Hydropower Sustainability Assessment Protocol

Official Assessment

TIWAG – Tiroler Wasserkraft AG

Kaunertal Expansion Project

Austria

Project Stage: Preparation

Assessment Date: 29/08/2016 to 05/09/2016

Final

Report Date: 19/06/2017

Client: TIWAG – Tiroler Wasserkraft AG

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Project size: 1015 MW

Cover page photo: Gepatsch Reservoir, Kaunertal Hydropower Project

Acronyms

Acronym	Full Text
BDA	*Bundesdenkmalamt,* i.e. Federal Monuments Office or National Heritage Agency
CAPEX	Capital Expenditure
CBA	Cost-Benefit Analysis
CEO	Chief Executive Officer
CO_2	Carbon Dioxide
CS	Construction Site
DCF	Discounted Cash Flow
EC	European Commission
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMS	Environmental Management System
ENSTO-E	European Network of Transmission System Operators for Electricity
E&SC	Erosion and Sediment Control
EU	European Union
FSL	Full Supply Level
GDP	Gross Domestic Product
GKI	Gemeinschaftskraftwerk Inn
GRI	Global Reporting Initiative
GWh	Giga Watt Hour
ha	hectares
HGV	Heavy Goods Vehicles
HPP	Hydropower Project
ICOLD	International Commission on Large Dams
ICS	Internal Control System
IHA	International Hydropower Association
IRR	Internal Rate of Return
ISO	International Standards Organisation
IT	Information Technology
IWRM	Integrated Water Resources Management
KPI	Key Performance Indicator
kV	Kilo Volt
KXP	Kaunertal Expansion Project
masl	Metres above sea level

MIRR	Modified Internal Rate of Return
MW	Mega Watt
MWh	Mega Watt Hour
MOL	Minimum Operating Level
MVA	Mega Volt Amp
NGO	Non-Government Organisation
NWMP	National Water Management Plan
OECD	Organisation for Economic Co-operation and Development
OH&S	Occupational Health and Safety
OPEX	Operational Expenditure
PCI	Project of Common Interest
PSHP	Pump Storage Hydropower Project
R2C	Risk-2-Chance
SBK	*Staubeckenkommission*, i.e. Austrian Commission on Reservoirs and Dams
SEA	Strategic Environmental Assessment
SME	Small-Medium Enterprise
SPC	Single Point of Contact
STD	Sexually Transmitted Disease
TBM	Tunnel Boring Machine
tCO_2	Tonnes Carbon Dioxide
TIGAS	Erdgas Tirol GmbH
TINETZ	Tiroler Netze GmbH
TIWAG	Tiroler Wasserkraft AG
TSS	Total Suspended Solids
TV	*Talsperrenverantwortliche*, i.e. TIWAG executive dam safety engineers
UN	United Nations
WACC	Weighted Average Cost of Capital
WFD	Water Framework Directive
WHO	World Health Organisation
WWF	World Wide Fund for Nature
WWTP	Wastewater Treatment Plan
ZAMG	*Zentralanstalt für Meteorologie und Geodynamik*, the Austrian Organisation for Meteorology and Geodynamics

Table of Contents

Executive Summary

This report represents an Official Assessment with the Preparation Tool of the Hydropower Sustainability Assessment Protocol (the 'Protocol'). The assessment was conducted for the Kaunertal Expansion Project in the province of Tyrol in Austria. The Kaunertal Expansion Project (KXP) is proposed by TIWAG-Tiroler Wasserkraft AG ("TIWAG"), a corporation owned by the Austrian Province of Tyrol with its registered office in Innsbruck, Austria. This is the first ever Official Protocol assessment conducted in Austria.

TIWAG has been an energy supplier in Austria and on international markets for more than 90 years, with the majority of its generation portfolio benefiting from the hydropower resources of the Tyrolean alps and river systems. TIWAG is a vertically integrated company operating in almost all sectors where electricity, gas and heat are supplied to customers via transmission lines.

The existing Kaunertal power system was built between 1961 and 1964, and has a generating capacity of 392 MW. The KXP would add more than 1,015 MW of capacity to the existing plant, for a total of 1,407.5 MW from this scheme. The main features of the KXP are creation of a pump storage project by adding an upper stage reservoir to the existing Gepatsch Reservoir; increasing the inflows to the Gepatsch Reservoir through diversions in the neighbouring Ötztal valley; and increasing capacity of three downstream hydropower stations on the Inn River. The KXP is one of around ten power plant projects that TIWAG has at various stages of development. TIWAG's hydropower upgrade and development program is in line with the Tyrolean government's Energy Strategy 2020, Sustainability Strategy and the Energy Autonomy 2050. These energy policy documents aim for reduced CO_2 emissions, and increased energy efficiency, renewable energy generation, system stability and energy security as well as securing affordable energy prices.

The assessment focuses on the sustainability aspects of the KXP. This said, under several Protocol topics, the corporate-level performance of the owner TIWAG is relevant.

The Preparation tool contains 23 topics, 21 of which were assessed and scored by the Assessment Team. The topics Resettlement and Indigenous Peoples were not relevant for this project.

Appendices B and C contain information on the interviews conducted and the documents reviewed. TIWAG staff as well as the assessment team have done their best to ensure the accuracy of the information provided in those appendices. Appendix D contains photos taken by the assessment team.

Triangulation of evidence – visual, verbal and documentary – is an important requirement for the evidence collection process. In this respect particular attention was paid to interviews with project-affected communities. The project-affected area for the KXP covers several valleys, and 14 municipalities in the Imst district and 11 municipalities in the Landeck district of Tyrol are affected by the project in a different way. The assessment team was able to meet a representative sample of affected people and their representatives, and in particular most of the mayors of the most affected municipalities.

Follow-up evidence was requested by, and provided to, the assessors in the weeks following the onsite assessment. A draft report was reviewed by TIWAG. This final report was provided to TIWAG on 13 January 2017.

At the time of the assessment, the KXP is part-way through the Environmental Impact Assessment (EIA) process applicable to this large hydropower project. TIWAG had submitted a first draft of the Environmental Impact Statement (EIS Revision 0) in 2012, which was reviewed by the Authority followed by a request for additional work. The next draft of the EIS (Revision 1) was submitted in 2015, and has been under review by the Authority but the assessment process is temporarily suspended whilst some legal matters are being clarified. TIWAG expects a prolonged EIA process and several more iterations of the EIS before it is accepted as complete and then formally circulated for public comment, and does not see construction commencing until the late 2020s. TIWAG is using this Protocol assessment to guide the business on opportunities for improving the project's processes and performance in line with this internationally-recognised hydropower sustainability tool.

Given the very long lead time before the end of the project preparation period, it can be difficult to score the Outcomes criterion. This requires a high degree of confidence on what will be delivered with the project, and there are a number of issues to be resolved during the remainder of the project preparation period. The approach taken by the assessors was that at the level of Basic Good Practice the Outcomes criterion was met if plans are designed to achieve the intended outcomes; however at the level of Proven Best Practice the Outcomes criterion was only met if there was sufficient evidence to show conclusively what the outcome would be.

An important aspect of the assessment is that significant gaps identified by the assessors are not double-counted. As such, a significant gap might be identified against the criteria in the scoring statements for several aspects of the same topic, or for several topics. It will, however, only be scored in one place.

Overall, the findings showed very strong performance at the level of basic good practice, with only a few areas requiring further work. Many of the proven best practice criteria are met, with some topics requiring further work in the assessment aspects; others requiring additional attention to communications, disclosure, collaboration and stakeholder engagement; and for a number of topics there was insufficient evidence at this point in time to demonstrate the Outcomes criterion was met.

18 of the 21 topics assessed scored at levels at or above basic good practice. The project generally scores highly because TIWAG has invested considerably into the preparation of this project, and has already had feedback from the Authority on its first EIS submission and through extensive stakeholder engagement. Topics scoring below Basic Good Practice were due to various reasons specific to each topic, including strong community opposition to the project (prevalent amongst some community groups, relevant to topic P-13 Project-Affected Communities and Livelihoods), limitations to the analysis with respect to the Protocol requirements (in the case of the cost-benefit analysis, relevant to topic P-11 Economic Viability), and limitations to the forms of information provision to support effective stakeholder engagement (relevant to topic P-23 Downstream Flow Regimes).

The KXP performs at the level of basic good practice (a score of 3, with two or more significant gaps at the level of proven best practice), for three topics: P-1 Communications and Consultation, P-3 Demonstrated Need and Strategic Fit, and P-19 Biodiversity and Invasive Species. It performs with one significant gap at the level of proven best practice (a score of 4) on seven topics: P-2 Governance, P-4 Siting and Design, P-5 Environmental and Social Impact Assessment and Management, P-7 Hydrological Resource, P-9 Financial Viability, P-10 Project Benefits and P-18 Public Health.

The KXP meets proven best practice (a score of 5) on the remaining eight topics: P-6 Integrated Project Management, P-8 Infrastructure Safety, P-12 Procurement, P-16 Labour and Working Conditions, P-17 Cultural Heritage, P-20 Erosion and Sedimentation, P-21 Water Quality, and P-22 Reservoir Planning.

The significant gaps that were identified in the assessment are summarised in the table on page *vii*, by criterion type and scoring level. It is notable that there were no gaps regarding Conformance/Compliance.

The spider diagram on the following page *vi* summarises the KXP assessment in numbers. Detailed comments for each topic follow in sections P-1 to P-23.

Sustainability Profile

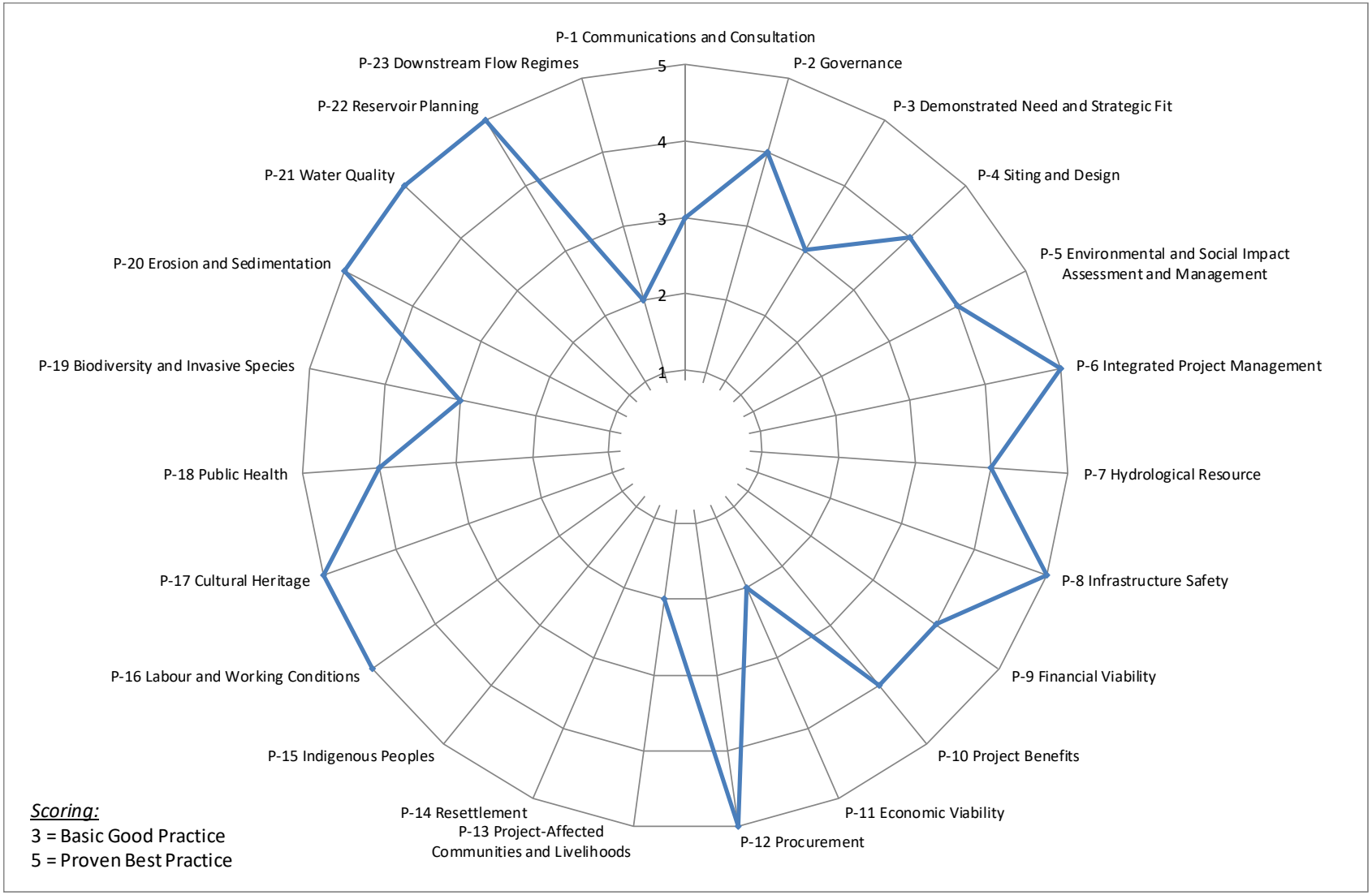

Table of Significant Gaps

	Level 3: Significant Gaps against Basic Good Practice	Level 5: Significant Gaps against Proven Best Practice
Assessment	**P-11:** Economic analyses have not taken all costs and benefits into account, and consequently a net benefit has not been demonstrated.	**P-2:** There is no corporate policy addressing stakeholder engagement, transparency and disclosure, nor processes to ascertain if stakeholder information needs and interests are being met. **P-3:** There is a perception of inadequate opportunities for informed dialogue on the need for and strategic fit of the KXP by some stakeholder groups. **P-14:** The assessment does not take into account a number of public health risks.
Management	**No significant gaps**	**P-1:** TIWAG has not tailored its communication and consultation approaches to meet the needs of all stakeholders. **P-7:** There is insufficient evidence to conclude that the KXP optimises the use of the hydrological resource. **P-19:** There is a lack of evidence of collaboration in consideration of either risks or opportunities with all existing or planned biodiversity improvement projects potentially affected by the KXP.
Stakeholder Engagement	**P-23:** There is no simple and concise description of downstream flow regimes and their objectives, for use in stakeholder engagement.	**P-1:** There is a perception by some stakeholder groups of a lack of thorough and timely feedback. **P-10:** The lack of public information leads to a lack of inclusive and participatory engagement by citizens on project benefits
Stakeholder Support	**P-13:** There is widespread and sustained opposition against the KXP in the Ötztal and among the rafting businesses.	**No significant gaps**
Conformance/ Compliance	**No significant gaps**	**No significant gaps**
Outcomes	**No significant gaps**	**P-3:** There is insufficient evidence to conclude that the KXP is a priority option to achieve all relevant demonstrated needs. **P-4:** There is insufficient evidence to conclude that the KXP represents an optimal siting and design. **P-5:** There is insufficient evidence to demonstrate that the KXP will avoid, minimise, mitigate and compensate all negative permanent social and environmental impacts. **P-9:** There is insufficient evidence to demonstrate that the KXP can manage financial issues under the broad range of scenarios that could be relevant in a decades' time. **P-19**: There is insufficient evidence to conclude that the proposed mitigation measures for biodiversity fully compensate for permanent negative residual impacts.

Introduction

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.

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

The objectives of this assessment of the Kaunertal Expansion Project are:

- To identify potential gaps in project sustainability
- To identify areas for improvement
- To communicate with NGOs and other stakeholders
- To get an independent, external perspective of the project
- To optimise TIWAG planning processes and ensure they are comprehensive

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

Project Description

The Kaunertal Expansion Project (KXP) is proposed by TIWAG-Tiroler Wasserkraft AG ("TIWAG"), a corporation owned by the Austrian Province of Tyrol with its registered office in Innsbruck, Austria. TIWAG has been an energy supplier in Austria and on international markets for more than 90 years, with the majority of its generation portfolio benefiting from the hydropower resources of the Tyrolean alps and river systems. TIWAG is a vertically integrated company operating in almost all sectors where electricity, gas and heat are supplied to customers via transmission lines. The TIWAG group covers the entire electricity value chain, from constructing power stations to the regulated electricity transmission grid business to power trading to distribution and sales to the consumer market. Regulated power distribution is the responsibility of TIWAG's subsidiary TINETZ-Tiroler Netze GmbH, while all natural gas activities are managed by another subsidiary, TIGAS-Erdgas Tirol GmbH. Other subsidiary companies and their focal areas include Tirol-Schiffahrt (ships for public transport on Lake Achensee); ÖKO Energie Tirol (100% hydropower, sells wholesale power); wasser tirol (drinking water, small hydropower and analytical labs); and Stadtwärme Lienz (biomass heating). Assets part-owned by TIWAG include Gemeinschaftskraftwerk Inn (GKI) (76%), BioEnergie Kufstein (50%), IKB (49.999%), Verbund (8%), EnergieAG (8.251%), SelGas (82 %),SelGasNet (49 %) and bayernGas (10%).

TIWAG's power generation assets are:

- Storage hydropower: Kaunertal, Sellrain-Silz, Achensee, Kalserbach
- Pump storage hydropower: Kühtai (linked to Sellrain-Silz)
- Run-of-river hydropower: Kirchbichl, Langkampfen
- Diversion hydropower: Imst, Amlach
- Medium-Small hydropower plants (<15 MW) – 36 plants, most of these run-of-river and <5 MW
- Solar – 6 plants
- Biomass – 3 plants

Table 1 provides a summary of the major existing hydropower plant assets of TIWAG, and shows the relative scale of the proposed KXP that is the subject of this assessment.

Table 1 – Kaunertal Expansion Project in the Context of TIWAG's Existing Major Hydropower Plant Assets

Existing major hydropower plant assets	year commissioned	power turbine capacity (MW)	power pump capacity (MW)	power generation (GWh/a)	storage capacity (million m^3)	head (m)
Achensee	1927	79		220	66	390
Imst	1956	89		550	0,8	144
Kaunertal	1964	392		661	138	844
Silz		*500*			*3*	1247
Kühtai		*289*	*250*		*60*	420
Sellrain-Silz (total)	1981	789	250	450	63	
Amlach	1988	60		219	0.24	370
TOTAL EXISTING		**1409**	**250**	**2100**	**268**	
Additions from proposed Kaunertal expansion project		**1015.5**	**390**	**913**	**42**	

The existing Kaunertal power system was built between 1961 and 1964, and has a generating capacity of 392 MW; the KXP would add more than 1,015 MW of capacity to the existing plant, for a total of 1,407.5 MW from this scheme. In the existing Kaunertal power scheme, water is collected from the mountains of the Kaunertal with its many glaciers, as well as from the neighbouring valleys Radurschltal and Pitztal, into the Gepatsch reservoir, and then is directed through a ~900 m head pressure shaft to the 392 MW Prutz power station. The Prutz Power Station has an annual average generation of 661 GWh. Despite its age, the Kaunertal power plant is still

one of the most powerful power generation installations in Austria, and generates peak load energy as well as balancing energy used for grid stability.

The KXP is not TIWAG's only project development and refurbishment proposal. Other projects are at various stages of progress ranging from preparation to construction to commissioning. Some of the originally conceived refurbishment activities have been incorporated into the Kaunertal Expansion Project because they are closely interlinked. TIWAG's power plant projects are:

- The new Kaunertal Pressure Shaft (just completed)
- Gemeinschaftskraftwerk Inn (GKI) hydropower project (under construction)
- The Kaunertal Expansion Project (the KXP, subject of this assessment)
- Prutz-Imst power plant expansion (included in the KXP)
- Imst-Haiming power plant expansion (submitted as its own project, but a third turbine and expansion of the Imst tailwater basin are included in the KXP)
- Kühtai storage power station expansion (recently approved)
- Kirchbichl power station expansion (under assessment)
- Tumpen-Habichen power plant Ötztaler Ache (recently approved)
- Tauernbach-Gruben power plant (under assessment)
- Schwarzach power plant expansion (under assessment)

TIWAG's hydropower upgrade and development program is in line with the Tyrolean government's Energy Strategy 2020 and the Energy Autonomy 2050. These energy policy documents aim for reduced CO_2 emissions, and increased energy efficiency, renewable energy generation and energy security.

TIWAG's activities started in the early 2000s, with an extensive search for potential hydropower sites. By 2004 TIWAG had identified the expansion of the Kaunertal power plant as a potential project. During the following years, alternative sites and designs for an upper reservoir in the area surrounding the existing Gepatsch reservoir were identified and evaluated, including at Rofental, Rifflsee, Taschachtal, Fernergriess and Platzertal. Following a progressive process, the Platzertal emerged as the preferred upper reservoir location.

The submission and approvals phase will last for at least five more years. Taking the construction time into consideration, this means that more than 20 years of lead time are needed to bring such a project to operation. Over this time, the project has to adapt to changes in national and EU policies and regulatory frameworks relating to renewable energy and water.

The Environmental Impact Assessment (EIA) concept was developed and agreed with the responsible government Authority in 2009, and describes what will be investigated, submitted, and assessed by the Authority. For large hydropower projects in Tyrol, there is an integrated assessment process led by the Tyrol provincial government Department of Environmental Protection, which is referred to as "the Authority". The Permit issued at the end of the assessment process addresses all authorisations required by the project to progress, including the environmental licence, water rights, construction licence, electricity connection permit, and the concession agreement. Consequently the Environmental Impact Statement (EIS) submitted by TIWAG to the Authority is a fully comprehensive submission that includes the results of all feasibility studies and the construction and operational plans for the project in addition to the environmental and social studies. For such a large project, it is not unusual for the EIS to go through several iterations with the Authority before the Authority accepts it as complete and the formal public review and comment period is held as part of the assessment process.

TIWAG submitted the EIS to the Authority on 04 July 2012, and this version is referred to as EIS Revision 0. The Authority provided its response on 07 May 2013 for further work to be done. Since this initial version, the project definition has been expanded to include separate project activities outlined in the Upper Tyrol Water Framework Management Plan into the KXP. These additional elements are the Imst 2 Power Station and part of the Haiming Power Station expansion involving installation of a third turbine and tailwater basin expansion, because these

activities are integrally linked to the KXP. On 29 June 2015, TIWAG submitted EIS Revision 1 to the Authority, but the assessment of this document by the Authority has been put on hold while some legal questions relating to water rights in the Ötztal are being resolved through the courts.

Figure 1 shows the part of Austria in which the KXP is located, in the Province of Tyrol and the Districts of Landeck, Imst and Innsbruck.

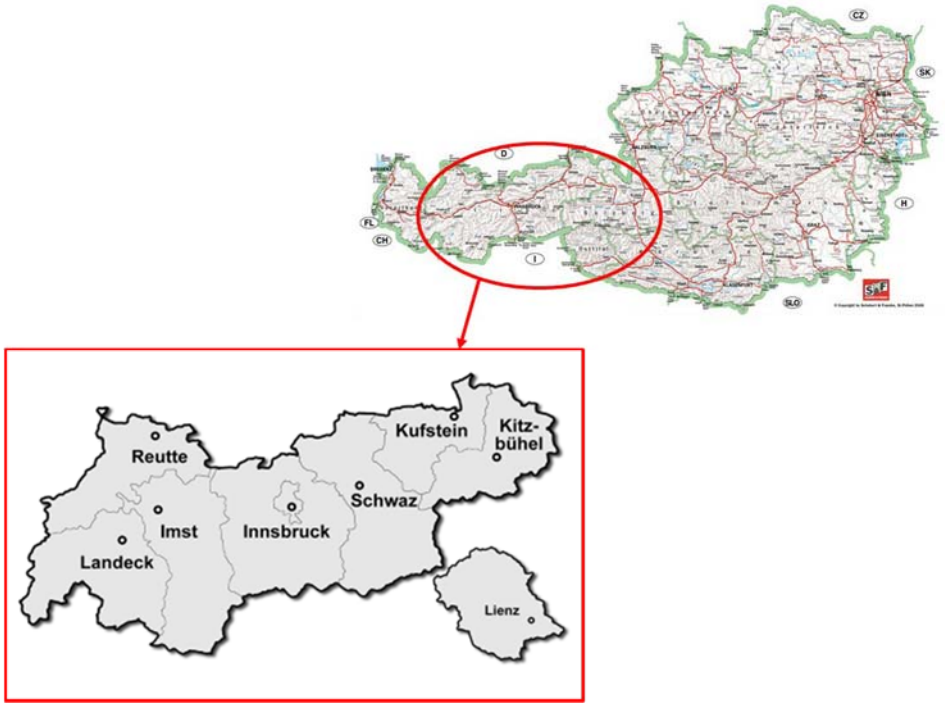

Fig. 1 – Austrian Province of Tyrol and Districts of Landeck, Imst and Innsbruck

Figure 2 shows the KXP features and location in more detail, and Figure 3 shows the overall layout.

The essential KXP features are:

- Use of water resources from the Ötztal valley, augmenting the catchment area by 272 km²
- A new upper stage reservoir for pump storage located in the Platzertal, with a catchment area of around 8 km²
- Use of the Gepatsch reservoir as the lower stage reservoir for pump storage
- A new pump storage hydropower plant (Versetz PSHP) close to the existing Gepatsch reservoir
- A new second power station (Prutz 2) and tailwater basin in Prutz
- Conversion of the old pressure tunnel as an underground conduit for 220 kV high voltage transmission between the Versetz PSHP and the Prutz substation. A new pressure tunnel between Gepatsch and Prutz, the "Prutz Pressure Shaft project", has already been built as a stand-alone project, as an upgrade was required ahead of the timing of the KXP
- Raising of the Runserau weir system for the storage of additional water supply
- A new second power station (Imst 2) in Imst together with a new pressure tunnel between Runserau and Imst and a tailwater basin
- Addition of a third turbine at Haiming Power Station plus enlargement of the tailwater basin.

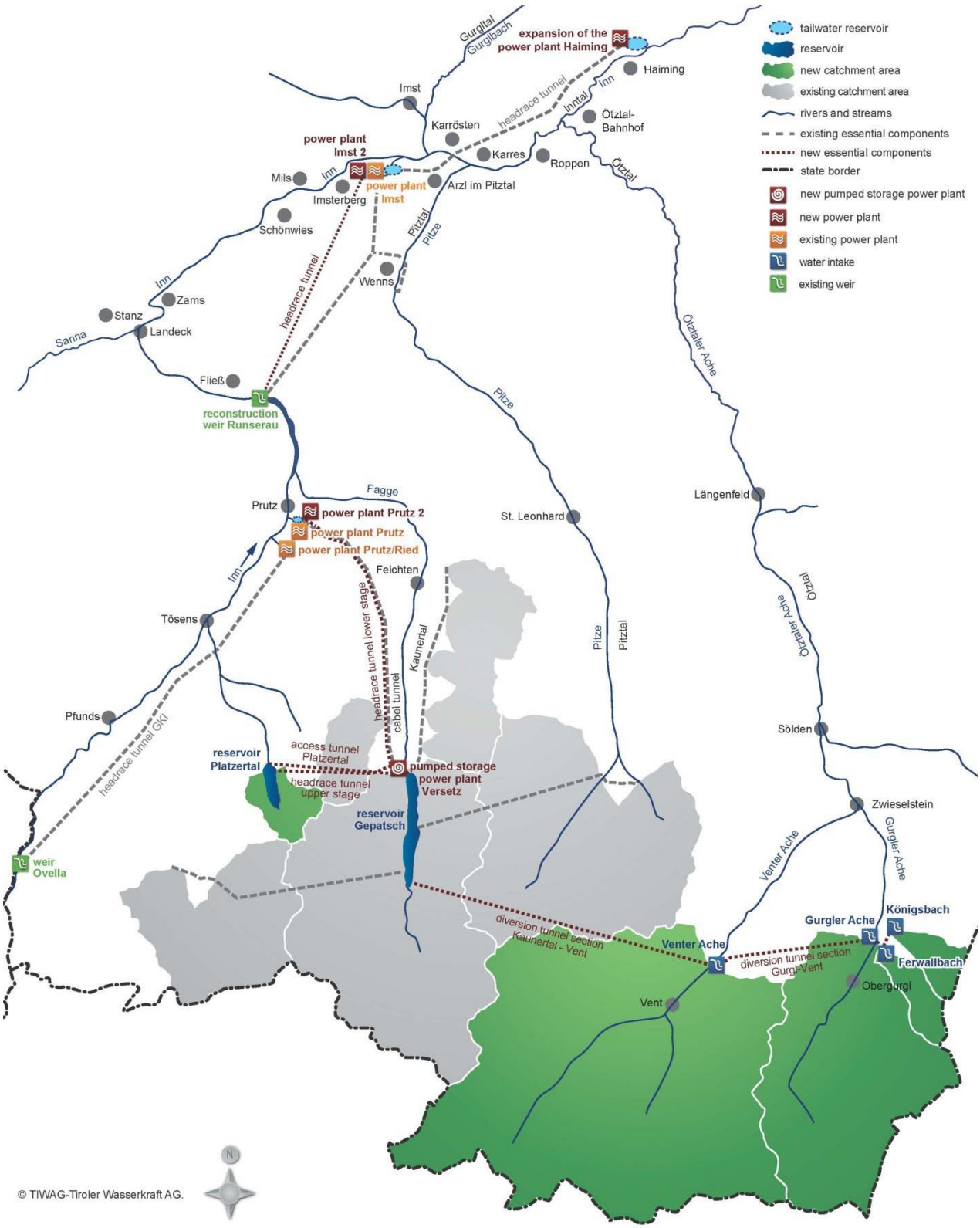

Fig. 2 - Map of the Kaunertal Expansion Project area of influence

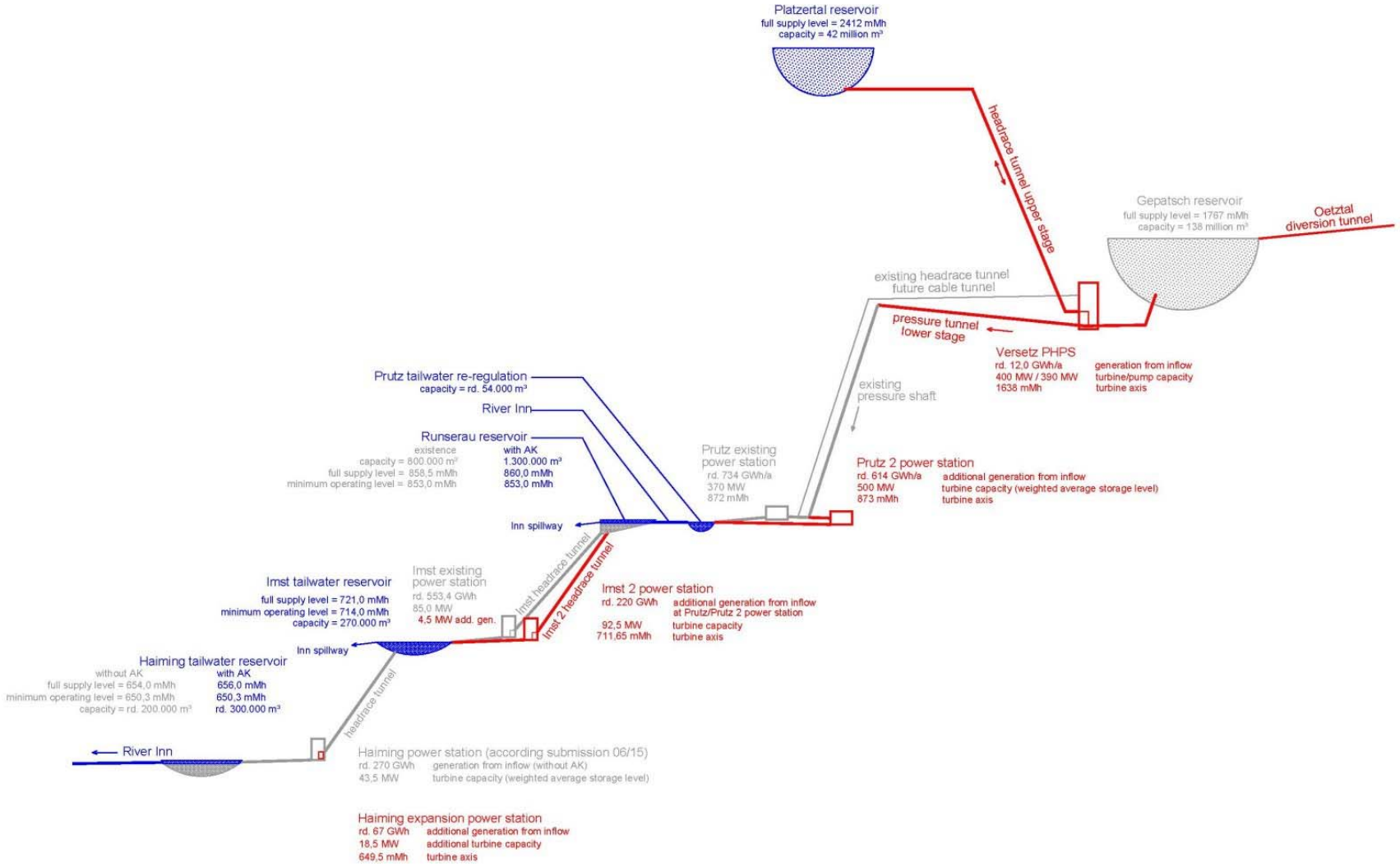

Fig.3 – Kaunertal Expansion Project design (grey colour are the existing and red the new parts)

The new Versetz PSHP will be located between the new Platzertal reservoir and the existing Gepatsch reservoir, in an underground cavern on the left hand side of the Gepatsch Dam. It has a head of approximately 600 m, and will generate 400 MW and will be able to pump 390 MW. The Prutz 2 power station will generate 500 MW and Imst 2 will generate 92.5 MW.

To increase the amount of water in the Gepatsch reservoir, thus increasing generated power and operational flexibility, the KXP includes the intake and transfer of water from the neighbouring Ötztal from an elevation of approximately 1850 masl. There are two large catchment areas (Gurgler Ache and Venter Ache) and two smaller catchment areas (Königsbach and Ferwallbach) associated with the two intake points. All four of the catchment areas are close to a Natura 2000 protected area; however, the points of abstraction are outside the Natura 2000 boundary. A diversion tunnel for the intake water will go through the mountains to the Gepatsch Reservoir. This tunnel will also be able to divert flood peaks from the Ötztal.

There is no development or upgrade requirement for the transmission system for the KXP. Locally the KXP needed a way to get the power from the new PSHP to the existing 380 kV transmission lines, and TIWAG wanted to minimise visual impact. TIWAG found a way to do this underground through an existing tunnel. The Prutz pressure shaft has been there since the 1960s, and ground movement over time was causing issues for the steel pipe. To address this, TIWAG needed to build a new tunnel, and decided to build a larger one so it could be used for the KXP even though at the time the KXP was only a concept. The new Prutz Pressure Shaft was built and commissioned in mid-2016.

The Imst-Haiming Project is a separate project with its own EIA and is progressing independently. The sequence of projects, with the Imst-Haiming Project to be implemented first followed by the upstream KXP, provides for a reduction of peaking impacts on the Inn River, which contributes to the Austrian implementation plans for the WFD.

The main project data for the KXP is summarised in Table 2.

Assessment Process

The assessment of the KXP is an official assessment according to the Terms & Conditions of Use of the Protocol. The assessment team members are accredited by the Protocol Governance Committee of the Hydropower Sustainability Assessment Protocol, and the assessment was conducted with the full support of TIWAG, demonstrated by their letter of support in Appendix A.

A Protocol assessment provides a snapshot in time for a project, in this case at the time of the onsite assessment in early September 2016. Leading up to this assessment were two visits: the first to provide an introduction to and training on the Protocol to TIWAG (January 2015, conducted by Simon Howard from IHA), and the second to ensure planning activities would be completed in time for the onsite assessment (6-10 June 2016, conducted by the Lead Assessor, Helen Locher and co-assessor Aida Khalil).

The Single Point of Contact for TIWAG was the Project Coordinator, Alexandra Zangerl, who reports to the KXP Project Manager, Wolfgang Stroppa. The SPC was supported by a Local Support Team comprising lead members of the KXP project team: Johann Neuner, Sebastian Perzlmaier, Martin Schletterer, Guenter Fitzka. TIWAG prepared a scoping document for the assessment, that provided background on each of the topics to be assessed and nominated the main proposed sources of documentary evidence and interviewees. The assessors each reviewed these proposals and requested additions or clarified aspects for more detail where required.

The planning and scoping exercise clarified that two of the topics would be treated as Not Relevant: P-14 Resettlement and P-15 Indigenous Peoples. One landowner may choose to temporarily move from his house near the Gurgler Ache intake during the construction period. This situation does not meet the definition of Resettlement which is focussed on permanent physical displacement, and so this particular situation is addressed under topic P-13 Project Affected Communities.

Table 2 – Main Project Data – Kaunertal Expansion Project

Overall Project Data	
Head upper stage / lower stage / Imst 2	647 / 864 / 141 m
Rated power Versetz PSHP / Prutz 2 / Imst 2 power stations	400 / 500 / 92.5 MW
Additional annual energy generation	913 GWh/annum
Total cost (2015 price level)	€ 1.3 billion
Planned construction time	2028-2034
Ötztal Intakes	
Additional catchment area Ötztal	271.5 km²
Koenigs water intake (type; elevation at FSL)	tyrolean weir; 1857 masl
Ferwallbach water intake (type; elevation at FSL)	tyrolean weir; 1855 masl
Venter Ache water intake (dam height, storage area, volume, elevation at FSL)	25 m, 1.3 ha, 70,000 m³, 1846.3 masl
Gurgler Ache water intake (dam height, storage area, volume, elevation at FSL)	25 m, 1.0 ha, 70,000 m³, 1843.5 masl
Diversion tunnel Ötztal to Gepatsch Reservoir	23 km
Platzertal Reservoir	
Additional catchment area Platzertal reservoir	8.2 km²
Capacity	42 million m³
Storage elevation at full supply level	2412 masl
Storage elevation at drawdown level	2330 masl
Storage water surface area at full supply level	90.2 ha
Dam volume of rock fill	8.2 million m³
Dam maximum height	119 m
Dam crest width/length	8 m / 660 m
Versetz Pump Storage Hydropower Station (PSHP)	
Cavern volume	158,000 m³
Turbine axis elevation	1638 masl
Rated power	400 MW
Number and type of units	4 pump-turbines
Maximum processed water quantity turbine/pump	77.2 m³/s / 53.6 m³/s
Rated power (TU/PU per unit)	110 / 110 MW
Nominal performance generator (per unit)	140 MVA
Prutz 2 Power Station	
Volume	~97,500 m³
Turbine axis elevation	873 masl
Rated power	500 MW
Number and type of units	4 Pelton turbines
Maximum processed water quantity	70 m³/s
Rated power (per unit)	135 MW
Nominal performance generator (per unit)	160 MVA
Imst 2 Power Station	
Volume	40,000 m³
Turbine axis elevation	711 masl
Rated power	92.5 MW
Number and type of units	2 Francis turbines
Maximum processed water quantity	85 m³/s
Rated power (per unit)	54 MW
Nominal performance generator (per unit)	64 MVA
Haiming Power Station	
Number and type of units (3rd turbine added with KXP)	1 Francis turbine
Maximum processed water quantity	43.3 m³/s
Rated power	24.3 MW
Nominal performance generator	30 MVA
Ancillary Structures	
Prutz cable duct (within former pressure tunnel)	220 kV
Transformer station Prutz (TINETZ project)	
Platzertal access tunnel	6.24 km
Gepatsch reservoir western shore road	5.9 km
Runserau weir expanded (weir height, storage area, volume, elevation at FSL)	13 m, 34 ha, 1.3 million m³, 860 masl
Runserau weir – Imst 2 power station headrace tunnel	11.8 km

An internet-based document share system was established for the project, and populated with a number of documents relevant to the Protocol topics prior to the arrival of the assessors for the onsite assessment. The assessors also undertook their own internet searches to obtain publicly available information about the project and background issues.

The onsite assessment was undertaken from 29 August to 5 September 2016 with a team of four Accredited Assessors (Helen Locher, Joerg Hartmann, Aida Khalil, Doug Smith) and one trainee assessor (Margaret Trias). The assessors undertook individual streams of investigations and site visits to ensure the widest coverage in the time available. Interviews and site visits were undertaken in Innsbruck, at all locations of project components as well as upstream and downstream locations, in surrounding villages and farming properties, and at locations of some mitigation measures. Some interviewees travelled to be able to participate in interviews at locations relevant to the subjects being discussed. Interviews were also conducted by phone where face-to-face was not possible, including for interviewees located in Vienna and in Germany. The assessors also visited the GKI project site at both Maria Stein and the reservoir to gain insights into project development processes and issues, and they interviewed a major contractor from the Prutz Pressure Shaft project.

In a few cases where interviewees were not available during the onsite assessment period, or follow-up clarifications were sought, the assessors corresponded by phone or email with these interviewees during the following weeks. A number of interviewees provided additional documentary evidence, which was shared with all team members and uploaded to the assessment document share site.

Documentary evidence was primarily in German. Some of this was translated into English for the assessors, but mostly the assessors who were not German-speakers used Google Translate. Most interviews were conducted in German with the use of translators. Interviews that were conducted in English had translators present to assist with any translation needs arising. TIWAG staff were not in attendance at any of the interviews, and the KXP project team was not in attendance at interviews with other TIWAG staff. As far as practical, interviews were held in the offices, homes or venues of the interviewees.

Following the assessment, the assessors submitted 176 questions and document requests relating to issues requiring further clarification. They received responses and further documentary evidence by 31 October 2016.

In total, the onsite assessment involved 83 interviews, and 345 items of documentary or web-based evidence were reviewed by the assessors. A report draft was shared with the TIWAG on 5 December 2016. TIWAG provided comments on the draft report on 22 December 2016, and the final report was submitted on 13 January 2017.

The final report was published on 23 February 2017 on the Protocol website http://www.hydrosustainability.org/Protocol-Assessments.aspx and on the TIWAG-Tiroler Wasserkraft AG ("TIWAG") website https://www.tiwag.at/en/about-tiwag/power-stations/expansion-of-hydropower/news/. During the consultation period, comments could be submitted through the Protocol website or through TIWAG. In accordance with the T&C for the use of the Protocol, the 60 calendar day period for public comment on the Kaunertal Expansion Project assessment report, and ran from 23 February 2017 to 24 April 2017. On receipt of comments, the assessment team had a further 60 calendar day period from the closing date of the public comment period to review and respond to the comments and publish an amended report if the assessment team considers that comments require report amendments. In the case of the Kaunertal Expansion Project Protocol assessment, the comment response report and amended final report were completed on 19 June 2017.An important general consideration for this assessment is that it was conducted in middle of the preparation phase. Consequently, several of the actions and processes that would respond to sustainability criteria in the Preparation tool of the Protocol are not yet met, sometimes not even initiated yet, due to the normal planning sequence of a hydropower project. In such cases, and when the assessors have found evidence that the preconditions that would ensure that these actions and processes will be implemented in a timely fashion are in place, these circumstances have not been considered significant gaps against the criteria. These would however

develop into gaps if not addressed within an appropriate period ahead of the start of construction. In other cases, if there was no indication that TIWAG has plans to close the gap, and no precedents in doing so as part of normal business practice, the omission has been counted as a significant gap.

Cross-cutting issues are assessed in accordance with the instructions on pages 23-25 of the Hydropower Sustainability Assessment Protocol. Important cross-cutting issues in the KXP assessment are: Human Rights (mainly covered in topics P-5, P-13, P-15 and P-16); Climate Change (P-7); Corruption (P-2 and P-12); Gender (P-1, P-5, P-13, and P-16); Grievance Mechanism (P-1, P-2, P-13 and P-15); Livelihoods (P-5, P-10, P-13, P-15 and P-23); IWRM (P-3, P-4, P-7 and P-23); Transboundary Issues (P-23) and Transparency (P-2, P-3, P-5, P-10, P-11, P-12, P-13, P-15 and P-23).

Assessment Experience

The assessment organisation was very professionally led by Alexandra Zangerl (the Single Point of Contact) and Wolfgang Stroppa (the KXP Project Manager), with the assistance of the Local Support Team. They assembled the documentary evidence and organised interviews with internal and external stakeholders. The need for interpretation in most of the interviews in the field was met with the use of a team of capable interpreters: (Mag. Anita Wilson, Mag. Regina Prokopetz, Dr. Ulrike Egger, Mag. Claudia Huber, Lea Knabl BA).

The sharing of documentary evidence has been problem free, utilising an Internet based file sharing site.

The onsite assessment was undertaken during the late summer season, which created some challenges in the availability of all proposed interviewees, and quite a few iterations and last-minute updates to develop the schedule. Considerable effort was invested by TIWAG to find solutions to all practical scheduling problems, and diverse approaches were effectively used to ensure the interview coverage was as comprehensive as possible (e.g. phone calls, written follow-up requests where time was not sufficient, one assessor undertaking an interview on behalf of another assessor, etc). Interviews are always a sampling exercise and it is not possible to talk to everyone to the extent that each interested party may feel is necessary. Interviews are relatively high level (any one of the Protocol topics could be the subject of its own dedicated assessment), with specific examples sought to illustrate points rather than to cover every aspect. Interviews are not designed or able to be forensic, but are used to validate documentary and visual evidence, draw out areas of divergent views, highlight areas where greater attention might be warranted, and provide clarifications and insights. TIWAG was very responsive to the needs and priorities of the assessors and to finding ways to accommodate who the assessors wanted to talk to, where, for how long, and logistics for direct assessor-interviewee follow-up where requested.

Travel times and logistics given the broad scope of the project and mountainous terrain required careful planning and a high degree of support for implementation. This was well supported by having cars, drivers and translators allocated to each assessor, allowing a high degree of flexibility for the assessors to pursue the lines of investigation relevant to their assigned topics. Time was made available in the schedule for some contingency, and this was well used by the assessors. The weekend in the middle of the assessment allowed the assessors to share and review findings and to consider areas of overlap and relationships amongst topics. This also allowed requests for further information to be provided which in some cases were able to be responded to on the last day (Monday 5 September).

Overall the assessors found this to be a very well organised, open and comprehensive assessment experience, and the experience was sufficient to form views on areas of strength and opportunities for improvement with the KXP.

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 developer (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

Stakeholders in the Kaunertal Expansion Project (KXP) that are directly affected are: the population and businesses in the region where the project is built and operated (a section of the Inntal with its side valleys Ötztal, Kaunertal and Platzertal) and tourists visiting the region; TIWAG employees; contractors and their employees; and local governments and public agencies with responsibilities for various aspects of the KXP. Additional stakeholder groups are the general public of Tyrol as ultimate owners of TIWAG; civil society groups; electricity customers throughout the Central European grid; and the Austrian Federal and other EU governments with commitments to make reductions in CO_2 emissions.

Stakeholder engagement on the KXP began in 2005, after the project was selected for development by the provincial government. TIWAG (until 2012, with the support of a public relations agency) conducted information events, produced newsletters and website materials, and initiated conversations with landowners and other directly affected groups. In some areas, particularly in the Kaunertal, a more intensive dialogue with the municipality was conducted. During the preparation of the Environmental Impact Assessment (EIA), the experts involved consulted with interested parties, but there has not yet been a formal public consultation. There are also a number communication channels with employees, government agencies, civil society and the general public.

This topic, P-1, addresses the management of communications and consultation, and overall performance in stakeholder engagement, whilst subsequent topics in this assessment focus on stakeholder engagement particularly relevant to the individual topic.

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 from the early stages of the project through a stakeholder map, which grew organically into a continuously updated stakeholder register. The stakeholders in the communications plan have been identified over time through TIWAG's long presence in the region (as main power generation, transmission and distribution provider), through specific preparation activities for the KXP, and through self-identification of interested groups such as NGOs. Many stakeholders are the same as for the long-existing Kaunertal and Prutz-Imst projects, the recent reconstruction of the Prutz pressure shaft, and for projects under preparation and construction such as Gemeinschaftskraftwerk Inn (GKI), Tumpen-Habichen, and Kühtai. Many stakeholders are personally known to TIWAG staff. TIWAG is also engaged with numerous stakeholders through joint organisations and initiatives, for example in flood management.

An analysis of stakeholders was first conducted in 2011, and the latest revision of that analysis was done in March 2016. Stakeholders are categorised as positive, neutral, critical or opposed; risks to the project are identified (with the highest risks entered into a risk management software, with probabilities and financial consequences); and communications measures are defined. No specific communications measures for critical stakeholders were listed between 2013 and 2016 in this stakeholder analysis, however.

TIWAG considers it a priority to identify directly affected landowners (as well as the holders of natural resource use rights such as for water, grazing, fishing, hunting, wood harvesting) at an early stage in project preparation. Some of these stakeholders need to provide their consent to project preparation activities (such as geotechnical investigations) and to negotiated compensation measures, usually financial payments. As soon as siting and design plans are more advanced, and land and resource requirements become clearer, all potentially affected properties and resource use rights, as well as their owners, are identified to initiate conversations, with the objective of reaching their consent to selling or temporarily leasing their lands or resource use rights. TIWAG has never had to resort to expropriation in a hydropower project and will try to avoid it in the KXP as well; additional details are provided in topic P-13 Project-Affected Communities and Livelihoods.

At the corporate level, TIWAG also identifies generic target groups for its communications efforts, including press releases, brochures, websites and reports such as the annual sustainability report.

Criteria met: Yes

Analysis against proven best practice

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

The communications plans are based on an extensive list of stakeholder categories. For example, for the 6-month period around the submission of the EIS Revision 0 in July 2012, multiple communications measures were planned for a wide variety of directly and indirectly affected stakeholders. Individual names and contact information are available for all key stakeholder categories such as mayors, landowners, and representatives of agencies and interested groups. Newsletter and invitations to events went to all individual households in project-affected communities. No stakeholders were identified in this assessment that were not already covered in TIWAG's communication plan.

In Austria, the formal consultation of stakeholders during an environmental permitting process is focused on the ability to submit comments and complaints once the proponent's EIS report is made public, and in public hearings (see also topic P-5 Environmental and Social Impact Assessment and Management). A number of stakeholder categories are recognised as 'interested parties' in the law and can make submissions, up to the highest levels of the federal courts. These include affected individuals and neighbours, the provincial environmental ombudsman, affected municipalities, water management authorities, citizens' initiatives with more than 200 registered members, and recognised environmental organizations. While this process would ensure that no major stakeholders can be ignored during permitting, in practice TIWAG's communications have reached a much wider audience.

Criteria met: Yes

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.*

The key responsibilities for stakeholder communications in new TIWAG projects rest with the project manager, one of whose primary functions is to ensure that stakeholders are well informed and supportive of the project.

The project manager is supported by a small number of TIWAG staff across a number of departments, up to the Management Board level, who are also expected to contribute to project communications. For example, Management Board members are involved with public discussion events and with communications at the provincial government level.

Communications measures for various stakeholder groups have evolved over time, from an early emphasis on stakeholder information to more interactive formats. Some measures have been discontinued or reduced, because they were not deemed to be particularly useful or because preparation of the KXP is currently suspended. There is no formal communications strategy, policy or framework for the KXP. Measures include the following:

- Between 2006 and 2010, a series of newsletters about the KXP were sent out via bulk mail to all households in the project area. Specific newsletters were produced for different areas, addressing local issues.
- A series of brochures, factsheets, visualisations of the future project components against the background of the natural landscape, and other materials on the KXP have been produced.
- Presentations and information fairs in the affected municipalities have been organised in the villages of St. Leonhard im Pitztal, Arzl im Pitztal, Pfunds, Toesens, Prutz, Faggen, Fliess, Kaunertal, Imsterberg, Obergurgl, Vent and Sölden. TIWAG also sets up information booths and KXP models at various events in the region, including the annual Innsbruck autumn fair. Residents are invited through various channels, and interested attendants had the opportunity to get individual information and time to speak directly to the TIWAG Management Board, experts and the KXP Project Manager.
- More intensive dialogues have been conducted with specific stakeholder groups. For example, there was a dialogue over several years with the municipality of Kaunertal, to address citizen questions and concerns, and there is a working group with the rafting association (which to date has mostly focused on the Imst-Haiming Project).
- At visitor centres in the existing Silz and Prutz power plants (since 2013 and 2015) and at an 'Info Point' at the Gepatsch reservoir, information panels and models have been set up informing visitors about the KXP background and design. Qualified guides for the visitor centres, construction sites and operational power plants are available upon request.
- The dedicated information portal about all hydropower expansion projects on TIWAG's website contains some relevant information on the KXP.
- Separate telephone numbers and e-mail addresses for each TIWAG project, including the KXP, are published on the project website for direct contact with the responsible project manager. These are not used frequently; for example the email address received 32 inquiries between 2011 and 2016.
- TIWAG is operating a customer service centre with a toll free hotline to respond to all stakeholder questions, and not just questions by TIWAG retail customers. The service centre received 160 inquiries about the KXP between 2011 and 2016. A new database software for customer service management is due to be introduced shortly. If questions on the KXP cannot be covered by service centre staff, they are forwarded to responsible departments. Media inquiries are handled by a press office (a team of two).
- Information on the KXP is contained in general TIWAG publications such as annual reports, inserts into regional newspapers, and a regular customer newspaper. Because TIWAG is operating in a competitive retail market, the emphasis of many general communications products as well as other public relations activities and sponsoring, is on marketing the TIWAG brand and products.
- General internal communications channels include the TIWAG intranet, the regular employee newsletter and the periodic surveys among employees (four times since 2006). There are also well-established project-specific communications mechanisms between the KXP Project Manager, relevant departments, and the Management Board (see also topics P-6 Integrated Project Management and P-16 Labour and Working Conditions).

There is no project-specific grievance mechanism for the KXP. TIWAG's website informs customers, business partners and community members about how they can raise enquiries, ideas and complaints. These are submitted by telephone, in writing, by email or by filling in the contact form on TIWAG's homepage, and are recorded and dealt with by TIWAG Service Center employees. A database is used to record dates, processing and closing of issues. Issues are allocated to the expert responsible at TIWAG (for example, if related to land acquisition, by the Land Acquisition department), and if response deadlines are not met the Management Board receives notifications. For new hydropower projects, customers are directed to contact the project manager responsible directly by telephone or email, with the responsible person and contact details published on the TIWAG homepage. Experiences from other projects under implementation, such as the GKI and the rehabilitation of the Prutz pressure shaft, demonstrated the use of project-specific hotlines, but grievances were also raised by citizens with the municipal administration, and often resolved through joint meetings with the project company.

If grievances are not resolved by TIWAG, they can be taken to the courts or into the political process. The courts have indeed put on hold, for the time being, the plans for diversion of water from the Ötztal for the KXP. The municipal councils of Kaunertal and Sölden have had or currently have representation from citizens' initiatives which are opposed to the KXP, and the provincial government coalition involves a party sceptical about the KXP, a representative of which resigned from TIWAG's Supervisory Board in late 2015. While the municipalities have no veto rights over the KXP, they generally own land or resource rights that have to be acquired for the project. Together, these options for stakeholders to raise grievances are appropriate.

Criteria met: Yes

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.*

TIWAG's plans and processes show various examples of sensitivity to different needs. The multiple channels allow stakeholders to choose their preferred mode of communication, tailored for their needs. TIWAG representatives can easily be contacted. Content on the TIWAG websites is available in high contrast, and some of it (however, not the specific information on new generation projects) in 'easy reading' language, avoiding complex technical descriptions. The 2012 communications plan and 2013-2016 logs of stakeholder meetings with the project manager show that the mayors are a focus of communication and consultation around the KXP. Mayors are regularly consulted on the most appropriate communications approaches for their municipalities, and it is often the mayors who pass on information to their councils and citizens (for example, to explain that the KXP permitting process is currently suspended). The municipality of Kaunertal is a good example for a well-organised consultation process, designed jointly with TIWAG, where concerns from different community groups were formulated with the support of professional moderators, and largely responded to by TIWAG in two question-and-answer rounds. For example, safety concerns were addressed, among other measures, by site visits to explain slope stability issues on the Gepatsch reservoir. Different municipalities have organised themselves in different ways for consultation; the municipal council of Pfunds, for example, has formed a 'Power Station Committee' to which non-council members have also been invited, and has retained a lawyer.

TIWAG recognises that initial communications approaches have not always been effective and have generated some resistance among affected communities and other interested groups. The last major projects had been built in the 1980s, with different communications requirements. For example, it is recognised that the 2004 Options Report on the remaining hydropower potential in Tyrol was a surprise to many communities and was not properly introduced, and that newsletters were not a very effective communication channel. A public relations agency that was involved with the early communication on the KXP and was criticised for a focus on lobbying, is no longer contracted. TIWAG has been working towards more open, sensitive and non-selective communications, particularly following recent changes in leadership roles. A number of stakeholders state that recent projects under implementation (for example, GKI) have performed much better than previous ones.

However, other stakeholder groups still see TIWAG's communications as reactive rather than proactive, with no noticeable change in attitudes, and express strong dissatisfaction with communication and consultation processes. In particular, some groups such as rafting businesses and other water users on the Inn and on the Ötztaler Ache, and conservation groups, require detailed technical information to understand possible impacts and to react early enough before project decisions are taken. The information that was shared through the working group with the rafting association was largely on the Imst-Haiming project. Information on the KXP is available in the EIS documentation, but has not been made easily accessible. The content on the TIWAG website regarding the KXP is quite basic and not quite up-to-date; some more detailed information has been shared only upon repeated requests with WWF. This follows a pattern of uneven, late or partial disclosure which had been criticised by stakeholder groups earlier, for example with regards to the Options Report and the Water Management Framework Plan for the Upper Tyrol, and has led to sustained stakeholder opposition. TIWAG has not tailored its approach to communications and consultation to meet the needs of all stakeholders, evident by the reactions of some stakeholder groups to aspects of TIWAG's approach, which is a **significant gap** against best practice and is seen to influence findings in a number of topics.

There is no formalised process for TIWAG to anticipate and respond to emerging communication risks and opportunities, such as stakeholder surveys. General surveys in the province of Tyrol are regularly commissioned by the regional newspaper Tiroler Tageszeitung, and in 2014 and 2015 have indicated majority support for an expansion of hydropower in general, and to a lesser extent, specifically for the KXP (in 2015, 88% for hydropower expansion and 78% for the KXP, across supporters of all political parties). Other surveys have also been commissioned, for example by WWF in 2012, indicating less support for the KXP. Such surveys illustrate broad trends, but are not sufficiently detailed and consistent to identify the position of individual groups and reasons for their support or opposition. TIWAG's strong presence across the province and strong links to political representatives, including in the project region, does ensure that most such risks and opportunities are detected. The evolution of the KXP communications approaches over time demonstrates TIWAG's capacity to learn and adapt, also from experiences in other ongoing projects. TIWAG has also adapted to public criticism at a corporate level, for example by ensuring since 2013 that all power marketed by TIWAG or used in pumped storage operations is 100% renewable. However, a lack of risk awareness in communications at the early stages of the KXP, when it was identified as an option without involving stakeholders, contributed to a loss of confidence in some groups and communities, and subsequent communications efforts have not been able to fully reverse this; this issue is essentially reflected in the gap noted above.

Criteria met: No

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.*

TIWAG started communications and engagement with communities affected by the KXP in 2005, directly after receiving the directive from the provincial government to investigate the project in detail. The timing of communications and engagement activities has generally been appropriate (although note the dissatisfaction of some groups with late disclosure). There are numerous examples for two-way communications that resulted in siting and design changes (see topic P-4 Siting and Design), where stakeholder suggestions were considered technically and financially feasible.

There are generally good personal relations between TIWAG staff and stakeholders. TIWAG is visible and approachable, and most households and businesses are TIWAG customers and benefit from relatively low power rates and high supply reliability, TIWAG financial contributions to municipalities, and in some cases from

sponsorships. Although some groups are dissatisfied with the KXP in general and stakeholder engagement in particular, there are no indications that TIWAG has not engaged and negotiated in good faith. As described above under Management, there are a number of processes for stakeholders to raise concerns, complaints or suggestions, and obtain feedback.

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.*

TIWAG has demonstrated openness to engage with all stakeholders, including opponents of the project, although engagement has been more intensive in the Kaunertal and the Platzertal than in the Ötztal, where it was insufficient to overcome opposition. Where impacts have been recognised by TIWAG and specific negotiations have begun, landowners and other stakeholders confirm that these are being conducted in good faith and effectively. Even KXP opponents such as the rafting association have been able to negotiate compensation arrangements for other projects in the past. Some groups such as farmers' associations in the Kaunertal still receive annual compensation payments for the loss of pasture areas to the Gepatsch reservoir, more than 50 years ago.

