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Aspects, targets and solutions in hydropeaking mitigation in South Tyrol / Italy – The example of Valsura River

Wasser Agenda 21 – Fachtagung 2016:
Sanierung der Auswirkungen von Schwall und Sunk - Herausforderungen und Lösungen

28. Oktober 2016

Georg Premstaller

wir sind südtiroler energie

siamo l'energia dell'alto adige

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Background

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Project‘s Background

- **South Tyrol/ Italy: has an** overall HPP production of 5,0 TWh;
- 2005 - 2010 **renewal of concessions** for 11 large HPPs in a competition

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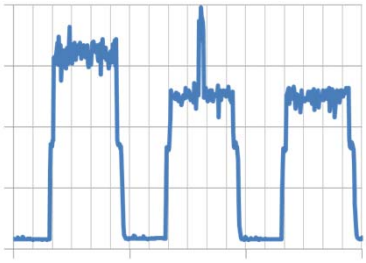
Project‘s Background

- Concrete environmental mitigation are on the realized and on the way for morphological improvements, fish passes and **hydropeaking mitigation projects**
- Budget for environmental measures approximately **350 Mio. Euro over 30 years**



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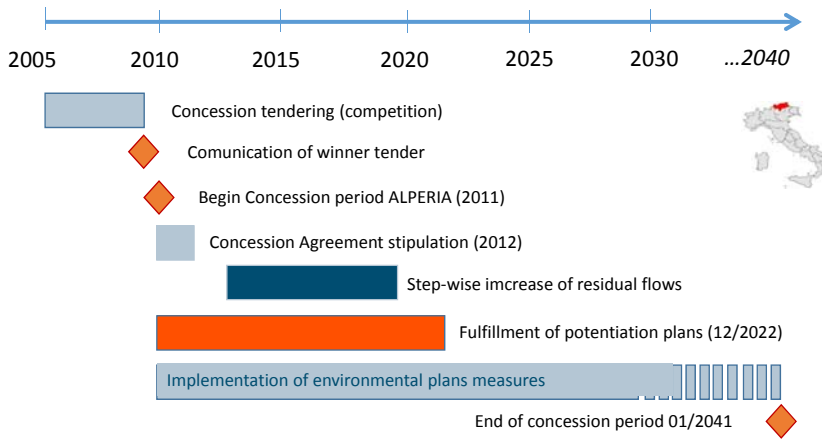
Time Schedule of concession renewal



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Hydropeaking mitigation projects

	HPP	Reservoir	Production
Isarco Cascade (1275 GWh)	Bressanone	Daily	451
	Pt. Gardena	Run-off-River	233
	Cardano	Run-off-River	591
Valsura Cascade (383 GWh)	Fontana bianca	Annual	1,3
	Pracomune (PSP)	Annual	13
	S. Valburga	Weekly	86
	S. Pancrazio	Annual	98
	Lana	Weekly	185
Molini Cascade (122 GWh)	Lappago	Annual	68
	Molini di Tures	Daily	54

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1. Project scoping

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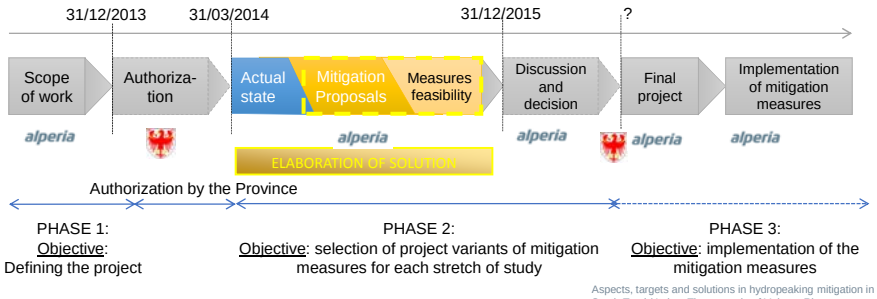
Project Scoping

- Since no concrete reference projects or guidelines **for hydropeaking mitigation** in Italy are available a **scoping phase** was performed to harmonize **expectations** of authorities and **contents** of the project
- The resulting **methodology** was applied for projects on three rivers (Falschauer, Eisack und Mühlwalderbach)



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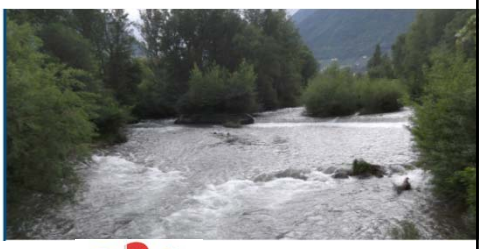
Project Objectives

Definition of Objectives:

Improvement of **ecological state**

Improvement of **human safety**



But:

- What does this exactly mean ???
  - How much improvement is necessary?

