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Preliminary results from the first year of the research project PIANOFORTE: CITISTRA

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Gomola Igor, *Slovak Medical University, Bratislava, Slovakia*

on behalf of the research team

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CITISTRA project

CITIzen measurements as complementary radiation monitoring STRAtegy in threats due to armed conflict or natural disasters

- reaction to current geopolitical situation in Europe
- feasibility of employment of citizen measurements using experimental study in three countries – Czech Republic, Slovak Republic and Poland
- citizen measurement data quality, training, support
- ethics, social aspects

Participating institutions:

SÚRO National Radiation Protection Institute

SLOVAK MEDICAL UNIVERSITY

THE HENRYK NIEWODNICZAŃSKI INSTITUTE OF NUCLEAR PHYSICS POLISH ACADEMY OF SCIENCES

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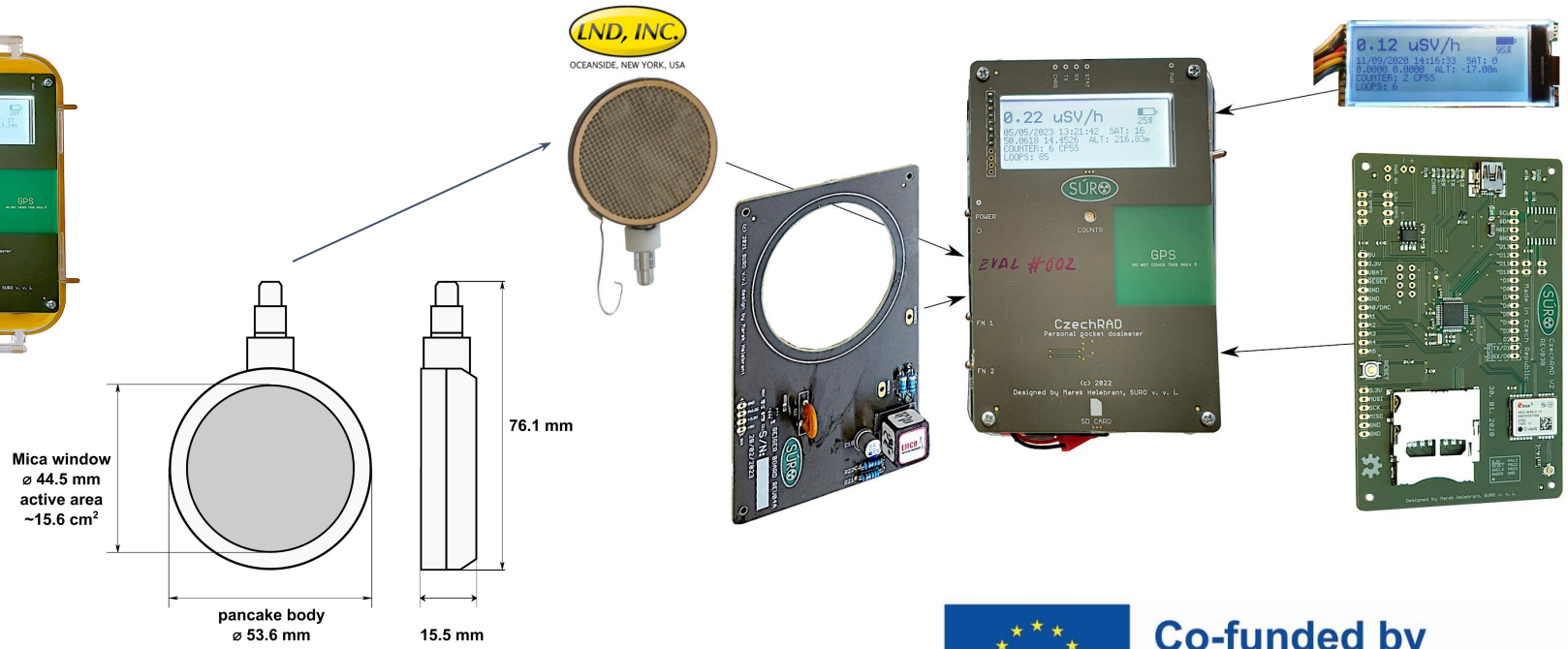
CITISTRA and CzechRad detector

- CzechRad is portable detector inspired by SAFECAST bGeigie Nano
- rechargeable battery, GPS and automatic data saving to SD card
- pancake GM tube, rugged weatherproof case

YouTube
CzechRad video



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CITISTRA and CzechRad detector

- CzechRad has no wireless (Wifi, Bluetooth), data has to be downloaded to a PC using usb cable or card reader - this also means:

