



Interreg
Latvija-Lietuva

European Regional Development Fund



EUROPEAN UNION

**Ecological flow estimation in Latvian – Lithuanian Transboundary river
basins (ECOFLOW) LLI-249**

**HYDROGRAPHS
FOR SELECTED CASE-STUDY RIVERS
IN LITHUANIAN PART OF VENTA RIVER
BASIN DISTRICT**



Table of contents

I. SELECTION OF CASE STUDY SITES IN LITHUANIAN PART OF VENTA RBD	4
II. HYDROGRAPHS FOR SELECTED CASE-STUDY RIVERS	5
III. CONCLUSION.....	8

Abbreviation

HPP	Hydropower Plant;
RBD	River Basin District;
Q	Multi-year average discharge, m ³ /s;
WGS	Water Gauging Station

I. SELECTION OF CASE STUDY SITES IN LITHUANIAN PART OF VENTA RBD

30 small hydro power plants (HPP) are constructed on 10 rivers of Venta RBD. Data of water discharge are available only for 5 of those rivers; however, the remaining five rivers were not investigated. Currently, water discharge measurements are carried out only in two rivers (where HPPs are operating) at 3 water gauging stations (WGS) (Table 1). These WGSs have long data sets of water discharge. Three river sites were selected as the case studies based on the level of their investigation (Fig. 1, Table 1 and Table 2). The case study I is related to the Rudikiai HPP (Table 2) on the Venta River (Papilė WGS, Table 1), the case study II – to the Kuodžiai HPP (Table 2) on the Venta River (Leckava WGS, Table 1) and the case study III – to the Skuodas HPP (Table 2) on the Bartuva River (WGS – Bartuva-Skuodas, Table 1).

