



Alpine Convention Platform Water Management in the Alps Small Hydropower

2 Best Practice Examples from Bavaria/Germany

1) Infrastructure-related Hydropower Plant Esterberg

- Former drinking water supply system (3,6 km pressure pipeline DN 400 newly run)
- Head max. 502 m (highest in Bavaria)
- Twin-jet Pelton turbine with 44 -154 l/s
- Capacity 636 kW, electrical work 3,1 GWh p.a.
- Costs about 1,7 Mio. €, amortizes within 10 years
- Built in 2008
- Very good acoustic insulation of the power plant
- Inconspicuous integration within townscape
- In case of power failure isolated operation possible
- <http://www.gemeindewerke-garmisch-partenkirchen.de>



Power plant building



Pelton turbine



Synchronous alternator 830 kVA; weight 3,15 t, water cooled



2) ILUP – *Hydro Power Plant Vilshofen*

- Integrated **L**and **U**se **P**lanning and River Basin management = project initiative within INTERREG IIIB
- Aim: transferable results for European-wide river basin management
- Component: investigation for sufficient **residual water** delivery and re-establishment of **river continuity**; criteria to achieve „good status of water bodies “ (WFD)

ILUP – Planning area

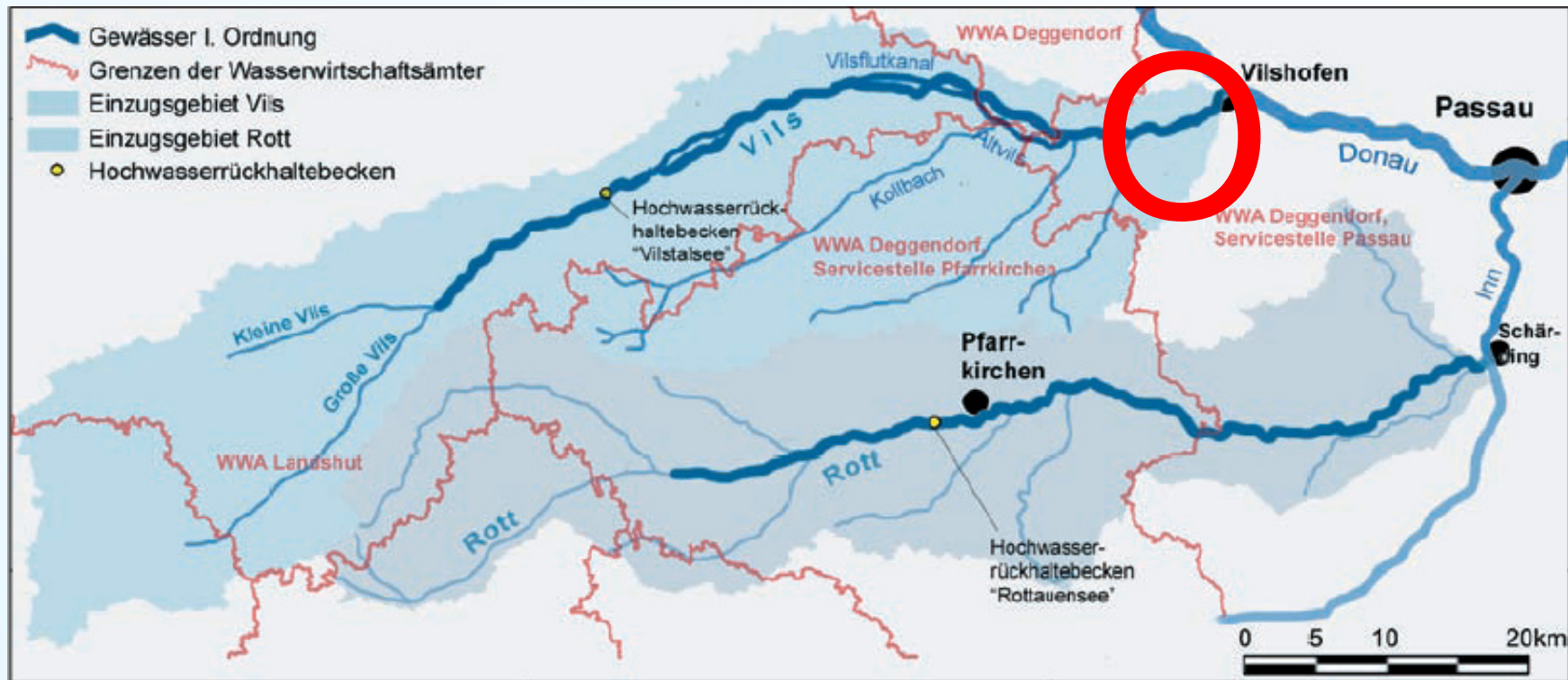





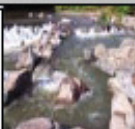


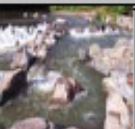


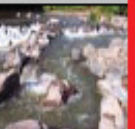


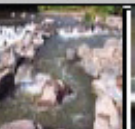

Abbildung 2: Das Projektgebiet in der Übersicht.