However, a participatory approach also requires that affected stakeholders can discuss project features such as the design of specific components, operational rules, or mitigation and compensation measures on the basis of detailed information (as discussed above), and that feedback is thorough and timely. The same stakeholders that have concerns about disclosure, also regard TIWAG's feedback as often not sufficiently thorough and timely, and attribute slow response times to bureaucratic procedures, the need to get Board approval, or a lack of interest or sense of urgency by TIWAG. Some stakeholders have complained that they gave information during the project preparation process, but did not feel informed and respected. WWF has expressed concern that frequent changes to the project concept make it difficult to follow developments and offer input, citing the various locations presented over the years for an upper stage reservoir, and the inclusion of several additional components on the Inn River in the 2015 EIS submission. While there are good reasons for these changes, addressing issues raised by stakeholders by adding project components from the Water Management Framework Plan for the Upper Tyrol (see topics P-3 Demonstrated Need and Strategic Fit, and P-4 Siting and Design), they may not have been communicated clearly, and perceptions of strongly entrenched positions have possibly not helped. The perception by some stakeholders of a lack of thorough and timely feedback is considered a **significant gap** against best practice, and is also an issue reflected in a number of other topics.

Several stakeholders have reported low levels of trust in TIWAG at the corporate level. This may be supported by the results of a survey of perceptions of Austrian energy companies in 2013, in which TIWAG was ranked second-to-last. TIWAG is aiming to overcome this issue, and has recently responded by modernising its website and focusing on three key messages:

- TIWAG guarantees a safe, high quality and lasting supply of electricity, gas and heating in the Tyrol;
- TIWAG supports the national and European goals on energy and against climate change; and
- TIWAG is a reliable and trustworthy local and regional partner for all our clients and employees.

In TIWAG's impression, the revamped corporate communications strategy is showing first results. This was tested through a public opinion survey in 2016, the results of which are planned to be published in early 2017.

Criteria met: No

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.*

TIWAG is following the legally prescribed processes for consultations during an Environmental Impact Assessment (EIA) process, which do not require the disclosure of the KXP EIS documents until these are considered final by the authorities. On a voluntary basis, some selected information is shared with stakeholders. The full documentation is also available to some stakeholders including mayors of affected communities, which can share it with local citizens. However, no commitments for further voluntary measures have been made by TIWAG in this regard.

Similarly, disclosure and consultations on the Water Management Framework Plan for the Upper Tyrol complied with legally prescribed processes. The draft documents were released by the federal government, following a public access to information request by environmental NGOs. Some NGOs have claimed that the integrated strategic environmental assessment of the Plan did not comply with public consultation requirements; however this has been rejected by the federal government and not been confirmed by the courts. Litigation is still ongoing.

There are no non-conformances with internal rules because TIWAG does not have a binding formal communications strategy or policy for the KXP. The semi-annual communications plans are non-binding work plans which are not always implemented as planned, but this is not considered a non-conformance.

Criteria met: Yes

Analysis against proven best practice

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

No non-compliances or non-conformances have been identified regarding communications and consultations in the KXP.

Criteria met: Yes

1.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

TIWAG has not tailored its approach to communications and consultation to meet the needs of all stakeholders.

There is a perception by some stakeholders of a lack of thorough and timely feedback.

2 or more significant gaps

1.3 Scoring Summary

TIWAG is consulting and communicating with external and internal stakeholders through a broad variety of channels and mechanisms, based on its long-standing presence across the province of Tyrol, and going beyond the formalised mechanisms prescribed for the project permitting process. However, this is made more difficult by a legacy of mistrust by some stakeholders, partially due to poor consultation and communications in the past, but also due to perceived strongly entrenched positions. While TIWAG has been modernising its communications

approaches, trying to overcome these problems, its approach to public disclosure has remained cautious. The communications and consultation approaches do not meet the needs of all stakeholders, and there is also a perception by some stakeholders that feedback on complaints, concerns or suggestions is not always thorough and timely. These create two significant gaps against proven best practice, resulting in a score of 3.

Topic Score: 3

1.4 Relevant Evidence

Interview:	4, 8, 10, 17-22, 29, 32, 34, 43, 45-47, 54-57, 62, 74
Document:	1-3, 6-9, 14-16, 18, 26-29, 34, 54, 157, 171, 224, 231, 260, 309, 310, 321, 327, 332
Photo:	31, 35, 42, 71

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

The main bodies to ensure sound corporate governance of TIWAG are:

- The owner – the Province of Tyrol, represented by the Government, who appoints the Supervisory Board;
- The Supervisory Board – comprises six shareholder representatives appointed by the Governor, after being approved by the General Assembly based on a Government Decree, and three employee representatives. The Supervisory Board elects its own chair. The present Chair commenced this role in March 2016.
- The Management Board – comprises three members. The Chairman of the present Management Board, who is the TIWAG CEO, commenced this role in January 2016.

The key elements of TIWAG's corporate strategy are:

- The TIWAG group guarantees a secure, high-quality, clean and sustainable electricity, gas and heat supply for Tyrol;
- The TIWAG group supports European and national energy goals and is the driving force behind climate protection in Tyrol's electricity, gas and heat supply; and
- The TIWAG group is a successful business enterprise and a reliable local partner.

TIWAG must comply with Tyrolean and Austrian legislation, as well as EU Directives (listed in topic P-3 Demonstrated Need and Strategic Fit). The Tyrol provincial government Department of Environmental Protection must assess and approve the permit for the Kaunertal Expansion Project (KXP). It is referred to as the "Authority" in this report.

Austria rates around the mid-point of European countries in anti-corruption indicators on the Transparency International website (www.transparency.org), and its scores have improved in recent years. Austria is party to the UN Convention against Corruption, the Civil Law Convention on Corruption, the Criminal Law Convention on Corruption and the OECD Anti-Bribery Convention, and the legal and administrative frameworks for anti-corruption are well established. Austria rates very poorly on its Right to Information provisions on the Right to Information website (www.rti-rating.org).

This topic has some overlap with topics P-1 Communications and Consultation, P-9 Financial Viability, and P-12 Procurement.

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.*

TIWAG has a variety of mechanisms in place to ensure that political, public sector and corporate governance requirements, issues and risks are identified on a regular basis. These are applicable to both the corporation generally and to the KXP specifically.

The legal requirements for development of the KXP are well understood by the business. For large hydropower projects, the approach is to obtain a single permit for all legal requirements relating to environmental protection, water rights, construction and electricity system connection during both the construction and operation stages. Alongside meeting all regulatory requirements for preparation of the Environmental Impact Statement (EIS), TIWAG must reach a number of agreements in relation to land acquisition, and also water, grazing, hunting and fishing rights and issues.

Responsibility for understanding all of these requirements, issues and risks rests primarily with the KXP Project Manager, who draws on expertise internally and externally to assist as required. Important internal resources providing support include the TIWAG departments of Corporate Development and Organisation; Land, Property and Surveying; Legal and Insurance; Finance and Accounting; Planning; Central Purchasing; and Internal Auditing.

TIWAG has various assessment processes regarding corporate governance requirements and issues. The Corporate Development and Organisation Department plays an important role in ensuring standard corporate processes for all areas of business responsibility, including those that must be followed for large hydropower development projects. This department has been mapping processes and ensuring that process standards are developed and thorough. The Internal Audit unit is responsible for TIWAG's Internal Control System (ICS); it takes a risk-based approach to internal auditing, and undertakes regular internal audits from which the findings are used to strengthen corporate processes. Internal and external audits are also undertaken for the Environmental Management System (EMS). For project development, a Permit Management System is used to ensure tracking all permit conditions. Training and professional development, continuous improvement, risk assessment and management, regular process and guidelines review, membership in professional associations, and external benchmarking are all mechanisms by which TIWAG ensures it keeps abreast of trends and issues arising.

Governance-related issues specific to the KXP are identified through the regular processes of the Management and Supervisory boards, internal continuous improvement processes, interactions with various tiers of government and stakeholders, and through monitoring of media, policy and legislation. TIWAG has its own media monitoring service provided by "Platzer media GmbH", and employees receive daily notices of media relevant to their areas of responsibility. Some of the governance-related issues arising and requiring close monitoring that are relevant to the KXP include compliance with EIS processes, reputational issues (e.g. see for example www.dietiwag.at), legal proceedings (e.g. with water rights in the Ötztal), and transparency and accountability (particularly in regards to agreements with key stakeholders).

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.*

One of TIWAG's Supervisory Board members resigned in late 2015 after raising a number of concerns relating to corporate governance. Concerns included a lack of access to information and dialogue with TIWAG management, insufficient risk governance and economic viability checks for large hydropower projects, and specific political interventions of TIWAG including adjusting laws and political strategies to obtain a strategic fit for TIWAG's projects Topic P-3 addresses Demonstrated Need and Strategic Fit for the KXP, and topic P-11 addresses Economic Viability, so these are not addressed here. As a public sector business, TIWAG is very close to political decision-makers in the province. Consequently the business is very aware of public sector governance issues and its need to be publicly accountable. Some significant changes have been made in the business during 2016, including in the leadership roles for both the Supervisory and Management boards, and in release of several new policies addressing sponsorship and fraud which add to a suite of policies for ethical business practices (see the Management criterion below).

With respect to corporate governance requirements and issues, TIWAG has a high commitment to continuous improvement, demonstrable through its development of internal processes and guidelines, its recent

certification of its EMS to ISO 14001, its use of independent review mechanisms, and its benchmarking of a number of its business activities against Austrian, EU and international standards. TIWAG's corporate sustainability report includes an evaluation of the business against Global Reporting Indicators (GRI), including supplementary indicators not required by GRI but provided on a voluntary basis.

A number of issues identified in this assessment fundamentally stem from an absence of corporate policy addressing stakeholder engagement, transparency and disclosure, including processes to ascertain if stakeholder communications needs and interests are being met (see for example topics P-1 Communications and Consultation, and P-4 Siting and Design). This is an opportunity for corporate governance improvement at the level of proven best practice and consequently a **significant gap** against this criterion.

Criteria met: No

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.*

TIWAG's Department of Corporate Development and Organisation is tasked with organisational development, organisational structures, corporate processes and corporate strategy. This section is responsible for the corporate process management standard, and helps departments develop the processes they are responsible for and ensures appropriate fit. Processes fit a hierarchical framework addressing strategic and operational levels, and may be group-wide or specific to one of the businesses (e.g. TIWAG, TIGAS, TINETZ). Within TIWAG there are three core processes (electricity trading, electricity production and electricity sales), and 29 management and service processes (e.g. risk management, personnel management, procurement management, public relations). All processes specify the process owner (Head of Department with responsibility), process management organisation (roles and responsibilities for aspects of process), process implementation (roles in process delivery), and process coordinator (responsible for standards and proper documentation).

Processes relevant to the areas listed in this topic criterion are as follows:

- ***Risk management***. Risk management is the responsibility of TIWAG's Department of Controlling and Investment Management. TIWAG has a sophisticated corporate risk approach. On a quarterly basis, TIWAG organisational units identify individual risks, record them locally and submit them for centralised statistical consolidation. The "Risk-2-Chance" (R2C) software system provides a systematic approach to identifying, assessing, analysing, managing and reporting on risk. Risk prioritisation workshops are held each year to inform the internal audit program, which draws on the R2C system, managers' views on past and present risks and problem areas, plus written correspondence received through the year. The Management Board sets the risk strategy, and the Supervisory Board is regularly informed about the company's risk situation. Major areas of risk closely managed by TIWAG include strategic and business risks; information technology (IT) security risks; market, quantity and price risks; personnel risks; financial risks; and legal and regulatory risks.
- ***Compliance***. TIWAG strongly emphasises its commitment to compliance in its Code of Conduct. TIWAG's Internal Control System (ICS) is the responsibility of the Internal Auditing unit, the head of which is the TIWAG Compliance Officer. The ICS relies on internal rules and instructions, and checks the effectiveness of these through an Internal Audit function on a randomised basis. Beyond the annual internal audit program, special focal areas for internal audit attention have included the complaints process, the compliance system, and individual projects (e.g. Silz in 2015, Prutz Pressure Shaft in 2014). The Internal Audit unit reports

regularly to both the Management and Supervisory boards, and follows the international standards of the Institute of Internal Auditors (IIA), the world's leading internal audit and risk management guidance-setting body. The Gutwin software system tracks installation-specific legal requirements at the operational stage across TIWAG, with 9,000 tasks included. In the Gutwin system, each law is broken down into its component requirements, and responsible individuals within TIWAG are identified for ensuring adherence. At the project level during the construction period, a Permit Management System used for the GKI project is planned to be applied to future construction projects.

- ***Social and environmental responsibility***. TIWAG states its commitment to the environment and sustainability in its Code of Conduct. The Environmental and Social Division in TINETZ is responsible for the TIWAG-wide Environmental Management System (EMS). All maintenance schedules require steps to ensure adequate consideration of environmental and social issues (see topic P-5 Environmental and Social Impact Assessment and Management). Work is underway to see how the EMS can connect and be incorporated into a range of processes, such as with Procurement (see topic P-12 Procurement). TIWAG also has a safety management system that is certified by the Austrian Energy Providers (see topic P-16 Labour and Working Conditions).

- ***Grievance mechanisms***. Grievance mechanisms at the corporate and project-level were described in topic P-1 Communications and Consultation. The Code of Conduct instructs employees to raise any issues of concern with laws or adherence with the Code with their superiors or with the TIWAG Compliance Officer. Legal processes are available and have been used in cases where issues are escalated.

- ***Ethical business practices***. TIWAG's Code of Conduct (2008) is the core statement of the business commitment to ethical business practices in the areas of integrity, compliance, fair treatment, human rights, and avoidance of conflicts of interest. It clearly addresses its lack of acceptance of any forms of undue influence and inappropriate lobbying, gift-giving or benefits. This Code of Conduct is supported by additional guidelines:

    - Austrian Electricity Suppliers Code of Conduct (2006);
    - Guidelines for Leadership and Cooperation (2008), addressing values and behaviours for executives;
    - Directive for Grants and Conflicts of Interest (2014), which includes requiring a lobbying register;
    - Guidelines for Sponsorship (2016), specifying terms for sponsorships and requiring a sponsorships register; and
    - Guidelines for Fraud (2016), based on the COSO model (the Committee of Sponsoring Organisations of the Treadway Commission), a U.S. initiative to combat corporate fraud centred on an internal control system that addresses organisational governance, business ethics, internal audit, enterprise risk, fraud and financial reporting.

  Also relevant are documents relating to procurement processes and delegations, which are described under topic P-12 Procurement.

- ***Transparency***. TIWAG has its external website, publishes an externally audited Annual Report, and publishes an externally-audited bi-annual Sustainability Report with the content mapped against the GRI. Some stakeholders have raised concerns about a lack of transparency on the part of TIWAG . TIWAG has no written guidelines or defined commitments regarding transparency or stakeholder engagement, but follows all legal requirements and exceeds these in cases such as seen with the KXP consultations (see topic P-1) and so basic good practice is considered met. The opportunity to strengthen the governance framework in this area was identified under the Assessment criterion as relevant to proven best practice expectations.

TIWAG has a commitment to moving the corporation from one which historically operated in divisional silos to one in which there is a high degree of cross-division collaboration guided by management processes. Communication of policies and processes internally is via TIWAG's intranet site, plus emails to all staff and

communications at team meetings as needed. All corporate processes are coded logically and mapped, and are able to be accessed by TIWAG staff on the intranet through logical steps of inquiry relevant to the users need.

Communication of TIWAG policies and processes externally, depending on the context, may be through the internet, the Annual Report, the bi-annual Sustainability Report, through procurement processes, and through processes of reaching agreements and developing contracts. Notably, the business commitment to compliance is a high level heading on its external website, and the TIWAG Code of Conduct and the Austrian Association of Electricity Supply Companies Code of Conduct are published on the TIWAG website.

Independent review mechanisms are used in a number of cases by TIWAG, in addition to the high degree of regulatory review e.g. with the EIS, and legal review in cases where legal proceedings have been initiated. Examples of areas in which TIWAG has independent review mechanisms applied that are relevant to the KXP include:

- BET with the EU electricity market model and the forecasting of revenues (see topic P-9 Financial Viability);
- Review of lessons learned with development of the Prutz Pressure Shaft (see topic P-6 Integrated Project Management);
- The Austrian Dam Safety Commission review for all questions on dam safety, and expert review regarding geotechnical questions for the Platzertal dam (see topic P-8 Infrastructure Safety);
- Review of procurement processes (see topic P-12 Procurement); and
- Several experts brought in for review regarding sediment deposits, sediment management and sediment transport (see topic P-20 Erosion and Sedimentation).

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.*

A number of processes ensure that contractors meet or having consistent policies as the developer (see topic P-12 Procurement). Supplier contracts are based on the Austrian standards called Ö-Normen, on the "General requirements for the provision of products and services in the electrical and electronics industry" (ABLE), on the "General procurement requirements of the TIWAG Group" (AEB), and on the supplementary, procurement-related binding contractual provisions governing compliance with the TIWAG guidelines.

Processes to anticipate and respond to emerging risks in relation to the KXP include outreach and engagement activities by the Project Manager, regular project reports submitted to the Management Board and the project steering committee that is formed during the construction phase, and monitoring and supervision processes during construction (see topic P-6 Integrated Project Management).

TIWAG's approaches to anticipate and respond to emerging risks and opportunities in core business activities are specified in its corporate processes. The development of TIWAG's processes management was initiated about 12 years ago following a benchmarking exercise. It has been gradually built up since then, and is still being refined, expanded and improved. TIWAG has a Continuous Improvement process which can be applied to any aspect of the business activities. In the last three years, TIWAG has focussed on process improvement in the area of hydropower project construction, providing a comprehensive process map for hydropower projects designed to help strengthen approaches and manage risks. TIWAG's risk-based auditing program has been expanded and improved on regularly, aiming to get an almost real time picture of risk.

For certified systems such as the EMS, periodic internal and external audits help anticipate and respond to emerging risks and opportunities. Actions that are identified as opportunities for improvement in the EMS audits are entered into the Gutwin system to allocate responsibility and track follow-up. This system includes all results of internal and external audits and site inspections, which go into the system as tasks, actions then are given a

responsible person, priority rating and delivery date. EMS and safety systems have standard management reports to the Management Board including legal compliance, external issues raised (e.g. through the call centre), progress against plans and KPIs, actions taken including preventative actions, forward actions, and opportunities for improvement.

The process of reaching agreements is an area of risk with respect to the KXP. The EIS lists every landowner and their rights. TIWAG needs to form agreements with respect to utilising land, water, grazing areas and hunting areas, not only for the areas on which the project activities will take place, but also where mitigation measures will be implemented. TIWAG has been working through this process, and agreements are at various stages of closure. In terms of governance, all contracts must be ready to be closed for the Permit to be issued by the Authority (subject to formal closure post-permit). TIWAG at this stage can only arrive at agreements on intent and options, with a holding deposit, to be closed upon notification that a Permit will be granted. TIWAG's Land Acquisition Department and Legal Department are responsible for reaching and closing agreements, and discussions and negotiations are facilitated by the KXP Project Manager. Contracts are submitted to the TIWAG Management Board for signature. If any land is bought or sold, the decision is brought to the TIWAG Supervisory Board.

For agreements with municipalities, TIWAG is working through processes described in topic P-10 Project Benefits.

Legal proceedings are an area of risk for TIWAG that it is presently dealing with for the KXP. Legal proceedings relate to water rights and priority water uses in the Ötztal, and the legality of the 2014 Water Management Framework Plan for the Upper Tyrol. Legal activities are one of the four standard streams of work in the project management process for large hydropower projects, and TIWAG resources this area from its Legal and Insurance department and from contracted legal firms. Austria has a robust judicial system with numerous courts at all levels of government. TIWAG expects stakeholders to protect their interests and challenge TIWAG's processes through legal channels, and has provided budget, resources and time for this in its KXP management plans.

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.*

TIWAG engages with the range of directly affected stakeholders through a variety of mechanisms, as described in topic P-1

Stakeholders directly affected by the KXP include the local municipalities, businesses, land owners and land users, water rights holders and water users, the tourism sector, and the recreational sector. Some of the issues important to these stakeholders include the demonstrated need for the KXP; the risks associated with the changes brought on by the KXP and how the risks will be avoided, minimised, mitigated and compensated; the opportunities associated with the KXP and how these will be pursued without incurring new risks; and the process by which stakeholders will be engaged and able to influence decisions.

The most significant project reports directly relating to the KXP are the Environmental Impact Statement (EIS) report(s). The early revisions (Revision O in 2012, Revision 1 in 2015) are not publicly released, because the Authority has not yet confirmed that the EIS is complete. These early revisions were released to a limited circulation list specified by the Authority as part of it getting inputs regarding its completeness evaluation, which includes all affected municipalities. Given that the EIS will be publicly released according to legal processes once deemed complete, there is no gap assigned at the level of basic good practice.

TIWAG has a dedicated area on its public website for the KXP. Public reporting on project performance in some sustainability areas has been through periodic newsletters and through updates to the website.

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.*

Some stakeholders have expressed a high interest in reports which provide important background and contextual information supporting the KXP. Many but not all relevant background and contextual reports have been made publicly available. These include the Options report 2004 (not currently publicly available), the Synthesis Report 2005 (publicly released), the Project of Common Interest reports (considerable documentation including evidence of stakeholder engagement processes can be found on the internet), and the Water Management Framework Plan for the River Inn (publicly released).

As part of its dialogue with the Kaunertal municipality, in 2013 TIWAG collated and responded to a number of areas of stakeholder interest through a Frequently Asked Questions report (available on the municipality website). The questions and responses addressed a wide range of issues, including: impacts to traffic, public health, nature, landscapes, farming, hunting, nature, tourism; implications of glacier retreat; management of landfill, contaminated sites, legacy issues, construction workers, fire risks, dam safety, road safety, slope stability, avalanches, hazardous materials, noise, dust, land rehabilitation; use of local companies; long-term benefits including jobs, taxes and tourism opportunities; legal issues; rehabilitation; and how people's views can be taken into account. As the KXP was suspended, this dialogue with the municipality and the discussions on project benefits (see also topic P-10) is also unfinished at this stage.

Much of what would be of interest to stakeholders is likely to be included in the EIS documents. The completeness check being undertaken by the Authority of the draft EIS is one process that helps ascertain if the information important to stakeholders is adequately included. The EIS documents, once accepted as complete, will be publicly available.

Presentation packages for consultations and exhibition activities have been put together on topics known to be of interest to stakeholders, for example noise, traffic and vibration at the Feichten exhibition day, and fish passage at Runserau weir. However, some stakeholders advised that they are not getting the information that they need to understand the impacts and effectiveness of mitigation measures for areas of importance to them, notably in relation to impacts to nature and to rafting, which is addressed in other topics (e.g. P-13 Project Affected Communities and Livelihoods, and P-23 Downstream Flow Regimes).

Criteria met: Yes

2.2.4 Conformance / Compliance

Analysis against basic good practice

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

The process of submission of the EIS and review by the Authority is in keeping with legally established processes. The Authority concluded that the initially submitted EIS (2012 Revision 0) was not complete, and requested revision work to be done. Revisions required on Revision 0 have been made in the updated EIS (2015 Revision 1), but, along with all other aspects of the KXP EIS, will not be confirmed as fully compliant until such a determination is made by the Authority. At this point in time there are no identified non-compliances..

Questions arise with the KXP about conformance of the project proposal with existing policies and strategies (see topic P-3 Demonstrated Need and Strategic Fit). The wording of this criterion does not ask about conformance,

but is limited to consideration of compliance. The number of legal processes challenging aspects of the KXP with respect to strategies, policies, conventions, rights, etc have not concluded any instances of non-compliance.

Concerns have been raised that TIWAG is working too closely with the government and has undue influence to ensure legal frameworks are adapted and interpreted to suit TIWAG's hydropower expansion plans. Examples for which these concerns or objections have been expressed include the Water Management Framework Plan for the Upper Tyrol, the EU PCI listing, the lack of applicability to TIWAG of a criteria catalogue developed by the Tyrolean government for evaluation of hydropower projects, and a lack of objectivity in TIWAG's published information about electricity supply and demand and energy security in Tyrol. Austria has the legal and judicial frameworks for such concerns to be tested if formally raised through legal processes, and there are no non-compliances.

TIWAG has experience specific to the KXP of an investigation into whether TIWAG was inappropriately sponsoring an activity in the municipality of Kaunertal for the purposes of getting municipal support for the KXP. This concern was investigated through the provincial auditor general and the courts, and no conclusive evidence was found against TIWAG or the Kaunertal mayor. It was, however, a cautionary experience for the corporation to avoid any perception of inappropriate processes; responses to this risk by TIWAG are reflected in their strengthening of their internal policies, guidelines and controls.

Criteria met: Yes

Analysis against proven best practice

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

As stated above, the KXP 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.*

TIWAG has many areas of challenge in relation to the KXP that it has to ensure it has appropriate processes to address. These areas, and TIWAG's actions in relation to them, include:

- Transformation and uncertainties for the energy supply industry and EU electricity market rules and trends; TIWAG manages this through its corporate strategy and risk management processes, and through the gated decision-making process for major projects such as the KXP.
- Perceptions of inappropriate influence, and of the potential for conflicts of interest for the Province given its multiple roles as TIWAG owner, legislator, regulator, and strategy setter; TIWAG has its Code of Conduct and has strengthened its internal governance framework in relation to these areas.
- Various legal challenges; these are progressing through legal processes.
- Low levels of community confidence, illustrated for example by a 2013 survey of 18 Austrian energy sector companies that listed TIWAG second to last; TIWAG has put considerable effort into trying to build community confidence and it will be necessary to see a repeat survey to form a view on their effectiveness.
- Changes in the legal and political framework, e.g. the EU WFD and other EU directives; TIWAG monitors policy developments closely, is committed to adherence, incorporates measures into its business strategy in light of them, and has its gated decision-making process with respect to progression of the KXP.
- Leakage of internal corporate information; TIWAG has its Code of Conduct and processes of internal audit and investigation.

Challenges are well-identified, TIWAG has processes in place to address these challenges, and all are on pathways towards resolution.

Criteria met: Yes

Analysis against proven best practice

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

TIWAG has not yet demonstrated that the actions it has put in place in response to concerns about governance and opportunities for improvement have fully resolved all governance issues, such as those identified in concerns expressed by the departing Supervisory Board member. TIWAG has committed to build community confidence in the company, its actions are in line with this commitment, and measures such as follow-up community surveys may well demonstrate improvements. TIWAG's commitment to continuous improvement was very evident in this assessment. The main unresolved corporate governance issue relevant to the KXP is that relating to corporate policy on disclosure, transparency and stakeholder engagement and processes to support corporate commitments in this area. This is already identified as a **significant gap** under the Assessment criterion in this topic, and so is noted but not double-counted here.

Criteria met: No

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 is an absence of corporate policy addressing stakeholder engagement, transparency and disclosure, including processes to ascertain if stakeholder information needs and interests are being met.

1 significant gap

2.3 Scoring Summary

TIWAG is an established corporate entity, with ownership, supervision and responsibilities well understood. The company closely monitors risk, compliance and effectiveness of its business strategies. Policies and processes are well considered, and TIWAG has developed an extensive system of internal process standards covering almost all aspects of its business responsibilities. Internal and external checks on adherence to process and performance, and identification of opportunities for improvement, are provided through an array of mechanisms, including internal and external reporting, regulatory oversight, audits, independent reviews, guidance by international standards, and engagement with stakeholders. TIWAG has refreshed and strengthened aspects of its corporate governance in recent times, including through new leadership roles and additional guidelines in areas of stakeholder concern (such as relating to sponsorship and fraud). TIWAG meets most proven best practice provisions, with the exception of an opportunity for improvement resulting in one gap against proven best practice, being to strengthen corporate policy and processes relating to transparency, stakeholder engagement and responsiveness, and public disclosure.

Topic Score: 4

2.4 Relevant Evidence

Interview:	4, 6, 8, 10-16, 32, 34, 37, 38, 40, 41, 54, 56, 62, 64, 67, 70, 73, 77, 80
Document:	1-5, 7, 8, 10-30, 33-36, 38, 40, 44, 54, 55, 58, 59, 62, 80, 88, 93, 95-97, 155-157, 174, 175, 178, 179, 182, 187, 188, 190, 224, 226, 228, 229, 231, 237, 246-248, 254-256, 296-298, 309, 336-339, 344, 345
Photo:	-

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

As the largest planned public investment project in Tyrol, the Kaunertal Expansion Project (KXP) has generated considerable discussions on the need for its services, and on its compatibility with and contributions to various relevant strategies and policies, at a number of levels (Europe, Austria, Tyrol, local governments, and TIWAG itself).

The primary justification for the KXP is its contribution to energy objectives, namely the expansion of renewable energy, system stability, energy security, and energy autonomy at affordable energy prices for consumers. Renewable energy would be expanded directly through additional generation, as well as indirectly through the provision of balancing energy, which provides support to the increasing generation from intermittent renewables (wind, solar), especially in neighbouring Germany. Secondary justifications for specific components of the project are related to its contributions to water management objectives, namely flood protection in the Ötztal and improved ecological conditions in the Inn River.

Key policies, strategies and plans that are in place can be summarized as follows:

- ***European level***: The European Union has issued a number of relevant directives, including the Renewable Energy, Water Framework and Floods directives. The Commission also maintains a list of 'Projects of Common Interest' under EU Regulation 347/2013, which support the policy objectives of a common internal energy market and a transition to renewables, and which includes the KXP. There are a number of other supranational policies applicable to the KXP, such as the 2012 joint declaration of the Austrian, Swiss and German governments to develop the pumped storage potential in the three countries, and the Alpine Convention on sustainable development of the Alps, supported by 8 countries.
- ***Federal level (Austria):*** As one of the EU member states, Austria is responsible for the implementation of EU directives. To this end, the national government has issued, for example, national plans for the implementation of the Water Framework Directive (2009, 2015) and the Renewable Energy Directive (2010). Other national level laws, policies and plans also apply.
- ***Provincial level (Tyrol):*** The Austrian provinces have considerable autonomy over many policy areas, including permitting of hydropower stations. The provincial government of Tyrol conducted a strategic planning exercise for the energy sector in 2007, which emphasises energy efficiency and the use of domestic renewable energy sources to mitigate climate change and reduce the costs of and dependence on imports of fossil energy sources. This is against the background of continuing population and economic growth, which led to primary energy demand growth of 48% between 1994 and 2004 and forecasted further growth of 3-15% until 2020, as well as reduced hydropower generation from existing stations by some 10%, due to the release of environmental flows and the introduction of stricter ramp-up and ramp-down rules. The strategy contemplates two scenarios: in one case hydropower is expanded by 1,100 GWh (equivalent to the four projects selected by the provincial government in 2006, including the KXP, from a list of options prepared by TIWAG); in a second, more aggressive case by an additional 200 GWh. The strategy was complemented in 2011 by a catalogue of criteria for hydropower, intended as a guide for provincial authorities in the permitting process, primarily for smaller hydropower stations. The current provincial government has reconfirmed its commitment to the KXP and other TIWAG projects. Other provincial level

laws, policies and plans also apply, including a long-term objective to achieve 100% renewable energy generation by 2050. As the owner of TIWAG, the province also ensures that TIWAG corporate strategies are consistent with its policies, through its appointments to the Supervisory Board.

- ***Local level:*** Municipalities and other entities (such as nature park management authorities, tourism associations, flood management associations etc.) in the project-affected region have their own development plans, investment interests, and budgets. For example, the municipality of Sölden in the Ötztal is planning to expand its own hydropower generation from the currently installed 6 MW (however, any new hydropower projects on the Gurgler and Venter Ache would not be compatible with the KXP), and the municipality of Kaunertal has conducted an 'innovation project' to define priorities for sustainable development of the valley (which may partly depend on revenue from the KXP).
- ***Corporate level:*** TIWAG's corporate mission, strategies and objectives are set by its Supervisory Board appointed by the provincial government, and are oriented towards implementing the province's energy strategy while remaining a commercially successful entity. Specific TIWAG plans are sometimes requested by the provincial government as a basis for political decisions (for example, the 2004 Options Report for new hydropower investments) or to explain the rationale for TIWAG's investment program from a public interest perspective (for example, the 2014 Water Management Framework Plan for the Upper Tyrol, which encompasses 6 larger hydropower projects, 3 of which are included within the KXP; this plan was approved by the federal Minister for Agriculture, Forestry, Environment and Water in 2014).

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.*

There is no single assessment of the planning context for the KXP, but there is a wide variety of relevant documents, which can be grouped as follows:

Needs, Options and Policies & Plans for Energy Services:

From its long-term presence in a deregulated and competitive generation market, TIWAG is well aware of the electricity needs in the Tyrolean and neighbouring markets. Total electricity generation in Tyrol in 2014 was 6,819 GWh, 95% of which from hydropower, and total consumption 6,181 GWh. The dominant retailer of electric power is TIWAG, which in a typical year sells approximately 5,500 GWh while it generates 3,100-3,200 GWh internally and purchases the rest on national and international markets. Power purchases include: some 600-800 GWh from the OeMAG, a marketing agency for subsidised renewables that every Austrian retailer has to purchase from; some from long-term trading relationships with large German utilities, which buy summer peak load in exchange for winter base load; some from smaller generators in Tyrol; and some from wholesalers. Due to its flexible and reliable generation capacity, TIWAG has supported regional, national and international system stability and supply security.

In 2016, TIWAG also increased its shares in power plants jointly owned with the second largest generator, Verbund. The generation from Verbund and from the ÖBB (Austrian Railways) is not available for retail in Tyrol, and non-electric energy (for mobility and heat) are largely provided by imported fossil fuels, which is why the Tyrolean energy strategy requires additional domestic generation for provincial energy autonomy.

Electricity generation in the large interconnected European grid has been generally stable over time, but is characterised by a changing mix of sources, and may increase over time as heat and mobility are increasingly

provided by electricity. The KXP would support the Tyrolean, Austrian and European-level plans to increase the shares of intermittent renewables, supply security and grid stability, and market integration. Specifically, the KXP would generate about 913 GWh per annum, reduce net imports of fossil fuels or electricity from fossil fuels, and displace CO_2 emissions by significant amounts.

The balancing energy from additional (pumped hydro) storage plants like the KXP would largely be required in Germany, the largest regional market with an aggressive program to replace fossil fuel and nuclear electricity generation with renewables. The KXP would be able to sell a range of different products on different markets (long-term, spot, intra-day, primary and secondary balancing, and reserve products, both to distributors and to transmission system operators). While power prices are currently low and the spread between peak and base load prices is small, and therefore hydropower plants in general and pumped storage plants in particular are financially not very attractive, this is expected to change over time as the need for balancing power becomes greater after 2025. The market prospects have been assessed through TIWAG's own modelling capacities and independent reviewers, predicting for the period 2030-2035 that prices will approximately double, with higher volatility (see also topic P-9 Financial Viability). The increased value of pumped storage for the 2030-2035 period in the Central European market is generally confirmed by recent studies, which point out that larger storages (with longer pumping cycles, for example between weekdays and weekends, and even seasonal storage) and high dispatch flexibility are expected to be most valuable. Naturally, all such assessments are subject to significant uncertainties in a rapidly changing energy market, and are intended to be revisited closer to an investment decision for the KXP.

Because the KXP pursues two major objectives and serves two different market segments with its conventional hydropower and pumped storage components, there would be many alternative options to achieve these objectives. Both additional renewable generation and additional balancing energy could be achieved with different technologies at different locations. Provincial-level targets place low emphasis on wind and solar PV power. It is generally accepted that wind power is neither technically nor visually well adapted to the mountainous terrain of Tyrol. There are government initiatives for solar PV (such as a survey of roofs with high potential) and initial small-scale investments by TIWAG, but recent TIWAG studies have shown a lack of commercial viability at this stage due to the high levelised cost of electricity (LCOE). Amongst hydropower alternatives, the KXP has been identified as a preferred option through a process of technical assessments (such as various studies on the hydropower potential of Tyrol, the last one by ILF Consultants for the province in 2012, TIWAG's 2004 Options Report, and the provincial government's multi-criteria evaluation in the 2005 Synthesis Report) and political decisions by the provincial government (such as the provincial energy targets for 2020 and 2050, the selection of a number of projects, including the KXP, and the corporate strategy for TIWAG), supported by the federal government. One of the criteria used in selecting projects was their size, in order to make a meaningful contribution to objectives and to use water resources effectively. This is one of the reasons why the provincial government prefers the use of water from the Ötztal through the KXP, with a much higher head, rather than through small plants in the Ötztal. However, because the previous application by the municipality of Sölden for a small plant on the Gurgler Ache has been upheld by the courts, a compatible solution will have to be found.

The KXP has also been listed by the European Commission as a 'Project of Common Interest' (PCI), which requires a project to 'have a significant impact on the energy markets and market integration of at least two EU countries, boost competition on energy markets and boost the EU's energy security by diversifying sources, and contribute to the EU's climate and energy goals by integrating renewables'. Western Tyrol has well-established high-voltage interconnections to Germany, the province of Vorarlberg, and Switzerland with spare capacity, and is thus well positioned to export and import additional generation. Due to formal requirements of the Trans-European Energy Networks (TEN-E) regulations, the entire KXP package has to be submitted to the European Commission, while the PCI status can only be provided for its pumped hydro storage module.

Needs, Options and Policies & Plans for Water Services:

Water resource management issues in the project region (i.e. the upper Inntal from Haiming to Tösens, with its three tributary valleys Ötztal, Kaunertal and Platzertal) are: domestic, agricultural and commercial water supply (including for snow making); flood management; river ecology; the aesthetic, cultural and recreational value of rivers (of relevance both for residents and for tourists); and hydropower generation. The objective of water resource management is to balance these objectives, within a given regulatory framework.

The needs for a range of water services were recognised in the provincial government's 2005 Synthesis Report which provided its evaluation of TIWAG's 2004 Options Report. For each of the 16 options, the evaluation considered, among other criteria, the effective energetic use of the water resources, alteration of natural hydrological regimes, contribution to flood management, exposure to climate change, river connectivity, required minimum flows, effects on municipal water supplies, on groundwater, on water quality, on high-conservation value aquatic habitats and species, and changes to recreational values. This evaluation was at the pre-feasibility level, with limited data availability, and could not yet consider the current configuration of the KXP. Among the available options, the KXP was rated relatively low with respect to social and environmental issues, which included the criteria mentioned above, except regarding flood management. However, the analysis also recognised that it is difficult to compare large projects like the KXP to small projects, and to compare pumped storage projects to storage and run-of-river projects due to their different characteristics in terms of operation and market purposes. There is widespread agreement that small projects in Tyrol are often financially unviable, especially when confronted with requirements to improve the ecological status of their river stretches.

The need for improved flood management is particularly relevant for the Ötztal, which has suffered from periodic floods (for example, in 1987 with 13 fatalities), and for the Inntal (for example, in 2005); flood risks are expected to increase with climate change. One study (Strobl 2006) compares technical options for the Ötztal (the KXP vs. a reservoir on the Rofenache, a tributary to the Venter Ache). In the EIS, one of the public interest expert opinions, from the point of view of flood protection, provides a detailed assessment of the potential contribution of the KXP (Petrascheck 2015). The combination of reducing the flood peak in the Ötztal by up to 80 m^3/s through the diversion tunnels, increasing the flood buffer through additional storage in the Platzertal reservoir, and increasing the ability to manage additional floodwaters in the Gepatsch reservoir through a second tunnel to the Inn River and through increased flood retention space in the reservoir, is seen as effective in reducing flood risks. The costs for the flood protection components of the KXP have been partially assessed (the additional tunnel capacity from the Ötztal to the Kaunertal, beyond what would be optimal from a pure hydropower perspective, is estimated at € 30 million; but there are no estimates for the costs of operational constraints on the reservoirs). Some non-technical options for flood management in the area, such as flood retention in natural floodplains, have been realized over the past ten years, but these are limited in scale because both the Ötztal and the Inntal are relatively narrow with high-value uses.

The need for improvement of the river ecology has been established through Austria's first two National Water Body Management Plans (2009, 2015), which address the first two periods for implementation of the EU Water Framework Directive. The first plan focused on the main rivers (such as the Inn as well as the lowest section of the Ötztaler Ache), the second one their main tributaries. Key objectives with relevance for the KXP in the plans are the improvement of connectivity, minimum flows, geomorphology, and reduction of negative impacts from peaking and water storage. In priority regions, the national plans are broken down further into regional plans and programs. TIWAG's 2014 Water Management Framework Plan for the Upper Tyrol, which has been declared to be in the public interest by the Federal Government, can be seen as such a plan. Chapter 10 addresses the contribution of the KXP to the relevant objectives. The impacts on the key objectives mentioned above in the multiple river stretches affected are highly complex. In summary, however, the KXP together with the other projects in the plan and their mitigation and compensation measures, are seen as affecting longer stretches of river more positively than negatively; in particular, a significant improvement of the peaking situation along the Inn is predicted, with the exception of a short stretch between Prutz and Runserau. Some groups such as WWF have expressed concerns that the plan was designed to justify the KXP after it had been selected. However, the

plan is able to show that from a cumulative point of view, and with an appropriate sequence and combination of projects, it is possible to get closer to the objectives of the Water Framework Directive than the status quo, while simultaneously addressing other policy objectives, also backed up by EU directives (specifically, on renewable energy and floods). Also, no component of the KXP would directly affect a protected area in a relevant manner, i.e. by affecting conservation objectives.

The need for domestic, agricultural and commercial water supply has been articulated in some areas where water is expected to become scarcer or more valuable in the future. This has not been described in the EIS, but applies particularly to the Ötztal, where total flows would be reduced by the KXP. In response to concerns for the low-flow season (winter), when future water demand for snow-making is expected to increase, the KXP would not divert water during the winter. The need for river uses for recreational purposes (in particular for fishing, kayaking and rafting) has been assessed in the Human Uses section of the EIS. These issues are further discussed under topic P-13 Project Affected Communities and Livelihoods.

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.*

There has been significant dialogue over the Tyrolean energy and water resource management strategies in general, and the KXP in particular. This dialogue in different forums, such as the provincial parliament and municipal councils, consultation and discussion events, and multidisciplinary expert groups, is reflected in the assessment documents outlined above.

Some key stakeholder groups that disagree with the KXP claim that they have not been appropriately involved in dialogue. WWF together with a number of other environment and recreation organisations presented a plan for ecological improvement of the Upper Inn and its tributaries in 2013, and requested the government to declare this plan to be in the public interest. The WWF plan would not be compatible with TIWAG's plans, in particular with any water diversions in the upper Ötztal, as it only recommends hydropower development on a small number of degraded river stretches. It is based on a WWF 'Eco-Masterplan' for Austria (3rd version 2014), which identified river stretches with different ecological values, at the same scale as the National Water Body Management Plans. Some of these high-value river stretches, including the Gurgler and Venter Ache, have previously been identified among 74 'river jewels', a 1998 designation that was also supported by the federal environment ministry. In 2011, WWF also published an assessment of the 12 'most damaging new hydropower projects' in Austria, showing that the KXP affected the highest number of 'highly sensitive' criteria, according to the Austrian federal criteria catalogue.

Certain key documents – such as the 2004 Options Report, which introduced the KXP for the first time, and the Water Management Framework Plan for the Upper Tyrol, which justified the KXP as part of a larger package – were developed internally by TIWAG, and not initially shared with stakeholders outside the provincial and federal governments. Dialogue is constrained by the fact that not all assessment documents are publicly available, or easily available, or available in a draft form and in a timely manner for stakeholders to react and contribute. The municipality of Sölden claims that attempts at dialogue with TIWAG have been unproductive, even after the courts decided in favour of the municipality over competing project proposals. WWF claims that attempts at dialogue with TIWAG or the provincial government, for example over the WWF reports mentioned above, have been rejected. The rafting association claims that they have no access to the section of the EIS describing the impacts on rafting, and that dialogue with TIWAG has been frustrating, with mitigation options offered by TIWAG that may not be feasible because they would introduce new flow variations. A TIWAG Supervisory Board member has resigned over (amongst other issues) the difficulty to conduct an open dialogue over the KXP. Some

stakeholders have resorted to the courts, claiming insufficient opportunities for dialogue. The perception of inadequate opportunities for informed dialogue on the need for and strategic fit of the KXP is seen as a **significant gap** against proven best practice.

The assessment process in general shows strong emphasis on social and environmental needs, policies and plans. The contribution of the KXP to climate change mitigation (in the case of increased renewables) and adaptation (in the case of flood management) are key justifications for the project. The second versions of both the Water Management Framework Plan for the Upper Tyrol (2014) and the KXP EIS (2015) show strong awareness of water management objectives, including the objective to avoid, minimise and compensate (as closely as possible to the impact site) negative ecological effects, and where possible to reach a net ecological benefit (defined as longer river stretches with improved status than river stretches with deteriorated status). Legally, a deterioration of status is only allowed as an exception, where it can be shown to be in the public interest (hence the interest in having the plan so declared by the federal government). While the plan for the Upper Tyrol is primarily developed from a sustainable energy development perspective, it deals comprehensively and in an integrated manner with other water management issues.

Criteria met: No

3.2.2 Stakeholder Engagement

Analysis against basic good practice

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

As mentioned above, there is not any one document that would summarise the results of the assessment of 'strategic fit'. Those results are distributed across multiple documents, some of which are not easily available and many of which have been contested. It is thus not easy for the general public to form an opinion about the KXP. However, the most important documents that demonstrate the need for the KXP – the Tyrolean energy strategy – and the strategic fit of the KXP - the Water Management Framework Plan for the Upper Tyrol and the KXP EIS – have been or will be made publicly available.

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.*

Available documents describe the strategic fit of the KXP with energy and water sector objectives, and various government levels (provincial, federal, European) have declared the project to be in the public interest, assuming that negative impacts can be mitigated to a level that is deemed acceptable, and a permit will be obtained.

A complex project such as the KXP, which affects multiple jurisdictions and multiple sectors with their own plans, will rarely be compatible with all such plans. Opponents point out, for example, that the KXP is not compatible with plans for water and energy services for the Ötztal, as it affects high-conservation value rivers and interferes with local plans for a small hydropower plant on the Gurgler Ache. However, those high-conservation value rivers are not officially protected, the intakes have been moved below the highest villages in the Ötztal, and the local hydropower project would not have the same strategic value as the KXP and would itself affect the high-conservation value rivers in a similar way as the KXP. Also, TIWAG has stated its willingness in principle to negotiate with the proponents of the small hydropower project, or to design the KXP in a way that would not

affect the local project. To support the conclusion that the diversion of water from the Ötztal is in the public interest, TIWAG conducted a study in 2014 to compare the different hydropower development options in the Ötztal, with and without TIWAG's two large-scale projects that would divert water from the Ötztal (the KXP and the expansion of the Kühtai project). There are up to 9 possible sites for run-of-river projects in the Ötztal. In a scenario without TIWAG's two large-scale projects, 7 of these would be plausible, with a total generation of 485 GWh/a. In a scenario with TIWAG's two large-scale projects, 4 of these would be plausible, with a total generation of 112 GWh/a. The water diverted from the Ötztal would generate another 806 GWh/a of high-value balancing energy.

In summary, the strategic fit of the KXP has been demonstrated.

Criteria met: Yes

Analysis against proven best practice

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

While the KXP was among the projects identified by TIWAG in the early 2000s and was selected by the provincial government as one of four projects to be pursued in more detail, there is a lack of clarity about that initial government decision and a lack of later comparative analyses that would demonstrate that the KXP is a priority option to meet demonstrated needs.

The selection by government does not follow clearly from the 2005 Synthesis Report, where the KXP was not among the projects preferred by the expert group because they were well-balanced between technical, economic, social and environmental criteria. The KXP belonged to a second group with a strong performance on technical and economic criteria.

From an energy point of view, the 2005 Synthesis Report comparison of the 16 options identified by TIWAG was largely qualitative. Renewable energy generation and energy storage technologies other than hydropower were not included in TIWAG's options, or at a later stage. Results of internal comparisons of advantages or disadvantages of different versions of the KXP (for example, the current configuration vs. a pure pumped storage project vs. an expanded generation project) have not been publicly discussed. While two of TIWAG's key conceptual objectives (use of existing infrastructure, and combination of expanded generation with pumped storage) are plausible, they may have constrained the range of options considered to meet the range of broader societal objectives.

From a flood protection point of view, a full range of options with their costs and benefits has not been compared (see also topic P-11 Economic Viability), so that it would be difficult to say that the KXP is the most cost-effective option. However, there is clearly an advantage in using infrastructure that is already required for the KXP, with only some modifications to design and operations.

From a river ecology point of view, while the whole package of projects described in TIWAG's Water Management Framework Plan for the Upper Tyrol may have a cumulative net benefit, primarily in terms of reducing peaking impacts on the Inn River, some of this is already achieved by the GKI project under construction. The alternatives assessed in the plan are the full package of projects versus the zero or baseline alternative, not the other possible combinations. It is also not clear whether the alternative regional plan presented by the NGOs in 2013 has been assessed by government and compared with TIWAG's plan. There does not seem to be an assessment of the most cost-effective way to achieve the river ecology objectives of the National Water Body Management Plans in the region, and the contributions that the KXP and other initiatives could make in a coordinated manner (see also topic P-19 Biodiversity and Invasive Species). Options to compensate for negative impacts by removing some small, inefficient power plants in the region have been explored, but no obvious candidates were identified.

In summary, there is not sufficient evidence to conclude that the KXP is a priority option to achieve the objectives listed above, which is a **significant gap** against proven best practice.

Criteria met: No

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 is a perception of inadequate opportunities for informed dialogue on the need for and strategic fit of the KXP.

There is insufficient evidence to conclude that the KXP is a priority option to achieve all relevant demonstrated needs.

2 or more significant gaps

3.3 Scoring Summary

The KXP responds to a range of needs. The expansion of pumped storage capacity is of European interest to integrate markets, increase supply security, and provide balancing power for an expansion of intermittent renewables. An increase in renewable generation also contributes to national and provincial objectives of mitigating climate change and increasing energy autonomy. With the addition of project components along the Inn River, the KXP also contributes to objectives of the Water Framework Directive regarding improved aquatic ecology conditions. Finally, the KXP contributes to flood control objectives. It is rare to find all these objectives delivered through one project; however, this also results in a complex package of project components.

There are two significant gaps with regards to proven best practice, resulting in a score of 3. Firstly, there is a perception by critical stakeholders that there has been inadequate opportunity for informed dialogue on the needs for the project and its strategic fit with all relevant plans. Secondly, there is no systematic analysis of alternatives to demonstrate that the KXP is the priority option to satisfy all these objectives.

Topic Score: 3

3.4 Relevant Evidence

Interview:	4, 6, 8, 10, 12, 18, 42, 54-56, 79
Document:	5, 35-40, 47, 51, 53, 152, 154, 167, 169, 179, 190, 196-197, 323-325, 327
Photo:	22

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 features of the Kaunertal Expansion Project (KXP) are exceptionally complex, covering multiple project components over a large project region. The most important components can be grouped as follows:

- Transfer of water from four intakes in the upper Ötztal to the existing Gepatsch reservoir in the Kaunertal, and its use to expand generation in a series of three power plants in the Inntal with expanded local water storage, and connected by tunnels; and
- Establishment of a pumped storage loop between the Gepatsch reservoir (as the lower reservoir) and the new Platzertal reservoir (as the upper reservoir), with a new power/pumping plant.

Project siting and design has evolved over several decades. The existing Kaunertal power station built in the 1960s uses water from three upper valley catchments (the Kaunertal, Pitztal and Radurschltal); already at the time there were considerations to transfer water from additional catchments and to add an upper stage to the Gepatsch reservoir. There have also been many different technical proposals for the Ötztal, one of the valleys with the largest and largely undeveloped hydropower potential in Tyrol. After selection of the KXP for further development by the provincial government in 2005, more focused siting and design studies were conducted. Several components were modified in this process (for example, the locations of the Ötztal intakes and the upper reservoir), and between the first submission of the Environmental Impact Statement (EIS) in 2012 and the second submission in 2015, several additional changes were made and components along the Inntal were added.

The footprint of the KXP is relatively small, compared to its generation potential, because: (1) existing infrastructure is used to the extent possible (such as the Gepatsch reservoir, Gepatsch-Prutz pressure shaft, transmission lines, the Haiming power station where a third unit will be installed, spoil deposits, and sites such as the Prutz power plant, which will not require expansion due to a very compact design); (2) much of the new infrastructure is underground; and (3) the high altitude difference provides the opportunity to harness high head. The most important new aboveground components are the reservoirs (see also topic P-22 Reservoir Planning).

This topic is related to a number of other topics which are affected by siting and design choices. The outcomes for specific issues are generally discussed under those topics, while P-4 focuses on the process of evaluating and deciding between siting and design alternatives. Measures to avoid, minimise or compensate impacts during construction and operations are only addressed under P-4 if they are related to the siting and design of KXP infrastructure.

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.*

TIWAG's 2004 Options Report included two variants for the KXP, as well as other options for harnessing the waters of the Ötztal and other valleys in Tyrol, and included some preliminary environmental and social information. Its evaluation in the 2005 Synthesis Report commissioned by the provincial government, by an interdisciplinary expert team, took multiple criteria and sources of information into account and already identified some issues with the KXP that would have to be addressed in the detailed preparation process.

In the following years TIWAG and a range of consultants conducted extensive investigations. On the technical side, these included:

- Geological and geotechnical site and underground investigations, at a total cost of € 38 million (see also topic P-8 Infrastructure Safety). These investigations have been thorough and have relied on multiple methods and sources. They often took years to prepare, to obtain landowner permission and the required government approvals, and had to be conducted under multiple constraints in the high alpine environment;
- Evaluation of long-term hydrological monitoring results (see also topic P-7 Hydrological Resource); and
- Hydraulic scale testing of different design options, for example by the University of Innsbruck for the Platzertal dam and Gurgler and Venter Ache intakes (in particular, for the bottom outlet and spillway designs, and sediment management).

Some of these investigations were supported by the long presence of TIWAG and others in the region. For example, earlier drilling results from the Austrian Railways at Imst could be used. In parallel, environmental and social investigations were conducted to identify impacts of preliminary siting and designs alternatives, summarised in the EIS for the preferred configuration (see also topic P-5 Environmental and Social Impact Assessment and Management); financial and economic models and studies for different alternatives were evaluated (see also topics P-9 Financial Viability and P-11 Economic Viability); and the implications of the evolving regulatory framework (for example, with respect to the first National Water Body Management Plan in 2009) were analysed.

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.*

Among the considerations that were identified during the siting and design process, and taken into account in the options considered, are the following:

- The very high head available between the water sources and the Inntal, enabling substantial generation from relatively small amounts of water;
- The significant impacts on the Inn River from current operational regimes (peaking from upstream plants in Switzerland, which is being mitigated by the design and operations of the GKI; peaking from TIWAG's existing Kaunertal project; and water diversions through TIWAG's existing Prutz-Imst project);
- The significant additional volumes of water that an inter-basin transfer from the Ötztal to the Kaunertal will add to the Inn River between Prutz and the confluence of the Ötztaler Ache and the Inn, which could create additional peaking impacts;
- The high value of winter season flows in the Ötztaler Ache;
- The opportunity to contribute to flood protection in the Ötztal and to a lesser extent, the Inntal; and
- The high sensitivity of the upper river reaches in the Ötztal.

These considerations were identified over time; first comprehensively described in the Water Management Framework Plan for the Upper Tyrol, which defined the KXP in its current configuration; and then reflected in detail in the 2015 version of the EIS.

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.*

All TIWAG projects undergo extensive siting and design processes. For the Gemeinschaftskraftwerk Inn (GKI), for example, several major alternatives have been considered since a project on this reach of the Inn River was first conceived almost one hundred years ago. During the recent feasibility studies, these alternatives included: a tunnel on the left instead of the right bank of the Inn; additional intakes between the weir at Ovella and the powerhouse; a powerhouse at the Runserau reservoir instead of at Prutz; and an aboveground powerhouse, instead of the finally realised underground powerhouse. All alternatives were investigated through multi-disciplinary studies. Nevertheless, unexpected geological problems at Ovella have led to significant delays, showing the relevance of sufficiently detailed preparatory studies and optimisation processes.

The core siting and design decision for the KXP is to combine expanded generation with pumped storage. The main driver for this decision is the storage capacity of the existing Gepatsch reservoir:

- The Gepatsch reservoir is too small to handle the inflows from the Ötztal by itself, without additional reservoir space, in terms of storing water for the low-flow winter season and for flood storage. Raising the crest of the Gepatsch dam is technically infeasible, thus requiring an additional reservoir; and
- Building only the pumped storage upper reservoir, without additional water from the Ötztal, would allow for only a weekly pumped storage cycle whose value is significantly lower than for cycles beyond a week, but at almost the same costs and impacts as the upper reservoir with its current storage.

Since 2004 the KXP has seen numerous changes concerning siting and design, in particular for the following components:

- ***Upper stage reservoir***: The main considerations for locating an upper stage reservoir are geological conditions, safety, availability of construction materials, accessibility, distance to and elevation difference with the lower stage reservoir Gepatsch, costs, and environmental and social impacts. The ideal location would be relatively close to and high above the Gepatsch reservoir. In the 2004 Options Report two different sites were considered, Rifflsee in the Pitztal and Rofenache in the Ötztal. These were excluded because of a combination of geological and environmental/permitting issues. Next investigated were Taschach in the Pitztal and Fernergriess in the Kaunertal (both excluded largely because of geological issues and, in the case of Fernergriess, because it is located in a Natura 2000 protected area, where TIWAG would have had to demonstrate that there is no reasonable alternative outside the area). The final Platzertal site was chosen after resolving that access could be built through a tunnel from the Kaunertal, without affecting the lower valley. Dam axis and design were then optimised to ensure that all material for the dam can be extracted from the reservoir area and tunnels, almost all construction activities can take place in the reservoir and dam area, and impacts on cattle farming and archaeological remains from mining are avoided or minimised. The outlets are designed to minimise impacts on the Platzerbach, which has a very small capacity, even in the event of emergency releases from the reservoir.
- ***Pressure tunnel from the Gepatsch reservoir to the River Inn***: Various options exist to transfer the additional water from the reservoir to an additional power plant on the Inn River, and to transfer the power from and to the new power/pumping plant at Versetz. After discussions with local municipalities, it became clear that the additional power plant should be located next to the existing Prutz plant, and that a high voltage transmission line would significantly impact the lower Kaunertal. The solution is to convert the existing pressure tunnel to a cable tunnel, and to build a larger new pressure tunnel that can handle both the current and the additional volumes of water. The new pressure tunnel was designed without additional adits, which would also have created visual impacts.

- ***Water intakes in the Ötztal***: Traditionally, hydropower planners in the region considered approximately 2,300 masl as an ideal elevation for water intakes. Because of protected areas and ecological sensitivity, however, the intakes are now located at approximately 1,850 masl below the highest villages, which means they have to feed into the lower and not the upper pumped storage reservoir. Also, from a purely technical-economic point of view, the optimal capacity of the transfer tunnel to the Gepatsch reservoir would have been approximately 50 m^3/s, instead of 80 m^3/s which was chosen to provide better peak flood protection, even if maximum diversion may only occur during two or three days a year. This tunnel will also be built without additional adits. The small reservoirs with their intakes on the sides are designed to be operable even at high flows with a high sediment load. The Gurgler Ache intake is on the right side of the river, to minimise impacts on the Natura 2000 protected area. The dams are now designed as concrete instead of rockfill dams, which makes them smaller and less visible; the overflows are designed to create a visually more appealing flow of water; and the reservoirs are in gorges, minimising visual impacts in particular on the Venter Ache.
- ***Components along the Inn River, to add generation and improve the ecological situation***: Three additional tailwater basins at the expanded power stations Prutz, Imst and Haiming are built, and the Runserau weir is raised, to be able to store additional water and reduce peaking impacts on the Inn River. The additional water diverted from the Ötztal will pass through a series of tunnels between the power stations and will not impact the Inn, until it is returned at Haiming just downstream of the confluence with the Ötztaler Ache, where it would be flowing naturally. The only section of the Inn with increased flows and increased peaking will be between Prutz (location of the additional power station Prutz II) and the Runserau weir (diversion into the additional Prutz-Imst pressure tunnel); fish will be able to bypass this short section through a channel on the left river side. Several alternative locations and designs for each tailwater basin were considered, to find a balance between capacity, costs and impacts (for example, on neighbours' heat pumps at Imst).