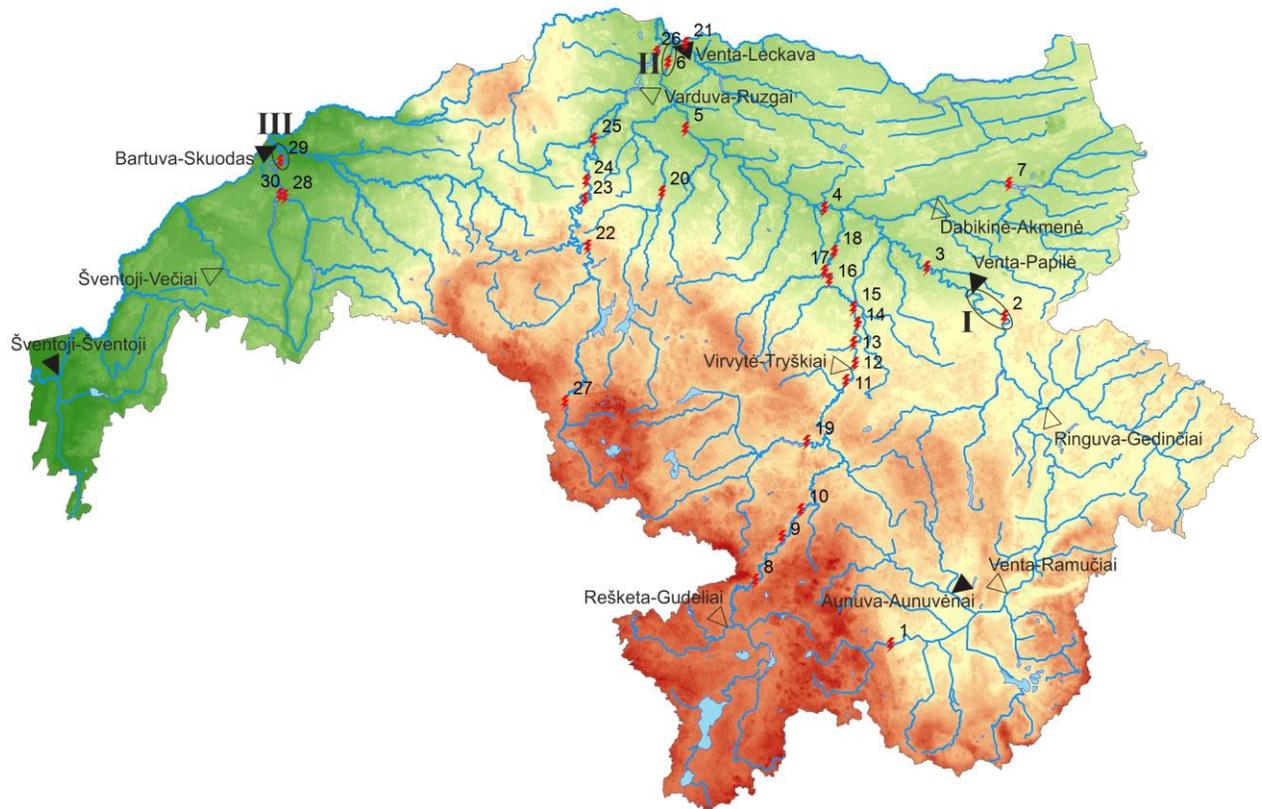


Fig. 1. Case study sites in Venta RBD

Table 1. Currently existing water gauging stations (WGS) on the rivers selected for case studies

No	River	WGS	Distance from the mouth, km	Basin area, km ²	Period of observations	Multi-year average discharge (Q), m ³ /s
1	Venta	Papilė	252.1	1560	1949-2015	9.93
2	Venta	Leckava	186.2	4024	1949-2015	29.1
3	Bartuva	Skuodas	48.7	616.7	1957-2015	7.37

Table 2. Small HPPs on the rivers selected for case studies

No	SHPP	River	Distance from the mouth, km	Basin area, km ²	HPP construction year	Installed capacity, kW
1	Rudikiai	Venta	261,2	1538	2002	70
2	Kuodžiai	Venta	188.9	4021	2005	600
3	Skuodas	Bartuva	52.8	259.6	2000	220

II. HYDROGRAPHS FOR SELECTED CASE-STUDY RIVERS

All hydro power plants on the rivers Venta and Bartuva were built after 2000. In order to assess the natural river runoff, i.e. without antropogenic (HPP) impact, the data sets of water discharge of 3 WGSs for the period of 1961-2000 were used (Table 3).

Probability analysis of forty-year discharge data sets revealed dry year (95% probability), normal year (50% probability), and wet year (5% probability) for each case study site. According to the data of different probability year, hydrographs for 3 WGSs were created (Fig. 2-4).

Hydrographs in Fig. 2 indicate that in the Venta River at Papilė WGS the biggest differences of runoff among dry, normal and wet years are in spring and autumn, while during the summer low flow period the differences are negligible.

Table 3. Average annual water discharge during the natural river regime (1961-2000). Red colour – dry year (95% probability), yellow colour – normal/average year (50% probability), and blue colour – wet year (5% probability)

	Average annual water discharge m ³ /s		
	Venta - Papilė WGS	Venta - Leckava WGS	Bartuva - Skuodas WGS
1961	8.67	28.2	6.26
1962	13.4	38.9	8.91
1963	8.16	24.7	8.01
1964	5.62	16.2	3.94
1965	7.43	21.5	5.41
1966	10.1	28.1	5.55
1967	10.3	29.3	8.47
1968	7.79	22.3	4.96
1969	5.43	13.8	3.19
1970	8.06	25.3	7.57
1971	4.46	16.2	4.56
1972	7.15	21.8	5.50
1973	5.45	18.4	7.51
1974	14.2	42.0	7.71
1975	6.68	21.1	3.88
1976	3.89	14.3	3.24
1977	8.83	31.8	9.89
1978	11.8	43.8	11.2
1979	11.1	36.4	9.79
1980	18.8	60.8	12.2
1981	14.0	52.2	13.6
1982	9.02	28.9	6.32
1983	11.7	40.2	9.86
1984	9.96	33.8	9.78
1985	15.7	43.7	9.58
1986	13.0	35.2	10.0
1987	12.8	32.5	8.48
1988	9.97	28.8	9.67
1989	9.32	29.9	8.13
1990	14.3	43.6	10.7
1991	10.2	30.1	8.53
1992	8.48	26.8	8.78
1993	7.76	25.2	7.19
1994	11.8	38.2	8.75
1995	13.9	40.4	8.55
1996	6.36	18.5	3.74
1997	9.68	27.6	8.10
1998	15.1	42.4	9.38
1999	10.8	31.5	7.84
2000	7.60	22.8	5.42

