

MONITORING OF GROUNDWATER AND AUTOMATIZATION OF HYDROLOGICAL OBSERVATIONS NETWORK, INCLUDING IN MOUNTAINOUS AREAS



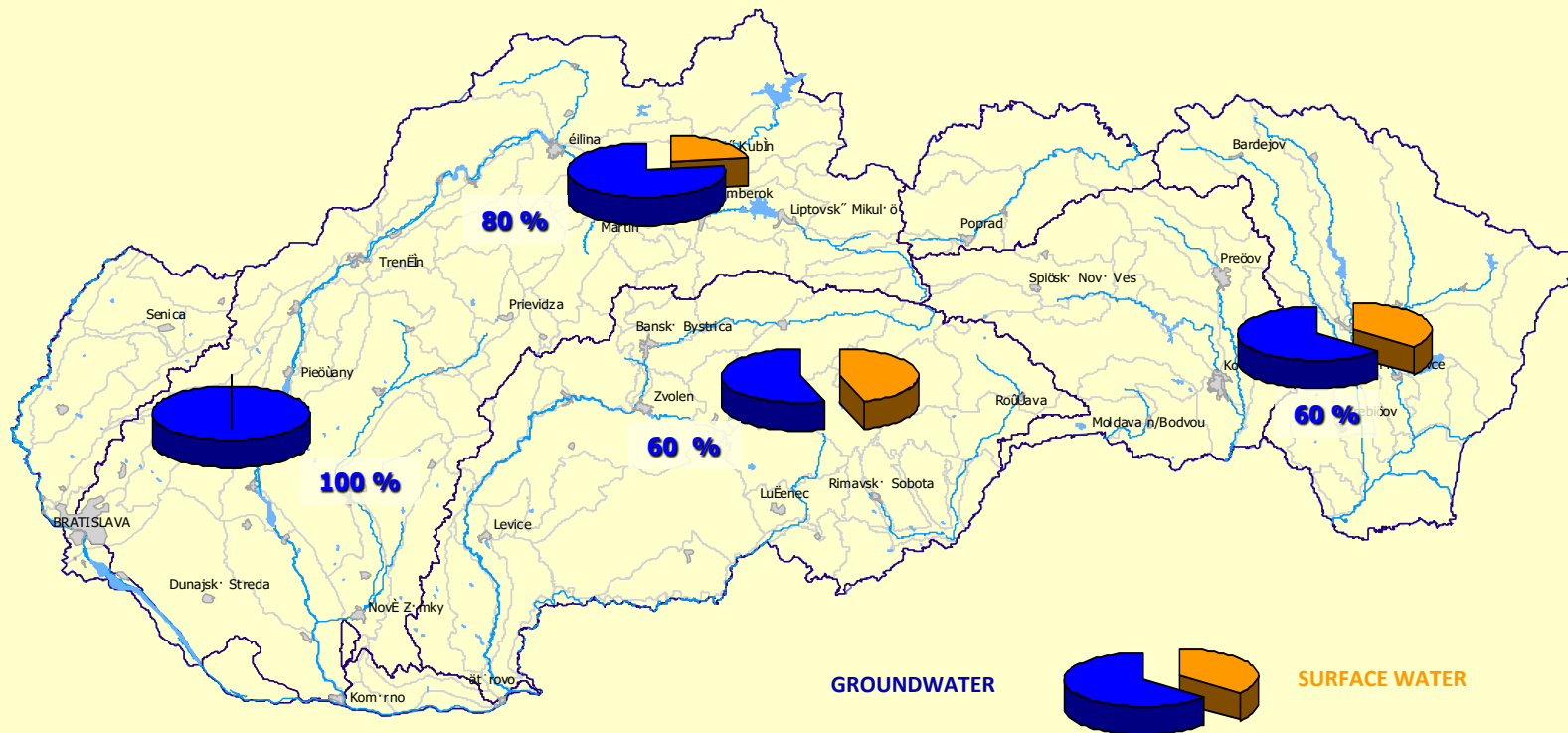
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FACILITATING THE EXCHANGE OF EXPERIENCE OF CENTRAL ASIAN COUNTRIES IN THE FIELD OF HYDROMETEOROLOGICAL SERVICES.,
Training Workshp November 2021, Bratislava, Slovakia

GROUNDWATER SOURCES PLAY IMPORTANT ROLE IN THE SLOVAK WATER MANAGEMENT AND DRINKING WATER SUPPLIES

(more than 80% in average)

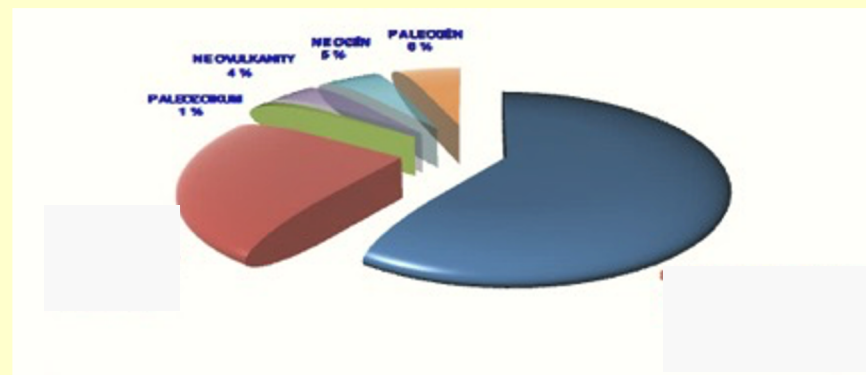


GROUNDWATER GEOLOGY HYDROGEOLOGY EXPLOITABLE AMOUNTS AND GROUNDWATER ABSTRACTION , RATIO

NATURAL RESOURCES OF GROUNDWATER - 130 000 – 140 000 I/s
EXPLOITABLE AMOUNT OF GROUNDWATER - 79.000 I/s (58%)
GROUNDWATER ABSTRACTION – 10 500 I/s (13 %)