There are multiple other examples of components which have undergone an optimisation process, either to reduce costs, to improve safety or operational flexibility, or to avoid, minimise and compensate impacts. Some components are primarily designed to benefit local communities. For example, while most construction traffic around the Gepatsch reservoir will be on the west shore road, there is a commitment to improve both the west and the east shore roads concerning avalanche safety, thus securing winter access to the Kaunertal skiing resort (which is regularly cut off by avalanches in this section). A number of small infrastructure measures are planned to compensate directly affected groups, such as improved water and power supply and road connections for the summer cattle pastures. The list of avoidance, mitigation and compensation measures for impacted forests, moors, pastures and streams is extensive and has evolved considerably over time. Compensation measures also include, where compensation close to a project component is not possible, a number of activities in neighbouring valleys.

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.*

Local stakeholders have been informed of early conceptual designs of the KXP since 2005. Information materials and consultation events have been supported by non-technical materials, such as visualisations (e.g. the

reservoirs against the background of the Gurgler-, Venter- and Platzer valleys), to help stakeholders understand implications of siting and design choices. When significant design changes were made, updated information was provided.

In several cases, local stakeholders confirmed that siting and design ideas were adapted from the first versions discussed in initial conversations, to later versions. This applies to a large number of components. For example, both larger components (e.g. the transmission line Prutz-Versetz, the surface design of the Platzertal dam) and smaller components (e.g. a small spoil deposit at the Gurgler Ache intake) were made less visible through design changes, after conversations with affected stakeholders. Some components have also been adapted for other stakeholder interests. For example, by filling up gaps left by the original spoil deposits at the bottom of the Gepatsch dam, and reducing the slope of the lower part, that area will become more useful as cattle pasture once it is rehabilitated. In some cases, TIWAG project planners reacted to stakeholder concerns by suggesting improvements themselves; in some cases they accepted suggestions from stakeholders; in some cases where changes were not considered feasible, this was explained to stakeholders. On a number of occasions, additional studies were conducted to explore the feasibility of stakeholder suggestions (for example, a traffic study to determine the best options for construction and public traffic on the east and west shore roads along the Gepatsch reservoir, and a hydropower options study for the Ötztal).

Stakeholders can continue to raise issues and receive feedback through the mechanisms described under topic P-1 Communications and Consultation.

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.*

The siting and design of project components has been influenced both by expert studies and by public feedback. All stakeholder groups have had opportunities and continue to have opportunities to engage in discussions on siting and design issues, as described in topic P-1 Communications and Consultation.

Some stakeholders have reported not being aware of the latest status of siting and design decisions that will affect them. For example, there is some uncertainty over the extension of the increased reservoir surface at Runserau, and how agriculture and other uses in the floodplain might be affected by changed groundwater levels caused by a raised water level in the reservoir, an excavated river bed, and the planned slurry trench walls along the reservoir. There is also some uncertainty with farmers and local authorities over the design of the dam face in the Platzertal. Stakeholders have repeatedly raised concerns that the dam face should be of a low slope, with vegetation cover, possibly to be used for grazing, and in any case not as visually intrusive as the Gepatsch dam in the neighbouring Kaunertal. It is unclear whether the technical and financial complexities, and the design compromise which involves a surface design using the same rock as on the surrounding slopes, have been sufficiently communicated to them.

Some of this uncertainty is due to issues with disclosure and with a lack of thorough and timely feedback, which are significant gaps already identified in topics P-1 Communications and Consultation and P-2 Governance and will not be double-counted here. Finally, some of it also appears to be due to some stakeholders not being sufficiently interested at this stage in obtaining the information, which TIWAG would be willing to supply if asked directly, or opposed to the project in principle and not interested in siting and design details.

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.*

The current siting and design status of the project, which may evolve further during the permitting process, is the result of many choices that took sustainability issues into account, as described above. Siting and design principles have included adding value to existing project components, and thus avoiding additional impacts; locating a number of components underground (Versetz power station, access roads, transmission lines, water transfer and pressure tunnels); and enabling other benefits such as flood control and improvement of aquatic ecology along the Inn River. No resettlement and no relocation of public infrastructure are required, and impacts on protected areas are minimal.

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 preparation process has been able to identify all relevant sustainability considerations. Most stakeholders including provincial government representatives appear to accept the compromises that have been found between technical, economic, social and environmental considerations. There is a sizable group of stakeholders in the project region, however, above all in the Ötztal and in groups concerned with the environment, tourism and recreation, that are dissatisfied with the consultative process and not convinced that the KXP represents an optimal or 'best fit' solution. To several stakeholders, irrespective of the design solutions described above, the siting of the KXP in the Ötztal and the diversion of its water is not acceptable. Since many siting and design features in the 2015 EIS Revision 1 are relatively new and have only recently been released to some stakeholders, there has not yet been an opportunity to gather feedback. Neither have the authorities had an opportunity to comment on the siting and design, and with the permitting process currently suspended, this opportunity may be some time off. At this stage, therefore, it would be premature to conclude that the KXP represents an optimal siting and design, which is considered a **significant gap** against best practice.

Criteria met: No

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

There is insufficient evidence to conclude that the KXP represents an optimal siting and design.

1 significant gap

4.3 Scoring Summary

Siting and design concerns the multiple individual project components, once the project concept has been selected (as described under topic P-3 Demonstrated Need and Strategic Fit). Overall, the KXP benefits from a small physical footprint compared to its generation potential. Many project components have been sited and designed in a well-considered and well-balanced way that avoids or minimises impacts, or increases benefits. Some positive siting and design features address legacy impacts (for example, peaking impacts on the Inn River

from upstream projects, and spoil deposits at the foot of the Gepatsch dam from the original construction in the 1960s). The multiple siting and design criteria have led to a highly complex project.

Not all stakeholders are prepared to accept the compromises that went into the siting and design decisions. Some of this reluctance is due to issues with disclosure and feedback, addressed under other topics. Some of it is due to alternative visions of how water should be used or how river health should be restored. Stakeholders and authorities have not yet had an opportunity to review the latest siting and design changes in Revision 1 of the EIS. There is insufficient evidence at present to conclude that the current siting and design represents an optimal balance between different sustainability considerations. This is a significant gap against proven best practice, resulting in a score of 4.

Topic Score: 4

4.4 Relevant Evidence

Interview:	1, 3, 5, 10, 52-56, 60, 65, 68, 71, 72
Document:	4, 5, 41-46, 48-50, 52, 81, 99, 115, 216-222, 226, 227, 323-325
Photo:	8-10, 13, 22, 34, 41, 60, 62

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

In Austria, hydropower plants larger than 15 MW require an Environmental Impact Assessment (EIA) and the Provincial Government is the competent authority to licence the project. Hydropower plants less than 15 MW do not require an EIA, and in cases the licencing falls under the competence of the District administration.

The Provincial Government of Tyrol (Department of Environmental Protection) has the competence to licence and approve the Kaunertal Expansion Project (KXP) Environmental Impact Statement (EIS) and the EIA after the public consultation. TIWAG submitted an EIA concept to the Provincial Government in 2008 for approval. TIWAG submitted an initial EIS to the Provincial Government in June 2012 (EIS Revision 0). The Provincial Government then published a Report on the Evaluation of Completeness to complete the EIS in May 2013. In response, TIWAG submitted a revised version of the EIS to fulfil the requirements of the Provincial Government in May 2015 (EIS Revision 1). TIWAG has suspended the EIA process until it has resolved conflicts concerning water rights at Gurgler and Sölden municipality's application for a small HPP in Ötztal.

KXP is subject to regulatory review by national authorities in accordance with the European Union (EU) Directives such as the EIA Directive, Habitats Directive, Birds Directive, Water Framework Directive, and associated national laws. National legislation does not specifically require an assessment of social impacts and intangible cultural heritage. KXP should also follow the Alpine convention and its protocols.

Communication and consultation is dealt with in detail in topic P-1 Communications and Consultation. This topic covers broad environmental and social assessment and management processes. Specific environmental issues are dealt with in topics P-19 to P-23, and specific social issues are dealt with in topics P-13 Project Affected Communities and Livelihoods, P-17 Cultural Heritage, and P-18 Public Health.

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.*

The EIS Revision 1 includes impact reports on environmental and social aspects for construction and operation. Environmental aspects include terrestrial and aquatic fauna, flora and habitats, landscape, soils, climate, surface and groundwater quality, noise and air pollution, and cultural heritage. Austrian EIA guidelines do not require assessment of social issues, but the EIS includes an analysis of impacts on leisure, recreation, tourism, agriculture, forestry, hunting, fishing, regional and inter-regional planning and transport, and effects on human health. KXP EIS Revision 1 addresses the comments of the Tyrolean Government on the Report on the Evaluation of

Completeness. The EIS describes how comments were considered. This revision involved additional field surveys of freshwater ecology and terrestrial biotopes.

Associated project facilities such as landfills, camp sites, access and by-pass roads, and the Runserau fish passage are included in the assessment. The project does not require a new overhead transmission line. The existing headrace tunnel from Gepatsch to Prutz will be re-fitted and re-used as a tunnel to house the transmission.

The project documentation identifies the land take requirements and land rights; however, impacts of land acquisition are not included in the EIS. More details are provided in topic P-13 Project-Affected Communities and Livelihoods.

The Upper Tyrol Water Management Framework Plan and its environmental analysis (similar to an SEA) proposes measures to address cumulative impacts of large hydropower projects in the region. Austrian EIA guidelines require an assessment of cumulative effects with other projects. The EIS addresses cumulative impacts with different project components, in the assessments of traffic, emissions, dust and noise, and water quality. The GKI HPP (89 MW) is currently under construction on the river Inn, upstream of the KXP area; the effects of this project have been considered in the baseline conditions for the KXP.

New HPPs planned in the KXP area include: TIWAG's Imst-Haiming HPP (43.5 MW) on the Inn river; the expansion of the Kühtai pump storage hydropower project (PSHP, 130 MW) which requires water intakes from tributaries of the Ötztal and Stubatal valleys; Tumpen-Habichen (14 MW) a run-of-river project to be developed by a joint venture between the municipality of Umhausen, the municipality of Ötz, Auer Beteiligungs GmbH, and TIWAG; and a small HPP (less than 10 MW) to be developed by Sölden municipality on the Ötztaler Ache. The EIS for Imst-Haiming HPP was submitted to the Tyrolean Provincial Government in June 2015; TIWAG is still waiting for a decision from the Tyrolean Government. The KXP EIS assumes that Imst-Haiming power plant is built. The extension of the Kühtai PSHP was granted approval in 2016. Significant cumulative impacts with other projects, such as the Kühtai expansion, are related to residual flows on the Ötztal, and biodiversity impacts; these are addressed under topics P-23 Downstream Flow Regimes and P-19 Biodiversity and Invasive Species respectively. It is not clear how the EIS addresses cumulative impacts with Tumpen-Habichen, and when this project will be developed, but potential cumulative effects are not likely to be significant given the existence of a natural fish migration barrier at the project location.

TIWAG has not undertaken an assessment of the role and capacity of third parties, but this is not considered significant. TIWAG's and government roles are well known and established, and there are no known concerns on their capacity. TIWAG, the EIS consultants (under the coordination of Freiland, the main EIS consultants) and the Provincial Government have experience in assessing hydropower projects. They are well aware of their roles through the project phases, and have experience in identifying capacity shortfalls.

Impacts associated with primary suppliers have been considered in the EIS, such as the use of materials from quarries, landfills, and use of municipal wastewater treatment plants. Impacts associated with aggregate suppliers, cement and other materials have not been evaluated. This is not a significant gap because TIWAG has a well-established procurement process that requires major suppliers to have an environmental management system and all suppliers to comply with environmental specifications (see topic P-12 Procurement).

The EIS was prepared using appropriate expertise: Freiland (the EIS consultants) have qualified experts; TIWAG has also hired an internal EIS coordinator and the EIS has been reviewed by a team of Provincial Government experts in the aspects addressed in the EIS. In addition a wide range of experts have contributed to the EIS, including experts in hydrology, sedimentology, glaciology, geology, biodiversity, etc.

A baseline has been established and is well-documented in the EIS. Some aspects, such as ecology and traffic may require updates prior to approval. For example, experts indicate that the validity of biological information is five years. Aspects related to operational HPPs (Prutz, and Imst) are documented as required by TIWAG's Environmental Management System (EMS).

TIWAG has provided inclusions in the 2015 EIS Revision 1 that respond to the requirements provided by the Provincial Government in response to the 2012 EIS Revision 0. Further revisions and updates of baseline data, assessment and measures may be required once the KXP resolves conflicts over water rights and the EIA process is resumed. Monitoring plans have not yet been developed for all environmental and social aspects; this will be undertaken by the Provincial Government once the EIA has been finalised. The EIS only includes very brief monitoring concepts for some environmental aspects, such as biodiversity and sedimentation. As seen in other hydropower projects in the Tyrol, monitoring plans will provide details on indicators to be monitored, frequency, budget and responsibilities.

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 EIS considered some broad aspects such as regional planning and regional transport issues. The project's objectives of minimising impacts of hydropeaking in the river Inn and of flood management in the Ötztal are opportunities that are addressed by the project. The Upper Tyrol Water Management Framework Plan SEA assessed these opportunities. The EIS does not address biodiversity cumulative impacts with the Kühtai expansion; this is addressed in topic P-19. The EIS will be updated to consider the effects of land acquisition shortly before the public disclosure of the EIS. Intangible cultural heritage is not addressed in the assessment, as it is not a requirement of the EIA guidelines; however this is not likely to be a significant issue. TIWAG is aware of festivities in the Platzertal area and construction activities will be planned to avoid possible impacts.

The assessment takes some risks such as invasive species and natural hazards into account, as well as opportunities to minimise the use and transportation of raw materials, and to re-use materials. A construction environmental risk assessment process will be implemented to manage natural hazards as seen in other projects.

There is no assessment of human rights. However the rights of local communities and workers, compensation rights, and the rights of consultation, are or planned to be respected in adherence with Austrian legislation. The EIS addresses land rights, grazing rights, water rights and hunting rights. There are no known precedents of infrastructure projects in the Tyrol violating human rights. Topic P-16 Labour and Working Conditions addresses the rights of workers.

Criteria met: Yes

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.*

The Austrian EIA guidelines require the inclusion of adequate measures to address identified impacts. The EIS identifies prevention, management and compensation measures for identified environmental and social impacts during construction and operation. In particular, Part B of the EIS describes measures incorporated into the design, and Part E of the EIS describes the mitigation measures. Measures address identified significant impacts.

Compensation values for land acquisition are calculated based on current market values using a comparative value method and considering the potential yield, or based on the opinions of an independent expert. TIWAG and affected landowners will sign private agreements based on contractual negotiations. Grievance mechanisms and redress procedures are in place if an agreement cannot be reached.

The project will be approved through a single permitting process, including the EIS process, and it will not require additional environmental permits. The permit is valid for construction and operation, and the Provincial Government will follow a 'check procedure' and issue an 'acceptance certificate' prior to operations. The Provincial Government's project approval decision will provide additional measures for construction and operation.

As seen in other hydropower construction projects in Tyrol, there are a number of processes that will be applied to KXP to ensure compliance with the plans. For example: reporting to the Provincial Government; internal and external inspections during construction and operation; and contractual requirements for contractors to comply with the EIS.

Regarding construction-related plans, the EIS includes management measures on traffic, noise, helicopter flights, vibration, and air quality for each project component that are relevant only during construction. The EIS Revision 1 addressed the issues raised in the Report on the Evaluation of Completeness, which included an extensive list of issues on noise and air quality. Site traffic management was required and is now documented for each construction stage, particularly at: Gepatsch and the construction of the west-side galleried road; Prutz and the construction of a by-pass road; and Runserau, where the project has to raise the main road and a protected bridge.

The EIS includes a construction site management plan, which identifies the footprint of the construction site for each project component and measures to be taken to manage potential impacts; for example, camp site requirements, water and wastewater management measures, specifications for storage of hazardous products, types of waste, waste volumes, and landfill requirements. Proposed landfill sites are located at Kaunertal (Talboden, Gschaidhang, and Versetz quarry), Vent (Gample landfill) and Imst (Arzl West). Hazardous waste (e.g. contaminated soils) will be stored in designated areas and disposed at approved landfills to comply with the Waste Management Act. Plans include measures for the rehabilitation and landscaping of slopes and disturbed areas following construction, e.g. re-use of topsoil where possible and replanting with native species. Contractors will be required to produce specific construction management plans to follow the EIS.

The EIS consultants, TIWAG and the Provincial Government experts, have experience in implementing and supervising the implementation of measures on hydropower projects. TIWAG will contract consultants in relevant environmental and social issues that have the expertise to implement the monitoring and management plans, and will report to the Provincial Government bi-annually.

The EIS and plans will be officially publicly disclosed as part of the EIA process. The EIA process requires public disclosure for a minimum period of six weeks after the Provincial Government validates the EIS as complete, which is followed by a public hearing. There are no requirements for official disclosure of the KXP EIS at this stage, but TIWAG has disclosed elements of the EIS at consultation events with communities and municipalities. Full copies of the EIS are available at affected municipalities. Legal transactions relating to land acquisition are made public in the official real estate register. The Federal Environmental Agency provides information on the status of the EIA process. Further details are provided under topics P-1 Communications and Consultation and P-13 Project-Affected Communities and Livelihoods.

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.*

As seen in other hydropower projects in Tyrol, monitoring plans and inspections will guide adaptive management measures; for example, the implementation of a grievance procedure to respond to complaints on noise, traffic and vibration. TIWAG monitors legal requirements, and plans to use the Verbund permit management system software from the GKI project (or a variation of this) to monitor KXP legal requirements. Usually commitments

are monitored during operations for 5-10 years. Measures to manage natural hazards during construction and operation are provided in the project documentation. Adaptive management can be implemented in response to any unexpected effects identified in the monitoring.

TIWAG's operating HPPs are certified to ISO 14001:2015. EMS internal and external inspections identify risks and opportunities, for example changes in legislation on handling hazardous products. The results of the EMS are compiled in a management report which includes legal compliance, external notifications, environmental performance and KPIs, progress on environmental implementation, preventive actions taken, actions since the last report, framework for next actions, and opportunities for improvement. Social aspects in the system are related to 'regional aspects'. KPIs on water, ecology, energy use, emissions, use of raw materials and solid waste management aspects are documented in TIWAG's biannual sustainability report, which addresses Global Reporting Initiative (GRI) indicators. TIWAG indicates that the KXP plans, and all other projects under preparation will be incorporated in the EMS during construction and operation.

Subsequent external and internal revisions of the EIS and the official consultation process can respond to emerging risks and opportunities. TIWAG is involved in a number of research projects, for example on hydropeaking, fish migration in the river Inn, and fish passages; results have been considered in the assessment.

Examples of independent review mechanisms utilised are: the reviews by independent experts representing the Provincial Government; and the EMS certification inspections that will apply to the KXP from the construction phase.

Lessons learnt from other projects have been considered in the KXP, for example using more restrictive noise thresholds to avoid and minimise impacts. Landfills are estimated to have larger capacity than needed (this was a learning from the GKI project), and opportunities have been implemented to re-use material and reduce the volume disposed.

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.*

TIWAG started communications and engagement with communities affected by the KXP in 2005. Official stakeholder consultation activities will take place once the EIS has been reviewed by experts, accepted and published. TIWAG chose to undertake consultation events in affected municipalities regarding the EIS Revision 0 in 2013; and three rounds of consultation events in 2015 regarding the EIS Revision 1. Other engagement activities are detailed in topic P-1 Communications and Consultation. Issues raised at consultation events undertaken in 2013 and responses are documented. Involvement of directly-affected stakeholders in the assessment and planning process has involved landowners, tourism and leisure businesses, fishers, and municipalities. Although it is not clear how much information has been disclosed on impacts and measures, copies of the EIS are available for the local residents to view at each municipality office.

Consultation events were appropriately timed, and beyond the public consultation requirements in the Austrian EIA regulations. The events were often two-way; issues raised and responses provided at consultation events undertaken in 2013 are documented. Issues raised related to project sites, access to roads, fear of floods, landslides and road safety, impacts on protected areas and wildlife, and effects of noise, traffic, dust on local residents, hunters, farmers and tourism businesses.

TIWAG also engaged with relevant government agencies in relation to the compensation measures, for example Austrian Federal Forests, the District Forest Office of Landeck and Imst, the Chamber of Agriculture, mayors, and

communities. TIWAG has a dedicated email solely for the KXP, but it does not have a systematic process to fully record all KXP-related queries and feedback provided. Ongoing processes to raise issues include the EIA consultation processes and public hearings, and direct contact with the KXP Project Manager. A project-specific communication process will be implemented during construction to address noise, dust and vibration, and other complaints. The grievance procedure has proven to be effective in other projects. Directly-affected stakeholders can also submit queries to the Environmental Ombudsman of the province of Tyrol.

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 with many but not all directly-affected stakeholders has been inclusive and participatory. There are some stakeholder groups that feel that TIWAG has not engaged sufficiently with them with regards to social and environmental issues, and that they have not received adequate information and feedback. Whilst these are significant gaps at the level of proven best practice, these gaps are assigned in topic P-1 Communications and Consultation and will not be double-counted here.

Criteria met: No

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.*

Design iterations have taken into account avoidance of environmental impacts, for example the siting of the new upper stage pumped storage reservoir (Platzertal) avoids impacts on protected areas. The project will implement a number of measures to avoid impacts, for example (see topic P-4 Siting and Design for more details):

- Avoiding the use of the road up to the Platzertal through the alpine huts area (Pfundser Tschey);
- Using a bypass road at Prutz to avoid noise and traffic congestion impacts;
- Avoiding impacts on the Natura 2000 area where possible with the siting of the diversion intakes;
- Quarrying materials at Platzertal within the reservoir area, and at the previously used quarry at Gepatsch;
- Spoil management to fill in existing disturbed areas; and
- Avoiding the need for an overhead transmission line.

Examples of minimisation measures include the limitation of working hours, minimisation of land take areas, use of low-noise construction vehicles and machinery, creation of buffer work zones near residential areas, and raising of the Pontlatz bridge. Mitigation measures have been designed to address impacts that cannot be avoided or minimised, for example, restoration of the Piller Moor, improvements in highly sensitive habitats, rehabilitation of river banks, rehabilitation of habitats for protected fauna, and compensation for land acquisition. Loss of alpine pastures will be compensated. Monitoring plans, if developed with the same level of detail as other projects in the Tyrol, will identify any changes in the baseline and whether the measures are effective. Approximately 2.33% of the project costs or € 31 million have been budgeted for environmental and social costs during construction, including budget for contingencies. Costs will be updated prior to construction to reflect any potential changes in the baseline, and permit requirements.

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.*

Landowners will be compensated for the acquisition of land (see topic P-13 Project-Affected Communities and Livelihoods). In 2012, 'Wald Landschaft Mensch' identified high alpine and subalpine areas with potential for improvement; and in 2015, REVITAL Integrative Naturraumplanung GmbH prepared a study to identify suitable compensation areas for different biotope types in the Ötztal, Inn and Pitz valleys. These studies were considered in the EIS.

There may be nuisance issues related to noise, blasting, vibration and dust, and localised noise exceedances at times, particularly at Gurgler, Vent and Prutz. These are limited to specific construction periods and experts do not expect effects on buildings or human health. Impacts of noise, vibration and dust on habitats and protected monuments are not considered significant. Socio-economic impacts related to tourism and hunting are considered temporary.

However, there is insufficient evidence to demonstrate that the project will compensate for all negative permanent environmental and social impacts and this is a **significant gap**. The EIS identifies a number of permanent residual impacts of importance for which the adequacy of the offsets is not yet demonstrated, or in cases not yet calculated. By way of example with environmental issues, compensation proposed for the loss of habitats for protected bird species (e.g. *Tetrao urogallus*) and the loss of wetlands and meandering river stretches has not yet been tested by the authorities (see topic P-19 Biodiversity and Invasive Species). On the social side, altered flows in some river stretches and associated impacts on the commercial viability of the rafting industry do not yet have any evidence of compensation measures, nor do impacts that may arise for tourism (see topic P-13 Project-Affected Communities and Livelihoods).

There are some examples of plans to provide enhancements to pre-project social and environmental conditions, for example, improved water supplies and quality for the Alm farmers at Platzertal (for livestock and cheese-making), flood protection, and better local roads for tourists and residents. Principally, the project will reduce hydro-peaking on the Inn, allowing for ecological restoration, in combination with the new fish channel.

Criteria met: No

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

Feedback to directly affected stakeholders has not been thorough and timely (this gap is addressed in topic P-1 Communications and Consultation and it will not be doubled-counted in this topic).

There is insufficient evidence to demonstrate that the project will avoid, minimise, mitigate and compensate all negative permanent environmental and social impacts.

1 significant gap

5.3 Scoring Summary

The project has followed the Austrian EIA guidelines for assessing, avoiding, mitigating and compensating its environmental and social impacts. The assessment takes some broad considerations into account, and the project has assessed risks and opportunities. All of TIWAG's operating plants are certified to ISO 14001:2015, and

the KXP plans are expected to be embedded in the EMS during construction and operation. Detailed monitoring plans are yet to be developed to be able to track any changes against pre-project conditions, but existing processes demonstrate that they will certainly be in place before the project commences. The project cannot yet demonstrate that it will compensate for all negative permanent social and environmental impacts, which is a significant gap against proven best practice, resulting in a score of 4.

Topic Score: 4

5.4 Relevant Evidence

Interview:	1,2,4, 7, 10, 13, 16, 17, 19, 25, 33, 38, 40, 63, 66, 77
Document:	3,5,6, 8, 13-15, 28, 54-57, 60-65, 67-77, 98-99, 106-110, 111-114, 129-131, 135, 150-151, 153, 157, 167, 173-180, 182, 190-192, 207-208, 216-223, 226-231, 272, 275, 278, 281
Photo:	1, 4, 5, 12, 13, 17, 18, 24, 31, 32, 34, 37, 41, 42, 44, 59, 76

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

The Kaunertal Expansion Project (KXP) is one of a number of large hydropower development and expansion projects that TIWAG is advancing, the others being:

- The new Kaunertal Pressure Shaft (just completed in 2016; additional work to put the power cable in the old pressure shaft is included in the KXP);
- Gemeinschaftskraftwerk Inn (GKI) (under construction, anticipated for completion in 2019);
- Kirchbichl power station expansion (anticipated to be constructed from 2017-2021);
- Kühtai storage power station scheme (anticipated to be constructed from 2020-2025); and
- Imst-Haiming power plant expansion (submitted as its own project; in addition, a third turbine and expansion of the Imst tailwater basin are included in the KXP).

The last major hydropower projects developed by TIWAG were in the 1980s (Sellrain-Silz in 1981, Amlach in 1988).

TIWAG's Power Plant Project unit has been created to manage the major power projects. This unit is responsible for overall coordination in terms of cost, time and resources. A master plan for the major power projects has been created for this purpose, and identifies the relative timing and connections between the projects. The Management Board receives quarterly cost reports. The master plan is updated every year or if a milestone has changed.

Major projects in TIWAG have five developmental phases, each with their own detailed management plan including approved budget, resourcing and timing targets:

- Phase 1 – Study
- Phase 2 – Feasibility
- Phase 3 – Submission and Approval
- Phase 4 – Construction
- Phase 5 – Operation

The KXP is a complex project presenting a number of challenges. Phase 3 extends over a long period during which many things can happen, such as changes in political and stakeholder support, energy solutions, and the electricity market. Phase 4 will require a number of in-parallel work locations and implementation requirements along with seasonal weather challenges and mountainous terrain; however, none of the individual construction activities are unusual in their requirements compared to Tyrolean construction experiences.

This topic focuses on the management processes for project delivery. Governance of the project is addressed under topic P-2 Governance; and management of the project's environmental and social issues is addressed under topic P-5 Environmental and Social Issues Assessment and Management. This topic has links with topic P-12 Procurement.

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.*

In Austria, long project gestation periods are the norm, and the project masterplan for the KXP take a realistic approach to the likely timeframe. The phased development of the KXP extends over a period of decades, and TIWAG plans this alongside and fitting in with the other planned project developments.

Phase 1 (Study) for the KXP was during 2004-2006, leading up to determination of the expansion of the Kaunertal power plant as a potential project for further study. Phase 2 (Feasibility) was during 2006-2012, involving preparation of the initial draft of the Environmental Impact Statement (EIS Revision 0) including the feasibility studies.

The KXP is presently in Phase 3 (Submission and Approval), commencing with approval by the Supervisory Board in 2012 to submit the EIS Revision 0 to the Authority for assessment. The project masterplan has Phase 3 continuing to 2028, allowing for several further revisions of the EIS before it is formally published for public comment, then a period of time for public comment and public hearings, then appeals, permit issue, and several years to organise and implement the tender process ahead of construction. Phase 4 is planned for approval by the Supervisory Board in 2026 or 2027, ahead of construction taking place between 2028-2034.

TIWAG has clear process standards for project development, with corresponding process manuals. These processes are designed to ensure standardised and efficient project management, integrated project documentation, transparency, accountability, organisational learning, and standardised data. Important TIWAG process standards guiding development of the KXP are:

- Process Manual project management T15.3, version 2.2
- Process Manual power plant implementation T14.4, version 0.1
- Definition and Standards for the department Program office/power plant-projects 01-11, Rev. 9

In the TIWAG process standard for project development, a project steering committee is formed ahead of the construction phase. For large hydropower projects at TIWAG, the Steering Committee comprises all 3 Management Board members, heads of a number of relevant divisions (financial control, power station operations, procurement, design, construction, land acquisition, program office), plus designated heads of legal, environmental and administration streams of work for the project.

The KXP Phase 3 (Submission and Approval) planning and processes are well defined through a project management plan that defines project milestones, budget targets, roles and responsibilities, accountabilities, and monitoring and reporting provisions. The KXP Project Manager is also the head of TIWAG's Power Plant Development Unit, and so reports directly to the Management Board. The project structure is based on four streams of work, each with a person nominated as lead: Engineering (focus on design and procurement), Environmental (focus on EIS studies), Project Control (focus on budgets, activity scopes, reporting) and Legal (focus on legal advice and services, land acquisition, contracts, agreements, permits e.g. for drilling). Also included as a parallel activity is the role of TINETZ regarding network connection. The Project Manager and Management Board member for Construction are responsible for stakeholder engagement and communication; they work with the Communication Department and have a process that they follow outlined within the Project Management process standard.

There are a number of actions being progressed during Phase 3 to avoid, minimise and manage risks. These risks, and actions in relation to them, include:

- Not getting the permit – all of TIWAG's activities during Phase 3 are oriented around meeting permit application requirements and responding to all needs identified by the Authority
- Unplanned delays – TIWAG's management plan for Phase 3 allows a conservative estimate of time requirements, of 16 years, during which a number of factors are allowed for which may cause this extended period of time to be required. TIWAG actively monitors a number of factors and maintains stakeholder relations to better understand potential causes of delay
- Problems in reaching agreements – TIWAG has a program during Phase 3 of engagement and dialogue with stakeholders with which it needs to reach agreement. There are a number of known issues in relation to these agreements that it is working through (see topics P-8 Project Benefits and P-10 Project-Affected Communities and Livelihoods)
- Legal actions – TIWAG has a legal team involved during Phase 3, and a high degree of attention has been required in this area due in particular to court cases about water rights in the Ötztal, but also in relation to reaching agreements on land acquisition and access to rights, and determinations of compensation
- Further and substantial revisions of the EIS – these are expected and planned for in the project management plan; every effort is made to meet EIS requirements but based on experience of other large projects TIWAG expects an extended and iterative process
- Cost increases beyond forecasts – costs during Phase 3 are closely monitored through the Project Control workstream. Learnings from other projects (both TIWAG's and others') are tracked to ensure realistic costs are budgeted for in the business case that will go to the Management and Supervisory boards ahead of the decision to go to tender (in around 2026 or 2027)
- Forecast revenue projections not eventuating – at this point in time, forecast revenues have been made long in advance of when they would be realised (in around 2034). The management processes include updating of revenue forecasts based on detailed studies, modelling and projections at the time of the Supervisory Board decision to proceed to tender.
- Technological changes – normal business monitoring processes will identify these, and the business will respond as needed
- Policy changes – normal business monitoring processes will identify these, and the business will respond as needed
- Lack of stakeholder support – a number of stakeholder engagement actions have been undertaken during Phase 3, described in topic P-1 Communications and Consultation, and TIWAG has plans during all phases for more such actions to take place. Whilst no one expects all stakeholders to be in favour of the project, and certain opposed groups may well remain strongly opposed, the environmental impact assessment and approval processes allow all stakeholders to formally submit their issues and have them heard and considered through the government's review processes ahead of any decision made on the project. TIWAG has allowed for an extended public hearings process in its Phase 3 plans.

The Phase 4 (Construction) planning and processes are well defined in the EIS documentation, Section B.03, as are plans for operations (EIS Section B.04). These are necessary inclusions in the EIS due to the assessment process considering all approval requirements including for the construction licence and the concession agreement. A tendering plan and procurement plan will be developed (see topic P-12 Procurement), and supervision will be the responsibility of the TIWAG Construction Department.

The main elements of the construction management plan are provided in tender documents, and the major contractors create more detailed plans as they relate to their areas of responsibility. The construction plan in EIS

Section B.03 systematically outlines plans for the seven-year construction period, separated into 18 different construction components:

- Platzertal Reservoir: dam, tunnelling, access
- Pressure tunnel upper phase
- Versetz power station including electro-mechanical
- Ötztal diversion tunnel – both segments
- Gurgler intake including two smaller intakes
- Venter intake
- Gepatsch Reservoir: lakeshore road west, and later connections with new and existing
- Versetz deposit area
- Lower Phase pressure tunnel
- Prutz 2 power station and tailwater basin
- Prutz cable tunnel (old tunnel upgrading with high voltage cables)
- Switchgear and network connections (110, 220, 380 kV)
- Runserau weir
- Inn River works (lowering river bed downstream of Prutz power station)
- Imst 2 pressure tunnel
- Imst 2 power station
- Tailwater basin Imst 2
- Expansion Imst-Haiming (additional turbine, enlargement of tailwater basin).

For each of the 18 areas, all relevant considerations are examined. Considerations include site development, construction processes, workshops, transportation, roads, water, power, lighting, blasting, personnel, waste, materials and supplies, hazardous materials, additives, excavation, spoils, safety, emergency and rehabilitation.

The contracts for project delivery define risks and responsibilities. The Risk-2-Chance (R2C) software is used to generate a risk profile for the project, updated at regular intervals.

Criteria met: Yes

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.*

During the project preparation stage, interface and delay issues are managed through the KXP project management plan. This is reviewed and approved annually, in line with normal corporate budget processes, and resource allocations to different streams of work increased and decreased as needed. The overall timetable and budget for this phase has been increased with progressive reviews, as the reality of the requirements to prepare such a large and complex project have become apparent through Authority feedback on the EIS, issues arising from stakeholder engagement, the experience with other projects, and legal challenges.

For the project implementation stage, considerable attention is taken by TIWAG to design the KXP to avoid interface and delay issues amongst project components. The overall design allows components to progress without interfering, blocking or creating dependencies on other components. TIWAG has around 100 staff in its Design department. The effectiveness of such design efforts can be seen with the GKI project, which is presently being constructed. Interface issues are avoided at GKI through siting and design of the major workshop and offices, tunnelling approaches, major equipment planning, supply routes, and waste and spoils management. For the KXP, plans minimise transport needs for incoming supplies and for disposal of wastes. There will be five

tunnel boring machines (TBMs) used for the KXP, none of which will be required twice (in two different areas), so that there are no dependencies.

The KXP construction plans provide for progressive fill and cultivation over time for spoil areas. The geology of materials and the characteristics of spoil from construction activities such as tunnelling have been carefully considered in terms of disposal or re-use options. Plans assume 100% disposal so there is no risk of problems arising with insufficient disposal space, but in practice re-use of waste materials will be pursued where possible.

During project implementation, the construction management plans for each work area are also alongside delivery of off-site mitigation works, all of which are the responsibility of the TIWAG project manager who ensures identification and management of any interface or other issues. Processes and roles ensure these can be anticipated and avoided or minimised through good planning, risk management, internal communications and coordination meetings, and monitoring and evaluation. TIWAG has sufficient in-house capacity to take the lead on supervision, and does not need to recruit an external owners-engineer. Systems and processes are in place for information management, records, signatures, etc. Formal communications approaches include weekly meetings amongst construction contractors and TIWAG supervisors, but informal and frequent communications are enabled due to the presence in the same building of TIWAG and contractors. This allows both risks and opportunities to be readily identified and responded to. TIWAG's experience and the lessons learned are the basis for its construction philosophy, for which the main guiding principles are:

- The contracts have to be fair (i.e. do not write anything in the contract you would not sign yourself);
- TIWAG has to have enough know how to clearly define the owners' wishes;
- The site management should be kept slim, with the responsibilities on site; and
- Problems are best solved on site.

TIWAG has a program to train and further educate project managers. This program assists its employees to build project management skills and knowledge, including for complex power station projects and the many aspects to manage (energy industry, legal, ecological, business, risk, media, conflict, processes, etc).

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.*

Based on presently available information and knowledge, the KXP appears likely to meet overall budget and timing objectives and targets.

For KXP Phase 3 (Submission and Approval), learnings from other projects at this phase have helped define what appears to be a realistic timetable and budget, allowing for more iterations of the EIS and an extensive public hearing process. The present budget and timetable have been varied since Phase 3 began, as the requirements have become more apparent.

The Phase 4 budget will be determined later in Phase 3, based on an updated and detailed financial analysis and costing (see topic P-9 Financial Viability). The planned timetable for construction takes into account a high level of local detail to avoid issues arising. For example, the Gepatsch lakeside west road upgrade will be done ahead of the major construction tunnelling to ensure traffic management throughout the construction period does not impinge on other road users, with the road work to be done over 3 summer seasons in 3 stages. A number of measures have been built into plans to minimise truck movements on the public road; for example tunnel excavations will fill the area just downstream of the Gepatsch reservoir.

Plans appear to avoid, minimise and mitigate construction risks with no significant gaps, as far as can be reasonably foreseen at this point in time. In addition to the risk definition and allocation in the contracts, and

the ongoing risk supervision supported by the R2C software, the EIS contains a detailed section, B.06, relating to risk at both the construction and operation stages. This analysis considers hazards relevant to each work area, and categorises them according to Ordinary events (e.g. alerts, evacuations), Extraordinary events (e.g. flood, rockfall, avalanche, earthquake), and Accidents (e.g. cavern flooding, fire, simultaneous failure of several system components). Structural measures (e.g. nets, protective walls) and organisational measures (e.g. monitoring, inspections, assessments, warning levels, roles, communications) are outlined. Both worker protection and community protection are considered in all cases.

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.*

TIWAG has not delivered a major project of the scale of the KXP for decades, but is actively building its internal capacities and recruiting strategically to ensure it brings in extensive experience with major project development into the business. Already the effectiveness of this strategy can be seen through the capacities of key staff and in the process standards being developed related to major project development. The forward program of project development will ensure that TIWAG continues to build its experience and expertise.

TIWAG's cost and time outcomes for recently finished projects are as follows:

Project	Budget	Final costs	Construction time	+/- time in months
Power shaft Kaunertal	€ 188 million	€ 170 million	60 months	0 months
Power plant Kanzingbach	€ 12.5 million	€ 12.8 million	20 months	2 months
Fishladder Langkampfen	€ 3.3 million	€ 2.8 million	8 months	0 months
Fish lift Runserau	€ 3.7 million	€ 4.7 million	16 months	0 months

Although these projects are considerably smaller than the KXP, the KXP is made up of a number of small projects. These few projects show that time overrun is not a problem if the normal geological risks do not occur. Delivery to budget is easier in long running projects as there are more items, so there may be an overrun in one area but savings in others. Projects that are very special, like the fish lift, are more difficult to estimate as there are no or very few reference projects, therefore a cost overrun is more acceptable than with a normal power plant. TIWAG starts with a contingency of around 10% for their projects. But as a project is developed this changes to a risk based approach, which is a common approach in Austrian infrastructure construction.

The Prutz Pressure Shaft project was delivered on time to budget, despite some geological surprises, little recent experience with inclined tunnelling, and some interface issues. Learnings from this and further projects leading up to the KXP (e.g. Kirchbichl, Kühtai) will assist in informing planning and supervision for the KXP construction phase. TIWAG commissioned an independent expert to undertake a "best practice" evaluation of the Prutz Pressure Shaft project to identify strengths and weaknesses, based on statements from the major contractors and TIWAG's supervisory team. One of the learnings was in relation to hand-over from the construction to operation phase. A TIWAG working group has been created to focus more closely on ensuring a coordinated approach to the process of hand-over from construction to operation; this will be able to be tested on the next project, Kirchbichl, and again on Kühtai before the KXP is built. Another continuous improvement example from the Prutz Pressure Shaft project was the testing of a new document management system that proved effective

in ensuring that TIWAG could submit necessary documentation to the Authority in a very short period of time. This system will be applied to future projects, and improved and refined based on further use.

The experience with the Prutz Pressure Shaft showed that when issues arose, the correct decisions were taken in a timely manner. TIWAG was active in supervision and monitoring on the construction site, and its in-house expertise allowed rapid and informed responses as needs arose. The experience strengthened the TIWAG view that the bulk of the work needs to be done at the start with respect to contracts, time schedules, and plans, and that a partnership approach with the major contractors is best. TIWAG puts a high weighting on quality in the major contract bidding process, and the TIWAG Construction Department has a lot of input into the contract development process to ensure the best outcomes for project quality.

Given the high degree of attention paid to project preparation using TIWAG's own in-house design expertise, the good risk assessment and management processes, the evidence of updating timing allocations and budgeting based on increasing experience and monitoring, the inclusion of sufficient financial contingency into budgets (see topic P-9 Financial Viability), the experience that will be gained with the other major projects ahead of the KXP, and the rigour of its process standards and continuous improvement approach to its major projects, all indications are that TIWAG is ensuring it can meet overall budget and timing objectives and targets. These targets will be established in the updated financial analysis and detailed project planning prior to the Supervisory Board decision to progress to the Construction Phase. It is not possible to say "highly likely to meet" these targets so far ahead of project implementation, but for the purposes of this assessment and this point in time there is no evidence to say that there is a significant gap in this regards.

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

TIWAG's development of the KXP is progressing in accordance with a staged process that is well-defined in the business. Major project development processes are guided by process standards to ensure that quality expectations are met, and that plans, responsibilities and decision-making are well understood. The KXP is one of a number of power projects for TIWAG, and an integrated masterplan sets out the timing and budgets for all of these. There are a number of risks for the KXP, for which actions are being progressed. Planning and processes for the construction and operation stage are set out in the Environmental Impact Statement, and will be taken to a more detailed level with the major contractors. Whilst the EIS Submission and Approval phase for the KXP is likely to be prolonged, TIWAG has allowed for this in its management plans based on the learnings from the early part of this phase and from other projects. TIWAG's performance in constructing projects to meet time and cost targets shows positive indications for its future projects including the KXP, and no significant gaps are identified against the criteria for this topic.

Topic Score: 5

6.4 Relevant Evidence

Interview:	1, 2, 6, 10, 11, 12, 14, 15, 27, 41, 51, 64, 67, 73, 77
Document:	7, 9, 11, 29, 55, 56, 58-62, 65, 87, 88, 93, 157, 187, 188, 228, 229
Photo:	-

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 Kaunertal Expansion Project (KXP) will utilise water flows from several catchments. The Versetz, Prutz and Prutz 2 power stations will use water flows as follows:

		Catchment area (km^2)	Average flows (m^3/sec)	Average annual inflow (million m^3/yr)	Glaciation %
Existing	Kaunertal, above Gepatsch	107	4.4	139	19.8
	Kaunertal, intakes on the eastern side of the valley	31.7	0.95	30	7.6
	Pitztal, two intakes	87.7	4	125	19.0
	Tscheybach and Radurschlbach (above Pfunds)	41	1.3	40	< 1
Expansion	Gurgler Ache	79.7	29.0	130	28.8
	Koenigsbach	5.7	1.1	7.1	0
	Fernwallbach	6.1	1.2	7.8	4.3
	Venter Ache	180.0	50.0	265	32.0

The catchment to the Platzertal is small (8.2 km^2) and will deliver just 8 million m^3 per year to the Platzertal reservoir, with a significant proportion of flows diverted to provide residual flow. As a pump storage plant, Versetz will use water from Gepatsch and Platzertal reservoirs repeatedly, and both of these reservoirs have storage capacity above annual in-flows.

Imst and Imst 2 power stations and the Haiming expansion use the above flows, in addition to the water of the River Inn. Current average annual inflow in the Prutz-Imst stretch is 1778 million m^3 per year, including 358 million m^3 per year discharged from Prutz.

With the exception of Tscheybach, Raderschbach, Koenigsbach and Platzertalbach, all of these flows are glacier-fed. Flows follow a unimodal pattern, peaking in the summer months, July-August, with meltwater from snow and glaciers in the upper catchments. Flows also show diurnal variation, with greater melting during the warmest times of the day.

This topic concerns the use of the available hydrological resource, whilst the implications of the alteration of hydrological flows for the reservoirs and downstream flows are addressed in topics P-22 Reservoir Planning and P-23 Downstream Flow Regimes respectively.

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.*

TIWAG has assessed the availability of the hydrological resource during the preparation of the KXP, as summarised in an 'Impact Factor Report – Hydrology', and a Detailed Technical Study on Surface Waters, compiled by Dr Schönlaub, a retired TIWAG staff member. The former presents the hydrological analysis that is used to determine the effects of components of the KXP – specifically the Ötztaler intakes, Platzertal dam, the diversion of Öbgrubenbach, and the expansion of Runserau weir – on hydrology. The latter presents similar information to assess the impacts of these components on surface water. Hydrological information is also provided in a report on public interest in flood protection, prepared by a former head of hydrology at TIWAG, Dr Petrashek, and Schönlaub. These reports present data and charts on the hydrological resource in terms of mean monthly inflows, mean annual inflows, and annual and daily variation in flows at various locations on the Ötztaler Ache, Platzerbach and Inn.

B.02 Chapter 01:03 of the EIS on water and energy provides a summary of hydrological characteristics and how the KXP is designed on that basis. These assessments were based on extensive and long-standing databases of field measurements compiled by TIWAG and others over decades, complemented by additional field measurements and extrapolations where necessary. The description of the present hydrological regime in the KXP project area was mainly based on observed data. A very dense network of run-off gauges and meteorological stations is available for the Tyrolean region and especially the Ötztal and Kaunertal area, some meteorological measurements reach back approximately 100 years, and run-off data in the Ötztal and along the River Inn is available for at least 30 to 50 years.

Data on water resources in the Ötztal are based on a data series from 1985 to 2012, and data on the Inn is from a series from 1997 to 2012. The latter series is available from 1997 only, and a comparison of the Ötztal series from 1985 to 2012 with the series from 1997 to 2012 does not show any serious deviations. These included: TIWAG databases of flows, snow measurements, runoff and water levels; operating data of the power plants Prutz, Silz and Imst; the Hydrological Atlas of Austria GIS database; a 1994-2001 database for the Ötztaler Ache; a 1994-2001 database for the other relevant basins; etc. Only daily average values were used for the period before 1985, and hourly average values used for the Inn over 1997-2012. New field measurements were taken in the Platzertal since 2011.

TIWAG uses several hydrological and hydraulic models to deliver temporal and spatial predictions. TIWAG uses a precipitation-run-off model for the river Inn, a hydraulic model based on field measurements for the Ötztal, and a precipitation-runoff model ('HQsim') for the Platzertal, for which fewer measurements were available. Effects on reduced outflow along the Ötztaler Ache and increased flow along the Inn were evaluated using hydrodynamic models: a 'HEC-RAS' model for the River Inn, and hydrodynamic and sediment calculations using 'BASEchain' software for the Ötztaler Ache. For daily operation in flood periods and for evaluation of design floods (floods considerably exceeding the observed floods), a rainfall/run-off model called HoPI, which covers the complete Inn catchment, was applied.

TIWAG has identified issues that may affect water availability, principally climate change and glacial ablation (thinning/melting), and these were factored into the above hydrological analysis. TIWAG has evaluated scenarios, uncertainties and risks through detailed glaciology studies, which have considered alternative climate changes scenario, glacier behaviour, and a range of temperature changes.

TIWAG has also recognised demand for water for artificial snow, irrigation and drinking, and has listed all existing water uses in the EIS, though they are not factored into the models. Specifically, demand for artificial snow in the Ötztaler Ache in winter has contributed to a decision not to use water from the Ötztal in winter.

Criteria met: YesCriteria 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.*

Uncertainties in hydrological predictions are low, due to the reliable and extensive meteorological and run-off datasets, and even predictive models have low uncertainties because they can be calibrated. In case of the rainfall/run-off models used for planning the KXP, uncertainties of the results were quantified, for example: Monte Carlo simulations were performed for the models used for Platzertal for design flood calculations; and uncertainties from the model initial states (soil moisture and snow coverage) were taken into account for the design discharge simulations, and the final design flood values were based on the upper range of the likely results for greatest dam safety.

The most immediate issue that may affect water availability is competition for the water resource in the Ötztal, due to competing water rights. This is a legal issue as referred to under topic P-2 Governance, but also a stakeholder support issue as referred to under topic P-13 Project-Affected Communities and Livelihoods. If a resolution cannot be found to enable TIWAG to use the waters of the Ötztal, the business will have to reconsider the project design.

The main long term issue in these catchments that may impact on water availability or reliability is climate change and glacial melting. Glaciers in the Tyrol have been thinning since 1980, losing approximately 1 metre in thickness per year. These issues have been assessed comprehensively in the short and long term, through the studies of an eminent glaciologist from the Institute of Atmospheric and Cryospheric Sciences in Innsbruck, who was the author of the Austrian Inventory of Glaciers in 1998. The studies have documented the present state of glaciers in the Ötztal and Gepatsch catchments since 2007, and have produced a model to predict glacial meltwater and run-off for IPCC climate change scenarios and magnitude of temperature increase. They have measured glacier thickness, including with laser scanning, produced maps of mass balance of glaciers, established an empirical relationship between glacier size and temperature, brought a hydrometeorogical model for precipitation together with a climate model for monthly temperature predictions, and estimated the monthly melt for altitude intervals, calibrated against observed run-off. The model's predictions of increased run-off broadly match observed run-off increases: flows at Vent were 6.0 m^3/sec during 1951 to 1978, and 7.6 m^3/sec during 1979-2012, and the increase of 1.6 m^3/sec between these two periods corresponds to 70% of the predicted glacier ablation. TIWAG focused on glaciers in Pitztal, Ötztal and Kaunertal because they account for about 70% of the glaciers by area in the catchment (within Austria) to Telfs. It is not clear why glaciers in the catchment of the Inn in Switzerland were not considered.

Under the Alp-S programme, TIWAG is supporting 'MUSICALS II', a € 600,000 study on snowmelt discharge into Alpine reservoirs. This has developed a model based on climate change scenarios (EURO-CORDEX scenarios of temperature and precipitation downscaled to hourly values) for the quantification of future changes in annual and seasonal meltwater discharge rates in snowmelt-dominated catchments. The spatial resolution of this analysis is from cells 10m x 10m up to 50m x 50m.

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.*

The project is designed on the basis of the available hydrological resource and the opportunity to provide great flexibility in renewable power generation. Plans for water use, outlined in the project design in B.02 Chapter 01:03 of the EIS, are – in very broad terms – to maximise use of the available water, whilst: meeting social and environmental constraints through a residual flow at each facility; enabling reservoir lowering for flood protection; avoiding extracting any water at all during winter in the Ötztal; and ensuring adequate flow for a fish ladder at Runserau. Residual flows are set out in detail in topic P-23 Downstream Flow Regimes. In summary:

- Flows from the Ötztal will be diverted into Gepatsch, making an additional 291.4 million m³ per year on average available for generation at Prutz/Prutz 2;
- The weir at Runserau will be raised to allow the diversion of these 291.4 million m^3 with additional inflows on the Inn, i.e. a total of an additional 580 million m³ per year available for generation at Imst / Imst 2 (an increase from 1858 to 2438 million m³ per year), and an additional 463 million m^3 per year available at Imst-Haiming (an increase from 1778 to 2241 million m³ per year); and
- The addition of the Platzertal reservoir allows both the existing and additional water resource to be used for pump storage.

The design allows the addition of facilities totalling over 270 m^3/sec in design flow, generating more than 900 GWh per year, compared to an existing 222 m^3/sec design flow and 1481 GWh per year (counting the Haiming project as 'existing').

Existing		*Prutz*	*Imst*	*Haiming*
Design flow (m^3/sec)		52	85	85
Generation (GWh/year)		661	550	270
Additional	*Versetz*	*Prutz 2*	*Imst 2*	*Haiming expansion*
Design flow (m^3/sec)	77.2 (but with maximum pump rate of 53.6)	70	85	45
Generation (GWh/year)	12	614	200	67

The annual storage capacity of Gepatsch and Platzertal will allow TIWAG to meet power system opportunities. Currently TIWAG has an annual deficit of 1300 GWh, which is "must purchase" power from other providers, mainly outside of Tyrol. Annual storage allows summer in-flows to the stored for generation in winter months, providing the means to meet winter peak demand in the wider market including in Germany. Prutz/Prutz 2 and Versetz will be able to respond to the market. Lower electricity prices, as well as a lower spread between peak and off-peak prices in recent years, present risks for pump storage projects, but the KXP will have greater flexibility as it does not consist entirely of pump storage.

KXP will use operating plans to manage the use of the water resource on a daily basis. These plans will incorporate operating rules, to ensure that residual flows, that will vary according to season and inflows, are met, and that maximum rates of increase and decrease in residual flows are adhered to. An example of an operating and monitoring manual for the Silz plant was made available to this assessment.

TIWAG's Division of Energy Trading and Energy Management forecasts demand, schedules generation and dispatches power. TIWAG seeks to ensure short-, medium-, and long-term optimisation, by targeting the product

(e.g. term, spot, intra-day, balancing reserve products) that they want to sell. They use a model of the European market and predict prices, capacity requirements, and volatility. This is described in more detail in topic P-9 Financial Viability. In addition, TIWAG uses short term forecasting of inflows. Currently this is 2-day forecasting, but they plan to expand to 5-day, seasonal forecasting, and longer-term climate change forecasts. The hydrological model underpinning the forecasting model is a rainfall/run-off model, the SES (Schnee und Eis Schmelz-modell) that includes temperature, radiation, windspeed etc. In addition, glacial mass-balance is fed into the model, based on laser measurements. This is now used for the existing Kaunertal project and would be used for the KXP.

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 anticipate and adapt to future changes.*

The design of the scheme and operations has a long term perspective, and the flexibility to adapt to future changes, in two areas: the changing electricity market; and altered glacier run-off arising from climate change. By 2035, electricity markets are anticipated to be quite different, with ongoing changes in the wider economy, including the German economy, and the German and Central European electricity network: nuclear and thermal generation for base load will be a smaller proportion of the energy mix, less predictable wind and solar will be a higher proportion, and electric vehicles with storage capability will be a higher proportion of demand. Through its expansion of annual capacity for generation, the KXP will provide the flexibility to adapt to these changes by providing balancing power and using surplus generation for pumping at Versetz. As described in topic P-9 Financial Viability, monitoring and forecasting of the market is central to the KXP design and it is intended to have the flexibility to adapt to future market opportunities and risks.

The incorporation of glaciology and climate change into hydrological planning demonstrates a long-term perspective. One of the benefits of the KXP is to manage increased glacier run-off. Run-off is predicted to increase, and move earlier in the year, up to the 2040s, and then decrease in the period 2040-2069, but predictions strongly depend on the scenarios used.

Multiple uses and integrated water resource management are taken into consideration by one of the principal objectives of the project, to enable ecological connectivity of the Inn. Increasing ecological constraints on water flows, with a requirement to achieve good ecological status or potential under the Water Framework Directive by 2027, is also an anticipated future change. There are questions regarding the efficacy of KXP in these ecological objectives, but these are addressed in topic P-19 Biodiversity and Invasive Species, and questions on whether KXP takes multiple uses, specifically rafting and other uses in the Ötztal, into account, but they are addressed in topic P-23 Downstream Flow Regimes.

TIWAG has followed an optimisation process in the design of the KXP, considering a series of alternative reservoir locations and alternative locations for the additional water intakes, from 2004 onwards. These are described in more depth in topic P-4 Siting and Design. The design of the project has optimised efficiency of water use for power generation against some other considerations (flood management and ecological restoration), but not for others (e.g. social needs given the community opposition expressed by some social groups, addressed in topic P-13 Project-Affected Communities and Livelihoods). For this reason, it is premature to conclude that the project optimises the use of the hydrological resource, which is a **significant gap** against proven best practice.

Criteria met: No

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

It cannot be concluded yet that the KXP represents an optimal use of the hydrological resource.

1 significant gap

7.3 Scoring Summary

TIWAG has assessed the availability of the hydrological resource during the preparation of the KXP based on extensive and long-standing databases of field measurements compiled by TIWAG and others over decades, complemented by additional field measurements and extrapolations where necessary. The project is designed on the basis of the available hydrological resource and the opportunity to provide flexibility in renewable power generation, and respond to opportunities in a changing electricity market. Multiple uses and integrated water resource management are taken into consideration by one of the principal objectives of the project, to enable ecological connectivity, as well as recognising existing water uses such as extraction for artificial snow in the Ötztaler Ache in winter. It takes into account, and is designed to allow adaptation to, long-term climate change and glacial ablation. However, the design competes with alternative proposals for the use of the water resource in the Ötztal, which would require a re-design if the issue is not resolved, and there are questions concerning KXP efficacy in ecological restoration or how well it takes into account downstream users. Until these issues are resolved, the KXP cannot be considered an optimal use of the water resource, resulting in a score of 4.

Topic Score: 4

7.4 Relevant Evidence

Interview:	10, 24, 27, 48, 52, 58, 65, 68, 72, 81, 84
Document:	4, 47, 50, 53, 60, 61, 68, 69, 195, 198, 199, 200, 202
Photo:	1-4, 6, 12, 14, 15, 45, 75

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

Potential hazards in the project area include: flood events with associated risk of dam failure; landslips, rockfall, and avalanches, affecting public roads and presenting the risk of surge waves in reservoirs; geological and seismic risks; and vehicle movement during construction. Peak flows occur in July to August, and flood events have previously occurred in July and August when high precipitation combines with snow and icemelt.

Key features of the infrastructural components of the KXP are as follows.

DAMS, INTAKES, AND TAILWATER BASINS		Height of retaining structure above foundation level (m)	Reservoir volume (m^3)	Details
Existing	Gepatsch dam and reservoir	152	138 million	Earth core rockfill dam. Spillway with discharge capacity of 210 m^3/sec. The future changes in the water level be in a winter week about 8 m and during a typical summer week about 5 m.
	Kaunertal, intakes on the eastern side of the valley	-	-	Tyrolean weir
	Taschach intake	14	9000	Concrete gravity wall and cantilever wall
	Pitztal, two intakes	-	-	Tyrolean weir
	Tscheybach and Radurschlbach (above Pfunds)	Tyrolean weir		
	Runserau weir	16	0.8 million	Gated weir
Expansion	Platzertal dam and reservoir	133	42 million	Rockfill dam with asphaltic core. Spillway capacity max 28.5 m^3/s, bottom outlet capacity max 34.5 m^3/s
	Gurgler Ache intake	19.5	70,000	Arch dam
	Königsbach	-	-	Tyrolean weir
	Fernwallbach	-	-	Tyrolean weir
	Venter Ache intake	19	70,000	Arch dam
	Runserau weir expansion	17.5	1.3 million	Gated weir
	Prutz tailwater basin	-	40,000	
	Imst tailwater basin	-	270,000	

PRESSURISED TUNNELS	Length of tunnel (km)	Width of tunnel (m)
Platzertal to Gepatsch	Pressure tunnel: 4.9 Pressure shaft: 1.1	Pressure tunnel: 3.9-4.4 Pressure shaft: 3.4
Gurgler to Venter	6.5	4.9
Venter to Gepatsch	16.2	6
Gepatsch to Prutz 1 and 2	13	6.4
Runserau to Imst 1 and 2	Existing to Imst 1: 12.3 New to Imst 2: 11.8	Existing to Imst 1: 5.1-5.3 New to Imst 2: 5.8

In addition to the pressurised tunnels, there are various service tunnels and adits, principally the 6.25 km tunnel from Platzertal and Gepatsch, and the 15 km cable tunnel from Gepatsch to Prutz which is the existing pressurised tunnel. KXP adds a further 3 power stations (Versetz with a cavern volume of 158,000 m^3, Prutz 2 volume 97,500 m^3, and Imst 240,000 m^3) to 2 existing power stations (total 5). In addition, ancillary structures include a new switchyard at Prutz, a road around the western shore of Gepatsch, and spoil heaps in Kaunertal and Venter Tal.

The Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW; Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft) regulates safety of dams over 15 m in height and reservoirs over 500,000 m^3 in volume. It uses a permanent panel of civil engineers, the *Staubeckenkommission* (i.e. Austrian Commission on Reservoirs and Dams; SBK) to supervise dam safety. Other aspects of infrastructure safety are addressed by the Tyrolean provincial authorities through the Environmental Impact Assessment (EIA) process. Local emergency services consist of the fire service and mountain rescue service, which include brigades of community volunteers, medical services and the police.

Hydrology is addressed in this topic in relation to risks of dam failure only, whilst topic P-7 Hydrological Resource addresses the use of the hydrological resource. This topic does not address occupational safety of workers, which is covered in topic P-16 Labour and Working Conditions.

Glacier lake outburst floods last occurred in the eighteenth century in this area, and are not expected and not taken into account, especially given that glaciers are shrinking. The development of glacial lakes in the future would be picked up by regular glacier monitoring.

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.*

TIWAG has comprehensively assessed dam and infrastructural safety risks. Detailed analysis of geology, stability, hydraulic calculations, earthquake loading, tunnel construction, rockfall and avalanches, and traffic safety are presented in sections C.02 to C.35 of the Environmental Impact Statement (EIS) for all main components from the Platzertal through to the tailwater basins. TIWAG has prepared dam-break flood wave analyses for both Platzertal and Gepatsch.

EIS Section B.06 “Ordinary and extraordinary events including accidents” presents a summary of safety risks for all of the components listed in the Background above. This analysis presented risks in construction and operation phases for each component, separating expected events (ordinary), and risks (extraordinary), and accidents for

the operation phase. The EIS includes three detailed documents showing analysis to SBK guidelines of the flood safety of Platzertal dam, Gurgl intake and Vent intake.

This assessment was completed by appropriate experts: project designs were prepared by TIWAG executive dam safety engineers i.e. *Talsperrenverantwortliche* (TVs); technical analysis was provided by Alp-Infra consulting engineers, and reviewed by TIWAG's TVs. Input parameters for seismic analysis were provided by Zentralanstalt für Meteorologie und Geodynamik (ZAMG; Central Institute for Meteorology and Geodynamics in Vienna). The Austrian Law on Water Rights requires that operators of dams above a certain size employ *Talsperrenverantwortliche* to conduct surveillance of existing dams, and TIWAG currently employs five TVs, and has established a programme to develop junior dam engineers into TVs. In addition, the SBK consists of well-established experts in civil engineering who serve at Austrian universities and on International Commission on Large Dams (ICOLD) committees.

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 is comprehensive and considers a broad range of scenarios and risks. For example, regarding the Gurgler intake, the following scenarios and risks are considered: floods combined with debris inflows; the risk of avalanches in the transitional period before and after winter; defective monitoring or reservoir levels; and the failure of hydraulic pumps. Further examples are the impact of the failure of both Gepatsch and Platzertal reservoirs on the downstream areas, the breadth of earthquake analysis, considering the maximum possible earthquake for Gepatsch and Platzertal dams, and the depth of analysis of surge waves in reservoirs due to rockfalls and avalanches (based on a hydraulic scale test carried out by the Technical University in Zurich for a reservoir similar to Platzertal).

TIWAG takes opportunities to support for detailed research programmes on aspects of safety, as described under Outcomes. TIWAG continuously assesses opportunities for improving knowledge on areas related to infrastructure safety, such as hydrology and seismic analysis, though they are not necessarily linked directly to the KXP.

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.*

Infrastructure safety is managed through the design of the facilities, complemented by a wide range of plans and procedures. For example, features of the project design features that ensure infrastructure safety include:

- The selection of the Platzertal reservoir location, based on geological considerations for the dam foundation and to minimise the impact of gravitational processes (rockfalls, mudflows and avalanches);
- Spillway design and bottom outlet design to allow discharge of probable maximum floods at full supply level – the Gepatsch spillway can discharge a flood of 207 m^3/sec, equivalent to a 1-in-5000 year flood;
- Shut-off devices near the Platzertal dam to prevent uncontrolled emptying (butterfly valves, spherical valves, roller gates);

- Engineering of the Platzertal dam to withstand a maximum credible earthquake; and
- Design of the Runserau extension to withstand a 1-in-100 year flood with one gate blocked (to meet Austrian regulations), and to withstand a 1-in-1000 year flood with all gates opened.

Examples of plans and processes for implementation and operation include:

- Coffer dams used during construction of the Gurgler and Venter intakes will be built to withstand a 1-in-30 year flood, and the sites will be cleared when monitoring shows exceedances of a 1-in-25 year flow;
- Quality assurance of construction components, as seen at the Gemeinschaftskraftwerk Inn (GKI) project currently under construction, where an institute, Wasser Tyrol, is used to quality control concrete tubbings (i.e. tunnel lining sections) to meet Austrian quality guidelines, for example to withstand 80 Newton per m^2;
- Plans to minimise construction traffic risks for local communities, for example the use of the tunnels from Gepatsch to Venter and from Gepatsch to Platzertal for construction traffic to avoid driving through Ötztal and Platzertal, and a diversion road to avoid construction traffic risk through Prutz;
- The existing flood retention measures in Gepatsch, i.e. a 4 m draw-down providing a storage capacity of 10.2 million m^3 each summer until the end of August, will be extended to a 9 m drawdown with storage capacity of 22.6 million m^3, until the end of August and 4 m / 10.2 million m^3 until mid-September, to accommodate Ötztal floods;
- A warning system operated by TIWAG ('typhones') which will sound a flood alarm if a reservoir level is exceeded as a result of a sudden flood, for example from a landslide or glacial lake outburst;
- Controlled avalanches around Gepatsch and Platzertal to ensure public safety and continued road access;
- Complete drawdown of the Ötztal intakes in winter, partly to avoid the risk of surge waves resulting from avalanches, and the maintenance of a freeboard at Gepatsch in winter;
- Lowering of the Gurgler and Venter reservoirs to provide freeboard of 3.5 m, a volume of about 30,000 m^3, in transitional times before and after winter, to avoid the risk of surge waves resulting from avalanches;
- Plans for fire prevention and escape in the powerhouses; and
- Maintenance activities to ensure safe operation, for example maintenance of the Runserau weir gates and flushing of sedimentation at Runserau and the Gurgler and Venter intakes. Maintenance is planned using the company's project management software, SAP.

TIWAG has provided evidence of the use of the SAP system for prompting maintenance activities through a series of screenshots. Each maintenance activity is described with frequency and documentation of executed activities, persons responsible, detailed procedures and linked documents.

Based on TIWAG's existing standard procedures, the project will use an Operating and Monitoring Manual. This will include details of monitoring measures. The main areas of monitoring will be: dam stability; dam seepage; seismic monitoring; machine temperature, vibrations, and flows; and avalanche risk around the reservoirs. Testing of operations and inspections of key safety infrastructure will be carried out annually, for example the Platzertal bottom outlet, emergency valves, and headrace water-tightness. Annual inspections are carried out in conjunction with the Tyrol authorities. Every five years, inspections will be conducted with the SBK, and every 10 years, the reservoirs are drawn down and headraces emptied to allow for visual inspections of infrastructure that is normally inundated with water.

The above design features and plans were developed in conjunction with relevant authorities. The SBK has provided independent review of the Platzertal dam, Gurgler and Venter intakes, and Gepatsch reservoir (Section C.04.20 of the EIS provides an overview of documentation submitted to SBK concerning these components, and Section C.07 provides the technical report submitted to SBK on Platzertal). Tyrolean authorities will review safety as part of the EIS process.

TIWAG will develop a project Crisis Management Plan and Emergency Response Plan that include details on the communication of public safety measures. A concept for the Crisis Management Plan is included in the EIS and it

will be populated with actual contact details upon project operation. It includes organisational responsibilities, decision-making charts, and interfaces with other organisations (provincial authorities, emergency services) and equipment requirements. A similar plan is used by all existing power plants. There will be procedures for public alarms, including a unified procedure for public alarms in the Prutz area affected by both Platzertal and Gepatsch.

The Emergency Response Plan will be developed prior to impoundment of Platzertal, and will be similar to plans used at existing plants, including applicable legislation and requirements, steps to take in the event of floods, mudflow and rockfall, disruptions to telecommunications equipment, technical defects, ice, avalanches, terrorist alerts, earthquakes, emergency levels of flow; and contact details of TIWAG operators, TVs, mountain rescue, police and fire services, and other relevant persons e.g. mayors, for each incident.

Emergency response simulations and training are regularly undertaken at existing plants, in the areas of fire protection, hazardous substances, flood alert, and general / large-scale exercises. For example: training events on fire extinguishers, and breathing protection with the fire brigade at Prutz in 2015 and 2009, and twice at Imst in 2009; an exercise on oil barriers with the local fire brigade at Prutz in 2016; a landslide-related exercise for Tyrol in 2013; and a flooding simulation for northern Tyrol planned for 2017.

In addition, every municipality has a natural hazard plan that is updated regularly, listing contacts of emergency services. The existing Feichten plan includes failure of Gepatsch as a hazard, for example, and TIWAG has provided directions to follow.

During project preparation, dam safety has been independently reviewed by the SBK, with the main issue identified concerning further investigations of slope stability. No further stipulations are required. The SBK are also involved in the construction phase, with site visits and meetings. The SBK is required to state that a facility meets the required stipulations before it is allowed to operate. TIWAG's TVs will provide independent surveillance during construction and operation: they report directly to the TIWAG Management Board for this function, and not to construction or operation departments. The expansion of Runserau has not been independently reviewed because it is a weir with gates that can be opened from the reservoir level down to the riverbed, and does not meet Austria's definition of a dam, and therefore is not under the responsibility of the SBK. However, the EIS process provides an opportunity for Provincial authorities to consider public safety of Runserau. TIWAG will be required to submit an annual report on dam safety on each dam to SBK during operations, and has provided evidence of annual reports for the existing Gepatsch dam. This provides details of monitoring programmes and results, deformation, seepage and underflow, etc.

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.*

Construction will be closely monitored by TIWAG's TVs and they will continue to monitor the project through operation, reporting directly to the TIWAG Management Board. The SBK expert that approved the design is required to approve construction before impoundment is permitted, and as an additional precaution, the reservoirs will be filled in a three stage process. There will be continuing reviews of safety during operation. TIWAG will be required to report annually to the Federal authorities, including all results of monitoring. TIWAG assesses risks by probability and severity for its operating plants, as seen in the example of Achensee. A risk assessment for the existing Kaunertal project including Gepatsch is currently in preparation. In addition, the project's insurers will carry out a risk assessment, as seen in an example of the Silz project.

Monitoring devices, for example within the dam for seepage, consist of at least two independent gauges, have redundant power supply and have at least two channels of communication (mobile telephony, copper wire etc), so that the risk of failure of one does not compromise effective monitoring of risks.

TIWAG has developed a procedure for the emergency drawdown of the Platzertal reservoir that would sacrifice project assets in order to maintain public safety in the event of damaging flows in Platzertal. Flows are typically 8 m^3/sec compared to a design flow of the bottom outlet of 30 m^3/sec. The aim of the procedure is to reduce hydraulic load acting on the dam by 50% within 8 days. The following steps will be taken to lower the reservoir, in order of priority: 1) generate with at least two turbines, connected to the grid; 2) a bottom outlet discharge of 6 m^3/sec and at least three machines close to runaway speed, accepting the risk of damage to the machines; 3) a bottom outlet discharge of 6 m^3/sec and at least 2 blocked machines, accepting the certain damage to the machines; and 4) only as a last resort, use of the bottom outlet to its full extent.

A further example of the breadth of TIWAG's anticipation of risks is the detailed research into the characteristics of 'complex deep-seated crystalline rockslide systems' around Gepatsch. This has involved surface and sub-surface geological investigations and deformation monitoring. In general, on the basis of data from 1966 onwards for some rock masses, it shows that there has been decreasing velocity of movement over time, suggesting a reduced interaction with the reservoir since impoundment. Seasonal fluctuations in movement correlate with reservoir levels. The topic was also addressed in detail by a working group of the SBK and the evidence provided by TIWAG confirmed. Movement will continue to be monitored through 3 adits on the western shore and 1 on the eastern shore of the reservoir.

Although minor emergencies are managed internally by the plant operation division of TIWAG ("Notfallorganisation"), to manage emergencies that affect more than only one division, TIWAG has a Group Crisis Management System in operation. Both cooperate with the Emergency Centre of Tyrol, which is the official crisis management team of the Tyrolean authorities. A TIWAG internal Group Crisis Management Procedure is currently being updated by a working group consisting of members from all divisions and the Managing Board.

The Emergency Response Plan described above will be part of the power plant's operation and monitoring manual that is reviewed by the EIA-authority before issuing the final operational approval, as for all other large TIWAG power plants. In addition, in accordance with Austrian law for civil protection, there will be an emergency manual which will be independently reviewed as part of regular certification of the Environmental Management System (EMS) in place at TIWAG, to ISO 14001 standards.

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.*

On the basis of the very extensive analyses of infrastructure safety, and the reviews of the SBK, there is very high confidence that TIWAG's designs and plans will avoid, minimise and mitigate the main infrastructure safety risks. TIWAG and the Austrian hydropower sector have a strong track record in infrastructure safety.

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.*

TIWAG has a number of plans or ongoing activities that contribute to addressing safety issues beyond those risks caused by the project itself. The project will construct a tunnelled and galleried road alongside the western side of Gepatsch reservoir. This is partly in response to the need to avoid a potential increase in the risk of landslides and avalanches due to the increased fluctuations of the reservoir, but it also provides greatly improved safety on this road, which is used in winter to access the Kaunertal ski area.

TIWAG supports Alp-S, a scientific consortium established 15 years ago, with financial and in-kind support from staff that totals € 2 million over 2014-2017. Several Alp-S projects directly concern or are linked to infrastructure safety: a € 400,000 study monitoring slope stability; a € 600,000 flood prognosis for the River Inn; and 'MUSICALS II', a € 600,000 study on snowmelt discharge. In addition, TIWAG is part of the European working group of ICOLD, disseminating best practices in dam safety.

In addition, TIWAG is currently the main funder of a research project of ZAMG (Zentralenstalt fur Meteorologie und Geodynamik, the Austrian Organisation for Meteorology and Geodynamics) to get more reliable data on seismic hazards with a very low return period. This six year project started in 2014.

Criteria met: Yes

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 significant gaps against proven best practice.

0 significant gaps

8.3 Scoring Summary

TIWAG has comprehensively assessed infrastructure safety risks, with detailed analysis of geology, stability, hydraulic calculations, dam break flood wave analysis for the new and existing dams, earthquake loading, tunnel construction, rockfall and avalanches, and traffic safety. Assessment is prepared by competent experts, the TIWAG executive dam safety engineers (Talsperrenverantwortliche) and reviewed by Austria's independent dam safety commission, the Staubeckenkommission.

Infrastructure safety is managed through the design of the facilities, complemented by a wide range of plans and procedures. Examples include the expansion of flood retention measures at Gepatsch, minimising construction traffic risks for local communities through the use of the access tunnels, controlled avalanches, drawdown of Venter and Gurgler intakes to avoid flood risk from landslides and avalanches, etc. TIWAG will follow its standard procedures in the management of maintenance, and the use of an Operating and Monitoring Manual, Crisis Management Plan and Emergency Response Plan. These have been or will be developed in conjunction with relevant regulatory and local authorities. Emergency response plans will include awareness and training programs.

TIWAG will identify and respond to risks to a wide range of monitoring activities, and procedures such as the emergency drawdown of Platzertal. On the basis of the very extensive analyses of dam safety, and the reviews of the SBK, there is high confidence that the designs and plans will avoid, minimise and mitigate the main safety risks. There are no significant gaps against the scoring criteria, resulting in a score of 5.

Topic Score: 5

8.4 Relevant Evidence

Interview:	24, 26, 43, 48, 52, 58, 65, 81
Document:	4, 47, 48, 49, 50, 52, 53, 60, 61, 62, 68, 69, 74, 76, 78, 79, 80 , 81, 82, 83, 84, 149, 184, 235, 237, 242, 243, 244, 245
Photo:	25-30, 36, 38, 43, 63, 72-74

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

TIWAG is a large corporation within the meaning of the Austrian Business Code (Section 221 Paragraph 3). The company prepares the annual financial statements according to the provisions contained in the Austrian Business Code (Unternehmensgesetzbuch, UGB) and the Austrian Stock Corporation Act (Aktiengesetz, AktG) as amended.

Despite a generally difficult economic climate with falling electricity prices, and dampened economic growth in both Austria and the EU, TIWAG has positioned itself as one of the most profitable electricity companies in Austria. TIWAG's hydropower portfolio is within the TIWAG Group's broader portfolio of electricity, gas and heat. Being vertically integrated, TIWAG operates in the full electricity value chain. TIWAG is actively involved in both Austrian and EU markets, and strategically pursues synergies and economies of scale. During 2015, the TIWAG Group achieved a sales revenue of € 1.282 million and profit on ordinary activities of € 126.8 million. The TIWAG Group's asset value is € 2.5 billion, of which shareholder equity is € 1.17 billion or 46.8%; this high equity ratio ensures the TIWAG Group's good credit standing. The cash flow from operating activities was € 245.6 million in 2015, which created a source of funds for hydropower expansion plus payment of a shareholder dividend (€ 4 million in 2015). In 2015, the TIWAG Group's return on sales was 10.2%, return on equity 7.4%, total return on capital 3.9%.

TIWAG is operating in a period of a major energy transition in Europe, towards a single market for energy based primarily on renewable energy. The process towards this transition has created challenging market circumstances, with extensive subsidies for wind and solar power leading to excess electricity capacity and declining wholesale electricity prices. Volatility in the electricity supply system is increasing due to the increasing percentage of renewables and decrease in base load power. These market circumstances underpin the business case for the Kaunertal Expansion Project (KXP), which will contribute to the need for electricity storage, flexibility in electricity supplies, and increased renewable energy to meet Austria and EU targets, as well as support Tyrolean and Austrian energy security objectives (see topic P-3 Demonstrated Need & Strategic Fit).

TIWAG's Division of Energy Trading and Energy Management is responsible for ensuring that TIWAG is well-positioned in energy markets both now and into the future, having the responsibility to buy and sell electricity and gas. Traditional business models have needed to adapt, given liberalised energy markets allowing easier market entry for new suppliers, an easier ability for customers to change suppliers, changing pricing mechanisms, new electricity and gas exchanges, and new products. TIWAG uses a mix of bilateral long-term contracts and sales/purchases on a mix of markets (spot, day, balancing, primary, secondary, reserve). Proceeds from secondary control energy sales and supplying control energy were important revenue streams during 2015.

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.*

Financial modelling of the KXP has been undertaken by TIWAG's Controlling and Investment Management Division, using a Discounted Cash Flow (DCF) analysis. This analysis was undertaken and presented to the Supervisory Board for approval in 2012, ahead of the decision by the Board to submit the Environmental Impact Statement (EIS) to the Authority and progress through Phase 3 of the project development cycle (see topic P-6 Integrated Project Management).

DCF is a well-recognised and increasingly promoted valuation method for investments, and is considered to best reflect the key drivers of share value (expected growth in operating earnings, capital efficiency, balance sheet capital structure, cost of equity and debt, and expected duration of growth). The DCF analysis uses future free cash flow projections and discounts them to arrive at a present value, which can then be compared to the current cost of the investment. TIWAG's DCF analysis for the KXP consists of three major parts:

1. ***Capital costs***. Capital costs are derived from TIWAG's Hydropower Engineering and Planning departments working with the Central Purchasing Department. Costs include construction costs as well as those required for mitigation measures, land acquisition and agreements.
2. ***Operating costs***. Operating costs are provided by TIWAG's Power Generation Department. These costs reflect operations and maintenance data, expected personnel costs, and anticipated refurbishment needs.
3. ***Expected revenues***. Revenue data is provided by TIWAG's Division of Energy Trading and Energy Management, based on their model of the EU market combined with the TIWAG system operating model.

The financial analysis generates a base case and calculates a Modified Internal Rate of Return (MIRR). The MIRR assumes that positive cash flows are reinvested at the firm's cost of capital, and the initial outlays are financed at the firm's financing cost. TIWAG uses MIRR for all its projects, instead of the more traditional Internal Rate of Return (IRR) which assumes that cash flows from a project are reinvested at the IRR, because the MIRR is considered to more accurately reflect the actual reality of cash flows related to a project.

For the sensitivity analysis, the modelling exercise involves varying the two most important input factors (capex ±25% and revenues ±25%) and calculates a grid of possible results. Scenarios examined include a 90-year concession period (relatively long) and a 60-year concession period (relatively short). In most similar infrastructure projects, unexpected costs would not normally be expected to exceed 10%, so +/-25% is considered a very broad range but appropriate to test at this stage of a project given that cost assumptions are based on estimates.

The revenue modelling generates a price curve. Because adverse events are captured in the sensitivity analysis, the most realistic future revenue is used as the input into the financial analysis, i.e. the median of the price curve. The business decision on the implications of the project for the long-term corporate financial viability, however, is based on the most conservative scenario. This is to give assurance to the owners that the most adverse scenario for the project would not make the business unviable.

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.*

The project cost estimates are derived from a rigorous and multi-faceted process involving a number of different TIWAG departments including hydropower engineering, planning, construction, land and property, and central purchasing. Costs are determined on the basis of key parameters, and are a result of TIWAG's cost estimates compared to actual experiences of both TIWAG and other company projects. Other companies are queried through networks and contacts. Costs are plotted over time, and use percentages to allow for inflation. Costs include unforeseeable costs, the percentage of which depends on how far the project is into the planning stage.

Construction contractors are presently facing a competitive market for their services in Tyrol, so are bidding with relatively small margins and carrying more risk than they would ideally like.

The projections about future revenue streams are tested through a detailed process including independent review. TIWAG's model covers every power plant in Europe, both current and planned, and including all energy types. The power price curve is divided into peak and base price, and the operating model is used for optimisation. The model considers short, medium and long-term positioning of the project amongst TIWAG's portfolio in the market, including seasonal variability. The model optimisation considers the ability of the KXP to be able to provide products to sell in multiple markets (a capability built into the project design), and projections of how existing and new markets will evolve by the mid-2030s (e.g. for ancillary services, balancing and reserve products). An independent expert (BET) reviews the model and the resultant power price curve, which projects out to 2050 after which it is assumed for modelling purposes to be stable.

The ±25% sensitivity test is considered a broad margin to test, and so should incorporate a wide range of potential future scenarios and risks. The financial model analysis undertaken to date has been to inform the business decision to progress with Phase 3 (Submission and Approval) of the project, i.e. to submit the EIS to the Authority and pursue the permit, and it is now 4-5 years old. The modelling will be reviewed and updated, and costs and revenues subject to fresh tests, ahead of the business decision to progress into Phase 4 of the project, i.e. tendering and construction.

At this point in time, it is not possible to demonstrate that the project costs and revenue streams are fully detailed and financial viability of the project has been optimised, which is a gap against this proven best practice criterion. However this is a process gap, and is not considered significant given that there are plans to do such analyses and optimisation at an appropriate point in the project development cycle (in about ten years), and there is every indication that TIWAG would do this as part of its normal business processes.

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.*

At this stage in the KXP development, financial plans have been developed in detail for Phase 3 (Submission and Approval), and have been developed broadly for the construction and operation phases sufficient to inform the financial analysis. Financial management plans for project implementation will be considerably detailed ahead of the next Supervisory Board decision, likely to be in around 2028. Several years are allowed for ahead of this decision, to develop the tendering plan and then the procurement plan, and the Supervisory Board's decision will be based on the project cost based on 70-80% "loadable offers" (i.e. offers expressed in bids submitted in response to the tenders, but not yet fully negotiated or closed as this requires the Supervisory Board approval to proceed).

Financial management plans for this present Phase 3 are detailed and closely managed. Financial management for the KXP is the responsibility of the KXP Project Manager, supported by a controller on the team from the Investment Management Division. The project has a work breakdown structure with tasks that are each scoped and costed, and the team's financial controller generates regular reports which are commented on and complemented with additional quantitative and qualitative data by the Project Manager. These reports are approved by the Project Manager and submitted to the Management Board. Cost over-runs are closely monitored and analysed.

Financial management processes for project implementation and operation are set out in process management standards, in line with the organisation-wide approach led by the Department of Corporate Development and

Organisation (see topic P-2 Governance). Internal control processes include delegations, internal reporting, and internal audits.

The project is at too premature a stage to propose a specific project financing approach. TIWAG has had experience of several different approaches to project financing to date. The small to medium HPPs in TIWAG's portfolio were built with its own corporate financing. Of the two large storage projects, Kaunertal was built with external financial partners based on an arrangement to ensure they received a fixed percentage of the power output of the plant for a defined period. The other large storage project, Sellrain-Silz, was financed by TIWAG on the basis of an arrangement with two German utilities for power exchange so that TIWAG could get guaranteed baseload power, thus reducing TIWAG's market risks. To develop the Gemeinschaftskraftwerk Inn (GKI) plant that is presently under construction, TIWAG has formed a joint venture with Verbund and Engadiner Kraftwerke, and financed part of its share through a € 150 million loan from the European Investment Bank (EIB).

For the KXP, there is no particular financing approach planned, but the project has been designed so that it can accommodate different scenarios, and there are no foreseeable difficulties in TIWAG's ability to access finance. In TIWAG's long-term financial plan, only traditional instruments of corporate finance are assumed so that the most conservative scenario can be assured to be manageable. Strategically, TIWAG will consider as it gets closer to Phase 4 (Construction) if it will want to share part of the financial or market risk.

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 KXP Phase 3 budget has been updated since its approval in 2012 to better incorporate well-considered measures for environmental and social issues during this phase, as well as technical and legal, arising through the approvals process. This update was based on the experience with other projects and better understanding of the needs for the KXP during this phase. The environmental and social activities are broken down to a high degree of detail, and all individually scoped. The updated budget takes a conservative approach to the requirements for completion of Phase 3, based on the experience with other project approvals processes to date.

Of the overall € 1.33 billion calculated for the construction of the KXP, based on 2015 price levels, approximately € 31 million is allocated to environmental and social costs during Phase 4. TIWAG has not at this point in time (at least ten years from developing the project business case) outlined detailed contingency measures for all environmental and social mitigation plans and commitments. Based on observation of the Phase 3 budget management it can be seen that such a process would be followed at the appropriate time, and this is not considered a significant gap. The preliminary allocations for environmental and social costs during the construction stage include:

Social costs, e.g. for project hot lines, and monitoring programs for community needs	€ 1.0 million
Construction environmental mitigation measures	€ 13.15 million
Imst re-regulation basin (for environmental mitigation)	€ 8.8 million
Environmental measures on the River Inn	€ 2.1 million
Enlargement of tailwater basin (for environmental mitigation)	€ 1.06 million
Fees for environmental costs	€ 2.8 million
Contingencies for environmental costs (i.e. additional environmental measures required by the Authority)	€ 2.0 million

Processes are in place to anticipate and respond to emerging financial risks and opportunities at a variety of levels. At the project budget management level, regular project reports are submitted and the project management team includes a project control function. At the corporate level, monitoring and forecasting of the market, and taking a long-term view of risks, opportunities, and planning, is central to the approach with the KXP. TIWAG's long-term financial plan provides a mechanism to monitor and ensure that TIWAG can afford the project, within the context of its existing and proposed development portfolio, and that it is not setting up for a stranded investment or unmanageable debt ratio at some future time period. Opportunities are pursued by TIWAG through: market analysis; pursuing new options in energy storage, energy efficiency, and energy services; process optimisation; customer engagement; and active involvement of suppliers in the value chain. The KXP is both an opportunity being pursued and a risk being managed, by ensuring TIWAG can rely in the future on adaptable power stations with variable output, load management and flexible energy storage.

Risks are closely monitored through the risk management system and the close involvement of both the Management and Supervisory boards. Risk management strategies including the internal control system, financial monitoring against Key Performance Indicators (KPIs), insurance management, and a strategic approach to financing. TIWAG has created a Group Treasury function to ensure a centralised and streamlined approach to financing. This helps the business to have a uniform presence on the capital markets, and to enable funds for upcoming major investments to be obtained at the best possible terms and conditions. This group has arranged refinancing to take advantage of the very low interest rates. Additionally, a bond (Euro private placement bond) was issued in 2015 as part of the preparations for the planned major investment program.

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.*

The financial analysis for the KXP was carried out prior to the decision in 2012 to proceed to Phase 3, and so 4-5 years has passed. Interest rate is an important factor in the analysis, as it influences the Weighted Average Cost of Capital (WACC), and interest rates have decreased in the last five years. Lower interest rates result in a reduced reamortisation (i.e. payback) period for the debt. However, electricity price levels have dropped from around ~€ 50/MWh to ~€ 25/MWh in the last 4-5 years, and the price difference between peak and base prices has dropped, which are also significant influences the project's financial position.

At the time of the financial analysis and decision to progress, in 2012, a 2024 start period was planned for the KXP. Based on market modelling, TIWAG remains of the view that the projected future market will favour development of the KXP. A critical question for TIWAG is when to launch the plant on the market, as electricity prices need to go up and reserve energy needs to be a very valuable asset. A number of utilities in the European market are putting plans for development of new pump storage on hold, waiting for more favourable market conditions. The market forecasting suggests that by 2030-35, 50-60% of the central European electricity market will be new renewables, dominated by Germany, which will result in an increase in the price of balancing energy. The forecasting suggests that electricity prices will be double their present levels, plus there will be a higher volatility in prices, i.e. prices will change rapidly during the day.

TIWAG is managing financial issues with the KXP through its phased project development approach, and through reconsidering its timetable for development. In response to these market conditions, the TIWAG CEO has publicly stated that the KXP is not projected to start operations until 2034. The Supervisory Board has approved the Phase 3 budget based on considerations of its long-term corporate financial plan. Phase 3 costs cannot exceed 10% of

the approved budget without scrutiny by the Management and Supervisory boards, and further agreement to proceed with an increased budget.

The approved KXP budget for Phase 3, including the budget for the Prutz – Imst extension (which was not part of the KXP in 2012-13), amounted up to € 83,883,000. To date in Phase 3, TIWAG has spent € 74,050,000 on preparing the project. One-third of these costs are TIWAG internal labour costs, and two-thirds are third party services and building costs. From this sum, 12% was used for project management, 24% for ecological survey and expert reports, and 64% for engineering and exploration.

The Supervisory Board approved a Phase 3 budget increase at its meeting on 23 November 2015 to € 106,189,000 due to the much longer authorisation process and cost rises due to inflation and other contingencies. Looking forward, it is anticipated that the cost for project management will rise and there are still a number of costs, e.g. for land acquisition, still to be determined.

TIWAG plans to work on the update of the project business case several years ahead of the Supervisory Board's decision to approve the project, to be made in about 2028. At this point in time there will be a lot more known factors in the financial modelling, including the length of the concession agreement. TIWAG will have the ability to consider continuing the KXP as planned, abandoning, or reconfiguring the project, as well as alternative financing and market positioning scenarios.

Given this point in time in the project development process, with an estimated ten years before any decision to progress to construction, it is concluded that TIWAG can manage financial issues in relation to the project under a range of scenarios (represented within the ±25% sensitivity testing), recognising that not proceeding is one management option. TIWAG has the ability to decide not progress the project, based on its updated financial modelling, without putting the business in an unviable financial position. All indications are that TIWAG will not pursue the project unless it is satisfied that it 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.

Criteria met: Yes

Analysis against proven best practice

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

Whilst the evidence indicates that the project can manage financial issues under a range of scenarios, it cannot be concluded that the project can manage financial issues under a broad range of scenarios with the level of confidence one would be looking for at proven best practice. Given the long lead time until the project is built, and the number of dependencies that will influence if the project proceeds, it is not even possible to articulate the range of scenarios and associated probabilities without a wide degree of speculation.

There are many questions about possible scenarios and whether or not the project would be financially viable under any one individual scenario, not to mention combinations of these scenarios. Scenarios that could be present in ten years' time include, e.g., electricity prices do not rise, the electricity market does not develop as anticipated, there are technological disruptions that create whole new ideas about energy futures, TIWAG does not get access to the Ötztal water rights and needs to consider a reconfigured design, TIWAG is not issued a permit, construction prices increase considerably, etc.

Whilst all indications are that the market conditions will favour projects such as the KXP, to conclude this criterion is met would require greater evidence than can be provided at this point in time. The lack of evidence to demonstrate that the project can manage financial issues under a broad range of scenarios is a **significant gap** at the level of proven best practice.

Criteria met: No

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 is insufficient evidence to demonstrate that the KXP can manage financial issues under the broad range of scenarios that could be relevant in a decades' time.

1 significant gap

9.3 Scoring Summary

The financial business case for the KXP was presented and approved by the TIWAG Supervisory Board in 2012, ahead of the decision to progress through the project development Phase 3, EIS Submission and Approvals. The next Supervisory Board decision will be made in approximately 2028, to inform the decision to progress to Phase 4, Construction. The 2012 business case was informed by carefully investigated estimates of capital costs, operating costs and expected revenues. Revenue forecasts are informed by extensive modelling of TIWAG's electricity markets, tested through independent review. A broad sensitivity test was conducted, ±25% for costs and revenues, and a highly conservative approach was taken to inform the Board decision to progress to Phase 3. It has become apparent that the market conditions favouring the KXP will not be ideal until the mid-2030s, and so an extended time requirement for Phase 3 is compatible with this timing. The Phase 3 budget for the KXP is well detailed, and has been revised and the timing adjusted in light of updated knowledge. TIWAG demonstrates all requirements for proven best practice, but a gap is assigned on outcomes as it is too premature to be able to state that the KXP can manage financial issues under the broad range of scenarios that could be relevant in ten years' time.

Topic Score: 4

9.4 Relevant Evidence

Interview:	6, 10, 14, 15, 36, 42, 51, 67, 80
Document:	7, 16, 17, 88, 93, 97, 229, 254, 256, 340, 341
Photo:	-

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

To reduce overlap with other topics, this topic P-10 defines 'project benefits' in a narrow sense. It does not revisit the wider regional and national benefits from the KXP, that have been described in topic P-3 Demonstrated Need and Strategic Fit. It also does not address measures to mitigate and compensate for negative impacts on project-affected communities, which will be discussed in topic P-13. Water management benefits, specifically contributions to flood control and reductions in flow variations along some river reaches, are discussed under topics P-3 Demonstrated Need and Strategic Fit, P-4 Siting and Design, and P-23 Downstream Flow Regimes. Economic and employment benefits, specifically secondary income effects and preferential hiring and skills training of local labour, are discussed under topics P-11 Economic Viability, P-12 Procurement and P-16 Labour and Working Conditions.

The reason for not revisiting water management benefits is that they are an integral part of the project design and not 'additional'. As described in the Water Management Framework Plan for the Upper Tyrol, the KXP is a multi-purpose project with important contributions to flood control and reduced impacts from peaking. Without the overall ecological improvements and contributions to the implementation of the European Water Framework Directive, the plan (and therefore, the KXP) could not have been declared in the public interest. The KXP only provides those benefits as a package, with additional components in the Inntal and an oversized (from a power generation point of view) diversion tunnel from the Ötztal.

The focus here is therefore on specific additional infrastructure and financial benefits for communities in the project area. The original Kaunertal project led to substantial improvements in infrastructure and tourism opportunities. In particular, the road into the upper Kaunertal was improved, preparing the opening of the road to the glacier skiing area in 1979-1980, one of the highest paved roads in the Alps. The KXP will further improve safety on this road in case of avalanche and rock fall (see topic P-8 Infrastructure Safety) and make access to the ski resort, with approximately 100 seasonal employees, more reliable. In the Ötztal, the current single 30 kV line will be supplemented by a line from the Kaunertal through the water transfer tunnel to Sölden, increasing security of supply without another aboveground line, thus avoiding visual impacts. Other contributions to local infrastructure are yet to be defined.

The most relevant financial benefits are payments to municipalities through so-called 'valley contracts'. Valley contracts are the standard mechanism in Tyrol to compensate municipalities for any additional impacts that cannot be individually calculated, and provide them with a share of the revenues. The original arrangements for the existing Kaunertal project dated back to 1966 and provided approximately € 850,000 per annum to 18 municipalities (€ 180,000 for Kaunertal, € 350,000 for all other municipalities, and € 320,000 for two farmers' associations who lost land in the Kaunertal - this last category is not seen as an additional benefit, and is addressed under topic P-13 Project-Affected Communities and Livelihoods). These original arrangements were paid for by TIWAG but negotiated by the provincial government. Around 2010 the responsibilities were moved entirely to TIWAG, and revised valley contracts were negotiated with a total of 64 municipalities (with 61 signed and 3 pending). For the existing Kaunertal project, the payment is now € 990,000 per annum (plus € 320,000 for the farmer's associations). The total payment for the KXP and its distribution between municipalities have not been established yet.

Regarding other potential financial benefits for municipalities: (1) tax receipts from TIWAG projects play only a minor role for municipalities during normal operations (as there are few TIWAG employees which pay their municipal income taxes locally, and TIWAG's corporate taxes are paid largely in the provincial capital Innsbruck), but during construction there will be a higher contribution from taxes; and (2) through sponsorship arrangements, TIWAG also supports some local clubs for sports, music, theatre, or fire brigades.

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.*

There has been no specific study to assess opportunities for additional benefits and benefit sharing. Because of the long presence of TIWAG in the region, and the previous hydropower projects which have already led to improved infrastructure and financial flows to municipalities, there is a common understanding and expectation that TIWAG will negotiate new benefits. The communities themselves are taking the lead in formulating lists of improvements that they prioritise, and that they want either TIWAG to finance directly or that they would finance out of the additional resources from the valley contracts. Some municipalities – in particular, Kaunertal – have undertaken a broad-based planning process to identify future priorities.

TIWAG's investment program that was authorized by the provincial government's decision in 2005, was also taken as an opportunity to reconsider the 'valley contracts'. These had been individually negotiated with municipalities in the past, and were sometimes criticised for a lack of transparency and fairness. The formula that was devised in consultation with the province and the Association of Tyrolean Municipalities is relatively simple, with fixed payments per GWh for different kinds of projects, and an allocation on the basis of only two criteria (shares of each municipality in the aboveground project infrastructure, and in water used by project). The weight of these criteria is generally 50/50 but can be adapted to each individual case. While this reform leads to reallocations in existing projects, historical payments to each municipality are at least maintained.

The pre-project baseline is well documented, both for the current status of infrastructure and for the financial status of the municipalities in the project area. Data are publicly available.

One of the supporting studies for the EIS, on the public interest in the KXP from the national and regional economic perspective, estimated the additional communal tax receipts of the affected municipalities at € 3.46 million during construction.

Criteria met: Yes

Analysis against proven best practice

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

The municipalities take a broad perspective when identifying their priorities, across all municipal functions. Also, additional benefits beyond the 'valley contracts' and infrastructure investment have been publicly discussed, but not yet negotiated. TIWAG has mentioned the possibility for municipalities to become equity partners in the KXP (as in the recently licensed 14 MW Tumpen-Habichen project in the Ötztal), and for additional investments in communal infrastructure in the project area, to be negotiated in due course as part of a 'Package for the Future'. A reallocation of TIWAG's taxes within the province, and increased employment by TIWAG in the project region have also been mentioned.

Criteria met: Yes

10.2.2 Management

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.*

The last years have seen a series of negotiations over valley contracts in the area, including the new Gemeinschaftskraftwerk Inn (GKI) project and renegotiations for the existing Prutz-Imst, Sellrain-Silz and Kaunertal projects, which approximately doubled the overall amounts. There is now an established process for negotiating payments. The overall amount per project ranges from approximately € 600,000 to € 1.1 million, and the numbers of municipalities affected by the various projects range from 7 to 17. Because municipalities benefit differently, depending on the weighting of criteria in the allocation formula, there is often an extended discussion over the new contract, as well as demands for additional support to municipalities apart from the valley contracts. In some cases, additional one-time payments are made (for example, by applying new formulas retroactively).

The new contracts are based on a range of values per GWh generated, between € 1,300 for run-of-river generation and € 1,950 for pumped storage generation, indexed to inflation. Based on these values, for the KXP, preliminary estimates suggest a total initial value of a renegotiated valley contract of approximately € 2.1 million annually. By linking payments to generation, municipalities share some of the risks and opportunities of variations in hydrological flows and other changes.

The preparation of the KXP has raised expectations among the affected communities. The Kaunertal municipality has conducted a number of planning exercises to prepare a position regarding the expansion project, compile catalogues of questions for TIWAG, and conclude a Development Program 2013-2017. The purpose of the Development Program was to develop a vision based on the two most important economic sectors, tourism and agriculture, and independent of the hydropower project; however, financing for some of the actions may not be available unless the hydropower project goes ahead, and may become part of the negotiations with TIWAG. Other municipalities and associations have conducted similar exercises. For example, the Tourism Association Upper Tyrol/Kaunertal presented the following list of expected benefits from the KXP:

- Glacier road – increased safety and opening (without toll payment) up to Fernergriess
- Cable car Kaunertal – Fendels, to link the Kaunertal to an additional ski area
- Ski lifts to the highest point in the Kaunertal glacier area, the Weissseespitze
- Sustained share in value added
- Special tourism promotion zone for the Kaunertal, with a subsidy program to increase quality and quantity of accommodation
- Improvement of public transport, including a hiking bus (natural gas or electric)
- Support by professional media agency, to avoid image problems during construction
- Other necessary infrastructure

The municipality of Kaunertal has prioritised major investments that it would find difficult to finance from its regular budget, such as the rehabilitation of the indoor swimming pool, safe roads into the valley, improvements in public transport, a small hydropower station owned by the municipality, and a “Kaunertal Foundation” linked to a future KXP.

Such lists are generally not commented on, or any specific commitments made, by TIWAG until a project is permitted. TIWAG does not have a fixed budget for additional benefits; estimates of € 1 million for ‘social costs’ and € 13.5 million for ‘construction mitigation’ have been reserved in the project budget, but the valley contracts and some infrastructure benefits will be additional to that. Experience shows that negotiations with

municipalities can be protracted and that they may threaten to not sell land which may be required, or to raise legal objections against the permit, if not satisfied with the outcome. Municipalities are generally advised by legal counsel in negotiations with TIWAG.

The ongoing relationship between TIWAG, the province and the municipalities affected by the KXP would serve to identify any risks or opportunities. While TIWAG could not justify major future infrastructure contributions beyond those initially agreed during project negotiations, and minor contributions and sponsoring have been somewhat curtailed in recent years, the valley contracts for existing projects have been substantially changed. This demonstrates that the province and TIWAG are responsive to changes over time, and reduces the potential for conflict between municipalities as levels of payment and the allocation formula have been standardised.

Democratically elected representatives in the municipalities, and the Supervisory Board members of TIWAG, also representing a democratically elected government, approve the negotiated contracts. They are also subject to auditing as any other public financial resources. However, the commitments are not made easily accessible to citizens: the contracts are not disclosed, the revenue from the valley contracts is not mentioned in the provincial statistics on municipal finances ('Gemeindefinanzbericht'), the budgets of the municipalities are not available on the municipal websites, and the valley contract revenue has not been discussed over the past years in council meetings, at least in two key municipalities (Kaunertal, Prutz). Online, the assessors have been able to find a single example of a municipal budget which identifies the valley contract revenues, for the municipality of Prutz. This is an excel file which is difficult to interpret, but is downloadable from the "open budget' website (www.offenerhaushalt.at). For other municipalities affected by the existing Kaunertal project, data are not available from this website. The main source of information on payments from TIWAG appear to be the public announcements that municipal administrations regularly make on their bulletin boards. There is no indication of an intention to improve disclosure for the KXP.

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.*

Municipalities are flexible in their use of the resources provided under the valley contracts, responding to changing priorities, risks and opportunities. Also, the reform of the valley contract system over the past years has shown the ability of the provincial government, TIWAG, and the municipalities to work together to expand local benefits and base their distribution on more objective and uniform criteria.

Criteria met: Yes

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.*

Tyrol has a well-established process to provide project benefits which gives local communities, represented by their municipal councils and mayors, a strong role in formulating expectations and negotiating with TIWAG. Experience from other projects shows that councils often achieve improvements over the first offers made by TIWAG. Issues are generally raised through the councils and feedback is provided to the councils; sometimes other political representatives (such as provincial parliamentarians or a representative of municipalities on the TIWAG Supervisory Board) get involved.

Valley contracts are generally concluded with all municipalities which have any project infrastructure and/or where waterbodies are used for a project. Under the new regime where valley contracts are negotiated by

TIWAG, there are no indications of municipalities outside the project areas, or organisations other than municipalities, requesting negotiations over project benefits.

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.*

Because negotiations between TIWAG and the affected municipalities are quite formalised, leading to substantial contractual commitments, and complex because of multiple partners involved who are pursuing the interests of their constituencies, they often take substantial amounts of time and are conducted with the support of lawyers. Both parties to the negotiations either have internal democratic processes, in the case of the municipalities, or are overseen by a democratically elected government, in the case of TIWAG. Both sides therefore offer some opportunities for citizen involvement, but this is not sufficient for an inclusive and participatory process, which would depend on making it easy for citizens to access information on benefits. It is unclear why the valley contracts, concluded between public entities, are not publicly disclosed, and why data on transfers from Tiwag are not made more easily accessible. Discussions in connections with payments seem to be largey internal within municipal councils, over expectations on the quantities and use of such payments. A broader public debate and direct engagement between diverse groups of local stakeholders and TIWAG is not taking place. Therefore, there is also no indication of thorough and timely feedback, except in the case of municipal administrations, most of which have managed to conclude agreements and report satisfctory consultations and negotiations.

The lack of public information leads to a lack of inclusive and participatory engagement by citizens on project benefits, which is a **significant gap** against proven best practice.

Criteria met: No

10.2.4 Outcomes

Analysis against basic good practice

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

As other hydropower projects in Tyrol, the KXP will deliver benefits to communities in the project area which go beyond compensating for negative impacts. These are delivered over the entire operating period of the KXP and, in the case of infrastructure improvements, provide long-lasting services.

No calculations have yet been conducted to estimate the overall fiscal impact of the KXP on the different municipalities. The relevance of project benefits depends on several factors, including the size and the financial situation of the different municipalities and the payment amounts and costs of infrastructure improvements that they receive. For example, the Kaunertal municipality has 594 citizens. In 2015, it received € 275,000 in local taxes, € 710,000 in shares of national taxes, and € 310,000 in user fees, and had € 1.6 million in debts. For this municipality, the current annual payments (€ 508,000 in 2016) as well as any infrastructure improvements and temporarily increased tax receipts are quite relevant. Because of the formula for valley contracts, however, no major additional payments could be expected from the KXP (no additional water resources from the Kaunertal will be used, and most of the additional infrastructure in the Kaunertal will be underground). For comparison, the municipality of Sölden in the Ötztal had 3,135 citizens, € 4.6 million in local taxes, € 4.8 million in shares of national taxes, € 2.9 million in user fees, and € 9.4 million in debts. Its share of the approximately € 2.1 million under the KXP valley contract may be estimated at about € 1 million, some 8% of the annual budget, plus a share of the additional € 3.46 million in local taxes during construction. It can be expected that, if it comes to specific negotiations with municipalities like Sölden or Kaunertal, the focus would be on substantial infrastructure

improvements (such as a bypass road for the town of Sölden, which has been mentioned as a priority investment).

Beyond those fiscal and infrastructure investments, the multi-purpose nature of the KXP with flood control and ecological improvements adds to the benefits of the project, even beyond the scope of this topic P-10.

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 payments under the valley contracts and other additional benefits negotiated with TIWAG constitute significant shares of municipality budgets; and the valley contract payments are for an indefinite period during the project's operations.

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 lack of public information leads to a lack of inclusive and participatory engagement by citizens on project benefits.

1 significant gap

10.3 Scoring Summary

Some benefits are built in to the KXP, such as flood control in the Ötztal and ecological improvements in the Inntal. Beyond these, TIWAG's projects generally provide substantial and sustained benefits to communities, in the form of infrastructure improvements based on priorities identified by and negotiated individually with the municipalities, as well as annual payments to municipalities linked to generation under a formula that has recently been updated. Commitments to infrastructure improvements are publicly known, but the so-called 'valley contracts' are not currently disclosed to citizens, and information about payments to municipalities could be made much easier to access. There are no plans to change this for the KXP. The current disclosure practices hinder an inclusive and participatory engagement on project benefits, which is a significant gap against proven best practice, resulting in a score of 4.

Topic Score: 4

10.4 Relevant Evidence

Interview:	8, 10, 18, 22, 32, 43, 47
Document:	24, 25, 85, 99, 306, 307, 320, 322, 342, 343
Photo:	34

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

Topic P-9 Financial Viability concerns profitability of the project for the owner, whilst this topic, P-11 Economic Viability, concerns the project's contribution to society. A project is economically viable if its total costs (financial costs plus negative externalities) are outweighed by its total benefits (financial revenues plus positive externalities). Negative externalities are the project's social and environmental impacts that cannot be effectively mitigated or that remain as residual impacts after mitigation. Positive externalities are the project's benefits such as a reduction in damages from climate change or flooding, or the restoration of riverine habitat. Most of these externalities are difficult to value in monetary terms.

With Gross Domestic Product (GDP) of € 29.9 billion in 2014, the Tyrol accounts for 9.1% of Austrian GDP. It was the fastest growing region of Austria over 2000 to 2013. In 2014, Tyrol's exports reached € 11.2 billion, giving a positive trade balance against imports of € 9.9 billion. Tyrol is well-known for its tourism industry, which contributes a value added of € 4 billion, and 16% of provincial GDP. Nearly one in four employees works in tourism or in tourism-related fields. Tyrol also has a strong manufacturing and research sector contributing almost 28% of GDP.

In 2014, Tyrol's workforce reached 407,200 persons or 9.0% of the national total, with 5.4% employed in the agriculture sector, 22.1% in industrial production and 72.5% in the service sector, similar to national levels. The Tyrolean economy is characterised by small and medium enterprises, which are 99.7% of enterprises. Tyrol's unemployment rate of 3.2% in 2014 lies below the Austrian average of 5.6% and also the EU-28 average (10.2%).

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.*

TIWAG has commissioned two assessments that address the economic benefits of the project:

- A cost-benefit analysis by ENTSO-E (the European Network of Transmission System Operators for Electricity) which is required as a precondition for the European Commission Projects of Common Interest (EC PCI) process; and
- An assessment of public interest from the perspective of national and regional economies, led by a Professor Emeritus (Dr Borsdorf) from the Institute for Geography at the University of Innsbruck, and the Institute for Interdisciplinary Mountain Research (IGF) of the Austrian Academy of Sciences.

In addition, two further 'public interest' documents set out the benefits of the project: public interest from the viewpoint of energy management and climate protection; and public interest from the viewpoint of flood protection. Please refer to topic P-7 Hydrological Resource for more details on the latter.

The ENTSO-E analysis involved the identification of cross-border benefits of the KXP for the EU electricity supply system, and it documented them in quantitative terms, though not in monetary terms except for one criterion (B2 – socio-economic welfare, see below). It addressed the pump storage element of the KXP rather than the

entire project because the PCI process concerns transmission and pump storage projects only. It used a standardised methodology, referred to as 'CBA 1.0' by ENTSO-E (the methodology is being updated and will then be referred to as CBA 2.0) that is recognised by the European Commission in the context of the TEN-E regulation, i.e. EU 347/2013, on guidelines for streamlining permitting for trans-European energy infrastructure, and the EU 10-year network development plan (TYNDP). CBA 1.0 was used to assess seven aspects of potential economic benefit from a regional energy system perspective:

- B1 security of electricity supply;
- B2 - socio-economic welfare;
- B3 - integration of renewables;
- B4 - reduced losses in the system;
- B5 - reduced CO_2 emissions;
- B6 - technical resilience/system safety; and
- B7 - power fluctuations, voltage support or frequency regulation.

Note that the 'socio-economic welfare' indicator concerns inter alia the value to society of storing electricity at times when prices are low, whilst offering it back to the system when the price is greater, thereby lowering the cost of electricity to society.

B1 to B5 were assessed for four scenarios related to demand and renewables penetration. The methodology defines how environmental impact and social impact are incorporated, but only for transmission lines (kilometres passing through environmentally or socially sensitive areas); these were considered not applicable for the KXP assessment because of the absence of need to build new transmission lines.

The Borsdorf analysis was an assessment of economic benefits of the KXP, especially benefits in the province, but it was not a full cost-benefit analysis. It involved the identification of some benefits, and it documented some in quantitative terms, including an input-output analysis to estimate the multiplier effect of the investment, including direct and indirect effects. Specifically, it analysed income and employment, enhanced tourism including tourism to visitor centres of hydropower facilities, increased foreign exchange, municipal tax revenues, benefits of flood management, and CO_2 emissions reductions.

TIWAG's Head of Department of Energy Strategy and Energy Efficiency combined these analyses by summing the financial cost of the KXP (CAPEX and OPEX) with monetary valuation of its benefits, to estimate its net benefit for 90 years after commissioning, for two of the four scenarios which were most consistent with EU strategy at the time. This used monetary estimates of socio-economic welfare (as defined above), avoided transmission losses benefits from the ENTSO-E analysis, avoided costs of flood damage, added value for industry in the EU, and avoided public costs of renewable energy support, flood protection, avalanche protection and infrastructure from the Borsdorf analysis.

However, these analyses were not designed to be comprehensive analyses that take into account all costs and benefits, as they follow a standard EU-level methodology that focuses on readility available data. None of the analyses incorporate the costs of negative social and environmental impacts in economic terms, or the full range of benefits, in either quantitative or qualitative terms. The ENTSO-E analysis addresses the pump storage component only. Dr Borsdorf's analysis is an analysis of potential economic advantages of the project, rather than a critical analysis of its economic benefits or viability. It assumes any expenditure would be positive, and it does not consider opportunity cost, for example of investment in other energy projects with a similar cost. The input-output analysis has little meaning when an investment in any other area might produce a similar result.

A more comprehensive range of costs might encompass: a reduction in tourism revenues during construction; costs of additional use of roads during construction; permanent loss in the value of tourism arising from rafting, due to altered flow regimes; the economic value of lost biodiversity; and visual impacts. A more comprehensive range of benefits might encompass: restoration of riverine habitat; increased recreational fishing; increased regional revenues due to improved road access to the Kaunertal ski resort; and the avoided social cost of the

damages caused by CO_2 emissions (the social cost of carbon, currently estimated by the U.S. government to be about USD 36 per tCO_2, at a 3% discount rate). The Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management published a CBA guideline in 2009 for structural flood mitigation, and whilst it is only required for Federally-financed projects, it may offer useful guidance for a more comprehensive CBA.

There are limitations in the analysis of the economic viability of the project, and consequently a net benefit cannot be demonstrated. This is a **significant gap** against basic good practice.

Criteria met: No

Analysis against proven best practice

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

Not assessed.

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 ENTSO-E analysis are presented briefly in an annex as no. 222 in to the TYNDP 2014/investment plan for the continental central south region (CCS) that is available on the ENTSO-E website. This presents the results of analysis of B1 to B5 for four scenarios, and B6 and B7. The results are set out under Outcomes below. No further detail than this appears to be available publicly. The findings are also available in a powerpoint presentation by TIWAG's Head of Department of Energy Strategy and Energy Efficiency on TIWAG's website. The Borsdorf assessment of public interest from the perspective of national and regional economies will be publicly disclosed as part of the EIS, in Section C.01.03. However, the quantitative analysis by TIWAG's Head of Department of Energy Strategy and Energy Efficiency is summarised in an internal powerpoint presentation, but it has not been made public, and the results are not incorporated into the EIS.

In summary, TIWAG has publicly disclosed some results of its economic analysis, but has not disclosed the results of a more comprehensive analysis of costs and benefits that is the intent of this topic. This is a gap, but is not significant because the gap relates to the limitations of the analysis of costs and benefits, which was identified as significant under the Assessment criterion.

Criteria met: Yes

Analysis against proven best practice

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

Not assessed.

11.2.3 Outcomes

Analysis against basic good practice

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

The results of the ENTSO-E analysis show positive economic contributions under all scenarios examined for four of the parameters assessed, as shown in the table below.

	B2 Socio-economic welfare (Million Euros per year to 2030; these figures also take account of B3 and B5)	B3 Integration of renewables (avoided 'spillage' – MWh per year to 2030)	B4 Reductions in losses in the system (GWh per year to 2030)	B5 Reductions in CO_2 emissions (kT per year to 2030)
Scenario 1 – 'Slow Progress'	48 to 58	0	36 to 44	370 to 450
Scenario 2 – 'Money Rules'	47 to 57	0	44 to 54	340 to 410
Scenario 3 – 'Green Transition'	81 to 99	1350 to 1650	50 to 61	280 to 345
Scenario 4 – 'Green Revolution'	79 to 97	12,960 to 15,480	48 to 58	240 to 300

B6 Technical resilience/system safety is described as '2' and B7 Flexibility is '3', though it is not clear how these scores relate to Key Performance Indicators (KPIs) that are described for each in the ENTSO-E CBA methodology. The KPIs for B6 concern technical failures and maintenance, steady state criteria, and voltage collapse criteria, and the KPIs for B7 concern flexibility to cope with ranges of scenarios concerning sources of generation in the grid and market conditions.

No results for security of electricity supply (B1) are given, as, according to TIWAG, it is impossible to calculate a systemwide benchmark.

The Borsdorf analysis quantifies economic benefits, during construction, as Gross Value Added (a measure of GDP for a region) of € 1.61 billion, additional income of approximately € 367 million and employment equivalent to approximately 12,233 person-years. There is a multiplier effect of each euro invested of 1.59 in production, 1.61 in income and 1.63 in employment. The analysis quantifies economic benefits during operation due to additional production of approximately € 10.3 million, approximately € 2.3 million in additional income, and approximately 63 jobs. However, the analysis does not take into account the low levels of unemployment in the Tyrol, which is currently below 5%, so the additional local employment and economic activity may be doubtful. TIWAG's analysis of net benefits results in a total discounted net benefit of between € 1.8 billion (ENTSO-E scenario 3) and € 2.0 billion (scenario 4) 25 years after commissioning. This rises to € 2.5 and € 2.8 billion respectively at 90 years. Looking at socio-economic welfare and avoided transmission losses only, TIWAG's analysis indicates net benefits of between € 135 million and € 286 million after 25 years, and between € 554 million and € 813 million after 90 years. The analysis shows that the most significant of the benefits, responsible for the majority of the difference between these 'with benefits' and 'without benefits' estimates, are 'added value for industry in the EU' and 'avoided costs of public support for renewables'. Although TIWAG did not analyse net benefits for scenarios 1 and 2, in these scenarios KXP reduces losses in the transmission system, so benefits are likely.

These figures demonstrate a net benefit based on the assessments undertaken, but they do not demonstrate that there is a net benefit from the project once all economic, social and environmental costs and benefits are factored in (as described in the intent statement for this topic) for the reasons set out under Assessment. There are limitations in the analysis of the economic viability of the project, and a net benefit cannot be demonstrated, which is a significant gap against proven best practice, and the same gap as described under Assessment.

Criteria met: No

Analysis against proven best practice

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

Not assessed.

11.2.4 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

Economic analyses have not taken all costs and benefits into account, and consequently a net benefit has not been demonstrated.

1 significant gap

Analysis of significant gaps against proven best practice

Not assessed.

11.3 Scoring Summary

TIWAG commissioned a cost-benefit analysis by ENTSO-E (the European Network of Transmission System Operators for Electricity), which was required as a precondition for the European Commission Projects of Common Interest process, and an assessment of public interest from the perspective of national and regional economies by a university professor. Two further 'public interest' documents set out the benefits of the project, in relation to public interest in energy management and climate protection, and in flood protection. The results of these analyses are publicly disclosed.

TIWAG also combined these analyses by summing the financial cost of the KXP (CAPEX and OPEX) with quantitative monetary valuation of its benefits, to estimate its net benefit for 90 years after commissioning.

However, none of the analyses were designed to be comprehensive analyses that take into account all costs and benefits. None of the analyses incorporate the costs of negative social and environmental impacts in economic terms, or the full range of benefits in either quantitative or qualitative terms, and consequently the net benefit of KXP has not been demonstrated in economic terms.

