Interreg
Latvija–Lietuva
European Regional Development Fund

EUROPEAN UNION

Trans WAT

Joint management of Latvian – Lithuanian transboundary river and lake water bodies (TRANSWAT)

Results of habitat surveys in Lithuania

Vytautas Akstinas | *hydromorphology expert*

Management of Latvian-Lithuanian transboundary water bodies
6 September 2022

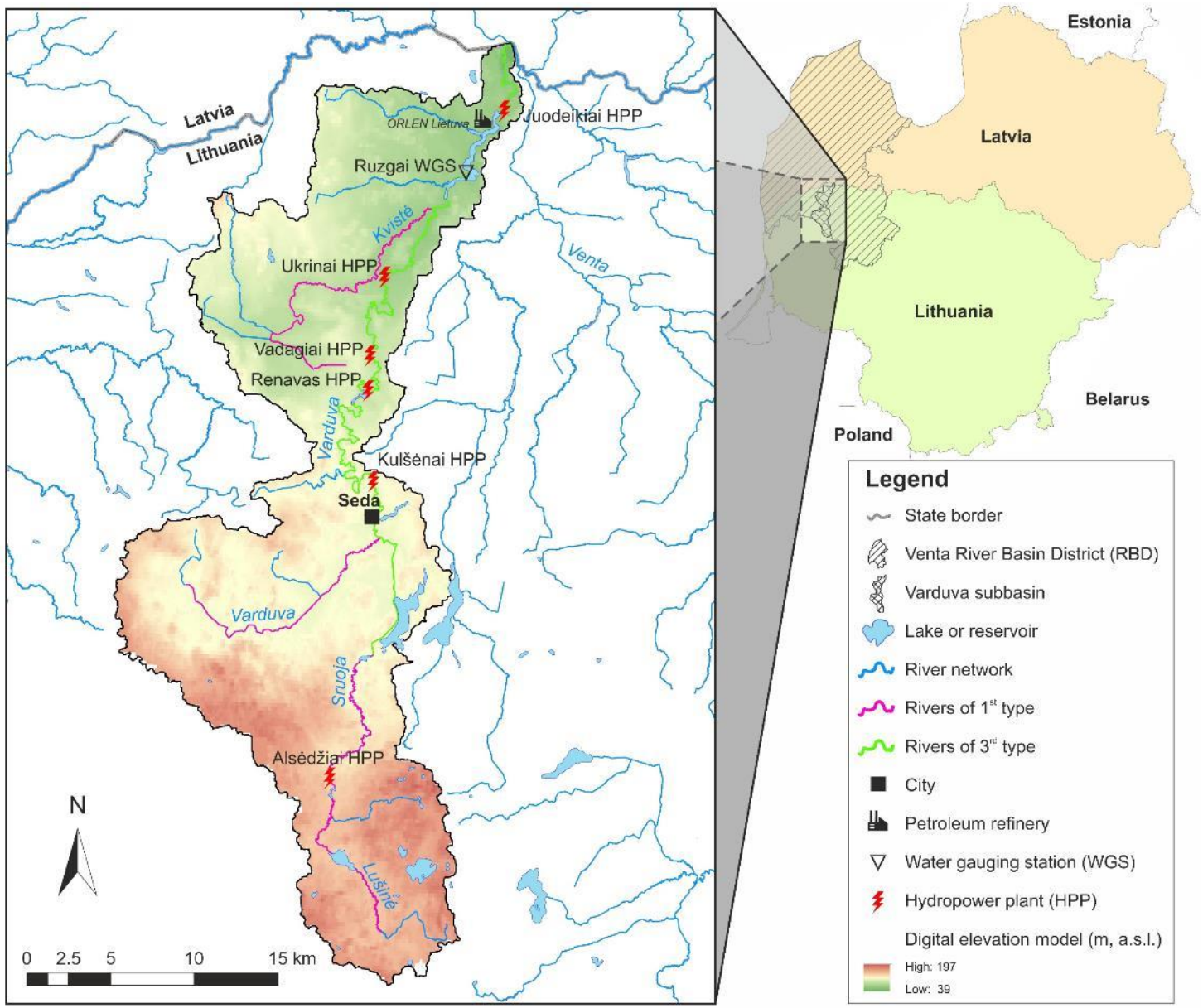
LATVIJAS VIDES, ĢEOLOĢIJAS UN METEOROLOĢIJAS CENTRS

LITHUANIAN ENERGY INSTITUTE

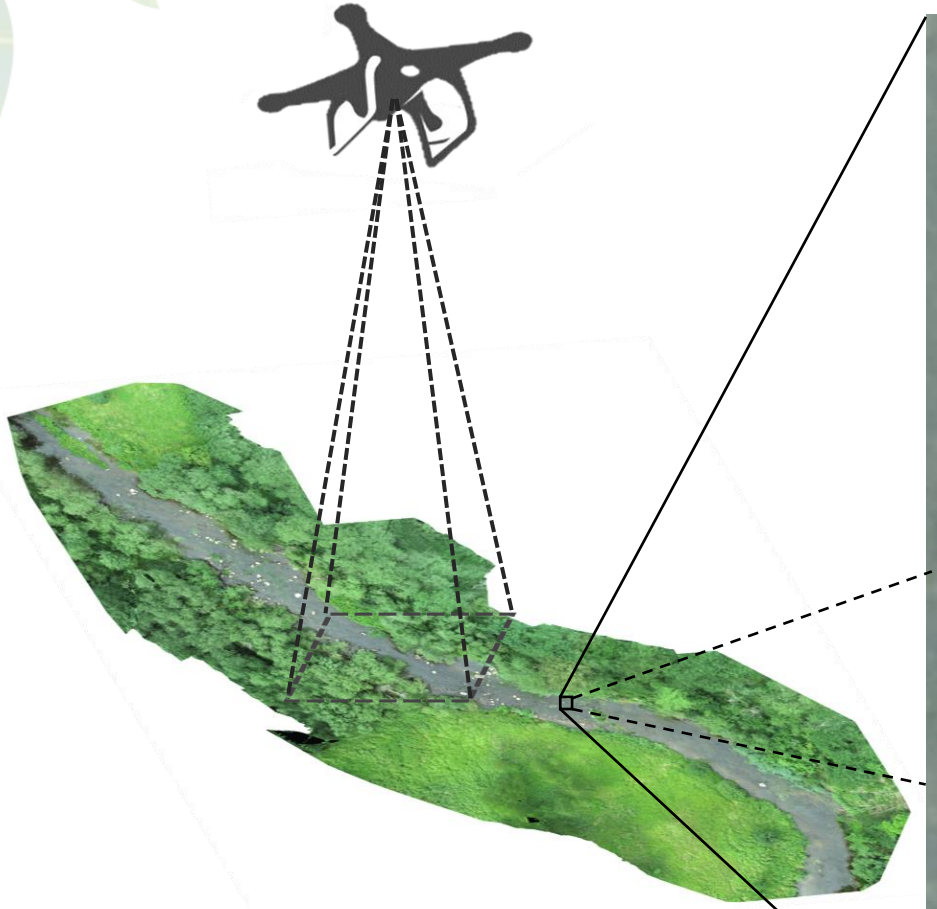
BIOR
INSTITUTE OF FOOD SAFETY, ANIMAL HEALTH AND ENVIRONMENT

UNIVERSITY OF LATVIA

Study area

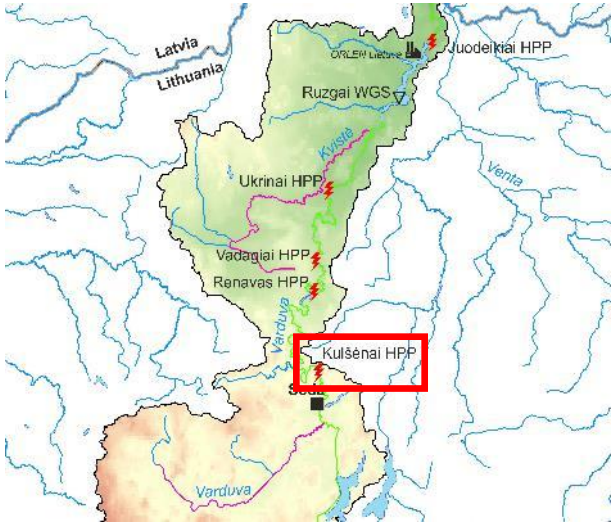

Latvia
Lithuania
ORLEN Lietuva
Juodeikiai HPP
Ruzgai WGS
Kvisté
Ukrinai HPP
Venta
Vadagiai HPP
Renavas HPP
Varduva
Kulšėnai HPP
Seda
Varduva
Sruoja
Alsėdžiai HPP
Lušinė
N
0 2.5 5 10 15 km
Estonia
Latvia
Lithuania
Belarus
Poland
Legend
State border
Venta River Basin District (RBD)
Varduva subbasin
Lake or reservoir
River network
Rivers of 1st type
Rivers of 3rd type
City
Petroleum refinery
Water gauging station (WGS)
Hydropower plant (HPP)
Digital elevation model (m, a.s.l.)
High: 197
Low: 39