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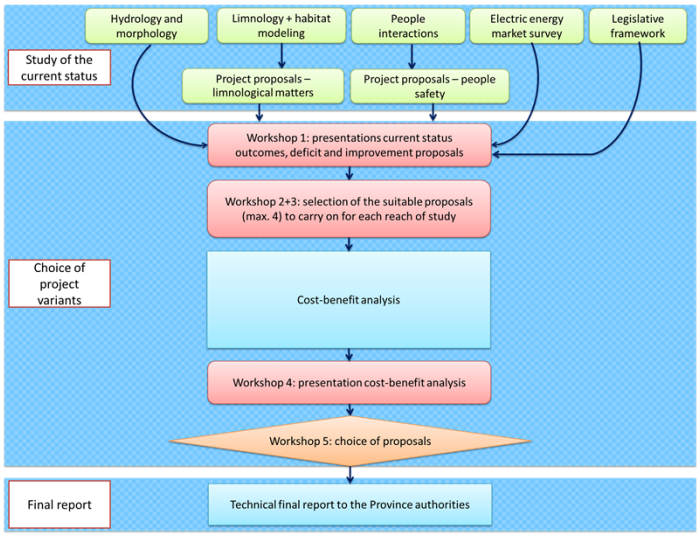
Project Setup



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2. Deficit analysis, improvement proposals and ecological targets

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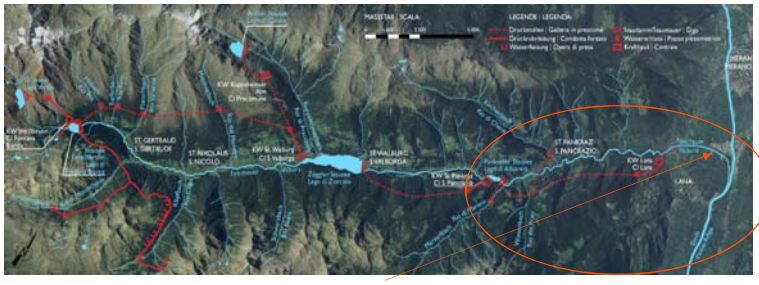
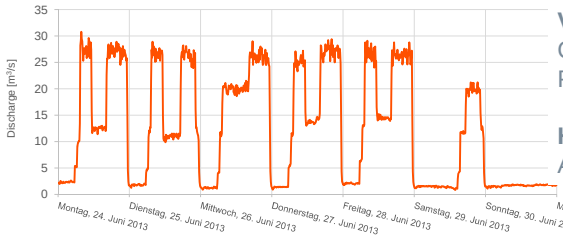
Valsura system and hydropeaking





Valsura River:
Off-Peak flow ~ 1 m³/s
Peak flow ~27 m³/s

Hydropeaked Stretch:
Approximately 4.5 km

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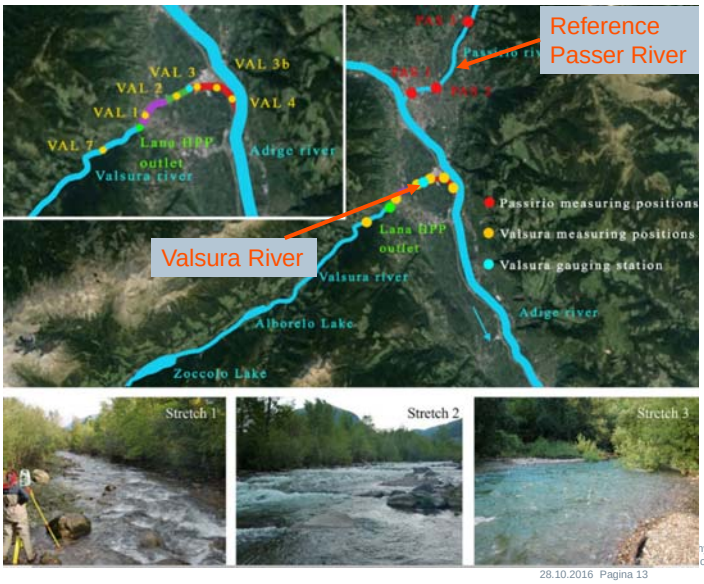
Actual state and deficit analysis



