gap at the level of proven best practice, resulting in a score of 4.

Topic Score: 4

5.4 Relevant Evidence

Interview:	128, 129, 130, 134, 135, 137, 138, 139, 150, 151, 157, 158, 159, 161, 175, 179, 180, 181, 189
Document:	2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 22, 24, 25, 26, 39, 40, 41, 43, 44, 45, 46, 47, 52, 79, 111
Photo:	1g, 1h, 1j, 1n, 1p, 1q, 1r, 1s, 1w, 1y

6 Integrated Project Management (P-6)

This topic addresses the developer's capacity to coordinate and manage all project components, taking into account project construction and future operation activities at all project-affected areas. The intent is that the project meets milestones across all components, delays in any component can be managed, and one component does not progress at the expense of another.

6.1 Background Information

As part of its corporate governance, Landsvirkjun has comprehensive processes and procedures for project management. In addition, Landsvirkjun has completed a number of similar projects to the Hvammur Hydropower project and is presently building a very similar hydropower plant in the Þjórsá/Tungnaá catchment (Búðarháls) which is due to be completed in early 2014. In the absence of detailed management planning for the construction phase of Hvammur, Búðarháls provides an example of how the corporate project-management processes and procedures have been applied to a construction project, and to the integration between the contractors and Landsvirkjun. It is expected that similar processes would be employed for Hvammur.

Considerable planning and project management is already in place for Hvammur to take the project from the preparation phase into implementation.

6.2 Detailed Topic Evaluation

6.2.1 Management

Analysis against basic good practice

Scoring statement: *An integrated project management plan and processes have been developed that takes into account all project components and activities with no significant gaps; and a construction management plan has been developed that identifies construction risks and describes processes that contractors and others are required to follow to manage these risks.*

Landsvirkjun has a project plan for the preparation phase which includes all key tasks, timelines, organisational and reporting charts, budget and key dependencies. This plan covers all components of the project and is regularly updated. The plan covers the time up to the end of the planning phase, including obtaining a Power Plant Licence from the National Energy Authority and Construction Licences from the Municipalities, as well as integration with and handover to the construction phase. In addition, a detailed risk register has been prepared for the Hvammur project.

The project manager(s) for Hvammur report to a steering committee which monitors political and financial issues, and makes changes to the project schedule as required. It is intended that the project manager for the construction phase is one of the members of the steering committee for the preparation phase, thus is aware of the risks/issues leading into the construction phase.

A construction management plan has not been developed for Hvammur, however, details of the construction management plan prepared for Búðarháls by the contractor Ístak, was provided. This plan was prepared in accordance with Landsvirkjun's requirements and is comprehensive, considering all aspects of the project and its management including a detailed risk register and work breakdown structure for each task.

Overseeing the contractors is a project management team (11 members) from Landsvirkjun who manage the construction contracts, budgets, timeline, risk, insurance, monitoring/compliance requirements, communications and permits. They meet regularly with the contractors, managing any developing risks/issues.

Analysis against proven best practice

Scoring statement: *In addition, the integrated project management plan sets out measures to manage interface and delay issues without impinging on overall project timetables and budgets; construction management plans ensure that land disturbance and waste generation activities will be managed so that later rehabilitation activities can be undertaken efficiently and effectively; and processes are in place to anticipate and respond to emerging risks and opportunities.*

Landsvirkjun's project management framework has clear processes to manage interfaces between preparation and construction, between different work streams, and between Landsvirkjun and contractors. These processes and interfaces ensure that any risk/issues are identified early, relevant management notified, and the risks/issues managed such that there are no significant delays to the project which could have been avoided or better managed. The exception to this is the Master Plan which has delayed finalisation of the preparation phase, however, as this is a State government initiative, this is not in the immediate sphere of influence of Landsvirkjun and its contractors.

The construction management plan for Búðarháls includes management of waste, resources and soils based on the environmental management plan for Búðarháls, prepared by Landsvirkjun. Landsvirkjun intends to produce a similar environmental management plan for Hvammur prior to construction, so that the required management measures are included in the construction management plan. At present, Landsvirkjun has prepared a report outlining all mitigation and monitoring it has committed to for Hvammur, and this will form the basis for the environmental management plan.

Criteria met: Yes

6.2.2 Outcomes

Analysis against basic good practice

Scoring statement: *The project is likely to meet overall budget and timing objectives and targets, and plans avoid, minimise and mitigate construction risks with no significant gaps.*

Project is likely to meet overall budgets. Timing of the preparation stage has been delayed by the Master Plan, but project schedules are being adjusted to accommodate the Master Plan outcomes. Management of Búðarháls construction, both by Landsvirkjun and Ístak, indicates that the project management is integrated and the construction risks are successfully managed, such that the project is on budget and schedule.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the project is highly likely to meet overall budget and timing objectives and targets; and plans avoid, minimise, mitigate and compensate construction risks with no identified gaps.*

Given the internal project management processes that Landsvirkjun has in place, its expectation of contractors, and based on the current management of the Búðarháls project, it is highly likely that Hvammur will meet overall budget and schedule objectives/targets, with construction risks managed in an integrated way.

Criteria met: Yes

6.2.3 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

6.3 Scoring Summary

Landsvirkjun has well developed procedures and processes that ensure that project management is integrated across and between all stages of a project, such that projects are successfully managed to budget and timelines, with clear responsibilities identified between project managers and contractors. Issues and risks are successfully identified and managed across all stages of a project, such that delays are avoided or minimised, and there is no major impact on the overall schedule, milestones and budget.

There are no significant gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

6.4 Relevant Evidence

Interview:	145, 147, 169, 170, 186, 189
Document:	44, 46, 47, 48, 49, 71, 72, 73, 79
Photo:	None

7 Hydrological Resource (P-7)

This topic addresses the level of understanding of the hydrological resource availability and reliability to the project, and the planning for generation operations based on these available water inflows. The intent is that the project's planned power generation takes into account a good understanding of the hydrological resource availability and reliability in the short- and long-term, taking into account other needs, issues or requirements for the inflows and outflows as well as likely future trends (including climate change) that could affect the project.

7.1 Background Information

The Þjórsá river is Iceland's longest river, and is fed by glacial runoff from three glaciers – Vatnajökull (Europe's largest), Hofsjökull and the small Tugnafellsjökull. It is already a strongly regulated river system, with five storage reservoirs with a total storage capacity of approximately $2 \times 10^9 \text{ m}^3$. The largest is Þórisvatn with a volume of $1.33 \times 10^9 \text{ m}^3$. The storage hence represents about 20% of the annual average runoff at the Hvammur project site, where the average discharge is around $317 \text{ m}^3/\text{s}$.

There are 5 operating hydropower plants in the catchment, and one more, Búðarháls, is under construction with scheduled start of operation in early 2014.

Extensive hydrological and glacial monitoring is carried out on a continuous basis and the hydrological resource is documented in detail. The Þjórsá river hydropower projects are operated through an integrated control system, which secures an efficient and optimised use of the water resource.

Iceland has taken part in the highly sophisticated research project on climate-change impacts conducted through the 2007-2010 strategy and action plan for the Nordic Energy Research under the auspices of the Nordic Council of Ministers.

7.2 Detailed Topic Evaluation

7.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment of hydrological resource availability has been undertaken utilising available data, field measurements, appropriate statistical indicators, and a hydrological model; issues which may impact on water availability or reliability have been identified and factored into the modelling; and scenarios, uncertainties and risks have been evaluated.*

Extensive modelling of groundwater and glacial-melt contributions to Þjórsá-river runoff has been, and is, continuously conducted by both public actors and Landsvirkjun itself. A complete catchment model was developed for the Uriðafoss project (a short distance downstream of Hvammur) and prorated for Hvammur. This model was based on 14-day flows, an approach which was sensitivity-tested and found to have no significant deviation as compared with hourly values due to the strong regulation of the system.

Standard variability aspects have been comprehensively investigated, including flow duration, flood estimations, and trends.

A graphic of one of the catchment models is shown in Photo P7-1.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, issues that may impact on water availability or reliability have been comprehensively identified; and uncertainties and risks including climate change have been extensively evaluated over the short- and long-term.*

State-of-art climate-change studies have been conducted by the Iceland Meteorological Office in a Nordic research co-operation effort. This was started for glaciers following the 1st IPCC report. Following the 3rd IPCC report, the Nordic council of ministers through Nordic Energy Research, initiated a new study aiming at impacts of climate change on hydropower. Downscaling was done to 9 km squares in general over Iceland and to 3 km squares for the Þjórsá-Tungnaá catchment. This study had active participation of end users – among them the power companies. There are plans for even more advanced studies dealing with, among other things, wind power under “harsh” conditions, and the wind power/hydropower interface.

Criteria met: Yes

7.2.2 Management

Analysis against basic good practice

Scoring statement: *A plan and processes for generation operations have been developed to ensure efficiency of water use, based on analysis of the hydrological resource availability, a range of technical considerations, an understanding of power system opportunities and constraints, and social, environmental and economic considerations including downstream flow regimes.*

A production model has been developed, based on the runoff model, which uses assigned water values. Each reservoir has a water price with a weekly resolution. A load curve is developed for each reservoir and the short-term (weekly) regulation is based upon this.

Dispatch is done by Landsnet (the national grid operator) on behalf of Landsvirkjun and Landsvirkjun owns and manages all the power plants in the catchment.

Long-term generation planning is based on 50 years of statistics and focuses on securing the utilisation of the reservoirs in the winter and their filling during the summer period.

New opportunities are constantly investigated, such as increased river flow due to climate change and the possibility of developing a peak-power market as well as export of electricity to mainland Europe through a cable on the Atlantic sea bed.

The downstream flow is used as a boundary condition in all modelling – such that all runs start by subtracting the adopted flow. The downstream flow will be delivered as “spill” over the dam, meaning that dam design will guarantee flow delivery.

Adjustments have been made to all models based on climate-change predictions.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, generation operations planning has a long-term perspective; takes into consideration multiple uses and integrated water resource management; fully optimises and maximises efficiency of water use; and has the flexibility to adapt to anticipate and adapt to future changes.*

For the anticipation and adaptation to future runoff changes as well as long-term approaches to generation planning – see above under Assessment.

There is a plan for a spot market in Iceland – possibly further contributing to an optimisation of water use.

There are no significant extractive needs for river-water services in the catchment, and the non-hydropower non-extractive uses centre on tourism and fishing. The river section close upstream and downstream of the Hvammur site has introduced stocks of salmon as a result of the fish ladder constructed at Búði in 1991 as a mitigation measure for upstream developments. Landsvirkjun has, thereby, provided additional benefits for local users of the river for fishing and recreation. The biodiversity repercussions of this mitigation are dealt with under Topic 19.

Design is done such that the dam can pass a 50-year flood at the reservoir’s full supply level, and management of runoff is always done with glacial outbursts in mind.

Criteria met: Yes

7.2.3 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

7.3 Scoring Summary

The catchment is modelled in detail both in terms of runoff and power generation. The resource is also well known due to a long history of power generation in the catchment, and the high degree of regulation in the system.

High-resolution sophisticated climate-change modelling has been conducted and used for predictive modelling of runoff volumes for optimisation.

There are no significant gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

7.4 Relevant Evidence

Interview:	132, 143, 167, 177, 183, 184
Document:	2, 3, 5, 6, 7, 22, 33, 34, 36, 37, 38, 39, 40, 41, 42, 50, 51, 52, 53, 96, 97
Photo:	1r, 1ae

8 Infrastructure Safety (P-8)

This topic addresses planning for dam and other infrastructure safety during project preparation, implementation and operation. The intent is that life, property and the environment are protected from the consequences of dam failure and other infrastructure safety risks.

8.1 Background Information

As a region prone to natural disasters, Iceland has well-developed emergency response plans to deal with flooding, earthquakes and volcanic eruptions. Landsvirkjun make good use of these existing plans and coordinate their risk assessment and response with national agencies. Owing to the existing hydropower plants farther upstream, the additional risk posed by the Hvammur project is considered low. However, corporate emergency-response procedures and plans will be applied, as they are across Landsvirkjun's hydro fleet. In Iceland, there are no regulatory standards for dam safety, and therefore Landsvirkjun follow Norwegian Standards.

Where the Búðarháls project is referred to under this topic, it is used to indicate how Landsvirkjun's policies and processes would apply during construction, as it is too early to have them applied to Hvammur at this stage.

8.2 Detailed Topic Evaluation

8.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment has been undertaken of dam and other infrastructure safety risks with appropriate expertise during project preparation, construction and operation, with no significant gaps.*

A comprehensive assessment of dam and other infrastructure-safety risks has been undertaken for the three proposed projects on the river Þjórsá. Three areas have been assessed: flood risk; ice jams; and geological and seismic risk, including risk from volcanic eruptions and jökulhlaups (a flood resulting from catastrophic emptying of a glacier-dammed volume of water or a volcanic eruption underneath a glacier).

These assessments focused entirely on the operation phase of the projects, because the risks due to infrastructure failure during construction are similar or less extreme than the risks during operation.

The assessment of flood risk included flooding due to hydrology, an upstream dam break, faults in technical systems, human error, and terrorist actions. It made a hazard assessment for each of the projects proposed for the Þjórsá river, and estimated the possible risk of death by flooding due to dam break. In addition, a background report to the Project Planning report provided a model of flood risk. The report was based on the Ministry of Environment's guidance that risk of death of downstream residents by flooding should not be higher than acceptable risk of a person living in an avalanche zone, as defined in Icelandic regulation (No. 505 / 2000). Models of the whole catchment's hydrology were described by some interviewees as 'based on decades of flow data', see further Topic 7.

The assessment of earthquake hazard and seismic action presented seismic features of the region, 'strong-motion'-estimation modelling (i.e. strong ground shaking and motion), risk of faults, and hazard analysis, leading to engineering-design provisions for the plants. In addition, it produced a synthesis of geological field data including seismic data and information on geological shears, slips and faults.

The ice-jam evaluation included modelling of ice-jam formation and break-up in the Hagalón reservoir, and the associated risk of flooding.

Appropriate expertise was used in these studies from a range of sources: Mannvit and Verkís consultants, Iceland Geosurvey and the National Energy Authority, the Earthquake Engineering Research Centre of the University of Iceland, University professors and the State Meteorological Office.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment includes consideration of a broad range of scenarios, and includes both risks and opportunities.*

The assessment covers a broad range of scenarios with all types of flooding investigated; precipitation, ice build-up, glacial melt including catastrophic glacial outbursts, dam break upstream, changes in the river due to hydropower operations, technical faults, human error, vandalism or terrorism. Multiple scenarios such as dam break, fuse-plug break, and side-dam break have been modelled and the flooded area calculated and documented in maps. An overview of the area's geology, earthquake and volcanic history is made and probable future impacts assessed. All scenarios model risks to fishermen and risk to life of local inhabitants. An example of an opportunity that has been taken in the assessment of risks is the involvement of university departments and national authorities such as the meteorological office. It is too early to have taken any other opportunities: the opportunity to deploy new technologies or software, for example, would be considered at the detailed design stage.

Criteria met: Yes

8.2.2 Management

Analysis against basic good practice

Scoring statement: *Dam and other infrastructure safety management plans and processes have been developed for project implementation and operation in conjunction with relevant regulatory and local authorities with no significant gaps and provide for communication of public safety measures; emergency response plans include awareness and training programs and emergency response simulations; and dam safety is independently reviewed.*

Detailed design of the dam structures is yet to be done and will take place only after the award of the design and build contract. Note that the risk to life of flooding is very low (see 'Outcomes'), and the dam is not designed to manage or control floods, or a catastrophic flood due to volcanic eruption (which would be a far more significant emergency than a Hvammur dam failure).

In addition, Landsvirkjun has numerous corporate processes and plans concerning infrastructure safety and all types of emergencies which will be applied to Hvammur. These include: a risk management plan to be embedded into the project tender documents; a procedure to follow when Landsvirkjun operations department takes over from the contractor when construction is almost complete; regular visual dam maintenance checks, structural monitoring equipment and leakage measurement; procedure 'GAT 277' describing the response required for pre-emptive, danger-level, and state-of-emergency situations; the 'LEI 250' emergency response plan for the lower Þjórsá, referring to 150 residences at risk; and 'LEI 225' outlining how to respond to an emergency. An existing net of seismic monitoring devices across southern Iceland and flow monitoring, to which the Meteorological Office has access, will feed into these systems. In addition, insurance companies will stipulate infrastructure-safety requirements (as an example a British standard has been required for tunnelling at Búðarháls).

Failure of either coffer dam is the key risk during the construction phase. Landsvirkjun will build stringent safety requirements for coffer dams into the tender documents, including a requirement to withstand a 1 in 50 year flood. Monitoring is less intensive than on the operational dam, but requires leakage below the coffer dam to

be measured. If leakage increases then planned response procedures are triggered. Risks are well assessed and contingencies planned for on the Búðarháls project.

There is no authority in Iceland with regulatory responsibility for dam safety, and no Icelandic regulations: Norwegian regulations are implemented instead. Landsvirkjun works closely with the Civil Protection Authorities to prepare emergency plans. For example, significant planning was required for the Fljótsdalur project, but no work has yet been undertaken for Búðarháls or Hvammur, given their early stages of development. In the case of an emergency, Landsvirkjun makes immediate contact with the Civil Protection Authority who takes over responsibility for public-safety measures in the event of an emergency, and enacts plans to contact the public.

Emergency-response plans include awareness and training programmes and emergency-response simulations. One exercise is undertaken every year involving all staff associated with Landsvirkjun's Emergency Management Committee and municipal emergency services, and the conclusions recorded in minutes. Significant exercises take place with the emergency services every three or four years and small scale exercises more regularly. Some interviewees expressed concern that simulations are not carried out frequently enough, however.

The risk assessment described above was prepared by independent consulting firms external to Landsvirkjun, drawing upon specialist expertise (also described above), and meets the requirements of an independent review of dam safety. The methodology used was based on a US Bureau of Reclamation Dam Safety Office methodology. Following the finalisation of the tender design for Hvammur, an additional independent dam-safety assessment, with involvement of the Iceland Construction Authority, will be carried out by independent experts from the project's financing banks in accordance with standard international practice.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities; plans provide for public safety measures to be widely communicated in a timely and accessible manner; and emergency response plans are independently reviewed.*

There are several processes in place to anticipate and respond to emerging risks and opportunities. First, inspection rules (included in corporate procedures and based on Norwegian standards) set out procedures for monitoring ground-water level, dam leakage, water transparency, movement of water level, and changes in pressure. Second, project reports are prepared on a monthly basis and include maintenance issues and emergency strategies. Third, an Emergency Committee consisting of five corporate-level heads of department and five plant managers convenes and reports annually to the Landsvirkjun board, describing what main issues and events that are arising, and training requirements. This committee is the highest governing body in the event of an emergency. Finally, an emergency-control room is located in Landsvirkjun's central office. Each year, the Emergency Committee reviews the processes for particular area of infrastructure safety. Incidents of every operating power plant are reviewed every year and recommendations for improved safety are incorporated into revised processes.

Landsvirkjun is a member of the 'Icelandic Power Sector Emergency Preparedness Forum' which operates with all power companies. This forum meets regularly to coordinate planning and share best practice, providing a forum for Landsvirkjun to consider risks and opportunities.