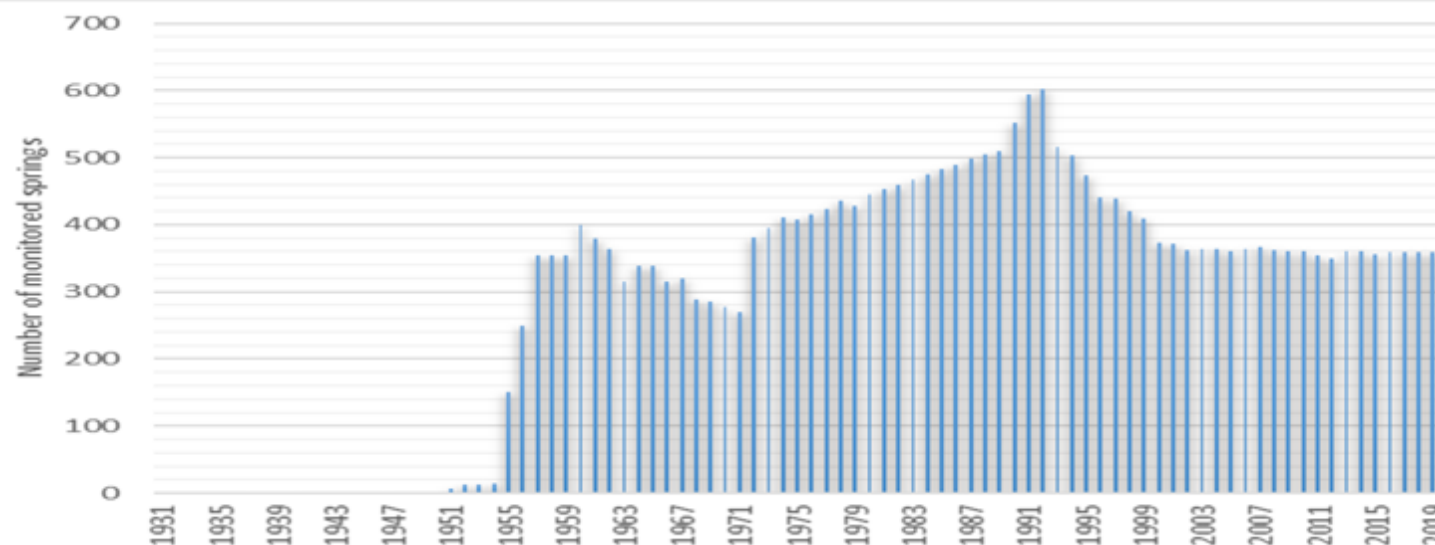
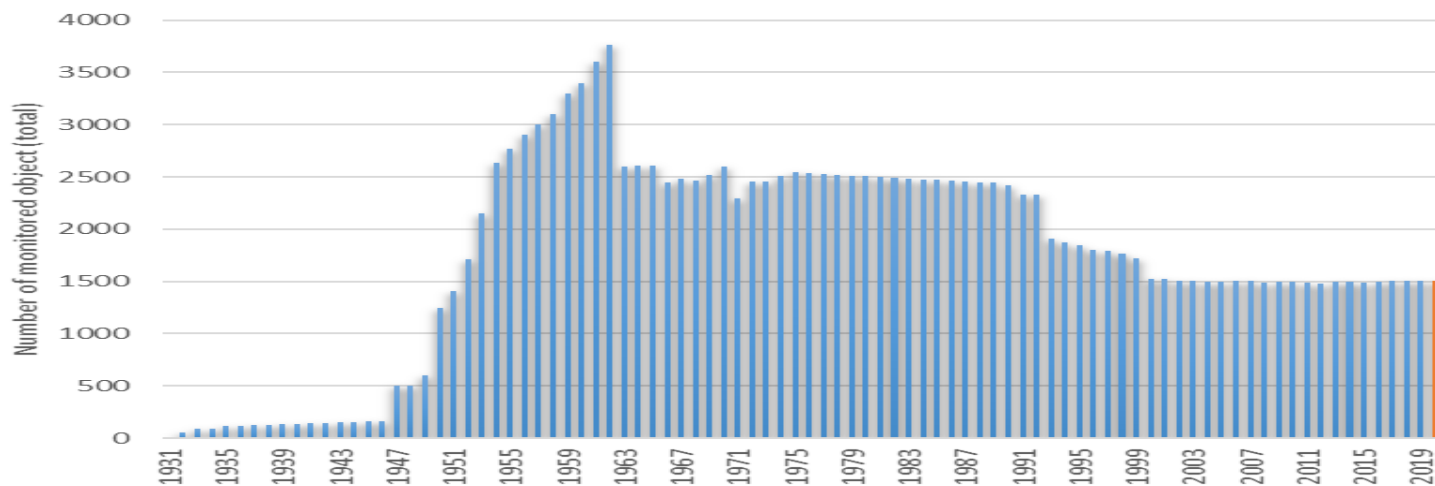
Quaternary sediments 60%
Mesozoic 24%