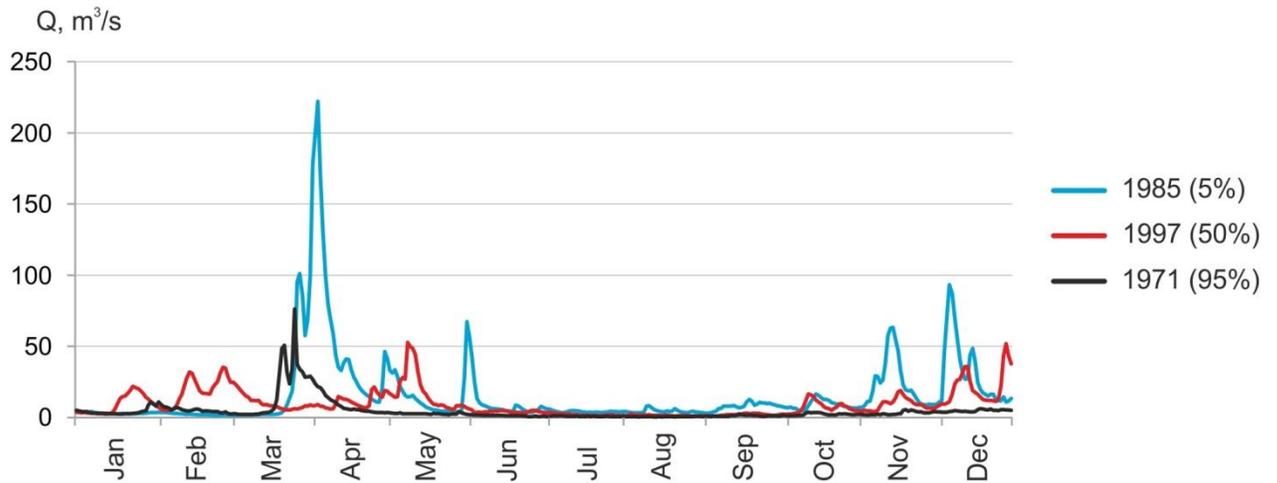


Fig. 2. Hydrographs of dry, normal and wet years for the Venta River - Papilė WGS