In the case of an emergency, Landsvirkjun makes immediate contact with the National Emergency Services, providing for public-safety measures to be communicated in a timely and accessible manner. The emergency services contact and evacuate affected members of the public if required. This will be done by SMS, recorded telephone calls, and house visits. In an emergency, one Landsvirkjun staff member would be stationed in the national emergency-response centre. This person would provide the communication link to the Landsvirkjun emergency control room.

The National Emergency Services independently review plans and ensure that they fit with national schemes. For example, changes have been made to Landsvirkjun plans to ensure that all organisations use the same words to mean the same thing.

Criteria met: Yes

8.2.3 Outcomes

Analysis against basic good practice

Scoring statement: Plans avoid, minimise and mitigate safety risks with no significant gaps.

The flood-risk and ice-jam assessments concluded that the increased risk to residents living near to the Þjórsá due to Hvammur is very small. In the event of a dam break, one farmhouse only, Urriðafoss, would suffer flooding, up to 2 metres, as it is located in the old river bed. The plans and processes described above will avoid and minimise safety risks.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: In addition, plans contribute to addressing safety issues beyond those risks caused by the project itself.

Landsvirkjun do not have any plans at this stage for addressing infrastructure safety issues beyond those caused by the project itself, with the exception of making the construction-site ambulance available to the public. This is a **significant gap**.

Criteria met: No

8.2.4 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no plans for addressing infrastructure safety beyond those of the project itself.

1 significant gap

8.3 Scoring Summary

A comprehensive assessment of dam safety on the lower Þjórsá river has been carried out using a team of appropriately-qualified independent experts. This assessment has concluded that the Hvammur project poses very little risk to the residents in the surrounding area. Landsvirkjun has company-wide detailed infrastructure-safety plans in place to monitor and manage dam safety, based on Norwegian standards. Emergency responses are well planned and will be delivered in close partnership with the Civil Protection Authority who are responsible for public communication in the event of an emergency. However, the project does not address infrastructure-safety issues beyond those caused by the project itself, which is a significant gap against proven best practice.

There is one gap at the level of proven best practice, resulting in a score of 4

Topic Score: 4

8.4 Relevant Evidence

Interview:	158, 182
Document:	24, 52, 54, 55, 57, 59
Photo:	None

9 Financial Viability (P-9)

This topic addresses both access to finance, and the ability of a project to generate the required financial returns to meet project funding requirements, including funding of measures aimed at ensuring project sustainability. The intent is that projects proceed with a sound financial basis that covers all project funding requirements including social and environmental measures, financing for resettlement and livelihood enhancement, delivery of project benefits, and commitments to shareholders/investors.

9.1 Background Information

At the project level, the financial viability of Hvammur is determined by the board of Landsvirkjun and only when a PPA has been negotiated.

The financial crisis in 2008-09 hit Iceland hard with bank crashes and other serious implications for the credit industry. Credit for front-heavy investments with returns under 25% has, thereafter, been difficult to obtain. The company has responded with innovative partnerships, and is successfully constructing a new hydropower project at Búðarhals, upstream in the same river, Þjórsá, in which the Hvammur project site is located.

9.2 Detailed Topic Evaluation

9.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment of corporate financial viability, including potential project costs and likely revenue streams, has been undertaken using recognised models with no significant gaps; analyses include risk assessment, scenario testing and sensitivity analyses.*

Landsvirkjun employs comprehensive financial modelling both at corporate and at project level, including scenarios for the major variables such as Aluminium price (some of the PPAs are indexed) and interest rates. Scenarios are analysed on a quarterly basis with all basic variables and detailed sensitivity analyses.

Financing is done on the company's balance sheet. Landsvirkjun is unique in Iceland following the crash of 2008-09, since it is regarded by foreign businesses as financially viable and reputable.

Risk management is mainly undertaken at corporate level. One important identified risk is the currency risk. Due to an innovative financing mechanism (see below under Management), the company had a lot of debt in €, but the main income was in \$US. In April of 2012, a deal was made to re-denominate two loans from € to \$US and fix the rate. The main reason for doing this is that the functional currency of the company is \$US, given that contracts with Aluminium smelters are made in that currency.

The PPAs are of long duration, there is one example with an Aluminium company where the PPA runs until the year 2028.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, project costs and revenue streams are fully detailed; and financial viability of the project has been analysed and optimised including extensive scenario testing, risk assessment, and sensitivity analyses.*

Project costs and revenue streams are fully detailed; and financial viability of the project has been analysed and optimised with extensive scenario testing, risk assessment, and sensitivity analyses.

Criteria met: Yes

9.2.2 Management

Analysis against basic good practice

Scoring statement: *Financial management plans and processes have been developed for project implementation and operation with no significant gaps, and opportunities for project financing have been evaluated and pursued.*

The finance division has recently been strengthened, and is now able to carry out state-of-the-art financial modelling. Financial planning for a project is done with a 50-year time horizon for hydropower (30 years for geo-thermal projects) and includes a 20% contingency for the construction phase.

One important step to improve financial strength was a board decision to work for an increased margin through higher PPA prices.

The company is strongly dependent on the Aluminium smelters for its revenue. It is now official policy to work for diversification of the off-takers. One focus is emerging “green businesses”, and a specific such, which is starting to grow, is that of data/server centres. The cold climate in combination with cheap electricity in Iceland could potentially be very attractive to these businesses.

Financing of Hvammur will likely follow the same pattern as that for the Búðarhals project, presently under construction. For Búðarhals, an ECA (the German export-credit facility) was involved in the \$US 45 million financing of the electro-mechanical component. This deal was awarded “Deal of the Year” for the Europe, Middle East and Africa regions for the year 2011 by the Trade Finance Magazine.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, financial management plans provide for well-considered contingency measures for all environmental and social mitigation plans and commitments; and processes are in place to anticipate and respond to emerging risks and opportunities.*

The risk management approach is comprehensive, solid and fully able to deal with emerging risks and opportunities. The innovative deal struck with the German export-credit bank mentioned at Level 3 is a strong demonstration of this.

Since project planning for Hvammur is not yet at the stage where all mitigation programmes and commitments are identified, a detailed contingency plan has yet to be developed. This is considered a non-significant gap at this stage, but the gap would have to be closed before the project enters the implementation phase, or it would become a significant gap against the Level 5 criteria, at the end of the Preparation phase.

Landsvirkjun conducts ongoing planning in order to respond to emerging opportunities, and are presently looking at using what are the most competitive PPAs in Europe for e.g. more, but diversified, investment in power-demanding businesses as well as the possibility of exporting power to Europe via a sea cable.

Criteria met: Yes

9.2.3 Outcomes

Analysis against basic good practice

Scoring statement: *The project can manage financial issues under a range of scenarios, can service its debt, can pay for all plans and commitments including social and environmental, and access to capital can be demonstrated.*

As a standard operating principle, Landsvirkjun does not start a new project until a long-term PPA is signed for the electricity from that project. This guarantees the revenue stream to service project debt. Under stringent

Icelandic legislation all costs, including socio-environmental mitigation and compensation, are covered by the project owner and are included in the total cost calculation for the project.

However, following the construction of the 690 MW Fljótsdalur hydropower project (more than a 1/3 of Landsvirkjun's total installed capacity), the company was heavily leveraged. This is partly resolved by 2012, but the company is trying to improve returns further in order to secure the financial situation. This has resulted in a preference for small to medium-sized projects at the moment, projects that can be handled one by one while continuing to deleverage the debt from Fljótsdalur.

For Hvammur, the finance division has a cost band within which the project will fall (engineers are still working on optimisation and other cost-cutting measures).

Landsvirkjun has access to around \$US 650 million in credit and has a debt of around \$US 2.5 billion. The maturity is high and the company is self-sufficient. With no new projects it could manage without further external funding. Landsvirkjun has a state guarantee, which they pay for, from their owner, the Government of Iceland. See also the work with ECAs under Management.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the project can manage financial issues under a broad range of scenarios.*

The project can manage financial issues under a broad range of scenarios.

Criteria met: Yes

9.2.4 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

9.3 Scoring Summary

Well-developed financial planning including risk assessment with scenario/sensitivity testing provides the foundation for Landsvirkjun's financial management. A focus on long-terms PPAs, signed before any project construction is started, improves the financial stability and reduces risk. The company is also implementing a concerted effort at reducing the currency risk (having debt in € and revenue in \$US).

Highly innovative and prize-winning project financing shows that Landsvirkjun is a company which is able to manage its businesses and service its debts. There are no significant gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

9.4 Relevant Evidence

Interview:	176, 178, 190, 192
Document:	2, 23, 63, 64, 65, 66, 67, 68
Photo:	None

10 Project Benefits (P-10)

This topic addresses the additional benefits that can arise from a hydropower project, and the sharing of benefits beyond one-time compensation payments or resettlement support for project affected communities. The intent is that opportunities for additional benefits and benefit sharing are evaluated and implemented, in dialogue with affected communities, so that benefits are delivered to communities affected by the project.

10.1 Background Information

Affected communities are described under P-13. They are rural communities, including the settlement of Árnes and isolated farms and households, distributed across two municipalities, Rangárþing ytra (on the left, eastern bank) and Skeiða og Gnúpverjahreppur (on the right, western bank).

There is no legal requirement for benefit-sharing, but the law on municipal revenue-raising (January 1995, no. 4) sets out the system for municipal tax, including property tax, contributions from central government, and income tax.

10.2 Detailed Topic Evaluation

10.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment of opportunities to increase the development contribution of the project through additional benefits and/or benefit sharing strategies has been undertaken; and the pre-project baseline against which delivery of benefits can be evaluated post-project is well-documented.*

The assessment of potential opportunities to increase the contribution of the project to the local communities, or to share benefits, was undertaken through repeated planning discussions with affected municipalities, and the benefits described under 'Management' below were thereby identified. This process did not explicitly consider a range of options for benefit-sharing or appraise alternative options, but this is a non-significant gap.

A pre-project baseline against which delivery of benefits can be evaluated is provided in the EIA 'Geography and Current Conditions' section, including transportation, population trends and employment, tourism and outdoor recreation. Existing road access is also documented in the Project Planning report.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, broad considerations have been taken into account in identifying opportunities.*

The assessment of project benefits has not considered broader considerations in identifying opportunities, with the exception that the internet-connection proposal is an example of an innovative benefit. No assessment has taken place in which a breadth of types of benefits or a breadth of stakeholder interests has been considered, and the planned benefits are not based on an assessment of local development objectives. Many of the benefits are derived directly from project requirements or mitigation measures (the road by the dike and farmland, the electricity connection and ambulance). The absence of an assessment that takes broad considerations into account is a **significant gap** against proven best practice.

Criteria met: No

Analysis against basic good practice

Scoring statement: *Project benefit plans and processes have been developed for project implementation and operation that incorporate additional benefit or benefit sharing commitments; commitments to project benefits are publicly disclosed.*

Plans to deliver project benefits are as follows:

- the provision of a new road within the Skeiða og Gnúpverjahreppur municipality along the western bank of the proposed reservoir which includes an intersection at Árnes community;
- the construction of a new bridge on the Þjórsá river downstream of the project site, similar to the existing Urriðafoss Bridge;
- the provision of internet-cable connection to every farm within the municipality Skeiða og Gnúpverjahreppur;
- reclamation of farmland on the western side of the dyke;
- a new connection to the electric distribution network at Hella will be required for construction activities but will remain part of the local distribution network after the construction period is over;
- a tourist centre in the Árnes local assembly hall; and
- during the construction phase, an ambulance will be available on site which could be used for both assisting construction workers and local communities.

Landsvirkjun and the State Road Authorities have planned and designed the proposed new road and a bridge which connects the road system of the municipalities affected by the project (Skeiða og Gnúpverjahreppur and Rangárþing ytra). The new road and bridge represent an opportunity to increase the accessibility, tourism and trade in the area and co-operation between the two municipalities. The proposed new bridge was not part of the State Road Authority's plans and therefore it could not be built without Landsvirkjun's support. The relocation of approximately 4 km of affected road to the west of the reservoir has been re-designed as a result of the outcomes of the EIA consultations, in order to reduce the size of the reservoir and minimise the land take from current landowners (Hagi and Melhagi farms). The Project Planning Report describes the specifications of the proposed new road and bridge.

The proposal to provide an internet cable to every farm in Skeiða og Gnúpverjahreppur is set out in a plan prepared by this municipality. The practice of making the onsite ambulance available to local communities when needed has been previously provided by Landsvirkjun at the Búðarháls construction site.

Commitments to project benefits (new road alignment and bridge) are publicly disclosed within the EIA and incorporated in the municipalities' planning strategies. The lower Þjórsá project website contains all available project documentation, including the project planning report (2006), the EIA and subsequent studies, which include these project benefits. Municipalities and stakeholders consulted acknowledged Landsvirkjun's plans for the construction of the proposed road and bridge, and stakeholders interviewed, such as the tourism association, were aware of benefits.

In keeping with the legal requirement mentioned above, Landsvirkjun will pay an annual recurrent tax to the Rangárþing ytra Municipality (where the power plant is located). The tax amount will depend on the size and cost of the powerhouse. Landsvirkjun are not required to pay tax to Skeiða og Gnúpverjahreppur municipality.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes have been developed to anticipate and respond to emerging risks and opportunities.*

There are no processes in place to anticipate and respond to emerging risks and opportunities regarding project benefits, other than the close working relationship between Landsvirkjun and the municipalities. There is no corporate process that would prompt the ongoing identification of project benefits in response to emerging risks or opportunities. This is a **significant gap** against proven best practice.

Criteria met: No

10.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The assessment and planning process relating to project benefits has involved appropriately timed, and often two-way, engagement with directly affected stakeholders; ongoing processes are in place for stakeholders to raise issues and get feedback.*

Stakeholder engagement on all project preparation is described under topic P-1. This part of the assessment concerns the assessment and planning of project benefits only.

Planning of the benefits described above has involved meetings and negotiations with affected municipalities and the affected landowners prior to and since the start of the EIA process. The project planning report (2006) and the municipal planning documents for Skeiða og Gnúpverjahreppur and Rangárþing ytra provide further details on the planning of the proposed road and bridge.

Furthermore, engagement has been two-way. The design of the west bank road was undertaken with negotiations and ongoing communications with affected municipalities and landowners starting from the EIA process. The road-design process took into consideration the opinions of affected municipalities and landowners, and as result, the final design reduces the size of the reservoir and facilitates reclamation of farmland.

The lower Þjórsá project website provides project updates and offers interested stakeholders a way to contact Landsvirkjun: these are ongoing processes in place for stakeholders to raise issues and get feedback. The lower Þjórsá Communications and Stakeholder Engagement Plan (2011) will also provide a process of consultation with local residents and municipalities when it is implemented.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, engagement with directly affected stakeholders has been inclusive and participatory; and feedback on how issues raised have been taken into consideration has been thorough and timely.*

All stakeholders interviewed were well-informed about the benefits of the project, including landowners and representatives from the tourism association of west Þjórsá and the angling club. Project planning meetings with landowners, municipalities and communications with the angling club have been undertaken in a participatory and timely manner. However, stakeholder engagement on the planning of benefits has focused mainly on municipalities, and has not been inclusive of other local directly-affected stakeholder groups such as recreational users and summer-house owners; this is a **significant gap** against proven best practice.

Note that where national-level directly-affected stakeholders are relevant to project benefits, they have been included in the development of plans (the National Planning Agency and the Icelandic Roads Administration).

Feedback in relation to project benefits has been thorough and timely through the discussions with municipalities (notwithstanding concerns about the timeliness of feedback on the overall project – see P5).

Criteria met: No

Analysis against basic good practice

Scoring statement: *Plans deliver benefits for communities affected by the project.*

The provision of the new road and bridge will not only benefit local project-affected people, it will also improve access to the municipalities for commuters, tourists, local residents and residents from other regions, and promote industry opportunities in the region. All stakeholders interviewed see the provision of the new road and bridge as a benefit to the area.

The provision of internet connections to all farms in Skeiða og Gnúpverjahreppur municipality will be a clear recognised benefit, identified by the municipality itself.

Oral evidence from a representative from the west-of-Þjórsá tourism association and the opinions survey undertaken in 2002 indicate that the new access road and bridge may promote the tourism and encourage people to move into this area, preventing depopulation of the area by younger people. The EIA also indicates that “the bridge could have a positive effect on tourism”.

The road and bridge proposals are consistent with the local authorities’ objectives and planning strategies. Affected communities will benefit from improved access to the adjacent municipality and the local presence of an ambulance during the construction phase.

The Rangárþing ytra Municipality will receive sustainable income in the form of a tax directly related to the size of investment and impact of the Hvammur project.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, plans deliver significant and sustained benefits for communities affected by the project.*

The project benefits, with the exception of the availability of a local ambulance during the construction period, will remain in the area available for the communities affected by the project, and can be expected to deliver significant and sustained benefits. For example, the construction of a new bridge was not part of the Road Planning Agency plans, and can bring significant benefits for local communities (e.g. improved access, community cohesion, employment and development of tourism). The tax revenue for the Rangárþing ytra Municipality will be a sustained benefit.

Criteria met: Yes

10.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

The absence of an assessment to increase the development contribution of the project that takes broad considerations into account;

The absence of a process to anticipate and respond to emerging risks and opportunities regarding project benefits;

The lack of inclusion of some relevant local stakeholder groups in the assessment and planning of project benefits.

10.3 Scoring Summary

Repeated planning discussions with municipalities and the publicly-disclosed EIA and project-planning processes comprise the process for the assessment of project benefits. This has involved timely and two-way stakeholder engagement, particularly with municipalities, resulting in plans for a range of benefits. As a result, the project is likely to generate significant and sustained benefits to local communities, beyond one-time compensation payments to directly-affected landowners. These centre on the construction of a bridge linking the left and right banks, Rangárþing ytra and Skeiða og Gnúpverjahreppur municipalities, the provision of internet connections to all farms in Skeiða og Gnúpverjahreppur and the tax revenue for the Rangárþing ytra Municipality

However, stakeholder engagement in the assessment and planning process has not included all directly-affected stakeholders, in particular local residents who do not lose land to the project. The assessment process has not embraced a broad approach to the assessment of benefits, and many benefits derive directly from project requirements. In addition, Landsvirkjun has not developed a process to identify emerging risks and opportunities related to project benefits on an ongoing basis.

There are 3 significant gaps at the level of proven best practice, resulting in a score of 3.

Topic Score: 3

10.4 Relevant Evidence

Interview:	129, 130, 135, 137, 150, 151, 161, 181
Document:	2, 4, 6, 7, 8, 69, 100, 111
Photo:	None

11 Economic Viability (P-11)

This topic addresses the net economic viability of the project. The intent is that there is a net benefit from the project once all economic, social and environmental costs and benefits are factored in.

11.1 Background Information

Standard cost-benefit analysis (CBA) including socio-environmental costing is not practiced as a practical evaluative tool by Landsvirkjun. However, all projects that were part of the master-planning exercise had to list a range within which their capital costs would fall.

11.2 Detailed Topic Evaluation

11.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment of economic viability has been undertaken with no significant gaps; the assessment has involved identification of costs and benefits of the project and either valuation in monetary terms or documentation in qualitative or quantitative dimensions.*

There has been no complete cost-benefit analysis (CBA), where all economic, social and environmental costs and benefits are factored in, completed for the project. CBA is not a requirement in Iceland and even described by one interviewee as a somewhat questioned tool, due to a lack of “tradition” of application in the country. It is, however, mentioned as a tool on the “Invest in Iceland” web site, indicating that it will indeed become more mainstream in the near future.