GROUNDWATER QUANTITY MONITORING HISTORY and DESIGN

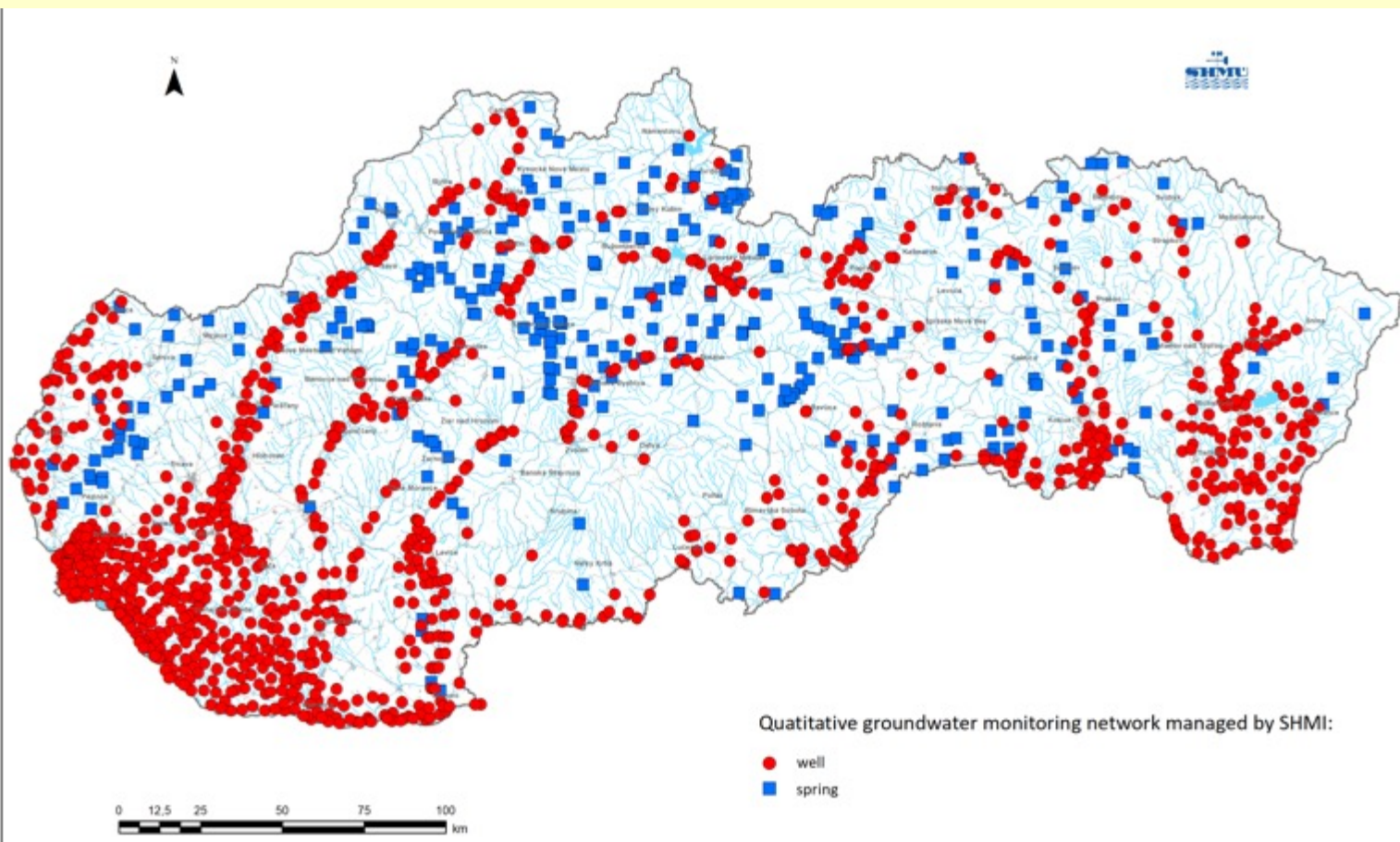
- state groundwater monitoring (wells) began in 1931 (6 monitoring wells)
158 wells was observed in Slovakia at the end of II. World War
- monitoring of springs yield began later in 1951 and increased in 1952 – 1957
- strategy/design of monitoring network
focused mainly :
 - on the Quaternary sediments
(alluvium of main rivers & large sedimentary basins ... Žitný ostrov,
depth 15 – 150 m)
 - important hydrogeological structure in core mountains
(Mesozoic, middle and upper Triassic karst, limestone, dolomites)
mainly springs
 - evaluation of quantitative status and trends analyses (WFD)
 - fixed locations !
 - no anthropogenic influence (maximal effort) !

NATIONAL GROUNDWATER QUANTITY MONITORING TOTAL HISTORY and DEVELOPMENT 'GOLDEN AGE' – 3700 THE PRESENT DAY – -1503

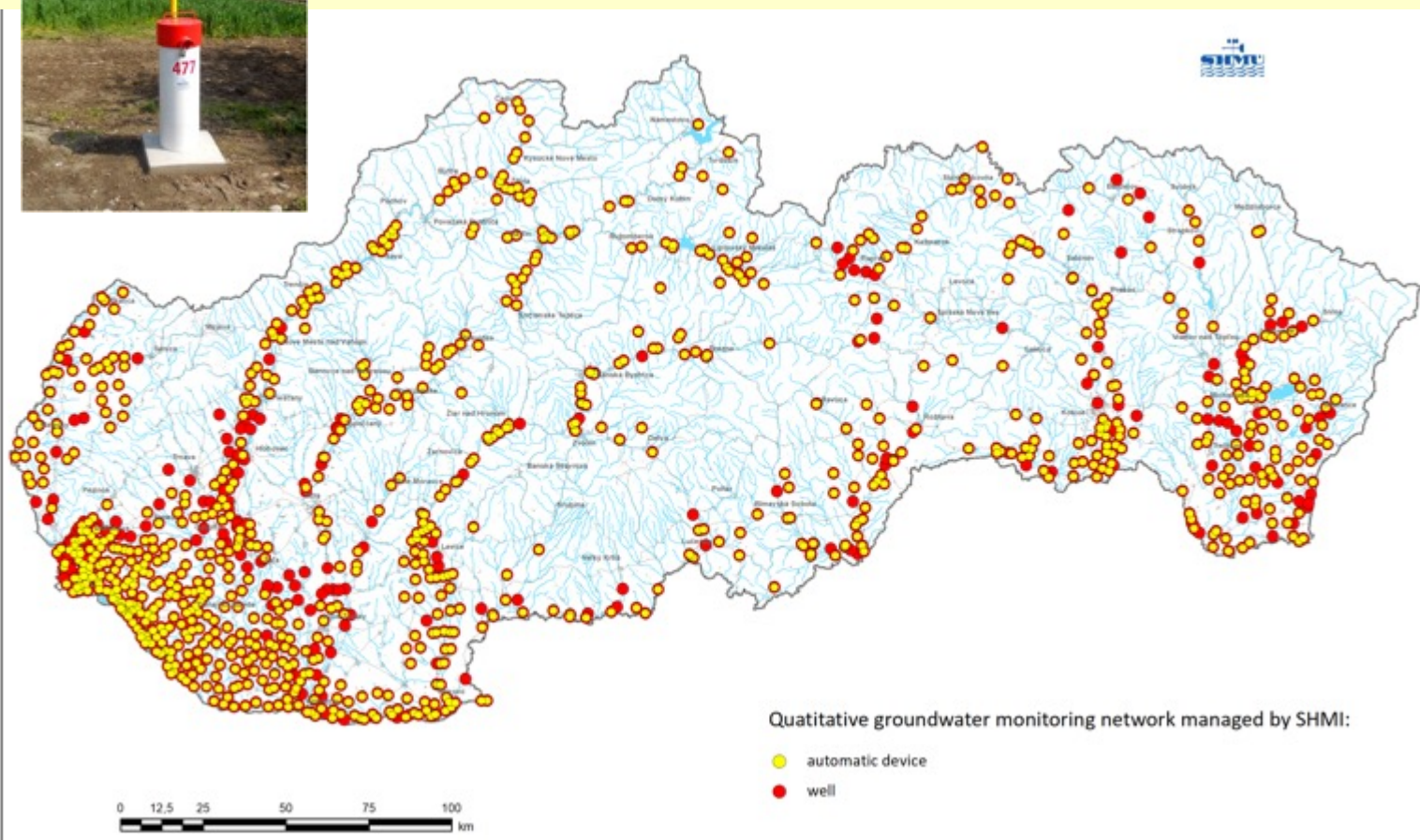


MAP OF CURRENT GROUNDWATER QUANTITY MONITORING NETWORK TOTAL 1144 wells and 359 springs , density 1/33 km²