Topic Score: 2

11.4 Relevant Evidence

Interview:	42, 79
Document:	37, 47, 85, 86, 167, 168, 169, 246, 247, 248, 251, 253
Photo:	-

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

The Kaunertal Expansion Project (KXP) is a large and complex project, but takes considerable advantage of existing infrastructure.

TIWAG's recent major hydropower project procurement experience has been with the joint-venture power plant Gemeinschaftskraftwerk Inn (GKI), presently under construction, with a total procurement volume of € 461 million, and the reconstruction of the Kaunertal pressure shaft (2012-2016) which had a total procurement volume of € 180 million.

The volume of TIWAG's annual procurement over the past 5 years for rehabilitation and renovation of existing facilities has been:

- 2010: € 101.15 million
- 2011: € 179.59 million
- 2012: € 223.14 million
- 2013: € 161.46 million
- 2014: € 153.36 million
- 2015: € 171.53 million

Austria has a long tradition of hydropower project development and operation, and in equipment manufacturing (e.g. electromechanical equipment, steel linings, penstocks). Numerous companies exist in Austria, not to mention in the EU, that are able to provide many of the products and services the KXP will require, some of which are world leaders in the industry (e.g. Andritz Hydro).

In 2013, Tyrol had a total of 34,215 firms (10.51% of Austrian firms) with 242,669 employees. 34% of Tyrol's enterprises are in services, 27% in accommodation and gastronomy, 19% in commerce, 11% in construction and 8% in further production. Regional manufacturing is characterised by chemical and pharmaceutical sectors, glass industry, mechanical engineering, steel, construction, electrical and metal industries. The enterprise structure of the Tyrolean economy is predominantly (99.7%) characterised by small-medium sized enterprises (SMEs).

This topic has some overlap with topic P-2 Governance, which addresses issues associated with project ownership, policies and corruption. There is also overlap with topic P-6 Integrated Project Management, which addresses the developer's capacity to coordinate and manage all project components.

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.*

The current project status for the KXP is Phase 3 (Submission and Approval). During the previous Phase 2 (Feasibility), procurement-related activities had two main focal areas: contracting of consultants for the

investigations and assessments, and providing inputs into determining the investment costs for the project to inform the business decision to proceed to Phase 3.

The investment cost planning was undertaken for all individual components of the project (mechanical, civil, electrical, general services) throughout the project life, meaning that operations, maintenance and refurbishment investment needs are also taken into account. The TIWAG Investment Policy forms the basis for the project milestone and investment cost planning. To develop the investment cost plan, TIWAG's Central Purchasing Department receives the inputs from the Hydropower Engineering and Planning departments, and provides the costs as inputs to the financial model and business case (see topic P-9 Financial Viability). Inputs to this assessment process are based on TIWAG's experiences of both its own and other companies' projects, drawing on information from other companies through networks and contacts. This process takes into consideration supply needs, sources and risks as well as relevant legislation and guidelines.

During Phase 3, there are procurement assessment requirements relating to expert professional services, and materials and supplies relating to the EIS studies and accompanying technical, legal and communication activities. These needs and requirements are assessed by TIWAG's Central Purchasing Department in consultation with the KXP Project Manager and heads of individual work streams.

The next major procurement assessment activity will be leading up to Phase 4 (Construction), estimated to start in around 2023. This will require a refresh of all cost estimates as inputs to the updated financial analysis, and also preparation of tender and procurement plans. The construction and procurement decision taken by the Supervisory Board will be based on 70-80% "loadable offers", meaning that the project costs are determined largely through bids for the tenders but the deals are not fully negotiated and closed. It is only after the Board decision that the Central Purchasing Department enters into the final negotiations on contracts.

Criteria met: Yes

Analysis against proven best practice

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

The procurement assessment process does not explicitly include opportunities for local suppliers and local capacity development due to the legal requirement to ensure an open and fair competitive bidding process. TIWAG does, however, indirectly provide opportunities for local participation through its choices in procurement approach.

TIWAG's assessment will determine the lot size and scope for the individual major contracts. It has a preference for breaking the project into smaller lot sizes rather than putting the whole project out to tender. This then opens up opportunities for more local participation. TIWAG chooses to break down into components for tendering because the business has the internal capacity to do the overall management itself, thus enabling closer supervision and responsive management of issues and interfaces (see topic P-6 Integrated Project Management).

TIWAG's experience, and feedback from a major contractor and regional industry associations, is that the major contractors regardless of where they come from tend to look locally for readily available services (e.g. accommodation, local transport, vehicle repairs, food, cleaning, and labour).

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.*

TIWAG has not made detailed tender or procurement plans yet as the authorisation process for the Permit will still take a number of years. At this stage, the estimated timeline for the Permit being issued is at the end of 2024. The preparation of tender documents, tendering and contracting services are scheduled to start at the end of March 2023 in the project milestone time schedule (last updated on 17 June 2016 as part of the TIWAG Masterplan).

TIWAG's Tendering Process Standard sets out the legal requirements applicable to tendering for different types of projects in relation to the Federal Procurement Act. Because TIWAG is a publicly owned company it is subject to the Federal Procurement Act, but electricity supply activities are exempt (because generation is a competitive activity, where public companies compete with private ones and should not be at a disadvantage). TIWAG's Tendering Process Standard clarifies how to approach tendering services in cases where they fall under and do not fall under this Act. TIWAG will first develop its tender plan, which will consider the packages and size lots that will be put to the market. This will form the basis for drawing up the tender documents. The tendering plan looks at the experience of other projects, and includes experiences with supply sources, contractors, etc. The tender requirements and specifications are generally created on an ad hoc basis. The structure of the tender and, subsequently, the contract are in accordance with the given structure. The criteria for the suitability of suppliers are tailored to the tendered measures. TIWAG publishes all calls for tender on the website. A newsletter about new and current calls for tender can also be requested on the website. The unsuccessful tenderer receives a rejection letter. The successful contractor will be announced only on request, but not the contract volume. Approximately 70% of the investment must be demonstrated through loadable offers in order to get a construction and procurement decision from the Supervisory Board.

The procurement plan is developed about a year after the tendering plan. The KXP Project Manager will look at delivery times of individual components required for the project, and in discussion with the construction and procurement departments, will determine the lead time for procurement. This will inform a procurement plan for the project. Procurement processes for major hydropower developments are well developed and understood in TIWAG, and are set out in the TIWAG Procurement Policy. This policy guides processes, timing and channels for procurement of various types of materials by TIWAG staff, and includes how to deal with crisis situations, fees, duties, charges, and purchases of various magnitudes down to petty purchases. The KXP Project Manager is responsible for the procurement planning.

TIWAG's tender and procurement planning for the KXP are at an appropriate stage of development given the overall timeline for project development. This timeline is closely monitored and reviewed as needed, and the processes are clearly established ready to progress when the timing is appropriate.

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.*

Processes to address procurement risks during the different project phases include:

- In Phase 2 (Feasibility), cost risks are minimised through the process of cost estimation involving the different departments working together and drawing on both internal and external sources to check and verify cost estimates. Cost risks are also minimised through the Supervisory Board review of the cost estimates in the context of the financial modelling, before approving the project to progress to Phase 3.
- In Phase 3 (Submission and Approval), the processes of tender and procurement planning, and drawing up tender documents according to established procedures and subject to internal control mechanisms, are designed to ensure quality and address corruption risks. The Construction Department has an active role in drawing up the contract documents, so that project implementation risks are well considered and responsibilities reflected in the contracts. Procurement risks are also minimised through the Supervisory

Board review and approval prior to progressing to final negotiations on the contracts. Civil law processes provide an avenue for complaints to be raised and independently evaluated relating to fairness of the bidding process.

- In Phase 4 (Construction), TIWAG's close supervisory processes ensure that cost, quality, transport and other risks are quickly identified and that they can be quickly responded to. Procurement risks are picked up through ongoing risk evaluation and the resultant change management, in close cooperation with the construction and installation management team on site and the project and sub-project managers in charge. Risks and opportunities are evaluated in monetary terms in the total cost forecast, for example with respect to deadlines, costs, quality, suppliers, geological risks, valorisation, etc. Processes to ensure the quality of good and services are a progression through phases 3 and 4, starting with the call for tender; the procurement processes as per the process standard; the technical specifications for goods and services in the technical tender documents; scrutiny of the bids for compliance with the technical requirements; continuous acceptance inspections by qualified construction management and installation/assembly staff; and repeated quality checks.

An important internal control measure relevant for all transactions is TIWAG's Authorisation to Sign and Approval Guidelines. These guidelines specify cost limits for signatures and approvals. Delegations require Management Board approval for purchases between € 370,000 and € 2.2 million, and a permanent working committee of the Supervisory Board provides approvals for expenditure greater than € 2.2 million. TIWAG's employee Code of Conduct is an important measure to help protect against corruption risks (see topic P-2 Governance).

In terms of procurement-related opportunities, TIWAG makes use of independent management consultants who review organisational units. TIWAG's Central Purchasing Department had a major review in 2012, with recommendations on potential cost and process optimisation approaches. Improvements undertaken since this major review include an electronic tendering platform, which was recently commissioned in August 2016. TIWAG has had an e-Procurement system since 2001, which has been updated and improved on a continuous basis. A supply management system is being developed, which comes with the e-tendering system. The Central Purchasing Department is reviewing processes and keeping track of project experiences such as with the Prutz Pressure Shaft and GKI projects. In 2016, another independent consultant looked at the department's continuous improvement activities and validated that they were on the right track. With TIWAG's certification to ISO 14001 Environmental Management, the Procurement Department attaches high importance to sustainable products such as with product eco-labels, and to buying from ISO-certified companies.

In terms of pre-qualification screening based on sustainability criteria, TIWAG uses a two-stage bidding process, with verification of the suitability of bidders in the first stage (pre-qualification). Screening criteria include checking that they have their official licenses, have paid their taxes, the workers are properly registered, the business is credit worthy, environmental standards are followed, and references are provided and checked. Tender documents request evidence of economic capacity, and bidders must furnish this evidence, among other things, by supplying certification of entry in the trade register, a tax clearance certificate from the competent tax authority, and a clearance certificate from the social insurance provider. Bidders are also checked for wage and social dumping with the Vienna Health Insurance Board (Wiener Gebietskrankenkasse). Labour and quality factors are considered in the best bidder process, which specifies the essential criteria to be met by each measure and evaluates bidders based on their ability to meet these criteria. Environmental criteria prescribed by the Authority in the project approval phase become an integral part of the tender documents and are monitored by the construction management and installation staff in the execution phase. Contracts explicitly refer to the necessity to comply with the legal requirements, for example under the labour protection act. In addition, Austrian construction site coordination law stipulates that tender documents – and the resulting contracts – must include an OH&S plan for the execution phase, and that a work plan must be developed for the operating phase.

Regarding the emphasis on anti-corruption in the pre-qualification screening and through procurement planning processes, the rules of European Union primary law, in particular the principle of non-discrimination, and the requirement for transparency as well as EU state aid law, must be considered in procurement. Monitoring to ensure corruption risks are avoided is based on the following TIWAG guidelines:

- Procurement guideline
- Approval guideline
- Guideline for contracting by TIWAG
- Guideline for signatures and authorisation at TIWAG
- Signature rules, powers of attorney and special rules for TIWAG central procurement

TIWAG's Group audit department reviews procurement processes and projects against these guidelines. As a public undertaking, TIWAG is subject to monitoring and control by the provincial and federal courts of auditors. As part of the annual audit, the independent auditor also scan for instances of corruption.

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 at TIWAG involves and draws upon a number of different guidelines, including the following:

- TIWAG Procurement Policy
- TIWAG Tender Process Guideline
- TIWAG Authorisation to Sign and Approval Guidelines
- TIWAG Code of Conduct
- TIWAG Investment Policy

For bidding documents, TIWAG uses the following as the basis of contract:

- General Conditions for the Performance of Services in the field of electrical and electronics industries (for electro-mechanical components); and
- B2110 (Austrian Standard 2110) Austrian General Conditions of Contract (for civil works components).

TIWAG's internal audit team does periodic checks of project procurement. The Prutz Pressure Shaft was the subject of an internal audit.

The EU Electricity Supply Exemption from Federal Procurement Act was passed in 2008 in line with the liberalisation of the Austrian electricity generation market. TIWAG follows this Act very closely anyway. The exemption means that TIWAG does not have to adhere to the timing deadlines specified in the Act for processing bids, and bidders are not allowed to raise objections but can still go to the civil courts where the primary rights of fairness, transparency, equal treatment, non-discrimination, economy, and efficiency can be tested.

TIWAG receives about five queries per year from the Austrian chamber of economics relating to procurement decisions, almost all focussing on the non-consideration of regional bidders. Under the Austrian Federal Procurement Act, Austrian- wide/EU-wide information on the subject matter of a contract is mandatory for projects subject to public notice, non-regional bidders are allowed to bid, and they must be awarded the contract if the pre-defined criteria show them to be the best or cheapest bidder. For more than thirty years, no public complaint (request for review under the Federal Procurement Act submitted to the competent provincial court of administration, formerly called independent administrative senate) has been brought to TIWAG's attention.

All procurement-related processes and commitments appear to be met for the KXP, and there are no major identified non-compliances.

Criteria met: Yes

Analysis against proven best practice

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

No non-compliances or non-conformances in relation to the KXP procurement processes have been identified.

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.*

At the stage in the development of the KXP, the Central Purchasing Department is working on the contracts for those agencies doing expert opinions, and is advancing tender and procurement plans for other major development projects that are farther progressed. Looking forward, tender planning for the KXP will start in around March 2023.

TIWAG's Procurement Policy states that all procurement activities are based on the legal principles of transparency and non-discrimination, and processes ensure economy, efficiency and appropriate care. With regards to transparency, TIWAG's maintains a webpage for tenders at https://www.tiwag.at/ueber-die-tiwag/einkauf/. TIWAG's Procurement Policy recognises the legal provisions that provide legal protection for potential suppliers, and notes that a violation can result in legal consequences for the TIWAG group.

All indications, including from a major contractor involved in another TIWAG major project, are that TIWAG's procurement processes are equitable, efficient, transparent, accountable, ethical and timely. There are some concerns that contractors may in cases be taking on too large a share of the project risk in the contract terms and conditions, but this is at their own choosing and is not fundamentally an equity issue with procurement processes.

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.*

TIWAG tenders for services, supplies and construction work in a way that regional providers have the possibility of participation in the contract. The integration of regional companies is most typically carried out by the major contractors through subcontracting. Skilled craft services are also tendered that enable regional suppliers and companies to get involved.

In practice, it was apparent to the assessors that the major projects of TIWAG do offer considerable opportunity for local suppliers. Quite a few locals are employed or contracted in the GKI project, including engineers, secretaries, wood suppliers, food services, and vehicle services. Interviews with community and contractor representatives showed that there are incentives for major contractors to use local services to cut down on costs and ensure continuity.

TIWAG does not have official targets for local business involvement, but does have statistics on the amount of work given locally. The total number of TIWAG individual contracts in 2015 was 27,000, and the total procurement volume was € 171 million; € 140 million of this 2015 procurement volume was sourced in Austria,

of which € 65 million was from Tyrolean businesses. For the GKI project, € 148.6 million of the procurement volume is being sourced in Austria (49.4% of total), of which € 21.4 million is from Tyrolean businesses. For the Prutz Pressure Shaft, € 144 million of the procurement volume was sourced in Austria (95.5% of total), of which € 3.2 million was from Tyrolean businesses.

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

TIWAG's Central Purchasing Department plays an active role in the KXP throughout all project development phases. During Phase 2, Feasibility, the department played a key role in the determination of project costs to inform the business case to proceed to Phase 3, EIS Submission and Approval. During Phase 3, specialists for the feasibility and EIS studies have been contracted, as well as supplies for monitoring and investigations. Late in Phase 3, the project costs will be rigorously recalculated, and then tendering and procurement plans will be prepared according to TIWAG's policies and the relevant process standards. Cost and procurement risks are well understood, and actions identified appropriate to address the risks. Procurement processes are guided by a number of policies and guidelines to ensure ethical, transparent and accountable practices, and are subject to audits and to independent review. All indications are that proven best practice criteria are fully met.

Topic Score: 5

12.4 Relevant Evidence

Interview:	14, 51, 64, 70
Document:	88, 89, 91-96, 100, 257-259, 335
Photo:	-

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

The most important project-affected communities are the populations of the Kaunertal and Ötztal as well as the part of the Inntal affected by project construction and operation. While the Platzertal has no permanent inhabitants, the population of the Kaunertal is about 600 people, and the Ötztal and Inntal have much larger populations. The regional population is generally growing slowly, although some communities such as the Kaunertal are losing inhabitants to out-migration. Temporary visitors such as tourists and seasonal workers in tourism and agriculture may also be affected.

Key impacts on livelihoods will be in the construction and tourism industry, with some impacts also on agriculture, particularly on summer grazing on high altitude pastures (alms). Key impacts on living standards will be from construction and the presence of a large temporary workforce, visual impacts, recreation, and socio-cultural effects, including the impact on community cohesion.

This topic is inter-dependent with many other topics. Specific impacts on public safety, public health and cultural heritage are discussed under topics P-8, P-18 and P-17. This topic P-13 focuses on the assessment and management of negative impacts, while positive impacts on communities are primarily addressed under topic P-10 Project Benefits.

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.*

Much of the project area has a high alpine character, at elevations of 1,800 masl in the Ötztal, more than 1,600 masl in the Kaunertal, and 2,200 masl in the Platzertal. There are no settlements at this elevation, except for some houses near the Gurgler Ache site. The components in the Inntal are relatively close to settlements.

All areas affected by the project have some human uses. As part of the Environmental Impact Statement (EIS) a number of these human uses were considered and the current status and impacts evaluated, no unacceptable negative impacts could be identified (see below), and the overall impact on communities is characterized as 'harmless'. Note that human uses are not protected and covered in the Austrian Environmental Impact Assessment (EIA) law, and discussed in the EIS, at the same level as other values, such as biodiversity or human health:

- ***Forestry***: Forests are owned and managed by individuals, cooperatives, municipalities or the state. A total of 35 hectares of forest, in a large number of small parcels, will be temporarily or permanently removed, about one third of which for ecological compensation measures. A small part of that forest has particularly

valuable functions, for example for the protection of steep mountain slopes, and in the mountain environment compensatory reforestation measures will take several decades to deliver the same functions.

- ***Hunting***: Hunting plays a significant cultural and ecological role, and is done by landowners and hunting tenants. Important game animals are two species of deer, chamois, marmots, and small numbers of other species. All hunting is under permit, and there are target quotas defined by the authorities. Impacts on game arise from noise (machinery, road traffic, helicopter flights, blasting), loss of habitat, and migration barriers. While temporary impacts in the Kauner- and Platzertal construction areas are relevant, long-term impacts are minor.

- ***Fishing*** (see also topics P-19 Biodiversity and Invasive Species, and P-23 Downstream Flow Regimes): There are 33 fishing concessions in the project area, held by individuals, municipalities, fishing clubs and others. 21 of these are positively affected (by reducing flow variations due to peaking, and increasing minimum flows) and the other 12 negatively affected (reduced flow due to diversions, water storage etc.) by the KXP. Brown and rainbow trout and grayling are the most important species. Most fishing concessions have high fishing values, one has a very high value, two medium values, and two low values (the upper reaches of the Gurgler and Venter Ache and the Platzerbach have no fish). Impacts during construction are related to temporarily increased turbidity below construction sites, and significant impacts in the reach of the Inn where the riverbed will be lowered (between Prutz and the Runserau reservoir). The relevant permanent impacts are: in the Ötztal, a reduction in habitat, but at the same time reduced floods and diversion of glacial silt in summer, which improve conditions for fish and angling success; and in the Inntal, negative impacts in the short stretch between Prutz and Runserau, and improvements downstream, even beyond the tailrace of the Imst-Haiming project.

- ***Agriculture***: Most agriculture is small scale, often as a secondary source of income, and related to cattle and dairy production. In the high alpine alms, Platzeralm (220 hectares of feeding areas with 100 cattle) and Birgalpe in the Kaunertal (335 hectares of feeding areas with 390 cattle), there will be significant reductions in productivity (13% and 2%, respectively). There may be some additional impacts on the alpine alms because of noise and other construction impacts, and because some affected areas on the Birgalpe are particularly important for spring and fall pasture). Total areas removed from agricultural use will be 83 hectares in the Platzertal and 38 hectares in the Birgalpe, in the Ötztal 8 hectares along the Venter Ache and 6 hectares along the Gurgler Ache, and in the Inntal 5 hectares at Prutz/Runserau, 6 hectares at Imst and 1 hectare at Haiming. Groundwater level changes are not expected to have relevant impacts except in the Runserau, where mitigation is planned.

- ***Recreation***: The entire project region is of relevance for recreational activities by tourists and residents, and will be impacted: (1) during the construction phase, by traffic, noise, dust, interruptions and detours of trails and parking areas, etc; and (2) during the operations phase, by visual changes from aboveground infrastructure and reservoirs (especially in the Platzertal), and changed flows in river reaches. Impacts during construction are expected to remain within regulatory limits. A small number of tourist businesses (for example, in Prutz and Gurgl) will be directly affected by construction noise, many others primarily by traffic noise. With the exception of the Platzertal, which is a largely natural and infrequently visited high alpine valley, all project areas are already affected by settlements, industrial uses, roads, ski lifts, hydropower installations, and other infrastructure. The additional visual impact will therefore be limited. Some additional visitors may be attracted by construction activities. Some possible effects are not covered in the EIS: visitors may not be able to find accommodation because rooms are taken by construction workers; some construction workers may fill rooms that become available because visitors stay away to avoid construction.

- ***Rafting and Kayaking*** (see also topic P-23 Downstream Flow Regimes): The Ötztaler Ache and the upper Inn offer some of the best kayaking and commercial rafting in Europe, including for experts tackling difficulty levels up to Class IV. There is a relatively long summer season for rafting (May to September/October). There are no data on frequency of use by private kayakers, but the rafting association has statistics on the number

of rafting crafts, companies (19 on the Inn and 12 on the Ötztaler Ache), customers (110,000 in 2013), sales (€ 5.1 million in 2013) and employees (100 permanent and 500 seasonal, some of which are possibly also engaged with other outdoor activities). There are also estimates on indirect economic effects (for example, numbers of overnight stays by rafting customers). The EIS, with contributions from local experts and guides, evaluates the 'experience value' for each river reach under flow conditions without and with the KXP operating. The effects are quite complex. On the Ötztaler Ache, reduced summer flows would make some reaches more accessible for non-experts, or accessible over more days, other reaches would have lower flows than required, and impacts on kayaking and rafting at different levels of expertise are often quite different. The most pronounced effect is on advanced rafting on the lower river, which would only be possible for 3 weeks per year. On the Inn, there will generally be a reduction of days on which kayaking and rafting are possible, and a reduction in the experience value.

- ***Settlements and Spatial Planning***: A range of regional development concepts and documents, from the Alpine Convention to municipal zoning plans, have been reviewed for compatibility with the KXP. At the level of municipal plans, the areas required for the KXP are generally zoned for forest, agriculture, small-scale commercial uses (for example, wood storage or camping sites), or are already zoned for hydropower-related uses. With the exception of the municipality of Prutz, where project components are close to settled areas and the fish bypass channel passes through an area zoned as a mixed commercial/settlement area (but changing the use of only 1,000 m^2), and the municipality of Sölden, where one building is temporarily affected during construction, no issues with zoning and municipal development objectives could be identified.

Some of these impacts on human uses have been quantitatively assessed (in particular, those related to land use and to the usability of the Ötztaler Ache and Inn for rafting and kayaking). However, for most of the impacts there are only qualitative assessments. There are no estimates, for example, of the impact on visitor numbers and tourism revenues.

In EIS Section C.01.05, water supply and wastewater along the affected river reaches is discussed. Of particular interest is the Ötztaler Ache, from which water will be diverted. 21 water intakes for irrigation, snow making and a concrete factory along the river have been identified. Municipal water supply comes from wells and springs, not surface water; there are three wastewater treatment plants. No impacts on wells and springs, minor impacts on water quality because of reduced dilution, and minor impacts on the availability of water for snow making in the early season (October-November) are predicted.

While the EIS does not discuss the effects of water diversion from the Ötztal for hydropower generation by planned downstream plants in the Ötztal, this is covered in a separate study on the hydropower generation options in the Ötztal (see also topic P-23).

The process for permanent and temporary land acquisition is not covered in the EIS, as it is considered an issue for private arrangements between landowners and TIWAG. TIWAG's Land Acquisition Department administers approximately 4,000 properties, as well as other resource rights (for example, fishing concessions), and is responsible for acquiring properties needed for the KXP. It has surveyed all such properties, researched their ownership, and entered into initial conversations with owners. About 1,000 properties with 400 owners (including public owners such as municipalities and the forest service) will be affected. A final list and plans will be contained in the final EIS, as regulatory rules require that this list be not older than three months at the time of licensing.

The EIS does not address impacts on community cohesion. The mayor of Kaunertal was acquitted in 2014 from a corruption charge in connection with sponsoring by TIWAG. Several municipalities have seen internal conflicts between supporters and opponents of the KXP, and there might also be conflicts between different sub-regions that support the KXP and those – like the Ötztal – that oppose it.

Criteria met: Yes

Analysis against proven best practice

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

Not assessed.

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.*

Some required land, particularly in the Kaunertal, is already largely owned by TIWAG. For other land and use rights, TIWAG has a robust acquisition process, and has always managed to avoid expropriations of land required for hydropower projects. Fairness and adequacy of purchase prices are ensured by basing it on market values or where these are not available, on reports by an independent expert, as well as through discussions with agricultural cooperatives, and are supervised by the authorities; TIWAG generally pays at the upper end of what is considered a plausible land value. The purchase price is publicly known because it is registered in the public land registry, and in the case of sales by municipalities, is approved by the municipal council.

For properties which are temporarily required during preparation of the KXP (for example, for geotechnical investigations) or during construction, temporary lease and compensation for damages agreements have been concluded, or options for such agreements have been discussed. For properties which will be permanently required, purchase options have been discussed and the first ones (for example, with the forest service for the land required for the Platzertal reservoir) have been concluded.

The following plans and processes to manage impacts on human uses identified in the EIS have been developed:

- ***Forestry***: Forest parcels required for the KXP will be purchased by TIWAG. The EIS contains an extensive list of mitigation, minimisation and compensation measures close to project components as well as, if necessary, at a greater distance (19 separate measures such as reforestation activities). The purpose of these measures is to restore the forest functions that are relevant not just for ecological purposes, but also for communities.
- ***Hunting***: During construction, measures will be taken to limit noise and other effects on wildlife, but negative impacts on hunting are seen as inevitable. During operations, habitat loss will largely be limited to the reservoir surfaces, where TIWAG as the new owner of these properties is also the owner of hunting rights.
- ***Fishing***: A number of mitigation, minimisation and compensation measures are also described for aquatic ecosystems, which will benefit fish in most river reaches and fishing concessions. TIWAG is also willing to buy up fishing concessions that become available, and may enter in direct discussions about additional compensation measures or payments with fishing associations.
- ***Agriculture***: The EIS estimates productivity losses in areas affected by KXP components, and describes mitigation, minimisation and compensation measures. For example, in the Platzertal, measures include revegetation of 7 hectares of construction yards and roads and creation of 9 hectares of new feeding areas by removal of rocks, shrubs, trees and seeding of grass. Other compensation measures under discussion with the agricultural cooperative are improvements to water supply, wastewater disposal and power supply at the summer alm buildings. In the Kaunertal, there is a discussion with agricultural cooperative over temporary relocation of cattle to a different alm area, and landscaping of the spoil deposits with low slopes to enable cattle grazing. Revegetation is also foreseen for all other areas temporarily used during construction. The productivity losses are not on the same scale as in the original Kaunertal project, which led to annual compensation payments to two cooperatives of € 320,000 which are still in force.

- ***Recreation***: Measures to reduce impacts on recreation include time limits on and scheduling of activities like blasting and heavy traffic, public information on construction activities, liaison officers, and temporary changes in hiking trails. In other projects, TIWAG has compensated tourism businesses for lost revenue, when they are directly adjacent to construction sites and an obvious link could be shown. One family in Alt-Poschach operates two apartments; TIWAG has offered to relocate them during construction and compensate them for any losses.
- ***Rafting and Kayaking*** (see also topic P-23 Downstream Flow Regimes): The EIS mentions a number of potential measures that could be taken to mitigate, minimise and compensate impacts on kayakers and on rafting businesses (release of additional water at certain times, structural measures in riverbed, replacement of craft, financial compensation etc.). It is unclear whether additional water releases would be compatible with the ecological objective of reducing frequent flow variations on the Inn. TIWAG has in the past negotiated compensation payments with the rafting association.
- ***Settlements and Spatial Planning***: While the project design in general tries to avoid changes in land use that would require re-zoning or impact future local development opportunities, in a number of cases minor adjustments will be necessary.

For the minor impact on water availability for snow making in the Ötztal (Hochgurgl), a consensual solution with the operating company will be sought.

The EIS does not yet present detailed and robust plans for the management of all impacts on communities. There is no fixed budget for social mitigation; estimates of € 1 million for 'social costs' and € 13.5 million for 'construction mitigation' have been reserved in the project budget, and up to 0.5% of the project costs, i.e. € 665,000 are expected to be paid as compensation for noise, dust etc. Monitoring programs described in the EIS are strongly focused on physical (e.g. hydrology, sediment) and biological parameters, not on social impacts and the effectiveness of social management measures. If the KXP were closer to implementation, these would be seen as significant gaps. However, experience from other TIWAG projects shows that community impacts are generally well known, impacts are managed, remaining damages are often compensated, and formal agreements with municipalities are publicly disclosed. For example, it is standard practice to reimburse municipalities for damages to public roads due to construction traffic, and this is communicated through council minutes of meetings. Thus, given the current stage of preparation, the incomplete management plans for community impacts are not seen as a significant gap.

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.*

Not assessed.

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.*

Landowners in general have reported early and satisfactory engagement. Also, engagement with a number of other strongly affected individual stakeholders and communities has been quite intensive. For example, the household affected by temporary relocation near the intake on the Gurgler Ache, and the Platzeralm farming cooperative, have reported advanced discussions with TIWAG representatives, and are confident that satisfactory arrangements can be found.

As described above, a number of impacts on communities are unresolved at this stage. Some directly affected stakeholders, such as the rafting association, are concerned that there will not be full compensation of their losses. TIWAG has an ongoing engagement with the rafting association (joint working group, joint rafting tours at different flow conditions and interviews with customers and guides during the EIS, joint development of an emergency plan), as well as with the fishing association. However, TIWAG has now suspended discussions with stakeholders specifically over the KXP while a solution of the conflict with Sölden over the Gurgler Ache is pursued. As described under topic P-1 Communications and Consultation, there are ongoing mechanisms for project affected communities to raise issues and obtain feedback.

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.*

Not assessed.

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.*

As described under topic P-1 Communications and Consultation, opinion surveys in the region have generally found majority support for the KXP, but with sizable shares of opponents.

Municipalities and other groups will generally not take a final position on any TIWAG project before negotiations are concluded. Several mayors reported broad based support in their councils, based on the assumption that as in previous projects, acceptable compromises will be found.

However, there is widespread and sustained opposition against the KXP in the Ötztal and among the rafting businesses. In the Ötztal, the municipality of Sölden, the tourism association Sölden/Hochgurgl/Obergurgl, as well as 17 agricultural cooperatives (although not directly affected by the project) have declared their rejection of the KXP. The municipal council has agreed to talks with TIWAG under the condition that the rejection of a diversion of water from the valley is non-negotiable. The rafting association has also expressed its concerns and doubts that an acceptable solution can be found. The public opposition is a **significant gap** against basic good practice.

Criteria met: No

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.*

Not assessed.

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.*

Properties and land use rights will be acquired at fair market rates, and sellers will be able to buy comparable property if they so choose. The minimisation, mitigation and compensation measures for many impacts, as well as the project benefits described in topic P-10 Project Benefits, are likely to improve livelihoods and living standards for most citizens in the region.

The municipality of Sölden is in a strong negotiating position, with the court ruling in favour of its own hydropower project, and would be able to ensure that it is fairly compensated in any negotiations with TIWAG. However, there is no quantitative assessment of potential economic losses in the tourism industry, and in particular among rafting businesses. While TIWAG is aware that a precondition for project licencing is likely to be fair compensation, the company has not made a public commitment to, or preparations for, compensating any economic displacement. This lack of public commitment and the uncertainty it creates among project affected communities is a gap but not counted as significant at the level of basic good practice (whereas it would be significant at the level of proven best practice), given that fair compensation is likely to be a condition of project approval.

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.*

Not assessed.

13.2.6 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There is widespread and sustained opposition against the KXP in the Ötztal and among the rafting businesses.

1 significant gap

Analysis of significant gaps against proven best practice

Not assessed.

13.3 Scoring Summary

Even though the social impacts of projects on communities are not a focus of the Austrian EIA and permitting process, there is generally an adequate understanding of these impacts in the case of the KXP. There is a robust land acquisition process that ensures fair treatment of landowners. Other human uses of the area and planned or possible minimisation, mitigation and compensation measures are discussed in the EIS; however, several impacts and the costs of management measures are not yet quantified and discussions with stakeholders are not yet concluded. TIWAG has not made a public commitment to improve livelihoods and living standards and compensate all economic displacement. This has contributed to uncertainty and to widespread and sustained opposition among important stakeholders, which is considered a significant gap against basic good practice, resulting in a score of 2.

Topic Score: 2

13.4 Relevant Evidence

Interview:	8, 10, 17-20, 22, 29-32, 34, 38, 40, 43-47, 49, 55-57, 74, 80
Document:	1, 3, 98, 99, 106-110, 127, 131, 133, 161, 224, 260, 264, 279, 280, 308, 311-319
Photo:	17-22, 31-35, 41, 49-51, 59, 61, 78

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 resettlees and host communities are improved.

The Kaunertal Expansion Project will not cause any physical displacement of people, other than the possible temporary relocation of one person if required (see topic P-13 Project-Affected Communities). This topic is, therefore, considered Not Relevant to the assessment and will not be assessed.

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.

The Kaunertal Expansion Project will not have any implications for Indigenous Peoples as defined in the Protocol. This topic is, therefore, considered Not Relevant to the assessment and will not be assessed.

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

The construction period for Kaunertal Expansion Project (KXP) has been estimated to be 7 years. The project will employ approximately 2,982 people during the construction period. The project will include a number of main construction sites (CS) that extend over the Ötztal, Kaunertal, Platzertal and Inn valleys area as follows:

- Kaunertal CS
- Platzertal CS
- Gurgl CS
- Vent CS
- Prutz CS
- Runserau CS
- CS for deepening the Inn riverbed at Prutz
- CS for the Ried-Runserau bypass channel

Human Resources and Occupational Health and Safety (OH&S) for KXP will be managed through existing TIWAG processes. As required by the Labour Act for all large companies in Austria, TIWAG's internal Workers Council (Betriebsrat), ensures that all regulatory aspects of labour protection are followed and implemented, and provides a conduit for grievances and other issues raised by staff. A strong Austrian legislative framework (Austrian Workers Protection Act, Austrian Construction Worker Protection Ordinance) is enforced by frequent and comprehensive site visits to TIWAG offices, plants and construction sites by the Labour Inspector (Arbeitsinspektor), which reinforces compliance with all aspects of the Labour Protection Act.

The unemployment rate in Tyrol was 3.2% in 2014 which lies below the Austrian average of 5.6% and also of the EU-28 average (10.2%), with about 20% of the working population being foreign nationals and 5% commuting to and from other provinces or countries. Recent large projects including tunnelling and hydropower projects in Austria have employed a number of skilled workers from Eastern Europe, including for the Gemeinschaftskraftwerk Inn (GKI) project. TIWAG anticipates that there will be no shortage of labour force for the KXP project.

The GKI project has reported 50 accidents with lost time since it began in July 2014, of which only 7 required hospital visits. The peak workforce was in 2016 with 500 workers. Of the 1,000,000 worked hours accumulated in 2016, only 720 hours were lost time due to injuries.

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.*

A preliminary assessment of labour needs for KXP is included in the Environmental Impact Statement (EIS). In addition, the concept level assessment of project specific occupational, health and safety (OH&S) challenges and risks is included in the assessment of labour needs. For example, the management of natural hazards and risks

specific to mountainous terrain includes considerations such as mud flows, avalanches, floods, rock falls and others. Other work hazards to which the workers are exposed include those inherent to tunnelling, blasting, working at heights and in confined spaces, hazardous substances and others. Any site-specific risks outside those considered by TIWAG's standard procedures will require specific procedures to be developed and implemented, and these procedures would be developed at a later stage.

Detailed labour management and OH&S plans for the construction phase are not typically detailed during the EIS phase, but will be developed and completed prior to issuing tender bidding documents, and will be included in tender and contract documents. The labour and OH&S needs of KXP will be based on recent TIWAG experience on similar projects, such as the GKI project that is currently under construction. Bidders will comment on the preliminary or conceptual labour and OH&S plans and formulate their detailed plans for the implementation stage of the project. The OH&S plans are then updated regularly by incorporating findings from the periodic internal and external OH&S inspections.

The EIS includes the provision of a construction camp to house workers at the largest construction site, Kaunertal CS. Workers at the other smaller construction sites listed above will be housed in surrounding villages that have large accommodation capacity outside the winter tourism (ski) season, which coincides with the main construction season.

The availability of a specialised workforce is the region is not expected to be an issue, as similarly sized projects in the last 10 years have been implemented without any labour shortages (e.g. large tunnelling or hydropower projects such as the railway and GKI project). TIWAG has a rolling hydropower development program over the next few decades, and it is anticipated that workers will be able to move from project to project, increasing their experience and capacities.

Labour planning for TIWAG employees follows a 5-year planning cycle and considers recruitment, retirement, student internship and trainees. Annual reviews are conducted for all staff, and company-wide surveys carried out every 2-3 years provide TIWAG with feedback on their human resources and labour policies and performance. The results and comments received from the surveys are categorised and presented to management and the Betriebsrat (Work Council) and then to staff. Issues raised are prioritised, and measures are defined to address the issues or make improvements. Follow-up monitoring of the implementation of the measures is presented to the Supervisory Board.

The Environmental Impact Assessment (EIA) process includes the review of EIS documents by governmental authorities and external experts. This process provides the opportunity for experts of related topics to discuss aspects of the project under the supervision of the authorities. In the case of labour and working conditions, the expert reviewers would include the regional (Tyrol) fire brigade inspector, the expert in charge of civil protection and disaster relief, and the Labour Inspector (Arbeitsinspektor), amongst others that are invited to review EIS documentation upon request.

The Arbeitsinspektor regularly inspects TIWAG work places (offices, plants and construction sites) on both a planned and unplanned (surprise) basis. Throughout the implementation of their past projects, TIWAG has established a good working relationship with the Tyrolean labour authority (Arbeitsinspektorat). A visit to the GKI construction site indicated that Environmental Health and Safety (EHS) practices are in line with industry standards and procedures are followed. Regular EHS meetings take place at the construction sites to identify on-going hazards throughout the construction phase, and include contractors and sub-contractors on-site. TIWAG's EHS department defines EHS criteria for the selection of subcontractors. Three full-time TIWAG EHS staff are dedicated to regularly inspect construction sites and operating facilities.

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 EIS for KXP takes into account broad considerations, such as avoiding impacts on tourism activities by moving workers out of local housing during the peak tourism season (winter ski season), and promoting local procurement and employment opportunities and practices by contractors and sub-contractors (see topic P-12 Procurement).

Natural hazard risks are quantified by experts and taken into account in the project design and the development of the construction scheduling (for example, avalanche risk days or potential days lost to avalanche events). In addition, smaller avalanches are remotely triggered to mitigate avalanche risk and the potential for workers at the various KXP construction sites to be isolated by larger avalanche events that risk cutting off access roads. In addition, specific sections of the EIS documents deal with dangerous works, fire prevention, and disaster prevention during both construction and operations phases.

The Tyrol fire department regularly conducts training and capacity building in collaboration with large companies such as TIWAG. In addition, TIWAG works closely with the Arbeitsinspektorat to determine safer work procedures and better emergency preparedness and response procedures during tunnelling and other hazardous types of work.

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.*

TIWAG's human resources policy framework is comprehensive and interlinks closely with legal requirements. The strong Austrian legislative framework and oversight by the Labour Inspector (Arbeitsinspektor) as well as the Betriebsrat (Work Council) ensure regulatory compliance. TIWAG's Betriebsrat is comprised of 45 members that elect a small council and a chairman. The Betriebsrat provides a means for grievances to be voiced, processed, followed-up and resolved. It has traditionally played a very strong role at TIWAG, and has a close relationship with the energy trade union in Tyrol which provides collective bargaining on behalf of workers.

The Environmental Management System (EMS) currently in place at TIWAG, certified to ISO 14001, includes provisions for OH&S such as procedures for emergency plans and simulations, emergency manuals, OH&S training requirements, tools for the management, handling and procurement of hazardous substances, the procurement of PPE, etc. The ISO 14001 certification obtained in 2015 applies to all TIWAG departments, operating plants and also applies to the development and construction of new projects such as KXP. Although there is no separate OH&S Management System per se, there are comprehensive OH&S guidelines, procedures and training materials available on TIWAG's intranet as well as internal human resources policies.

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.*

The Betriebsrat at TIWAG has traditionally had a stronger role than work councils at similarly sized or other energy sector companies. It is involved in any change in the organisation as well as staffing and planning for large projects. Works Council members are represented on the Supervisory Board.

TIWAG is proactive in creating a skilled workforce, and provides opportunities for staff to change positions or transfer from one group to another within the company, as well as training and capacity building opportunities. Technical staff also attend conferences and publish in peer reviewed journals. The attrition rate at TIWAG is very

low (it was reported to be less than one percent) and on average, it was reported that employees stay with the company for 20 years.

In addition to TIWAG's in-house and external training and workshops for staff, TIWAG has developed succession planning processes to ensure it has the capacity and expertise to design and manage the operations of hydropower facilities as these relate to dam safety and emergency response. To address potential staff shortages during project planning, design and implementation phases, TIWAG will retain external consultants or engineering and consulting firms to complement in-house resources when needed. For example, the firm Freiland was retained to contribute to the KXP's EIS, as well as external traffic and noise specialists. Similarly, additional resources to carry out detailed engineering of the fish passage at Runserau were required. TIWAG's Central Purchasing Department works with the KXP Project Manager regarding contracting external services and the criteria used for qualifying sub-contractors.

Emerging OH&S risks and opportunities are considered seriously by TIWAG. Examples of this were noted during the visit to the GKI construction site, where mechanisms and an alarm system on rock fall protection nets warn workers of rock falls. Other instances where TIWAG is proactive in anticipating OH&S risks were shared by the Arbeitsinspektor, and include TIWAG's consultation with the Arbeitsinspektorat in order to address OH&S issues and challenges during construction and find the best solution. Examples of this include designing better ways of providing redundancy in tunnel ventilation systems, and emergency procedures during excavation or tunnelling or other hazardous works in confined spaces.

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.*

Through their company-wide surveys and the Betriebsrat, TIWAG is able to understand employees' needs, concerns and grievances. The results of the surveys are categorized and presented to management, the Works Council and then to staff. HR is asked to define measures to address the issues raised in the surveys and then group managers are asked to implement the measures and then they monitor progress and report to the board. TIWAG addresses grievances openly and transparently, and shares progress with staff regularly.

TIWAG maintains up to date OH&S policies and procedures on the intranet and offers OH&S training to their employees. Important notices or changes in procedures are also sent to employees via e-mail.

Mechanisms are in place throughout TIWAG operations and at construction sites for employees, contractors and sub-contractors to raise concerns and grievances. Issues and concerns can be directed to the employee's supervisor, although many TIWAG employees will report issues and concerns directly to the Betriebsrat who will speak on their behalf and discuss the issue at hand with management. Workers can also take their grievances to the Chamber of Labour or the ArbeitsInspektorat directly.

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.*

The Betriebsrat ensures that all concerns raised by TIWAG employees are addressed thoroughly and in a timely manner, and includes all of TIWAG work places, including offices, operating plants and construction sites. The Betriebsrat maintains a register of the issues and how they were resolved by the company. In addition, the Betriebsrat is consulted on issues specific to construction projects and sites; these include definitions and profiles

in work agreements that become binding for the workers and the company, shift work schedules, travel logs using company vehicles, surveillance cameras etc.

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 identified inconsistencies of labour management policies plans and practices with internationally recognised labour rights. Contractors and sub-contractors are required to meet legal requirements.

Austrian law provides workers freedom of association and the right to collective bargaining. It prohibits anti-union discrimination or retaliation against strikers, and provides for the reinstatement of workers fired for union activity. In addition, Austria is signatory of the Universal Declaration of Human Rights (1948) and has ratified all eight Fundamental International Labour Organisation (ILO) conventions related to fundamental labour rights and other related conventions.

Although not certified under the International Organization for Standardization (ISO)/Occupational Health and Safety Assessment Series (OHSAS) 18001 standards, TIWAG's labour management policies, plans and practices are consistent with internationally recognised labour rights and Austrian labour law; furthermore, TIWAG's Betriebsrat ensures labour laws are respected by the company.

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.*

A country report issued in 2013 by the Bureau of Democracy, Human Rights and Labour of the United States indicates that Austrian labour policies, plans and practices meet internationally-recognised labour rights. This report notes that a number of domestic and international human rights groups generally operate in Austria without government restriction, investigating and publishing their findings on human rights cases. Government officials generally were cooperative and responsive to their views.

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

The EIS includes a preliminary assessment of labour needs for KXP, as well as a concept level assessment of project specific OH&S challenges and risks. The EIS takes into account broad considerations, such as avoiding impacts on tourism activities by moving workers out of local housing during the peak tourism season (winter ski

season), and promoting local procurement and employment opportunities and practices by contractors and sub-contractors. Ongoing processes are in place for employees throughout TIWAG operations and at construction sites for employees, contractors and sub-contractors to raise human resources and labour management issues and get feedback internally through the Betriebsrat; they can also address their concerns and grievances through the Chamber of Labour and the ArbeitsInspektorat. Labour management policies, plans and practices are comprehensive and consistent with internationally recognised labour rights. There are no significant gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

16.4 Relevant Evidence

Interview:	9, 61, 62, 69, 76, 77
Document:	4, 13, 27, 28, 56, 60, 61, 95, 101, 102, 171, 203, 204, 207
Photo:	86, 87

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

The Federal Monuments Office or National Heritage Agency (*Bundesdenkmalamt*, BDA) is the competent authority for protecting and preserving cultural heritage in Austria. The BDA monuments register contains over 37,700 objects of which 4,812 are in the Tyrol Province.

The Kaunertal Expansion Project (KXP) is located in an area with evidence of human presence from the Mesolithic period and Stone Age (6,500 - 5,500 BC) through to the Neolithic (5,500– 2,200 BC), Bronze Age (2,200 -80 BC), the Iron Age (800 - 15 BC) and the Roman period (15 BC - 600 AD). A natural mummy called 'Ötzi' was found in the Ötztal Alps, and is dated to 3,300 BC. During the 12th-13th century, alpine huts and mining expanded in the region. The KXP area was not significantly affected by World War II.

There are a number of protected cultural heritage assets from different historical periods in the KXP area that may be affected: mesolithic hunter resting places at Platzertal; buildings for grassland management such as alpine huts and cattle enclosures at Venter; small chapels, memorials and roadside crosses near the Runserau weir, Gurgler and Versetz; Marienkapelle, a chapel built in 1677 near the Gurgler site; the remains of an old silver mine at Platzertal; and the Pontlatz bridge which was built in 1899 upstream of the Runserau weir. Historic records indicate that the alignment of the old Roman road 'Via Claudia Augusta' passed near Prutz HPP, and continued along the proposed fish passage at Runserau. Upstream of the Ötztal intakes there are areas of archaeological and pre-historic significance that will not be affected by KXP.

There are also designated natural monuments and landscapes in the project area. Natural monuments include: Gletschertopf, a 'megablock' with potholes caused by the ice and melting water near Versetz; the Piller Moor near the Runserau weir; and the Piburg lake in the lower Ötztal. Protected landscapes include: Milser Au, a popular recreational and forestry area that is also used as pasture adjacent to the Inn River between Runserau and Imst; and Siltzer Pichert and Birgele, located by the Inn River, downstream of Haiming hydropower plant. Cultural landscapes such as the alpine huts at Platzertal are landscapes considered of importance by affected people, including visitors, and landscapes in the Ötztal valley are also part of Natura 2000 protected areas and the Kaunergrat Nature Park.

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.*

'Pumpernig and Partner' prepared the cultural heritage assessment for the Environmental Impact Statement (EIS). The assessment identifies, at each project site, construction and operation impacts on culturally and historically significant monuments. These include: protected and not protected historic traditional buildings; religious buildings, such as churches, monasteries, chapels, and rectories; historic paths; memorials, such as wayside shrines, roadside crosses, and plaques; archaeological sites; and unexplored areas.

The assessment was based on data from the Federal Monuments Office, previous studies undertaken in the region, such as the Imst-Haiming EIS, historic maps, and zoning plans of local municipalities and the Provincial Government. Prospections were carried out in areas directly impacted by construction, areas to be inundated, and locations of roads, bridges and landfills involved in the KXP.

Identified assets are classified by level of importance, and areas are classified by their cultural heritage sensitivity (low, moderate, high and very high). For example, the Gurgler area is classified with low sensitivity to archaeological monuments; and the Platzertal area is classified with moderate to very high sensitivity because of the archaeological potential, soil and historic sites (e.g. Mesolithic hunter resting places, and the disused silver mine).

The assessment concludes that reservoir filling and operation activities are likely to have an impact on the presumed alignment of Via Claudia Augusta, and on archaeological remains, particularly at Platzertal and on Mount Pirchhuettberg in the Gurgler area.

Based on the sensitivity and 'high risk' areas, consultants will undertake detailed investigations on Mount Pirchhuettberg. Comprehensive explorations, including excavations, test pitting, collection of artefacts, surveys, metal detection surveys, and photo-documentation is planned in the Platzertal valley. This will involve archaeologists specialised in the Stone Age carrying out pollen sampling and analysis at Platzertal.

Umweltbüro GmbH prepared the landscape assessment for the EIS. The landscape assessment also takes into account historic buildings of cultural significance, land uses, aesthetic and recreational values (based on potential changes in microclimates, air quality, noise, and odour), the sensitivity of landscapes, and cultural assets that are of landscape importance. Very highly sensitive landscapes have been identified at Platzertal, Pontlatz bridge, Venter, and Gurgler – Obergurgl; and landscapes in sections of the Ötztal river, and the Inn river at Perjen and Imst. Protected landscape areas that may be impacted by KXP are Milser Au, Kaunergrat Nature Park, and the Ötztal and Sonnenhänge Natura 2000 areas. Potential impacts have been identified in the landscape assessment, including the visual effects of changes in landscape appearance, and flows. The assessment does not specifically address palaeontology. Interviews indicate that fossils have not been found in the project area and palaeontology is not at a significant risk.

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 takes into account not only protected resources, but also existing public infrastructure beyond immediate impact areas (e.g. bridges downstream of the Platzertal reservoir). The assessment takes into account risks of emissions and vibration, and indicates that impacts are unlikely. Imst was scoped out from prospections, due to the current level of intervention and the assumption that most of the work will be carried out under the Imst-Haiming Environmental Impact Assessment (EIA) process. Risks of erosion and landslips are also considered in the EIS (see topic P-20 Erosion and Sedimentation), and no risks of dust deposition are expected.

The Provincial Government review of the 2012 EIS (Revision 0) identified risks, for example the potential to discover any of prehistoric artefacts when restoring the Piller Moor.

TIWAG has considered the risks and opportunities to preserve the old Platzertal silver mine. The municipality, the Federal Forestry Office and the Mining Association are exploring opportunities for tourism with the restoration of the old silver mine at Platzertal.

The impact on cultural landscapes has been assessed in the KXP EIS and the Strategic Environmental Assessment of the Water Management Framework Plan for the Upper Tyrol.

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.*

Detailed archaeological explorations and excavations will only be undertaken prior to construction. A qualified consultant hired by TIWAG will prepare the detailed plans, and BDA will review them. Excavations and relocation of assets require a permit from BDA, and agreements with landowners.

Initial measures presented in the assessment include, for example: to protect and prevent damage (relevant to the old silver mine); traffic management; maintenance and diversions of bike trails; raising the Pontlatz bridge; and relocations of some white crosses and memorials (e.g. Pontlatzer Adler, 1809) in close proximity to their original location; and if protection and relocation is not possible, the assets will be documented. Some findings may be exhibited in local museums, but TIWAG will agree on this with BDA and the museums.

The project has proposed landscaping measures to restore and plant habitat-specific species in cleared areas and landfills; waterbody sections and shorelines will be restored to as near-natural a state as possible; and landscaping measures will be implemented for the proposed dam in Platzertal. The plans are for the Platzertal dam to be vegetated and landscaped so that it will look like a natural cone of scree, although there is still dialogue with local stakeholders on the details of this.

Archaeological project supervision will be provided at the relevant construction sites. A chance-find procedure is a standard practice in Austria, and it requires the presence of an archaeologist during intrusive works. If archaeological remains are found the works are halted, and findings are inspected and documented by the archaeologist who will seek the opinion of BDA.

During operation, there may be sampling, trial drillings and excavations to see if impacts are likely or if chance-find procedures are required. Any requirements of this nature would be included in the concept plan agreed with BDA.

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.*

Consultation, approvals and continuous liaison with BDA through the planning and construction phases will enable the project to anticipate and respond to risks and opportunities. TIWAG indicates that the KXP will restore the old ore processing buildings that were affected by a natural landslide at Platzertal. This will require BDA approval to ensure that they are restored, preserving their traditional style.

The plans will be part of the project approval permit, and their implementation will be supervised by the Provincial Government and BDA. Contractors will have to comply with the chance-find procedure. If protected buildings are damaged, TIWAG will be legally required to upgrade and restore them.

Preservation ex-situ of archaeological findings will require agreements with landowners and museums. Archaeological finds are owned by the landowner (50%) and the Provincial Government (50%); preservation ex-situ will require 100% ownership by the government and compensation for the landowner based on the area of land affected. Prospections also require an agreement with the landowner. At the time of the assessment, there

were no expressions of opposition to this process or negotiations that could have a significant risk to the project development, and this has not been experienced on TIWAG's other projects.

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.*

Planning for cultural heritage resources has involved appropriately timed, and often two-way, engagement with BDA, landowners affected by the prospections, municipalities, the mining association, and research organisations, particularly the University of Innsbruck, who has an interest in archaeology, and sociocultural history of mountain agriculture.

The consultation report (2013) does not raise particular concerns on cultural heritage, and only one comment was raised on the preservation of the cultural landscape in relation to impacts on pastures and improvements.

There may be opportunities to engage with local associations and school tours to attend 'open excavation days' as seen in other projects, but at this stage there are no plans to do so for the KXP.

Ongoing processes to raise issues and get feedback on cultural heritage issues are direct contact to BDA or TIWAG's project manager, but there is no evidence of any issues being raised since the consultation events.

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 with directly affected stakeholders has been inclusive and participatory on this topic. This is evidenced on consultation events, and agreements with landowners. Issues related to cultural landscapes, and measures required engagement with the Chamber of Agriculture, Kaunergrat Nature Reserve and the Nature Reserve Administration, Austrian Federal Forests, local governments, and tourism businesses.

There is evidence that issues raised have been considered in a thorough and timely manner, for example, the avoidance of impacts to the alpine huts, and exploring opportunities to restore the mine buildings at Platzertal. Visual impacts caused by the Platzertal dam have also been the subject of discussions with the directly affected stakeholders at Platzertal.

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.*

There is no evidence that directly-affected stakeholders are opposed to the cultural heritage assessment, plans and measures. Some groups are concerned about impacts on cultural landscapes and heritage resources, but they are not opposed (e.g. mines association, NGOs, and farmers).

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.*

Formal agreements have been reached with directly affected landowners and BDA for prospections undertaken to date. Further agreements will have to be formalised with BDA, and landowners for detailed investigations, and preservation measures ex-situ.

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.

Significant residual impacts are not expected for construction or operation on physical cultural resources if measures are correctly implemented. No impacts from vibrations are expected.

Artefacts that will be inundated will be documented, and possibly disseminated through the publications of articles under TIWAG's approval. TIWAG has published results for other recent projects, e.g. Kühtai. The Kühtai archaeological studies are also relevant to KXP given its proximity. Presentation of findings ex-situ will require BDA approvals. Local museums are usually interested in collecting findings e.g. the Tyrolean Provincial Museum, and the Fliess museum in Landeck.

Cultural landscapes will be permanently modified particularly in the upper Platzertal and upper Ötztal valleys. To offset the loss of land for Platzertal alpine farm, ground will be cleared, rocks removed and species-rich, well-structured pastureland will be created. These measures will be based on the Alpine pasture development concept drafted for Platzeralm. Impacts on the Platzertal cultural landscape will be avoided, and areas of alpine meadows affected will be compensated (see also topic P-19 Biodiversity and Invasive Species).

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.*

The EIS evaluates the effectiveness of proposed measures to assess the significance of potential residual impacts. Residual effects related to physical cultural heritage resources are the potential loss of artefacts with the creation of the Platzertal reservoir, but these will be documented. Regarding cultural landscapes, medium to high residual visual impacts will remain at Venter and Gurgler due to the reduced flows and new structures; and very high at Platzertal due to the creation of the reservoir, but this is not possible to avoid completely if the development is accepted and efforts are made to blend in with the landscape.

Verbal evidence indicates that TIWAG will restore the ruins of the old silver mine at Platzertal, which is beyond the impacts caused by KXP. This is yet to be formalised.

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 landscape and cultural heritage assessments for the KXP require approval by the Provincial Government and BDA. Sensitive areas are the Platzertal valley, and Mount Pirchhuettberg in the Gurgler area. Detailed investigations will be undertaken in these areas prior to construction, and this will require subsequent approvals and agreements with landowners. Risks of vibration are not expected. The project will implement a chance-find procedure during construction. Measures to restore alpine landscapes have been proposed for construction and operation where possible.

The assessment and planning process relating to cultural heritage has involved engagement with directly-affected stakeholders such as BDA, the Federal Forestry Office, and landowners. Impacts on the cultural landscape have been considered in the landscape assessment. There is no ongoing opposition to the assessment and plans for cultural heritage management. There are no significant gaps, resulting in a score of 5.

Topic Score: 5

17.4 Relevant Evidence

Interview:	7
Document:	3,5,6, 8, 103-105, 214, 302
Photo:	1, 4, 55, 56, 67, 79-82

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

Austria's health care system has a high density of easily accessible health care facilities, and it is ranked amongst the top 10 in the world according to the World Health Organization (WHO) in 2000 (this survey has not been updated). Health statistics from the Organisation for Economic Co-operation and Development (OECD) indicate that in 2015, Austria has the fourth highest number of hospital beds among all OECD countries, and 93% of people say they are satisfied with the quality of their water, higher than the OECD average. Tyroleans have a life expectancy above the Austrian average, which is about 81 years at birth. The most frequent health issues are cardiovascular diseases, cancer and respiratory diseases. Cardiovascular diseases, and ski and motorcycle accidents are also common in the Tyrol.

The Tyrol has nine general public hospitals and three specialist public hospitals with a total of 4,150 beds. There are also nine private hospitals. Health services in the KXP area include: St Vinzenz general hospital in Zams that provides services to the districts of Landeck and Imst, and the Innsbruck hospital. The population of Landeck and Imst districts is 100,000 inhabitants and it doubles in winter.

The KXP is likely to generate a number of potential health-related issues during construction, including: nuisance caused by noise and vibration from blasting activities, and traffic of Heavy Goods Vehicles (HGV); nuisance from dust generation and deposition; emissions from vehicles and traffic congestion; generation of hazardous waste (e.g. paints, oil drums, chemicals), and contaminated soils from disturbance of old landfill or industrial sites; and potential effects on the capacity of public health services, particularly during the winter (November-March). During operation, there are few potential public health issues beyond those that might relate to exposures to electromagnetic fields. There are no particular health issues associated with the existing Kaunertal HPP.

There is no evidence indicating that the bio-accumulation of methyl-mercury in fish is an issue in the project area.

Public safety along the roads used by the KXP and around the reservoirs is addressed in topic P-8 Infrastructure Safety. Any water quality issues that may cause impacts on public health are addressed in topic P-21 Water Quality.