The cost estimate for Hvammur is developed to a high level of detail. Costs and benefits for socio-environmental aspects have been calculated based on an estimate of mitigation and compensation costs. The environmental services concept is not practiced in Iceland.

Landsvirkjun develops C/B ratios, including financing costs, for all projects. The finance division take these estimates and calculate an IRR, with scenarios for base, worst and best cases.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment takes broad considerations into account, and includes sensitivity analyses.*

Landsvirkjun does perform sensitivity analyses but the assessment cannot be judged to take broader considerations into account, as it is quite technical and looks mostly at direct monetary costs. There is no valuation of environmental goods and services. The failure to take broader considerations in combination with a lack of full CBA is a **significant gap**.

Criteria met: No

11.2.2 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The results of the economic viability analysis are publicly disclosed.*

The results of the C/B-ratio calculation and the total capital expenditure are made public. Landsvirkjun also carries out more detailed internal analyses which are, however, kept confidential.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *The economic viability analysis is publicly disclosed.*

The C/B ratios and capital expenditures are publicly disclosed.

Criteria met: Yes

11.2.3 Outcomes

Analysis against basic good practice

Scoring statement: *From an economic perspective, a net benefit can be demonstrated.*

The project scored in the 4th group of 6 for economic viability in the master planning, all projects evaluated in the master plan were demonstrated to be profitable.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the project benefits outweigh project costs under a wide range of circumstances.*

Landsvirkjun has carried out detailed analyses before the project was allowed to enter the tender-design phase. This has included scenario studies.

Criteria met: Yes

11.2.4 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

The assessment of economic viability does not take broader concerns into account. Examples of such could be: a broad view of stakeholder perspectives on what is a cost or a benefit; a broad view on relevant issues requiring costs and benefits; and a broader view on how to assess costs and benefits in the economic-viability analysis.

1 significant gap

11.3 Scoring Summary

The project's economic viability is analysed in great detail, including sensitivity analyses for the base, best and worst cases. The calculated C/B ratio along with the total capital cost is made public and a cost range was filed with the national master-planning exercise in order to rank the project against all other candidate projects in Iceland.

The significant gap identified concerns the assessment criterion at Level 5 for assessment where there is a lack of broader considerations in the analysis.

There is one significant gap at the level of proven best practice, resulting in a score of 4.

Topic Score: 4

11.4 Relevant Evidence

Interview:	148, 152, 162, 163, 164, 165
Document:	2, 3, 5, 21, 22, 23, 38, 39, 42, 51, 53, 66, 69, 107
Photo:	None

12 Procurement (P-12)

This topic addresses all project-related procurement including works, goods and services. The intent is that procurement processes are equitable, transparent and accountable; support achievement of project timeline, quality and budgetary milestones; support developer and contractor environmental, social and ethical performance; and promote opportunities for local industries.

12.1 Background Information

Landsvirkjun has comprehensive internal processes and procedures for procurement which are available to all staff via Landsvirkjun's intranet. Landsvirkjun has three tiers of procurement, dependent upon the size and service type required, with the most complex being a formal tender processes. Tender documentation is currently being prepared for the construction phase of Hvammur in accordance with international standards (FIDIC - International Federation of Consulting Engineers) to ensure the entire processes is transparent, equitable and accountable from preparation of the tender documentation to award of the contract. Grievance processes are in place if required.

12.2 Detailed Topic Evaluation

12.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment of major supply needs, supply sources, relevant legislation and guidelines, supply chain risks and corruption risks has been undertaken with no significant gaps.*

At the level of the project, responsibility for procurement lies with the Project Manager. The project manager completes a risk assessment for the project which includes assessment of supply needs, sources, legislative requirements and supply-chain risks. A procurement plan is prepared for every project, which breaks the project into different contracts and such a plan has been prepared for Hvammur dividing the construction phase into six different contracts.

Landsvirkjun has clear rules around tendering, including transparency and management of corruption risks. Tenders are evaluated based on financial capacity, technical capability, experience and capacity to complete the project.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment includes opportunities for local suppliers and local capacity development.*

Landsvirkjun has three tiers of procurement: tender process (for large works), small procurement and direct purchase. Tenders are advertised internationally, but small procurements and direct purchases are directed at local suppliers. For large projects such as Hvammur, Landsvirkjun looks for opportunities to support local suppliers, both during construction and operational phases as part of their being a 'good neighbour'.

Criteria met: Yes

12.2.2 Management

Analysis against basic good practice

Scoring statement: *Procurement plans and processes have been developed for project implementation and operation with no significant gaps.*

Landsvirkjun has clear procurement procedures and processes, which all staff have access to via their intranet site, and training is provided. A procurement plan has been developed for the construction phase outlining key contracts and timelines. Procurement for the construction phase of Hvammur is currently underway, with the tender documentation being prepared in line with international standards (FIDIC - International Federation of Consulting Engineers).

All contractors are required to work in accordance with Landsvirkjun's policies i.e. ethics, environment and occupational health and safety.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities; sustainability and anti-corruption criteria are specified in the pre-qualification screening; and anti-corruption measures are strongly emphasised in procurement planning processes.*

Procurement for a project is managed by the project manager, with procurement needs and risks managed as part of the risk assessment for the project. Landsvirkjun policies, including those on corruption, under which all contractors are required to work are stated as part of any prequalification or tender proceedings and are considered as part of the tender evaluation .

Criteria met: Yes

12.2.3 Conformance / Compliance

Analysis against basic good practice

Scoring statement: *Processes and objectives relating to procurement have been and are on track to be met with no major non-compliances or non-conformances, and any procurement related commitments have been or are on track to be met.*

Procurement for the construction phase of Hvammur is currently being managed and is on track (timing for completion dependent upon the Master Planning process). Tender documentation is currently being prepared in accordance with international guidelines (FIDIC).

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, there are no non-compliances or non-conformances.*

There are currently no non-compliances or non-conformances associated with Hvammur.

Criteria met: Yes

12.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Procurement of works, goods and services across major project components is equitable, efficient, transparent, accountable, ethical and timely, and contracts are progressing or have been concluded within budget or that changes on contracts are clearly justifiable.*

Landsvirkjun’s policies and processes around procurement ensure that all procurement is transparent, ethical and equitable. Clear project timelines are being used to manage the procurement process for Hvammur so that budgets and timelines are managed moving from the preparation to the construction phase.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, opportunities for local suppliers including initiatives for local capacity development have been delivered or are on track to be delivered.*

Procurement for the construction phase of Hvammur has not yet commenced, however, Landsvirkjun has demonstrated its intention to be a “good neighbour” on other projects by supporting opportunities for local suppliers. It is expected that similar processes will be applied to the Hvammur project.

Criteria met: Yes

12.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

12.3 Scoring Summary

Landsvirkjun’s procurement procedures are comprehensive and ensure that the process is equitable, ethical, transparent and accountable. Landsvirkjun’s three tiers of procurement promotes opportunities for local industries and suppliers (being a “good neighbour”) as well as meets international standards for complex contracts. All major contracts are advertised internationally and comply with FIDIC standards.

Tender documentation for large construction projects provides a clear documentation of the project requirements, milestones, timelines and Landsvirkjun’s expectation in regards to project management, the environment, social responsibility, ethics and safety.

There are no significant gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

12.4 Relevant Evidence

Interview:	169, 170, 173, 189
Document:	71, 72, 73, 74
Photo:	None

13 Project-Affected Communities and Livelihoods (P-13)

This topic addresses impacts of the project on project affected communities, including economic displacement, impacts on livelihoods and living standards, and impacts to rights, risks and opportunities of those affected by the project. The intent is that livelihoods and living standards impacted by the project are improved relative to pre-project conditions for project affected communities with the aim of self-sufficiency in the long-term, and that commitments to project affected communities are fully delivered over an appropriate period of time.

13.1 Background Information

Communities and groups affected by the Hvammur project include landowners and farmers, other residents, the settlement of Árnes (located approximately 6 km to the west of the project site), Rangárþing ytra and Skeiða og Gnúpverjahreppur municipalities, and the Þjórsá Angling Club. A number of the residents are summerhouse owners, residing in the area during weekends and holiday periods only.

Many residents are concerned about out-migration of young people from the area to Reykjavik, and express a desire for measures to maintain a demographic balance in the community by slowing out-migration. Some residents are concerned about the risk that the project will decrease property values.

Land in the area is privately owned and almost completely dedicated to livestock farming. The project will take land from 8 farms. There are local tourism and service businesses, and one tourism business operates on the river itself. A gravel extraction area is located on the west bank of the river near the Hagi and Melhagi farms (approximately 3 km from the dam site). The river is used for fishing, but more than 80% of the fish is caught farther downstream, near Urriðafoss.

13.2 Detailed Topic Evaluation

13.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment of issues relating to project affected communities has been undertaken with no significant gaps, utilising local knowledge.*

Issues affecting project-affected communities include:

- During construction: temporary loss of land; noise; dust; traffic; workforce-community interactions; visual impact; amenity and recreation (including fishing); property values; economic effects of the presence of a large workforce; and risk due to dam failure and accidents.
- During operation: permanent loss of land; dust from the dewatered river channel; permanent visual impact; altered amenity; economic contraction on the departure of the construction workforce; property values; perceived loss of the integrity of the river and Viðey island in the view of some community members; and risk due to dam failure and accidents.

Out of these, the EIA assessed issues in relation to: loss of land; noise; transportation; visual impacts; dust from the dewatered river channel; outdoor recreation; tourism; and employment. The EIA did not assess issues related to: workforce-community interactions; economic effects of the presence/departure of a large workforce; loss of property value; or perceived loss of the integrity of the river. Risks due to dam failure were assessed in a separate study.

An opinion survey of the Núpur option was undertaken in 2002, providing an important input of local knowledge. Opinion appears to be divided on the impact of the project on property values, and varies according to district, residency (permanent vs. summer-house owners) and proximity to the river. However, this and other economic issues were not assessed in the subsequent EIA process.

These gaps in the assessment are not significant gaps against basic good practice for the following reasons: workforce-community interactions are unlikely to be significant or have adverse impacts, and corporate occupational health and safety processes will prompt good worker accommodation and conditions, which will limit the need for the workers to leave the site (see P-16); this will also limit the economic effects of the presence and departure of the workforce; the EIA extensively addresses visual impact, which is the main ongoing risk to property values; the perceived loss of the river's integrity is a broader consideration (see 'proven best practice' below).

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment takes broad considerations into account, and both risks and opportunities.*

The gaps in the assessment process (workforce-community interactions; economic effects of the presence/departure of a large workforce; loss of property value; perceived loss of the integrity of the river) are broader considerations and risks that have not been taken into account. The first three of these are risks, whilst the last is a broader consideration. The absence of their assessment – despite being raised in public consultation – is a **significant gap** against proven best practice.

Generally, the assessment process has been weaker on social and economic issues than on environmental issues: the opinion survey showed diverging opinions between stakeholder groups but there has been no exploration of why that may be and if there are any implications for communications or management; issues such as how the project might assist with the reduction of out-migration of youth or the 'cultural landscape' value of the area, both of which were raised in interviews, have not been explored.

However, specific opportunities have been considered, in liaison with directly-affected landowners and municipalities, resulting in the benefits described in P-10.

Criteria met: No

13.2.2 Management

Analysis against basic good practice

Scoring statement: *Management plans and processes for issues that affect project affected communities have been developed with no significant gaps including monitoring procedures, utilising local expertise when available; and if there are formal agreements with project affected communities these are publicly disclosed*

An outline of plans for the management of social issues is provided by the mitigation and monitoring measures in the EIA report and the measures set out in the Project Planning Report that have responded to potential impacts, as well as in the ruling by the National Planning Agency. These include measures to address the issues identified under 'Assessment' above, such as: measures to reduce visual impact including harmonisation of permanent structures within the natural environment, removal of temporary roads and replanting of spoil areas; re-vegetating the dewatered river channel, which is one of the measures addressed by the ruling of the National Planning Agency.

Specific management plans and monitoring procedures for project-affected communities have not been prepared at this stage; it is too early in the preparation phase. Landsvirkjun's corporate environmental management system, and tendering requirements, will prompt the development of an Environmental

Management Plan (EMP). If the Hvammur EMP is prepared in a similar manner to the Búðarháls EMP, it is likely to include some social aspects (tourism) but not all, and not include monitoring procedures. Landsvirkjun has an opportunity to address this gap in the final part of the preparation stage. Should they fail to do so, this will be a significant gap against basic good practice by the end of the preparation phase.

Six compensation agreements with landowners who will lose land to the project have been signed to date and only two are still under negotiation. The agreements include a confidentiality clause between Landsvirkjun and the landowner, and therefore they have not been publicly disclosed. Contracts with both municipalities have also been agreed. There is one additional formal agreement with project-affected communities, which concerns the internet connection to be provided by Landsvirkjun for the Skeiða og Gnúpverjahreppur municipality.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

Similar to P-10, there are no processes in place to anticipate and respond to emerging risks and opportunities regarding project-affected communities and livelihoods, other than the close working relationship between Landsvirkjun and the municipalities. There is no corporate process that would prompt the ongoing identification of emerging risks or opportunities. This is a **significant gap** against proven best practice.

Criteria met: No

13.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *Engagement with project affected communities has been appropriately timed and often two-way; ongoing processes are in place for project affected communities to raise issues and receive feedback.*

Engagement with project-affected communities has been appropriately timed. Engagement with affected landowners and municipalities commenced with individual meetings prior to the commencement of the EIA process (2000-2001).

All directly-affected communities (landowners, local residents, tourists businesses and summer-house owners) were invited to attend 4 public meetings during the scoping process for the EIA (2000-2001), and 4 public meetings during the EIA phase (2002-2003). Landsvirkjun and the National Planning Agency held three open meetings during the consultation period of the EIA (2003), to which all directly-affected and indirectly-affected communities were invited.

After the EIA (2006-2008) ongoing communications and meetings with affected landowners and municipalities were held, to communicate and engage them in the planning and project design-definition process through face-to-face meetings. In 2009, the project risk assessment was presented to the public at an open meeting.

Communications were often two-way. Landowners and local government representatives consulted stated that they had the opportunity to negotiate and mutually make decisions. The design process has allowed for changes, as proposed by affected landowners, to minimise land take (e.g. changes in the tailrace canal, construction-camp sites and reservoir surface area). Other affected residents interviewed indicated that they had the opportunity to comment on the EIA following the open meetings; they also received feedback on the majority of post-EIA queries.

Landsvirkjun also distributed bi-annual newsletters to all local residents (2006-2008) to provide project updates. Landsvirkjun's annual open meeting in Reykjavík provides a further opportunity for affected communities to raise issues and receive feedback. The lower Þjórsá communications plan (2011) sets out the

current ongoing processes in place for consultation with communities and for raising concerns and receive feedback. Project-affected communities can also raise issues through the project-dedicated website. Some amongst affected communities are frustrated by the lack of feedback in recent years, which is due to the delay to the project; this is a gap that Landsvirkjun plan to rectify, and is not judged to be a significant gap (see P-1 and P-5).

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, engagement with project affected communities has been inclusive and participatory; and feedback on how issues raised have been taken into consideration has been thorough and timely.*

Details on stakeholder engagement are set out under topic P-1 and P-5, and much of this engagement has concerned project-affected communities. Stakeholder engagement through the EIA process has been participatory and inclusive: numerous open meetings have been held in the local area and in Reykjavík, and information on the project has been provided through newsletters and websites. In conclusion: people who wanted to be involved could generally find a way to be involved and none of the interviewees suggested that there are people left out of the process due to e.g. living in an isolated location, lacking transport; or lacking internet connection.

Criteria met: Yes

13.2.4 Stakeholder Support

Analysis against basic good practice

Scoring statement: *Affected communities generally support or have no major ongoing opposition to the plans for the issues that specifically affect their community.*

Affected communities generally support the project. Landowners who will lose land to the project are strongly in favour and have no major concerns.

The opinions survey undertaken in 2002 indicates that half of all local residents were generally positive towards Núpur Power Plant (project now withdrawn), but 31% of all local residents were opposed to the plant with male respondents being generally in favour / female respondents opposed, and older respondents showing a more positive attitude than younger respondents.

There is evidence of some opposition amongst some affected people, and indications of divided opinions within communities. However, this is not considered to be 'major ongoing opposition' to the plans affecting these communities, rather a frustration with the delay, and feeling uninformed on current plans and the recent lack of communication (see P-1).

Most of the affected people interviewed are in favour of the project and believe that the project will improve communities' livelihoods, in particular with the provision of the new bridge. Fishing groups are not against the project but they would like to be more engaged in the project development.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, formal agreements with nearly all the directly affected communities have been reached for the mitigation, management and compensation measures relating to their communities.*

Contracts with both directly-affected municipalities have been agreed (we have not been provided with them as evidence, though Landsvirkjun has referred to contracts in the context of project benefits). Municipal plans and maps that include the latest project plans are also formal agreements: the Skeiða og Gnúpverjahreppur

planning map (2004-2016) was signed by both parties in 2006 and the Rangárþing Ytra planning map (2010-2022) was signed by both parties in 2010-2011.

Formal agreements with 6 out of 8 of the directly-affected landowners are in place to provide compensation for land take, and the remaining 2 are likely to be in place in due course. Landsvirkjun stated to the assessors that every single contract takes into account the views and suggestions of landowners.

The municipalities are responsible for the legal approvals of the project and its construction permit, so the formal agreement with the municipalities on management measures would be set out clearly in these approvals in due course.

Criteria met: Yes

13.2.5 Outcomes

Analysis against basic good practice

Scoring statement: Plans provide for livelihoods and living standards impacted by the project to be improved, and economic displacement fairly compensated, preferably through provision of comparable goods, property or services.

Livelihoods and living standards could be affected by the project due to loss of land, and possible disruption to tourism activity (especially during construction).

The project will require compensation for land take affected by the proposed project components including the power house, the tailrace canal, the penstock, the Hagalón reservoir, sediment spoil areas and construction camps.

Compensation agreements for loss of land / economic displacement have been signed by six out of eight affected landowners so far and there are plans to compensate cultivated land with comparable cultivated land. Adverse impacts on livelihoods and living standards due to disruption to tourism activity will not be significant.

Livelihoods and living standards will be improved by the provision of the new road and bridge, employment generation, improved access between municipalities, internet connections and a potential use of the community fund. (the Landsvirkjun community fund is not specific to this project, and sponsors environmental and energy-related initiatives, including planting schemes and training nationwide).

It is anticipated that tourism information sign-posts and improved tourism paths will be provided to enhance tourism in the area. This approach is already being taken at Búðarháls and is included in its EMP.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: In addition plans provide for livelihoods and living standards that are impacted by the project to be improved with the aim of self-sufficiency in the long-term; and the project contributes to addressing issues for project affected communities beyond impacts caused by the project itself.

Compensation agreements and mitigation plans included in the EIA will restore the livelihoods of directly affected landowners affected by the project, through monetary compensation and the creation of cultivable land. The improvement of livelihoods and living standards, to self-sufficiency, is not relevant in this context.

