Sustainability of Hydropower – Global Challenges and a Global Tool

Joerg Hartmann PhD
Independent Consultant
Accredited Lead Assessor
joerg.hartmann.water@gmail.com

The Challenges of Dams in Cold Climates
Design, Construction, Permitting and Environmental Issues
USSD Fall 2017 Workshops and Field Trips
Overview

- Protocol - Evolution, Governance, Methods, Results 10:30am – 11:30am
- Case Studies from Northern Countries 11:30am – 12pm
- Lunch break
- Lessons learned from Protocol applications in Iceland, Norway, Sweden and Canada 1:30pm-2:30pm
- Exercises: Scoring the Sustainability Performance of a Project Against International Best Practices 2:30pm-3:30pm
- Discussion: Practical Requirements for Assessments, Added Value of Assessments, and Possible Next Steps in Alaska 4pm-5pm
Protocol - Evolution, Governance, Methods, Results
10:30am – 11:30am
Global hydropower capacity is expected to increase by 50-100% by 2050. 800 GW of capacity would require approx. US$2 trillion of investment.
Multiple Challenges

- large footprint
- project management issues
- conflicting demands on reservoirs
- changing hydrology
- high capital costs
- public skepticism
- regulatory uncertainty
- uncertain eligibility for renewables incentives
- etc.


Diagram: 86% of projects saw cost overruns with an average increase of 64% from announced price.
Sustainability concerns led to the Protocol
Protocol Vision, Goals and Principles

• To advance sustainable hydropower globally and ensure hydro contributes to a low carbon future
• By 2018, the Protocol is accepted and used by all stakeholder groups in the sector as the primary tool for measuring and guiding sustainable hydropower
Protocol Vision, Goals and Principles

• Sustainability is not just a philosophical concept – it’s a practical and achievable level of project quality
• It is possible to find a global consensus on defining sustainability
• “You cannot manage what you cannot measure”
• “Doing the right projects, and doing them right”
The Protocol

What is it?

• A methodology designed for all project stages
• A definition of sustainability in hydropower, consisting of over 20 sustainability topics
• Multi-stakeholder, internationally-agreed, and globally-applicable
• Governed by a council, and terms and conditions

What is it for?

• Internal, second- or third-party review of project performance
• Benchmarking with international good and best practices
• Identification, targeting and management of sustainability issues
• A neutral platform for communication with stakeholders
• Facilitating access to finance and markets
<table>
<thead>
<tr>
<th>1. TOOLS</th>
<th>4</th>
<th>There are four tools corresponding to project stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. TOPICS</td>
<td>23</td>
<td>Each tool consists of up to 23 topics</td>
</tr>
<tr>
<td>3. CRITERIA</td>
<td>6</td>
<td>Up to six criteria are used to assess each topic:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Assessment</td>
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<td></td>
<td></td>
<td>• Management</td>
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<td></td>
<td>• Stakeholder Engagement</td>
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<td>• Stakeholder Support</td>
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<td>• Conformance and Compliance</td>
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<td></td>
<td>• Outcomes</td>
</tr>
<tr>
<td>4. SCORING</td>
<td>2</td>
<td>Each criterion is assessed against two levels:</td>
</tr>
<tr>
<td>STATEMENTS</td>
<td></td>
<td>• Basic Good practice</td>
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<tr>
<td></td>
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<td>• Proven Best practice</td>
</tr>
</tbody>
</table>
Topics