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.*

The KXP Environmental Impact Statement (EIS) addresses public health issues from an environmental health perspective in the 'human effects' chapter. This chapter evaluates the construction effects of noise, vibration, emissions and electromagnetic fields. No environmental health effects are expected during operation. Prutz has been identified as a traffic hotspot because of the number of receptors that may be affected by construction traffic. Imst is a blasting hotspot. Construction activities at Gurgler will also affect one local family.

Section C.04.04 of the EIS identifies potential contaminated land areas, such as the old mining areas; industrial or commercial areas; and landfills.

The EIS does not include an assessment of public health system capacities and access to health services, but this is not considered a significant gap. The health system is well-known and there is a high density of easily accessible health care facilities.

The EIS does not differentiate needs, issues and risks for different community groups, but this is not considered a significant gap. It is difficult to differentiate how potential environmental health effects will affect different community groups beyond addressing the sensitivity of residents living closest to the roads and construction sites. The EIS surveyed the sensitivity to vibration and noise of those residents.

The EIS Revision 0 (2012) chapter on human effects was considered unsatisfactory in the Tyrol government's 2013 Report on the Evaluation of Completeness, and the Tyrolean Government requested a re-evaluation of the effects of noise, dust, other air pollutants, odours, lighting, and electro-magnetic fields. These have been addressed in the EIS Revision 1 (2015). The EIS does not address odours and light, as the experts considered that those effects will not be relevant.

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 EIS takes into account broad considerations, for example, the traffic and noise assessment has also considered residents' sensitivity, and considers a broad area of roads that will be used for transporting materials to construction sites, and effects on junctions between project area roads and the main road along the river Inn.

The noise assessment considers the thresholds recommended by WHO, which are more stringent than the Austrian thresholds. A medical expert from the Tyrolean Government will review the health-related aspects of EIS Revision 1, and may provide further comments for completeness.

The assessment has considered opportunities to improve existing roads, flood risk management and minimise the transport of materials which will reduce public health risks.

A number of potential health risks have not been assessed, for example: community-workers interaction and potential risks of increasing the transmission of diseases (including Sexually Transmitted Diseases, STDs) and violence; potential effects on well-being (e.g. limited access to paths, busier roads, landscape perception); fear of safety risks; access to health facilities through busy roads during construction in winter; capacity of health facilities; reduced emergency access to the ski resort located in the Kaunertal valley during construction; and other well-being risks associated with potential voluntary relocation during construction (see topic P-13 Project-Affected Communities and Livelihoods). These have been assumed to not be significant issues, as there are no precedents of significance from other similar projects in the region. However, the KXP will be a large scale project with many concurrent work sites, and may introduce new issues which have not been previously experienced. The lack of a comprehensive consideration of all potential public health risks is a **significant gap** against proven best practice.

Criteria met: No

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.*

The human effects chapter of the EIS presents a number of environmental and traffic management measures to avoid and minimise noise and vibration, traffic congestion, emissions and dust during construction. For example: speed limits of 30 km/h; limiting truck movements at night and during peak hours to avoid traffic jams; signage and mirrors; limiting the access to Platzertal through the alpine huts area; construction site lighting designed to avoid glare or interference; dampening roads to avoid dust; and grievance mechanisms for local residents. Electromagnetic fields are not expected to be an issue but signs will be put up in the vicinity of the switchgear installations. The measures will be included in construction specifications.

Some measures have already been included in the design, for example: to reduce the risk of mobilising contaminants; reduce the use of stone materials from tunnel excavations to reduce HGV traffic; use of an existing tunnel for transmission line cables; the design of a by-pass road at Prutz; and a new galleried road on the west wide of Gepatsch reservoir. Camp site rules and workforce management measures will be used to avoid and minimise community-workforce interaction (see topic P-16 Labour and Working Conditions).

The assessment indicates that medical-related measures are not required because the activities will not pose a health risk. Additional measures for operation will not be required.

Waste, contaminated land and other hazardous substances management measures are addressed under topic P-5 Environmental and Social Impact Assessment and Management, and measures related to water quality are addressed under topic P-21 Water Quality.

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.*

Monitoring plans for water quality, emissions, and noise, and the implementation of grievance mechanisms will allow the identification of any emerging public health risks and potentially, opportunities in the project area.

KXP will develop an air quality and noise monitoring plan to identify potential risks of exceedances (see topic P- 5 Environmental and Social Impact Assessment and Management). Noise threshold limits in Austria allow for short term exceedances compared to WHO limits, but the Government instructed that the project will have to meet the WHO limits. Monitoring programmes will be developed to avoid risks of water contamination. These are covered in more detail under topic P-21 Water Quality.

Local hospitals monitor and keep records of diseases following the 'International Classification of Diseases'. The Tyrolean Government analyses the data and, in accordance with trends and forecasts, the government directs funds to provide additional facilities where needed. Construction workers requiring health checks have to attend a special work health institute for occupational health issues.

Risks of avalanches and floods are present in the region. The public health system has developed and implemented a 'disaster relief plan' which outlines the procedure that health authorities have to follow in cases of minor to major accidents; the same procedure is also applied in cases of epidemics.

Criteria met: Yes

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.*

Directly-affected stakeholders for this topic include: local residents who may be affected by noise, vibration, dust and traffic; and communities using springs for water supply. Ongoing processes for overall engagement with directly-affected communities are set out in topic P-1 Communications and Consultation.

Public health service providers and local hospitals have not been directly engaged in the KXP preparation. This is not a common practice in EIS, but medical government experts have been involved in reviewing the EIS. The traffic assessment involved consultation with local residents. Noise perception was tested using trucks with different loads driving at different speeds. The noise and traffic EIS expert participated in a 3-day consultation event and exhibition to discuss impacts with communities in 2014 in Feichten.

A communication process will be implemented during construction to address noise, dust and vibration, and other complaints. The grievance procedure has proven to be effective in other projects.

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.*

Topic P-1 Communications and Consultation describes many channels of engagement with project-affected communities that would include health concerns. For example, public health related issues raised at consultation events undertaken in 2013 relate to concerns from Prutz, Platzertal and Ötztal communities on the health effects of traffic, dust and noise. TIWAG responded thoroughly and timely to these concerns and responses are documented. Whilst there have been significant concerns raised about engagement and feedback in topic P-1, this does not seem to relate to public health concerns.

Criteria met: Yes

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.*

Plans to avoid temporary residual noise and other nuisance impacts include, for example the voluntary relocation of residents during construction. A voluntary temporary relocation arrangement has been offered to a family in the Gurgler area, to be undertaken if deemed necessary.

The design will avoid and minimise effects related to traffic, noise and disturbance of contaminated land areas. The underground transmission line avoids potential electromagnetic field effects.

The KXP is unlikely to have any permanent effects on public health. There will be temporary local increases in the levels of traffic and construction noise and air emissions, particularly at Prutz, but this is not anticipated to generate human health impacts. There may be issues at local road junctions, but no significant implications of the KXP for the whole network. In the long term, traffic levels and trends are levelling off and are not expected to increase significantly. Communities may adapt to permanent visual landscape changes, and will make use of improved and safer access roads and walking paths. The capacity of the public health system to provide services to the public will not be affected. The emergency services direct their patients in accordance with the capacity and type of injury.

Other recent construction projects shown that the grievance mechanism has been effective and no community-workers interaction issues were identified. Construction specifications and inspections during construction will ensure compliance with Austrian standards and the EIS measures; and monitoring plans if implemented

accordingly will identify unanticipated effects or exceedances of thresholds and respond accordingly to avoid public health impacts.

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.*

Despite the gaps in the public health assessment against proven best practice expectations (under the Assessment criterion), any unforeseen public health impacts are considered likely to be identified and avoided or managed given the strong public health system and facilities in place. There are no plans to provide enhancements to pre-project public health conditions or contribute to addressing public health issues beyond those impacts caused by the project. This is not considered a significant gap given that there are no other opportunities for enhancements that the KXP could address. The project addresses long term flood risks and road safety issues that indirectly contribute to a better public health status.

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

The assessment does not take into account a number of public health risks.

1 significant gap

18.3 Scoring Summary

The KXP is not anticipated to have any significant negative health impacts during the operation phase. During the construction phase, anticipated impacts are related to noise, vibration, dust, electromagnetic fields, and construction traffic. The design has accommodated options to avoid and minimise the impacts of these, for example through the use of a by-pass road at Prutz. Health impacts are understood and adequate measures have been proposed. Communities concerns are primarily related to emissions, dust, traffic and noise, and there has been some engagement activities with medical experts and communities. There are a number of potential public health risks that have not been considered in the assessment, for example risks of worker-community interaction; wellbeing risks; access to health facilities; and health system capacity. Whilst these may be low risk, all potential risks should be considered at the level of proven best practice; given the scale and complexity of the project these omissions represent a significant gap against proven best practice, resulting in a score of 4.

Topic Score: 4

18.4 Relevant Evidence

Interview:	2, 23, 25, 44
Document:	3,5,6, 8, 106-108, 299, 303, 305
Photo:	5, 59, 83

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 KXP project is located in Austria's high alpine areas and valleys, within or close to a range of types of protected areas. The upper Ötztal valley, sections of the Inn River at Runseraru and Imst, and the Gepatsch reservoir are located within the Kaunergrat Nature Park, which encompasses the districts of Imst and Landeck. The intakes in the Ötztal are located in the Ötztal Nature Park, and are adjacent to a Natura 2000 area. The water diversion tunnels will run under the Ötztal Nature Park and Natura 2000 areas. There are further Natura 2000 areas on the Inn River: on the mountain slopes immediately downstream of the Runserau weir, at the confluence with Pitze River, and at Haiming.

Platzertal valley is a near-natural alpine valley that comprises lowland fens intermeshed with *Nardus* grasslands, and extensively managed alpine meadows in the lower areas. In the upper valley, the meandering Platzertal stream creates standing waterbodies classified as 'fen' wetlands. Gepatsch, Gurgl and Vent are characterised by sub-alpine stone pine kampf zones, near-natural stone pine forests and spruce and larch forests, mostly with steep terrain (kampf zone and adjoining forest belt). The Ötztaler Ache is bordered by riverine habitats of willows, spruces, ashes, grey alders and other species; banks on lower reaches of the Ötztal are modified. Natural riverbank vegetation along the now regulated River Inn originally consisted mainly of grey alders (*Alnus incana*), and there is a narrow remnant strip of habitats composed of grey alders and various willow species (*Salix myrsinifolia*, *S.purpurea*, *S.alba*).

Two alpine areas in the vicinity of the KXP had previously been designated as UNESCO Biosphere Reserves, noted to have an outstanding relevance for nature research and protection, and for being model regions of how humans and nature can co-exist. Gurgler Kamm was located upstream and in close proximity to the Gurgler intake; and Gossenköllesee was located within the Stubaier Alpen Natura 2000 and in close proximity to the Kühtai reservoir.

However, the Austrian National Committee for the UNESCO program withdrew Gurgler Kamm and Gossenköllesee biosphere reserves in 2014, stating that they no longer comply with the criteria for UNESCO biosphere reserves including because of an absence of a zone plan. In addition, alpine wetlands are protected by the Tyrolean Nature Conservation Act 2005. The soils protocol of the Alpine Convention (2005) indicates that signatory countries should preserve high and lowland moors.

In the KXP area, the EIS states that there are at least 23 species of mammals protected under the Tyrolean Nature Conservation Ordinance, including bats, 12 small mammals, beavers, ermines and weasels. There are about 24 species of birds that are listed in Annex 1 of the EU Birds Directive, and 80 species that are listed on the Tyrolean Red List. Beavers are or have been present at Runserau, and there is evidence of beavers and otters at Milser Au. Milser Au is located on the Inn River, between Runserau and Imst.

Fish recorded in the KXP area include: grayling (*Thymallus thymallus*), brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), bullhead (*Cottus gobio*), lake trout (*Salmo trutta f. lacustris*), minnow (*Phoxinus phoxinus*), huchen or Danube salmon, (*Hucho hucho*), vairone (*Telestes souffia*) and roach (*Rutilus rutilus*). Rainbow trout, brook trout and lake trout are introduced species in Austria. Grayling, Danube salmon, and bullhead are listed in the Austrian Red List and Annex II of the EU Habitat Directive and are found in the river Inn. A fish lift was put into operation at Runserau weir at the end of 2015. There are recreational

fishing and re-stocking programs that are run by fishing associations on the river Inn, Gepatsch reservoir, and stretches of the Ötztaler Ache.

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.*

Assessments of terrestrial and aquatic biodiversity, and the project's impacts on biodiversity, have been comprehensively assessed, in three main areas: flora; terrestrial fauna; and aquatic biodiversity.

The EIS includes an assessment of terrestrial biodiversity. UmweltBüro prepared an assessment of flora and habitats, and ÖkoTeam prepared the assessment of fauna and habitats. The assessments also consider ancillary facilities such as roads and landfills.

Flora surveys followed the Braun-Blanquet method and were undertaken at: Taschach, Ventertal, Gurglertal, Ötztal, Fernergriess in July 2009 and October 2014; Kaunertal, Inntal, Prutz-Runserau, and Inn in July 2013; Platzertal in August 2010 and 2013; and Imst in June 2013. The surveys recorded the occurrence of plant species and trees by height, diameter and coverage. The results indicate which plant species are listed in the EU Habitats Directive (Annex IV) and / or Tyrolean Nature Conservation Regulations, and the Red List of endangered plants in Austria. The sensitivity of habitats was determined based on a scale of risk categories, level of protection and regeneration capacity.

Habitats classified with 'very high sensitivity' include:

- the high alpine meandering sections of the Platzertal;
- riparian habitats in montane and lower subalpine areas in the Ötztal;
- gravel and sand river banks with pioneer vegetation in the Prutz-Runserau stretch of the Inn river, Platzertal, Ventertal, Erbach, and Ötztal; oligotrophic-natural ponds and ponds in highlands;
- alkaline fens in Milser Au;
- lowland hay meadows in the Inn and Imst;
- semi-natural lime-dry grasslands with notable orchids;
- riparian forests of willows, gray alder, oak-elm-ash in Prutz-Runserau stretch of the Inn river;
- montane spruce forests in Imst;
- species-rich Nardus grasslands in the Ötztal; and
- herbaceous habitats in alpine rivers with presence of German tamarisk (*Myricaria germanica*), in the Ötztal.

Habitats were mapped 300 m around the construction areas, and along the river reaches affected by altered flows. The surveys identified a total of 95 protected plants, lichen and moss species. Qualitative and quantitative impacts were identified for each site.

The assessment concluded that the permanent loss of peat moss / fen wetlands and meandering river habitats in the upper Platzertal valley, and effects on riverine habitats in the Ötztal and Runserau are significant impacts. Vent and Gurgl intakes are outside, but adjacent to the Natura 2000 area Ötztal Alps. According to Article 6 of the EU Habitats Directive, developments that are likely to cause significant effects on Natura 2000 sites require an 'appropriate assessment', and the Provincial Government will determine whether it is required. The assessment indicates that impacts on the resources protected by the Natura 2000 area and its conservation status are not expected. Based on the mountain groundwater study, the depth of the tunnels, lining of the

tunnels with concrete rings, and experiences from other tunnelling projects, effects of groundwater depletion are not expected in the Natura 2000 areas. No endemic flora species were identified. No negative effects are expected in the long-term associated with changes in the sediment dynamics. German tamarisk (*Myricaria germanica*) at the Ötztal is not directly affected and indirect impacts from altered flows are not expected.

The scope of the fauna assessment considered potential effects on mammals and game fauna, reptiles, amphibians, birds, and invertebrates. Field surveys were carried out on a radius of about 500 m and also considered possible migration distances and habitat requirements for different groups; for example, birds and bats require greater survey areas. The fauna assessment followed a similar approach to the plants and habitats surveys in determining the sensitivity of habitats and fauna, and considers possible effects from emissions, noise, light and traffic. The assessment identified highly sensitive species such as: crickets (*Tetrix turquoise* and *Tetrix tuerki*) that may be present on dynamic gravel banks on the Ötztal; western capercaillie (*Tetrao urogallus*); cicadas (*Pseudodelphacodes flaviceps*); and species of ants, beetles, and grasshoppers (*Chortippus pullus*). The assessment found that a type of flush mire (*Caricion bicoloris-atrofuscae*) is not in the study area, but this is disputed by WWF.

The assessment identified key impacts including:

- temporary disturbance to the western capercaillie, golden eagle, and ptarmigan;
- habitat loss for small alpine birds, hazel grouse and whinchat;
- loss of habitats for sandpiper and grey heron in the Inn;
- loss of summer and winter habitat for chamois, red and roe deer and ibex; loss and degradation of habitats for marmot and dormouse;
- loss of hunting habitats and migration corridors for bats;
- impairment of reptile habitat and migration corridors along the Inn;
- loss of beaver habitat at Runserau; and
- loss of amphibian spawning areas.

The assessment indicates that there is one possible endemic species of beetle, and six of spiders, but these have not been found. No significant impacts are expected on protected areas on the Inn or the Ötztal valley due to altered flows and changes in sediment dynamics, and monitoring plans will be prepared.

ARGE Limnologie prepared the assessment of aquatic ecology. The assessment presents baseline conditions on: hydro-morphological water quality; bacteriological water quality; hydromorphology; phytobenthos; macrozoobenthos; and fish fauna. Population densities were calculated based on results of multi-habitat sampling for each river affected. Danube salmon was found in stretches of the Inn River. The assessment includes a model to determine if optimal conditions (e.g. velocity, flows, depth) will be achieved for Danube salmon in representative river stretches of affected rivers. The assessment identifies optimal and seasonal conditions for adults and juveniles of brook trout and grayling, including the stretch below the mouth of the Sanna River, and for a mayfly species (*Baetis alpinus*). The assessment also considers the effects of the Gemeinschaftskraftwerk Inn (GKI) and Imst-Haiming hydropower projects (HPPs).

Invasive plant species such as Goldenrod (*Solidago canadensis*), Japanese knotweed (*Reynoutria japonica*), and Himalayan balsam (*Impatiens glandulifera*) are present in the project area. These invasive species are identified in the EIS. TIWAG and their consultants are aware of invasive plant species that require special management.

A monitoring concept is included in the EIS, and this will be reviewed and adapted by the Provincial Government after project approval. The monitoring concept applies to selected areas where mitigation activities will take place, and includes: a freshwater ecology monitoring program that will monitor phytobenthos and macrozoobenthos; monitoring of amphibians and spawning grounds; monitoring of highly sensitive fauna (e.g. grasshoppers, butterflies, cicadas, beetles, moor dragonflies); monitoring of woodpecker trees; fish monitoring at Runserau using electrofishing and labelling methods; monitoring of habitats and flora at Fotschertal.

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 studies take broad considerations into account, for example: cumulative effects of altered downstream flows from Kühtai, GKI and Imst-Haiming HPPs; interrelationship with results from other studies e.g. groundwater effects, and noise; potential changes on the ecological status on the Inn River down to Inzing; and effects on the Natura 2000-area "Ortolan Habitat Silz–Haiming–Stams". The EIS considers a number of risks: risks of invasive species; risks to an existing grayling spawning ground on the confluence of the Fagge River with the Sana River that may be affected near Runserau; and risks to the habitats potential for beavers near Runserau.

Socio-economic risks associated with hunting and fishing activities during construction are addressed under topic P-13 Project-Affected Communities and Livelihoods. Provincial Government revisions of the EIS will contribute to identify other risks and opportunities to be included in the assessment and monitoring plans.

The assessment considered opportunities to improve the ecological status of the Inn River. TIWAG invests in a number of fish and aquatic ecology research projects, and re-stocking programmes. Lessons learnt, for example on the effectiveness of the fish lift, are considered in the design of the new fish passage.

Criteria met: Yes

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.*

Measures were included in the KXP design to avoid impacts, for example: avoiding construction impacts on Natura 2000 areas during construction; construction methods; and implementing most construction works in winter at Gurgler and Venter. Minimisation measures were considered in the design, for example minimising land take required for camp sites. The project design includes a fish passage of about 10 km to bypass the Runserau weir, maintain the connectivity in the river Inn, and contribute to achieve the WFD objectives. Monitoring results of the effectiveness of the current fish lift are not yet available. The fish lift permit requires monitoring during the first 3 years of operation. Data collected by the lift's camera between February and October 2016 indicates that 1,246 fish have used the fish lift, which was operated 3,294 times.

The EIS studies propose about 90 mitigation measures for construction and operation, with an assessment of their effectiveness to address each impact identified. These include general preventive and control measures during construction, such as hoarding, fencing tree areas, reclamation and revegetation of cleared areas, topsoil removal and storage before construction, collection and transportation of wastewater, run-off control measures, and fish catching before dredging, and measures specific for each site, including re-creation and rehabilitation of riparian and woodland habitats, and relocation of part of alpine wetlands and restoration of amphibian spawning areas. Risks concerning invasive species will be managed by removing the plants and contaminated soil and disposing them in a landfill. Local or site-specific material and species will be used for site restoration.

The EIS studies predict that most impacts will be successfully mitigated, and monitoring plans will be implemented to ensure effectiveness. Restoration of habitats will follow Austrian standards, and will be carried out at appropriate times before the impacts are caused.

The EIS proposes measures to compensate permanent impacts that cannot be mitigated.

Measures proposed to compensate for impacts at Platzertal include:

- the restoration of Piller Moor and moor areas in Fliess and Kaunerberg;
- improvement of the ecological status of selected moorlands;

- habitat improvements at Fotschertal which includes a meandering stretch at the Seealm gorge;
- restoration of a fen wetland area downstream of the reservoir;
- expansion of the Gaisau nature reserve;
- expansion of small river bank areas on the Ötztaler Ache;
- areas for woodpecker trees; habitat improvement measures for western capercaillie (*Tetrao urogallus*); and
- recultivation of Stadlingerbach.

In Kaunertal, a small area of fen wetlands will be recreated at the tail of the reservoir. There are also areas identified for the protection of whinchat, and re-creation of beaver habitats. At Runserau measures include the raising of river banks and forest improvements, fish stocking with grayling and brown trout, and restoration of waterbeds at Fagge.

Compensation measures still require the approval of provincial authorities such as the Forestry Agency, and have to comply with the Tyrolean standards for habitats restoration. The Natura 2000-area "Ortolan Habitat Silz–Haiming–Stams" is the only Natura 2000 area with a management plan in place, and no conflicts have been identified. The Tyrolean government is responsible for keeping an inventory of the areas. The provincial government will prepare detailed monitoring plans for the KXP and TIWAG will be responsible for their implementation during construction and operation.

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.*

Processes to anticipate and respond to emerging risks and opportunities include:

- The reviews by independent experts representing the Provincial Government and adaptive management in response to any changes observed from monitoring results will contribute to the identification of risks and opportunities. For example, this might include the need for an 'appropriate assessment' to meet the EU Habitats Directive requirements, or additional studies;
- Monitoring programmes for freshwater ecology, fish, habitats, sensitive flora and fauna; and
- Adaptive management in response to monitoring results, for example measures to address any emerging impacts of altered flows downstream of Runserau resulting in changes in groundwater levels with consequential impacts on amphibian populations at Milser Au.

Concerns were expressed during the assessment by WWF about the impact of the KXP on several existing ecological restoration projects along the Inn river: one to increase ecological connectivity through barrier removal in the Fagge estuary, and one involving restoration of riparian forest at Milser Au. Additionally WWF submitted that it has restoration measures implemented and planned for Inn River reaches up to 100 km downstream of the Prutz power station which may potentially get affected. Whilst it is not possible for the assessors to draw a conclusion on whether the KXP might negatively impact on these other ecological restoration initiatives, from a process perspective there is a lack of evidence of collaboration in consideration of either risks or opportunities with all existing or planned biodiversity improvement projects potentially affected by the KXP, which is a **significant gap** at the level of proven best practice.Measures and monitoring plans will be made public during the EIA process, and included in the project's approval/permit; this will make the plans public, formal and legally enforceable. The implementation of the plans will be supervised by the Provincial Government.

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.*

The project construction will require temporary use of about 17 hectares that will be restored. The table below presents the area of habitats in hectares that will be permanently lost with KXP, and the area proposed for mitigation:

Permanent loss of habitats (hectares)	Alpine waters and gravel banks	Alpine wetland and peatlands	Alpine meadows	Extensive meadows	Dwarf shrub heath	Alpine talus	Natural and sub-natural forests	Riparian forests	Total loss of habitats	Area of mitigation measures for habitats, fauna and flora
Plazertal	2.25	6.34	28.70	-	22.54	29.87	-	-	89.70	109.52
Kaunertal	0.35	0.33	3.11	-	0.66	0.56	1.16	-	6.17	11.84
Venter	1.41	-	0.45	-	0.17	-	0.95	-	2.98	3.15
Gurgler	0.58	-	0.05	-	-	-	0.74	-	1.37	2.03
Runserau	0.42	3.42	-	-	-	-	1.06	6.82	11.72	24.00
Imst	-	-	-	0.10	-	-	0.43	-	0.53	22.56
Total	5.01	10.09	32.31	0.10	23.37	30.43	4.34	6.82	112.47	173.10

The largest loss of habitat will occur at Platzertal, outside any protected areas. The reservoir area at Platzertal will affect natural meandering water bodies of importance for wetlands and spawning grounds for amphibians. Wetlands and marmots will be relocated prior to construction. At the Gurgler and Venter Ache intakes, the areas affected are outside of Natura 2000 areas, and the water level will reach the Natura 2000 boundary during summer. Tunnelling effects on Natura 2000 areas are not expected. Impacts on fauna are in the construction phase cannot be fully compensated until the operation phase.

KXP includes measures to avoid, minimise, mitigate and compensate for significant impacts. According to figures in the table relating to the area of mitigation measures for habitats, fauna and flora, these exceed the area lost due to project impacts. This was not able to be fully tested by the assessors, but for the purposes of basic good practice it is accepted that measures are intended to provide full compensation. This objective will be achieved if the basis for the offsets is confirmed through testing by the Authority during the EIA process, and also if implemented correctly together with adequate monitoring plans. Residual impacts remaining after compensation will not cause a degradation or risk of the conservation status of protected areas, and habitats and fauna in the context of the Alpine region and the Tyrol; and they will not cause significant adverse effects, such as the extinction of a unique habitat or species. Monitoring will also consider areas directly affected and areas where potential risks may arise, such as Milser Au, and lower Ötztal.

There are no significant water quality issues at the existing Gepatsch reservoir. Fish populations depend on stocking activities.

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.*

The biodiversity studies indicate that there are a number of permanent impacts that cannot be fully compensated: specific reaches of the Platzerbach and habitats associated with the meandering mountain stream (about 0.53 ha); two fish spawning grounds on the Inn valley; about 0.07 ha of gravel banks in the Venter area; and the loss of fauna habitats in the Platzertal. There will also be residual temporary effects during construction, on birds and mammals on the Platzertal and Kaunertal / Gepatsch due to temporary habitat loss. Cumulative effects with Kühtai HPP on the loss of fen wetlands or peatland, and effects on meandering alpine rivers in the Tyrol context have not been considered, that are a concern for WWF. The SEA of Upper Tyrol/Tyrol Oberland Water Management Framework does not go to the level of detail of types of habitats and what the loss means in the regional context.

Because they have not yet been tested through the provincial government assessment processes, there is insufficient evidence to conclude that the mitigation measures proposed for biodiversity fully compensate for permanent negative residual impacts, resulting in a **significant gap** against proven best practice.

Plans provide for improvements of the ecological status of the Inn River (see also topic P-21 Water Quality).

Criteria met: No

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

There is a lack of evidence of collaboration in consideration of either risks or opportunities with all existing or planned biodiversity improvement projects potentially affected by the KXP.

There is insufficient evidence to conclude that the proposed mitigation measures for biodiversity fully compensate for permanent negative residual impacts.

2 or more significant gaps

19.3 Scoring Summary

The KXP is located in a region with a number of areas with European- and regional-level protected status. TIWAG and the EIS consultants have assessed the biodiversity impacts of the KXP project, including associated project components, during construction and operation. The proposed measures are designed to avoid, minimise, mitigate and compensate significant biodiversity impacts, and to improve the ecological status of the river Inn between Runserau and Haiming. There is a lack of evidence of collaboration in consideration of either risks or opportunities with all existing or planned biodiversity improvement projects potentially affected by the KXP. Additionally, because they have not yet gone through provincial government assessment processes, there is insufficient evidence to conclude that the proposed biodiversity measures fully compensate all permanent negiative residual impacts. These two issues result in two significant gaps against proven best practice, resulting in a score of 3.

Topic Score: 3

19.4 Relevant Evidence

Interview:	7, 35, 40, 50, 53, 54, 56
Document:	3,5,6, 8, 111-113, 126, 129-131, 161-164, 166, 167, 173, 180, 193, 208, 211-214, 266-274, 276-277, 293-298, 300-301

Photo:	1, 4, 12, 24, 39, 46-56, 69, 70, 78

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 upstream intakes of the Kaunertal Expansion Project (KXP) are located in the non-regulated reaches of the Gurgler and Ventertal valleys. Erosion and sedimentation dynamics in these rivers are influenced by the seasonal hydrology of glacial-fed gravel bed streams, valley slope stability, and naturally occurring landslides and avalanches. These rivers are characterised by high bedload concentrations and high concentrations of suspended sediments. A new upper stage reservoir for pump storage will be located in the Platzertal. The downstream portion of the KXP is located in the regulated reaches of the Fagge and Inn Rivers and takes advantage of the existing Gepatsch Reservoir (as the lower stage reservoir for the pumped storage scheme) and Runserau Weir on the Fagge and Inn rivers, respectively.

Many reaches of the Inn and Fagge rivers, as well as Ötztaler Ache reaches have been subject to channel straightening and modification and have little or reduced riverbed structure which has affected sediment transport and erosion processes. The Inn River receives sediment from the glacier-fed catchments in Switzerland and is also subject to the effects of hydropeaking surges from hydropower plants in Switzerland and Austria.

The KXP project will influence erosion and sedimentation processes in the following project areas:

- In the Ötztaler Ache and in its tributaries, the Venter Ache and Gurgler Ache
- In the existing Gepatsch Reservoir
- In the Platzertal valley
- At the existing Runserau weir and along the Inn River
- Downstream of the proposed re-regulation or tailwater basin at the Prutz 2 power plant and at the Imst tailwater basin

This topic covers erosion and sedimentation issues in general while the design-specific aspects of the sediment load are also related to topic P-4 Siting and Design. Certain aspects also relate to topics P-21 Water Quality and P-22 Reservoir Planning.

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 potential impacts that may be caused by the project and are identified in the EIS include:

- Impact on sediment transport in the Ötztaler Ache, Venter Ache and Gurgler Ache: as a result of the decreased flows, sediment may accumulate in the flatter reaches of the river system
- Sediment accumulation at the Venter Ache and Gurgler Ache weirs
- Sediment dynamics and erosion in the Platzertal valley: as a result of potential changes to flows and water quality with the Platzertal dam and KXP upper stage reservoir

- Impact on sediment dynamics in the Gepatsch reservoir as a result of changes to operations and flows
- Impact on sediment dynamics at the Runserau weir: as a result of increase in water level and flow dynamics
- Impact on sediment dynamics in the Inn River: as a result of changes in operations and flows

Since the 1960's, TIWAG has been studying topics related to sediment transport in alpine and glacier-fed rivers in order to estimate mean annual sediment transport capacities and to better understand sediment dynamics in project catchment areas and river reaches.

For the KXP project, different methods and types of investigations were used to estimate the rate of sediment transport in the project river systems. Total suspended solids (TSS) sampling and in-line turbidity measurements as well as historic data were obtained at various gauging stations located on the Inn River and the Ötztaler Ache operated by the Tyrolean Hydrographic Service and TIWAG. Particle size distribution, flood hydrology and other statistical methods were also used to characterise sediment dynamics in the project areas.

TIWAG commissioned a series of experts to conduct the sediment transport studies to support the design of the various components of the project. These studies provided input into the design of the Tyrolean weirs and sediment flushing gates located at the Venter and Gurgler Ache diversion works. In addition, the studies provided an understanding of the effects that the KXP flow diversions at the Venter and Gurgler Ache would have on the sediment transport rates in the downstream reaches of the Ötztaler Ache as a result of the decreased flow regime. These predicted that the glacial sediment that accumulates above the intake weirs will be flushed down regularly during floods. Because there will be less flow in the Ötztaler Ache, some of the sediment will not be carried down as far and will settle in flatter reaches, which will need to be dredged. Fines may end up in Gepatsch but increased turbulence will keep them suspended. The studies included 2-D modelling carried out by experts at the University of Innsbruck and 1-D numerical modelling of bedload transport by experts at ETH (Swiss Federal Institute of Technology in Zurich). TIWAG also commissioned the University of Innsbruck to build a physical model of one of the diversion weirs to ensure the sediment transport assumptions used in the modelling and design of the weirs were accurate. The models were subsequently calibrated with the results from the physical model.

The results of the technical sediment studies were summarised (in document D03.06-1 of the Environmental Impact Statement, EIS) by Dr Roni Hunziker of Hunziker, Zarn and Partner, a Swiss engineering consulting firm specialising in water resources.

In addition, the EIS identifies issues that may impact the project. Alpine processes such as mass movements and slope stability, debris and mud flows, rockfalls and avalanches are considered systematically for each area of the project. For example, during the options assessment for the selection of the location of the upper stage reservoir, one of the sites did not have favourable slope stability conditions. These considerations are presented in Part C of the EIS documentation. The sediment regime of the Gepatsch reservoir is discussed in section C.13.05 of the EIS documentation.

The Tyrolean authorities have retained their own independent expert to review the sediment studies presented in the EIS documents, Dr Theodor Stroebl, professor of hydraulic structures and water resources engineering at the Technical University of Munich. Dr Stroebl was asked to review the sediment studies carried out in the Ötztaler Ache and the KXP intakes and was asked to review aspects of the project relating to flood protection in the Ötztaler Ache and the sediment transport modelling. He concluded that the boundary conditions used for the modelling studies were reasonable and that the 1-D modelling combined with the physical modelling gave reasonable results. Although the assessment establishes a thorough understanding of sediment dynamics in the affected river system Professor Stroebl recommended additional 1-D modelling of the Ötztaler Ache, which is taking place in late 2016 with results expected in early 2017.

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 sediment studies and modelling carried out for the project take into account worst case scenarios with respect to sediment. They drew on TIWAG's experience with sediment transport in glacier-fed river systems and TIWAG's experience owning and operating a reservoir with significant slope stability issues, the Gepatsch reservoir.

The sediment design parameters used in the modelling include potential future climate change. For example, if flood flows increase as a result of climate change, an increase of 50% in sediment bedload is used in calculations. The preliminary sediment management plans that have been developed can cope with a 15% increase of bedload.

TIWAG is also involved in research and development initiatives that will contribute to a better understanding of sediment transport in alpine river systems. These include the geophone stations which contribute to the understanding of bedload transport in general and in the Ötztaler Ache in particular.

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.*

Erosion and sedimentation issues have been considered throughout the KXP project planning and design process. The selection of the location of the new reservoir and intakes of the KXP project was based, amongst other criteria, on the stability of the slopes, including the consideration of the future effects of the impounded water on the stability of the slopes.

The sediment studies and hybrid modelling (numerical and physical) of the diversion weirs at the Venter and Gurgler Ache have contributed to the development of operating rules for the sediment flushing gates during flood flows, to ensure sediment from these catchments does not reach the Gepatsch reservoir. The physical modelling has determined that the low level flushing gates should be operated after the flood peak when flows start to recede at around 70-80% of the peak flow. In addition, sediment transport modelling indicates that dredging in the Ötztal River may be required, and a plan is in place to monitor the effects of decreased flows in the flatter river reaches along the Ötztal River. The Sediment Management Concept (in EIS document B.04.20.1010) establishes the monitoring and potential dredging locations on the Inn River (2 locations) and in the Ötztal river. The potential locations that may need dredging during KXP operations include the Scheiber licensed aggregate extraction site downstream of Sölden (where extraction of river bed material takes place now), the town of Sölden and the confluence of the Venter Ache and Gurgler Ache (where the authorities already dredge in these areas when needed to avoid flooding), and at Längenfeld near the Aquadome (where dredging may be necessary every 10 years to ensure permissible river bed levels are maintained for adequate flood protection).

In the Platzertal valley, the upstream inflows will be re-routed around the reservoir and re-enter the Platzertal stream at the toe of the dam, in order to maintain the sediment and water quality characteristics of the Platzerbach downstream.

The Gepatsch reservoir has historically experienced slope stability issues. It is equipped with a comprehensive monitoring array which detects slope movement around the reservoir and centralises readings at a station at the dam. The additional flows coming into the Gepatsch reservoir and pumped to the Platzertal reservoir will not

change the rule curves for Gepatsch operations, and are not expected to change sediment dynamics in the downstream Fagge River.

The raising of the Runserau weir and the new sedimentation basin are not expected to affect sediment transport in the downstream reach of the Inn River. Sediment in the Inn River comes from catchments in Switzerland, and gauging stations along the Inn River monitor suspended sediment with in-line turbidity probes. The "improvement order" of the EIS issued by the Tyrolean government upon their review of the 2012 EIS (Revision 0) requested that the Inn River reach between the Prutz plant and the Runserau weir be monitored twice a year for erosion in addition to the downstream reaches of the KXP project. In the Inn River, the KXP project will serve to reduce the effects of hydropeaking and any associated erosion by the means of the proposed re-regulation or tailwater basins at the Prutz and at the Imst sites.

During the construction of the Venter and Gurgler weirs and intake works, erosion and sediment control will be provided by upstream and downstream coffer dams, and a sump pump will pump silty water to water treatment tanks prior to being discharged back into the streams. Specifications are to be included in the tender bidding documents such that water quality parameters are met. Other erosion and sediment control measures include topsoil being kept in seeded hedgerows of a maximum of 1.5 m height, that will be reused during rehabilitation works, and the use of geotextile on exposed slopes of coffer dams.

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.*

TIWAG's support to research programmes provide opportunities to improve their understanding of sediment dynamics in the river systems in which they operate. Amongst various research and development initiatives to anticipate and respond to issues related to sediment transport, TIWAG is currently studying fluvial sediment transport in gravel bed rivers using impact plate geophones. The geophone sensors record the motion of bedload particles transported over an array of steel plates mounted flush with the channel bed. The calibration of the geophone system is done by carrying out simultaneous direct bedload transport measurements using a basket type sampler.

TIWAG owns and operates a geophone station (since 2011) at a gauging station on the Ötztaler Ache, and the Tyrolean Hydrographic Service owns and operates a similar station (since 2000) upstream of Vent on a tributary of the Venter Ache (on the Rofenache stream). Data from the geophone stations owned by TIWAG is analysed by WSL (Swiss Federal Research Institute). Although the reliability of the data obtained with geophones is still under study, TIWAG is actively working on optimising the development of this technology to help estimate bedload transport in mountains streams. This data will eventually contribute to the understanding of the sediment bedload transport in the Ötztaler Ache.

The Gepatsch reservoir was built in the 1960's with a total volume of 138 Mm^3 and has been monitored closely due to sedimentation and slope stability issues. After 50 years, the reservoir has lost 3 Mm^3 of storage capacity. Silting in the reservoir is reaching the intake works and is gaining importance, and TIWAG is looking for sustainable solutions for future silt management in all TIWAG reservoirs in collaboration with Universities (the "Nachhaltige Sediment Bewirtschaftung" or Sustainable Sediment Management project is to be completed in 2017).

TIWAG's monitoring provides the information base by which it anticipates and respond to risks. For example, the centralised monitoring station linked to an array of electronic metering capabilities that is located on the Gepatsch embankment dam monitors land mass movement of the slopes surrounding the reservoir, and allows TIWAG to anticipate landslide, rock fall and erosion processes that may affect the reservoir. The KXP project studies have provided new information and data used to update the existing slope stability model, whereby the predictions of the model are compared with the actual behaviour of the reservoir slopes. TIWAG's experience

and understanding of the behaviour of the reservoir and the lower stage components of the KXP scheme in terms of erosion and sediment transport is demonstrated by their management of their existing plants along these river systems. In addition, the alarm systems in place at the GKI construction site to detect rock falls indicate an understanding of this type of risk.

In addition, TIWAG is actively pursuing research partnership opportunities around sediment transport, such as the application for funding under the Christian Doppler Laboratory for Research and Management with BOKU (University of Natural Resources and Life Sciences in Vienna).

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.*

Aspects of the planning and design of KXP project components will avoid, minimise and mitigate erosion and sediment related issues, for example through the following measures.

- The site selection of the upper stage reservoir avoids locations with slope stability issues, and includes the consideration of the future effects of the impounded water on the stability of the slopes
- The design and operation of the diversion weirs at the Venter Ache and Gurgler Ache includes flushing gates that allow the accumulated sediment to be passed downstream and reach the Ötztaler Ache
- The monitoring and dredging plans on the Ötztaler Ache will ensure that any accumulated sediment in the flatter reaches of the river system do not cause localised flooding
- Modelling of the sediment dynamics in the Gepatsch reservoir indicates that the increased turbulence due to the increased flow into the reservoir will cause fines (coming from the Venter and Gurgler Ache catchments) to remain suspended, and that there will be no net gain of sedimentation in the Gepatsch reservoir (Section C.13.05 of the EIS)
- Monitoring of sediment transport along the Inn River will allow mitigation measures to be adapted if needed
- Re-regulating tailwater basins at Prutz and Imst will dampen the effects of hydropeaking and decrease related sediment transport and erosion processes in the Inn River.

In addition, the design and plans consider potential changes in flow and sediment transport due to future climate change.

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.*

Research and development activities carried out by TIWAG and in collaboration with Institutes and Universities within and outside Austria contribute to addressing erosion and sediment issues beyond those impacts caused by the project. These include a PhD Thesis in collaboration with the University of Lisbon, which looks at ways to reduce hydropeaking on the Inn River, specifically related to the GKI project; the partnership between BOKU (University of Natural Resources and Life Sciences in Vienna) regarding sediment research; and applications for funding under the Christina Doppler Laboratory research funding from the Ministry of Economics in collaboration with other entities and University research laboratories.

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 intakes of the KXP project are located in unregulated river catchments. Erosion and sedimentation dynamics in these rivers are influenced by the seasonal hydrology of glacial-fed gravel bed streams, valley slope stability, and naturally occurring landslides and avalanches. The site selection of the upper stage reservoir avoided locations with slope stability issues, including the consideration of the future effects of the impounded water on the stability of the slopes. The downstream portion of the KXP is located in the regulated reaches of the Fagge and Inn rivers and takes advantage of the existing Gepatsch Reservoir and Runserau Weir on the Fagge and Inn rivers. The project will dampen the hydropeaking fluctuations in the Inn River from upstream hydropower facilities in Austria and Switzerland. In addition, alpine processes such as mass movements and slope stability, debris and mud flows, rockfalls and avalanches are considered systematically for each area of the project in the EIS.

The design and operations of the intakes at Gurgler and Venter Ache include the provision of flushing gates that allow the accumulated sediment to be passed downstream during floods. Independent sediment studies included a physical model of the intakes developed by the University of Innsbruck.

Management plans will be prepared to address the construction related erosion issues and control debris, rockfalls and avalanches, as well as erosion and sediment issues caused by changes in waste levels and flows in the Inn River during the operation stage. The monitoring of sediment dynamics and dredging plans along the Ötztaler Ache will likely avoid and minimise problems caused by the project due to reduced flows in the river.

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

Topic Score: 5

20.4 Relevant Evidence

Interview:	3, 5, 9, 24, 31, 52, 65, 83
Document:	4, 42, 43, 44, 45, 48, 49, 50, 52, 56, 60, 61, 73, 80, 116, 117, 118, 119, 120, 121, 122, 123, 139, 140, 146, 164, 216, 334
Photo:	9-11, 13-16, 25-28, 37, 39, 68, 84, 85

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

The National Water Management Plan (NWMP) is the main instrument for the implementation of the Water Framework Directive (WFD) in Austria. The WFD sets out that by 2027: surface waters and heavily modified or artificial water bodies should achieve good ecological and chemical status; there is a systematic improvement and no further deterioration of the water status; and groundwater should achieve good chemical status. The surface water status according to the WFD is determined by the ecological status and the chemical status (content of priority substances listed in the WFD). Ecological status is recorded as very good, good, moderate, poor or bad. 'Very good' represents 'largely undisturbed conditions'. The ecological status integrates: the biological status, which includes macro and phytobentos, invertebrates and fish; the physico-chemical elements, such as dissolved oxygen, phosphorus, ammonia and pollutants listed in Annex VIII; and the hydromorphological alterations. The term 'potential' is used instead of 'status' for heavily modified or artificial water bodies to indicate the maximum it could achieve.

The NWMP indicates that, in Austria, 15% of the natural surface water (89% of the water network) has a 'very good' status, 19% a 'good' status, 55% 'moderate' status, 9% 'unsatisfactory', and 2% have a 'poor' status. About 15% of the national water network is 'untouched' and naturally preserved stretches of water.

The NWMP (2015) digital maps provide information on the state of the water for the rivers affected by Kaunertal Expansion Project (KXP):

River / Water Body	Ecological Status and Potential	Chemical Status	Biological Status or potential - hydro morphological pressures
Fagge River	Upstream of the reservoir: very good/moderate Downstream of the reservoir: moderate/poor	Upstream of the reservoir: good or better Downstream of the reservoir: good or better (artificial and heavily modified water body)	Moderate/poor
Gepatsch reservoir	Good or better	Good or better (artificial and heavily modified water body)	Good/poor
Platzerbach, Oebgrubenbach and Toesnertalbach	Good, Very good; Very good and unsatisfactory from the confluence with the Platzerbach to the river Inn	Good or better	Good
Inn River	Moderate and Poor	Good or better (artificial and heavily modified water body)	Moderate/poor
Ötztaler Ache	Good	Good or better	Good
Gurgler Ache	Good (from the intake and downstream) Very good (upstream of the intake)	Good or better	Very good in the upper areas / good
Venter Ache	Good (from the intake and downstream)	Good or better	Very good in the upper areas / good

	Very good (upstream of the intake)		
Verwallbach	Very good	Good or better	Very good
Konigsbach	Unknown	Unknown	Unknown

The Upper Tyrol Water Management Framework Plan (2014) sets out that existing and planned hydropower plants should aim to achieve 'good ecological potential' and alleviate hydropeaking on the Inn River. Freiland conducted a Strategic Environmental Assessment (SEA) of the Upper Tyrol Water Management Framework Plan for TIWAG in 2012, which was revised in 2014.

Water uses in the KXP area include: groundwater abstractions for domestic water supply; extraction of river water for snowmaking in the Ötztal; rafting and kayaking on the Inn particularly from Landeck to Imst and on the lower Ötztaler Ache; and irrigation for agriculture in the Ötztal. There are wastewater treatment plants (WWTPs) in Sautens, Langenfeld, Sölden and Obergurgl.

This topic addresses biochemical water quality in the KXP project reservoirs, rivers, and broader catchment issues. It also addresses the treatment of water quality at working areas and labour camps during construction. Topic P-19 Biodiversity and Invasive Species addresses the biological status and impacts of aquatic life; and topic P-20 Erosion and Sedimentation addresses turbidity issues. The use of flows for generation, and downstream flow regimes are addressed in topics P-7 Hydrological Resource and P-23 Downstream Flow Regimes respectively.

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.*

The Environmental Impact Statement (EIS) includes an assessment of current surface water and groundwater quality conditions. The assessment identifies potential impacts of construction and operation activities.

The EIS consultants sampled surface water quality at a number of points: 15 around Prutz-Imst in 2013-2014, 3 in the Platzertal, 4 at Runserau and 19 in the Ötztal in 2010-2011. Sampling points included stretches affected by the intakes and points immediately after wastewater discharges. The sampling and analysis complied with the standards and protocols established by the Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW). The sampling determined the levels of standard parameters such as pH, electrical conductivity, water temperature, oxygen content, five-day biochemical oxygen demand (BOD5), chemical oxygen demand (COD), total organic carbon (TOC), nitrates, heavy metals, sulphates, and ammonium. Sewage discharge data from municipal wastewater plants, including capacity and efficiency, was considered in the assessment and modelling of residual flows and quality.

TIWAG's consultants conducted studies to determine the impact of the KXP on the dilution potential of pollutants from domestic wastewater plants and potential effects on drinking water supply. The assessment indicates that there will be no relevant effects on water quality, during construction and operation.

Potential water quality impacts considered by the EIS during construction include: construction of landfill sites that could affect drinking water supply; effects of the lowering of groundwater on existing wells; introduction of urban wastewater in municipal sewer systems; effects on the capacity and efficiency of existing wastewater treatment plants, particularly during winter when the groundwater levels will be lowered; and uncontrolled discharges of construction run-off. Potential water quality impacts considered by the EIS during operation include: effects of landfills on sanitation systems; effects of the groundwater lowering on existing wells;

combination of discharges from road drainage, treatment plants and sewers; and potential changes in the reservoir and discharges.

The Austrian Environmental Protection Agency (Umweltbundesamt) researched the effects of wastewater treatment plants effluents on the levels of WFD priority substances, such as heavy metals, in water bodies. This was considered in the assessment. During operation, the Platzertal reservoir will be comparable to other alpine reservoirs at similar altitude, such as the Gepatsch reservoir, and it will be (ultra)-oligotrophic. Therefore, effects such as reduced oxygenation, pollutant inflow, eutrophication, and potential for algae blooms, will not be relevant.

TIWAG carries out a five-year routine monitoring campaign on existing reservoirs to report on the status of the water bodies affected by their operations, and to identify any issues towards achieving WFD objectives.

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 assessment takes broad considerations into account. The EIS considered the results of a regional survey on future developments to understand the domestic water supply and demand needs, and future population growth until 2030. The results show that the water supply in the project area exceeds current demand and it will not be an issue in the future. The assessment of urban management water considers that planned projects, such as Kühtai pump storage hydropower (PSHP) extension, Imst-Haiming hydropower plant (HPP), and the approved Tumpen-Habichen HPP are part of the baseline conditions.

The assessment considers potential risks during construction and operation, for example: potential effects on water rights, springs and fishing rights; water quality risks during the winter considering population growth and trends; and existing capacity of wastewater treatment plants and needs for the construction period. The project has identified opportunities to improve the ecological status of the river Inn with the regulation of hydropeaking, and improving water quality at Platzertal.

TIWAG carried out the latest routine monitoring campaign in 2016 (for the period 2012-2016) and no significant issues were identified at the Gepatsch reservoir. Stratification is not an issue. Water quality assessment data will be updated prior to construction to develop detailed water quality monitoring plans for KXP construction and operation. This, and the routine monitoring campaigns, will help to identify risks and opportunities.

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.*

Water management measures have been proposed to meet the water quality targets of the WFD and Austrian quality standards. Measures to address key construction risks identified include: the Imst tailwater basin will be sealed to avoid water pollution when water levels increase; contaminated soils that need to be disturbed will be treated and disposed in a landfill; and runoff water will be collected and treated at all construction sites.

Specific measures to protect groundwater include: site mobilisation areas will have oil separators and spill skirts to handle water-polluting substances e.g. at refuelling stations, workshops, and washing bays; runoff water will be directed to oil separators; biologically degradable and water-insoluble fuels, lubricants and oils will be used where is technically feasible; spill kits will be at all construction sites; an alarm scheme will be established; water resulting from tunnel excavations will be released through a watercourse protection system; the volume and

quality of water released will be recorded, and if volumes are too high, sealing measures will be implemented; seepage water generated from tunnel construction will be treated; wastewater will be collected on site and taken to municipal treatment plants in Sölden and Prutz; and a temporary wastewater treatment plant will be installed at the Kaunertal construction camp. The existing pressure tunnel will be sealed as required to limit any mountain water ingresses before using it as a cable tunnel.

During operation, water from upstream of the Platzertal reservoir, i.e. from Öbgrubenbach, will be diverted to provide a residual flow in Platzertal with similar quality to current flow, thereby avoiding the introduction of glacial water from Ötztal and Kaunertal into the valley. In winter, seepage water from the Platzertal dam and the access tunnel to Kaunertal will be used to guarantee flows, in the event that the Öbgrubenbach waters freeze in the diversion channel and pipe. The project will install a treatment facility downstream of the reservoir where domestic wastewater from the Alm buildings is currently discharged directly to the Platzerbach.

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.*

During construction and the first few years of operation, water quality in affected rivers will be monitored to ensure compliance with the plans. In the long-term, emerging risks and opportunities could be identified through the routine monitoring campaigns. The data is used to assess management needs and the effectiveness of measures.

Regarding opportunities, a number have been identified, including:

- The Langenfeld municipality is going to expand current water treatment facilities in the short-term, and this will address existing and future discharge issues;
- As seen in other recent projects such as at GKI, new modular wastewater treatment technologies with automated adjustments made in response to continuous data collected by in-built probes are likely to be applied to the KXP construction sites;
- There is an opportunity to improve domestic wastewater disposal with the construction of a treatment facility at the PlatzerAlm located downstream of the proposed dam, which in turn will improve water quality in the downstream Platzerbach; and
- Water diversions from local springs and seepage water will be established to deliver the minimum flows in the downstream Platzerbach, rather than using the glacially-derived water stored in the Platzertal reservoir, to ensure no significant changes in the natural chemical composition of the downstream aquatic environment.

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.*

Plans are designed to avoid, minimise and mitigate negative impacts if implemented correctly with sound water quality monitoring plans.

The chemical and ecological status of affected watercourses is not expected to worsen or change, and measures are proposed to avoid potential water contamination during construction and operation.

Based on the evidence provided, and if management measures are implemented correctly, there will be no significant negative impacts on watercourses from water treatment plants, and no significant negative impacts on drinking water supply systems (wells or springs) during construction or operation.

There are no significant water quality issues at the existing Gepatsch reservoir and the diversions. Water quality in the Platzertal reservoir is expected to be similar to Gepatsch and it will be included in the routine monitoring campaigns.

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.*

There are no residual impacts requiring compensation. It is expected that the baseline conditions will remain the same in relation to the effects of effluent discharges. During operation, water will not be diverted from the Ötztaler Ache during winter, when the WWTPs' maximum flow discharges occur and river flows are lower.

The project will enhance pre-project conditions by improving the ecological status of the Inn River in part relating to water quality characteristics, contributing to WFD objectives on the Inn River. The PlatzerAlm does not have any wastewater treatment facilities, and KXP will build facilities to be used during construction that will remain for the Alm's use during operations.

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 project has to comply with the requirements of the WFD. Water quality in the watercourses affected by the project has a 'good' to 'very good' chemical status. Groundwater quality is also good. TIWAG undertakes sampling campaigns every six years to report to the Austrian Government on any changes towards achieving the WFD targets. Water quality monitoring plans for construction and operation of KXP are to be developed before construction.

Experts do not foresee any changes in the 'good chemical status' or significant risks on affected watercourses or groundwater. Plans intend to improve water quality in the Platzerbach and improve the ecological status of the Inn River. There are no significant gaps against best practice, resulting in a score of 5.

Topic Score: 5

21.4 Relevant Evidence

Interview:	7, 35, 63, 82
Document:	67-71, 127, 136, 201, 202, 209-210, 282, 304
Photo:	1, 4, 23, 68

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

This topic concerns the planning of reservoir filling and operations, integrating a range of issues, some of which may be covered in more depth on the more relevant topic. For example, considerations relating to siting and design are addressed in topic P-4 Siting and Design. Topic P-22 encompasses the acquisition of land for the reservoir areas, but topic P-13 Project-Affected Communities and Livelihoods covers impacts on communities in more depth. It covers heritage issues, but topic P-17 Cultural Heritage provides more depth. Sedimentation of reservoirs is mentioned in topic P-22, but topic P-20 Erosion and Sedimentation addresses it in more depth.

The Kaunertal Expansion Project (KXP), upon completion, will encompass the water bodies and associated characteristics summarised in the following table.

Catchment	Waterbody	Surface area at FSL (km^2)	Storage capacity (10^6 m^3)	FSL (m above sea level)	Minimum operating level (MOL) (m)	Comments
Ötztal	Gurgler reservoir[1]	0.01	0.07	1843.5		
	Koenigsbach weir[1]	-	-	-	-	Tyrolean Weir
	Fernwallbach weir[1]	-	-	-	-	Tyrolean Weir
	Venter reservoir[1]	0.013	0.07	1846.3		
Platzertal	Plaztertal reservoir[1]	0.902	42	2412	2330	Large range in reservoir levels
Kaunertal	Gepatsch reservoir[2]	2.61	138	1767	1695	Large range in reservoir levels
Inn	Prutz tailwater basin[1]	0.014	0.04	868.3	865	
	Runserau reservoir[2]	0.34	1.3	858.5	853	
	Imst tailwater basin[1]	0.048	0.27	721	714	
	Haiming tailwater basin[3]	0.059	0.3	656	650.3	

[1] Newly built for KXP, [2] Existing but modified by KXP, [3] Newly built for the Imst-Haiming project

The existing small reservoirs created by intakes on the eastern side of Kaunertal, Pitztal, and Tscheybach and Radurschlbach will not change with the KXP, and are not considered in this assessment.

The project's water bodies will be managed for the purposes of power generation and flood management. They are not planned to have any other purposes such as recreation or water supply.

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.*

TIWAG has assessed the most important considerations relating to the KXP-affected water bodies, through the design of the project and the Environmental Impact Assessment (EIA) process.

In the Ötztal, the important considerations are: sedimentation of the reservoirs and weirs during operations; flood management during operations; and avalanches during operations. The project description provides a summary of TIWAG's assessment of the geology, hydrogeology and natural hazards affecting the Gurgler and Venter intakes. Section C.41.01 of the Environmental Impact Statement (EIS) summarises TIWAG's assessment of the sedimentation of the intakes. Regarding flood management, Section D.03.05-1 provides an 'Impact Factor Report' on Hydrology and C.01.02-1 describes public interest regarding flood protection, including the Ötztal. The project description for the operation phase (EIS Section B.04) also describes access and accessibility, and storage management for Gurgler and Venter intakes. The areas required are small and in steep gorges, so land acquisition and clearance is minimal.

In the Platzertal, the important considerations prior to filling are: acquisition of and compensation for the reservoir land area; impacts to hunting, grazing, access to the historical mine, etc; the relocation of sites of biodiversity value that are located in the inundated area; localised impacts to wildlife during the construction phase; and quarrying of construction materials within the reservoir area. These are assessed in the project description for the construction phase (EIS Section B.03). The assessment of human uses in the EIS encompasses the use of pasture in the Platzertal reservoir area.

For Gepatsch, the most important considerations prior to operation concern: construction management, including traffic management; the avoidance of landslide risk; and the construction of a galleried road on the western shore. These are assessed in the project description or the construction phase (EIS Section B.03). TIWAG will also create wetland habitat at the upper end of the reservoir, in compensation for habitat loss at Platzertal.

In both Platzertal and Gepatsch, the most important considerations during operation are: fluctuations in reservoir levels with generation operations; slope stability around the reservoirs; and the containment of flood waters and pulse waves. The project description for the operation phase (B.04) provides a summary of TIWAG's assessment of the geology, hydrogeology and natural hazards affecting the Platzertal reservoir including falling rock masses and pulse waves from avalanches, as well as access and accessibility, and storage management for both, and sediment management for Gepatsch. In addition, it provides TIWAG's assessment of the levels of Platzertal reservoir that will result from operations, describing daily, weekly and annual variation. TIWAG has also carried out technical assessment of slope stability around both reservoirs, with detailed investigations and the analysis of seismicity and hydraulic load, and this also includes a summary of reservoir levels in Gepatsch and how they will change with the expansion project.

Regarding Runserau and the other Inn tailwater basins, TIWAG assessed exploration and engineering geology, stability analysis, hydraulic design / spillway capacity, and groundwater impacts (just as for the larger waterbodies). The most important considerations prior to filling are: the acquisition of and compensation for additional land; relocation of affected infrastructure, including roads and, for Runserau, the raising of a bridge of heritage value; sedimentation during operations; and a methodology of construction that minimises impact on groundwater in the construction phase. The project design for the construction phase describes some of these for Runserau (the raising of the shoreline, groundwater regulation, and lifting of the Pontlatzer bridge). The project description for the operation phase describes access and accessibility and storage management for Runserau. The most important consideration during operations is avoiding the interaction of the water in the basins with groundwater.

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 assessment and management measures are based on dialogue with local community representatives. Specifically, at Platzertal, the TIWAG and leaders of the Alms farmers are in a three-way dialogue, with the Federal Forestry Office, regarding acquisition and agreements for use of land owned by the latter, on which the farmers have grazing and hunting rights. In addition, TIWAG and the farmers have discussed many other issues, such as the landscaping of the dam face, and access of cattle to the reservoir. TIWAG is in dialogue with municipality leaders, but one municipality is opposed to the project (Sölden). In addition, TIWAG is in discussion with individual landowners, to get to pre-contracts, conditional upon project construction. Issues of dialogue with stakeholders including municipalities are discussed further in topic P-1 Communications and Consultation, and land acquisition is discussed in more depth in topic P-13 Project-Affected Communities and Livelihoods.