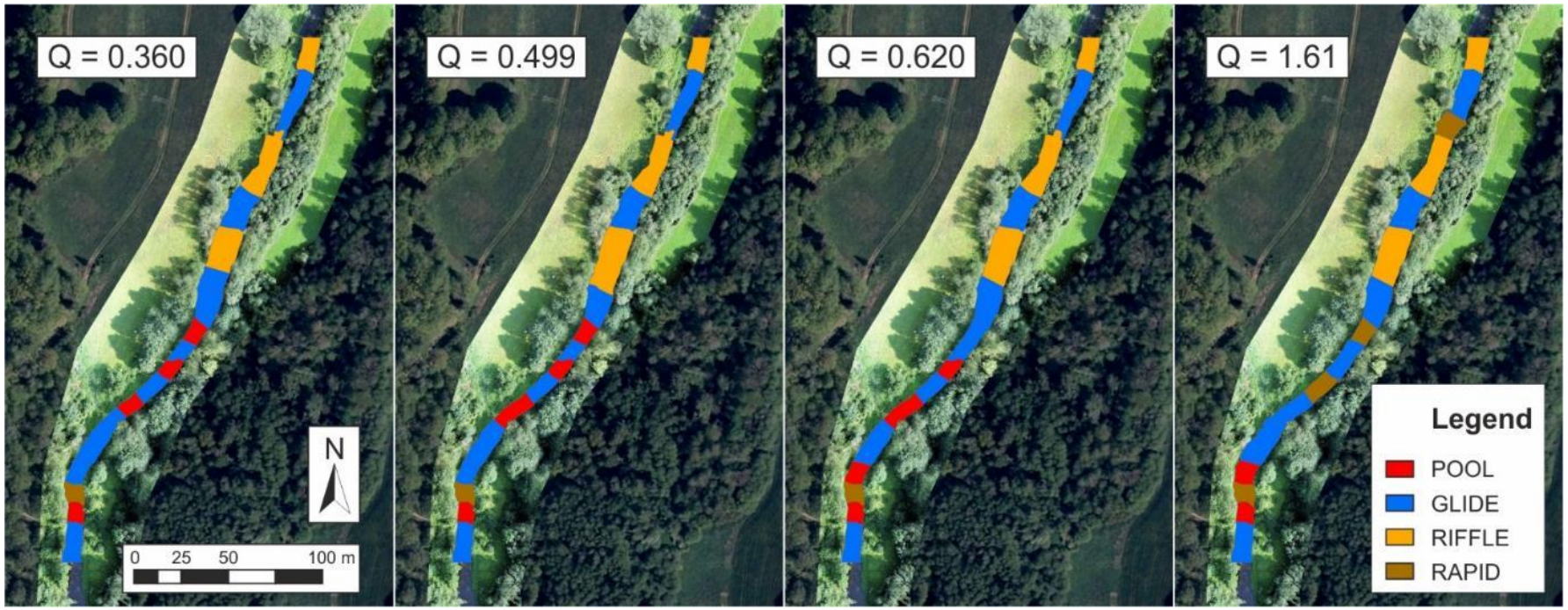
Field works



Kulšėnai HPP

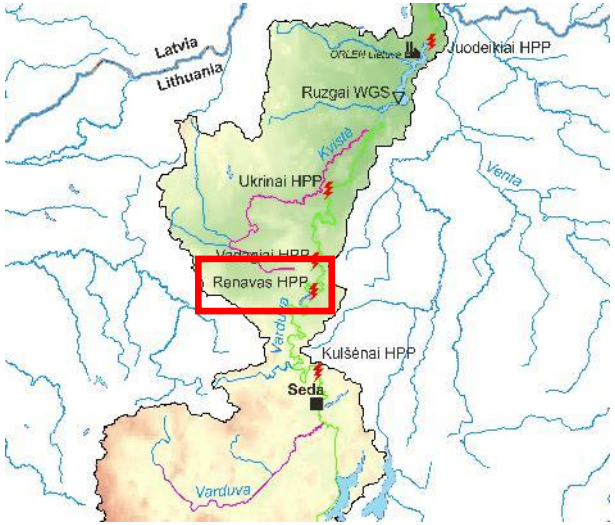
Variable	Q, m^3/s
$Q_{environmental}$	0.20 (95%)
Q_{30_min}	0.227 ✖
Q_{30_ave}	0.607 ✖
Q_{30_max}	1.59 ✖
Annual mean	3.16

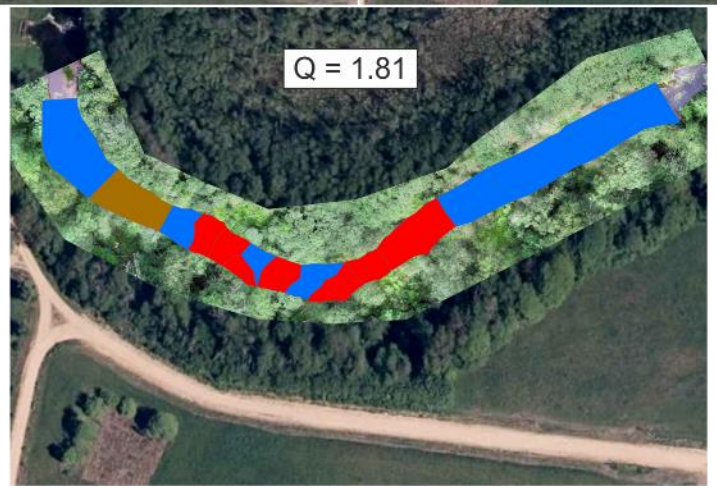




Renavas HPP

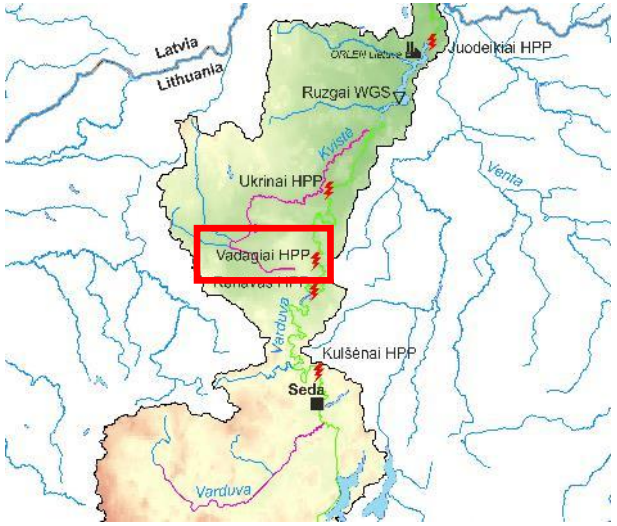
Variable	Q, m³/s
$Q_{environmental}$	0.39 (80%)
Q_{30_min}	0.244 ✖
Q_{30_ave}	0.652 ✖
Q_{30_max}	1.71 ✖
Annual mean	3.40