Four tools corresponding to four stages of development

Early stage  Preparation  Implementation  Operation
<table>
<thead>
<tr>
<th>Topic</th>
<th>P</th>
<th>I</th>
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</thead>
<tbody>
<tr>
<td>Communications and Consultation</td>
<td>●</td>
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<tr>
<td>Governance</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Demonstrated Need and Strategic Fit</td>
<td>●</td>
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<tr>
<td>Siting and Design</td>
<td>●</td>
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<tr>
<td>Environmental and Social Impact Assessment and Management</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Integrated Project Management</td>
<td>●</td>
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<tr>
<td>Hydrological Resource</td>
<td>●</td>
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<td>●</td>
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<tr>
<td>Asset reliability and efficiency</td>
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<td>●</td>
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<tr>
<td>Infrastructure Safety</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Financial Viability</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Project Benefits</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Economic Viability</td>
<td></td>
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<td>●</td>
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<tr>
<td>Procurement</td>
<td>●</td>
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<tr>
<td>Topic</td>
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<tr>
<td>Project Affected Communities and Livelihoods</td>
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<tr>
<td>Resettlement</td>
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<tr>
<td>Indigenous Peoples</td>
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<tr>
<td>Labour and Working Conditions</td>
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<tr>
<td>Cultural Heritage</td>
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<td>Public Health</td>
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<tr>
<td>Biodiversity and Invasive Species</td>
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<tr>
<td>Erosion and Sedimentation</td>
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<tr>
<td>Water Quality</td>
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<tr>
<td>Waste, noise and air quality</td>
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<tr>
<td>Reservoir Planning / Preparation and Filling / Management</td>
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<td>Downstream Flow Regimes</td>
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</tbody>
</table>
Grouping the Topics

Business
- Governance
- Procurement
- Integrated project management
- Financial viability

Technical
- Hydrological resource
- Asset reliability and efficiency
- Infrastructure safety

Balancing of Issues
- Demonstrated need and strategic fit
- Siting and design
- Economic viability
- Reservoir management
- Downstream flow regimes

Social
- Communications and consultation
- Project benefits
- Project affected communities and livelihoods
- Resettlement
- Indigenous peoples
- Labour and working conditions
- Public health
- Cultural heritage

Environmental
- Environmental and social assessment and management
- Biodiversity and invasive species
- Erosion and sedimentation
- Water quality
- Waste, noise and air quality
Assessment: Issues that may affect indigenous peoples in relation to the project have been identified through an assessment process utilizing local knowledge; and monitoring of project impacts and effectiveness of management measures is being undertaken during project implementation appropriate to the identified issues.

Management: Measures are in place to address identified issues that may affect indigenous peoples in relation to the project, and to meet commitments made to address these issues; and formal agreements with indigenous peoples are publicly disclosed.

Stakeholder Engagement: Ongoing and mutually agreed processes are in place for indigenous peoples to raise issues and get feedback.

Stakeholder Support: Directly affected indigenous groups generally support or have no major ongoing opposition to the plans for issues that specifically affect their group.

Conformance/Compliance: Processes and objectives relating to issues that may affect indigenous peoples have been and are on track to be met with no major non-compliances or non-conformances, and any indigenous peoples related commitments have been or are on track to be met.

Outcomes: Plans provide for major negative impacts of the project to indigenous peoples and their associated culture, knowledge, access to land and resources, and practices to be avoided, minimised, mitigated or compensated with no significant gaps, and some practicable opportunities for positive impacts to be achieved.
Scoring Statements

**P-7 Hydrological Resource**

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.

**Scoring:**

1. There are significant gaps relative to basic good practice.
2. Most relevant elements of basic good practice have been undertaken, but there is one significant gap.
3. **Assessment:** 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.
   **Management:** 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.
4. All relevant elements of basic good practice have been undertaken and in one or more cases exceeded, but there is one significant gap in the requirements for proven best practice.
5. **Assessment:** 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.
   **Management:** 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.

3 - Basic Good Practice

5 - Proven Best Practice
Two Levels

Basic good practice
• Projects in all contexts should be working toward basic good practice
• A level to aim for