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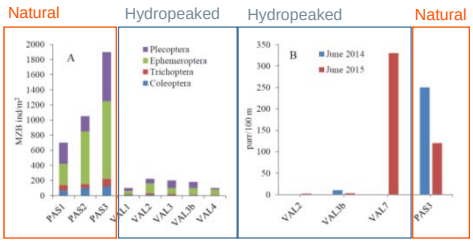
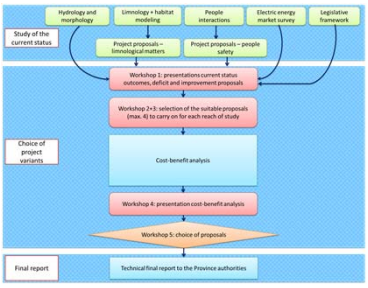
Ecological target





Actual state

Definition of a target:
"[…] good ecological functionality of the river […]"

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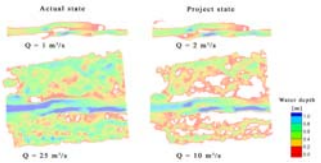
Hydrological translation of ecological targets

Hydraulic Simulations



Limnological experts (Adami, Schweizer)

Habitat modelling (PhD Pisaturo)

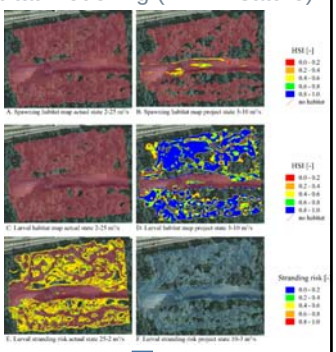


Table 4. Ecological and hydrological targets to improve habitat status.

	Q_{min}	Q_{max}	Water depth max down ramping rate 7 $m^3/s \rightarrow Q_{min}$	Operational mitigation measures	Fish ecology
Month	[m^3/s]	[m^3/s]	[cm/min]		Important factors
January	2	10	0.4		Water depth for juvenile and adult; redd stability;
February	2	10	0.2		Water depth for juvenile and adult; redd stability; brown trout alevin emergency
March	3	5	0.2	Few days with 5 $m^3/s<Q<8$ m^3/s	Water depth for juvenile and adult; redd stability; brown trout alevin emergency; grayling spawning
April	3	10	0.2		Water depth for juvenile and adult; redd stability; grayling spawning; grayling alevin emergency
May	3	10	0.2	Flood of riparian forest $Q>25$ m^3/s	Water depth for juvenile and adult; grayling alevin emergency
June	3	10	0.4	Flood of riparian forest $Q>25$ m^3/s	Water depth for juvenile and adult; juvenile brown trout
July	3	10	0.4		Water depth for juvenile and adult; juvenile brown trout
August	3	10	0.4		Water depth for juvenile and adult; juvenile brown trout
September	3	10	0.4		Water depth for juvenile and adult; juvenile brown trout
October	3	10	0.4	Declogging $Q\approx15$ m^3/s	Water depth for juvenile and adult; juvenile brown trout
November	2	10	0.4	Few days with 5 $m^3/s<Q<8$ m^3/s	Water depth for juvenile and adult; brown trout spawning; redd stability
December	2	10	0.4		Water depth for juvenile and adult; brown trout spawning; redd stability

Hydrological Target State

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Hydrological translation of ecological targets

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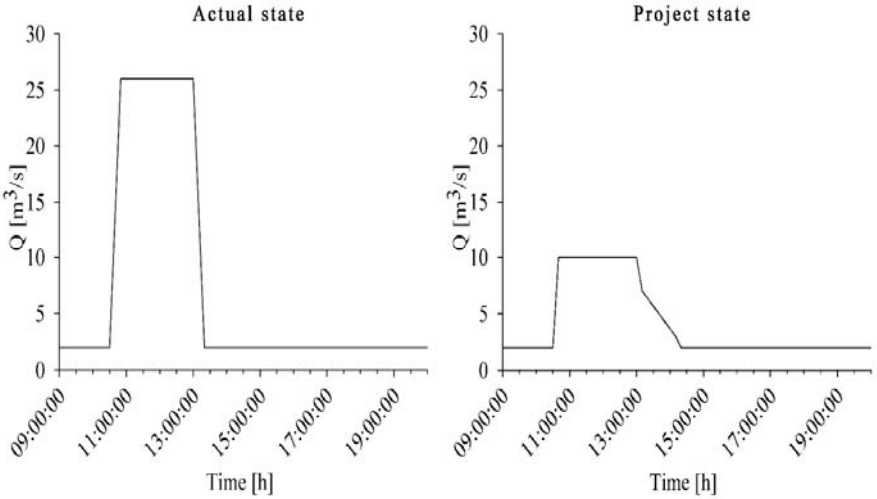
Proposed Peak-Off-Peak situations