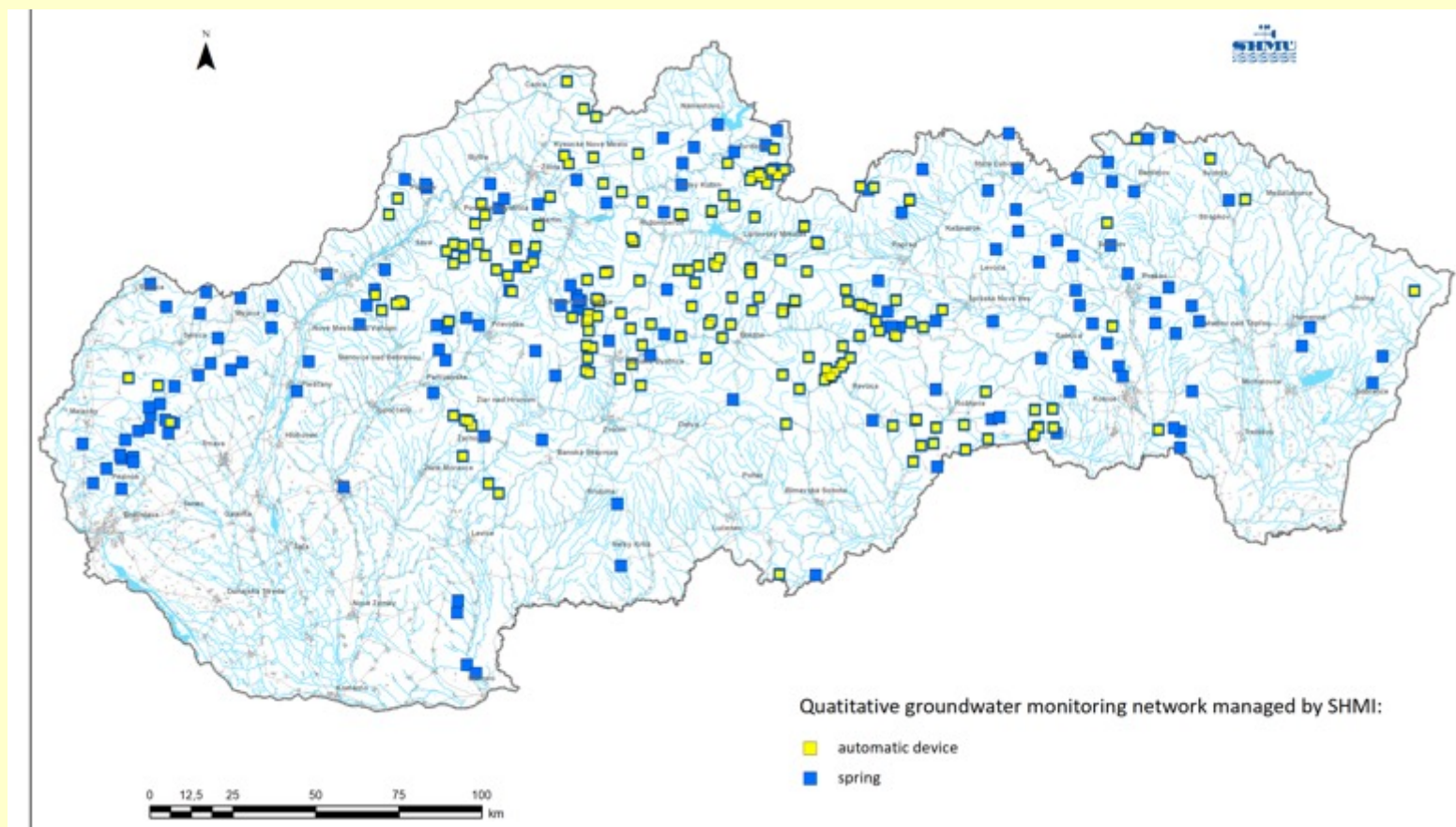
Groundwater quantity network is, in terms of the number of observation objects,
the most extensive monitoring network in Slovakia