Plans for the provision of a new road and bridge, and internet connections, will address the issues of access, services and the tourism economy, which are issues identified by project-affected communities, and are beyond impacts caused by the project. These plans will improve connectivity between communities and municipalities located on both sides of the river Þjórsá, promote the tourism in the region and encourage people to move into this area.

Criteria met: Yes

13.2.6 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

The absence of the assessment of broader considerations and risks – despite certain risks and issues being raised in public consultation – is a significant gap against proven best practice.

There are no processes in place to anticipate and respond to emerging risks and opportunities regarding project-affected communities and livelihoods.

2 or more significant gaps

13.3 Scoring Summary

Issues related to project-affected communities have been assessed, with a range of management measures (avoidance, mitigation and compensation) being developed through the EIA and project-planning processes. There has been extensive stakeholder engagement through these, and later, processes, resulting in overall community support and formal agreements with municipalities and directly-affected landowners, which indicate that the Hvammur project's commitments to project-affected communities are likely to be delivered. However, delays in feedback in recent years have left some amongst the affected communities feeling frustrated, and there is (at best) a minority of opposition to the project or (at worst) a strongly divided local community. The assessment of issues affecting communities did not consider broader issues such as the integrity of the river, or risks to property values or of poorly-managed workforce-community interactions. In addition, there are no processes in place to respond to emerging risks and opportunities on community issues.

There are 2 significant gaps at the level of proven best practice, resulting in a score of 3.

Topic Score: 3

13.4 Relevant Evidence

Interview:	128, 129, 130, 134, 135, 137, 151, 157, 161, 175, 181, 189
Document:	2, 4, 6, 7, 8, 9, 10, 11, 12, 14, 39, 40, 41, 69, 105, 111
Photo:	1a, 1b, 1c, 1d, 1g, 1p, 1ab, 1ac

14 Resettlement (P-14)

This topic addresses physical displacement arising from the hydropower project development. The intent is that the dignity and human rights of those physically displaced are respected; that these matters are dealt with in a fair and equitable manner; and that livelihoods and standards of living for resettles and host communities are improved.

This topic is Not Relevant in Hvammur's case, because the Hvammur project will not require any physical displacement.

15 Indigenous Peoples (P-15)

This topic addresses the rights, risks and opportunities of indigenous peoples with respect to the project, recognising that as social groups with identities distinct from dominant groups in national societies, they are often the most marginalized and vulnerable segments of the population. The intent is that the project respects the dignity, human rights, aspirations, culture, lands, knowledge, practices and natural resource-based livelihoods of indigenous peoples in an ongoing manner throughout the project life.

This topic is Not Relevant in Hvammur's case, because the Hvammur project will not affect any peoples that meet the definition of Indigenous Peoples.

16 Labour and Working Conditions (P-16)

This topic addresses labour and working conditions, including employee and contractor opportunity, equity, diversity, health and safety. The intent is that workers are treated fairly and protected.

16.1 Background Information

Two-hundred and fifty employees will work on the construction of the project, and in total seven hundred employees will be involved in construction (estimates cited in the Environmental Impact Assessment). Only six permanent employees will be involved in the maintenance and operation of the power plant.

Landsvirkjun applies detailed corporate-level occupational health and safety and human-resources management systems, and operates within Iceland's stringent labour laws. All construction work is governed by an agreement with the Icelandic Federation of Labour, which requires high standards for workers. In Iceland, 84% of workers belong to a labour union.

Where the Búðarháls project is referred to under this topic, it is used to indicate how Landsvirkjun's policies and processes would apply, once put in place, since it is too early for them to have been applied to Hvammur.

16.2 Detailed Topic Evaluation

16.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment has been undertaken of human resource and labour management requirements for the project, including project occupational health and safety (OH&S) issues, risks, and management measures, with no significant gaps.*

An assessment of human-resource and labour-management requirements for the project has not been undertaken for construction or operation. This is a gap, but is not significant at this stage, as Landsvirkjun's corporate policies and systems will prompt an assessment prior to the commencement of construction.

For example, tendering procedures will require that potential contractors assess human-resource and labour-management issues when tendering for the project. Tender documents will include a full assessment of labour-management requirements, and all tenderers will have to comply with the labour union 'Agreement on Major Developments', between the Confederation of Icelandic Employers on behalf of its members, and the Icelandic Confederation of Labour (ASÍ), according to their collaboration agreement. The tendering process will include assessment of project occupational health and safety (OHS) issues, risks and management measures. Specific risk assessment of particular issues such as extreme weather will be undertaken. Although this assessment is yet to be made, the assessment team are confident this process will be implemented, as demonstrated on the Búðarháls project that is currently under construction. In addition, OHS is included in the project risk register which has been developed for the Búðarháls project and will be used for the Hvammur project.

Landsvirkjun's Handbook 'SSL' (see 'Management' below) includes procedures that prompt assessment of OHS issues for both construction and operation stages. For example, this includes internal audits and biannual external audits. In addition, weekly, monthly and quarterly project reports include sections of OHS, including security, and staffing issues.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment takes broad considerations into account, and both risks and opportunities.*

No assessment for the Hvammur project has taken place to date. This is a gap, but not significant at this stage of preparation. An example of a procedure that would prompt the identification of risks is the risk-management matrix now being applied at Búðarháls, and likely to be applied at Hvammur as well. This catalogues operational risks and the required management response for a range of project-construction issues, including OHS, and is updated monthly. Monthly and quarterly project reports would also refer to risks, whilst an example of opportunities is the requirement that these reports consider any training requirements.

Criteria met: Yes

16.2.2 Management

Analysis against basic good practice

Scoring statement: *Human resource and labour management policies, plans and processes have been developed for project implementation and operation that cover all labour management planning components, including those of contractors, subcontractors, and intermediaries, with no significant gaps.*

Human resource and labour-management policies, plans and processes that are part of corporate systems will be applied to the Hvammur project's implementation and operation. This system combines quality, environmental and OHS management, encompasses 'SSL' handbooks, 36 policies and 84 procedures, and is accessible to all employees via Landsvirkjun's Lotus Notes system, including those working at the construction site. The system is ISO 18001 certified. This is an on-line quality management system which brings together all procedures to be followed.

Corporate-level human-resource policies cover human resources, gender equality and continuous education. All documents are easily accessible for all employees through the Lotus Notes System. A Gender Equality Committee also works within Landsvirkjun to ensure that gender-equality policies and plans are achieving their desired outcome.

The SSL system can be seen in operation at the Búðarháls project: human resource and labour management policies, plans and processes required of the contractors are set out in union contracts; the contractor on the Búðarháls project operates under a company-level human resource policy that covers the project; plans cover all contractors, subcontractors, and intermediaries; and all contractors were required to prepare a safety handbook before commencing work. The handbook includes environmental and health and safety policy, site rules, a legislation register, and official government guidelines on topics such as manual lifting and induction training. A checklist of what to do in the case of an accident is made accessible at various locations around the site. OHS audits are carried out every month, and a risk-management matrix covering all site risks and opportunities is actively updated and used.

The relationship between Landsvirkjun and the union is described as good by both parties. An agreement has been signed between the Confederation of Icelandic Employers and the Icelandic Federation of Labour, on wage rates and conditions of labour for major developments (this agreement is usually called the "Agreement on major development"). Subcontractors must comply with Icelandic Labour legislation and the Agreement on Major Development as a minimum requirement, and the latter is included in Landsvirkjun's Tender and Contract documents.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

Corporate processes are in place to anticipate and respond to emerging risks and opportunities, and practice at other sites show additional processes. For example, contractors at Búðarháls are paid separately to employ 1 full-time site-safety manager per 100 employees to continuously assess and monitor site safety. Safety is a specific funding clause in the contractor's agreement, making it an item which can be withheld if aspects of safety management are not met. Also, a work-method statement has to be prepared before each new work stage; this requires a full new risk assessment, and if the work design changes through the process, a revised risk assessment is required. Identical procedures are planned for the Hvammur project. Regular internal and external audits will identify emerging OHS risks, and the Administration of Occupational Health and Safety will visit the site at least once per month. In addition, Landsvirkjun's Safety Council meetings are held monthly.

Regarding emerging opportunities, processes demonstrated at Búðarháls, and to be applied at Hvammur as well, include the opportunity to fill out comment cards which can detail an emerging opportunity regarding labour and working conditions, a complaint, a compliment or a suggestion for improving operations as well as weekly, monthly and quarterly project manager's reports including details on training requirements and on the results of internal OHS audits.

Criteria met: Yes

16.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *Ongoing processes are in place for employees and contractors to raise human resources and labour management issues and get feedback.*

There are ongoing processes in place for employees and contractors to raise human resources and labour management issues. Landsvirkjun operates in an open culture where all workers feel able to talk with their superior, the site manager or the union representative. This is demonstrated at the Búðarháls site where the union representative has his own office with a separate entrance. The separate entrance is important as it ensures employees can communicate with the union in relative anonymity.

Safety officers employed at the construction site will provide a key mechanism for employees to raise issues. Staff can raise safety or labour issues, report an accident or compliment good performance via suggestions cards which are reviewed daily at safety meetings. At Búðarháls, managers receive between one and six suggestions a day, and feedback on how issues are dealt with is given at daily safety meetings and at the monthly safety review. In addition, anyone can enter incidents or something they are unhappy with in the corporate Lotus Notes system.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, feedback on how issues raised have been taken into consideration has been thorough and timely.*

Given the early stage of project development, here the assessment team have interpreted the scoring criterion as "processes for ensuring that feedback will be thorough and timely have been developed" and have used the Búðarháls project as an indicator of how Landsvirkjun's corporate management succeeds in this area.

Landsvirkjun's corporate human-resources and OHS-management policies will be applied. These are described under level 3 above, and will ensure that feedback is timely, for example in daily safety meetings, and thorough, e.g. in discussion with the union representative and HR officers.

Criteria met: Yes

16.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *There are no identified inconsistencies of labour management policies, plans and practices with internationally recognised labour rights.*

There are no inconsistencies between labour management policies, plans and practices and internationally recognised labour rights, as demonstrated by certification to ISO 18001. Landsvirkjun's ability to deliver good working conditions and safety performance is demonstrated in the Búðarháls project where there is a very low LTIF (lost time incident frequency) of 1.6 incidents per 1 000 000 working hours.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, labour management policies, plans and practices are demonstrated to be consistent with internationally recognised labour rights.*

Occupational health and safety policies, plans and practices are demonstrated to be consistent with internationally recognised labour rights through certification to ISO / OHSAS 18001 standards.

Landsvirkjun has not demonstrated that other labour policies, plans and practices meet internationally-recognised labour rights, for example through a separate analysis. However, this is not a significant gap, as Landsvirkjun is fully legally compliant in a jurisdiction that has put into force relevant international conventions.² Whilst Iceland has not ratified the UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families (referred to in IFC Performance Standard 2), Landsvirkjun explicitly requires contractors and sub-contractors to apply Icelandic labour laws and the Agreement on Major Development to migrant labour, and problems of migrant workers' pay and conditions (as experienced at the beginning of the construction of Fljótsdalur) are highly unlikely in the case of Hvammur's.

Criteria met: Yes

16.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

16.3 Scoring Summary

Assessment of human resources and labour management requirements is not yet required for the project during its preparation, but there are strong indications that assessment will be prompted, and management procedures applied through Landsvirkjun's corporate quality-management system which incorporates OHS and their human-resources policies, as demonstrated during the construction of Búðarháls. OHS procedures are certified to meet the OHSAS 18001 international standard. Icelandic Labour laws and union agreements set

² Iceland has put into force all of the ILO 'fundamental' conventions and the UN Convention on the Rights of the Child, referred to in the IFC Performance Standard (2) on Labour and Working Conditions.

very high standards for labour and working conditions, which Landsvirkjun meets. There are multiple ways for stakeholders to raise issues and gain feedback, and processes competently deal with new and emerging issues.

There are no gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

16.4 Relevant Evidence

Interview:	136, 138, 139, 159, 172, 175, 182, 180, 189
Document:	24, 25, 27, 43, 58, 62, 71, 72, 73, 76, 78, 79, 109, 110, 209
Photo:	1y

17 Cultural Heritage (P-17)

This topic addresses cultural heritage, with specific reference to physical cultural resources, at risk of damage or loss by the hydropower project and associated infrastructure impacts (e.g. new roads, transmission lines). The intent is that physical cultural resources are identified, their importance is understood, and measures are in place to address those identified to be of high importance.

17.1 Background Information

Hvammur is located in an area which has been populated since the first settlers came to Iceland just before the year 900. Any sites older than 100 years are considered to be cultural-heritage sites in Iceland. Construction and operation of the Hvammur project has the potential to affect sites due to the inundation area/reservoir, power-station infrastructure (power station, tailrace, tunnels, dam) and transmission line.

17.2 Detailed Topic Evaluation

17.2.1 Assessment

Analysis against basic good practice

Scoring statement: *A cultural heritage assessment has been undertaken with no significant gaps; the assessment includes identification and recording of physical cultural resources, evaluation of the relative levels of importance, and identification of any risks arising from the project.*

A cultural-heritage impact assessment has been undertaken for the EIA by a qualified archaeologist from The Archaeological Office. The scope of the study is in accordance with requirements of the Archaeological Heritage Agency of Iceland.

Initial assessment involved identification and assessment of sites of cultural significance (i.e. sites more than 100 years old) and covered the inundation area (including islands) and surrounding land, power-station location and associated infrastructure. Islands downstream were not surveyed as they will not be directly affected by the project. The initial report included assessment of relative significance of the identified sites. Following submission of the initial report, the Agency provided scope for further studies i.e. excavation of more significant sites (partial or full).

The studies undertaken for Hvammur are comprehensive and have resulted in recommendations to minimise impacts on sites of cultural-heritage significance associated with Hvammur, including development of a map which outlines the location of all sites located within the study area and their significance/recommended mitigation. These studies have been completed and a report submitted to Landsvirkjun and the final report has been submitted to the Agency. At this stage, Landsvirkjun has completed all the Agency's requirements.

At the time of the surveys, the location of the construction camps had not been identified. Once the location(s) have been finalised, surveys and possible identification of necessary mitigation will need to be completed for those areas.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment takes broad considerations into account, and both risks and opportunities.*

The cultural heritage assessment undertaken for Hvammur is very thorough with excavation (partial or full) at all sites of potential significance. The archaeologist has used an own method for assessing significance of sites

as there is no official guideline for this in Iceland. The method is based on thorough experience in Iceland, and knowledge of the types and preservation status of sites around the country. This allows assessment of the sites on a local, regional and wider (national, international) basis. This assessment has been applied to all identified sites and has influenced the development of mitigation measures for the sites.

Consideration has been made of the impact of bank and soil erosion as a result of the project, with mitigation measures included for bank stabilisation near the farm (Ruin 16) to protect the farm from the reservoir.

Criteria met: Yes

17.2.2 Management

Analysis against basic good practice

Scoring statement: *Plans and processes to address physical cultural resources have been developed for project implementation and operation with no significant gaps; plans include arrangements for chance finds, and ensure that cultural heritage expertise will be on site and regularly liaised with by the project management team during construction.*

As part of the surveys, sites were assessed as to whether they could be destroyed/inundated or required protection. A map and report has been produced outlining the location of all sites with colour-coding based on whether all survey requirements have been fulfilled and whether they can be destroyed/inundated, require fencing for protection during the construction period, or if no protection is required (as in e.g. away from immediate construction area) but contractors should be aware of the location of the site.

This map and recommendations for mitigation of impacts has been included in a summary of Landsvirkjun obligations for Hvammur, and will be included in the environmental management plan developed for Hvammur. This will then inform the construction-management plan as is presently the case for the ongoing Búðarháls construction.

Due to the relatively short human habitation of Iceland (~1 100 years), all archaeological finds are very superficial, i.e. within 1.5 metres. Hence, it is unlikely that any site associated with the project area has not been identified. Thus chance-find procedures are normally not mandated by the regulator. However, Landsvirkjun is open to conducting more surveys if required. An archaeologist will be on site during the construction phase to ensure that there are no impacts to cultural resources.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities; and plans are supported by public, formal and legally enforceable commitments.*

As stated above under basic good practice, , all archaeological finds are very superficial. Hence, the risks are well-known to be minimal and chance-find procedures normally not mandated by the regulator. However, Landsvirkjun is open to conducting more surveys if required. Current plans/recommendations for the sites are supported by the local land owners and the Agency, and will form part of the regulatory requirements for the project.

Criteria met: Yes

17.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The assessment and planning for cultural heritage issues has involved appropriately timed, and often two-way, engagement with directly affected stakeholders; ongoing processes are in place for stakeholders to raise issues and get feedback.*

The Agency has no formal requirements for stakeholder consultation during the assessment process. Still, the initial surveys involved consultation with landowners affected by the Hvammur project, as well as the wider local communities, to identify potential/known sites. Throughout the process the local landowners have been kept informed of the status of the surveys, significance of the sites and recommended mitigation measures. No objections have been raised in regards to the recommendations.

In addition, there have been regular meetings between Landsvirkjun, the Agency and the consultant archaeologist regarding the findings of the surveys, implications to the project and recommended mitigation measures. These meetings were held on site and provide an opportunity for the landowners to raise any issues if required.

The lower Þjórsá communications plan (2011) sets out the current ongoing processes in place for consultation with communities and for raising concerns and receive feedback.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, engagement with directly affected stakeholders has been inclusive and participatory; and feedback on how issues raised have been taken into consideration has been thorough and timely.*

All local landowners were encouraged to learn more about the sites on their land and were also engaged by the survey/excavation teams when on site. The information on the status of the surveys, significance of the sites and recommended mitigation measures has been conducted in an inclusive and participatory manner. The feedback on issues raised has been thorough and timely through the processes described under P-1.

Presentation has been made by Landsvirkjun to the Archaeological Heritage Centre on the findings from Hvammur and the proposed management measures. In addition, Landsvirkjun looks for opportunities to do things for the community such as an historical exhibition at Árnes or Búrfell (Búrfell already has an exhibition on the history of the area and information from Hvammur could be used to expand this exhibition). Landsvirkjun has previously been involved in recreating a Viking house (Þjóðveldisbærinn) close to its Búrfell power station.

There is some general frustration amongst local residents that they have not received feedback on issues raised during the consultation period in a thorough and timely manner, but this does not specifically apply to Cultural Heritage, and the communications plan mentioned above is an instrument to provide this in the future.

Criteria met: Yes

17.2.4 Stakeholder Support

Analysis against basic good practice

Scoring statement: *There is general support or no major ongoing opposition amongst directly affected stakeholder groups for the cultural heritage assessment, planning or implementation measures.*

Local landowners on whose land the sites are located have been kept informed throughout the process and have raised no concerns regarding the outcomes.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, formal agreements with the directly affected stakeholder groups have been reached for cultural heritage management measures.*

Agreements have been negotiated and are still being formalised with landowners regarding disturbance and use of their land by Landsvirkjun for Hvammur. Landowners have been involved at all stages in the identification of cultural-heritage sites on their property and the development of recommended mitigation measures.

Current plans/recommendations for the sites are supported by the local land owners and the Agency, and will form part of the regulatory requirements for the project.

There are no indigenous groups associated with the project area.

Criteria met: Yes

17.2.5 Outcomes

Analysis against basic good practice

Scoring statement: *Plans avoid, minimise, mitigate, and compensate negative impacts on cultural heritage arising from project activities with no significant gaps.*

Reports and maps have been prepared, outlining recommended mitigation measures for cultural heritage. At present this does not include any potential sites associated with the construction camps as the location of these camps is still to be determined. Once determined, these areas will be surveyed and recommendations for management made.