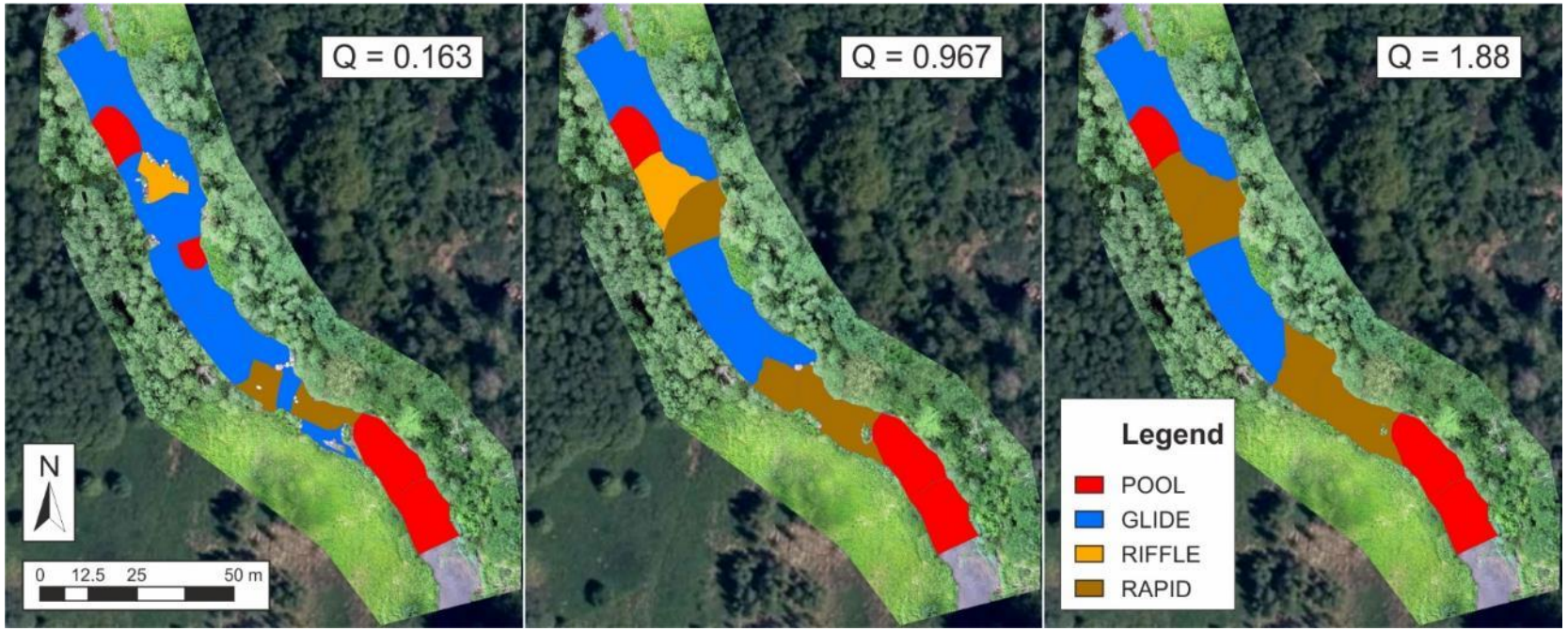




Vadagiai HPP

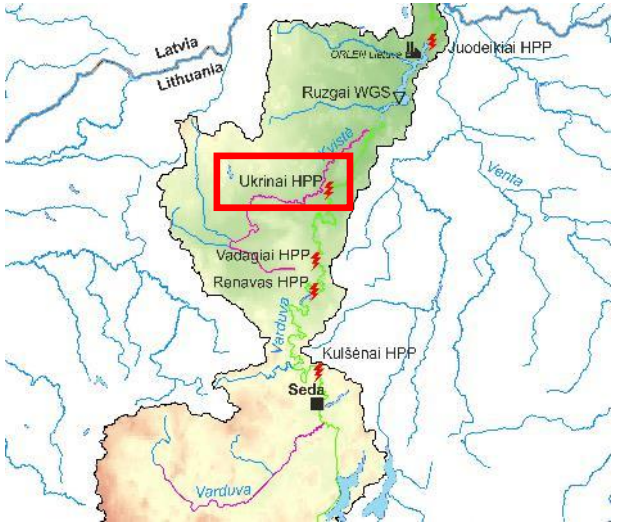
Variable	Q, m³/s
$Q_{environmental}$	0.41 (80%)
Q_{30_min}	0.251 ✖
Q_{30_ave}	0.673 ✖
Q_{30_max}	1.77 ✖
Annual mean	3.51

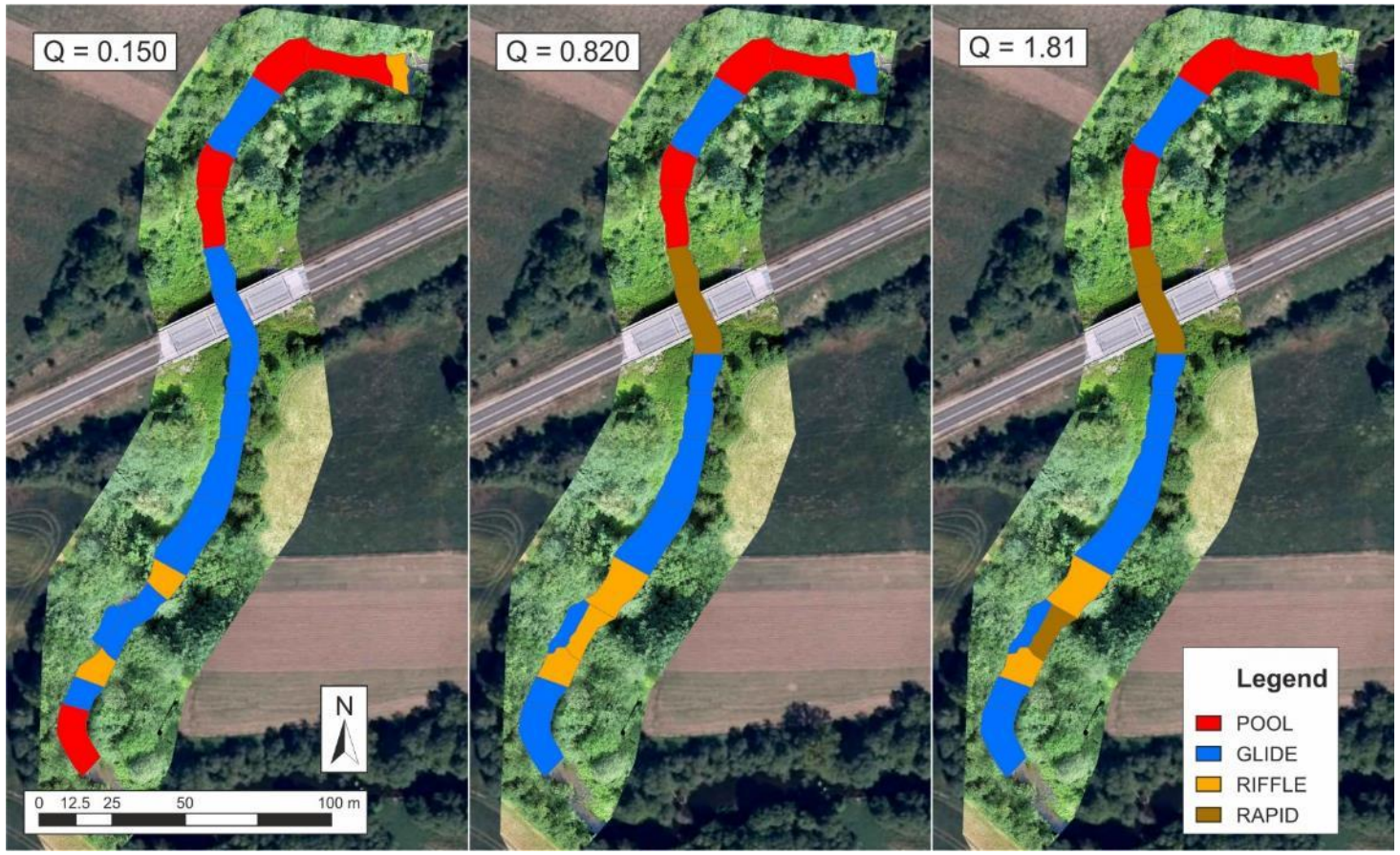




Ukrinai HPP

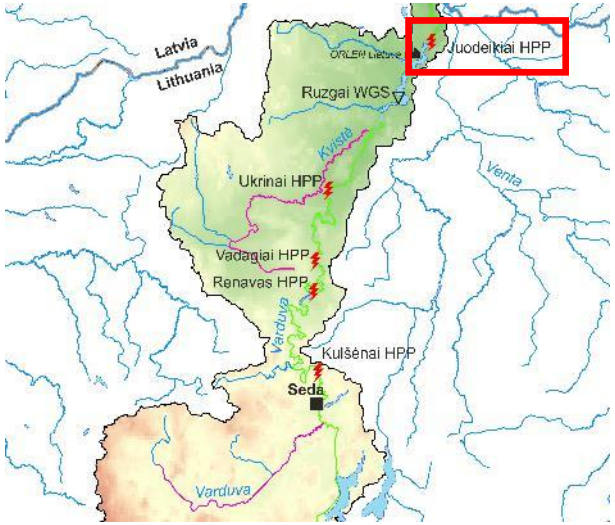
Variable	Q, m³/s
$Q_{environmental}$	0.46 (80%)
Q_{30_min}	0.260 ✖
Q_{30_ave}	0.696 ✖
Q_{30_max}	1.83 ✖
Annual mean	3.63