Proven best practice
• Innovative and not easy to reach
• Practical decisions need to be made on priorities
• May depend on other stakeholders, not just the developer
• But - proven to be achieved in multiple country contexts, and not only by large projects
Scoring allows clear presentation of results
<table>
<thead>
<tr>
<th></th>
<th>Level 3: Significant Gaps against Basic Good Practice</th>
<th>Level 5: Significant Gaps against Proven Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment</strong></td>
<td>No significant gaps</td>
<td></td>
</tr>
<tr>
<td><strong>Management</strong></td>
<td></td>
<td><strong>P1</strong>: The absence of communications and consultation plans and processes developed for all project stages that set out communications and consultation needs and approaches for all stakeholder groups.</td>
</tr>
<tr>
<td><strong>Stakeholder Engagement</strong></td>
<td>No significant gaps</td>
<td><strong>P10</strong>: No process to anticipate and respond to emerging risks and opportunities regarding project benefits.</td>
</tr>
<tr>
<td><strong>Stakeholder Support</strong></td>
<td>No significant gaps</td>
<td><strong>P13</strong>: No assessment of broader considerations and risks. No processes in place to anticipate and respond to emerging risks and opportunities.</td>
</tr>
<tr>
<td><strong>Conformance/Compliance</strong></td>
<td>No significant gaps</td>
<td><strong>P19</strong>: No reassessment of risks and opportunities since the EIA.</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>No significant gaps</td>
<td><strong>P8</strong>: There are no plans for addressing infrastructure safety beyond those of the project itself.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>P23</strong>: Slow or no feedback on opinions / communication to/from stakeholders regarding the process leading to stakeholder dissatisfaction.</td>
</tr>
</tbody>
</table>
A range of consultation processes have been undertaken from an early stage during project preparation (see ‘Stakeholder Engagement’ below). Direct links between landowners that will lose land and the contact details provided through newsletters and the lower Pjórsá website can be considered as 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). There are no procedures to track and respond to grievances raised, or plans for grievance mechanisms for the implementation or operation stages, but this is not considered to be a significant gap at this stage, as Landsvirkjun has enough time to develop such mechanisms in cooperation with other stakeholders.

Landsvirkjun developed a Communication and Stakeholder Engagement Plan for the preparation phase of the lower Pjórsá hydropower development in 2011, which sets out a process and tasks for communicating and engaging with local residents and elected representatives over a period of 6-11 weeks. The plan has been on hold waiting for the parliamentary decision on the National Master Plan.