The most significant site recorded is located near the banks of the proposed reservoir. Recommendations have been made for bank-stabilisation works in the vicinity of this site, with a qualified archaeologist to be present on site during these works.

The Agency acknowledges that all their requirements have been met by Landsvirkjun, with no gaps other than surveys of the construction camps which are still to be completed.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, plans avoid, minimise, mitigate and compensate negative cultural heritage impacts with no identified gaps; and contribute to addressing cultural heritage issues beyond those impacts caused by the project.*

Whilst there are plans to mitigate/manage all potential impacts, the consultant archaeologist is not sure that the proposed plans to stabilise the banks of the reservoir near the farm site will be sufficient to avoid any impact to the site. However, the Agency is satisfied that the mitigation measures will be sufficient and an archaeologist will be present on site whilst the works are being undertaken.

All sites identified and described as part of the assessment have been included on the national register for cultural heritage sites. This will help to expand the knowledge of cultural heritage sites in Iceland as only 20% of remains have been registered in Iceland.

In addition, beyond the direct impact of the project, Landsvirkjun continuously looks for opportunities to assist the community with e.g. an historical exhibition at Árnes or Búrfell (Búrfell already has an exhibition on the history of the area and information from Hvammur could be used to expand this exhibition).

Criteria met: Yes

17.2.6 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

17.3 Scoring Summary

The cultural-heritage assessment for Hvammur is comprehensive and meets all of the requirements of the Archaeological Heritage Agency of Iceland. In addition, landowners have been engaged in the process and are supportive of the outcomes. All sites identified within the project area have been evaluated in terms of their significance and included on the national register. Clear recommendations have been provided to minimise and mitigate impacts on sites of cultural significance, and these have been incorporated into Landsvirkjun’s planning for the construction phase.

There are no significant gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

17.4 Relevant Evidence

Interview:	154, 155, 170
Document:	2, 5, 6, 7, 45, 80
Photo:	1l, 1m

18 Public Health (P-18)

This topic addresses public health issues associated with the hydropower project. The intent is that the project does not create or exacerbate any public health issues, and that improvements in public health can be achieved through the project in project-affected areas where there are significant pre-existing public health issues.

18.1 Background Information

Iceland has a well-developed national public-health system that covers all citizens and projects/construction sites and employees are covered by this national scheme. Due to this, and the fact that the project is not expected to have any public-health implications, this topic is not relevant to certain scoring criteria.

18.2 Detailed Topic Evaluation

18.2.1 Assessment

Analysis against basic good practice

Scoring statement: *A public health issues assessment has been undertaken with no significant gaps; the assessment includes public health system capacities and access to health services, and has considered health needs, issues and risks for different community groups.*

Iceland has a well-developed national public-health system and any projects/construction sites are covered by this national scheme. The hospital at Selfoss is known to have sufficient resources to cover the workforce associated with the construction phase of Hvammur.

Drinking water in Iceland and in the vicinity of Hvammur is sourced from springs and not the rivers, even though the water quality in the river is good.

Given this, and the construction and waste-management practices associated with other Landsvirkjun hydropower developments e.g. Búðarháls in the same general region of the country, Hvammur is not expected to cause any public-health issues or affect the public-health system.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment takes broad considerations into account, and both risks and opportunities.*

Broad considerations, risks and opportunities are taken into account by stationing an ambulance and a medic at the construction site, in the same manner as has been done for the Búðarháls project. This service is also available for the local community in case of an emergency, as is the fire-fighting crew, also stationed at the construction site.

Criteria met: Yes

18.2.2 Management

Analysis against basic good practice

Scoring statement: *Plans and processes to address identified public health issues have been developed for project implementation and operation with no significant gaps.*

Given that Iceland has a very well-developed national public-health system and that no public-health issues are identified, no management plans or processes are required to manage broader public-health issues.

In relation to the construction site, it is expected that the construction management plan developed for Hvammur will be similar to that prepared for Búðarháls, including measures to manage and monitor any environmental incidents and waste on site, such that there are no public-health risks.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

Given the context of the project (as discussed above), this criterion is not considered to be relevant.

18.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The assessment and planning for public health has involved appropriately timed, and often two-way, engagement with directly affected stakeholders, including health officials and project affected communities; ongoing processes are in place for stakeholders to raise issues and get feedback.*

Given the national health system, stakeholder engagement has not been required regarding public health as there are no issues and no stakeholders whose public health concerns will be directly affected by the Hvammur project. Thus, this scoring statement is considered not relevant in the context of this project.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, engagement with directly affected stakeholders has been inclusive and participatory; and feedback on how issues raised have been taken into consideration has been thorough and timely.*

As discussed above, this criterion is not considered relevant in the context of this project.

18.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Plans avoid, minimise and mitigate negative public health impacts arising from project activities with no significant gaps.*

No negative public health issues are identified for the Hvammur project. It is expected that the construction management plan developed for Hvammur will be similar to that prepared for Búðarháls and will include measures to manage and monitor any environmental incidents and waste on site, such that there are no public-health risks. No significant gaps were identified in the plan for Búðarháls.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, plans avoid, minimise, mitigate and compensate negative public health impacts with no identified gaps; and provide for enhancements to pre-project public health conditions or contribute to addressing public health issues beyond those impacts caused by the project.*

No public health issues are identified for the project and the construction management plan (based on evidence from Búðarháls) is expected to address any on-site issues which may lead to public-health issues through e.g. spills. No gaps were identified.

The project will address issues beyond its own impacts by enforcing the local emergency services (ambulance and fire-fighting) during the construction phase.

Criteria met: Yes

18.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

18.3 Scoring Summary

No public health issues associated with the Hvammur hydropower project have been identified, and any incidents that may arise during construction which may affect public health are expected to be successfully managed through the development and implementation of the construction management plan. In addition, the project will provide a public-health benefit to the local community through the availability of ambulance and fire-fighting services based at the construction site.

There are no significant gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

18.4 Relevant Evidence

Interview:	145, 191
Document:	44, 62, 73
Photo:	None

19 Biodiversity and Invasive Species (P-19)

This topic addresses ecosystem values, habitat and specific issues such as threatened species and fish passage in the catchment, reservoir and downstream areas, as well as potential impacts arising from pest and invasive species associated with the planned project. The intent is that there are healthy, functional and viable aquatic and terrestrial ecosystems in the project-affected area that are sustainable over the long-term, and that biodiversity impacts arising from project activities are managed responsibly.

19.1 Background Information

The Þjórsá is home to one of Iceland's largest Salmon populations and approximately 6.5% of Iceland's annual Salmon harvest is caught there. The Salmon's original range was limited by the natural migration barrier at Búði waterfall, downstream of the Hvammur project site. A fish ladder was installed at Búði by Landsvirkjun in 1991 (as a mitigation measure for the impacts of power plants farther up in the Þjórsá) which has extended the distribution of Salmon in the Þjórsá River up to and beyond the area of the Hvammur project. Since 1991, Salmon migrations upstream of Búði have gradually increased and are expected to increase further.

Prior to the preparation of the Environmental Impact Assessment (EIA), a Scoping Document was prepared by Landsvirkjun for the project in accordance with the Environmental Impact Assessment Act 2000. The Scoping Document provided an analysis of the project and its concomitant activities, environmental factors deemed most likely to be affected, and appropriate methods to assess potential impacts. Prior to submission of the scoping document to the National Planning Agency (NPA), stakeholders (including government agencies) provided feedback on the proposed project. Following submission to NPA, the NPA also sought the opinion of regulators and other relevant bodies as to whether the document provided a sufficiently clear depiction of the project and whether adequate information and assessment had been included. In accordance with the Environmental Impact Assessment Act 2000, the EIA is to be consistent with the approved Scoping Document.

19.2 Detailed Topic Evaluation

19.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment of terrestrial biodiversity; aquatic biodiversity including passage of aquatic species and loss of connectivity to significant habitat; and risks of invasive species has been undertaken with no significant gaps.*

The Scoping Document noted that impacts to the marine environment were not expected, and there was no requirement for assessment of invasive species such as Lupins, *Lupinus nootkatensis*, or Didymo (*Didymosphenia geminate*) included in the document. The sections of the EIA prepared for the Hvammur project met the biodiversity requirements within the Scoping Document.

Both the vegetation and bird studies were completed for the EIA by the Icelandic Institute of Natural History in order that the outcomes could be integrated with the assessment of bird habitats. The surveys included land that will be inundated (including the largest island in the Þjórsá, which will be partially inundated - Hagaey) and that which will be affected by construction of the project. A vegetation map for the project area (up to 2000 m from the Þjórsá) was included in the EIA identifying predominantly grasslands, bryophyte flora, cultivated land and heath-land. Of the identified non-vascular plant species, one moss (considered internationally rare), three lichens and one lichenicolous fungi are listed as rare in Iceland.

Three vulnerable bird species are known to occur within the project area. In addition, several bird species which are protected under the Bern convention are known to use the river in the vicinity of Hvammur. For the three vulnerable species recorded in the study, Hvammur will reduce the nesting habitat for two species.

The island of Viðey was noted as being of high conservation value and the Nature Conservation Agency had requested negotiations with landowners about protecting the island. More recently, in accordance with an agreement between Landsvirkjun and the landowner of Viðey, Landsvirkjun financed a Bachelors thesis dealing with the vegetation of Viðey. It identified over 70 vascular plant species, including two nationally rare plants. Viðey is an unusually well-vegetated island in the Icelandic landscape, as it has been protected from sheep grazing by the river, with trees up to seven metres in height. It is thought to represent the conditions in south-western Iceland prior to human settlement. In August 2011, Viðey was listed as a nature reserve under the Nature Conservation Act 1999.

Assessment of aquatic biodiversity for the EIA was undertaken by the Institute of Freshwater Fisheries. Whilst the studies were focused mainly on two migratory species of fish (i.e. Salmon and Brown Trout) other species e.g. Arctic Char, Stickleback and macroinvertebrates were also surveyed. Salmon and Brown Trout were the dominant species, with the Þjórsá containing significant Salmon spawning areas. Arctic Char was less dominant, as it prefers slower-flowing habitat, whilst the Stickleback was found to be present in many parts of the Þjórsá river basin. Þjórsá Salmon were recognised as providing an important fisheries resource for Iceland and the species most likely to be affected by the proposed Hvammur project. Thus the aquatic studies for the EIA focused on this species and its ecology within the Þjórsá River.

Since the EIA approval, the Institute of Freshwater Fisheries, on behalf of Landsvirkjun, has undertaken considerable additional work on Salmon usage of the river and requirements for downstream flow and fish passage to maintain the populations in the river as required by the National Planning Agency Ruling in 2004. In addition, the Institute sought advice from overseas experts (e.g. people working on Salmon in the Columbia River, north-western USA) in regards to fish passage for salmonids. The Institute is aware that Didymo (an invasive diatom which is often introduced on fishing gear) has been recorded in the upper reaches of the Þjórsá, however, they do not appear concerned about the record as it has not prompted any monitoring efforts. Previous studies in Iceland have shown that the distribution and abundance of Didymo is not increasing, and has actually decreased since 1997.

Whilst invasive species were not considered as a part of the EIA, nor in subsequent studies, this is seen as a non-significant gap at this level, given the Scoping Document, and the demonstrated lack of concern on the part of regulatory authorities in regards to the risk of an increase in the distribution and abundance of invasive species. It was not raised as an issue by the Environment Agency of Iceland during the assessment. See further below.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment takes broad considerations into account, and both risks and opportunities.*

The EIA for the Hvammur project was prepared in accordance with the Scoping Document, with no additional assessments undertaken other than that stipulated in the EIA Ruling and the Bachelors thesis on the vegetation of Viðey. Two areas of concern were raised as part of the IHA assessment by the Icelandic Institute of Natural History and the Environmental Agency respectively: invasive species and impacts on Viðey.

There are six species which have been identified as invasive in Iceland, including Lupins and Cow Parsley (*Anthriscus sylvestris*), with a further 18 species considered to be potentially invasive. Whilst the Scoping Document and EIA required no formal assessment of the impact of invasive species, the presence of Lupins on Viðey and Viðey's high conservation value was known at the time of the EIA. However, at the time of the EIA, Lupins had not yet been declared an invasive species in Iceland. The Lupin is still being used to combat soil

erosion, but its recent status as an invasive species has required rules on where and how it should be used. Despite growing concerns regarding the spread of Lupins and Cow Parsley since the EIA, no studies have been undertaken to assess the risk that the Hvammur project could increase the distribution of these, in particular on Viðey.

Similarly, whilst the high conservation value of Viðey was recognised in the EIA, no assessment has been undertaken to assess potential impacts of the project due to changes in water level on the island. Although the listing of Viðey includes provisions by the Minister for Environment and Natural Resources for the ongoing management of Viðey, including management of invasive species and fencing of the island if the Hvammur project goes ahead, the lack of assessment of this issue, along with the lack of assessment of invasive species is a **significant gap** against proven best practice.

Criteria met: No

19.2.2 Management

Analysis against basic good practice

Scoring statement: *Plans and processes to address identified biodiversity issues have been developed for project implementation and operation with no significant gaps.*

Given the significance of Viðey island, botanists who worked on the EIA raised concerns about the impacts of the project on the island and its vegetation, in particular the potential for Lupins (already present on the island) and Cow Parsley (not currently present) to further colonise the island due to reduced water levels (increased area of disturbance) and the known presence of seed populations upstream. At the time that Viðey was listed as a nature reserve, no specific requirements were included regarding mitigation of potential impacts associated with Hvammur. It was noted, however, that the Ministry for the Environment and Natural Resources had agreed to undertake any necessary actions if and when the natural habitat of the island was threatened e.g. removal of Lupins or other invasive species. In addition, if the Hvammur project proceeded, the Ministry for the Environment and Natural Resources would coordinate the fencing off of Viðey for protection purposes.

A report was prepared in 2008 based on the EIA and subsequent studies which outlines the commitments (mitigation/management measures and monitoring programmes) which Landsvirkjun will implement for the Hvammur project. The report includes measures to address aquatic biodiversity issues recommended by the Icelandic Institute of Freshwater Fisheries:

- provision of upstream fish passage for Salmon (fish ladder);
- use of minimum-gap Kaplan turbines (expected smolt-survival rate >90%);
- downstream minimum flow of 10 m³/s between the dam and the tailrace (a distance of app. 3 km);
- dam design to prevent gas super-saturation;
- whilst downstream bypass has not been included in the current design, if required Landsvirkjun would support its inclusion in the redesign of the power station. Given the expected survival rates of smolt through the turbines and over the spillway (>90%), such a bypass may not be necessary;
- in accordance with Condition 5 of the EIA Ruling there is annual monitoring of Salmon, Trout and Arctic Char in the Þjórsá River. This work is to be implemented for Landsvirkjun by the Icelandic Institute of Fisheries and made public on Landsvirkjun's external website. Monitoring to include pre and post dam-construction periods: a) annual surveys for juveniles, count and catch; b) macroinvertebrate (pre-survey completed 2001), next to be done is for post-construction; c) stock size of salmon run including the use of tagging; and d) smolt outrun;
- monitoring of the effectiveness of the fish ladder to be constructed.

Recommendations by the Icelandic Institute of Natural History included in the EIA to manage potential terrestrial biodiversity issues:

- reinstate lost land: the reservoir will inundate currently cultivated areas. Extraction and deposition of reservoir sediments should take place in three areas (one on the north bank and two on the south bank) to replant land and reclaim lost land for cultivation;
- spoil deposits in the east to be filled to level of eroded banks;
- areas disturbed by the construction of the project to be restored in harmony with vegetation in the area;
- re-vegetation of eroded areas as compensation for loss of land to inundation by the reservoir – selection of areas will be determined in consultation with the individual landowners;
- monitoring of the success of rehabilitated areas;
- use of rock barriers to minimise bank erosion; and
- monitoring of bank erosion for ten years post-inundation.

It is expected that the soil conservation service will be in charge of the re-vegetation. Areas around Hvammur are less erodible than most Icelandic soils and are expected to respond well to re-vegetation efforts. Landsvirkjun is currently preparing a re-vegetation policy which will be applied to Hvammur. Areas to the north-west of the planned reservoir are already being re-vegetated by Landsvirkjun through the application of fertilizer. This has been shown to be successful in encouraging the native seed bank to germinate, thus supporting the survival of native species in the area.

The soil conservation service will be involved in ongoing monitoring including:

- sand drift associated with the reservoir and the undertaking of mitigation measures as required (fencing, seeding and fertilization);
- the success of the re-vegetation areas as part of a larger regional monitoring programme, as well as separate monitoring for Landsvirkjun.

Landsvirkjun will, based on the 2008 report mentioned above, develop an environmental management plan for Hvammur similar to the one developed for Búðarháls. This is scheduled to be compiled immediately when/if the project receives permission to go ahead. This plan will guide development of the construction management plan and ongoing mitigation/management of issues for the Hvammur project as the project moves into the implementation phase. Recommendations which affect dam design (e.g. fish passage, oxygen management, turbine type) have or are currently being incorporated into the final design for Hvammur for inclusion in the tender documentation.

The Environmental Agency of Iceland confirms its ruling and the recommended mitigation measures from the EIA for Hvammur. However, it does express concerns regarding the ongoing management of Viðey and the need to understand potential impacts of the Hvammur project on the island. The Environmental Agency also acknowledges that Landsvirkjun has committed to doing more than expected to mitigate, manage and monitor potential impacts from the project. In addition, the listing for Viðey as a nature reserve (August 2011) includes commitments by the Minister for Environment and Natural Resources for the ongoing management of Viðey, including management of invasive species and fencing of the island if the Hvammur project proceeds.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities; and commitments in plans are public, formal and legally enforceable.*

The EIA for Hvammur project was approved in 2004, and whilst specific studies have been undertaken in accordance with the ruling and Landsvirkjun financed the Bachelors thesis on the vegetation of Viðey, no re-assessment taking emerging risks or opportunities into account has been done since the EIA was approved. Whilst there is no formal requirement from the National Planning Agency to re-evaluate the project, given the time that has passed since the original EIA was done, the lack of re-assessment is seen as a **significant gap** against proven best practice.

The commitments made in relation to biodiversity management are publicly available and legally enforceable.

Criteria met: No

19.2.3 Outcomes

Analysis against basic good practice

Scoring statement: Plans avoid, minimise, mitigate, and compensate negative biodiversity impacts arising from project activities with no significant gaps.

Plans (as described above) have been identified to manage issues identified in the EIA and its ruling, to avoid, minimise, mitigate or compensate negative biodiversity impacts.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: In addition, plans avoid, minimise, mitigate and compensate negative biodiversity impacts due to project activities with no identified gaps; and plans provide for enhancements to pre-project biodiversity conditions or contribute to addressing biodiversity issues beyond those impacts caused by the project.

Based on the outcomes of the EIA and additional studies undertaken in accordance with the 2004 ruling, there are plans to avoid, minimise and compensate negative biodiversity impacts (as identified above), with no identified gaps. In addition, Landsvirkjun has been involved in a broader re-vegetation programme in the area and will continue to be involved as part of the Hvammur project mitigation activities. This will provide benefits to the region by helping to reduce soil erosion.