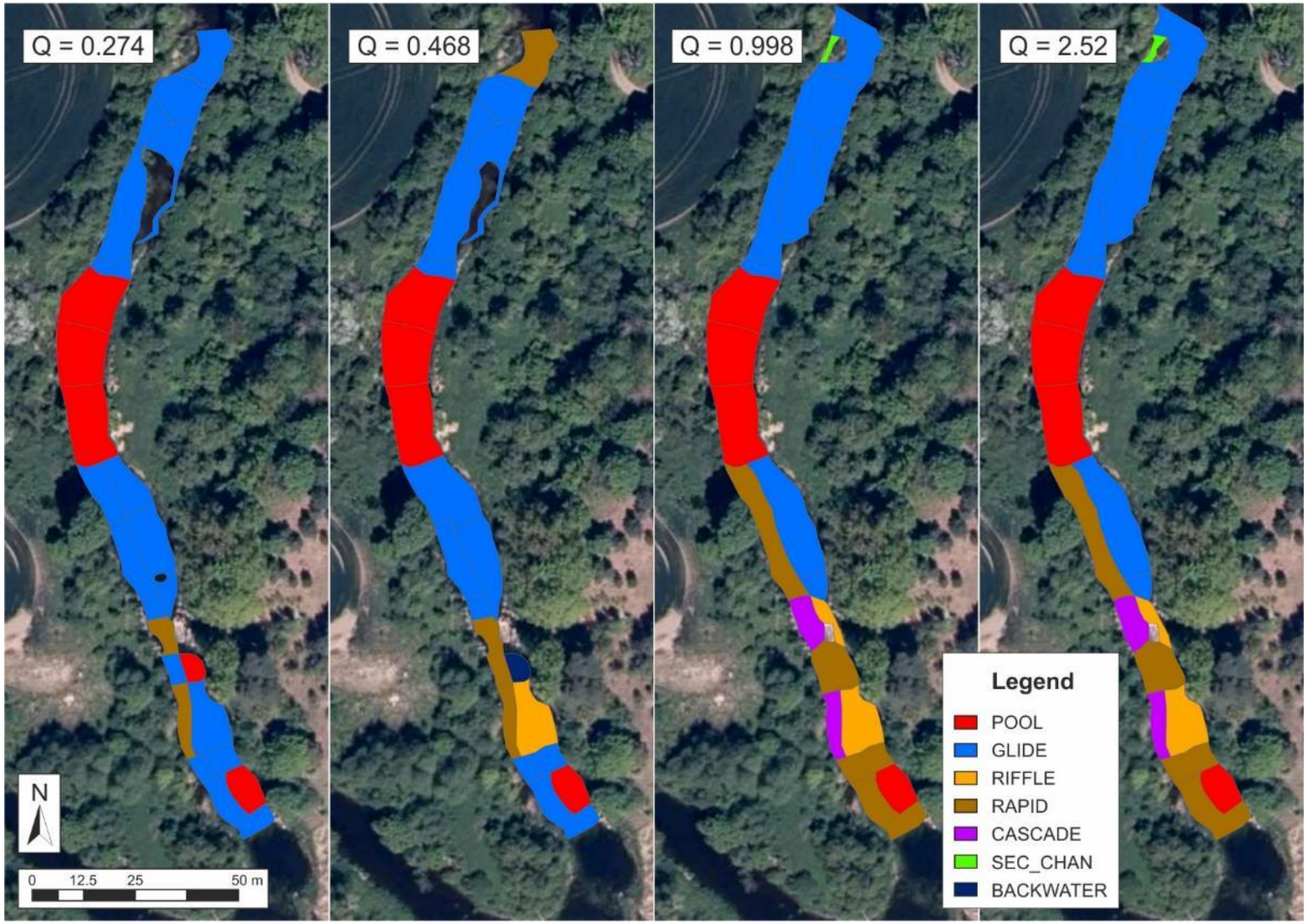




Juodeikiai HPP

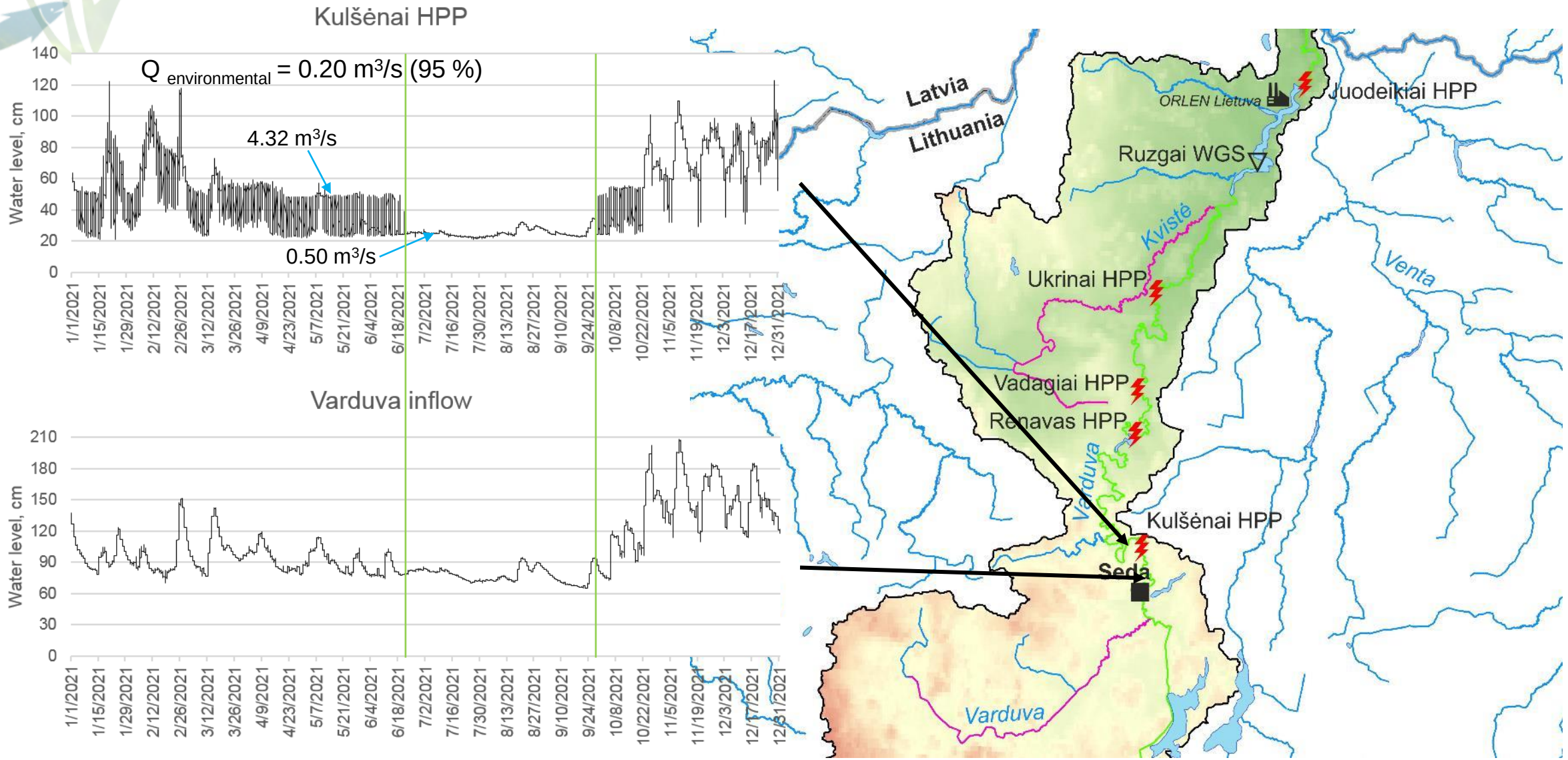
Variable	Q, m^3/s
$Q_{environmental}$	0.91 (80%)
Q_{30_min}	0.393 ✖
Q_{30_ave}	1.05 ✖
Q_{30_max}	2.76 ✖
Annual mean	5.49