TIWAG has assessed broader considerations and risks. For example: TIWAG has assessed risks of creating reservoirs on contaminated land (all areas have been assessed, including Imst); they have assessed cultural heritage in the Platzertal, Runserau and Imst areas; the visual impact of varying water levels in Platzertal; and public safety around the reservoirs (considered to be acceptable in alpine regions, with signage, and resulting in the need for fencing around Prutz tailwater basin and Runserau weir). TIWAG has assessed opportunities through the planning of reservoir management involving stakeholder consultation. Examples of opportunities considered include: creation of new wetlands on the southern shore of Gepatsch and Platzertal reservoirs; boating on Platzertal and Gepatsch reservoirs (rejected on public safety grounds); hiking around Platzertal reservoir; touristic use of the access tunnel from Gepatsch to Platzertal considered but refused for safety reasons; and the western shore gallery on Gepatsch reservoir.

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.*

TIWAG has developed plans for the management of most of the important considerations above, as follows.

At all sites, land will be acquired prior to reservoir filling, and agreements will be reached as needed for use of land around the reservoirs. The number of plots to be purchased totals many hundreds, and in particular, acquisition for the Runserau expansion will involve many individual private owners. Other areas have comparatively simple ownership structures. During construction of the Venter intake, one neighbouring household will be given support to move temporarily to avoid disturbance (see topic P-13 Project-Affected Communities and Livelihoods).

In the Ötztal, during operation, pulse waves caused by rockfall and avalanches at both Gurgler and Venter intakes will be avoided by emptying the reservoirs during the winter months (as described in topic P-7 Hydrological Resource) and providing a freeboard in the transitional months. The later will operate between 15 November and 15 December and between 15 April and 15 May each year, and will provide a freeboard of 3 to 4 m in Gurgler and 4 to 4.8 m in Venter. Sedimentation during operations will be managed by flushing procedures. These are set out in the project description section of the EIS, and entail step-by-step procedures that will be followed in summer when flows exceed an agreed level (essentially, lowering the reservoir level using the inlet, opening the bottom outlet, closing the inlet, then opening the bottom outlet fully).

In Platzertal, prior to filling, a small fen (or 'bog') that consists of sedges (a grass-like genus) that is of biodiversity interest, will be relocated from inside the reservoir area, and re-established outside of the reservoir (see topic P-19 Biodiversity and Invasive Species). The EIS Section on mitigation measures details the precise measures to be taken. In addition, materials for the construction of the dam will be quarried from within the reservoir area, and maps showing these areas are included in the EIS.

During operations, levels of the Platzertal reservoir will be managed so that a 1 m freeboard is provided during winter to retain pulse waves from rockfalls and avalanches, and a 7 m flood retention zone, with capacity of 6.1 million m^3, is provided in summer (at an intake capacity of 80 m^3/sec from the Ötztal, this will be just over 21 hours of flood). Maximum reservoir levels are as follows: from 1 July to 31 August, 2405 m above sea level (masl), providing a 7 m flood retention zone; from 1 to 14 September, 2409 masl, providing a 3 m flood retention zone; from 15 September to 14 November, 2412 masl (full supply level); from 15 November to 30 April, 2411 masl providing a freeboard of 1 m; and from 1 May to 30 June, 2412 masl. In reality, levels may be well below this, especially in winter. Reservoir levels will vary by up to 14 m in a typical winter week, and by up to 7 m in a typical summer week. In addition, during operation, the project will support the restoration and improvement of pasture and forage areas in Platzertal, and avoid impacts on a disused mine with heritage value.

Currently the Gepatsch reservoir has a full storage level of 1767 masl, at which levels are permitted to decrease by no more than 0.074 m per hour, and a minimum operating level of 1665 masl, at which levels are permitted to increase by no more than 1.23 m per hour. Above 1710 masl, the long-term average minimum and maximum changes are 5.5 m and 13.1 m per week respectively; between 1710 and 1695 masl, minimum and maximum are 5.2 m and 15.0 m per week. The long term average monthly change is 16.5 m per month. With the expansion project, changes in levels will be no more than: over 1710 masl, 4 m per day, 12 m per week, and 35 m per month; and between 1710 and 1695 masl, 4 m per day, and 12 m per week; i.e. increased daily variation is permitted but there will be no greater weekly or monthly changes. Below 1695 masl, levels will be the same as the current situation as the operation of Prutz 2 power station and Versetz pumping station are limited to reservoir levels above 1695 masl.

TIWAG will carry out controlled explosions by helicopter to control avalanches, around both Platzertal and Gepatsch. In addition, TIWAG will construct a new tunnel and galleried road around the western perimeter of Gepatsch, 2 km in length, to improve road access and safety on this road, which leads to a ski resort. This will limit any impact of slope instability around the reservoir.

Regarding the waterbodies on the Inn, TIWAG has set out measures in the EIS concerning some specific actions to be taken, such as the restoration of beaver habitats at Runserau, the raising of the wooden Pontlatzer bridge, which is listed due to its heritage value, and the revegetation restoration of areas affected by construction activities. Groundwater concerns during operations have resulted in a design for the tailwater basins with sand-bentonite blankets as sealing elements, covered by gravel and placed in sections, and landscaping concerns resulted in a minimum drawdown level at least 0.5 m above the bed of the basins. The required area of the Imst tailwater basin was halved compared to the initial design to reduce land use, which was achieved by raising the full supply level and adapting the downstream surge chamber of Imst 1.

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.*

Dialogue on reservoir plans with local community and government representatives is described under Assessment above, and in more depth in topic P-1 Communications and Consultation.

Processes to anticipate and respond to emerging risks and opportunities related to reservoir preparation and management are included in TIWAG's corporate processes, for example: independent inspections; maintenance procedures for infrastructure safety (as described in topic P-8 Infrastructure Safety); operation rules for all reservoirs (concerning water levels, freeboard etc) and updating of these rules as needed; and meetings of TIWAG's managers of large-scale plants to exchange information about current developments. The ISO 14001 certified environmental management system may also be used to manage risks and opportunities, although the current system does not explicitly include any reservoir-related aspects. The Platzertal reservoir will be filled

initially on a step-by-step basis with pauses to measure and verify the expected behaviour of the dam and the reservoir.

Criteria met: Yes

22.2.3 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There are no gaps against basic good practice.

0 significant gaps

Analysis of significant gaps against proven best practice

There are no gaps against proven best practice.

0 significant gaps

22.3 Scoring Summary

The KXP will create a new reservoir, Platzertal, with an area of 0.902 km^2 and modify the existing Gepatsch (2.61 km^2) and Runserau (0.34 km^2) reservoirs, as well as creating six smaller water bodies. TWIAG has assessed the most important considerations relating to these water bodies, through the design of the project and the EIS process, for example sedimentation, flood management, avalanches, groundwater impacts, environmental and social impacts, and construction management.

TIWAG has developed a range of design and management procedures for the management of these considerations, including land acquisition, emptying intakes to avoid flood risk, freeboard, maximum rates of increase and decrease in reservoir levels, sedimentation flushing, and sealing of tailwater basins to prevent groundwater contamination, for example. The assessment and these management measures are based on dialogue with local community representatives. Through these mechanisms, TIWAG has assessed risks and opportunities for reservoir management, and there are a number of processes to continue to adapt to emerging risks and opportunities. There are no gaps against proven best practice, resulting in a score of 5.

Topic Score: 5

22.4 Relevant Evidence

Interview:	29, 33, 40, 58, 75, 81
Document:	48, 49, 50, 56, 60, 61, 63, 64, 73, 74, 77, 123, 128, 134, 138, 139, 140, 142, 143, 144, 145, 186, 278, 281
Photo:	23, 24, 26, 27, 32, 64-67, 76, 77

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

Rainfall and flows in the project area naturally follow a unimodal distribution, with peaks in the late summer (July-August) as snowmelt and glacial meltwater peaks. In the summer months, flows on the upper rivers show diurnal variation due to increased melting during the day.

Flows on the Inn are highly modified. Immediately upstream of the Austrian-Swiss border, a complex of plants is operated by Engadiner Kraftwerke AG (EKW), the lowest of which is the Pradella-Martina plant. A TIWAG-Verbund-EKW joint venture, GKI (Gemeinschaftskraftwerk Inn) is currently constructing an 89 MW project on the Inn, at the location of the Austrian-Swiss border, which will re-regulate flows. Further downstream, TIWAG has proposed the Imst-Haiming hydropower project (HPP), which the KXP would expand with the addition of one unit, and there are several facilities downstream of Innsbruck.

There are a number of river reaches affected by KXP. Pre-project average minimum and maximum flows downstream of specific locations are outlined in the following table in m^3/sec (1997 to 2012, except 1994 to 2000 for Ovella Weir).

River / River Stretch	Proposed project component or location	FEB		MAY		AUG		OCT	
		Average MIN (m^3/sec)	Average MAX (m^3/sec)	Average MIN (m^3/sec)	Average MAX (m^3/sec)	Average MIN (m^3/sec)	Average MAX (m^3/sec)	Average MIN (m^3/sec)	Average MAX (m^3/sec)
Gurgler Ache	Gurgler intake	0.24	0.280	1.150	11.10	5.28	20.42	0.899	5.86
Venter Ache	Venter intake	0.70	0.84	2.24	16.89	11.84	44.62	2.55	9.27
Ötztaler Ache	Sölden	1.88	2.18	6.79	46.79	23.11	81.62	6.16	23.99
Platzerbach	Platzertal dam	0.030	0.050	0.120	1.503	0.362	1.103	0.124	0.296
Fagge (in Kaunertal)	Gepatsch dam	0	0	0	0	0	0	0	0
Inn River	Ovella Weir	5.67	50.99	28.74	144.9	31.72	129.9	13.54	82.8
	Prutz 1 (gauge on Inn)	14.8	70.3	48.1	208.7	55.4	191.3	26.7	102.1
	Runserau	0.73	6.85	4.40	152.3	4.07	128.7	0.74	44.72
	Landeck (after confluence with Sanna)	7.11	13.63	30.54	233.1	24.74	204.5	14.2	65.16
	Imst 1 (gauge on the Inn)	27.16	81.3	93.8	316.3	93.3	302.6	52.0	144.5
	Haiming (Telfs gauge)	38.52	100.3	122.10	435.6	158.84	437.1	76.70	194.4

The project diverts water from the Ötztal and releases it into the Inn, so the general effect of the project is to decrease flows in the Ötztaler Ache and to increase flows in the Inn. More specifically:

- During filling and operations, flows will be reduced in the Ötztaler Ache in summer but not in winter, and reduced in Platzerbach throughout the year;
- During operations, on the Inn there will be increased flows and an altered pattern of flows between Prutz and Runserau, and downstream of the proposed Imst and Haiming tailwater basins, but there will be *decreased* average flows and an altered pattern of flows between Runserau and Imst; and
- During spilling and flushing operations, there will be rapid increases in flow below the Gurgler and Venter intakes in the Ötztal and below Runserau.

An ordinance of the Federal Ministry of Agriculture, Forestry, Environment and Water Management, concerning the management of the ecological condition for surface waters, defines minimum flow criteria, based on the Water Law of 1959 (Federal Law Gazette No 215), most recently amended by Federal Law Gazette No.s 123/2006 and 3/2009. There is no legal requirement for a minimum flow for social reasons, but the Environmental Impact Assessment (EIA) process provides an opportunity to assess impacts and determine legal commitments.

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.*

TIWAG has prepared a detailed assessment of the range of flows and their variability in all affected river reaches on the Ötztaler Ache, Platzertal and Inn River, as summarised in an 'Impact Factor Report – Hydrology', and a Detailed Technical Study on Surface Waters, compiled by Dr Schönlaub, a retired former staff member of TIWAG. These show daily, monthly and annual variation in flows at various locations and the predicted effects of the project.

TIWAG fed this information into further studies that assessed, amongst other things, the implications of altered flows for sedimentation, aquatic biodiversity, decreased flood risk, economic benefits of decreased flood risk, and flow conditions for whitewater rafting, canoeing and kayaking which are popular with tourists and the basis of a significant local industry. Studies on aquatic biodiversity identified flow ranges and variability required for wetted width of river, depth and flow velocity, linked to habitat availability for invertebrates, and fish species (grayling and brown trout), and studies on sedimentation were based on flow ranges and variability. Studies in other areas did not identify flow ranges and variability required, but instead looked at the potential impacts of the proposed regimes. The Tyrol provincial authorities will also assess flows during the EIA process, and may require modifications if a sufficient case is made for them.

The Impact Factor Report – Hydrology and the Detailed Technical Study on Surface Waters drew on scientific information, as described in topic P-7 Hydrological Resource (extensive and long-standing databases of field measurements, additional field measurements, flood prediction model etc). Other studies that drew on scientific information include the aquatic biodiversity studies, on habitat availability for invertebrates and fish species and river classification using Water Framework Directive categories ('good ecological status' etc), and the sedimentation studies.

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.*

Not assessed.

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.*

TIWAG has developed plans for downstream flow regimes and their delivery for all project components, some of which consist of rules on the magnitude, range and variability of flows, as follows:

<table>
<tr><th>Project component</th><th>Regime / Rule</th></tr>
<tr><td>Gurgler and Venter intakes</td><td>Residual flows equal to 20% of inflows to the reservoirs, but with a minimum of 2 m^3/sec;

Between 15th December and 15th April, the intakes will not be used, no water will be diverted, and flows will match natural flows;

During high flows in summer, residual flows may exceed 20% when in-flows exceed the 50 m^3/sec that will be diverted to Gepatsch;

Rules for flushing sediment using the bottom outlet.</td></tr>
<tr><td>Koenigsbach and Fernwallbach weirs</td><td>Residual flow equal to 15% of inflows, but with a minimum winter threshold.</td></tr>
<tr><td>Plaztertal dam</td><td>Flow will be diverted to the Platzerbach from the Oebgrubenbach, a stream above the Platzertal reservoir, and it will be augmented by seepage water from the dam and the access tunnel. TIWAG predicts that this will provide 45-75% of pre-project flows in winter, and 18-58% in summer, on the 7.5 km stretch to the confluence with the Toesnerbach.</td></tr>
<tr><td>Gepatsch dam</td><td>Regarding residual flow, there is no change to the current regime which provides only seepage water downstream.</td></tr>
<tr><td>Prutz tailwater basin (before confluence of basin with Inn)</td><td>No rules are planned.</td></tr>
<tr><td>Below Runserau weir</td><td>Residual flow requirements will be increased. The current residual flow is 5 m^3/sec, but the new regime will be 5 m^3/sec in winter (1 November to 15 April), 10 m^3/sec in spring and autumn (16 April to 31 May, and 16 September to 30 October), and 15 m^3/sec in summer (1 June to 15 September). Note that total average flows will be lower than at present however.</td></tr>
<tr><td>Imst tailwater basin</td><td>Maximum rates of increase and decreases in outflows, for five levels of flows in the Inn, as measured at Imst:
<table>
<tr><th>Flow at Imst (m^3/sec)</th><th>Maximum rate of increase (m^3/sec per hour)</th><th>Maximum rate of decrease (m^3/sec per hour)</th></tr>
<tr><td>Less than 90
90 – 180
180 – 250
250 – 300
More than 300</td><td>17
21
28
38
50</td><td>13
17
21
30
40</td></tr>
</table></td></tr>
<tr><td>Haiming tailwater basin</td><td>Maximum rates of increase and decreases in outflows, for five levels of flows in the Inn, as measured at Telfs:</td></tr>
</table>

Flow at Telfs (m^3/sec)	Maximum rate of increase (m^3/sec per hour)	Maximum rate of decrease (m^3/sec per hour)
Less than 90	13	10
90 – 180	16	12.5
180 – 250	27	20
250 – 300	48	37
More than 300	57	45

The objective of the regimes of the components that release water into the Inn is principally ecological, and is determined by one of the project's objectives, to obtain the status of good ecological potential on the Inn. This objective is set out in an ordinance of the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW; Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft), the 274th Ordinance dated 03.11.2014. This defines three 6-year steps for ecological restoration: improving upstream migration and continuity of flow (residual flows), for example with the fish-lift at Runserau; improving downstream migration; and reduction in hydropeaking, through the GKI project, Imst-Haiming expansion, and KXP. The GKI project, which aims to re-regulate flows to Runserau (4 m^3/sec in winter, and 10 to 20 m^3/sec in summer depending on in-flows, as determined by modelling of habitat availability for grayling, brown trout and invertebrates). The ordinance refers to the KXP project as the most ecologically-sustainable use of hydropower in the upper Tyrol, delivering a substantial increase in hydroelectric power generation, whilst maintaining and achieving independent stocks of grayling and brown trout, and achieving good ecological potential.

TIWAG has not planned maximum rates of increase and decreases in outflows from Prutz tailwater basin. The volume of the basin will be too small to guarantee defined gradients, as with Imst and Haiming tailwater basins. TIWAG stated that this is acceptable because the remaining flow stretch until Runserau is short, and the fish migration channel will bypass this section. Prutz 2 will add a maximum of 70 m^3/sec to Runserau, compared to average minimum flows of less than 15 m^3/sec at the Prutz gauge. This is the reason that Runserau weir will be raised, but the implications for changing flows and levels in Runserau reservoir are not clear. This is discussed in topic P-22 Reservoir Planning. The EIS non-technical summary refers to permissible fluctuation rates of -12 cm/h (low flow) and 15 cm/h (high flow) downstream of all HPPs (page 23), but this may not apply to the Prutz tailwater basin.

Downstream flow regimes for the other components do not have such clearly defined objectives as the components on the Inn, but they have been designed to minimise impacts. In the Ötztal, the objective of the winter regime is to provide sufficient flow for extraction for artificial snow in winter and for dilution of wastewater during the skiing season, and the 20% summer regime has been determined to minimise impacts on aquatic ecology (it has been determined through habitat modelling and cross-sectional measurements of habitat availability).

In the Platzertal, the measures are intended to preserve flows in the Platzerbach as much as feasible whilst ensuring a similar mineral quality as at present (i.e. avoiding glacial water from the Ötztal and Kaunertal with different mineral content). Water will be captured from the Öbgrubenbach in a Tyrolean weir, and piped 1700 m, partly underground. The risk that water from the Öbgrubenbach will freeze in this pipe in winter has required the option of using seepage water from the dam and access tunnel. However, objectives of providing this flow are not defined.

The project will not alter residual flows in the Kaunertal, but the objectives of leaving these unchanged have not been defined. Flows will have to be reviewed by 2027 under Water Framework Directive requirements in any case; it is not clear why a case has not been made for reviewing Kaunertal flows as part of the KXP.

Practically, rules will be incorporated into Operating and Monitoring Manuals, as seen at Silz, and into TIWAG's ISO 14001 certified environmental management system.

Details of locations at which flows will be verified are set out in the non-technical summary of the EIS, which describes recording, checking and archiving parameters at points of residual flows of great importance. TIWAG operates an extensive range of monitoring stations, especially on the Ötztaler Ache, Inn River and Fagge River, and will continue to monitor these during KXP operations.

All data will be recorded, checked and archived in the Water Management Information System (Wasserwirtschaftliches Informationssystem, WISKI) used by TIWAG. Details of the measuring locations, some of which are existing, are set out for Tösnerbach (above Platzerbach), Platzerbach, Venter and Gurgler and the smaller intakes of Königsbach and Ferwallbach, Prutz 2, Runserau, the intake of the Ried-Runserau bypass channel, Imst 2 and Haiming.

Monitoring results will be reviewed by Provincial authorities on water management.

As a result of the EIS process and licensing, TIWAG would make a formal commitment to downstream flow regimes or objectives and the EIS process provides an opportunity for these to be publicly disclosed. However, consultation on downstream flow regimes is a gap, addressed under Stakeholder Engagement below.

Note that TIWAG supports research of relevance for downstream flow management, including research on methodology development for assessing the impacts of peaking, ecological consequences of floods on Austrian streams and rehabilitation options, hydrodynamic-numerical modelling, and hydro-morphological research using drones.

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.*

Not assessed.

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.*

In the Ötztal, directly-affected stakeholders include several municipalities, communities along the Ötztaler Ache, recreational fishers, and rafters and kayakers using the stretch immediately upstream of the confluence with the Inn River. In the Platzertal, directly-affected stakeholders include farmers with rights to graze cattle in the Alm, hikers, and the tourism industry serving hikers. In the Kaunertal, they include downstream residents, for example in Feichten who have raised the possibility of restoring a residual flow downstream of intakes on the eastern side of the valley. Directly-affected stakeholders on the Inn include recreational fishers, rafting and watersports companies and the wider tourism industry, recreational walkers and cyclists, and environmental NGOs and provincial authorities with interests in ecological restoration.

There are concerns with stakeholder engagement in general, as described in topic P-1 Communications and Consultation. To date, there have been direct consultations with a range of the directly-affected stakeholders described above, although it is not clear how much of this engagement has addressed downstream flow regimes. TIWAG convened a working group with rafting organisations in 2012 and 2013, holding 7 meetings in total and a presentation in 2015, focused on the Imst-Haiming HPP, though the rafting associations describe their previous experience of consultation on downstream flows, on the GKI project, as 'like a bulldozer'. The Rafting Association, with legal assistance, has made an official submission to the EIS process for the Imst-Haiming HPP, which includes reference to the KXP. TIWAG is required to respond to this via the authorities, in an official capacity, but is yet to

do so. There is time during preparation and the licencing process for further engagement, for example on the analysis of how altered flows affect numbers of days available for kayaking and rafting that is presented in Chapter 7 of the human uses part of the EIS (C.01.04, presenting the numbers of days available for different abilities and stretches of rivers in a way that is tailored for the rafting/kayaking industry). However it is not clear that stakeholder engagement on downstream flow regimes (not only on rafting and kayaking) would be two-way, or enable all stakeholders to raise issues on the proposed regimes, because TIWAG has not clearly and transparently defined the objectives of the flow regimes for all components or the magnitude, range and variability in terms that can be easily understood by the public. The EIS does not include a clear synopsis of the regimes and their objectives. There has been no stakeholder engagement on Ordinance 274, which is because there is no legal requirement for such consultation. The lack of a simple and concise description of downstream flow regimes and their objectives, for use in stakeholder engagement is a **significant gap** against basic good practice.

Criteria met: No

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.*

Not assessed.

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 planned downstream flows take into account environmental, social and economic objectives by contributing to ecological restoration of the Inn, managing floods on the Ötztal, minimising environmental impacts of withdrawing water from Ötztaler Ache, and enabling rafting to continue, whilst delivering additional power generation and renewables penetration.

When the plans described above are put in place, flows downstream of the following locations will be:

River / River Stretch	Proposed project component or location	FEB		MAY		AUG		OCT	
		Average MIN (m^3/sec)	Average MAX (m^3/sec)	Average MIN (m^3/sec)	Average MAX (m^3/sec)	Average MIN (m^3/sec)	Average MAX (m^3/sec)	Average MIN (m^3/sec)	Average MAX (m^3/sec)
Gurgler Ache	Gurgler intake	0,24	0,28	0.48	3.78	1.20	13.85	0.3	1.17
Venter Ache	Venter intake	0.70	0.84	1.71	5.45	3.20	28.10	1.00	1.92
Ötztal	Sölden	1.88	2.18	5.36	25.79	9.82	48.36	3.87	11.52
Platzerbach	Plaztertal dam	0.025	0.025	0.084	0.150	0.170	0.150	0.037	0.050
Fagge (in Kaunertal)	Gepatsch dam	0.004	0.008	00.10	0.035	0.010	0.025	0.008	0.015

In summary for the Ötztaler Ache, flows will be reduced except in winter, and the average residual flow will exceed 20% of present flows on average, either due to the 2 m^3/sec minimum in spring and autumn or to spilling in summer. As a proportion of present flows, residual flows will be lowest in summer, around 22-25% at Gurgler

and Venter. Inflows further downstream mean that the average residual flow, as a proportion of present flows, in the lowest flow month will be 40% at Sölden and 52% at Brunau (just before the confluence with the Inn).

With the GKI, KXP, and Imst-Haiming projects, flows downstream of the following locations will be:

River / River Stretch	Proposed project component or location	FEB		MAY		AUG		OCT	
		Average MIN (m^3/sec)	Average MAX (m^3/sec)	Average MIN (m^3/sec)	Average MAX (m^3/sec)	Average MIN (m^3/sec)	Average MAX (m^3/sec)	Average MIN (m^3/sec)	Average MAX (m^3/sec)
Inn River	Ovella Weir	5.5	5.5	7	70.55	10	55.2	5.5	5.5
	Prutz 1 and 2	15.1	69.3	53.7	237.0	63.4	191.7	29.3	107.6
	Runserau	5	5	10	77.4	15	37.7	10	17.8
	Landeck (after confluence with Sanna)	10.32	12.45	32.6	148.3	32.4	103.1	21.8	45.8
	Imst 1 (guage)	13.0	16.2	44.6	217.3	42.1	163.5	27.8	64.7
	Haiming (Telfs guage)	30.8	97.4	113.9	447	141.3	404	78.6	186

In summary, for the Inn River, flows will be higher on average in winter (due to a higher residual flow) but lower in summer downstream of Runserau, lower on average through the year at Imst, and unchanged at Telfs.

There will be a reduction in hydropeaking below Prutz and Imst, which, with the 10 km fish passage to be constructed around Runserau, should allow restoration of fish species populations. There are questions concerning the ecological impact on downstream wetlands, discussed in topic P-19 Biodiversity and Invasive Species. In addition, there may be other, more cost-effective ways to achieve ecological restoration, especially once GKI is operating, discussed in topics P-3 Demonstrated Need and Strategic Fit, and P-4 Siting and Design. Although environmental objectives of flows on the Ötztaler Ache and Platzerbach are not defined, substantial residual flows will be maintained, thereby minimising ecological impacts and maintaining visual amenity.

The biggest unresolved social issue is the impact of the altered flow regime on watersports, especially rafting. Rafting is an important component of the tourism industry in the area, with 22 rafting companies that directly employ 600 young people in the summer season, bringing in an estimated € 40 million per year to the region. It is considered to be a flagship activity, attracting tourists who then also pursue a range of other activities, such as those offered by a large outdoors activities centre, 'Area 47' on the Ötztaler Ache, and also extending the length of the tourism season. The main river stretch that is used for rafting is the Imst-Haiming stretch, though rafting is also practiced as far upstream as the Austrian-Swiss border, and on the Sanna and Ötztaler Ache. Kayaking is also practised over a wider area, and the World Championship for kayaking has been held here. Rafters fear that the KXP will shorten their season, shorten the length of the rafting days, and eliminate the use of certain stretches. TIWAG has provided an analysis of impacts on kayaking and rafting, included in the EIS, and surveys of users' experiences, and has stated that the rafting industry can use smaller boats, and the project could provide some hydropeaking.

It is difficult to envisage a solution that will allow the range of rafting and kayaking activities carried out to-date, which benefit from hydropeaking surges, whilst meeting the ecological objectives of restoring the Inn. The EIS analysis shows an increased number of days when it is not feasible to kayak and raft on the Oztaler and not feasible to raft on the Inn, and increases in the proportion of days where kayaking and rafting remains possible

but at lower flows. As rafting and kayaking will remain possible but on fewer days, it is possible to say that in part some social objectives are met. Flows on the Ötztaler Ache between Tumpen and Bunau, where rafting is practiced, will be roughly 65% of pre-project flows.In addition, the GKI and Imst-Haiming HPPs will already have altered flows in the Inn, and the additional impact of the KXP on rafting may be limited by comparison. The main issue here is the difficulty of engaging with stakeholders who are so directly affected by flows without a clear description of how flows will alter and where as a result of each of the GKI, Imst-Haiming and KXP projects, which is discussed under Stakeholder Enagagement above.

With regard to spilling, at the Gurgler and Venter intakes, inflows will exceed the intake capacities of 50 m^3/sec rarely, but an increase in flows from 62.5 to 75 m^3/sec would result in the residual flow doubling from 12.5 to 25 m^3/sec. With flood events, Runserau currently spills when the intake capacity is exceeded, for example increasing from 5 to 200 m^3/sec during a flood event in 2000. The expanded Runserau reservoir and intake capacity will slightly delay such spilling and shorten its duration.

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.*

Not assessed.

23.2.5 Evaluation of Significant Gaps

Analysis of significant gaps against basic good practice

There is no simple and concise description of downstream flow regimes and their objectives, for use in stakeholder engagement.

1 significant gap

Analysis of significant gaps against proven best practice

Not assessed.

23.3 Scoring Summary

TIWAG has prepared a detailed assessment of the range of flows and their variability in all affected river reaches on the Ötztaler Ache, Platzerbach and Inn River, and has fed this information into further studies on a range of environmental, social and economic issues. TIWAG has also developed plans for downstream flow regimes and their delivery for all project components, consisting of a minimum proportion of inflows, minimum absolute flows, and ramping rules.

The objective of these regimes is clearly defined for the Inn – to contribute to obtaining the status of good ecological potential for the Inn – but the objectives for the Ötztaler Ache and Platzerbach are less clearly defined, and should include ecological as well as social objectives. Stakeholder engagement to date has not addressed downstream flow regimes effectively. Until TIWAG clearly and transparently defines the objectives of the flow regimes for all components and the magnitude, range and variability in terms that can be easily understood by the public, stakeholder engagement on downstream flow regimes cannot be two-way, and cannot enable stakeholders to raise issues on the proposed regimes.

Topic Score: 2

23.4 Relevant Evidence

Interview:	10, 19, 20, 24, 27, 29, 33, 41, 43, 52, 55, 58, 65, 68, 72, 75, 81, 84

Document:	38, 56, 60, 61, 63, 64, 136, 195, 279, 280
Photo:	1, 2, 6-10, 12, 14, 15, 17-21, 40, 45, 49, 57, 58

Appendix A: Written Support of the Project Developer

Datum: 10.11.2016

TIWAG-
Tiroler Wasserkraft AG
Eduard-Wallnöfer-Platz 2
6020 Innsbruck
www.tiroler-wasserkraft.at

tiroler wasser kraft

Dipl.-Ing. Johann Herdina
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Tiroler Wasserkraft - Energie mit Perspektiven

IHA Sustainability Ltd
IHA Central Office
Chancery House
St Nicholas Way
Sutton, London
SM1 1JB United Kingdom

Reference: IHA Sustainability Assessment Protocol - Kaunertal Expansion Project

Dear Ms. Helen Locher,

TIWAG-Tiroler Wasserkraft AG, an energy supplier in Austria and on international markets, located in Innsbruck, Austria, commissioned the International Hydropower Association („IHA") to undertake an official assessment based on the Hydropower Sustainability Assessment Protocol („HSAP") on the Kaunertal Expansion Project.

This letter confirms that TIWAG is fully supportive of this assessment, will cooperate fully and provide information and agreements, as required by the IHA assessors, to allow a comprehensive evaluation of the project against HSAP criteria.

TIWAG is therefore committed to continuous improvement of its socio-environmental practices.

Kind regards,

Dr. Erich Entstrasser

DI Johann Herdina

Sitz der Gesellschaft: Innsbruck, Firmenbuchgericht Innsbruck,
FN 44133b, UID: ATU31727904, DVR: 0164089, DV-Form: MOWbrief09

Öffentlich
Seite 1 von 1

Appendix B: Verbal Evidence

Ref	Interviewee	Date	Location	Interviewer
1	DI Günter Fitzka, Freiland civil engineering Ltd. EIA Coordination on behalf of TIWAG	29.08.2016	TIWAG Office Innsbruck	Helen Locher
2	DI Dr. Kurt Fallast, Ingenieurbuero fuer Verkehrswesen Expert of the detailed technical study traffic, noise, vibrations and secondary airborne noise	29.08.2016	TIWAG Office Innsbruck	Helen Locher
3	Dr.-Ing. Sebastian Perzlmaier, TIWAG Project Design Department - Geo Engineering	29.08.2016	TIWAG Office Innsbruck	Margaret Trias
4	Robert Renzler, Oesterreichischer Alpenverein Austrian Alpine Club / General Secretary	29.08.2016	Office Alpine Club	Helen Locher
5	Dr.-Ing. Johann Neuner, TIWAG Project Design Department – Water Engineering	29.08.2016	TIWAG Office Innsbruck	Margaret Trias
6	Dr. Paul Reimeir, TIWAG Division Manager for the Trade in Economy and Energy Economy Department	29.08.2016	TIWAG Office Innsbruck	Helen Locher, Jörg Hartmann
7	Dipl.-Ing. Brigitte Kurz, TIWAG EIS Coordination on behalf of TIWAG	29.08.2016	TIWAG Office Innsbruck	Margaret Trias
8	LH-Stv. Josef Geisler, Amt der Tiroler Landesregierung Provincial Government of the Tyrol / Vice Governor, water economy	29.08.2016	Office Innsbruck	Helen Locher, Jörg Hartmann
9	Dipl.-Ing. Wolfgang Stroppa, TIWAG Project Manager for the Kaunertal Expansion Project (Project Presentation)	29.08.2016	TIWAG Office Innsbruck	Margaret Trias
10	Dipl.-Ing. Wolfgang Stroppa, TIWAG Project Manager for the Kaunertal Expansion Project (Project Presentation)	29.08.2016	TIWAG Office Innsbruck	Helen Locher, Jörg Hartmann, Doug Smith, Aida Khalil, Margaret Trias
11	Dr. Ing. Eckhard Knapp, TIWAG Manager of the Corporation Audit Department and Compliance Officer	30.08.2016	TIWAG Office Innsbruck	Helen Locher
12	Dr. Erich Entstrasser, Dr. Reinhard Schretter, TIWAG Managing Board	30.08.2016	TIWAG Office Innsbruck	Helen Locher
13	Dipl.-Ing. Martin Sailer, Amt der Tiroler Landesregierung Provincial Government of the Tyrol	30.08.2016	Office Innsbruck	Helen Locher
14	Dipl.-Ing. Johann Herdina, TIWAG Engineering Management Board Section	30.08.2016	TIWAG Office Innsbruck	Helen Locher
15	Mag. Hermann Meysel, TIWAG Head of Controlling and Investment Management	30.08.2016	TIWAG Office Innsbruck	Helen Locher
16	Dipl.-Ing. Wilfried Pistecky, Ingenieurbuero PISTECKY EIA Coordination on behalf of the approval authorities	30.08.2016	Phone call	Helen Locher
17	Gebhard Gstrein, Ferienwohnungen Alt Poschach Farmer of the “Alt Poschach” house	30.08.2016	Alt Poschach house	Jörg Hartmann
18	Reinhard Scheiber, Gemeinde Sölden Vice Mayor of Sölden	30.08.2016	Office Sölden	Jörg Hartmann
19	Marcel Pachler, Tiroler Raftingverband Faszinatour Rafting & Canyoning Luis Ambrosi	30.08.2016	Office Haiming	Jörg Hartmann, Douglas Smith
20	Christian Schnoeller, Area 47 Betriebs GmbH Manager Area 47	30.08.2016	Area 47	Jörg Hartmann, Douglas Smith
21	Ing. Markus Huter, TIWAG Organization, Coordination Info Centre	30.08.2016	Info Centre Silz	Jörg Hartmann

Ref	Interviewee	Date	Location	Interviewer
22	Hans-Peter Bock, Gemeinde Fließ Mayor of Fließ	30.08.2016	Office Fließ	Jörg Hartmann
23	Prof. Dr. Christian Vutuc, Humanmediziner Doctor of medicine	30.08.2016	Phone call	Aida Khalil
24	Ing. Robert Neuner, TIWAG Operation manager	30.08.2016	Office Silz	Douglas Smith, Margaret Trias
25	Dr. Peter Sturm, TU Graz Expert of the detailed technical study air	30.08.2016	Phone call	Aida Khalil
26	Dipl.-Ing. Helmut Czerny, Bundesministerium für Land- und Forstwirtschaft Austrian Dam Expert Commission / Director	30.08.2016	Phone call	Douglas Smith
27	Ing. Christian Schlatter, BSc, TIWAG GKI Project Manager	31.08.2016	Office Maria Stein	Helen Locher, Jörg Hartmann
28	Dipl.-Ing. Rene Schabhüttl Environmental Manager	31.08.2016	Office Maria Stein	Aida Khalil, Margaret Trias
29	Johann Thöni, Obmann Agrargemeinschaft Platzer Alm Chairman of the Platzeralm	31.08.2016	Platzeralp	Jörg Hartmann, Douglas Smith
30	Christian Sturm, Obmann Bergwerksverein Platzertal Mining Association	31.08.2016	Platzeralp	Aida Khalil
31	Dipl.-Ing. Wolfgang Stroppa, TIWAG Project Manager for the Kaunertal Expansion Project	31.08.2016	Platzeralp	Margaret Trias
32	Rupert Schuchter, Gemeinde Pfunds Major of Pfunds	31.08.2016	Office Pfunds	Helen Locher, Jörg Hartmann
33	Ing. Helmut Kettner, Dipl. Ing. Matthias Reinalter, TIWAG Manager of the Safety and Environmental Protection Department & Employee	31.08.2016	Office Prutz	Aida Khalil
34	Armin Falkner, TVB-Tiroler Oberland Chairman – Tourism Association Tiroler Oberland	31.08.2016	Fendels	Helen Locher, Jörg Hartmann
35	Dr. Martin Schletterer, TIWAG EIS Coordination TIWAG	31.08.2016	Runserau	Aida Khalil, Margaret Trias
36	Dipl.-Ing. Dominic Nailis, BET - Buero fuer Energiewirtschaft und technische Planung GmbH Expert for Energy Economics and Climate Protection	01.09.2016	Phone call	Helen Locher
37	Mag. Gebhard Ellmerer, TIWAG Employee and Representative for the Division Manager of the Centralised Purchasing Department	01.09.2016	TIWAG Office Innsbruck	Helen Locher
38	Mag. Ferdinand Gruener, Landwirtschaftskammer (Kammerdirektor) Director of the Chamber of Agriculture	01.09.2016	Office Innsbruck	Helen Locher
39	Mag. Tamara Senfter Talpa - office for archaeological services	01.09.2016	TIWAG Office Innsbruck	Helen Locher
40	Dipl.-Ing. Egon Fritz, Oesterr. Bundesforste als Grundeigentümer Federal Forestry Office / Landowner (Platzertal), Hunting Expert	01.09.2016	TIWAG Office Innsbruck	Helen Locher
41	Dr. Christian Schmelz, Schoenherr Rechtsanwälte Lawyer representing TIWAG	01.09.2016	TIWAG Office Innsbruck	Helen Locher, Douglas Smith
42	Dr. Peter Bauhofer, TIWAG Head of the Department Energy Strategy and Energy Efficiency	01.09.2016	TIWAG Office Innsbruck	Helen Locher, Douglas Smith
43	Josef Raich, Gemeinde Feichten Major Kaunertal / Feichten	01.09.2016	Office Feichten	Jörg Hartmann, Douglas Smith
44	Dipl. KH-Bw. Bernhard Guggenbichler, Krankenhaus St. Vinzenz Zams Manager General Hospital for the District Landeck and Imst	01.09.2016	Office Zams	Aida Khalil, Margaret Trias

Ref	Interviewee	Date	Location	Interviewer
45	Herbert Praxmarer, Agrargemeinschaft Kaunertal Member Kaunertal Agricultural Community	01.09.2016	Feichten	Jörg Hartmann
46	KR Eugen Larcher, Kaunertal Gletscher Manager - Kaunertal Gletscher skiing resort	01.09.2016	Feichten	Jörg Hartmann
47	Ing. Heinz Kofler, Gemeinde Prutz Mayor of Prutz	01.09.2016	Prutz	Jörg Hartmann
48	Prof. Dr. Peter Kuhn, Institut für Meteorologie und Geophysik, Universitaet Innsbruck Expert Glacioligist	01.09.2016	TIWAG Office Innsbruck	Douglas Smith
49	Dipl.-Ing. Alfons Gruber, Landesfeuerwehrverband Regional Fire Brigade Authority	01.09.2016	Office Telfs	Aida Khalil, Margaret Trias
50	Priv. Doz. Mag. Dr. Werner Holzinger, Oekoteam Institut fuer Tieroekologie und Naturraumplanung Expert of the technical paper animals on behalf of TIWAG	01.09.2016	Phone Call	Aida Khalil, Margaret Trias
51	Ing. Wolfgang Pacher, Swietelsky Tunnelbau GmbH & CO KG Project Manager (Contractor)	02.09.2016	Phone Call	Helen Locher
52	Dr. Bernhard Hofer, TIWAG Head of the Project Design Department	02.09.2016	TIWAG Office Innsbruck	Jörg Hartmann, Douglas Smith, Margaret Trias
53	DI Thomas Kucher, Umweltbuero GmbH Expert of the technical paper plants on behalf of TIWAG	02.09.2016	TIWAG Office Innsbruck	Aida Khalil
54	Mag. Christoph Walder, expert in River ecology, WWF	02.09.2016	Office Innsbruck	Helen Locher, Aida Khalil
55	HR DI Hubert Steiner, Amt der Tiroler Landesregierung Provincial Government of the Tyrol / Head of the Water Management Department	02.09.2016	Office Innsbruck	Jörg Hartmann, Douglas Smith, Margaret Trias
56	Mag. Johannes Kostenzer, Amt der Tiroler Landesregierung Provincial Government of the Tyrol - Environmental Ombudsmen	02.09.2016	Office Innsbruck	Helen Locher, Aida Khalil
57	Dieter Schmid, TIWAG Manager Energy Data Management and Customer Service Centre	02.09.2016	TIWAG Office Innsbruck	Jörg Hartmann
58	Dr.-Ing. Sebastian Perzlmaier, TIWAG Project Design Department - Geo Engineering	02.09.2016	TIWAG Office Innsbruck	Douglas Smith
59	Prof. Helmut Habersack, BOKU - Universitaet fuer Bodenkultur Wien Expert Soil Culture	02.09.2016	Phone Call	Margaret Trias
60	Dr. –Ing. Sebastian Perzlmair Project Design Department - Geo Engineering	02.09.2016	TIWAG Office Innsbruck	Jörg Hartmann
61	Dr. Andreas Falkner, TIWAG Manager Human Resources	02.09.2016	TIWAG Office Innsbruck	Margaret Trias
62	Anton Pertl, TIWAG TIWAG - Central Works Council	02.09.2016	TIWAG Office Innsbruck	Helen Locher, Margaret Trias
63	Assoc. Prof. Dipl.-Ing. Dr. Manfred Kleidorfer Expert Environmental Engineering	02.09.2016	TIWAG Office Innsbruck	Aida Khalil
64	Dipl.-Ing. Klaus Mitteregger, TIWAG Manager of the Construction Department	02.09.2016	TIWAG Office Innsbruck	Helen Locher
65	Dr. Roni Hunziker, Hunziker Zarn & Partner - Ingenieurbuero fuer Fluss- und Wasserbau Contracted Expert Engineering Office for River and Water Management	02.09.2016	TIWAG Office Innsbruck	Jörg Hartmann, Douglas Smith, Margaret Trias
66	Alexandra Zangerl, TIWAG HSAP Organisation Coordination	02.09.2016	TIWAG Office Innsbruck	Aida Khalil
67	Dipl.-Ing. Wolfgang Stroppa, TIWAG Project Manager for the Kaunertal Expansion Project	02.09.2016	TIWAG Office Innsbruck	Helen Locher

Ref	Interviewee	Date	Location	Interviewer
68	Dr. Armin Petrascheck & Dipl.-Ing. Dr. Helmut Schönlaub Experts for Water Management and Flood Control	02.09.2016	TIWAG Office Innsbruck	Jörg Hartmann, Douglas Smith
69	Alexandra Zangerl, TIWAG HSAP Organization Coordination	02.09.2016	TIWAG Office Innsbruck	Margaret Trias
70	Ing. Eduard Fröschl Board member - Federation of Austrian Industries / Tyrol	05.09.2016	Office Hall	Helen Locher, Margaret Trias
71	Dr. Robert Reindl, TIWAG Project Design Department - Water Engineering	05.09.2016	TIWAG Office Innsbruck	Jörg Hartmann
72	Dr. Johannes Schöber, TIWAG Project Design Department - Water Engineering	05.09.2016	TIWAG Office Innsbruck	Douglas Smith
73	Andreas Profunser, TIWAG Corporate Development and Organization Department	05.09.2016	TIWAG Office Innsbruck	Helen Locher
74	Dipl.-Ing. Georg Marberger, Tiroler Fischereiverband Chairman Fishery Association - District Imst Bernhard Riml, Tourismusverband Oetztal Manager - Tourism Association Oetztal	05.09.2016	TIWAG Office Innsbruck	Jörg Hartmann
75	Alois Thurner, Gemeinde Imsterberg Mayor of Imsterberg	05.09.2016	TIWAG Office Innsbruck	Douglas Smith
76	Dipl.-Ing. Josef Kurzthaler, Arbeitsinspektorat Innsbruck Labour Inspector for the province of the Tyrol	05.09.2016	TIWAG Office Innsbruck	Margaret Trias
77	Ing. Helmut Kettner, Dipl. Ing. Matthias Reinalter, TIWAG Manager of the Safety and Environmental Protection Department & Employee	05.09.2016	TIWAG Office Innsbruck	Helen Locher, Margaret Trias
78	Dr. Stephan Fischer, TIWAG Manager - Land Acquisition Department	05.09.2016	TIWAG Office Innsbruck	Jörg Hartmann
79	Prof. Dr. Axel Borsdorf University of Innsbruck - Expert of National and Regional Economy	05.09.2016	TIWAG Office Innsbruck	Douglas Smith
80	Mag. Thomas Köhle, Direktor Wirtschaftskammer Tirol Tyrolean Economic Chamber	05.09.2016	Office Innsbruck	Helen Locher, Jörg Hartmann
81	Dr.-Ing. Sebastian Perzlmaier, TIWAG Project Design Department - Geo Engineering	05.09.2016	TIWAG Office Innsbruck	Douglas Smith
82	Mag. Michael Hubmann, ARGE Limnologie GesmbH Expert of the technical paper aquatic ecology on behalf of TIWAG	04.10.2016	Phone Call	Aida Khalil
83	Prof. Dr.-Ing. Theodor Strobl, Independent Expert Expert on Hydro Engineering and Water Management	25.10.2016	Phone Call	Margaret Trias

Appendix C: Documentary Evidence

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
1	TIWAG	Various newsletters and invitation letters	2006-2013	German	Documents: - 2002 Leaflet Kaunertal Power Plant.pdf - 2008-10-09 Mailing Letter GurglerAche.pdf - 2008-10-09 Mailing Letter VenterAche.pdf - 2008-11-06 Mailing Letter - VenterAcheInfo101108.pdf - 2008-11-12 Information Gurgler Ache HotelAlpenaussicht171108.pdf - 2013 Invitation Letter FAQ List Kaunertal Innovation Project.pdf - TIWAG Invitation and Newsletter Dialogue and Encounters 2011 (1).pdf - TIWAG Mailing Letter Kaunertal Jan 2010.pdf - TIWAG Mailing Letter Kaunertal May 2010.pdf - TIWAG Mailing Letter Kaunertal Nov 2006.pdf - TIWAG Mailing Letter Kaunertal Oct 2008.pdf - TIWAG Mailing Letter Oetztal Oct 2008.pdf - TIWAG Mailing Letter Pitztal Okt 2008.pdf - TIWAG Mailing Letter Soelden Nov 2006.pdf
2	TIWAG	Communication plan	2012	German	Document: 20120203 Communication Plan AK.PDF
3	Municipality Kaunertal	FAQ list Kaunertal innovation project	2013	German	Document: P4-8 2013 FAQ List Stakeholder input and TIWAG respone (1).pdf
4	TIWAG	Report: B.01 Introduction and Overview	2015	German	Document: B.01-1 Introduction Overview.pdf
5	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Synthese report by the Tyrolean Government 2005	2005	German	Documents: - 2005 Synthese Report.pdf - P4-3 Synthese Report 2005
6	TIWAG	Stakeholder Analyse	2016	German	Document: stakeholder_analyse_03_2016.pdf
7	TIWAG	Risk management report	2016	German	Document: 2016_09_14_ManagementReport_R2C.pdf
8	TIWAG	Chronology of stakeholder activities	2016	German	Document: chronology2014-2016.xlsx
9	TIWAG	Project under construction		German	www.gemeinschaftskraftwerk-inn.com
10	TIWAG	Definition and Standards for the Department Programme office PP projects 01-11 Rev.9	2016	German	Document: Definition and Standards for the department Program office PP projects 01-11Rev9.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
11	TIWAG	Handbook of Processes for EPM, Ver. 2.2 dated 02/10/2015	2015	German	Document: TIWAG Process Manual project mgnt T15.3 vers 2.2.pdf
12	TIWAG	Compliance Directive	2014	German	Document: TIWAG Compliance Directive.pdf
13	Quality Austria	ISO 14001 Certificate 2015 and the press release	2015	German	Documents: - ISO 14001 Certificate 2015.pdf - ISO 14001 Certificate and Press release.msg
14	TIWAG	Sustainability Report 2014/2015 and Press release	2015	German	Documents: - Sustainability Rep 2014_15.pdf - ISO 14001 Certificate and Press release.msg - Sustainability Rep Table of Content.pdf
15	TIWAG	Sustainability report 2012/2013	2013	German	Document: Sustainability Rep 2012_13.pdf
16	TIWAG	TIWAG Annual Business Report 2015	2015	English	Document: TIWAG Annual Business Report 2015.pdf
17	TIWAG	Organisation Chart 2015	2016	English	Document: Organisation Chart.pdf
18	TIWAG	TIWAG Code of Conduct	2013	German	Document: TWAG Code of Conduct.pdf
19	TIWAG	TIWAG Guidelines for Leadership and Cooperation	2008	German	Document: TIWAG_Guidelines_for_Leadership_and_Cooperation.pdf
20	TIWAG	2014_01_07_TIWAG directive benefits and conflict of interest	2014	German	Document: 2014_01_07_TIWAG_directive benefits and conflict of interest
21	TIWAG	TIWAG guidelines for sponsorship	2016	German	
22	TIWAG	Fraud process	2016	German	Document: TIWAG_guidlines_for_fraud.pdf
23	VEOe	VEOE Code of Conduct for energy suppliers	2006	German	Document: VEOE Code of Conduct for energy suppliers.pdf
24	TIWAG	Guideline for Sponsorship	2016	German	Document: TIWAG_guidelines_for_sponsorship_2016.pdf
25	TIWAG	List of sponsorships between 2010 and 2016 in the project area KXP	2016	German	Documents: - Sponsorprojekte ab 10.000 Euro im KJ 2016.xlsx - Aufstellung Kaunertal, Prutz usw. 2010-2016.xlsx
26	TIWAG	Contact form		German	https://www.tiwag.at/no_cache/service-center/kontaktformular
27	TIWAG	TIWAG Process Grievance Mechanism (Service Centre)		German	