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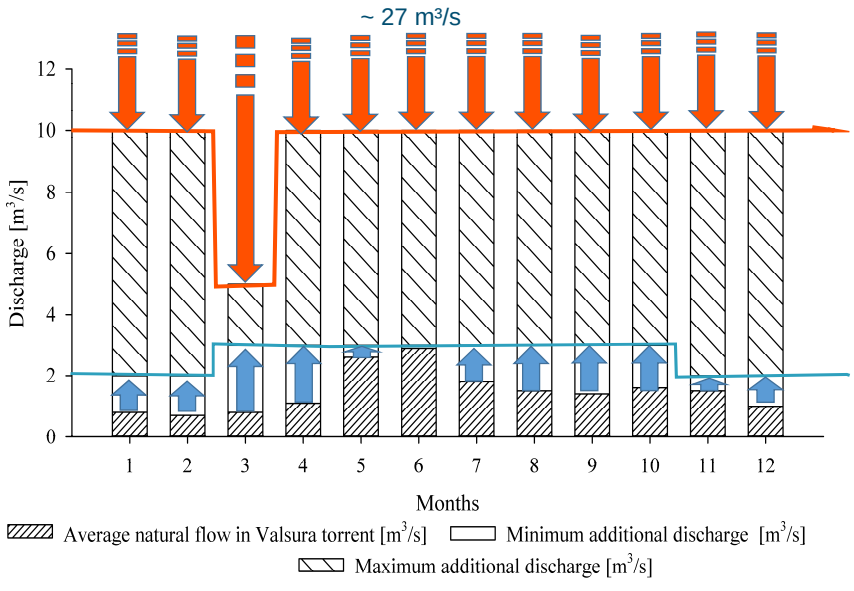
Discharge limitations



Further aspects considered

Further aspects:
- Human Safety
- Irrigation
- Biotope
- Groundwater
- Climate change
- Social change

Even more further aspects:
- Energy production
- Economics
- Concession aspects
- Local politics
- Funding and incentives
- Rights and property
- …

3. Proposed solution

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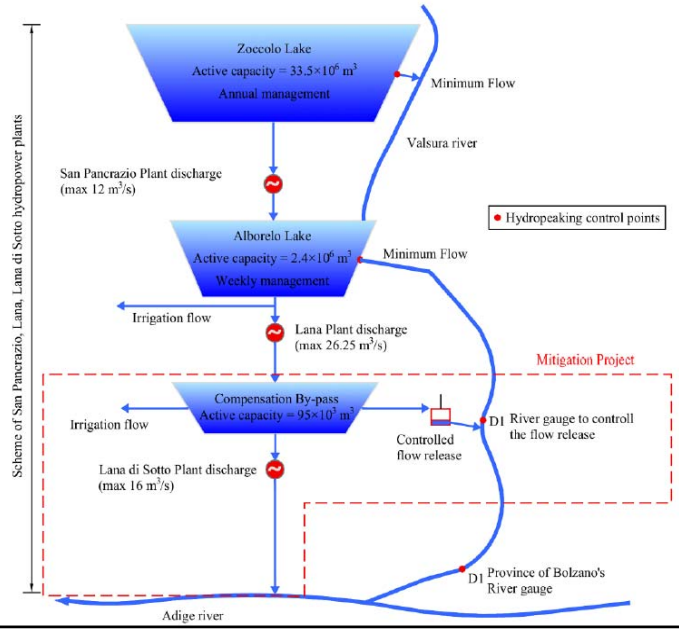
Proposed technical solution