WELLS 1144 , 910 with datalogger - 80%



SPRINGS 359, 202 with datalogger - 56%

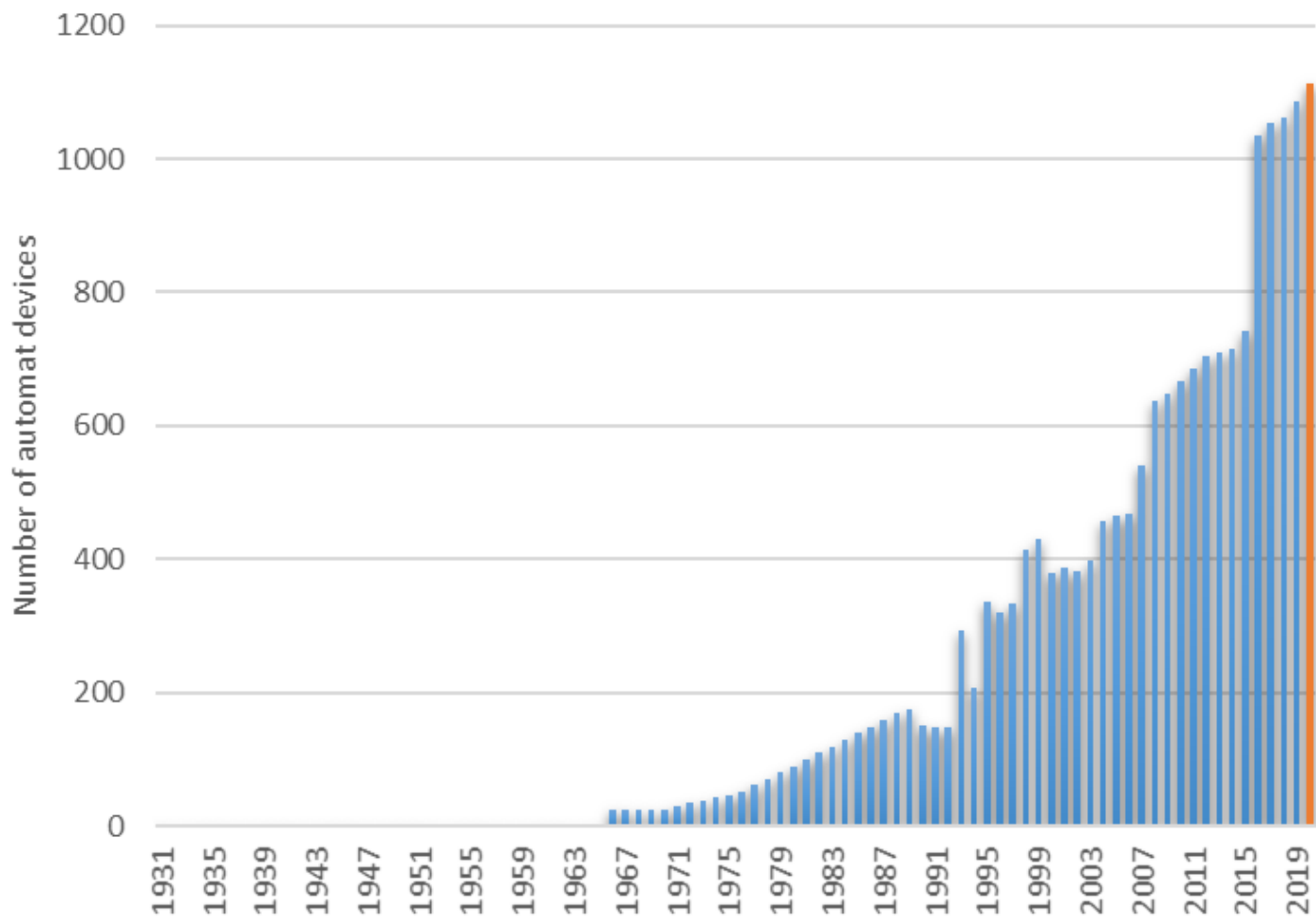


GROUNDWATER QUANTITY MONITORING

- measuring parameters : level, discharge, temperature
- frequency – volunteers (weekly) , automatic unit (hourly)
- monitoring process with automatic station started in the period 1966 to 1970 applying limnigraph devices
- progress 1993. As a consequence of construction of dams on Danube river,
- from 1994 to 2021 number of dataloggers gradually increased (MARS – made in Slovakia)