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
28	TIWAG	Information about complaint management procedure and			https://www.tiwag.at/ueber-die-tiwag/organisation/anregungen-und-beschwerden/informationen-ueber-das-verfahren-zur-beschwerdebearbeitung/ https://www.tiwag.at/ueber-die-tiwag/organisation/anregungen-und-beschwerden/
29	TIWAG	Project contact		German / English	https://www.tiwag.at/ueber-die-tiwag/kraftwerke/wasserkraftausbau/unsere-kraftwerksprojekte/ausbau-kraftwerk-kaunertal/ausbau-kw-kaunertal-projektkontakt/
30	Justiz	Lobbying register for the business	2016	German	Document: Lobbyingregisterauszug_TIWAG_10_2016.pdf
31	Austrian Standards Institute	Austrian Standards (ÖNORM)	2016	German / English	Link: www.austrian-standards.at
32	Binder Grösswang Rechtsanwälte GmbH	Report of search and inspection	2014	German	Document: Hausdurchsuchung_Bericht_12_2014_Binder-Grösswang.pdf
33	National Council	"State treaty" between Austria and Switzerland	2008	German	Documents: - BGBl III 99-2008.pdf - BGBl III 99-2008 Anlage.pdf
34	TIWAG	Contact details for the project		English	Document: Contact Details Projects.pdf
35	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Tyrolean Energy Strategy 2020		German	Document: Tyrolean Energy Strategy 2020.pdf
36	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Declaration of the Tyrolean Provincial Government for common understanding on the future use of hydropower in the Tyrol dated 15 March 2011	2011	German	Document: 2001 Declaration Common Understanding future HPP in Tyrol.pdf
37	TIWAG (EIA)	C.01.01-1 Expert opinion on public interest from the viewpoint of energy management and climate protection	2013	German	Document: C.01.01-1 Expert opinion public interest energy management and climate protection.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
38	TIWAG	Water Management Framework for large-scale hydropower plants in Western Tyrol	2014	English	Document: Water Mgmt Framework HPP in Western Tyrol Table of Content.pdf
39	TIWAG	PV Concept (presentation)	2016	German	Document: 20160406PV_Konzept.pptx
40	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Provincial governments decision	2006	German	Document: Regierungsantrag 19062006.pdf
41	TIWAG	Comparative analyse of the different possibilities for the upper reservoir in the KXP	2010	German	Documents: - Beilage 3.pdf - Beilage 2.pdf
42	TIWAG	Multi criteria analysis Platzertal upper stage reservoir	2010	German	Documents: - P4-6 Multi criteria analysis Platzertal upper stage reservoir.docx - Beilage 2.pdf
43	TIWAG	Option 2 AK from the Options report 2004	2004	English	Document: P4-2 Options report 2004 Option2 AK
44	TIWAG	Options report, table of content 2004 and report for option 2 AK	2004	English	Document: P4-2 Options report 2004 Table of Content
45	TIWAG	Oetztal study 2015	2015	German	Document: P4-7 280115 Presentation Oetztal Study
46	TIWAG	B.01 chapter 02.01 AK design and development overview	2015	German	Document: B.01-02.01 AK design and development overview.pdf
47	TIWAG	C.01.02-1 Expert opinion on public interest from the viewpoint of flood protection, report	2015	German	Document: C.01.02-1 Public interest from the viewpoint of flood protection.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
48	TIWAG	C.02.02-1 Geology – basic data, overview of investigations	2015	German	Document: C.02.02-1 Geology basic data overview of investigations
49	TIWAG	C.07.08 Platzertal reservoir, model test of on-site installations	2012	German	Document: C.07.08 Platzertal reservoir model test of on-site installations
50	TIWAG	C.11.06-1 Gurgler Ache water intake, report on model tests	2014	German	Document: C.11.06 Gurgler Ache water intake, report on model tests.pdf
51	Studiengesellschaft Westtirol GmbH	The water forces of the Oetztal "expansion plan of the research association Westtirol, Innsbruck 1950	1950	German	Document: P4-1 The water forces of the Oetztal expansion plan of the research association Westtirol, Innsbruck 1950.pdf
52	TIWAG	Aspects of engineering geology concerning the site selection of the upper stage reservoir for the project "Ausbau Kraftwerk Kaunertal". Geomechanics and Tunneling, Volume 5, October 2012, p. 473 – 484	2012	English	Document: P4-4 Aspects of eng geology concerning site selection upper stage reservoir.pdf
53	Dr.-Ing. Theodor Strobl	Expert Report flood control	2007	German	Document: P4-5 20070630 Expert Report flood control Prof STROBL.pdf
54	Beratung Krismer	FAQ List from stakeholders from the Kaunertal, input and response	2013	German	Document: P4-8 2013 FAQ List Stakeholder input and TIWAG response (1) .pdf
55	TIWAG (EIA)	A.02.1001 Content of Revision 1	2015	German	Document: A.02.1001 Content of Revision 1.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
56	TIWAG (EIA)	D.01-1 NonTechnical Summary of EIS	2015	English	Document: D.01-1 Non Technical Summary EIS.pdf
57	Österreichische Forschungsgesellschaft Straße - Schiene - Verkehr	Austrian Road-Construction-Guidelines for Environmental Impact Studies (RVS 04.01.11)	2008	German	Document: P5-1 Austrian Guidelines for Environmental Impact Studies.pdf
58	TIWAG, TIGAS, TINETZ	TIWAG Process Manual project management T15.3, version 2.2	2015	German	Document: TIWAG Process Manual project mgnt T15.3 vers 2.2.pdf
59	TIWAG	TIWAG Process Manual power plant implementation T14.4, version 0.1	2016	German	Document: TIWAG Process Manual PP implementation T14.4, version 0.1.pdf
60	TIWAG (EIA)	B.03-1 Construction phase	2015	German	Document: B.03-1 Construction phase.pdf
61	TIWAG (EIA)	B.04-1 Operation phase	2015	German	Document: B.04-1 Operation phase.pdf
62	TIWAG (EIA)	B.06-1 Ordinary and extraordinary events incl. Incidents	2015	German	Document: B.06-1 Ordinary and extraordinary events incl. Incidents
63	TIWAG (EIA)	E.01-1 Mitigation measures table of content	2015	English	Document: E.01-1 Mitigation Measures Table of Content.pdf
64	TIWAG (EIA)	E.01-1 Mitigation measures	2015	German	Document: E.01-1 Mitigation Measures.pdf
65	TIWAG (EIA)	B.03.01.1000-1 Construction site management/project schedule	2015	German	Document: B.03.01.1000-1 Constr site mgnt project schedule.pdf
66	Alps Electric CO. LTD.	alp-s Annual report 2015	2015	English	Document: alps Annual rep 2015.pdf
67	TIWAG (EIA)	B.02 chapter 01.03 Plant description, water and energy management	2015	German	Document: B.02 chapter 01.03 Plant description water and energy mgmt.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
68	TIWAG (EIA)	D.03.05-1 Impact factor report – hydrology	2015	German	Document: D.03.05-1 Impact factor rep hydrology.pdf
69	TIWAG (EIA)	D.04.04.01-1 Detailed Technical Study – surface waters	2015	German	Document: D.04.04.01-1 Detailed technical study surface waters.pdf
70	TIWAG (EIA)	D.04.04.02-1001 Detailed Technical Study – mountain groundwater	2015	German	Document: D.04.04.02.1001-1Detailed Tech Study mountain groundwater.pdf
71	TIWAG (EIA)	D.04.04.03-1 Detailed Technical Study – valley groundwater	2015	German	Document: D.04.04.03-1Detailed Tech Study valley groundwater.pdf
72	TIWAG (EIA)	C.04.02 Key energy-related data and system efficiency	2015	German	Document: C.04.02 Key energy-related data and system efficiency
73	TIWAG (EIA)	C.13.02 Gepatsch reservoir, processes	2015	German	Document: C.13.02 Gepatsch reservoir processes.pdf
74	TIWAG (EIA)	C.07.07.1005 Flood wave calculation – Platzertal-Ried dam	2012	German	Document: C.07.07.1005 Flood wave calculation Platzertal-Ried dam.pdf
75	TIWAG (EIA)	B.06.01.1040 Natural disaster prevention concept – operational phase	2015	German	Document: B.06.01.1040 Natural disaster prevention concept operational phase.pdf
76	TIWAG (EIA)	B.06.01.1000-1 Fire prevention and escape route concept	2015	German	Document: B.06.01.1000-1 Fire prevention and escape route concept.pdf
77	TIWAG (EIA)	B.02 chapter 08.02 Plant description, section western shore lane	2015	German	Document: B.02-08.02 Plant description, section western shore lane.pdf
78	TIWAG	Design, Surveillance and Rehabilitation of Dams as Means of		English	Documents: - Design Surveillance Rehabilitation of Dams.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		Personal Education. Proceedings of the 8th ICOLD European Club Symposium, September 2010, Innsbruck, Austria, A-2, p 5 - 8.			- P8-1 Design Surveillance and Rehabilitation of Dams as Means of Personal Education
79	TIWAG	Emergency manual Sellrain-Silz power plant, example	2015	German	Document: P8-2 Emergency manual Sellrain-Silz PP example.pdf
80	Österreichische Staubeckenkommission	Austrian dam reservoir expert commission, expert opinion of Vent, Gurgl, Gepatsch and Platzertal	2012/ 2013	German	Documents: - 2012 Expert report Gurgler Ache aut dam commission.pdf - 2012 Expert report Platzertal reservoir aut dam commission.pdf - 2012 Export report Venter Ache aut dam commission.pdf - 2013 Expert report Gepatsch reservoir aut dam commission.pdf
81	TIWAG	Selection of pump-turbines and arrangements of waterways for the 400 MW Versetz scheme, Tyrol. International Journal on Hydropower and Dams, Vol. 20, Issue 5, 2013, p. 52 - 57.	2013	English	Document: P8-4 Selection of pump-turbines and arrangements of waterways for the 400 MW Versetz scheme.pdf
82	TIWAG	Flood control: Principles for the operation of existing and the planning of new storage power plants. Proceedings of HYDRO 2013 "Promoting the Versatile Role of Hydro" Innsbruck, 7. - 9.10.2013.	2013	English	Document: P8-5 Flood control principles operation of existing and the planning of new storage PPs.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
83	TIWAG	Aspects of Public Safety in Hydropower Design and Operation at TIWAG-Tiroler Wasserkraft AK. Proceedings of the 8th ICOLD European Club Symposium, September 2010, Innsbruck, Austria, B-16, p. 147-152.	2000	English	Document: P8-6 Aspects of Public Safety in Hydropower Design and Operation at TIWAG.pdf
84	TIWAG	Achensee power plant, incidence analysis	2015	German	Documents: - P8-7 Achensee PP incidence analysis.pdf - P8-7a Achensee PP incidence analysis.xlsm
85	TIWAG (EIA)	C.01.03-1 Public interest from the viewpoint of the national and regional economy	2015	German	Document: C.01.03-1 Public interest from the viewpoint of the national and regional economy.pdf
86	TIWAG	Cost Benefit Analysis for the project (CBA) 2015	2015	English	Document: PCI Kaunertal CBA for the project 2015.pdf
87	TIWAG	Project milestone time schedule 2016 - 2020	2015	German	Document: P12-1 Project milestone schedule 2016-2020.pdf
88	TIWAG	Project investment cost allocation	2016	German	Document: Project investment cost allocation 2015-2019.xlsx
89	EU Commission/ National Council	Exemption from the Federal Procurement Act for the electricity operation market	2006+ 2008	German	Documents: - P12-2 Exemption from the Federal Procurement Act 2008.pdf - P12-3 Federal Procurement Act 2006.pdf
90	National Council	Federal Law Gazette Nr. 54	2014	English	Document: P12-3a Federal Law Gazette 2014.pdf
91	TIWAG	TIWAG Tendering Process	2009	German	Document: P12-4 TIWAG Tendering Process 2009.pdf
92	TIWAG	TIWAG Procurement Policy	2010	German	Document: P12-5 TIWAG Procurement Policy 2010.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
93	TIWAG	Signatures and Approvals	2014	German	Document: P12-5a TIWAG Sig and Approvals 2014.pdf
94	TIWAG	Table of content tender document	2011	German	Document: P12-6 Table of content tender docmt 2011.pdf
95	TIWAG	TIWAG Code of Conduct - homepage/intrane t	2013	German	Document: P12-7 TIWAG Code of Conduct.pdf
96	Verband der Elektrizitäts-werke Österreichs	TIWAG General conditions for the performance of services in the field of electrical and electronics industries – homepage		German	Document: TIWAG General conditions for the performance of services in the field of elec and elec industries.pdf
97	TIWAG	TIWAG Investment Policy 2012	2012	German	Document: TIWAG Investment Policy2008.pdf
98	TIWAG (EIA)	E.01 chapter 03.03.02.04 measure A-Bet-36 Almentwicklungsk onzept Platzer Alm Platzer Alm development concept	2015	German	Document: E.01-1 chapter 03.03.02.04 measure A Bet 36 PlatzerAlm development concept.pdf
99	TIWAG (EIA)	C.01.04. Human uses	2015	German	Document: C.01.04-1 Human uses.pdf
100	TIWAG	TIWAG General conditions for the performance of services in the field of elec and elec industries		German	Document: TIWAG General conditions for the performance of services in the field of elec and elec industries.pdf
101	Common Accident Insurance (Allgemeine Unfallversicher ungsanstalt)	Austrian Workers Protection Act	2015	German	Document: Austrian workers protection act.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
102	Common Accident Insurance (Allgemeine Unfallversicherungsanstalt)	Austrian Worker Protection Ordinance	2012	German	Document: Austrian Construction Worker Protection Ordinance.pdf
103	TIWAG (EIA)	D.04.07 Detailed Technical Study – material assets and cultural heritage	2015	German	Document: D.04.07 Detailed Technical Study material assets and cultural heritage.pdf
104	TALPA Gnbr	Archaeological Diggings in the Längental (Kuehtai) 2009	2009	German	Document: Kuehtai report, diggings Längental.pdf
105	TALPA Gnbr	Kuehtai report, archaeological diggings for the Längental		German	
106	TIWAG (EIA)	D.04.05.01-1 Detailed Technical Study – air	2015	German	Document: D.04.05.01-1 Detailed Technical Study air.pdf
107	TIWAG (EIA)	C.04.06-1 Basic traffic report	2015	German	Document: C.04.06-1 Basic traffic report.pdf
108	TIWAG (EIA)	D.03.01-1 Impact factor report – noise	2015	German	Document: D.03.01-1 Impact factor report noise.pdf
109	TIWAG (EIA)	D.03.03-1 Impact factor report – vibrations and secondary impact noise	2015	German	Document: D.03.03-1 Impact factor report vibrations and secondary impact noise.pdf
110	TIWAG (EIA)	D.04.01-1 Detailed Technical Study – human being	2015	German	Document: D.04.01-1 Detailed Technical Study human being.pdf
111	TIWAG (EIA)	D.04.02.01-1 Detailed Technical Study – animals and their habitats	2015	German	Document: D.04.02.01-1 Detailed Technical Study animals and their habitats.pdf
112	TIWAG (EIA)	D.04.02.02-1 Technical Study –	2015	German	Document: D.04.02.02-1 Detailed Technical Study plants and their habitats.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		plants and their habitats			
113	TIWAG (EIA)	D.04.02.03-1 Detailed Technical Study – aquatic ecology	2015	German	Document: D.04.02.03-1 Detailed Technical Study aquatic ecology.pdf
114	TIWAG (EIA)	D.03.06-1 Impact factor report – sediment regime	2015	German	Document: D.03.06-1 Impact factor report sediment regime.pdf
115	University of Innsbruck	Report physical modelling Gurgler Ache water intake 2014	2014	German	Document: - Report physical modelling Gurgler Ache water intake 2014.pdf
116	TIWAG (EIA)	B.04. chapter 20 bedload management	2015	German	Document: B.04 chapter 20 bedload mgnt.pdf
117	TIWAG (EIA)	C.13.05-0 Gepatsch reservoir, sediment regime	2012	German	Document: C.13.05-0 Gepatsch reservoir sediment regime.pdf
118	TIWAG (EIA)	C.41.01.1001-1 Flow conditions and Bedload Input in Oetztal	2015	German	Document: C.41.01.1001-1 Flow conditions and bedload input in Oetztal.pdf
119	TIWAG (EIA)	C.41.01.1002-1 Basic data on sediment regime – Oetztal	2015	German	Document: C.41.01.1002-1 Basic data on sediment regime Oetztal.pdf
120	TIWAG (EIA)	C.41.01.1003-1 Investigations into the sediment regime of Oetztaler Ache	2015	German	Document: C.41.01.1003-1 Investigations into the sediment regime of Oetztaler Ache.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
121	TIWAG (EIA)	C.41.02-1 Basic data on sediment regime – River Inn	2015	German	Documents: - C.41.02-1 Basic data on sediment regime River Inn.pdf - C.41.02.1000-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1001-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1002-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1003-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1004-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1005-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1006-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1007-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1008-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1009-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1010-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1011-1 layout Basic data on sediment regime River Inn.pdf - C.41.02.1012-1 report mapping bedload probing.pdf
122	TIWAG (EIA)	C.41.03.1001-1 Basic data on sediment regime – Platzertal	2015	German	Document: C.41.03.1001-1 Basic data on sediment regime Platzertal.pdf
123	TIWAG	Drawdown of Gepatsch reservoir 2016	2015	English	Document: Drawdown of Gepatsch Reservoir 2015.pdf
124	University of Innsbruck	Alpine Airborne Hydro Mapping	2016	German	Document: Alpine Airborne Hydro Mapping.pdf
125	TIWAG	Report, methods of remote sensing of terrain structures	2013	German	Document: Report methods of remote sensing of terrain structures.pdf
126	TIWAG (EIA)	E01-1 chapter 04.06.03 Other mitigation measures,	2015	German	Document: E.01-1 chapter 04.06.03 Other mitigation measures monitoring aquatic ecology.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		monitoring aquatic ecology			
127	TIWAG (EIA)	C.01.05-1 Domestic water supplies	2015	German	Document: C.01.05-1_Domestic water supplies.pdf
128	TIWAG (EIA)	B.03.02.1000 Platzertal reservoir and dam, construction	2012	German	Document: B.03.02.1000 Platzertal reservoir and dam construction.pdf
129	TIWAG (EIA)	E.01 chapter 02.12.04 Measure Vi-Bau-01 Plant pool, interim storage area, preservation of autochthonous material	2015	German	Document: E.01 chapter 02.12.04 MeasureVi-Bau-01Plant pool interim storage area preservation autochthonous material.pdf
130	TIWAG (EIA)	E.01 chapter 03.03.02 Measure A-Bet-05, section Platzertal reservoir - facility of a fen-small sedge complex at the beginning of the backwater	2015	German	Document: E.01 chapter 03.03.02 Measure A-Bet-05 section Platzertal reservoir facility fen small sedge complex beginning backwater.pdf
131	TIWAG (EIA)	E.01 chapter 03.03.02.04 A-Bet-36 PlatzerAlm development concept	2015	German	Document: E.01 chapter 03.03.02.04 A-Bet-36 PlatzerAlm development concept.pdf
132	TIWAG (EIA)	C.04.04 Contaminated land/ potentially contaminated areas	2015	German	Document: C.04.04 Contaminated land potentially contaminated areas.pdf
133	TIWAG (EIA)	C.01.04 Human benefits, alpine farming and agriculture	2015	German	Document: C.01.04 chapter 05 Human benefits alpine farming agriculture.pdf
134	TIWAG (EIA)	C.07.05.1001 Platzertal reservoir, stability	2015	German	Document: C.07.05.1001 Platzertal reservoir stability evaluations reservoir slopes.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		evaluations – reservoir slopes			
135	TIWAG (EIA)	B.03 chapter 01.05 construction phase, section construction site installation	2015	German	Document: B.03 chapter 01.05 Construction phase section construction site installation.pdf
136	TIWAG (EIA)	B.04 chapter 01.03 Management of power plants in compliance with the requirements of the Water Management Framework - Western Tyrol	2015	German	Document: B.04 chapter 01.03 Mgnt of PPs compliance requirements Water Mgnt Framework WesternTyrol.pdf
137	TIWAG (EIA)	B.02 chapter 02.04.05 Plant description, section measurement and control facility of the dam with remote monitoring	2015	German	Document: B.02 chapter 02.04.05 Plant description sect measurement and control facility dam remote monitoring.pdf
138	TIWAG (EIA)	B.04 chapter 02 Operational phase, Platzertal reservoir	2015	German	Document: B.04 chapter 02 Operational phase Platzertal reservoir.pdf
139	TIWAG (EIA)	B.04 chapter 06 Operational phase, Gurgl intake structure	2015	German	Document: B.04 chapter 06 Operational phase Gurgl intake structure.pdf
140	TIWAG (EIA)	B.04 chapter 07 Operational phase, Vent intake structure	2015	German	Document: B.04 chapter 07 Operational phase Vent intake structure.pdf
141	TIWAG (EIA)	B.02 chapters 02.01.02 Plant description, geological conditions and soundings)	2015	German	Document: B.02 chapter 02.01.02 Plant description geological conditions and soundings.pdf
142	TIWAG (EIA)	B.02 chapters 06.01 Plant description,	2015	German	Document: B.02 chapter 06.01 Plant description GurglerAche waterintake.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		Gurgler Ache water intake			
143	TIWAG (EIA)	B.02 chapters 07.01 Plant description, Venter Ache water intake	2015	German	Document: B.02 chapter 07.01 Plant description VenterAche waterintake.pdf
144	TIWAG (EIA)	B.02 chapter 08.01.01 Plant description, Gepatsch reservoir planning processes, conception and main data	2015	German	Document: B.02 chapter 08.01.01 Plant description Gepatsch reservoir planning processes conception and main data.pdf
145	TIWAG (EIA)	C.13.01 Gepatsch reservoir, engineering geology and hydrogeology	2013	German	Document: C.13.01 Gepatsch reservoir engineering geology and hydrogeology.pdf
146	TIWAG (EIA)	C.13.03 Gepatsch reservoir, stability evaluations of reservoir slopes	2015	German	Document: C.13.03 Gepatsch reservoir stability evaluations reservoir slopes.pdf
147	TIWAG (EIA)	C.11.05.1002-1 2D numerical modelling of bedload transport Gurgler Ache and Venter Ache water intakes	2015	German	Documents: - C.11.05.1002-1 2D numerical modelling of bedload transport.pdf - C.11.05.1002 2Dnumerical modelling bedload transport GurglerAche and VenterAche waterintakes.pdf*
148	TIWAG (EIA)	B.02 chapter 02.03.05 Mitigation measure Platzer Bach residual water facility – access tunnel		German	Documents: - B.02 chapter 02.03.05 Mitigation measure residual water facility PlatzerBach.pdf - B.02 chapter 02.03.05 Mitigation measure PlatzerBach residual water facility access tunnel.pdf
149	TIWAG	Flood control - Principles for the operation of existing and the planning of new storage power plants		English	Document: P23-1 2013 Principles operation existing and planning new storage PPs.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
150	TIWAG	Map of monitoring stations		German	Document: Map of Monitoring Stations AK KD IH.pdf
151	TIWAG	EIS Submission Documents	2016	English	Document: 20160425 en Submission Doc Table of Content Rev 1.pdf
152	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Climate Strategy Tyrol	2014	German	Document: 2014 Climate Strategy Tyrol Syntheses Report.pdf
153	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Decision Kuehtai Storage PS 24 June 2016	2016	German	Document: 20160624 Decision Kuehtai Storage PS.pdf
154	Austrian Alpine Club	Comments on Draft Water Framework Tiroler Oberland	2014	German	Document: 20140908 Comments on Draft Water Framework Tiroler Oberland.pdf
155	TIWAG	Presentation for the Austrian Alpine Club: HP Expansion in the Tyrol / The Kaunertal Expansion project	2014	German	Document: HP Expansion in the Tyrol The Kaunertal Expansion Project.pdf
156	TIWAG	TIWAG Project proposal for the tyrolean HP expansion (for the Austrian Alpine Club)	2005	German	Document: TIWAG Project proposals for the tyrolean HP expansion.pdf
157	TIWAG	TIWAG Intranet	2016	German	Document: TIWAG Intranet.jpg
158	TIWAG	Monitoring concept Wenns	2013	German	Document: PI_196_0004_000_NA.pdf
159	TIWAG	Report Wenns	2016	German	Document: PI_196_0017_000_NA.pdf
160	Tokyo University of Agriculture and Technology,	Random Forests Hydrodynamic Flow Classification in a Vertical Slot	2016	English	Document: 2016_Fukuda_Random Forests Hydrodynamic Flow.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
	TIWAG, SJE Ecohydraulic Engineering GmbH, Centre for Biorobotics	Fishway Using a Bioinspired Artificial Lateral Line Probe			
161	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Example on fishery rights		German	Document: HSAP_P19_example on fishery rights.pdf
162	TIWAG	Example on monitoring activities - table of content 2	2013	German	Document: HSAP_P19_example on monitoring activities_LM2013_WK090-0086.pdf
163	TIWAG	Example on monitoring activities - table of content 1	2013	German	Document: HSAP_P19_example on monitoring activities_LM2013_WK090-0085.pdf
164	TIWAG, ARGE Limnologie GesmbH, droneproject.at, University of Stuttgart, University of Natural Resources and Life Sciences Vienna	ISRS publication on monitoring SEG: Integrative monitoring approaches for the sediment management in alpine reservoirs: Case study Gepatsch (HPP Kaunertal, Tyrol)		English	Document: ch200.pdf
165	TIWAG	Employee Food Voucher and List of Contracted Parties	2016	German	Document: Lunch Voucher and List of Contracted Parties.pdf
166	Austrian Ministry for Agriculture, Forestry, Environment and Watermanagement (Bundes-ministerium für Land- und	Quality Objective Ordinance Ecology guidance document	2011	German	Document: 160901 Quality Objective Ordinance Ecology guidance document german.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
	Forstwirtschaft, Umwelt und Wasserwirt-schaft)				
167	TIWAG	IHA Hydropower Sustainability Assessment (Interview Presentation P Bauhofer)	2016	English	Documents: - IHA Sust Assessment Presentation P Bauhofer.pdf - IHA Sust Assessment AK 2016 P-3 P-11 Bauhofer 30 8 2016 short.pdf
168	European network of transmission system operators for electricity	Link Entso E TYNDP 2014 and CBA-outcome for AK		English	Document: Link Entso E TYNDP 2014 and CBA-outcome for AK .jpg
169	TIWAG	Mail: 2016 PCI Stakeholder Process - public hearing	2016	German	Document: 2016 PCI Stakeholder Process (mail Bauhofer) public hearing.jpg
170	TIWAG	CC-INFOSERVICE TIWAG-employees highly motivated and socially committed	2015	German	Document: CC-INFOSERVICE TIWAG-employees highly motivated and socially committed.msg
171	TIWAG	Employee survey 2014	2015	German	Document: Employee survey 2014.pdf
172	TIWAG	Analysis Pressure Shaft Kaunertal Success Factors	2016	German	Document: Analysis Pressure Shaft Kaunertal Success Factors 2016.pdf
173	Environmental Ombudsman / Kostenzer	Gurgler und Venter Ache: preliminary investigations	2010	German	Document: Environmental Ombudsman Doc Gurgler und Venter Ache preliminary investigations.pdf
174	Environmental Ombudsman / Kostenzer	Additional statement Klasgarten	2010	German	Document: Environmental Ombudsman Doc additional statement Klasgarten.pdf
175	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Letter from Provincial Government to Tiwag about the status of the project	2015	German	Document: Environmental Ombudsman Doc TIWAG Schönherr.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
176	Swiss Academies of Arts and Science	Report renewable energy - see page 25	2011	German	Document: Environmental Ombudsman Doc Report renewable energy see page 25.pdf
177	Environmental Ombudsman / Kostenzer	Summary of draft for the water management framework	2014	German	Document: Environmental Ombudsman Doc water management framework Oberland.pdf
178	Environmental Ombudsman / Kostenzer	Statement for AK	2012	German	Document: Environmental Ombudsman Doc Statement for AK .pdf
179	Environmental Ombudsman / Kostenzer	Statement for water management framework Oberland	2014	German	Document: Environmental Ombudsman Doc summary of draft for the water management framework.pdf
180	Environmental Ombudsman / Kostenzer	Statement Geological Preliminary Investigation Platzertal	2010	German	Document: Environmental Ombudsman Doc Statement Geological Preliminary Investigation Platzertal.pdf
181	Austrian Ministry for Agriculture, Forestry, Environment and Watermanagement (Bundes-ministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirt-schaft)	Statement Ministry of Life EIS AK	2012	German	Document: Environmental Ombudsman Doc Statement Ministry of Life EIS AK.pdf
182	Environmental Ombudsman / Kostenzer	Environmental Ombudsman Progress Report	2011	German	Document: Environmental Ombudsman Doc Progress Report.pdf
183	TIWAG (EIA)	B.04-1 Operation phase	2015	German	Document: B.04-1.pdf
184	TIWAG (EIA)	C.04.20 Overview of documentation submitted to Austrian Commission on	2015	German	Document: C.04.20-1.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		Reservoirs and Dams			
185	TIWAG (EIA)	C.07.09 Platzertal reservoir, earthquake loading of proposed Platzertal reservoir	2012	German	Document: C.07.09-0.pdf
186	TIWAG (EIA)	C.07.03 Platzertal reservoir, processes	2015	German	Document: - C.07.03 Platzertal reservoir_ processes
187	TIWAG	Process Management Handbook	2015	German	Document: Process Management Handbook.pdf
188	TIWAG	2016 Presentation TIWAG Process Management	2016	German	Document: 2016 Presentation TIWAG Process Management .pdf
189	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung) / Sailer	Test Methodology		German	Document: Test Methodology .pdf
190	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)/ Sailer	Communication report on the examination of the TIWAG Option Report	2005	German	Document: Communication report on the examination of the TIWAG Option Report.pdf
191	TIWAG (EIA)	A.02.1002-1 explanations regarding improvements of EIS	2016	German	Document: A.02.1002-1 explanations regarding improvements of EIS.pdf
192	Österreichische Forschungsgesellschaft Straße - Schiene - Verkehr	Austrian Road-Construction-Guidelines for mitigation measures (RVS 04.01.12)	2015	German	Document: RVS-04-01-12_Env mitigation measures_Oct-2015.pdf
193	Österreichische Forschungsgesellschaft Straße	Austrian Road-Construction-Guidelines for	2015	German	Document: RVS_04_03_15_151001_GT_OPT.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
	- Schiene - Verkehr	species protection (RVS 04.03.15)			
194	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Guideline survey fauna flora Tirol		German	Document: Guideline survey fauna flora Tirol .pdf
195	DI Petrascheck / EXPERT water mngmt & flood control	Interview Notes Petrascheck	2016	English	Documents: - Petrascheck notes to climate change and sustainability.pdf - note Petrascheck.pdf
196	TIWAG	Sunk info river Inn	2014	German	Document: EU water framework directive_Info Reindl.pdf
197	TIWAG	EU water framework directive Info	2016	German	Document: Sunk Info RIver Inn_Reindl.pdf
198	University of Innsbruck	Simulations of future runoff conditions for glacierized catchments in the Ötztal Alps (Austria)	2016	English	Document: egu2016_musicals.pdf
199	TIWAG	Flood control - Principles for the operation of existing and the planning of new storage power plants	2013	English	Document: Hofer_etal_2013_Flood control_principles for the operation_HPP.pdf
200	University of Innsbruck	Multilevel spatiotemperoal validation of snow / ice mass balance and runoff modeling in glacierized catchments	2016	English	Document: Hanzer_etal_2016_MUSICALS1_paper.pdf
201	TIWAG (EIA)	C.01.05-1 household water management	2015	German	Document: C.01.05-1 household water management.pdf
202	DI Petrascheck / EXPERT water	Information Dr. Petrascheck	2016	English	Document: Information Petrascheck.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
	mngmt & flood control				
203	TIWAG	Screenshot homepage EMS	2016	German	Documents: - EMS asptects.jpg - EMS screenshots.jpg
204	TIWAG	sitemap-Homepage-SEP	2016	German	Document: sitemap-Homepage-SU.pdf
205	TIWAG	T14.4 Process PS-Implementation	2016	German	Document: T14.4 Process PS-Implementation .pdf
206	TIWAG	Employee and Environmental protection during operation		German	Document: Employee and Environmental protection during operation.pdf
207	TIWAG	EMS Management Report	2015	German	Document: 2015_15_10_ems_management_report.pdf
208	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Link: TIRIS			https://portal.tirol.gv.at/weboffice/tirisMaps/synserver;jsessionid=20A1A8CEE41905F2A56C38D6D25C0CC0?synergis_session=0f3ad392-0520-4c6e-904c-284413e238cd&view=wasser_information&user=guest&project=tmap_master
209	Austrian Ministry for Agriculture, Forestry, Environment and Water Management (Bundes-ministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirt-schaft)	Link: implementation Water Framework Directive		German	https://www.bmlfuw.gv.at/wasser/wasser-oesterreich/plan_gewaesser_ngp/umsetzung_wasserrahmenrichtlinie/hymoleitbilder.html
210	TIWAG (EIA)	C.22.02-1 Mitigation measures – restoration of watercourses, hydraulic calculations	2015	German	Document: C.22.02-1.pdf
211	TIWAG (EIA)	C.42.02-1 Bog areas where	2015	German	Document: C.42.02-1.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		measures are needed to enhance nature conservation aspects			
212	TIWAG (EIA)	C.42.01-1 Restoration of Pillermoor peatlands – general concept	2015	German	Document: C.42.01-1.pdf
213	TIWAG (EIA)	C.42.03-1 Baseline analysis of Fotschertal	2015	German	Document: C.42.03-1.pdf
214	TIWAG (EIA)	D.04.06-1 Detailed Technical Study – landscape and recreational value	2015	German	Document: D.04.06-1.pdf
215	TIWAG	Example for the measurement of physico-chemical parameters at the gauging station Prutz during the controlled drawdown of the Gepatsch reservoir in winter 2015/2016	2015-2016	German	Documents: - pictures_physio-chemischeMessstellen.zip - HSAP_P21_measurements of physico-chemical parameters at gauge Prutz (SEG)_01 .JPG - HSAP_P21_measurements of physico-chemical parameters at gauge Prutz (SEG)_02 .JPG - HSAP_P21_measurements of physico-chemical parameters at gauge Prutz (SEG)_03.JPG - HSAP_P21_measurements of physico-chemical parameters at gauge Prutz (SEG)_04 .JPG - HSAP_P21_measurements of physico-chemical parameters at gauge Prutz (SEG)_05.JPG
216	TIWAG (EIA)	B.02.01.1000-1 overall plant - general map	2015	German	Document: B.02.01.1000-1_overall_plant_general map.pdf
217	TIWAG (EIA)	B.02.01.1001-1 upper stage - general layout	2015	German	Document: B.02.01.1001-1_upper_stage_general_layout.pdf
218	TIWAG (EIA)	B.02.01.1002-0 lower stage - general layout	2011	German	Document: B.02.01.1002-0_lower_stage_general_layout.pdf
219	TIWAG (EIA)	B.02.01.1003-1 Ötztal diversion tunnel - general Layout	2015	German	Document: B.02.01.1003-1_Oetztal_diversion_tunnel_general_layout.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
220	TIWAG (EIA)	B.02.01.1004-1 section Ried to Runserau - general Layout	2015	German	Document: B.02.01.1004-1_section_Ried_to_Runserau_general layout.pdf
221	TIWAG (EIA)	B.02.01.1005-1 section Runserau to Imst	2015	German	Document: B.02.01.1005-1_section_Runserau_to_Imst.pdf
222	TIWAG (EIA)	B.02.01.1006-1 section Imst to Haiming	2015	German	Document: B.02.01.1006-1_section_Imst_to_Haiming
223	Austrian Environment Agency (Umweltbundes-amt)	Overview about approvals and status of the EIAs		German	http://www.umweltbundesamt.at/umweltsituation/uvpsup/uvpoesterreich1/uvpdatenbank/uvpstatistik/
224	Municipality Kaunertal	Results of the stakeholder involvement process		German	http://www.kaunertal.eu/
225	TIWAG	Profile 2018 - Employee Information TIWAG-Tiroler Wasserkraft AG	2015	German	Document: TIWAG empl leaflet corp philosophy 2015.pdf
226	TIWAG	Strategic Environmental Assessment of the Water Management Framework for the River Inn	2014	German	Documents: - Water Management Framework Upper Tyrol - SEA.pdf - WWRP_Revision2 Umweltbericht_DRUCK.pdf
227	WLM/ Revital/ TIWAG	Scoping Study of potential options for areas to implement mitigation / compensation measures	2012+ 2015	German	Documents: - 2012 Scoping study mitigation measures.pdf - 2015 Scoping study mitigation measures.pdf - Folder search for mitigation measures.pdf
228	TIWAG	Risk assessment on environmental risks for the GKI project	2016	German	Document: 2016_10_20_projektrisikomanagement_GKI_naturgefahren_wetterrisiken.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
229	TIWAG	Quarterly project manager report	2016	German	Document: Projektstatusbericht_Phase3_Ausbau Kraftwerk Kaunertal_I Halbjahr 2016-signed.pdf
230	TIWAG / GKI	GKI Information Brochure		English	http://www.gemeinschaftskraftwerk-inn.com/wp-content/uploads/2015/04/GKI-Broschuere_EN_20150331_web.pdf
231	TIWAG/GKI	GKI - Several Newsletters		German	Documents: - NEWSLETTER_OESTERREICH_GKI.compressed.pdf - NEWSLETTER_AUT_compressed.pdf - NEWSLETTER_AUT_compressed (1).pdf
232	TIWAG	Design, Surveillance and Rehabilitation of Dams as means of Professional Education		English	
233	TIWAG	Report Dr. Hofer / Dr. Schönlaub - Flood retention by storage reservoirs	2008	English	Document: Paper Hofer Flood Retention.pdf
234	Austrian Ministry for Agriculture, Forestry, Environment and Water Management (Bundes-ministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirt-schaft)	"Staubeckenkommission" guidelines		German	The website of the Staubeckenkommission is: https://www.bmlfuw.gv.at/wasser/nutzung-wasser/stauanlagen.html The valid guidelines can be found in the following link: https://www.bmlfuw.gv.at/wasser/nutzung-wasser/Richtlinien.html
235	TIWAG	"Operating and monitoring manual" for Silz	2014	German	Document: S300-0025 Betriebs- und Überwachungsordnung SSi samt Beilagen.pdf
236	TIWAG	Reports on dam safety	2015-2016	German	Documents: - S300-0028 annual dam safety report Finsertal dam 2015-16.pdf - S300-0029 annual dam safety report Längental dam 2015-16.pdf - K10-0334 annual dam safety report Gepatsch dam 2015.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
237	RISKConsult	Risk analysis for Silz (survey report)	2010	German	Document: 5983_201009_TIWAG_KW-Silz_RM_VN_vkl
238	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Emergency Center of Tyrol		German	https://www.tirol.gv.at/sicherheit/katziv/lwz/
239	TIWAG (EIA)	C.07.07.1003-0 Design flood Platzertal dam	2012	German	Document: C.07.07.1003-0.pdf
240	TIWAG (EIA)	C.11.05.1001-0 Design flood Gurgl intake	2012	German	Document: C.11.05.1001-0. Pdf
241	TIWAG (EIA)	C.12.05.1001-0 Design flood Vent intake	2012	German	Document: C.12.05.1001-0.pdf
242	TIWAG	List of emergency response simulations	2005-2016	German	Document: List of emergency response simulations.xlsx
243	alpS, University of British Columbia, TIWAG	Kinematic behaviour and velocity characteristics of a complex deep seated crystalline rockslide system in relation to its interaction with a dam reservoir	2010	English	Document: Zangerl et al 2010.pdf
244	TIWAG, University of Natural Resources and Life Sciences Vienna, University of Innsbruck	Deformation characteristics of a deep-seated rockslide interacting with a reservoir	2015	English	Document: Holzmann at al 2015.pdf
245	ZAMG Zentralanstalt für Meteorologie und Geodynamik	Report of the goals and methodology of the ZAMG project (on seismic hazards) and	2014	German	Documents: - Kurzfassung_Zamg.pdf - 20160901_BE_Zwischenbericht_2_ Erdbebenforschung_Tirol.pdf - 20150901_BE_Zwischenbericht_1 _Erdbebenforschung_Tirol.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		intermediate reports			
246	European network of transmission system operators for electricity	Website: Ten-Year Network Development Plan 2014		English	https://www.entsoe.eu/major-projects/ten-year-network-development-plan/tyndp-2014/Pages/default.aspx
247	European network of transmission system operators for electricity	Full Report of TYNDP 2014: Project Assessment Kaunertal (Project 222) on page 394		English	https://www.entsoe.eu/major-projects/ten-year-network-development-plan/tyndp-2014/Documents/TYNDP%202014_FINAL.pdf
248	European network of transmission system operators for electricity	TYNDP 2014 - RIP CCS – Regional Investment Plan Central South: Project Assessment Kaunertal (Project 222) on page 272		English	https://www.entsoe.eu/major-projects/ten-year-network-development-plan/tyndp-2014/Documents/RgIP%20CCS%202014_FINAL.pdf
249	TIWAG	TIWAG presentation held by Bauhofer on 15 January 2015	2015	English	Document: ENTSO-E_TYNDP_2014_CBA_Kaunertal_Extension_Project_English_website_150119.pdf
250	European network of transmission system operators for electricity	ENTSO-E TYNDP and CBA webpage		English	https://www.entsoe.eu/major-projects/ten-year-network-development-plan/CBA-Methodology/Pages/default.aspx
251	European network of transmission system operators for electricity	ENTSO-E CBA Guideline as approved by European Commission on 5 February 2015	2015	English	https://www.entsoe.eu/Documents/SDC%20documents/TYNDP/ENTSO-E%20cost%20benefit%20analysis%20approved%20by%20the%20European%20Commission%20on%204%20February%202015.pdf Document: ENTSO-E cost benefit analysis approved by the European Commission on 4 February 2015.pdf
252	European network of	Regional investment Plan		English	Document: RgIP CCS 2014_FINAL.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
	transmission system operators for electricity	2014 Continental central south			
253	Austrian Ministry for Agriculture, Forestry, Environment and Water Management (Bundes-ministerium für Land- und Forstwirtschaft , Umwelt und Wasserwirt-schaft)	CBA Guideline		German	Document: CBA Guidline.pdf
254	KPMG	Report of annual audit of the KMPG	2016	German	Document: - 160427 Präsentationsunterlage KPMG, Auszug.pptx
255	TIWAG	International Standards Professional Practice of Internal Auditing		German	
256	TIWAG	Audit procedure Corp Audit Dptm		German	
257	Illwerke VKW / TIWAG	Statistic of the degree of use of local suppliers and locals: - "Obervermuntwer k II" - GKI - Pressure Shaft Kaunertal	2016	German	Documents: - 161102 Folie Wertschöpfung in Österreich VIW zu Frage 98.pptx - 161103 Folien GKI und Druckschacht.pptx
258	TIWAG	TIWAG Homepage: Current calls for tender		German	https://www.tiwag.at/ueber-die-tiwag/einkauf/
259	TIWAG	TIWAG Homepage: Newsletter about current calls for tender		German	https://www.tiwag.at/ueber-die-tiwag/einkauf/

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
260	Tiroler Raftingverband / TIWAG	Examples for inclusive and participatory engagement with stakeholders		German/ English	Documents: - emergency plan.jpg - questionnaire customers.ppt - questionnaire guide.ppt
261	Österreichs Energie	Technical Safety Management from Österreichs Energie		German	http://oesterreichsenergie.at/ueber-uns/oesterreichs-energie-zertifizierung/liste-der-zertifizierten-stromnetzbetreiber.html
262	TIWAG	Safety handbook for the operation of power plants		German	http://team.tiwag.at/sites/tinetz-tsm/Sicherheit%20und%20Umwelt/Handbuch%20Sicherheit/hs.html%23allgemeines
263	TIWAG	Compendium safety - TIWAG-Tiroler Wasserkraft AG		German	
264	TIWAG	Agreement from a land owner for drilling a bore hole on his plot of land	2016	German	Documents: - Muster Zustimmungserklärung Voruntersuchung.pdf - Vertragsmuster Voruntersuchung.pdf
265	Arbeitsmedizinisches Zentrum Hall in Tirol GmbH	Work health institute for all health checks for workers		German	http://www.arbeitsmedizin-hall.at/
266	TIWAG	Options for re-establishing river continuity, with an emphasis on the special solution "fish lift": examples from Austria	2016	English	Document: - Schletterer_2016b_16954-57494-1-PB_.pdf
267	TIWAG	Technical Fish Monitoring: First Installation of a RiverWatcher Fish Counter in Austria	2015	German	Document: - Schletterer_2015_b.pdf
268	TIWAG	Ecological Considerations for the Planning of the 1st Fish Lift in Austria	2015	German	Document: - Schletterer_2015_a.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		at the Weir Runserau, Tyrol			
269	ARGE Limnologie/ Institut für Ökologie OG	Example of Wetlands	2009,2011,2016	German	Documents: - Example Wetlands – HPP Kartell.pdf - Example Wetlands - HPP Reisseck.pdf - Example wetlands - miscellaneous.pdf
270	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Natura 2000 area		German	https://www.tirol.gv.at/umwelt/naturschutz/natura2000-tirol/
271	Austrian Environment Agency (Umweltbundes-amt)	Paper published by the University of Innsbruck on bioaccumulation of metals in fish	2009	German	http://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0247.pdf
272	TIWAG/GKI	Project GKI: afforestation concept on Prutz site	2015	German	Documents: - 151123_Aufforstungskonzept PR Rev1.pdf - 151123_Abb.5.1 Aufforstungskonzept PR REv1.pdf
273	TIWAG/GKI	Project GKI: materials deposition at Prutz	2014	German	Document: MM-14-12-22_Beilage 7_PR14BE2290ZU0080F_LBP Lageplan.pdf
274	TIWAG/GKI	Project GKI: monitoring of vegetation ecology	2015	German	Document: 478_GKI_AUEN_Monitoring_KONZEPT_20150707v1.3.pdf
275	TIWAG/GKI	Project GKI: information about all accompanying and mitigation measures related to landscaping for GKI	2016	German	Document: 2016-06-09 Ausgleichsmn_Aufforstung u Rekult_Grundlagen.pdf
276	TIWAG	Summary table indicating: project site, area lost, area of significant or protected habitats, significant or protected sps, measures/areas considered for mitigation or compensation,	2016	German / English	Document: Question 150 Summary table.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		measures selected and why			
277	TIWAG	Example of the LM programme related to the existing HPP Kaunertal	2013	German	Documents: - HSAP_P19_example on monitoring activities_LM2013_WK090-0085.pdf - HSAP_P19_example on monitoring activities_LM2013_WK090-0086.pdf - K_196_0001_000_NA.pdf - K_196_0002_000_NA.pdf - K_196_0003_000_NA.pdf - K_196_0005_000_NA.pdf - K_196_0006_000_NA.pdf - K_196_0007_000_NA.pdf - K_196_0009_000_NA.pdf - K_196_0010_000_NA.pdf - K_196_0011_000_NA.pdf - K_196_0012_000_NA.pdf - K_196_0013_000_NA.pdf - K_196_0016_000_NA.pdf - K_196_0017_000_NA.pdf - K_196_0018_000_NA.pdf - K_196_0019_000_NA.pdf - K_196_0020_000_NA.pdf - K_196_0021_000_NA.pdf - K_196_0022_000_NA.pdf - K_196_0033_000_NA.pdf
278	TIWAG (EIA)	B.02.17.1000-1 tailwater basin Imst	2015	German	Document: B.02.17.1000-1.pdf
279	Tiroler Raftingverband / TIWAG	Minutes of the working group meetings held with the rafters' association.	2012-2013	German	Documents: - minute 1. session rafting 15-05-2012.pdf - minute 2. session rafting 29-06-2012.pdf - minute 3. session rafting 21-09-2012.pdf - minute 4. session rafting 16-11-2012.pdf - minute 5. session rafting 06-05-2013.pdf - minute 6. session rafting 06-08-2013.pdf - minute 7. session rafting 31-10-2013.pdf
280	Tiroler Raftingverband / Lawyer Götzl	Statement of the rafters' association	2016	German	Document: Kraftwerk Innstufe Imst-Haiming_Rechtsanwalt Dr. Philipp Götzl.pdf
281	TIWAG	R&D Projects		German	https://www.tiwag.at/ueber-die-tiwag/kraftwerke/wasserkraftausbau/oekologie/forschung-und-entwicklung/

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
282	Austrian Ministry for Agriculture, Forestry, Environment and Water Management (Bundes-ministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirt-schaft)	Website of the ministry regarding WFD measures		German	https://www.bmlfuw.gv.at/wasser/wasser-oesterreich/plan_gewaesser_ngp/umsetzung_wasserrahmenrichtlinie/schwallstudie.html
283	Dr. Strobl	**Fachwissenschaftliche Bewertung der Projektvorschläge für den weiteren Ausbau der heimischen Wasserkraft in Tirol**	2007	German	Document: Strobl_Gutachten1.pdf
284	DI Petrascheck / EXPERT water mngmt & flood control	Questions of Petrascheck	2016	English	Document: TIWAG flows questions-Petraschek_SA_SLB.pdf
285	Austrian Ministry for Agriculture, Forestry, Environment and Water Management (Bundes-ministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirt-schaft)	Quality targets for the ecological status of surface waters	2009	English / German	Documents: - Quality objective regulation ecology.pdf - 160901 Quality Objective Ordinance Ecology_consolidated english.pdf - 160901 Quality Objective Ordinance Ecology_consolidated german.PDF
286	TIWAG (EIA)	EIA Report B.04-1, chapter 01.05.03	2015	English	Document: AK B 04-1 Betriebsphase_2015-06-12_Kap01 05 03_en Pz_final.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
287	University of Innsbruck, alpS, University of Zurich, Vienna University of Technology, TIWAG	Analyzing the operational performance of the hydrological models in an alpine flood forecasting system	2011	English	Document: Achleitner_etal_2012_Operational performance of the hydrological models in flood forecasting.pdf
288	TIWAG	Presentation "Hydrologische Prozessmodellierung im Hochgebirge"	2015	German	Document: Schoeber_2015_Vortrag_KHR_ASG_20151126.pdf
289	University of Innsbruck, TIWAG	Assessment of the Design Flood Discharge in High Alpine Catchments using the Examples of the Planned Water Intakes Venter and Gurgler Ache	2014	German	Document: Achleitner_etal_2014_HQ_Intakes_Vent_Gurgl.pdf
290	alpsS, University of Innsbruck, TIWAG, Regional Government of Tyrol, Vienna University of Technology	Flood forecasting system for the Tyrolean Inn River (Austria): current state and further enhancements of a modular forecasting system for alpine catchments	2016	English	Document: Huttenlau_et_al_2016_HoPI_INTERPRAEVENT.pdf
291	TIWAG	Documentation "Der Bau des Kaunertal Kraftwerkes 1961-1964"	2013	German	DVD
292	TIWAG/GKI	Project GKI: List of all accidents	2016	German	Document: Aufstellung Unfallmeldungen GKI 161029.xlsx
293	Alpine Convention	Alpine Convention and Protocols	1995-2006	English	http://www.alpconv.org/en/convention/protocols/default.html
294	Tirol Unser Land	Tiris – Tyrolean Geographical Information System	2016	English	https://www.tirol.gv.at/statistik-budget/tiris/

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
295	Naturpark Ötztal	Naturpark Ötztal	2016	English	http://www.naturpark-oetztal.at/en/nature-culture/protected-areas/ruhegebiet-oetztal-alps.html
296	European Commission	Habitats Directive	1992	English	http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf
297	WWF	WWF comments for the Kaunertal Hydropower Sustainability Assessment and complementary documents	2016	English / German	
298	Various	Documentation provided by the Environmental Ombudsman	various	German	
299	OECD	Health at a Glance 2015. How does Austria compare?	2015	English	https://www.oecd.org/austria/Health-at-a-Glance-2015-Key-Findings-AUSTRIA.pdf
300	Austrian Commission for UNESCO	Annual report 2014	2014	English	http://www.unesco.at/unesco/jbpdf/jahrbuch2014engl.pdf
301	UNESCO	UNESCO´s MAB programme in Austria	2005	English	http://epub.oeaw.ac.at/0xc1aa500e_0x000f98ec.pdf
302	BDA	BDA	2016	German	http://www.bda.at/
303	WHO	Public Health in Austria	2011	English	http://www.euro.who.int/__data/assets/pdf_file/0004/153868/e95955.pdf
304	WISA	Wasser Informationssystem Austria	2016	German	http://wisa.bmlfuw.gv.at/wasserkarten/gewaesserbewirtschaftungsplan-2015/fluesse_und_seen/ngp_omassn_geplant_quer_laengs/ngp_omassn_geplant_quer_laengs.html
305	Tirol Unser Land	Health in the Tyrol	2016	English	https://www.tirol.gv.at/en/health/
306	Municipality Kaunertal	Innovationsprojekt	n.d.	German	http://kaunertal.riskommunal.net/system/web/datei.aspx?menuonr=221094004&typid=221094000&detailonr=221094000
307	Provincial Government of the Tyrol (Amt der Tiroler Landesregierung)	Gemeindefinanzbericht 2016	2016	German	https://www.tirol.gv.at/fileadmin/themen/tirol-europa/gemeinden/downloads/GFB2016.pdf

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
308	Tiroler Raftingverband (Tyrolean Rafting Association)	Wertschoepfungsdaten des Rafting-Sports im Tiroler Oberland	2014	German	
309	OGM (Österreichische Gesellschaft für Marketing)	Umfrage APA/OGM Vertrauensindex Wirtschaft Energieunternehmen	2013	German	http://www.ogm.at/inhalt/2013/06/vertrauensindex-wirtschaft/APA-OGM-Vertrauensindex-Wirtschaft-Energie_Juni-13.pdf
310	Tiroler Tageszeitung	Forum bringt Gegner an einen Tisch	2012	German	Forum bringt Gegner an einen Tisch
311	Oetztal-Tourismus	Beschluss des Oetztal Tourismus gegen die Ableitung der Gurgler und Venter Achen ins Kraftwerk Kaunertal	n.d.	German	http://user.tt.com/download.php?file=31848
312	Tiroler Rafting-Verband (Tyrolean Rafting Association)	Sachverhaltsdarstellung zum Wasserwirtschaftplan Tiroler Oberland	2014	German	
313	INITIATIVE PITZTAL - AKTIONSBÜNDNIS ÖTZTAL - LEBENSWERTES KAUNERTAL	TIWAG-Projekt Kaunertal vor dem endgültigen AUS	2006	German	http://www.dietiwag.at/mat/taschachtal.pdf
314	Verwaltungsgerichtshof	Entscheidung 18.12.2014	2014		
315	Gemeinderat Sölden	Sitzungsprotokolle		German	http://www.soelden.tirol.gv.at/Gemeindepolitik/Sitzungsprotokolle
316	Gemeinderat Kaunertal	Sitzungsprotokolle		German	http://www.kaunertal.eu/
317	Gemeinderat Prutz	Sitzungsprotokolle		German	http://www.prutz.tirol.gv.at/Politik/Sitzungsprotokolle
318	TIWAG	Schreiben an Landesregierung zur	2015	German	

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
		Vorhabensmodifikation hinsichtlich "Gurgler Ache"			
319	17 Agrargemeinschaften Oetztal	Vollversammlungsbeschlüsse	2012-2013	German	
320	Gemeinde Kaunertal	Entwicklungsprogramm 2013-2017	2013	German	
321	Gemeinde Kaunertal/TIWAG	Kraftwerk Kaunertal - Informationsblatt Störfall	n.d.	German	http://kaunertal.riskommunal.net/gemeindeamt/download/Kraftwerk%20Kaunertal%20-%20St%C3%B6rfall%20Information.pdf
322	Tiroler Tageszeitung	Tiwag bietet Kaunertal doppelte Entschädigung	2012	German	http://www.tt.com/home/4434559-91/tiwag-bietet-kaunertal-doppelte-entsch%C3%A4digung.csp
323	WWF et al	Gewaesserschutzplan Unser Inn	2013	German	http://www.fluessevollerleben.at/fileadmin/user_upload/PDF/Gewaesserschutzplan_Unser_Inn.pdf
324	WWF	ÖKOMASTERPLAN STUFE III - Schutz für Österreichs Flussjuwele	2014	German	http://www.fluessevollerleben.at/fileadmin/user_upload/Downloads/Oekomasterplan_III.pdf
325	WWF	GEFAHR FÜR DIE ÖTZTALER ALPEN - MEGA-PROJEKT AUSBAU KRAFTWERK KAUNERTAL	n.d.	German	http://www.wwf.at/de/view/files/download/showDownload/?tool=12&feld=download&sprach_connect=2049
326	Regula Imhof	Offener Brief Rücktritt TIWAG Aufsichtsrat	2015	German	https://www.alpenverein.at/portal_wAssets/docs/natur-umwelt/aktuell/3_Alpine-Raumordnung/Wasserkraft/Ruecktritt_TIWAG_Aufsichtsrat_Regula_Imhof_2015.pdf
327	WWF	Energiewende und Gewässerschutz in Tirol	2016	German	http://www.wwf.at/de/view/files/download/showDownload/?tool=12&feld=download&sprach_connect=3101
328	TIWAG	Wasserwirtschaftlicher Rahmenplan Tiroler Oberland	2014	German	https://www.tirol.gv.at/fileadmin/themen/umwelt/wasser/wasserkraft/WWRP%20Tiroler%20Oberland.pdf
329	Bundesminister für Land und Forstwirtschaft, Umwelt und	Verordnung BGBL. II Nr. 274-2014 Zusammenfassende Erklärung zur	2014	German	http://wisa.bmlfuw.gv.at/fachinformation/ngp/WWRP_Tirol_erlassen.html

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
	Wasserwirtschaft	Öffentlichkeitsbeteiligung zum Wasserwirtschaftlichen Rahmenplan Tiroler Oberland			
330	ETH Zürich	Pumpspeicher im trilateralen Umfeld Deutschland, Österreich und Schweiz	2014	German	http://www.bmwfw.gv.at/EnergieUndBergbau/Energieversorgung/Documents/Pumpspeicher%20im%20trilateralen%20Umfeld%20Deutschland,%20%C3%96sterreich%20und%20Schweiz.pdf
331	ETG - VDE	Energiespeicher für die Energiewende	2012	German	http://www.chemieingenieurwesen.de/VDE-Studie_Energiespeicher_Kurzfassung.pdf
332	EASI/WWF	AUSBAU SPEICHERKRAFTWERK KAUNERTAL UND ERWEITERUNG AUF PUMPSPEICHERUNG	n.d.	German	http://www.wwf.at/de/view/files/download/showDownload/?tool=12&feld=download&sprach_connect=2258
333	Landesrechnungshof Tirol	Bericht über die Sonderprüfung bei der TIWAG zum „Sonderprojekt Kaunertal" sowie der Verwendung der für Werbung, Öffentlichkeitsarbeit, Beratung und Agenturen bilanzierten Mittel in den Jahren 2008, 2009 und 2010 bisher	2011	German	
334	Perlzmaier, Hofer, Holtzmann,	Aspects of engineering geology concerning the selection of a site for the upper stage reservoir for the Kaunertal power plant expansion project	2012		Geomechanik und Tunnelbau 5(5) · October 2012

Ref	Organisation	Title / Description	Year	Language	Weblink / Documents:
335	ec.europa.eu	Article on industry in Tyrol Province			https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/tyrol
336	Transparency International				https://www.transparency.org/country/#AUT_DataResearch
337	Dietiwag website				www.dietiwag.at
338	Committee of Sponsoring Organizations o f the Treadway Commission				http://www.coso.org/
339	Right to Information				http://www.rti-rating.org/country-data/
340	Investopedia	Web information on discounted cash flow			http://www.investopedia.com/walkthrough/corporate-finance/3/discounted-cash-flow/introduction.aspx
341	ICIS.com	Article on German pump storage			http://www.icis.com/resources/news/2014/09/03/9817356/german-pumped-storage-in-crisis-as-solar-crushes-economics/
342	Offener Haushalt	Website with selected municipal budgets		German	https://www.offenerhaushalt.at/ https://www.offenerhaushalt.at/gemeinde/prutz
343	Gemeinde Kaunertal	Municipal budget annnouncements 26 Jan 2016, 21 Nov 2016, and 13 Dec 2016; page 50 of 2016 budget reconcialiation		German	
344	European Commission	Information regarding PCI and link for the PCI-list of the European Commission			https://ec.europa.eu/energy/en/topics/infrastructure/projects-common-interest
345	European network of transmission system operators for electricity	ENTSO-E stakeholder engagement information			https://www.entsoe.eu/major-projects/ten-year-network-development-plan/stakeholder-interaction/Pages/default.aspx https://www.entsoe.eu/major-projects/ten-year-network-development-plan/long-term-network-development-stakeholder-group/Pages/default.aspx

Appendix D: Visual Evidence

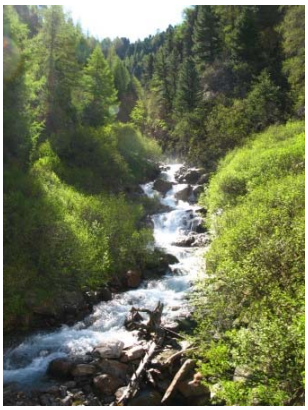
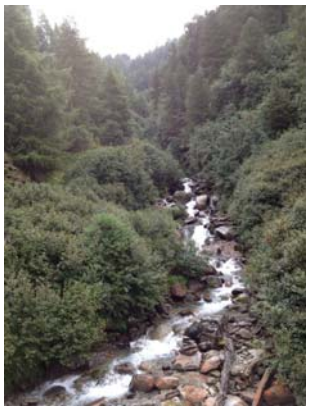
	

Photo 1: P19 21 Ferwallbach intake area	Photo 2: P-7 P-23 Site of Koenigsbach weir
	
Photo 3: P-7 Site of Gurgler intake	Photo 4: P19 P21 Gurgler Ache intake area
	
Photo 5: P5 P18 Proposed construction site at Gurgler	Photo 6: P-7 Gurgler Ache downstream of the intake site, where the track bridges the river

	
Photo 7: P-23 View of Gurgler Ache immediately downstream of the site of the intake	Photo 8: P-4 P-23 Physical model of Gurgler intake
	
Photo 9: P-23 Intake structure on physical model of Gurgler intake	Photo 10: P-4 P-20 P23 Bottom outlet (downstream) on physical model of Gurgler intake

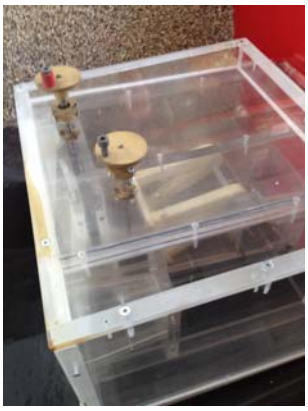



Photo 11: P-4 P-20 P23 Bottom outlet on physical model of Gurgler intake	Photo 12: P-7 Site of Venter intake

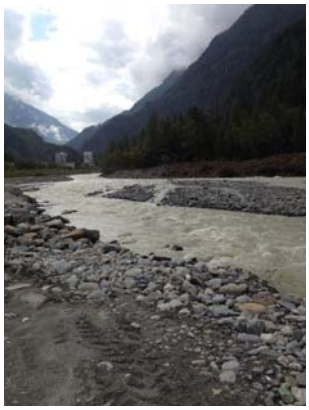
	
Photo 13: P-4 Deposit area Venter Ache intake	Photo 14: P-7 Monitoring point on Ötztaler Ache
	
Photo 15: P-7 P-23 Sölden monitoring point	Photo 16: P-20 Gravel extraction area, Ötztaler Ache
	
Photo 17: P-13 Ötztaler Ache at kayaking reach	Photo 18: P-13 Area 47 pool - largest rafting business

	
Photo 19: P-13 Ötztaler Ache kayak world championships	Photo 20: P-13 P-23 Rafting centre, Ötztaler Ache
	
Photo 21: P-23 View downstream of Öztaler Ache from rafter's centre	Photo 22: P-3 P-4 P-13 Kaunertal valley before reservoir
	
Photo 23: P21 P22 View of the Gepatsch reservoir	Photo 24: P-22 Left bank of Gepatsch reservoir where improved galleries road will be built

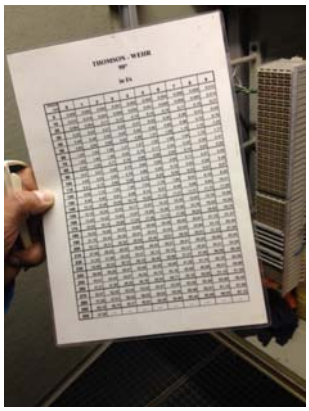
	
Photo 25: P-8 Monitoring point on Gepatsch dam	Photo 26: P-8 P-22 Landslide on left bank of Gepatsch dam
	
Photo 27: P-8 P-22 Landslip on left bank of Gepatsch dam	Photo 28: P-8 Records of dam movement monitoring within Gepatsch dam
	
Photo 29: P-8 Seepage monitoring at base of Gepatsch dam	Photo 30: P-8 Dam movement monitoring instrumentation within Gepatsch dam

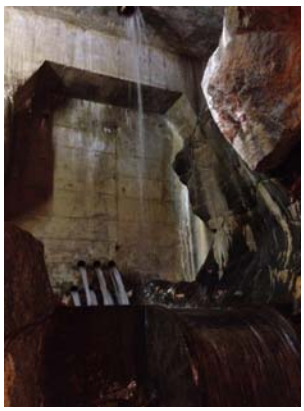
	
Photo 31: P-13 Exhibition at TIWAG info center at Gepatsch	Photo 32: P-13 P-22 Visitors from tourist buses at Gepatsch dam
	
Photo 33: P-13 cattle above Gepatsch reservoir	Photo 34: P-4 P-10 West shore road on Gepatsch reservoir, future access to ski area
	
Photo 35: P-1 P-13 Tourists visiting Gepatsch dam	Photo 36: P-8 At base of Gepatsch dam
	
Photo 37: P5 Old quarry near by the Gepatsch reservoir	Photo 38: P-8 Adit to reach monitoring points for deep-seated rock masses research

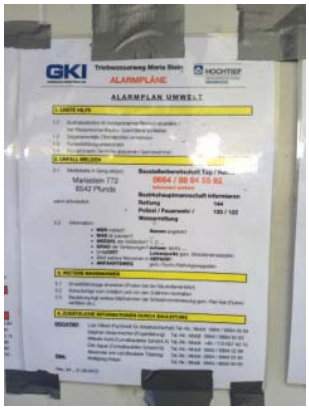
	
Photo 39: P19 Tail of the Gepatsch reservoir in June 2016, wetland restoration area	Photo 40: P-23 Part of Gepatsch dam with Fagge stream in foreground
	
Photo 41: P-4 P-13 Road to Kaunertal through Prutz	Photo 42: P1 P5 KXP EIA Rev 1 in office of Kaunertal mayor
	
Photo 43: P-8 Concrete tubbings for use on GKI project	Photo 44: P5 Environmental emergency plan at GKI
	
Photo 45: P-23 River Inn at GKI	Photo 46: P19 landscape near Pfunds

	
Photo 47: P5 P17 P19 Pfundser Tschey cabins	Photo 48: P19 View of the Platzertal valley
	
Photo 49: P-13 P-23 Platzer Alm at Platzertalbach	Photo 50: P-13 Platzeralm
	
Photo 51: P-13 Platzertal valley vegetation below dam	Photo 52: P19 Amphibian at the Platzertal
	
Photo 53: P19 Marmot at the Platzertal	Photo 54: P19 Game species at the Platzertal

	
Photo 55: P17 Old ore processing plant buildings at Platzertal	Photo 56: P17 P19 Traditional landscape of alpine meadows and huts in the Platzertal
	
Photo 57: P-23 Platzertalbach immediately below dam site	Photo 58: P-23 Platzertalbach downstream of dam site
	
Photo 59: P5 P13 P18 Junction at Prutz	Photo 60: P-4 Prutz tailrace and switchyard area
	
Photo 61: P-13 Housing adjacent to Prutz power station	Photo 62: P-4 Runserau Weir on Inn (to be raised)

	
Photo 63: P-8 Runserau Weir	Photo 64: P-22 Life-saving ring at Runserau Weir
	
Photo 65: P-22 Path beside Runserau Weir, not effectively restricted to the public	Photo 66: P-22 Runersau Weir as seen from upstream
	
Photo 67: P-22 Bridge over Runserau to be raised	Photo 68: P21 Water monitoring point
	
Photo 69: P19 Existing Fish Lift at Runserau	Photo 70: P19 Invasive Species at Runserau

	
Photo 71: P-1 TIWAG visitor center Silz	Photo 72: P-8 manager of Silz plant demonstrating Operating and Monitoring Manual

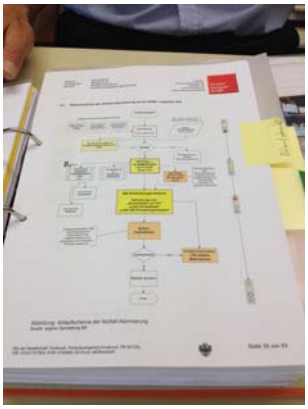



Photo 73: P-8 Manager of Silz plant describes the Emergency Response Plan	Photo 74: P-8 Manager of Silz plant shows compilation of monitoring data for the reservoirs
	
Photo 75: P-7 Imst powerplant	Photo 76: P-22 Area adjacent to Imst to become tailwater basin
	
Photo 77: P-22 Tailrace of Imst looking towards the railway	Photo 78: P13 P19 Fishing club supporting restocking programmes in the Inn river

Photo 79: P17 Roadside memorial to be relocated near Runserau

Photo 80: P17 Monument to be relocated near Runserau

Photo 81: P17 Pontlatz bridge

Photo 82: P17 Route of Via Claudia Augusta displayed at Pontlatz bridge

Photo 83: P18 Hospital with helipad at Zams