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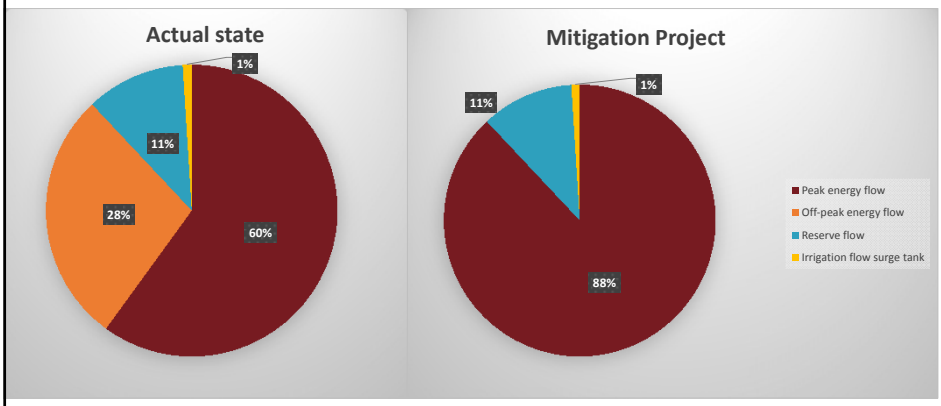
Hydrographs and Water balance at intakes



Proposed solution

- River:
  Increase base flow to 2-3 m³/s
  Reduce peak flow 10 m³/s
- Technical solution:

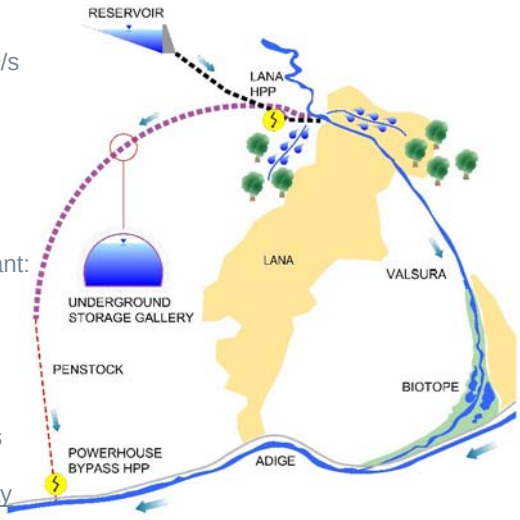
  Storage Gallery 95.000 m³

  Downstream hydropower plant:

  Design discharge 16 m³/s

  Installed Power 9 MW

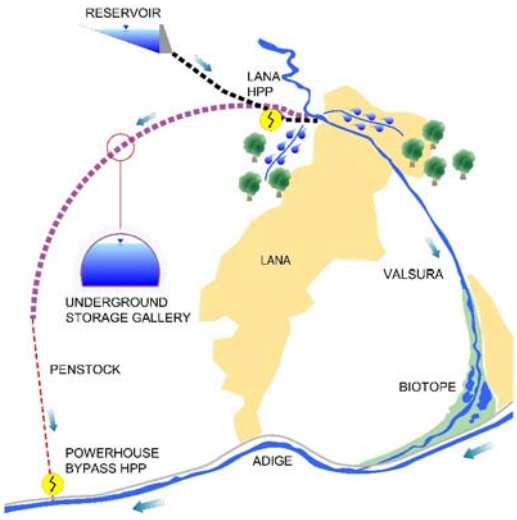
  Maintain irrigation releases
- Increase operational flexibility



4. Current state of the project

Current state

- The described project was handed in by the competent authorities
- Additional investigations are on the way to investigate the impacts on e.g. **ground water, biotope and landscape, irrigation**



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Water balance at HPP intake

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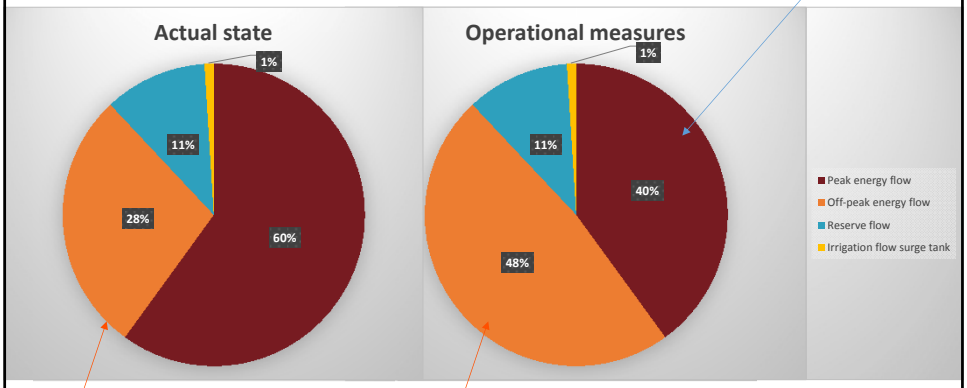

Approx. 28 % available water is used for irrigation → Off-peak production

In future additional 20% will released to improve base flow in future