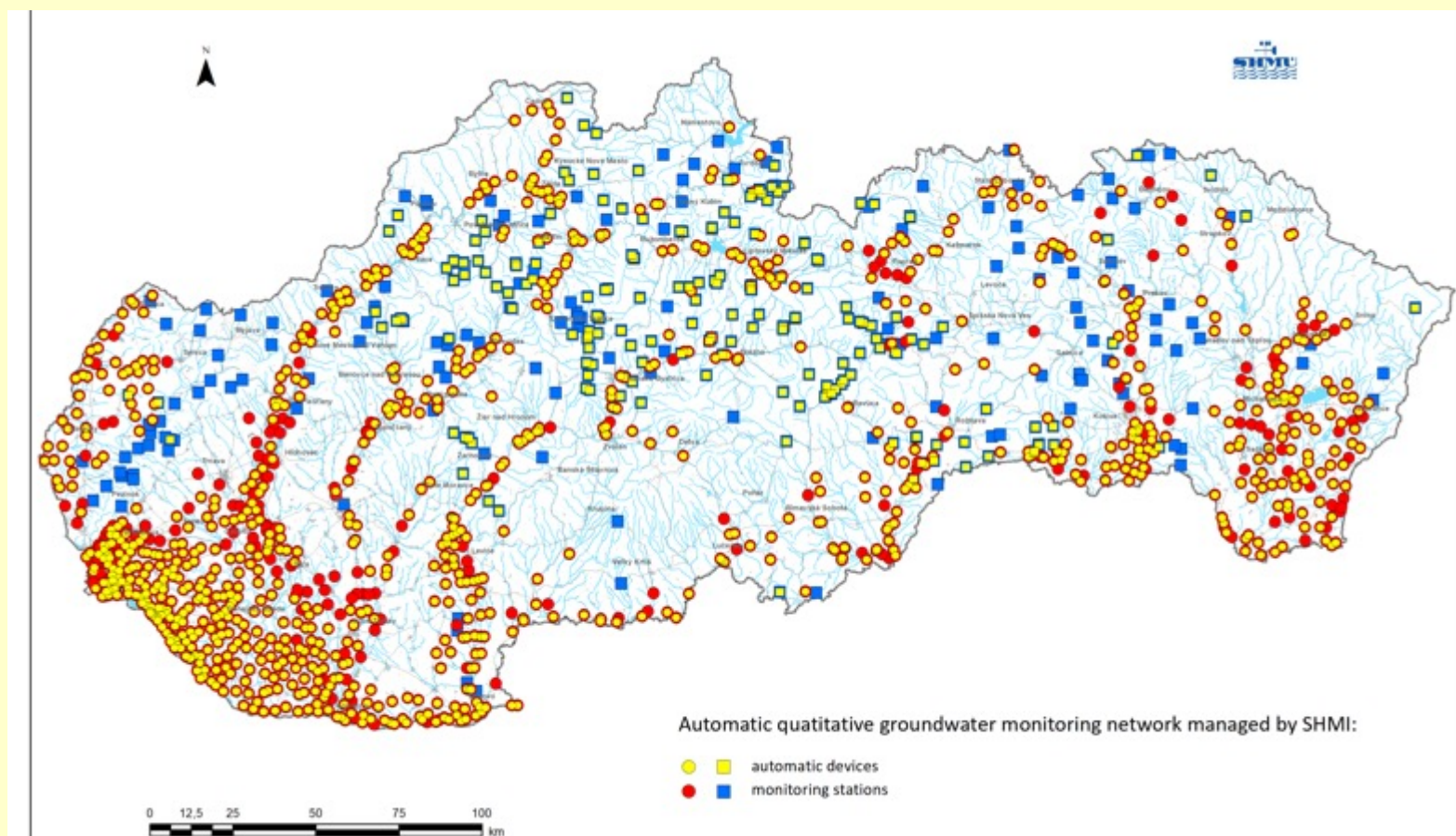


GROUNDWATER QUANTITY MONITORING DATALOGGERS 1112



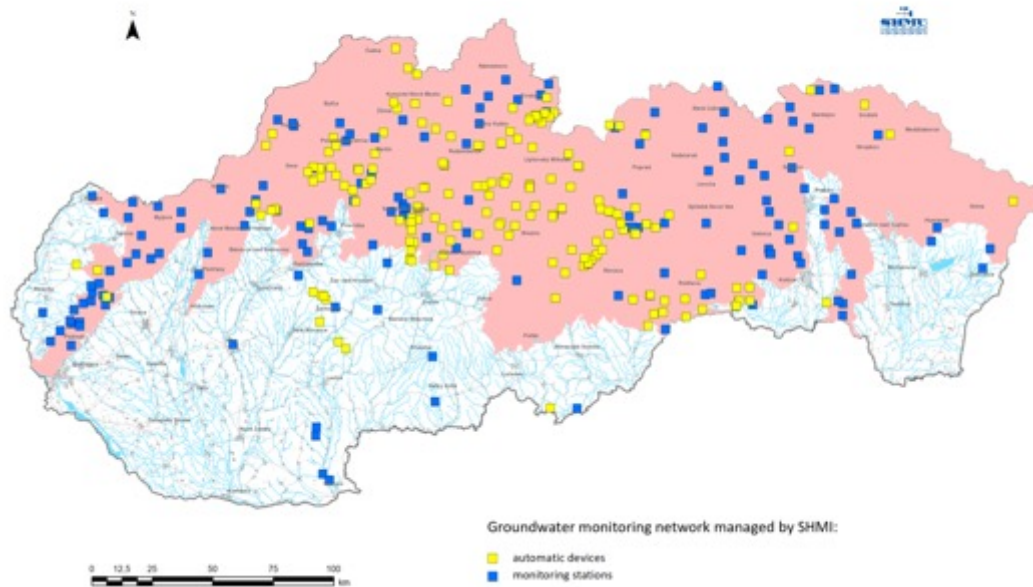
GROUNDWATER QUANTITY MONITORING

1503 / -, DATALOGGERS 1112, 74 %



LOCATION OF GROUNDWATER MONITORING NETWORK IN MOUNTAINOUS AREAS

MOUNTAINOUS AREAS AND PREQUARERNARY GROUNDWATER BODIES
COVERED BY GROUNDWATER MONITORING NETWORK