However, no plans for communications or consultation have been developed that outline needs and approaches for the different stakeholder groups and topics, for the ongoing preparation stage, nor for the implementation and operation stages. It may be too early to develop these plans or processes for these later stages, 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). This absence of communications and consultation plans for the later project phases, combined with the absence of a process or procedure which would prompt the development of such plans, is a significant gap against basic good practice.
<table>
<thead>
<tr>
<th>Date</th>
<th>Project</th>
<th>Organization</th>
<th>Country</th>
<th>Capacity</th>
<th>Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct-10</td>
<td>Shardara</td>
<td>Shardara HPP JSC</td>
<td>Kazakhstan</td>
<td>100 MW</td>
<td>Operation</td>
</tr>
<tr>
<td>Oct-11</td>
<td>Trevallyn</td>
<td>Hydro Tasmania</td>
<td>Australia</td>
<td>97 MW</td>
<td>Operation</td>
</tr>
<tr>
<td>Sep-12</td>
<td>Murum</td>
<td>Sarawak Energy</td>
<td>Malaysia</td>
<td>944 MW</td>
<td>Implementation</td>
</tr>
<tr>
<td>Mar-12</td>
<td>Walchensee</td>
<td>EON</td>
<td>Germany</td>
<td>124 MW</td>
<td>Operation</td>
</tr>
<tr>
<td>May-12</td>
<td>Hvammur</td>
<td>Landsvirkjun</td>
<td>Iceland</td>
<td>84 MW</td>
<td>Preparation</td>
</tr>
<tr>
<td>Aug-12</td>
<td>Jostedal</td>
<td>Statkraft</td>
<td>Norway</td>
<td>290 MW</td>
<td>Operation</td>
</tr>
<tr>
<td>Sep-12</td>
<td>Jirau</td>
<td>ESBR (GDF Suez)</td>
<td>Brazil</td>
<td>3,750 MW</td>
<td>Implementation</td>
</tr>
<tr>
<td>Dec-12</td>
<td>Keeyask</td>
<td>Manitoba Hydro</td>
<td>Canada</td>
<td>695 MW</td>
<td>Preparation</td>
</tr>
<tr>
<td>Jun-13</td>
<td>Gavet</td>
<td>EDF</td>
<td>France</td>
<td>92 MW</td>
<td>Implementation</td>
</tr>
<tr>
<td>Sep-13</td>
<td>Blanda</td>
<td>Landsvirkjun</td>
<td>Iceland</td>
<td>150 MW</td>
<td>Operation</td>
</tr>
<tr>
<td>Oct-13</td>
<td>Sogamoso</td>
<td>Isagen</td>
<td>Colombia</td>
<td>820 MW</td>
<td>Implementation</td>
</tr>
<tr>
<td>Jan-14</td>
<td>Trung Son</td>
<td>EVN/TSHPCo</td>
<td>Vietnam</td>
<td>260 MW</td>
<td>Implementation</td>
</tr>
<tr>
<td>Apr-14</td>
<td>Santo Antonio</td>
<td>SAE</td>
<td>Brazil</td>
<td>3,150 MW</td>
<td>Implementation</td>
</tr>
<tr>
<td>Jun-14</td>
<td>Miel</td>
<td>Isagen</td>
<td>Colombia</td>
<td>260 MW</td>
<td>Operation</td>
</tr>
<tr>
<td>Mar-14</td>
<td>Cañafisto</td>
<td>Isagen</td>
<td>Colombia</td>
<td>936 MW</td>
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<tr>
<td>Jun-14</td>
<td>Sava River Program</td>
<td>Program Sava Ltd</td>
<td>Croatia</td>
<td>160 MW</td>
<td>Early Stage</td>
</tr>
<tr>
<td>Sep-14</td>
<td>Kabeli A</td>
<td>Kabeli Hydro</td>
<td>Nepal</td>
<td>38 MW</td>
<td>Preparation</td>
</tr>
<tr>
<td>Nov-14</td>
<td>Semla IV</td>
<td>EON</td>
<td>Sweden</td>
<td>3 MW</td>
<td>Preparation</td>
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<tr>
<td>Mar-15</td>
<td>Multiple Projects</td>
<td>Government of Ghana</td>
<td>Ghana</td>
<td>Early Stage</td>
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<td>Apr-15</td>
<td>Nam Lik</td>
<td>China Three Gorges</td>
<td>Laos</td>
<td>100MW</td>
<td>Operation</td>
</tr>
<tr>
<td>Jun-15</td>
<td>Chaglla</td>
<td>Odebrecht</td>
<td>Peru</td>
<td>456 MW</td>
<td>Implementation</td>
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<tr>
<td>Aug-15</td>
<td>Itaipu</td>
<td>Itaipu Binacional</td>
<td>Brazil / Paraguay</td>
<td>14,000 MW</td>
<td>Operation</td>
</tr>
<tr>
<td>Feb-16</td>
<td>Mangdechhu</td>
<td>Mangdechhu Project Authority</td>
<td>Bhutan</td>
<td>720 MW</td>
<td>Preparation</td>
</tr>
<tr>
<td>Sep-16</td>
<td>Kaunertal Expansion</td>
<td>TIWAG</td>
<td>Austria</td>
<td>1,015 MW</td>
<td>Preparation</td>
</tr>
<tr>
<td>Nov-16</td>
<td>Devoll</td>
<td>Statkraft Albania</td>
<td>Albania</td>
<td>235 MW</td>
<td>Implementation</td>
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</tbody>
</table>
Continuous Improvement – Even in Developed Countries
A Reminder - What the Protocol is and is not

• A rapid and objective **health check** of a project’s sustainability performance. ✔

• Not a **standard**. No pass or fail. Each topic has a separate score and findings. ✗

• Not a replacement for national or local **regulatory requirements, bank safeguards,** or **EIA** ✗
Oversight and Quality Control

**Multi-stakeholder Governance**
Council established to ensure multi-stakeholder input and confidence in the Protocol content and application

**Accredited Assessors**
Formal assessments can only be undertaken by accredited assessors
Assessors are trained to deliver consistent results
“The application of the Protocol followed by a management plan to address identified gaps are likely the most powerful existing tools to improve the sustainability performance of hydropower schemes.”
Case studies from northern countries
11:30am – 12pm
Hydropower in northern countries

Power Generation (MWh/pc/year)

Hydropower Share of Installed Capacity (%)
Manitoba Hydro is a ‘crown corporation’ owned by the provincial government of Manitoba, with an installed capacity of 5,700 MW.