In addition, the project is expected to have positive impacts on Arctic Char which prefer slower-flowing water close to the shore and are expected to increase in the reservoir area, as well as on vegetation in the immediate vicinity of the project area through the re-vegetation of an offset area in consultation with landowners.

Criteria met: Yes

19.2.4 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

The lack of assessment of the concerns raised by the Icelandic Institute of Natural History and the Environmental Agency (invasive species and water-level impacts on Viðey) is a significant gap against proven best practice for Assessment.

The lack of re-assessment of risks and opportunities since the EIA approval (8 years) represents a significant gaps against proven best practice for Management.

2 or more significant gaps

19.3 Scoring Summary

The EIA was prepared in accordance with the Scoping Document, which had been reviewed by stakeholders and regulatory authorities, and approved by the National Planning Agency. Several additional studies have been undertaken since then in accordance with the EIA ruling, but these do not consider some of the broader

risks that were known already at the time of the EIA, but which were then of lower significance than they are at the time of this assessment (i.e. invasive species and impacts to Viðey).

Management processes are in place, together with a comprehensive monitoring programme, with a clear division of responsibilities between Landsvirkjun and the Ministry for the Environment and Natural Resources and the Soil Conservation Service.

There are two significant gaps at the level of proven best practice, resulting in a score of 3.

Topic Score: 3

19.4 Relevant Evidence

Interview:	133, 140, 146, 156, 167, 168, 170, 171, 193
Document:	2, 5, 6, 7, 23, 34, 37, 46, 47, 49, 81, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 124, 125, 126, 201, 202, 203, 204, 205, 206, 207
Photo:	1h, 1i, 1p, 1q, 1r, 1v, 1w, 1x, 1aa, 1ab, 1af, 1ag

20 Erosion and Sedimentation (P-20)

This topic addresses the management of erosion and sedimentation issues associated with the project. The intent is that erosion and sedimentation caused by the project is managed responsibly and does not present problems with respect to other social, environmental and economic objectives, and that external erosion or sedimentation occurrences which may have impacts on the project are recognised and managed.

20.1 Background Information

The Þjórsá river is a glacier-fed river and, in its non-regulated state, carried high concentrations and loads of fine glacial sediments. The construction of several hydropower plants and associated reservoirs in the upper parts of the Þjórsá catchment has resulted in considerable deposition in those upstream reservoirs, reducing the amount of fine sediments present in the lower reaches of the river.

Active sediment control has a long history in the catchment, and extensive monitoring has been carried out by Landsvirkjun.

This topic has some overlap with Topic 22. All assessment criteria relating to erosion and sediment issues that are affected by reservoir operation and therefore relevant also to Topic 22, will be scored only under the more relevant of the two topics.

20.2 Detailed Topic Evaluation

20.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An erosion and sedimentation issues assessment has been undertaken with no significant gaps; the assessment identifies impacts that may be caused by the project, issues that may impact on the project, and establishes an understanding of the sediment load and dynamics for the affected river system.*

The assessment process for suspended and bed-load transport in Þjórsá has been very detailed and spans many decades. Depth-integrated sampling was carried out in the pre-hydropower period, up until 1968. This data has been used and augmented by a wide scope of sediment-source and transportation-mechanism studies. These have aimed at assessing the potential for sedimentation in the future Hagalón reservoir (the Hvammur project's intake reservoir) and also for induced erosion due to the changes in runoff regime resulting from the project. For that purpose, work is under way on the current sediment-transport regime in the entire Þjórsá river, looking at the changes brought about by the hydropower development in the catchment.

The suspended-sediment concentration in the river has been considerably reduced as a result of the upstream reservoirs, making it possible for the salmon to populate new habitat in the river (also facilitated by the construction of a fish passage at Búði).

In the late 1980s, problems with ice-induced erosion in the lower reaches of Þjórsá led to research being conducted on possible mitigation. Landsvirkjun has also conducted research on ice-related erosion in reservoirs. It has been shown that in intake ponds with a set surface level, a solid ice cover easily forms and the water flows beneath this.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment takes broad considerations into account, and both risks and opportunities.*

Assessment is carried out with a catchment approach, studying cumulative effects along the entire river and including risks and opportunities related to wind-blown sand and wind erosion from seasonally exposed river beds.

Aggressive-river syndrome has been identified in the Þjórsá river, and detailed calculations regarding how much sediment would be available for entrainment downstream of Búrfell power station have been conducted. Based on a larger river stretch, the figure arrived at was 140 000 m³/year, but later studies of sediment availability along that river reach came to the lower figure of 50 000 m³/year. Even with the higher figure this would yield a half-life of the Hagalón reservoir of approximately 55 years. The lower, more probable figure results in a half-life of around 155 years.

Criteria met: Yes

20.2.2 Management

Analysis against basic good practice

Scoring statement: *Plans and processes to address identified erosion and sedimentation issues have been developed for project implementation and operation with no significant gaps.*

There are signed contracts between Landsvirkjun and the national soil conservation service regarding monitoring and management of erosion in the project-affected areas.

The result of the ice research mentioned under assessment above has been internalised into Landsvirkjun operations such that the operational principle (fixed surface level) of the Hagalón reservoir will significantly reduce the risks of ice-induced erosion of the reservoir banks.

Small dykes have been constructed to reduce the bank erosion caused by the elevated winter flows resulting from river regulation.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

Continuous monitoring takes place both at project and catchment level – guaranteeing early identification of any emerging risks.

There is also an agreement struck with the farmer on the west bank along the future Hagalón reservoir. In order to improve his farm, the road will be moved and pass right at the edge of the reservoir and sediment from the upstream end, where most sediments will settle, will be pumped up over the road to provide a level area of land to farm (the area in question can be seen in photo 1p). See also the contracts with the national soil conservation service under Level 3 above.

Criteria met: Yes

20.2.3 Outcomes

Analysis against basic good practice

Scoring statement: *Plans avoid, minimise and mitigate erosion and sedimentation issues arising from project activities and erosion and sedimentation issues that may impact on the project with no significant gaps.*

All aspects of erosion and sediment-related problems caused by the project and acting on the project are well understood and will be avoided, minimised or mitigated.

Erosion processes in the area of the Hvammur project are dominated by wind erosion. Due to the lack of vegetation, the wind has free reign, and the soil pack is severely eroded over large areas (see photos 1t, 1u and 1x). Landsvirkjun takes part in various programmes addressing this issue – there is e.g. a local/regional effort in the Hekla area, see further under Level 5 scoring.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, plans avoid, minimise, mitigate and compensate erosion and sedimentation issues due to project activities with no identified gaps; and plans provide for enhancements to pre-project erosion and sedimentation conditions or contribute to addressing erosion and sedimentation issues beyond those impacts caused by the project.*

All sedimentation issues related to the project will be avoided, minimised or mitigated with no gaps. Landsvirkjun continuously works to manage the erosion and sedimentation situation along the river and in the surrounding area. The re-vegetation projects mentioned under Level 3 is such an effort. Areas to be re-vegetated are determined in close consultation with landowners and the soil conservation service. Areas to the north-west of the reservoir area are already being re-vegetated through the application of fertilizer. This has been shown to be successful in encouraging the native seed bank to germinate.

Criteria met: Yes

20.2.4 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

20.3 Scoring Summary

The assessment, management and outcomes for erosion and sedimentation issues demonstrate proven best practice across the board.

The very long data sets and detailed analyses of sediment sources and transport mechanisms, together with attention to ice- and wind-erosion aspects, and the innovative partnerships with other stakeholders will likely result in enhancements to pre-project conditions.

There are no significant gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

20.4 Relevant Evidence

Interview:	153, 177, 185
Document:	5, 6, 7, 22, 37, 38, 39, 45, 50, 51, 52, 75, 92, 93, 94, 95, 97, 108
Photo:	1p, 1t, 1u, 1y

21 Water Quality (P-21)

This topic addresses the management of water quality issues associated with the project. The intent is that water quality in the vicinity of the project is not adversely impacted by project activities.

21.1 Background Information

Water quality of the Þjórsá River was first measured in 1971 as part of a larger study for south-eastern Iceland.

Iceland is a member of the European Economic Area, and as such party to the European Union Water Framework Directive. As a part of its work with the directive, the Meteorological Office is looking to expand its current monitoring programme for Iceland and develop a national water-quality data base.

Although the water quality of the Þjórsá River is generally of high quality it is not used as domestic water supply since such water is drawn from ground-water sources.

21.2 Detailed Topic Evaluation

21.2.1 Assessment

Analysis against basic good practice

Scoring statement: *A water quality issues assessment has been undertaken with no significant gaps.*

Baseline water-quality data has been collected by the Meteorological Office at two sites in the Þjórsá/Tungnaá catchment, as part of a larger regional programme that has been undertaken over the last ten years and is ongoing. This programme is partially funded by Landsvirkjun. Analysis of the data has shown that the water quality of the Þjórsá River is of a high quality, and that the hydropower developments in the catchment have not had significant, negative impacts on the quality of the water, rather the opposite due to the up-stream sedimentation of a large part of the glacial sediments which are a natural part of the rivers morphology. Based on this, it is not expected that development of the Hvammur project would have any negative impacts on the water quality of the Þjórsá River.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment takes broad considerations into account, and both risks and opportunities.*

Assessment of water quality in the Þjórsá/Tungnaá catchment and across the southern region is undertaken by the Meteorological Office, supported by Landsvirkjun. This broader programme has identified no water-quality issues associated with the Þjórsá/Tungnaá catchment, hence no risks either. The excellent quality of the water means that opportunities (for improvement/management) are not relevant.

Criteria met: Yes

21.2.2 Management

Analysis against basic good practice

Scoring statement: *Plans and processes to address identified water quality issues have been developed for project implementation and operation with no significant gaps.*

Analysis of baseline water-quality information by the Meteorological Office reveal no water-quality issues nor does it indicate that further hydropower development on the Þjórsá River will have any negative impacts on

the water quality of the river. The Meteorological Office's monitoring acts as the relevant management tool to maintain control of potential emerging issues.

The construction management plan for the Búðarháls project includes appropriate attention to the management of waste, water resources and soils. Landsvirkjun intend to produce a similar environmental management plan for the Hvammur project prior to construction, so that the required management measures are included in the construction management plan.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities.*

Analysis of the monitoring programme undertaken by the Meteorological Office in the Þjórsá/Tungnaá catchment is carried out annually. As part of work on the European Union Water Framework Directive, the Meteorological Office is looking to expand its current monitoring programme for Iceland and develop a national water-quality data base. The combination of the monitoring programme and the database development allow the identification of emerging risks and opportunities to be identified, as the data is reviewed and analysed by independent experts each year, to assess changes and long-term trends.

Criteria met: Yes

21.2.3 Outcomes

Analysis against basic good practice

Scoring statement: *Plans avoid, minimise and mitigate negative water quality impacts arising from project activities with no significant gaps.*

In the context of the Hvammur project, this scoring statement is not relevant, as there are no identified water-quality issues. The construction management plan that will be developed for Hvammur is expected to address any potential impacts from the construction works.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, plans avoid, minimise, mitigate and compensate negative water quality impacts with no identified gaps; and plans provide for enhancements to pre-project water quality conditions or contribute to addressing water quality issues beyond those impacts caused by the project.*

No negative water-quality impacts are expected from the project based on the current, ongoing studies of water quality, and the water quality in the Þjórsá/Tungnaá catchment is high. Hydropower development has improved water quality through sediment retention in reservoirs in the upper parts of the catchment and the Hvammur project will add further to this demonstrated positive impact.

Criteria met: Yes

21.2.4 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

21.3 Scoring Summary

The Meteorological Office (supported by Landsvirkjun) conducts ongoing monitoring of the water quality in the Þjórsá/Tungnaá catchment and the water is of a high quality. Hydropower development has improved water quality by sediment retention in reservoirs in the upper parts of the catchment, and the Hvammur project will add some additional positive effect in this respect.

Future developments as part of Iceland's work with the EU Framework Directive on Water will add a dimension to the ongoing identification of potential emerging risks and opportunities.

The construction management plan that will be prepared for the Hvammur project is based on an existing model proven to address the management of potential issues associated with construction.

There are no significant gaps at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

21.4 Relevant Evidence

Interview:	133, 140, 170, 187, 193
Document:	2, 5, 6, 7, 44, 47, 126, 202, 203, 205
Photo:	1k, 1r, 1v

22 Reservoir Planning (P-22)

This topic addresses the planning for management of environmental, social and economic issues within the reservoir area during project implementation and operation. The intent is that the reservoir will be well managed taking into account power generation operations, environmental and social management requirements, and multi-purpose uses where relevant.

22.1 Background Information

The Hagalón reservoir will be 4.6 km² in size, and almost 3 km² of that was previously river, leaving less than 2 km² as effective land take for the reservoir. The water level of the reservoir will be kept at a near constant level of 116.00 m.a.s.l. The volume will be only 15.5 million m³, sufficient to run the plant for 14 hours at the long-term average flow of the river.

The spillway is designed to pass a flood with a return period of 50 years with a water level that does not exceed the normal water level (NWL). A flood with a 1000-year return period must be discharged while keeping the reservoir level less than or equal to 1.5 m above NWL.

This topic has some overlap with Topics 17 and 20. All assessment criteria relating to reservoir operation and also relevant to those other topics will be scored only under the more relevant topic.

22.2 Detailed Topic Evaluation

22.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment has been undertaken of the important considerations prior to and during reservoir filling and during reservoir operations, with no significant gaps.*

The reservoir is small in comparison to river flow, and would fill in approximately 14 hours at long-term average river discharge.

Issues that are relevant to the filling and operational phases have been or are on track to be assessed with no significant gaps. The most important issues concern slope stability in the reservoir banks, birds' nests and archaeological remains.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment is based on dialogue with local community representatives, and takes broad considerations, risks and opportunities into account.*

The local municipalities have been closely involved in the planning of the Hvammur project, including aspects of reservoir design. This has been an open two-way communication (municipalities can decline or prevent development initiatives in their respective areas), resulting in the project being included on the municipal plans for both the affected municipalities: Skeiða og Gnúpverjahreppur (western side of the river Þjórsá) and Rangárþing ytra (eastern side of the river).

The Hvammur reservoir will not be filled during the nesting period for birds (April to June).

Road alignment has been discussed in detail with the farmer on the west side of the reservoir, and a protective dyke will be constructed on the left bank of the river, in order to contain the reservoir at high water levels.

The proposal from some community members to lower the reservoir surface but maintain the level of production by extending the tailrace canal has been studied, but abandoned on technical grounds.

Criteria met: Yes

22.2.2 Management

Analysis against basic good practice

Scoring statement: *Plans and processes to manage reservoir preparation, filling and operations have been developed.*

A comprehensive plan for slope stabilisation is in place which builds on Landsvirkjun's extensive experience of this same issue elsewhere in the catchment and Iceland.

The archaeological finds and their management have been assessed under P-17.

The reservoir will be operated at a set level of 116.0 m.a.s.l., a level at which the installations will be able to pass a 50-year flood.

Due to the small size of the reservoir relative to the flow, many major issues normally associated with the initial filling of the reservoir such as downstream flows during filling, biomass removal and wildlife rescue operations are irrelevant in the case of the Hagalón reservoir, with the notable exception of attention to the timing of filling in order to not coincide with the nesting period of birds.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, reservoir plans are based on dialogue with local community and government representatives; and processes are in place to anticipate and respond to emerging risks and opportunities.*

For the involvement of the local communities – see above under Assessment.

The design of the reservoir along the west-bank road has been done in close co-operation with the local farmer. An agreement has been made to locate spoil and future sediments to be excavated from the reservoir on the west side of the road on this farmer's land in order to establish new areas of gently-sloping land for farming.

Continuous dialogue with the municipalities and other stakeholders guarantees early discovery of emerging risks and opportunities.

Criteria met: Yes

22.2.3 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no significant gaps against proven best practice.

0 significant gaps

22.3 Scoring Summary

The Hagalón reservoir will cover 4.6 km² large at normal water level, almost 3 km² of that was previously river, leaving just under 2 km² as effective land take for the reservoir. The water level will be kept constant during all but extreme situations.

All important issues for filling and operation have been assessed, and plans are made for those aspects in need of management intervention.

Consultations with local stakeholders, including the municipalities on both sides of the river, have resulted in significant changes to road design and future reservoir management in line with expressed stakeholder opinions. The two affected municipalities have both included the reservoir on their plan maps. Other alternative designs have been suggested by stakeholders. Landsvirkjun has investigated their potential, but abandoned those suggestions on technical grounds.

There are no significant gap at the level of proven best practice, resulting in a score of 5.

Topic Score: 5

22.4 Relevant Evidence

Interview:	153, 184
Document:	5, 6, 7, 22, 29, 30, 38, 39, 41, 45, 50, 51, 52, 75, 82, 87, 96, 98
Photo:	1o, 1p, 1s

23 Downstream Flow Regimes (P-23)

This topic addresses the flow regimes downstream of hydropower project infrastructure in relation to environmental, social and economic impacts and benefits. The intent is that flow regimes downstream of hydropower project infrastructure are planned and delivered with an awareness of and measures incorporated to address environmental, social and economic objectives affected by those flows.

23.1 Background Information

The major sustainability aspects to consider for the approximately 3 km stretch of river where the flow of the Þjórsá river will be strongly affected/limited by the Hvammur project are: wind erosion of the river bed when only the downstream flow is being passed through the old river course; aesthetic aspects of having an almost empty river bed, groundwater-table impacts with concomitant impacts on Viðey island with its unique vegetation and protected status and; impact on fish and fish migration.

The Hvammur area is not a natural habitat for the salmon, but it has been introduced to the area by aid of a fish ladder built in 1991 by Landsvirkjun at Búði (Photo 1af), around 10 km downstream from the Hvammur project site as a mitigation/compensation measure for upstream hydropower developments. Habitat enlargement is common practice in Iceland where the habitat of Atlantic salmon has been enlarged by approximately 1/3 through human interventions.

Salmon migration is stated as the reason for the Hvammur project (together with the other lower Þjórsá projects) being moved into the “more studies needed” category when the ministers for environment and industry put their proposed paper on the master plan to parliament.

The Hvammur hydropower plant is designed to operate mainly as a base-load plant, meaning there will be no major impact on the hydrology downstream from where the water, via the tailrace, re-joins the main river course.

This topic has some overlap with P-19. All assessment criteria relating to downstream-flow regimes and also relevant to that topic will be scored only under the more relevant topic.

23.2 Detailed Topic Evaluation

23.2.1 Assessment

Analysis against basic good practice

Scoring statement: *An assessment of flow regimes downstream of project infrastructure over all potentially affected river reaches, including identification of the flow ranges and variability to achieve different environmental, social and economic objectives, has been undertaken based on relevant scientific and other information with no significant gaps.*

The affected river reach downstream of Hvammur is studied in the EIA, the Project Planning Report and several specialised studies, with environmental, social and economic aspects taken into account.

The clearly prioritised issue for the local community has been the preservation of salmon migration past the planned Hvammur dam. For this reason, various fish studies have been carried out by Landsvirkjun throughout the assessment process, as well as annual monitoring of fish migrations along the lower Þjórsá river. The Institute for Freshwater Fisheries has determined that a downstream flow of 10 m³/s would be sufficient to maintain habitat and migration on the affected river stretch.