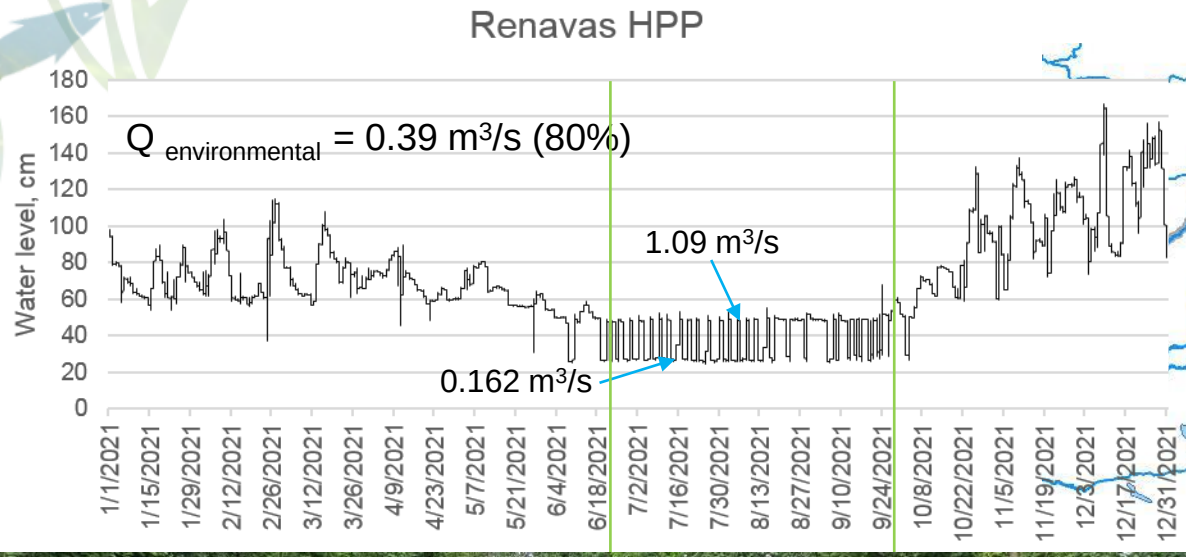


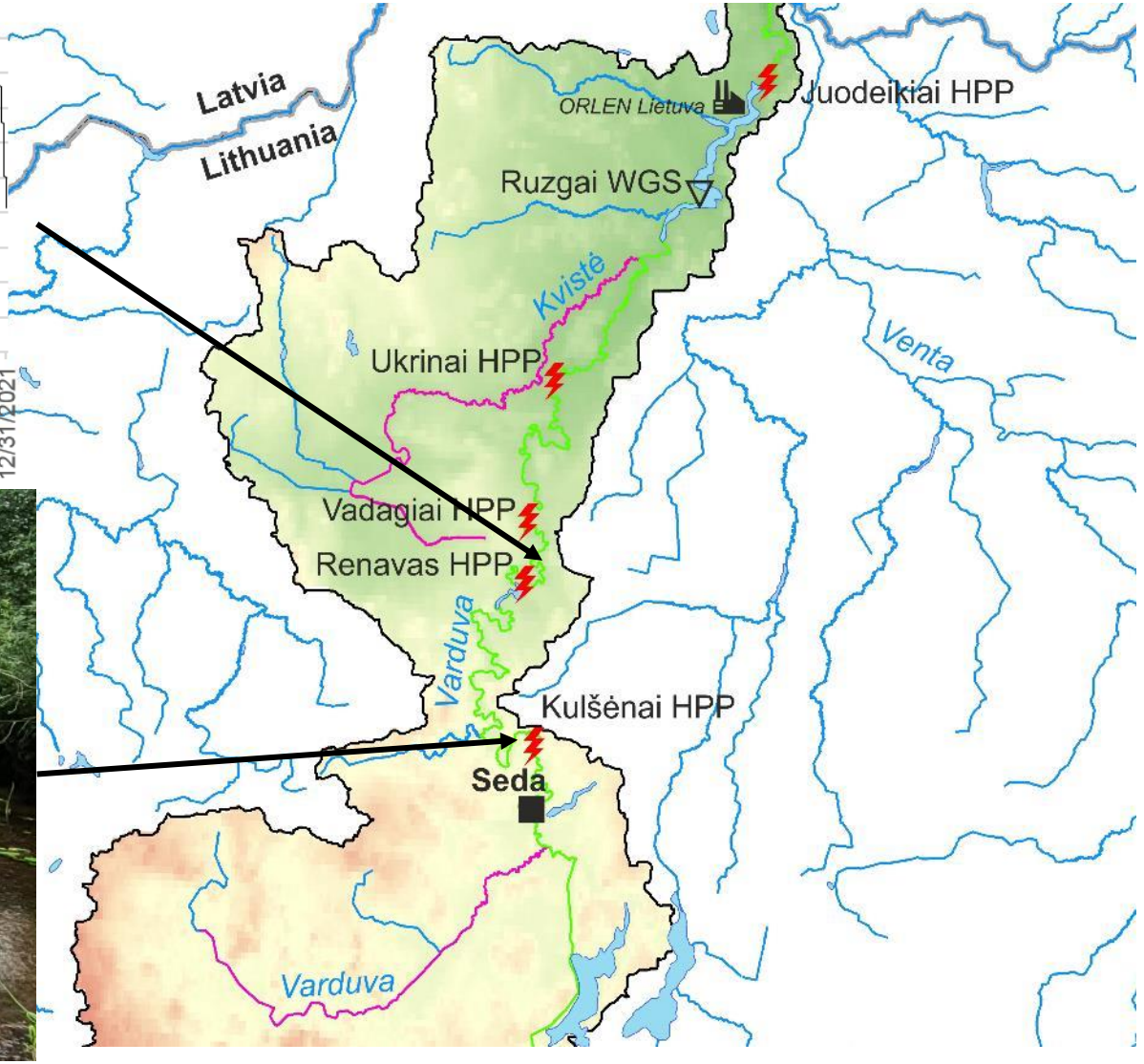
Water level measurements

Water level measurements (I)