The 695 MW hydropower project is located in a remote region in northern Canada, in the lower basin of the Nelson River.

The licensing process with public hearings began in September 2013.

The project is being developed by Manitoba Hydro jointly with four indigenous groups (Cree First Nations).

It does not require resettlement and does not affect land directly owned by the Cree, but affects traditional resource areas.

Manitoba Hydro will provide management services for the KHLP project company, and own at least 75% of the equity.
Keeyask: Technical Information

• 695 MW - 7 units
• 3 dams (2.264 m total length)
• Head of 18m
• Reservoir area 45 km², expected to increase by 8 km² during the first 30 years of operation, due to bank erosion
• Small operational range of reservoir between 158-159 m.a.s.l.
• Construction time estimated for 2014 to 2022
Keeyask: Objectives of the Assessment

- To understand the overall sustainability of the Project in the Preparation phase as assessed with the Protocol
- Further, to indicate where the Project performs well and where the Project presents opportunities for improvement
- The information obtained through the assessment will be used during licensing process
<table>
<thead>
<tr>
<th>Day</th>
<th>Activity</th>
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<tbody>
<tr>
<td>Tuesday (04th Dec 12)</td>
<td><strong>Opening meeting</strong>, interviews with Manitoba Hydro staff, document review</td>
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<tr>
<td>Wednesday</td>
<td>Interviews with Manitoba Hydro staff, Cree Nation project partners, and consultants in Winnipeg, Document review</td>
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</table>
| Thursday            | **Team 1**: Interviews in Winnipeg: Manitoba Hydro staff, representatives of provincial government agencies  
                      | **Team 2**: flight to Gillam, overflight of project area, visit and interviews with local communities                                    |
| Friday              | **Team 1**: Interviews in Winnipeg  
                      | **Team 2**: Interviews with local communities and government authorities                                                              |
| Saturday            | Team meetings and document review                                                                                                       |
| Sunday              | Team meetings and document review                                                                                                       |
| Monday              | Additional interviews in Winnipeg  
                      | **Closing meeting and presentation of initial findings**                                                                               |
Keeyask: Roles in the assessment

- Lead Assessor: Dr Bernt Rydgren, AF Consult
- Co-Assessors: Doug Smith, Simon Howard and Aida Khalil, IHA; Dr Joerg Hartmann, Independent Consultant
- Trainee Assessor: Dr Donal O’Leary, Transparency International
- Single Point of Contact: Viviana Burijson, Senior Sustainability Advisor, Manitoba Hydro
- Local support team: 8 Manitoba Hydro staff in Winnipeg and in the site camp
- Interviewees: 71 people in Winnipeg, Gillam, Cree Nations communities and site camp
- Observers: Manitoba Hydro internal auditors
Keeyask: Results
Keeyask: Results

- No gaps against basic good practice
- Seven gaps against proven best practice
- Lowest score on Public Health, with (1) no processes to respond to expected increase in non-communicable diseases, (2) no plans to support local health services to address pre-project health issues

