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On suspended sediment transport and water chemistry in river Jökulsá í Fljótsdal drainage area in relation to Fljótsdalur hydro power plant

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I. Suspended Sediment Transport

In the period 1966-1980 some 198 suspended sediment samples have been collected in river Jökulsá í Fljótdal at water gauge 109, Hóll. Mean values of the sediment disharge are listed in Table I.

Table I. Mean suspended sediment disharge, water gauge 109, Hóll.

Fractions		mg/l	%
Sand	> 0,2 mm	15	3
Coarse silt	0,02-0,2 mm	84	20
Fine silt	0,002-0,02 mm	163	38
Clay	< 0,002 mm	165	39
	Total:	427	100

Dissolved solids on evaporation 56 mg/l

The river Jökulsá í Fljótsdal flows further downstream into lake Lögurinn, from which flows river Lagarfljót. On this river water gauge 17 is situated, at Lagarfoss. In the period 1966-1978 some 92 suspended sediment samples have been collected there. Mean values of this station are listed in table 2.

Table 2. Mean suspended sediment discharge, water gauge 17, Lagarfoss.

Fractions		mg/l	%
Sand	> 0,2 mm	1	1
Coarse silt	0,02-0,2 mm	3	7
Fine silt	0,002-0,02 mm	11	44
Clay	< 0,002 mm	11	46
	Total:	26	100

Dissolved solids on evaporation 38 mg/l

When comparing the capacity-inflow ratios of on the one hand reservoirs of Fljótsdalur Hydro Power Plant and on the other hand lake Lögurinn, it appears that they are very similar, or about 0,65. This ratio has been related to the trap efficiency of reservoirs (Chow V.T. 1964, p. 17-22) and in this case gives a value of 93-99 % trap efficiency.

Using the value of Hóll as input and the value of Lagarfoss as output for lake Lögurinn the trap efficiency is 94%, on within the expected range.

Accordingly the values of table 2 are considered the best approxiation available of the suspended sediment discharge to the Fljótsdalur Hydro Power Plant. As for the characteristics of individual grains, the majority is volcanic glass. Scarce fragments of somewhataltered volcanic rocks appear, mainly in the sand fraction. Clay minerals should be rather scarce, although unusually abundant compared to other rivers in Iceland.

II. Water Chemistry

There are rather few measurements on water chemistry from river Jökulsá í Fljótsdal, but the main characteristics of the water chemistry of the area have been studied in some detail. The drainage area may be divided into three main categories.

1. The Glacier
2. The East Montain-Area.
3. The Highland Plateau, west of the river.

No direct measurements are avialable from the glacier runoff. However in tarns under influence of the river on Eyjabakkar, contuctivity was about 50 µS /cm at temp. 25°C. The rivers draining the east montain area are mineral poor, due to the geological features and barren grounds. During the springthaw their conductivity is about 20 µS /cm and pH may be below 7,0. The lawest measured were around 6,5, which is likely to be charecteristic for the meltwater. The pH increases as the influence of meltwater decreases (table 3).

Table 3.

Water chemistry of some waters from the Lagarfljót drainage area.

	8 - 12 July			6 - 12 August		
	H_{25}	pH	A	H_{25}	pH	A
Gilsá (Eiðaþingsá)	20	6,5	0,11	20	7,1	0,10
Selfljót	22	6,7	0,11	23	7,3	0,14
Uppsalaá	48	7,0	0,37	58	7,5	0,45
Eyvindará v.brú (+Miðhúsaá)	21	(7,1)	0,14	22	6,9	0,15
" á Flötum	21	6,8	0,16	21	6,9	0,16
Slenjudalsá				17	6,9	0,07
Grímsá	34	7,1	0,12	50	7,1	0,28
Gilsá (á Völlum)	65	7,3	0,34	58	7,35	0,34
Kelduá	20	6,85	0,12	21	7,0	0,22
Hrafngerðisá	95	7,65	0,77			
Ormarsstaðaá	78	7,4	0,61	100	7,8	0,96
Svína	112	7,8	0,91	125	8,0	1,12
Rangá	70	7,5	o,59	77	7,5	0,56
Laxá í Jökulsárhlíð				69	7,7	0,60
Fossá				51	7,7	0,74
Sauðá				29		
kaldá				17	7,0	0,11

The water from the western highland is generaly richer in minerals, see table 4 for Hölkna, Grjótá and Laugará.

Table 4. Water chemistry of Lagarfjót drainage area.

	Date	pH	Cond H_{25}	mg l^{-1}								
				tot diss.	SiO_2	Na	K	Ca	Mg	$[HCO_3^-]$	Cl	F
J. Fljótsdal	1974.08.13	7,0	54	106	25,3	4,1	0,24	7,2	1,4	36	2,1	0,02
Lögurinn, Lagarfoss	1974.08.14	7,o	51	102	24,3	4,7	0,24	6,1	2,5	37	3,8	0,01
Lögurinn, Atlavík	1975.07.12	7,4										
" "	1975.08.22	9,5										
" Egilsst.	1975.07.13	7,3										
" "	1975.08.27	7,3										
" "	1978.07.14	7,0										
Kelduá	1977.07.29		27		4,7		0,14	2,6	0,64			
"	1980.07.08	6,85	20							7,3		
"	1980.08.08	7,0	21							13,4		
Hólkná	1978.07.19	7,2	85									
"	1978.07.26		64									
Grjótá	1978.07.19	6,9	30									
Laugará	1978.07.24		85									

From river Jökulsá í Fljótsdas only one measurement is available. It is from the inlet to Lake Lögurinn, after river Kelduá has joined it. All measurements of river Kelduá have given water poorer in minerals which means that the glacial water most likely has been richer than the figures in table 4 show.

Newertheless the power plant will never get water solely of either glacial east montain or west highland water, nor solely melt water. But water from a rerervoir-pool, which is an admixture of above categories. Most likely the pH will be close to 7.0, and the conductivity lowest close to 30, but most of the time at least 50.

References: Chow V.T. 1964. Handbook of Applied Hydrology. McGraw Hill.