ILUP - Method

- Fish migration obstructed by transversal structures, e.g. hydroelectric power plants
- Evaluation of technical, hydrologic and economic data helps to provide suitable technical and economic proposals to re-establish river continuity
- All in all 261 transversal structures at rivers Vils & Rott
- 61 HPPs as serious obstacle for fish migration
- For each individual hydroelectric power plant and transversal structure applicable solutions have been examined on basis of evaluation pattern

ILUP - Method

Wanderweg	 Wiederherstellung der Durchgängigkeit am Wehr über die Ausleitungsstrecke						 Wiederherstellung der Durchgängigkeit am Krafthaus					
Lage	Fischaufstieg auf der am Obergraben liegenden Wehrseite			Fischaufstieg auf der dem Obergraben gegenüberliegenden Wehrseite			Fischaufstieg am Krafthaus (in Fließrichtung links)			Fischaufstieg am Krafthaus (in Fließrichtung rechts)		
Bauweise	 Naturnahes Umgehungs- gerinne	 Naturnaher Fischpass	 Technischer Fischpass	 Naturnahes Umgehungs- gerinne	 Naturnaher Fischpass	 Technischer Fischpass	 Naturnahes Umgehungs- gerinne	 Naturnaher Fischpass	 Technischer Fischpass	 Naturnahes Umgehungs- gerinne	 Naturnaher Fischpass	 Technischer Fischpass
Funktionalität	n. b.	n. b.	-	-	-	-	n. b.	n. b.	+	n. b.	n. b.	n. b.
Landschaftsbild	n. b.	n. b.	o	+	+	-	n. b.	n. b.	o	n. b.	n. b.	n. b.
Hochwassersicherheit	n. b.	n. b.	o	o	o	o	n. b.	n. b.	+	n. b.	n. b.	n. b.
Flächenbedarf	--	--	-	-	o	o	--	--	-	--	--	--
Investition	n. b.	n. b.	-	o	o	-	n. b.	n. b.	-	n. b.	n. b.	n. b.
Unterhaltung	n. b.	n. b.	o	o	o	-	n. b.	n. b.	o	n. b.	n. b.	n. b.
Summe:	0	0	3	5	6	2	0	0	6	0	0	0

Legende:

++	3 Punkte
+	2 Punkte
o	1 Punkt
-	0 Punkte
--	Ausschlusskriterium
n. b.	nicht bewertungsrelevant, da diese Variante durch andere Parameter ausgeschlossen wird Es ist keine für die Planung der Fischaufstiegsanlage relevante Ausleitungsstrecke vorhanden



ILUP - Criteria

- For hydroelectric power plants energetic and financial consequences of residual water delivery evaluated
- As well as effects of increased feed-in tariff after renewable energy sources act (EEG)
- Thus cost effectiveness has been examined from plant operators point of view



ILUP – HPP Vilshofen - Results

- In formerly dry river bed between existing weir and inlet of tailwater channel now 1,300 l/s residual water
- River stretch of approx. 210 m re-vitalized and ecologically re-valued
- Discharge provided by residual water turbine and fish ladder
- 85 m fish ladder designed for 300 l/s, so that fish and water organisms can reach headwater
- 27 small basins to overcome 4 m height difference to reach traditional spawning grounds upstream

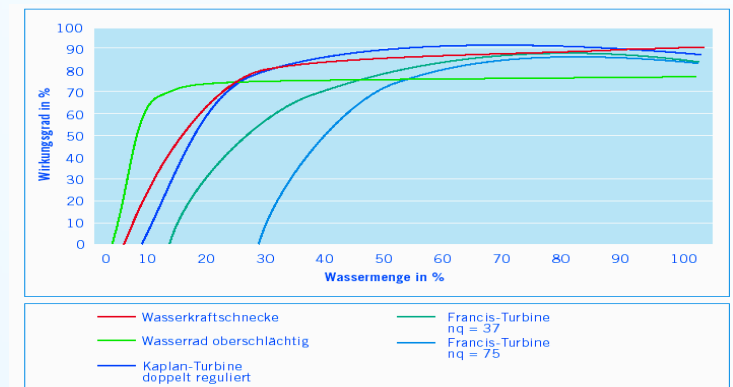
ILUP – HPP Vilshofen - Results





ILUP – HPP Vilshofen - Results

- Fish friendly turbine: energetic reversal of water auger
- Electrical output 26.5 KW; discharge 1.000 l/s guarantees ecologically necessary minimum water discharge in old river bed; produces over 200,000 kWh
- Together with existing plant expected 2.2 million kWh per year at this location (supply for 630 households)
- Fish-friendly transformation of screening unit: small organisms sticking with floating debris remain in water; flat iron bars with welded on round steel to minimize danger of fish injury





ILUP – HPP Vilshofen - Results

- Ecological improvements by providing **residual water discharge** and re-establishing **river continuity** fulfills condition for an **increased feed-in tariff** after EEG
- Transacted investments will thus already amortize in medium term
- Modernisation of HPP Vilshofen is good example of how ecological and economic interests can be brought together
- <http://interreg-ilup.de.basicbox18.server-home.net/ilupexp.html>
- <http://www.stadtwerke-vilshofen.de/>