In order to prevent dust from blowing out of the affected reach of the Þjórsá channel, as well as for aesthetic reasons, re-vegetation measures are planned. This mitigation response might be somewhat difficult to realise,

given that the channel will always be subjected to high flows during certain periods of the summer, making vegetation establishment difficult. The experts of the Institute for Freshwater Fisheries emphasise channel-shape control as an important mitigation approach, given that this will govern depth and wet perimeter of the channel in response to various flows.

Until recently, there has been very limited attention paid to non-salmon flow-release impacts. A BSc thesis studied the vegetation of Viðey island in 2011 and there is now significant worry among botanists that the lowered water table below the dam will contribute to desiccation of the island's unique vegetation, and also possibly facilitate the increased colonisation of alien species such as Lupins (see P-19). Lupins are, however, already present on the island. Risks concerning sheep and other grazing animals gaining access to the island when water levels are lower have also been identified by some stakeholders.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, the assessment is based on field studies, and takes broad considerations, risks and opportunities into account.*

A wealth of field studies have been undertaken to act as basis for the identification of a suitable flow regime. The expected cumulative impacts on salmon migration have been studied for the three planned hydropower developments on the lower Þjórsá.

However, the strong focus on salmon migration (in direct response to stakeholders' concerns) has resulted in a process that cannot be said to take broad considerations and opportunities into account, as the linkages between e.g. flow and the Viðey-island biodiversity have not been sufficiently studied. Landsvirkjun has been reactive in this regard, and allowed outside stakeholders to set a too limited agenda for the flow assessment. This is an un-assessed risk of future impacts which constitutes a **significant gap** at this level.

Criteria met: No

23.2.2 Management

Analysis against basic good practice

Scoring statement: *Plans and processes for delivery of downstream flow regimes have been developed that include the flow objectives; the magnitude, range and variability of the flow regimes; the locations at which flows will be verified; and ongoing monitoring; and where formal commitments have been made, these are publicly disclosed.*

The delivery of a downstream flow is determined to be a constant 10 m³/s, believed by experts from the Institute of Freshwater Fisheries to be a satisfactory level for the maintenance of successful salmon migration. The flow will be released as an over-flow over the dam. This design solution means that at normal operating level of the reservoir, the required flow will automatically be released. The commitment is publicly disclosed, through the EIA and the master-planning process.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, processes are in place to anticipate and respond to emerging risks and opportunities; and commitments in plans are public, formal and legally enforceable.*

The ruling of the EIA is a binding document for the management of downstream-flow commitments and the necessary processes are in place through Landsvirkjun's environmental management team to respond to whatever decision comes out of the ongoing parliamentary process, as well as other emerging risks and opportunities.

23.2.3 Stakeholder Engagement

Analysis against basic good practice

Scoring statement: *The assessment and planning process for downstream flow regimes has involved appropriately timed, and often two-way, engagement with directly affected stakeholders; ongoing processes are in place for stakeholders to raise issues with downstream flow regimes and get feedback.*

Stakeholder engagement on project preparation is described in general terms under P-1. This part of the assessment concerns engagement on the planning of a downstream-flow regime.

Two-way engagement with key stakeholders regarding downstream flows has taken place throughout the various phases of project development. The number of stakeholders and interests has increased over time, partly as a result of the introduction of salmon to the river above Búði, and partly because the island of Viðey has been granted protected status.

The municipalities, Skeiða og Gnúpverjahreppur (western side of the river Þjórsá) and Rangárþing ytra (eastern side of the river) have been involved in the Hvammur project planning, contributing opinions and suggestions during various stages of Master planning, Municipal planning and Construction planning. The municipalities can decline or prevent development initiatives in their respective areas.

However, there are stakeholders who do not feel that their opinions have been sufficiently addressed in the determination of a downstream flow regime. The Salmon and Trout Society of Þjórsá/Veiðifélag also expresses doubts as to the independence of those institutions/experts that have provided scientific expertise to the process. Several stakeholder representatives describe a slowness in feedback on the part of Landsvirkjun, and there seems to be a limited amount of ongoing processes for stakeholders to raise issues with the downstream flow regime. This is mainly the result of the ongoing political process concerning the master-planning. This lack of satisfactory ongoing engagement with stakeholders is considered a non-significant gap at the moment. However, as soon as the political process on the master plan is settled by a parliamentary ruling, lack of renewed attention to this by Landsvirkjun would render this a significant gap against basic good practice.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, engagement with directly affected stakeholders has been inclusive and participatory; and feedback on how issues raised have been taken into consideration has been thorough and timely.*

Engagement has been both inclusive and participatory. All stakeholders have been given ample opportunity to voice opinions and take part in the various meetings, processes and exchanges that have taken place. Several open meetings have been conducted and the master-planning exercise has given multiple opportunities for engagement.

Some stakeholders do, however, express dissatisfaction with Landsvirkjun's responsiveness. This is most clear among environmental NGOs and the local angling association. To a certain extent this can be explained by the political process, but the strongly voiced opinions by certain stakeholders regarding Landsvirkjun's lack of timely responsiveness results in a **significant gap** at this level.

Criteria met: No

23.2.4 Outcomes

Analysis against basic good practice

Scoring statement: *Plans for downstream flows take into account environmental, social and economic objectives, and where relevant, agreed transboundary objectives.*

The plans for downstream flows have taken all aspects of sustainability into account, but mainly due to strong expressed stakeholder priorities, the issue of salmon migration has become the dominant issue.

Criteria met: Yes

Analysis against proven best practice

Scoring statement: *In addition, plans for downstream flow regimes represent an optimal fit amongst environmental, social and economic objectives.*

The EIA and several subsequent studies have identified (mainly) salmon and char migration as the key aspect in the determination of a downstream-flow regime. Senior fisheries experts on salmon from the Institute of Freshwater Fisheries have determined that the adopted minimum downstream flow is satisfactory for the maintenance of successful salmon migration.

The issue of wind-blown sediments from the partly dry riverbed can be mitigated for a wide range of determined flows.

The multiple concerns relevant to downstream flow determination have not been sufficiently internalised in the flow determination to clearly demonstrate an optimal fit. This is a **significant gap**, but the same gap as under Assessment above.

Criteria met: No

23.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no significant gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

Landsvirkjun has not taken broad consideration in the downstream-flow determination. As a result of this, sustainability aspects other than fish migration have not been internalised in a satisfactory manner.

Slow feedback on opinions/communication to/from stakeholders regarding the process leading to stakeholder dissatisfaction.

2 or more significant gaps

23.3 Scoring Summary

External stakeholders, mainly environmental groups and local fishing interests, have put a very strong emphasis on salmon migration in their concerns on the studies and planning for a downstream-flow delivery. The issue of salmon migration has also been used as an argument in the highly politicised debate on the lower Þjórsá projects, and is the stated reason for parliament to reconsider the suitability of the three projects in question. The experts from the Institute for Freshwater Fisheries do, however, argue strongly that the 10 m³/s is an appropriate minimum downstream flow for the continued successful migration of Atlantic salmon past the Hvammur area and the planned dam.

Several stakeholders are dissatisfied with communication and responsiveness on the part of Landsvirkjun related to the downstream flow discussions, and even express doubts regarding the independence of some of the scientific expertise involved.

The downstream-flow determination has been based almost entirely on the issue of salmon migration. Given that there are other relevant sustainability aspects, this cannot be considered an optimal fit.

There are 2 significant gaps at the level of proven best practice (affecting three of the criteria at Level 5), resulting in a score of 3.

Topic Score: 3

23.4 Relevant Evidence

Interview:	131, 148, 152, 153, 183, 185
Document:	2, 3, 5, 6, 7, 8, 11, 16, 17, 22, 29, 30, 33, 34, 37, 38, 39, 41, 45, 53, 75, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92
Photo:	1q, 1r, 1w, 1af

Appendix A: Written Support of the Project Developer



Landsvirkjun

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IHA – International Hydropower Association
Central Office
Nine Sutton Court Road, Sutton
London SM1 4SZ
United Kingdom
Attention: Douglas Smith

Reykjavík: 03.05.2013
Our Ref.: 07.01

Subject: Assessment of the Hvammur Project Using the Preparation Tool of the Hydropower Sustainability Assessment Protocol

Landsvirkjun is pleased to be amongst the first to implement the Hydropower Sustainability Assessment Protocol, as a Sustainability Partner of IHA. Landsvirkjun welcomes the application of the Preparation Tool of the Protocol to the Hvammur project as part of this partnership, and hopes that the experience will provide important lessons for increasing adoption of the Protocol around the world, and the future development of the Protocol, as well as for Landsvirkjun. We provide our full support and coordination to the Assessment Team conducting this assessment of the Hvammur project.

Yours Sincerely

A handwritten signature in blue ink that reads "Óli Grétar Blíndal Sveinsson".

Óli Grétar Blíndal Sveinsson
Executive Vice President
Research & Development Division

Appendix B: Verbal Evidence

Ref	Interviewee / s, Position	Organisation	Date	Lead Interviewer
128	Njörður Geirdal	Landowner - Hvammur	21/05/2012	Doug Smith
129	Gunnsteinn R. Ómarsson, Director of the Local Council; Ásgeir Jónsson, Planning Analyst and Consultant for the local council, Councillors	Rangárþing ytra Municipality	21/05/2012	Doug Smith
130	Guðfinnur Jakobsson, Chairman and Ingibjörg Elsa Björnsdóttir, Board Member	Náttúruverndarsamtök Suðurlands (NGO - Environmental Organization for the South part of Iceland.)	21/05/2012	Doug Smith
131	Sigurður Guðjónsson, CEO; Magnús Jóhannsson, Ichthyologist	Institute of Freshwater Fisheries	21/05/2012	Dr Bernt Rydgren
132	Einar M. Júlíusson, Project Designer, Helgi Jóhannesson, Project Manager Landsvirkjun.	Mannvit Consulting Engineers	21/05/2012	Dr Bernt Rydgren
133	Sveinn Kári Valdimarsson, Fish Biologist, Einar M. Júlíusson, Project Designer, Mannvit.	Landsvirkjun	21/05/2012	Dr Eleni Taylor-Wood
134	Oddur Bjarnason, Chairman	Thjórsá Angling Club	22/05/2012	Simon Howard
135	Kristófer Tómasson, Director of the Local Council; Councillors	Skeiða- og Gnúpverjahreppur Municipality	22/05/2012	Doug Smith
136	Hermann Sigurðsson, CEO; Páll Eggertsson, Project Manager, Sveinn Fjeldsted, ISTAK Safety Manager for Búðarháls	ISTAK, Búðarháls	22/05/2012	Simon Howard
137	Ásborg Arnþórsdóttir	Tourist Association west of Thjórsá	22/05/2012	Doug Smith
138	Kristinn Eiríksson, Resident Engineer - Búðarháls	Landsvirkjun	22/05/2012	Doug Smith
139	Kristján Kristinsson, Safety Manager - Búðarháls	Landsvirkjun	22/05/2012	Doug Smith
140	Sigurður Guðjónsson, CEO; Magnús Jóhannsson, Ichthyologist	Institute of Freshwater Fisheries	21/05/2012	Dr Eleni Taylor-Wood
141	Njörður Geirdal	Landowner - Hvammur	21/05/2012	Dr Bernt Rydgren

Ref	Interviewee / s, Position	Organisation	Date	Lead Interviewer
142	Gunnsteinn R. Ómarsson, Director of the Local Council; Ásgeir Jónsson, Planning Analyst and Consultant for the local council, Councillors	Rangárþing ytra Municipality	21/05/2012	Dr Bernt Rydgren
143	Oddur Bjarnason, Chairman	Thjórsá Angling Club	22/05/2012	Dr Bernt Rydgren
144	Kristófer Tómasson, Director of the Local Council; Councillors	Skeiða- og Gnúpverjahreppur Municipality	22/05/2012	Dr Bernt Rydgren
145	Hermann Sigurðsson, CEO; Páll Eggertsson, Project Manager, Sveinn Fjeldsted, ISTAK Safety Manager for Búðarhals	ISTAK, Búðarháls	22/05/2012	Dr Eleni Taylor-Wood
146	Jóhann Þórsson	Soil Conservation Service of Iceland	22/05/2012	Dr Eleni Taylor-Wood
147	Helgi Bjarnason, Project Manager	Landsvirkjun	22/05/2012	Dr Eleni Taylor-Wood
148	Helgi Bjarnarson, Project Manager; Helgi Jóhannesson, Project Manager	Landsvirkjun	22/05/2012	Dr Bernt Rydgren
149	Sigurður H. Magnússon, Biologist	Icelandic Institute of Natural History	22/05/2012	Dr Bernt Rydgren
150	Einar M. Júlíusson, Project Designer; Helgi Bjarnarson, Project Manager	Mannvit Consulting Engineers / Landsvirkjun	23/05/2012	Doug Smith
151	Guðmundur Ingi Guðbrandsson, Executive Manager; Helga Ögmundardóttir, Board member	Landvernd, Icelandic Environment Association (NGO)	23/05/2012	Doug Smith
152	Guðmundur Ingi Guðbrandsson, Executive Manager; Helga Ögmundardóttir, Board member	Landvernd, Icelandic Environment Association (NGO)	23/05/2012	Dr Bernt Rydgren
153	Einar M. Júlíusson, Project Designer; Helgi Bjarnarson, Project Manager; Helgi Jóhannesson, Project Manager	Mannvit Consulting Engineers / Landsvirkjun/ Landsvirkjun	23/05/2012	Dr Bernt Rydgren

Ref	Interviewee / s, Position	Organisation	Date	Lead Interviewer
154	Kristinn Magnússon, Archaeologist	The Archaeological Heritage Agency of Iceland	23/05/2012	Dr Eleni Taylor-Wood
155	Bjarni F. Einarsson, Archaeologist	The Archaeological Office	23/05/2012	Dr Eleni Taylor-Wood
156	Orri Vigfússon, President	North Atlantic Salmon Fund	23/05/2012	Dr Eleni Taylor-Wood
157	Helgi Jensson, Consultant; Ólafur A. Jónsson, Division Manager	The Environment Agency of Iceland	23/05/2012	Simon Howard
158	Dóra Hjálmarasdóttir, Security Specialist	Verkís	23/05/2012	Doug Smith
159	Guðmundur S. Pétursson, Quality Manager; Ragnheiður Ólafssdóttir, Environmental Manager	Landsvirkjun	23/05/2012	Doug Smith
160	Magnús Þór Gylfason, Acting Head of Communications	Landsvirkjun	23/05/2012	Doug Smith
161	Jakob Gunnarsson (Skipulagsstofnun), Analyst (EIA)	The Icelandic National Planning Agency	23/05/2012	Doug Smith
162	Jakob Gunnarsson (Skipulagsstofnun), Analyst (EIA)	The Icelandic National Planning Agency	23/05/2012	Dr Bernt Rydgren
163	Helgi Jensson, Consultant; Ólafur A. Jónsson, Division Manager	The Environment Agency of Iceland	23/05/2012	Dr Bernt Rydgren
164	Svanfríður I. Jónasdóttir, Project Manager Phase I and Sveinbjörn Björnsson, Project Manager Phase II	Master Plan for energy and natural conversation (Rammaáætlun.is)	23/05/2012	Dr Bernt Rydgren
165	Guðni Jóhannesson, CEO	National Energy Authority	23/05/2012	Dr Bernt Rydgren
166	Úlfar Linnét, Manager of Research Department	Landsvirkjun	23/05/2012	Dr Bernt Rydgren
167	Guðni Jóhannesson, CEO	National Energy Authority	23/05/2012	Dr Eleni Taylor-Wood
168	Helgi Jensson, Consultant; Ólafur A. Jónsson, Division Manager	The Environment Agency of Iceland	23/05/2012	Dr Eleni Taylor-Wood
169	Kristján M. Sigurjónsson, Project Manager (designer); Helgi Bjarnarson, Project Manager	Verkís Consulting Engineers / Landsvirkjun	23/05/2012	Dr Eleni Taylor-Wood

Ref	Interviewee / s, Position	Organisation	Date	Lead Interviewer
170	Helgi Bjarnason, Project Manager; Helgi Jóhannesson, Project Manager	Landsvirkjun	23/05/2012	Dr Eleni Taylor-Wood
171	Jón Sveinsson, Legal Division, Supreme Court Attorney	Landsvirkjun	23/05/2012	Dr Eleni Taylor-Wood
172	Halldór Grönnvöld, Assistant Director, Kristján Þórður Snæbjarnarson, Chairman of the Electricians' Union of Iceland (RSI), Ísleifur Tómasson, Employee and the Electricians' Union of Iceland (RSI)	Icelandic Labour Union (ASÍ)	23/05/2012	Simon Howard
173	Pétur Pétursson, Head of Purchasing	Landsvirkjun	24/05/2012	Dr Eleni Taylor-Wood
174	Kristján Gunnarsson, Head of Treasury	Landsvirkjun	24/05/2012	Dr Eleni Taylor-Wood
175	Ragna Árnadóttir, Executive Vice President	Landsvirkjun	24/05/2012	Doug Smith
176	Kristján Gunnarsson, Head of Treasury	Landsvirkjun	24/05/2012	Dr Bernt Rydgren
177	Hörn Hrafnadóttir, Civil Engineer	Verkís Consulting Engineers	24/05/2012	Dr Bernt Rydgren
178	Stella Marta, Business Director - Marketing and Business Development Landsvirkjun and Edvard Guðnason, Landsvirkjun	Landsvirkjun	24/05/2012	Dr Bernt Rydgren
179	Sigmundur Einarsson, EIA Consultant	Almenna Verkfræðistofan consultancy	24/05/2012	Simon Howard
180	Einar Mathiesen, Head of Operations	Landsvirkjun	24/05/2012	Doug Smith
181	Helgi Bjarnason, Project Manager; Helgi Jóhannesson, Project Manager	Landsvirkjun	24/05/2012	Doug Smith
182	Rögnvaldur Ólafsson, Landsvirkjun's point of contact at the Civil Protection	Civil Protection in Iceland	24/05/2012	Simon Howard
183	Árni Snorrason, CEO; Jórunn Harðardóttir, Hydrologist	Iceland Meteorological Office	24/05/2012	Dr Bernt Rydgren

Ref	Interviewee / s, Position	Organisation	Date	Lead Interviewer
184	Eggert Guðjónsson, Power System Planner	Landsvirkjun	24/05/2012	Dr Bernt Rydgren
185	Helgi Bjarnason, Project Manager; Helgi Jóhannesson, Project Manager	Landsvirkjun	24/05/2012	Dr Bernt Rydgren
186	Helgi Bjarnason, Project Manager	Landsvirkjun	24/05/2012	Dr Eleni Taylor-Wood
187	Árni Snorrason, CEO; Jórunn Harðardóttir, Hydrologist	Iceland Meteorological Office	24/05/2012	Dr Eleni Taylor-Wood
188	Kristján Skarphéðinsson, Permanent Secretary	Ministry of Industry, energy and Tourism	24/05/2012	Dr Eleni Taylor-Wood
189	Guðlaugur Þórarinnsson, Project Manager	Landsvirkjun	25/05/2012	Doug Smith
190	Andreas Hutzler, Senior Area Manager; Pablo von Waldenfels, Euler Hermes and Exportkreditgarantien der Bundesrepublik Deutschland	Voith / Euler - Export Credits	25/05/2012	Dr Bernt Rydgren
191	Kristján Kristinsson, Safety Manager Búðarháls	Landsvirkjun	25/05/2012	Dr Eleni Taylor-Wood
192	Àrmann Jónsson, Head of Risk Management	Landsvirkjun	25/05/2012	Dr Bernt Rydgren
193	Helgi Jóhannesson and Sveinn Kári Valdimarsson	Landsvirkjun	24/08/2012	Dr Eleni Taylor-Wood