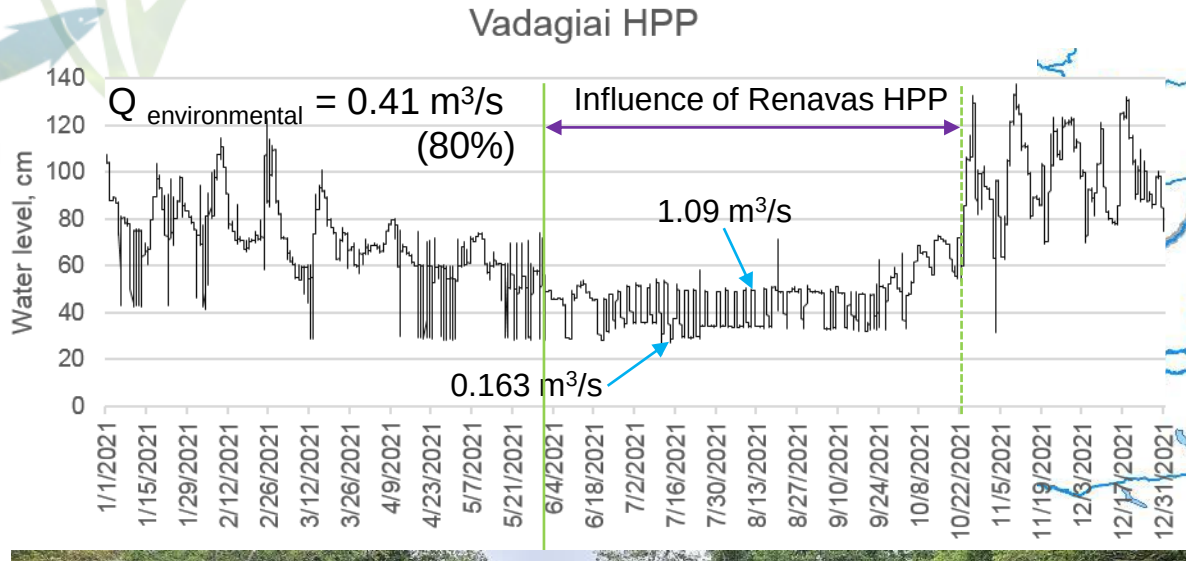


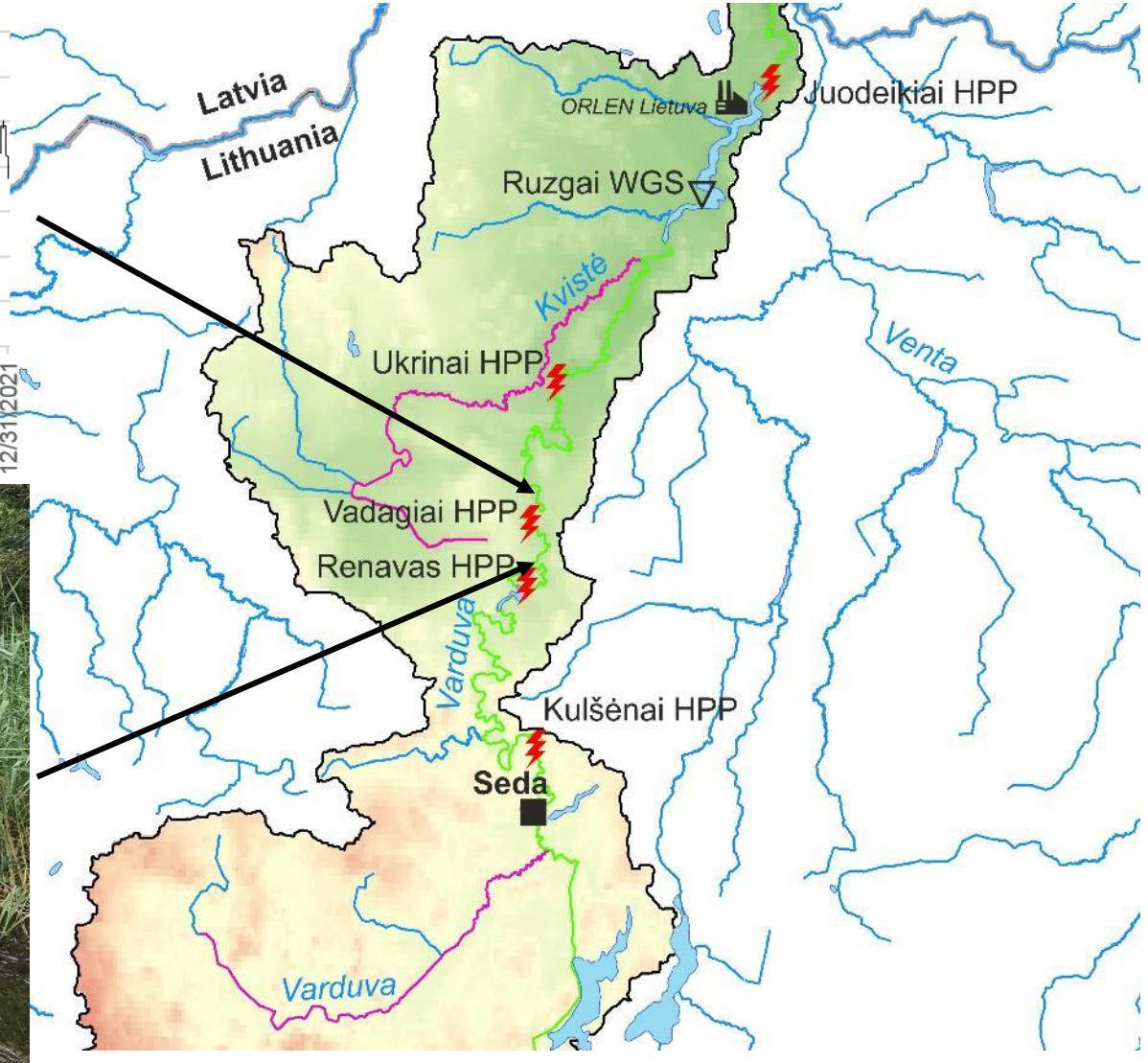
Water level measurements (II)



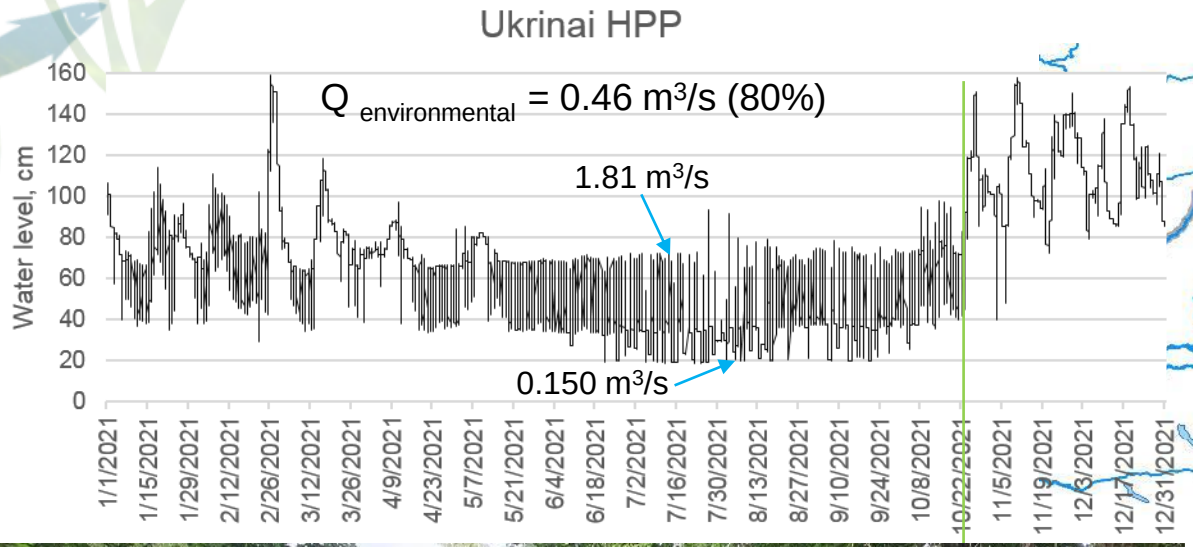


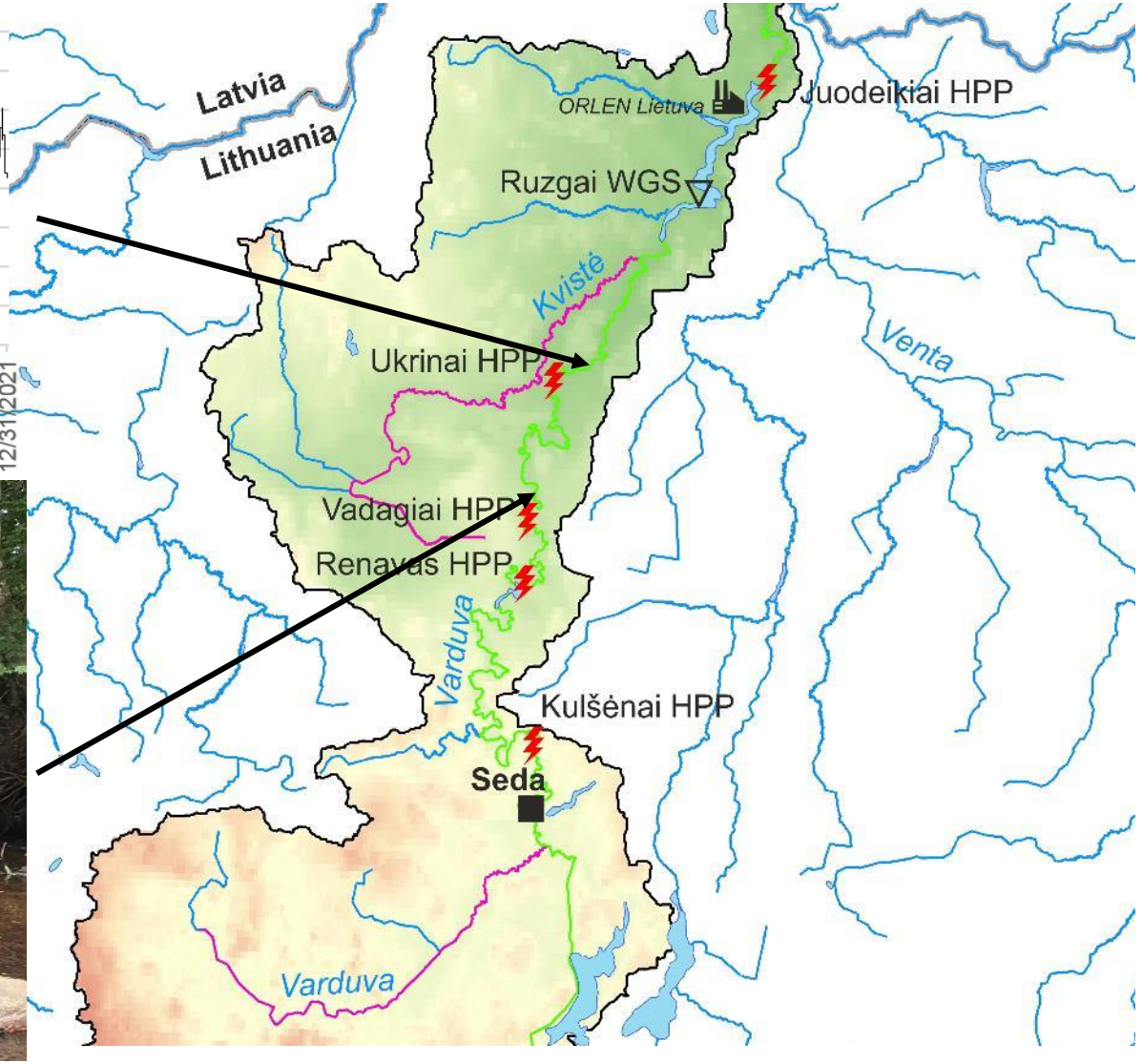
Water level measurements (III)