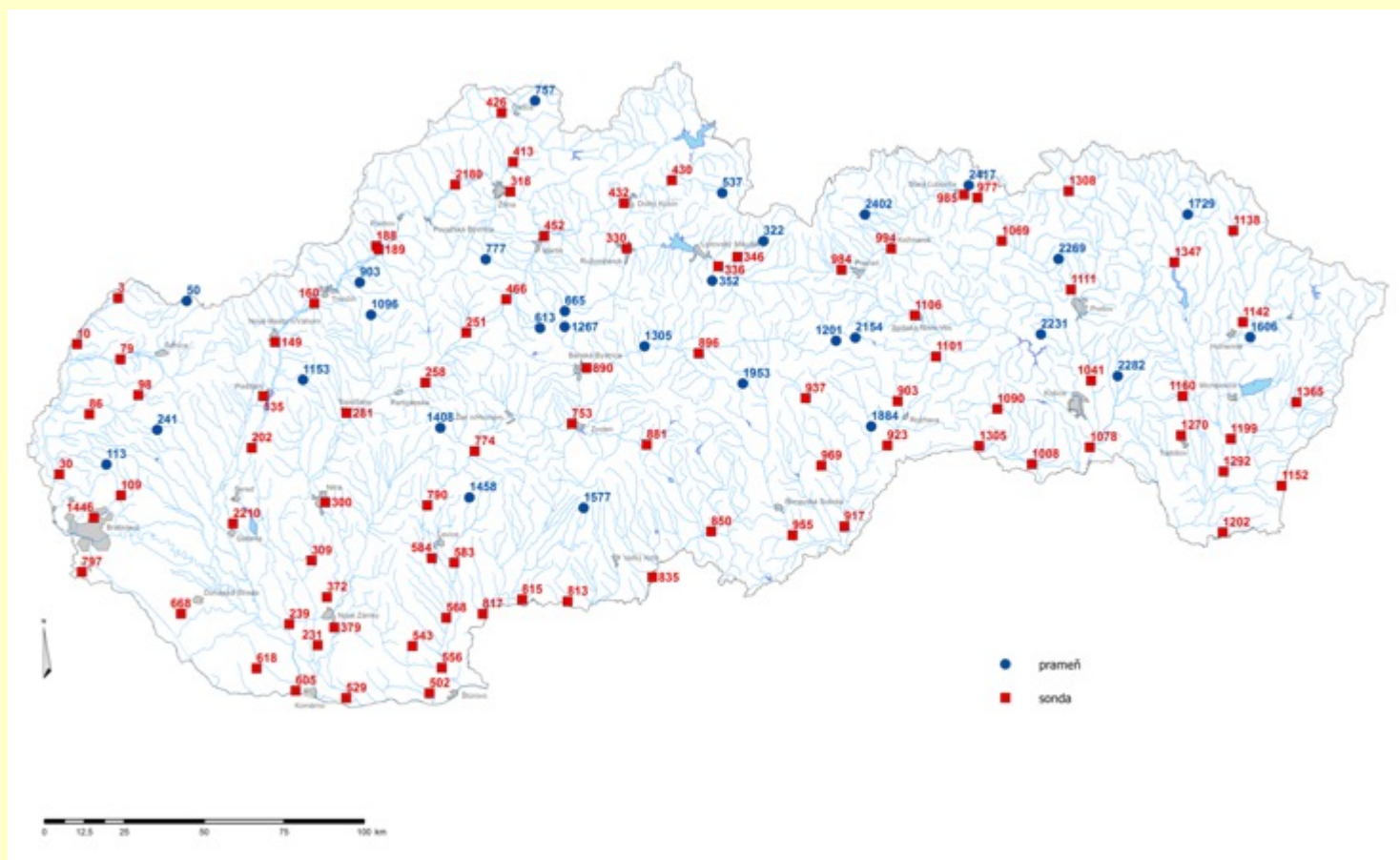


In this mountainous area - 157 objects and 112 automatic devices

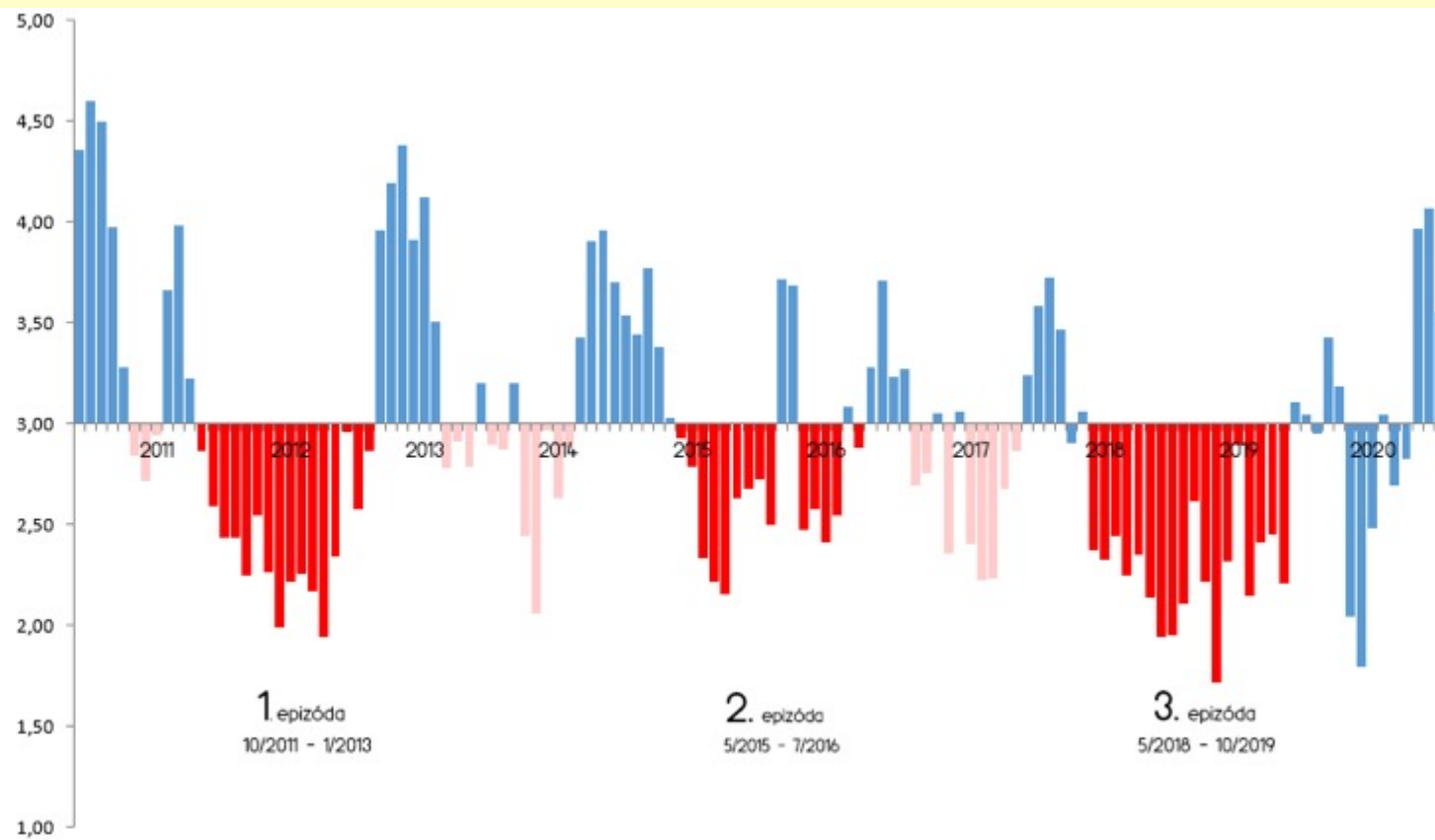
GROUNDWATER QUANTITY MONITORING

ONLINE from the year 2017

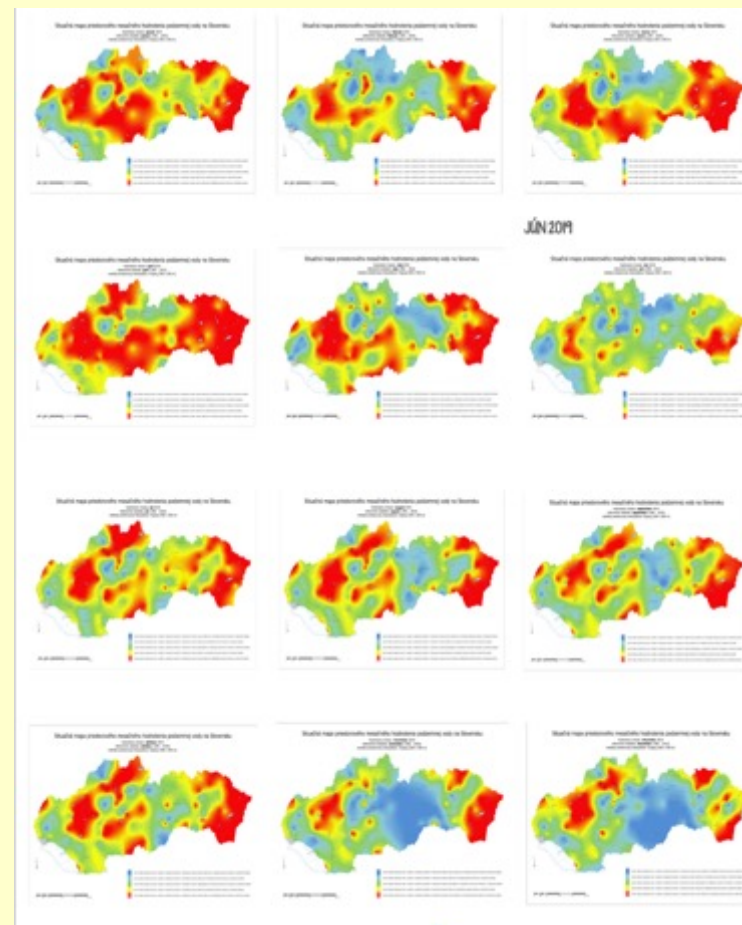
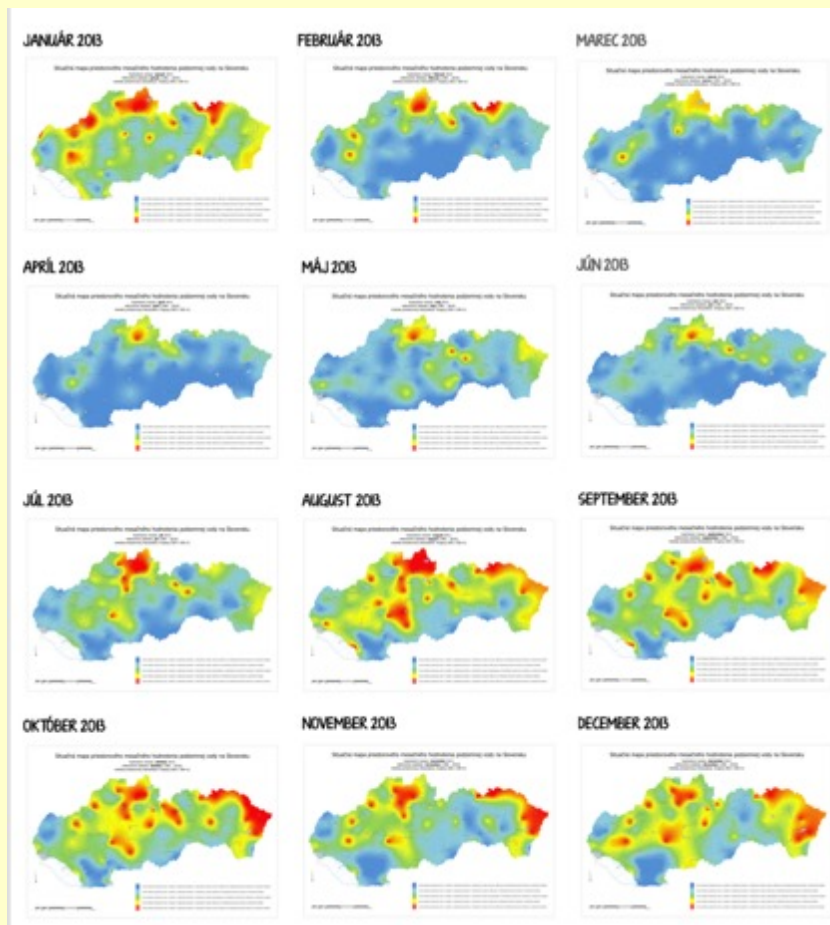
86 Wells and 33 springs 119 total
In general on web page SHMI