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<thead>
<tr>
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<th>Level 3: Significant Gaps against Basic Good Practice</th>
<th>Level 5: Significant Gaps against Proven Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>No significant gaps</td>
<td>P-7: Assessment of the impact of climate change on the Nelson River flow will not be complete before the Keeyask design is finalised.</td>
</tr>
<tr>
<td>Management</td>
<td>No significant gaps</td>
<td>P-8: There is no process for the independent review of emergency-response plans.</td>
</tr>
<tr>
<td>Stakeholder Engagement</td>
<td>No significant gaps</td>
<td>P-12: Anti-corruption criteria are not explicitly addressed in contract documents nor emphasised in procurement-planning processes.</td>
</tr>
<tr>
<td>Stakeholder Support</td>
<td>No significant gaps</td>
<td>P-18: The absence of processes to respond to an increased incidence and severity of non-communicable diseases resulting from Keeyask's development.</td>
</tr>
<tr>
<td>Conformance/Compliance</td>
<td>No significant gaps</td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td>No significant gaps</td>
<td>P-11: There is not enough evidence to argue that benefits of the project outweigh costs under a wide range of circumstances.</td>
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<td>P-16: Labour management policies, plans and practices are not demonstrated to be consistent with internationally recognised labour rights.</td>
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<td>P-18: The absence of plans to support and enhance the capacity of health services in KCN communities and the town of Gillam to address significant pre-project public health conditions, particularly those of non-communicable diseases.</td>
</tr>
</tbody>
</table>
Landsvirkjun, Iceland’s national power company, has an installed capacity of 1,970 MW.

The 150 MW hydropower project is located in north-western Iceland, on the glacial Blanda river.

The project was commissioned in 1991.
Blanda: Technical Information

- 150 MW (3x50 MW units)
- Annual generation 800 GWh
- Reservoir area 56 km² (Blöndulón) and 5 km² (Gilsárlón)
- Water is channeled through a series of canals and natural lakes
- Head 287 m
Blanda: Objectives of the Assessment

• Ensure the sustainability of the operation of Blanda Power Station
• Ensure high standards in the operation of power stations owned by Landsvirkjun
• Find improvement opportunities for the operation of Blanda Power Station
• Ensure transparency of the operation of Blanda Power Station and the engagement of stakeholders
• Benchmark Landsvirkjun against international companies
<table>
<thead>
<tr>
<th>Day</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday (9\textsuperscript{th} Sept 13)</td>
<td>Opening meeting, interviews with Landsvirkjun and national-level stakeholder staff in Reykjavik, drive to Blanda</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Field visit project area, interviews with municipal council, tour of power station</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Interviews at power station, field visits, document review</td>
</tr>
<tr>
<td>Thursday</td>
<td>Interviews at power station and with local stakeholders</td>
</tr>
<tr>
<td>Friday</td>
<td>Interviews at power station, closing meeting, return to Reykjavik</td>
</tr>
</tbody>
</table>
Blanda: Roles in the assessment

- **Lead Assessor:** Dr Joerg Hartmann, Independent Consultant
- **Co-Assessors:** Simon Howard, IHA; Dr Helen Locher, Hydro Tasmania
- **Single Point of Contact:** Ragnheiður Ólafsdóttir (Environmental Manager)
- **Local support team:** 1 staff member, 1 consultant
- **Interviewees:** 55 people in Reykjavik and the project area
Blanda: Results
Blanda: Results

- No gaps against basic good practice
- Three gaps against proven best practice
- IHA Blue Planet Prize 2017

<table>
<thead>
<tr>
<th></th>
<th>Level 3: Significant Gaps against Basic Good Practice</th>
<th>Level 5: Significant Gaps against Proven Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>No significant gaps</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>No significant gaps</td>
<td>0-15: There are insufficient processes in place to anticipate and respond to emerging biodiversity risks and opportunities. 0-17: There is a lack of systematic monitoring of the physical, chemical and biological properties of water in the project area.</td>
</tr>
<tr>
<td>Stakeholder Engagement</td>
<td>No significant gaps</td>
<td>No significant gaps</td>
</tr>
<tr>
<td>Conformance/Compliance</td>
<td>No significant gaps</td>
<td>No significant gaps</td>
</tr>
<tr>
<td>Outcomes</td>
<td>No significant gaps</td>
<td>No significant gaps</td>
</tr>
</tbody>
</table>
Semla, Sweden and Jostedal, Norway

Semla IV - 3.5 MW project owned by E.ON (replacement of existing projects, originally from 1887)