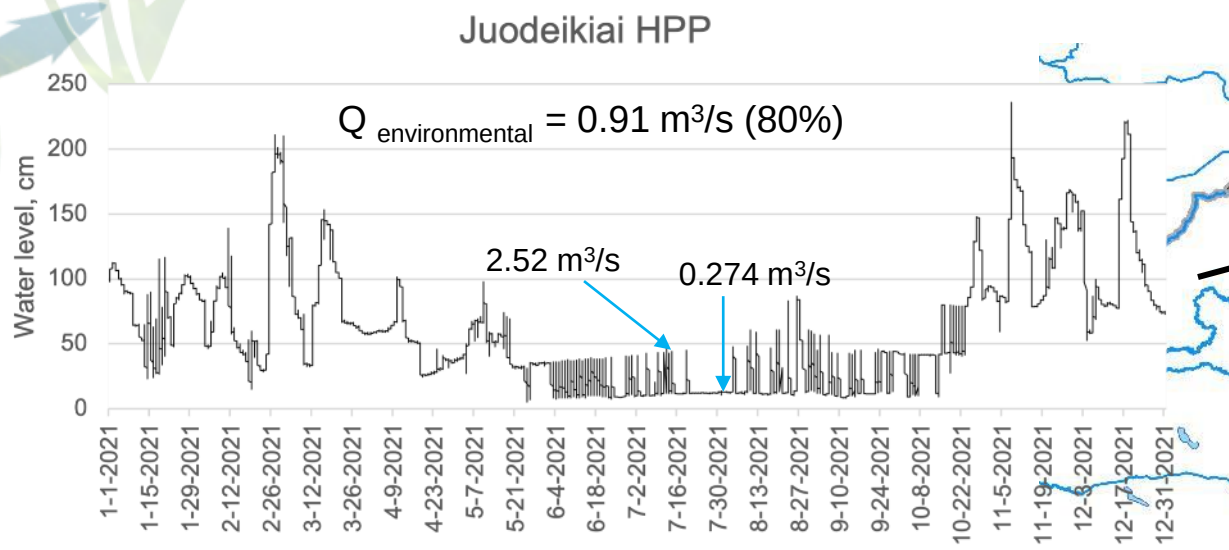


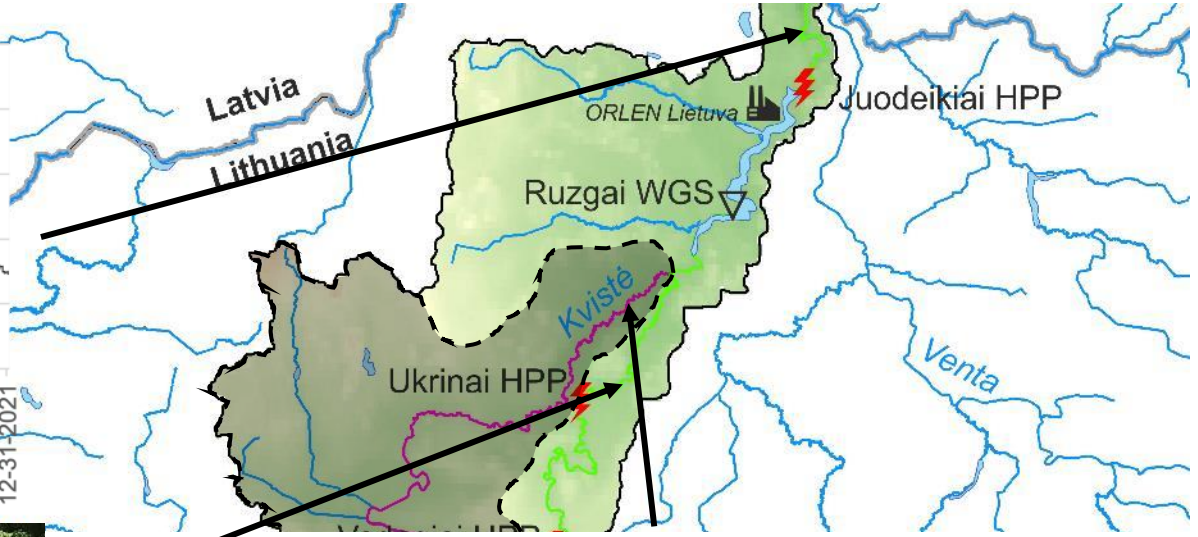
Water level measurements (IV)





Water level measurements (V)



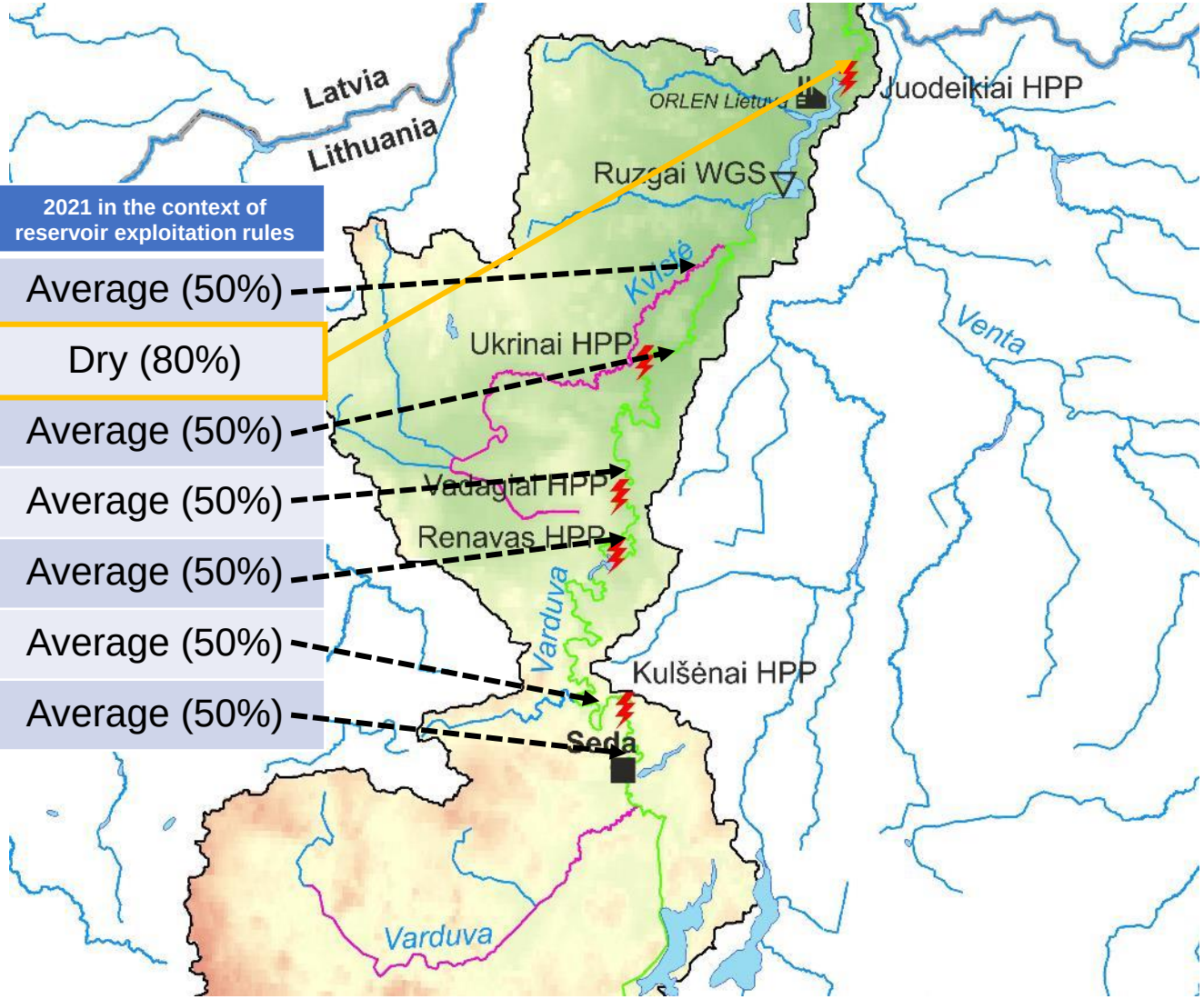


River discharge measurements (I)