Appendix C: Documentary Evidence

Ref	Document
2	Lower Thjórsá Project Website
3	Master Plan for Geothermal and Hydropower Development in Iceland, available at: http://www.rammaaetlun.is/english
4	Landsvirkjun's Newsletters available at: http://www.thjorsa.is/category.aspx?catID=29
5	Environmental Impact Assessment (EIA) report. Hydropower Development of the Thjórsá River by Núpur and the Modification of Búrfell Line 1 (in Icelandic)
6	EIA Summary
7	Ruling of the Planning Agency on the Environmental Impact Assessment and ruling of the Minister for the Environment
8	Meetings and meeting minutes with stakeholders (2007-2009) (in Icelandic)
9	Hvammsvirkjun - Status of negotiations between landowners and Landsvirkjun. March 2012. (in English)
10	Landsvirkjun's Communications Plan (2011)
11	Record of email communication between Landsvirkjun and Oddur Bjarnason
12	Example of newsletter: Hydropower stations in river Thjórsá. Landsvirkjun's Newsletter from August 5th 2008. (in Icelandic)
13	Older meeting minutes (before 2006) (in Icelandic)
14	Stakeholder mapping (2011)
15	Landsvirkjun's Organizational chart, available at: http://www.landsvirkjun.com/about-us/company-structure/
16	Landsvirkjun's Environmental Policy (in English), available at: http://www.landsvirkjun.com/environment/environmental-policy/
17	Landsvirkjun's Strategy on Corporate Social Responsibility, available at: http://www.landsvirkjun.com/about-us/news/nr/1527
18	Landsvirkjun's Policy in Safety, Health and Work Environment Matters (in Icelandic and English)
19	New projects in Thjórsá river. Hvammur, Holt and Urridafoss. Project Organizational chart (in English)
20	Presentation of Ragna Sara Jónsdóttir on Landsvirkjun's Strategy on Corporate Social Responsibility
21	Landsvirkjun's Social Responsibility Report (in English)
22	Landsvirkjun's Environmental Report 2011 (in Icelandic and draft in English)
23	Landsvirkjun's Annual Report 2011 (in Icelandic)
24	Landsvirkjun's Environmental, Quality and Safety Management System (in English). Website: http://www.landsvirkjun.com/about-us/certifications/
25	Landsvirkjun's ISO 9001 Quality System Certificate (in Icelandic and English)
26	Landsvirkjun's ISO 14001 Environmental Mgt System Certificate (in Icelandic and English)
27	OHSAS 18001 Occupational Health and Safety Management System Certificate
28	Corporate Quality-Environmental and Safety - Audit reports in Focal - Document Control System
29	Municipal Planning for Skeiða and Gnúpverjahreppur
30	Municipal Planning for Rangárþing ytra

Ref	Document
31	Changes in Municipal Planning for Skeiða and Gnúpverjahreppur - Report
32	Changes in Municipal Planning for Skeiða and Gnúpverjahreppur - Map
33	Welfare for the Future, the government policy on Sustainability (Velferd til framtíðar), available at: http://www.umhverfisraduneyti.is/utgefing-efni/nr/249
34	The Nature Conservation Act no. 44/1999, available at: http://eng.umhverfisraduneyti.is/legislation/nr/389
35	Iceland Nature Conservation List (in Icelandic), available at: http://www.ust.is/einstaklingar/nattura/natturuminjaskra/
36	Energy Policy for Iceland (Orkustefna)
37	Description of Hvammur by Sveinbjörn Björnsson for Master Plan of hydro and geothermal resources in Iceland
38	Landsvirkjun's presentation of Hvammur for Master Plan of hydro and geothermal resources in Iceland
39	Hvammsvirkjun Hydroelectric Project, Project Planning Report (Volume 1) LV-2006-036
40	Hvammsvirkjun Hydroelectric Project, Project Planning Report (Volume 2) LV-2008-036
41	Hvammur HEP - Changes to the design after the EIA (Draft) (in English)
42	SEA for Energy - Planning Agency (in Icelandic) available at: http://www.rammaaetlun.is/media/samradsferli/Umhverfisskyrsla-verndar--og-orkunyttingaraetlunar.pdf
43	Landsvirkjun's Environmental, Quality and Safety System, available at: http://www.landsvirkjun.com/about-us/certifications/
44	Environmental and Safety Management Plan for Búðarháls
45	Hvammsvirkjun-Umhverfisþættir. Hvammsvirkjun-Environmental Aspects. Mitigation Measures and Monitoring (in Icelandic) LV-2008-115
46	Búðarháls HEP - Project Organizational Chart. April 2012 (in Icelandic and English)
47	Búðarháls HEP - Environmental Management Plan (in English)
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49	lower Thjórsá. Tentative time schedule. From 2006 (in English)
50	Operational Plan and Limitations in Thjórsá River (in Icelandic) LEI-72.
51	Assessment of potential energy and feasibility of proposed power plants in lower Thjórsá River basin and Búðarháls Power Plant (in Icelandic) LV-2008-004
52	Þjórsá River South Iceland, Hvammur and Urriðafoss Hydroelectric Projects, Ice Jam Evaluation (Chapter 6) LV-2009-127.
53	Nordic Council of Ministers (2011). Climate Change and Energy Systems - Impacts, Risk and Adaptation in the Nordic and Baltic Countries. Report (in English)
54	Earthquake hazard and seismic action for proposed power plants in the South Iceland Lowland. LV-2008-056.
55	Fractures and Leakages at the Holtavirkjun Project Sites, South Iceland Seismic Zone. LV-2008/088
56	Áhættumat : Virkjanir í Þjórsá neðan Búrfells. (in Icelandic) LV-2008-057
57	Emergency Plan for Landsvirkjun
58	Safety Management Certificate for Landsvirkjun's Operation (in Icelandic), available at: http://www.landsvirkjun.is/um-landsvirkjun/vottanir-landsvirkjunar/nr/807

Ref	Document
59	Hvammsvirkjun, Holtavirkjun Urriðafossvirkjun, Synthesis of 2001-2010 Geological Field Data from Hreppar and south Iceland Seismic zone, LV-2011-073
60	Emergency management
61	Additional information from Dóra Hjálmsdóttir
62	Safety in the Búðarháls Project
63	Financial risk assessment (internal website viewed under confidentiality agreement)
64	Financial Plan (internal website viewed under confidentiality agreement)
65	Landsvirkjun Risk Register from 14.12.200 by Ármann Jónsson, Head of Risk (in English)
66	Landsvirkjun Renewable Energy Potential and its impact on Iceland's Economy
67	Press release - Búðarháls financing
68	Press release - Rescheduling of Landsvirkjun's debt from Euro to USD
69	Project Benefits of Hvammur Hydropower Project
70	Law nr. 4/1995 (law regarding taxes paid to the Municipalities) (in Icelandic) available at: http://www.althingi.is/dba-bin/unds.pl?txi=/wwwtext/html/lagasofn/140a/1995004.html&leito=fasteignaskatt\Ofasteignaskatta\Ofasteignaskattana\Ofasteignaskattanna\Ofasteignaskattar\Ofasteignaskattarnir\Ofasteignaskatti\Ofasteignaskattinn\Ofasteignaskattinu#word1
71	Búðarháls Hydroelectric Project. Contract Documents BUD-01, No. 20015. Civil Works. Volume 2-Part 1 of 2. Specification. June 2010. (in English) LV-2010-050.
72	Búðarháls Hydroelectric Project. Contract Documents BUD-01, No. 20015. Civil Works. Volume 1. Conditions of Contract and Contract Forms. June 2010. (in English) LV-2010-050
73	Búðarháls Hydroelectric Project. Contract BUD-01, No. 20015. Civil Works. Tender Procedures. June 2010. (in English) LV-2010-050.
74	Documents from Pétur Pétursson, Head of Purchasing.
75	Urriðafoss Power Plant & Núpur Power Plant - Effects on Tourism, Outdoor Recreation and Community. Report (in Icelandic) LV-2002-022
76	Landsvirkjun - Gender Equality Policy
77	Landsvirkjun - Education Policy
78	Landsvirkjun - Human Resource Policy
79	HSE Report for Búðarháls
80	Report describing archaeological studies in 2009 - In Icelandic.LV-2010-003.
81	Videy, island in river Thjorsa - Nature reserve, available at: http://www.ust.is/einstaklingar/nattura/fridlyst-svaedi/sudurland/videy-i-thjorsa/
82	The Nature Conservation Act, no. 44/1999, available at: http://www.ust.is/library/Skrar/Atvinnulif/Log/Enska/The_Nature_Conservation_Act.pdf
83	Magnús Jóhannsson, Benóný Jónsson og Sigurður Guðjónsson, 2008. Fiskrannsóknir á vatnasvæði Þjórsár. Samantekt rannsókna árin 2003 til 2007. Veiðimálastofnun VMST/08020 - In English LV-2008-066.
84	Lecture by Margaret J. Filardo at the University of Iceland of the impact of power plants on fish in Columbia River
85	Helgi Jóhannesson - Presentation at the University of Iceland: The impact of power plants in lower-Thjórsá on fish
86	Letter from North Atlantic Salmon Fund (NASF) to the Minister of Industry (in Icelandic)

Ref	Document
87	The Possible Effects on Vegetation and Birdlife in the Area of the Proposed Nupur Power Plant, on the Þjórsá River NÍ-02009 (in Icelandic and English)
88	Letter to the Parliament about the master plan from the Nationwide organization of fish right owners in rivers and lakes (in Icelandic)
89	Letter to the Parliament about the master plan from the Organization of fish right owners in Þjórsá River (in Icelandic)
90	Documents from Orri Vigfússon the chairman of the North Atlantic Salmon Fund (NASF)
91	Letter from Þjórsá Angling Club 20.5.2012
92	Oblique aerial Photos of sections downstream from Hvammur showing the impact and existence of various erosion measures and partial diversion of the channel in one place. Photos from Helgi Bjarnason (biodiversity/erosion topic)
93	Strandrof við lón í Neðri-Þjórsá (in Icelandic) LV-2002-088
94	Coastal Erosion of Proposed Reservoir in the lower Region of the Þjórsá River (summary and conclusion in English) LV-2002-088.
95	Almenna: "Setmyndun í Hagalóni: Rannsóknir, úrvinnsla og útreikningar" (in Icelandic) LV-2006-003.
96	Reservoir Limitations for Hvammur: Able to pass 50 year flood at normal water level, Able to pass 1000 year flood and keeping the reservoir level at less than or equal to 1,5 m above normal water level (Landsvirkjun Design Memorandum)
97	Notes on Discharge and Sediment Load in Thjórsá in recent decades (in English)
98	Kárahnjúkar Hydroelectric Project. Waterways Operation Manual. Revision 1. (in English) LV-2009-014
99	Additional information from Dóra Hjálmsdóttir (Verkis consulting) - Risk assessment
100	Corporate Community Fund, information available at: http://www.landsvirkjun.com/about-us/community-fund/
101	Preliminary Report on Possible Projects on the lower Thjórsá, 1981
102	Lahmeyer International, 2000, Lower Thjórsá River Development: Conceptual Study
103	Power Production Capacity in the Lower Thjórsá Region, 2004
104	Review of the draft parliamentary motion concerning the Master Plan for conservation and energy utilization of geographical areas.
105	Map of proposed Hvammur infrastructure: road and reservoir
106	Benedikt Steingrímsson, Sveinbjörn Björnsson & Hákon Adalsteinsson. 2007. Master Plan for Geothermal and Hydropower Development in Iceland. Article. (in English)
107	Presentation of Landsvirkjun's Marketing and Business Development: Why the demand for power in Iceland? May 17th 2012 (in English)
108	Memorandum from the Icelandic Met Office: A few notes on Discharge and Sediment Load in Thjórsá in recent decades. May 14th, 2012. (in English)
109	Agreement between the Icelandic Federation of Labour (AI), SGS, RSI, SA and Landsvirkjun concerning wages and terms for work on NPC Power Projects (Effective from 2004-2007) (in Icelandic and English)
110	Agreement between the Icelandic Federation of Labour (AI), SGS, RSI, SA and Landsvirkjun concerning wages and terms for work on NPC Power Projects (Effective from 2008) (in Icelandic and English)

Ref	Document
111	Environmental Impact Assessment (EIA) Summary. Hydropower Development of the Þjórsá River by Núpur and the Modification of Búrfell Line 1 (Translations in English - chapters 1, 2, 3, 7, 10, 11 and 12)
112	Urriðafoss Power Plant & Núpur Power Plant - Effects on Tourism, Outdoor Recreation and Community. Content and Summary (in English) LV-2002-022
113	Coastal Erosion of Proposed Reservoir in the lower Region of the Þjórsá River. Report (in Icelandic) LV-2002-088.
114	Sediment transport in Hagalón Reservoir. Report (in Icelandic) LV-2006-003.
115	Sediment transport in Hagalón Reservoir. Summary and conclusion (in English) LV-2006-003.
116	Risk Assessment: Hydropower plants in lower Thjórsá river (LV-2008-057. Áhættumat : Virkjanir í Þjórsá neðan Búrfells). Report (in Icelandic) LV-2008-057.
117	Fish Studies in the Thjórsá River Basin. Summary of Research 2003 to 2007. Final Report. Institute of Freshwater Fisheries (in Icelandic) LV-2008-066.
118	Fish Studies in the Thjórsá River Basin. Summary of Research 2003 to 2007. Summary. (in English) LV-2008-066.
119	Master Plan for hydro and geothermal energy resources in Iceland. Conclusion of Phase 1 (Economic summary -Table 5.11) (Niðurstöður 1. áfanga Rammaáætlunar) (in Icelandic)
120	Chemical Composition, river flow and sediment load in river in south of Iceland XIII. Report (in Icelandic) RH-22-2010.
121	Landsvirkjun's external web site (http://www.landsvirkjun.com/)
122	Landsvirkjun's internal web site
123	Landsvirkjun-Alcoa sustainability initiative at http://www.sustainability.is
124	Nobanis – Invasive Alien Species Fact Sheet: <i>Lupinus nootkatensis</i>
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126	Efnasamsetning, rennsli og aurburður straumvatna á Suðurlandi XIII. Gagnagrunnur Raunvísindastofnunar of Orkustofnunar RH-22-2010 (in Icelandic)
201	Order for the protection of the island Viðey, in the Þjórsá River, August 2011
202	Environmental Impact Assessment Act 2000.
203	Regulations on Environmental Impact Assessment 1123/2005 English translation
204	Jonnson, G. S., Jonsson, I. R., Björnsson, M. and Einarsson, S. M. (2000) Using regionalization in mapping the distribution of the diatom species <i>Didymosphenia geminata</i> (Lyngb.) M. Smith in Icelandic rivers. <i>Verh. Intl Verein. Limnol.</i> 27 : 340-343.
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206	Ottósson, J. G. (2010) Controlling two invasive plant species in Iceland (<i>Lupinus nootkatensis</i> and <i>Anthriscus sylvestris</i>). Presentation by Icelandic Institute of Natural History.
207	Anna Sigríður Valdimarsdóttir, 1981, Gróður í Viðey í Þjórsá (<i>Vegetation in Forgotten Þjórsá</i>), BSc Thesis
208	Agreement regarding the internet connection to be provided by Landsvirkjun to Skeiða og Gnúpverjahreppur municipality (in Icelandic).
209	“Agreement on Major Development” Between the Confederation of Icelandic Employers (SA) on behalf of its members and The Icelandic Federation of Labor (ASÍ), according to their collaboration agreement. June 2007. Translated from Icelandic by Ellen Ingvadóttir, Certified Court Interpreter and Translator.

Appendix D: Visual Evidence

	
<p>Photo 1a: Farm House on west bank</p>	<p>Photo 1b: Farmhouses Fosness on west bank</p>
	
<p>Photo 1c: Gravel Extraction on west bank</p>	<p>Photo 1d: Hagi and Melhagi farms, west bank</p>
	
<p>Photo 1e: Horses on west bank</p>	<p>Photo 1f: Powerhouse site</p>



Photo 1g: Summerhouses



Photo 1h: View of Viðey Island from west bank



Photo 1i: Dam red landmark and view of Hagaey Island



Photo 1j: Height of proposed Hagalón reservoir, west bank



Photo 1k: Urriðafoss existing bridge



Photo 1l: Archaeological site



Photo 1m: Archaeological site 2



Photo 1n: Existing road, west bank



Photo 1o: Abandoned farm up stream of Hvammur dam









Photo 1p: Area agreed for land enhancement and road realignment



Photo 1q: Viðey Vegetation



Photo 1r: Downstream view from Hvammur dam site with Viðey

	
<p>Photo 1s: Future reservoir FSL indicated by sign on slope</p>	<p>Photo 1t: Power house site in heavily eroded landscape</p>
	
<p>Photo 1u: Transmission line corridor</p>	<p>Photo 1v: Urriðafoss</p>
	
<p>Photo 1w: Viðey from across the river</p>	<p>Photo 1x: Example of wind erosion</p>

— PROJECT RISK REGISTER — (Búðarháls)

Category	Item	Priority	Status	Responsible
Safety	1	High	Open	A </td
	2	Medium	Open	B
	3	Low	Open	C
	4	Very Low	Open	D
Quality	5	High	Open	A
	6	Medium	Open	B
	7	Low	Open	C
	8	Very Low	Open	D
Environment	9	High	Open	A
	10	Medium	Open	B
	11	Low	Open	C
	12	Very Low	Open	D
Social	13	High	Open	A
	14	Medium	Open	B
	15	Low	Open	C
	16	Very Low	Open	D



Photo 1y: Búðarháls risk register

Photo 1z: Notice concerning Urriðafoss waterfall and planned dam



Photo 1aa: View upstream from dam site, east bank

Photo 1ab: West bank with existing road in foreground



Photo 1ac: West bank with road in foreground

Photo 1ad: Djorsarstofa community hall, Árnes

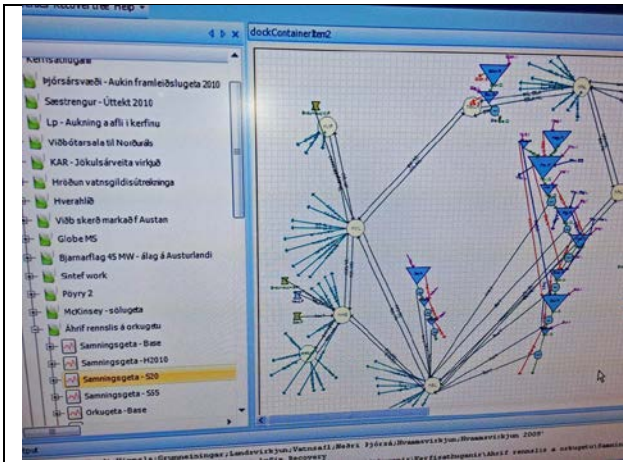


Photo 1ae: Hydrological Model

Photo 1af: Fish Ladder at Búði (Photo provided by Landsvirkjun)



Photo 1ag: Greylag geese at Hvammur project site