Jostedal - 288 MW project owned by Statkraft, operating since 1989, head of 1186 m
Lessons learned from Protocol applications in Iceland, Norway, Sweden and Canada
1:30-2:30pm
• Water Quality – Semla, Sweden
• Hydrological Resource Management – Jostedal, Norway
• Indigenous Peoples – Keeyask, Canada
• Erosion and Sedimentation – Blanda, Iceland
Exercises:
Scoring the Sustainability Performance of a Project against International Best Practices
2:30-3:30pm
Exercises

• Biodiversity and Invasive Species
  Exercise from Hydro Tasmania’s Trevallyn Project, Australia

• Resettlement
  (Hypothetical) Exercise from the Whitewater Project

• Infrastructure Safety
  Exercise from Landsvirkjun’s Kárahnjúkar Project, Iceland
Exercises

• Biodiversity and Invasive Species
  Exercise from Hydro Tasmania’s Trevallyn Project, Australia
Exercises

• Resettlement
  (Hypothetical) Exercise from the Whitewater Project
Exercises

- Infrastructure Safety
  Exercise from Landsvirkjun’s Kárahnjúkar Project, Iceland
There are significant gaps relative to basic good practice.

Most relevant elements of basic good practice have been undertaken, but there is one significant gap.

Assessment: Routine monitoring of dam and infrastructure safety is being undertaken to identify risks and assess the effectiveness of management measures; and ongoing or emerging dam and other infrastructure safety issues have been identified.

Management: Dam and other infrastructure safety management plans and processes have been developed in conjunction with relevant regulatory and local authorities with no significant gaps, and provide for communication of public safety measures; emergency response plans and processes include awareness and training programs and emergency response simulations.

Conformance/Compliance: Processes and objectives relating to safety have been met with no major non-compliances or non-conformances, and safety related commitments have been or are on track to be met.

Outcomes: Safety risks have been avoided, minimised and mitigated with no significant gaps.

All relevant elements of basic good practice have been undertaken and in one or more cases exceeded, but there is one significant gap in the requirements for proven best practice.

Assessment: In addition, identification of ongoing or emerging safety issues takes into account consideration of a broad range of scenarios and both risks and opportunities.

Management: In addition, processes are in place to anticipate and respond to emerging risks and opportunities; and public safety measures are widely communicated in a timely and accessible manner.

Conformance/Compliance: In addition, there are no non-compliances or non-conformances.

Outcomes: In addition, safety risks have been avoided, minimised and mitigated with no identified gaps; and safety issues have been addressed beyond those risks caused by the operating facility itself.

Infrastructure Safety
Public safety issues: Spilling
Public safety issues: Spilling

Water can be released to the riverbed without warning.
Public safety issues: Improved access to hazards
Public safety issues: Access to project infrastructure
Discussion:
Practical Requirements for Assessments, Added Value of Assessments, and Possible Next Steps in North America
Options for Using the Protocol

**Official Assessment**
- published
- unpublished

**Unofficial Assessment**
- partial assessment (for example, only good practice and only E&S aspects)
- assisted self-assessment
- internal self-assessment
Cost of Using the Protocol

- Cost of external assessor(s)
- Opportunity cost of project staff
- Logistics
- Cost of corrective actions, if any
- If published – does greater transparency create more exposure?
Cost of corrective actions can be substantial

Hypothetical case of moving a whole region towards best practice hydropower
improved planning (1%), alternative siting (10%), mitigation (2%), and
operational constraints (2%) - Total 15%
Benefits of Using the Protocol

• Better project selection and design
• Improved financing terms
• Institutional learning and capacity building (thinking outside the box, learning from other projects, integration into business processes)
• Improved information management
• Reputational gains (among employees, customers, regulators etc)
• Ability to obtain higher prices, payments for other services, or subsidies
• Avoiding costly retrofits by anticipating future requirements
“Site selection is the best mitigation”
More certainty over project selection?
Avoiding risky projects?
Getting good projects onto permitting fast-track?

Provincial equity injection a possibility for debt-burdened Manitoba Hydro, executives say

By: Alexandra Paul
Posted: 10/18/2016 9:34 PM | Last Modified: 10/18/2016 9:39 PM | Updates | Comments:

Staff reductions at Manitoba Hydro, substantial rate hikes and even a provincial equity injection are being considered to cover off billions in debt, Manitoba Hydro executives told a public meeting Tuesday evening.