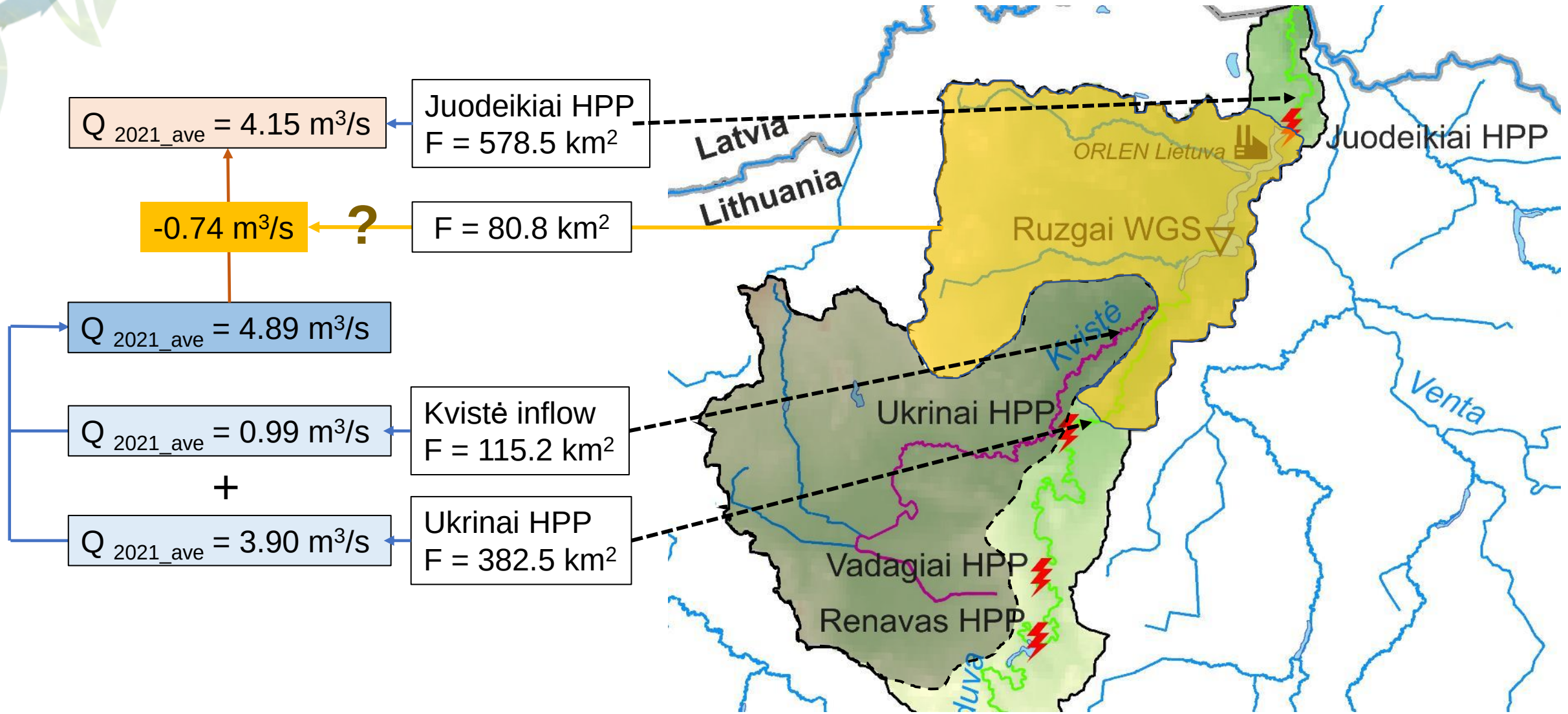
River	Site	Q_{ave} hist.	Q_{2021_ave}	2021 in the context of reservoir exploitation rules
Kvistė	Inflow	0.97**	0.99	Average (50%)
Varduva	Juodeikiai HPP	5.49*	4.15	Dry (80%)
Varduva	Ukrinai HPP	3.63*	3.90	Average (50%)
Varduva	Vadagiai HPP	3.51*	3.78	Average (50%)
Varduva	Renavas HPP	3.40*	3.74	Average (50%)
Varduva	Kulšėnai HPP	3.16*	3.52	Average (50%)
Varduva	Inflow	3.12*	3.48	Average (50%)

* According to Ruzgai WGS in 1956–1972

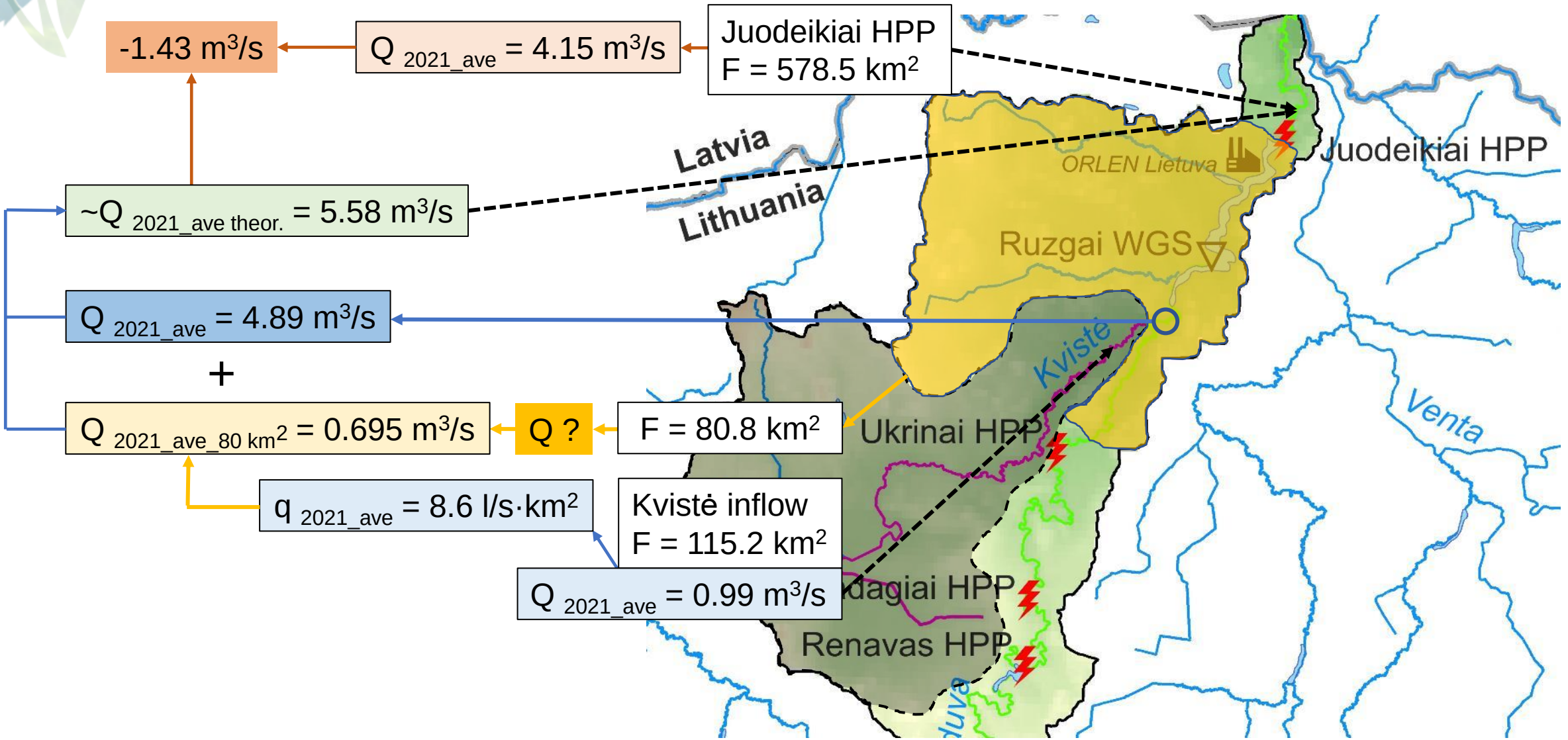
** According to the River cadastre of the Lithuanian SSR (Part III)



River discharge measurements (II)



River discharge measurements (III)



Summary of water balance

	Losses / usage	* Water volume thous. m^3	* Average annual water discharge m^3/s	
Losses	Evaporation	314	0.010	
	Infiltration	1246	0.040	-0.183 m^3/s
Usage	Industry	4198.4	0.133	
	Env. flow	39256.3	1.24	5.97 m^3/s
	Energetics	149079.3	4.73	

* According to Juodeikiai HPP reservoir exploitation rules, 2005

Ukrinai HPP + Kvistė

Q_{2021_ave} = 4.89 m^3/s

-0.183 m^3/s

Ukrinai HPP + Kvistė + 80 km^2

$\sim Q_{2021\_ave\ theor.}$ = 5.58 m^3/s

-0.183 m^3/s

$Q_{2021\_ave\ theor.}$ below Juodeikiai HPP ~4.70–5.40 m^3/s

≠

Juodeikiai HPP

Q_{2021_ave} = 4.15 m^3/s

Conclusions

- The hydromorphology was studied in the selected sites of the Varduva River below the Kulšėnai, Renavas, Vadagiai, Ukrinai and Juodeikiai HPPs. Hydromorphological measurements were performed at least at three different low-flow discharge situations. This made it possible to assess the changes in fish habitats due to the operation of the HPPs cascade.

- Automatic water level loggers were used to observe and record the water level fluctuations at 15 minutes time step below each of the 5 investigated HPPs. Observations were carried out in 2021 and showed clearly expressed hydropeaking.

- In the section of the Varduva River between Ukrinai HPP and Juodeikiai HPP, it was found the deficit in the average annual discharge of 2021. The obtained differences are contrary to hydrological regularities. Considering the water losses and use in industry (specified in Juodeikiai HPP reservoir exploitation rules), the deficit of river discharge in the mentioned section may vary from 0.55 to 1.25 m^3/s.

Thank you for your attention!

Contacts:

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