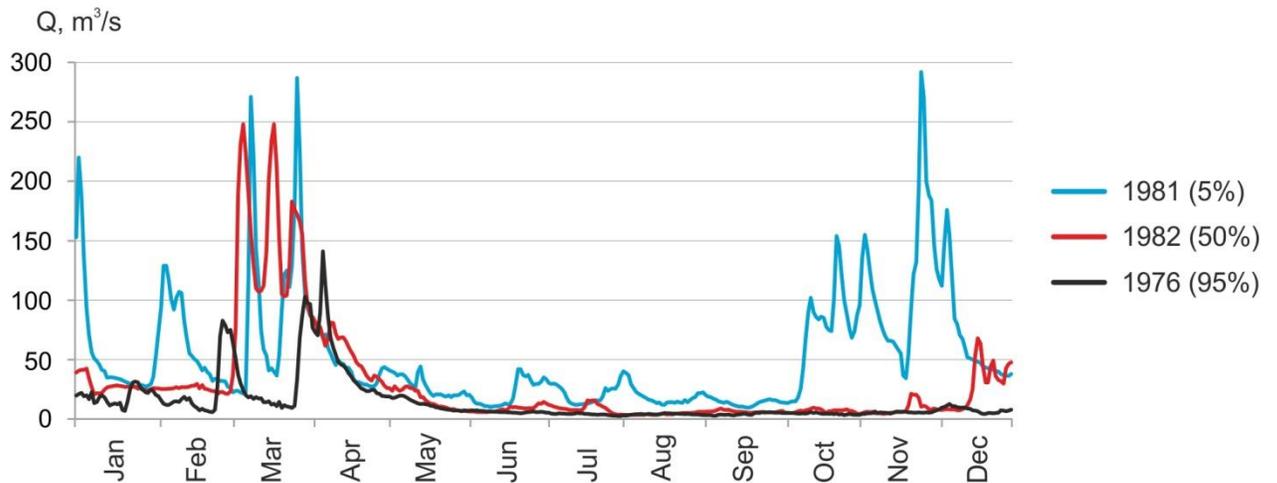


Fig. 3. Hydrographs of dry, normal and wet years for the Venta River - Leckava WGS

Hydrographs of the Venta River - Leckava WGS (Fig. 3) illustrate large runoff differences between dry and wet year not only in spring and autumn, but in summer low flow period as well. During summer low flow period of wet year runoff is uneven, while in dry year it is quite uniform. This WGS can be characterised as having a long low flow period (from May to September).

Similar situation is observed in hydrographs of the Bartuva River (Fig. 4); only low flow period in this river lasts shorter, especially during wet year.

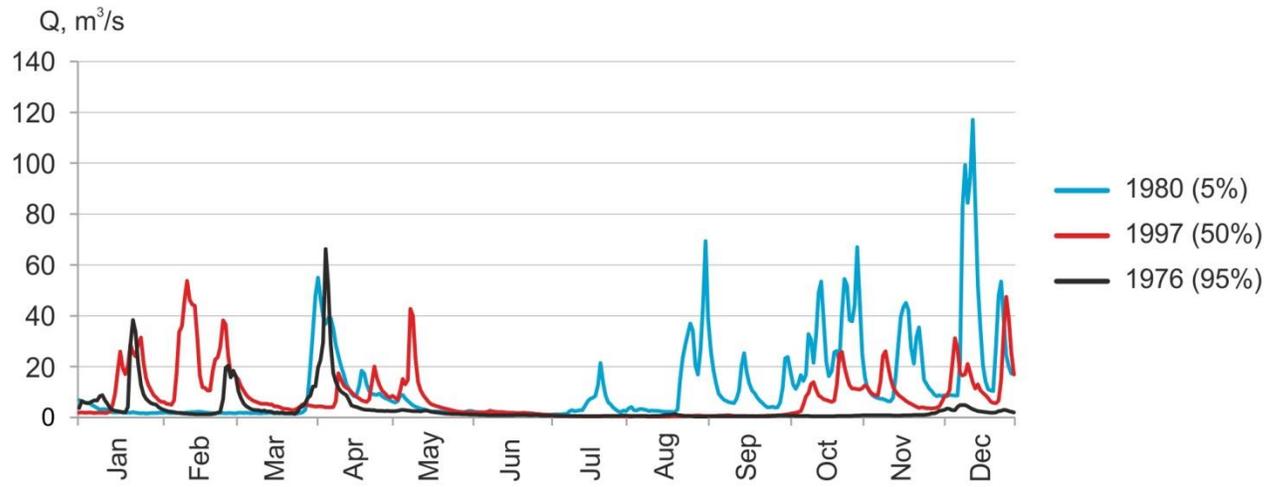


Fig. 4. Hydrographs of dry, normal and wet years for the Bartuva River - Skuodas WGS

III. CONCLUSION

Prepared river hydrographs are going to be used for an assessment of e-flow patterns in Venta RBD.