GROUNDWATER QUANTITY MONITORING EVALUATION LONG TIME REGIME CHANGES

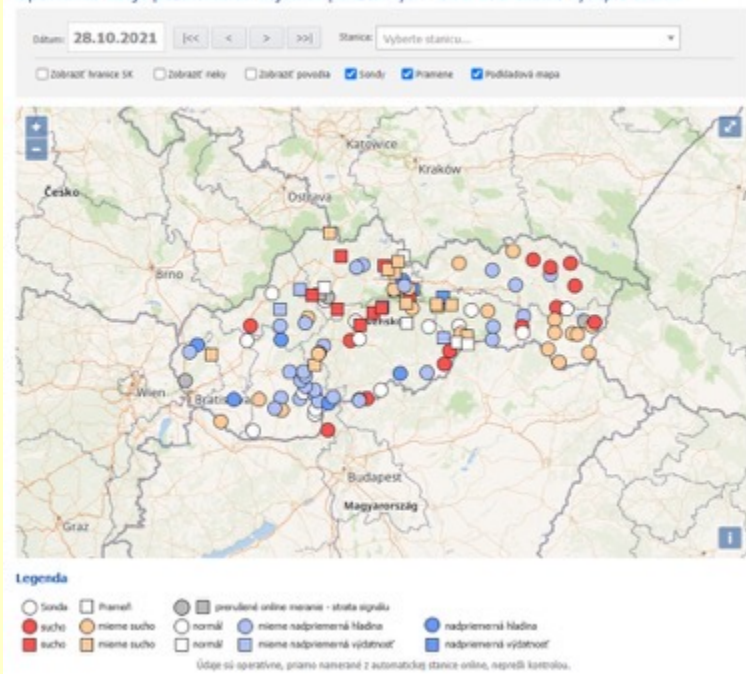


GROUNDWATER QUANTITY MONITORING EVALUATION DISCHARGE AND REFILL HYDROGEOLOGICAL STRUCTURE

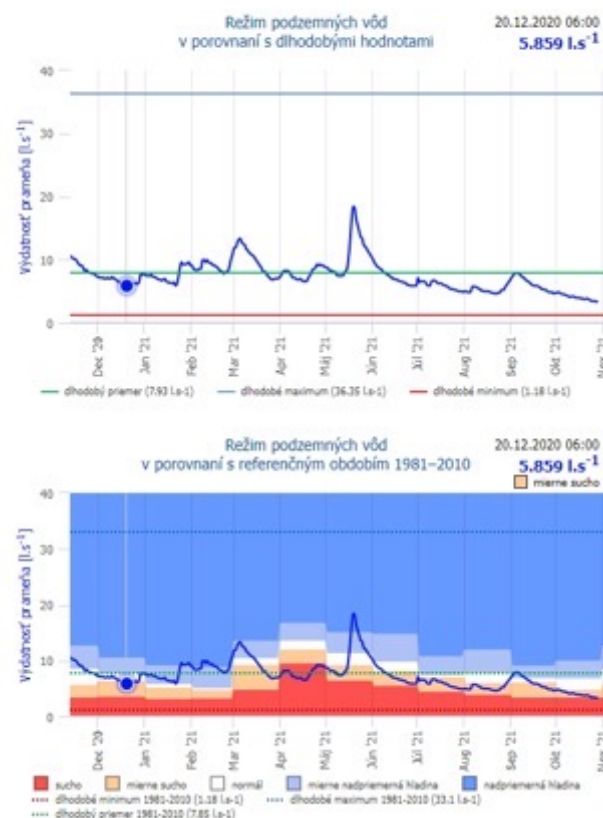


GROUNDWATER QUANTITY MONITORING EVALUATION DROUGHT

Operatívne údaje pozorovacích objektov podzemných vôd a hodnotenie výskytu sucha



Telgárt - číslo stanice: 1201



Výdatnosť prameňa [l.s⁻¹]

Dátum merania [dd-mm]	Výdatnosť prameňa [l.s ⁻¹]	Rozdiel výdatnosti [l.s ⁻¹]
28.10.2021	3.354	0
27.10.2021	3.354	-0.1
26.10.2021	3.45	0
25.10.2021	3.45	0
24.10.2021	3.45	-0.2
23.10.2021	3.647	-0.1
22.10.2021	3.748	-0.1
21.10.2021	3.851	+0.1
20.10.2021	3.748	0
19.10.2021	3.748	-0.1
18.10.2021	3.851	0
17.10.2021	3.851	-0.1
16.10.2021	3.955	0
15.10.2021	3.955	0
14.10.2021	3.955	-0.11
13.10.2021	4.061	-0.11
12.10.2021	4.169	0
11.10.2021	4.169	+0.11
10.10.2021	4.061	-0.11
09.10.2021	4.169	-0.11
08.10.2021	4.278	-0.11
07.10.2021	4.39	-0.11
06.10.2021	4.502	0
05.10.2021	4.502	-0.12
04.10.2021	4.617	-0.12
03.10.2021	4.733	-0.12
02.10.2021	4.851	+0.12
01.10.2021	4.733	0
30.09.2021	4.733	+0.12
29.09.2021	4.617	-0.23

(Rozdiel výdatnosti od predchádzajúceho dňa o 06:00)

GROUNDWATER QUANTITY MONITORING PROBLEMS

- technical condition of monitoring units (mainly springs)
reconstruction , renewal
- connection with online units in mountains region
- location in terms of property (private area)
- damage , thievery