Manitoba Hydro board says it has “no choice” but to move forward with Keeyask hydropower plant, associated transmission line
Improved financing terms for best practice projects?

Insurance companies increase premium for hydropower plants

NEW DELHI: Insurance companies have raised the premium for hydropower plants across the country after last year’s flash floods in Uttarakhand that led to huge claims. Companies like National Insurance Co Ltd, United India Insurance Co Ltd and Oriental Insurance Co have raised premium rates manifold for hydroelectric projects.

Brazil pension funds to invest in infrastructure

LogZ Logística (LogZ), a Brazilian company formed by pension funds including Banco do Brasil’s Previ and Caixa Econômica Federal’s Funcef, is planning to invest in infrastructure projects worth some 1.8bn reais (US$475mn) that are set to begin in 2016,

Norway Fjordland’s BKK dives in with a green hydro bond - NOK 1.1bn ($171.7m), 7yrs - closes bond within 3 hrs! Yes, strong demand. Expect more green hydro bonds!

 Posted: Sep 25, 2014 by Sean Kidney
BKK, a Norwegian power company based in Bergen, yesterday closed Norway’s first corporate green bond. It overtook IBRD’s NOK 460m bond as the largest green issuance in Norwegian Krone. Demand from domestic investors was high - the bond was placed in under 3 hours to 11 different investors - pushing the issue from proposed NOK 1bn to NOK 1.1bn. Tenor is 7 years, the coupon is floating at 59.00 above NIBOR (the Norwegian Interbank Offered Rate) and SEB were the sole organiser of the unrated deal.

BKK will use the proceeds of the bond to fund hydropower projects on the West Coast of Norway. CICERO has done a great job with the second opinion on the environmental framework. They highlight BKK’s strong environmental policies as well as risks to natural environment of building such large scale infrastructure projects. Clearly BKK had been upfront about project controversies
Capacity building; reputational gains; information management; access to markets; public guarantees, higher prices, payments for services, subsidies; avoiding costly retrofits by anticipating future requirements; etc.

Oregon’s Renewable Portfolio Standards

Hydroelectricity in the Oregon RPS

The Oregon Renewable Portfolio Standards (RPS) law states that “hydroelectric energy is an important renewable energy source” and designates three sources of hydroelectricity as eligible for the Oregon RPS (ORS 469A.010 (3)).

The RPS sets targets for acquiring new, renewable sources of energy (e.g. 25% of 2025), allowing each complying utility to determine the best mix of new renewable sources. The three types of hydroelectricity that are eligible for the Oregon RPS are:

- Hydroelectric Efficiency Upgrades: electricity from efficiency upgrades made to the facility after Jan. 1, 1995. Limitations are made to Bonneville Power Administration (BPA) facilities in that only the portion that is attributable to Oregon’s share of the electricity generation may be used to comply.

- Low-Impact Hydroelectric Projects: electricity from projects that have been certified by the Low-Impact Hydropower Institute (LIHI, www.lowimpacthydro.org). In order to be certified by LIHI a facility must meet criteria in the following areas: river flows, water quality and protection, watershed protection, threatened and endangered species protection, resource protection, recreation, and not recommended for removal. In one case a utility can use no more than 50 MW of generation from LIHI-certified facilities in Oregon utilities; and 40 MW from LIHI-certified facilities not owned by a utility in Oregon (90 MW or 788,400 MWh/REC total per year).

- New Hydroelectric Projects: electricity from facilities that became operational after July 23, 1999 and is located outside protected areas designated by Pacific Northwest Electric Power and Conservation Council as of July 23, 1999 (http://www.newcouncil.org/latex/protectedareas/home/). Or any area protected under the federal Wild and Scenic Rivers Act or the Oregon Scenic Waterways Act.

Colombia Sells Stake in Power Generator Isagen to Canadian Investment Fund

The $2 billion deal is country’s biggest privatization in a decade
Possible Next Steps in Alaska?