1) CzechRad can be safely used in areas where wireless devices are prohibited, or can cause trouble to the user (e.g. detected by the enemy)

2) privacy / user safety - user decides when to send the data and what not to send (Safecast data measured in Ukraine were intentionally delayed - to prevent the device user from getting into trouble)

3) the device cannot be remotely hacked

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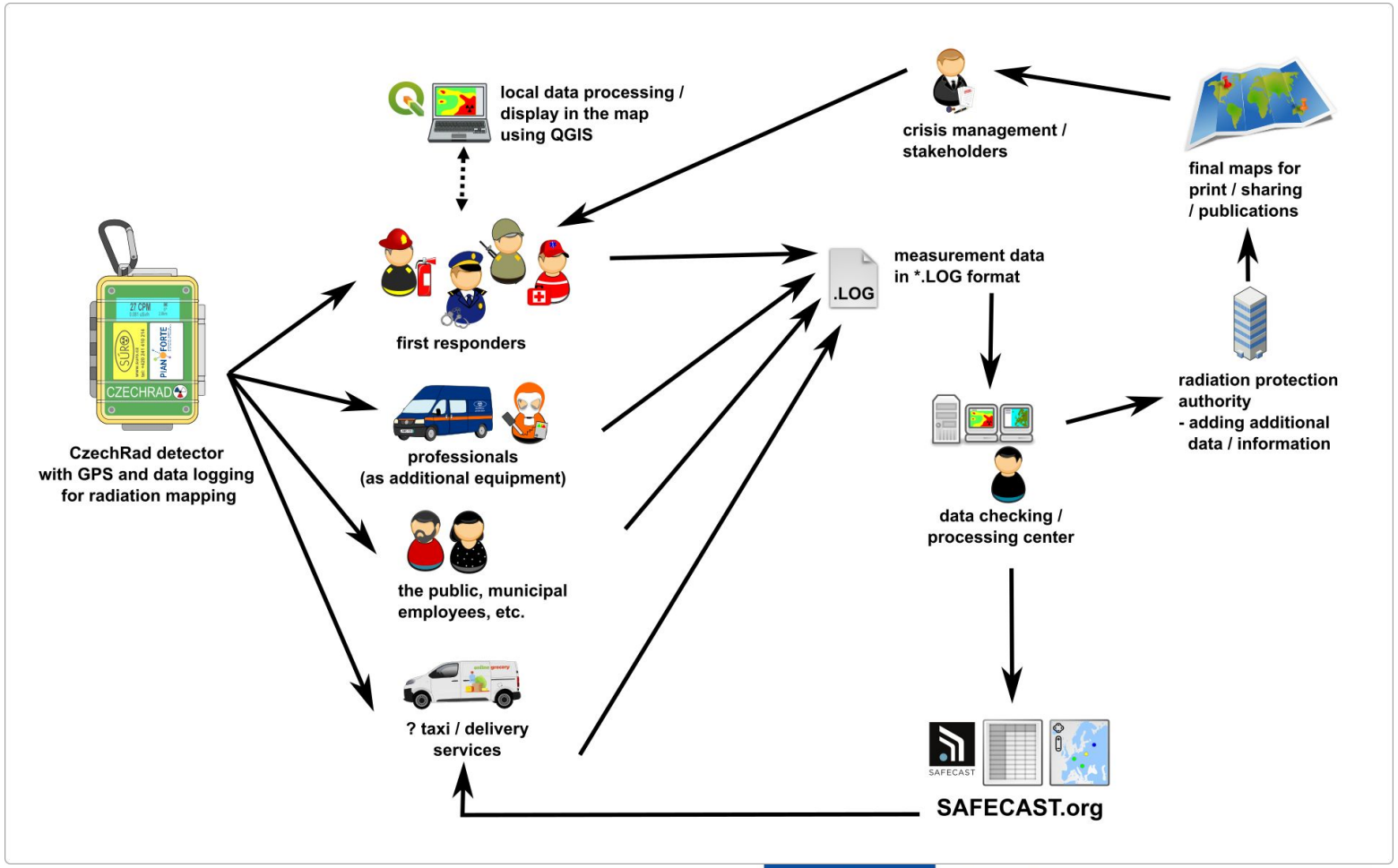
CITISTRA and CzechRad detector

- implementation of the CzechRad detector with GPS

- 200 detectors → Poland
- 100 detectors → Slovakia

(*Czechia already has 200 detectors)

- use of existing and proven applications - QGIS and Radiation Toolbox plugin, SAFECAST.org online apps (Safecast Map and API)



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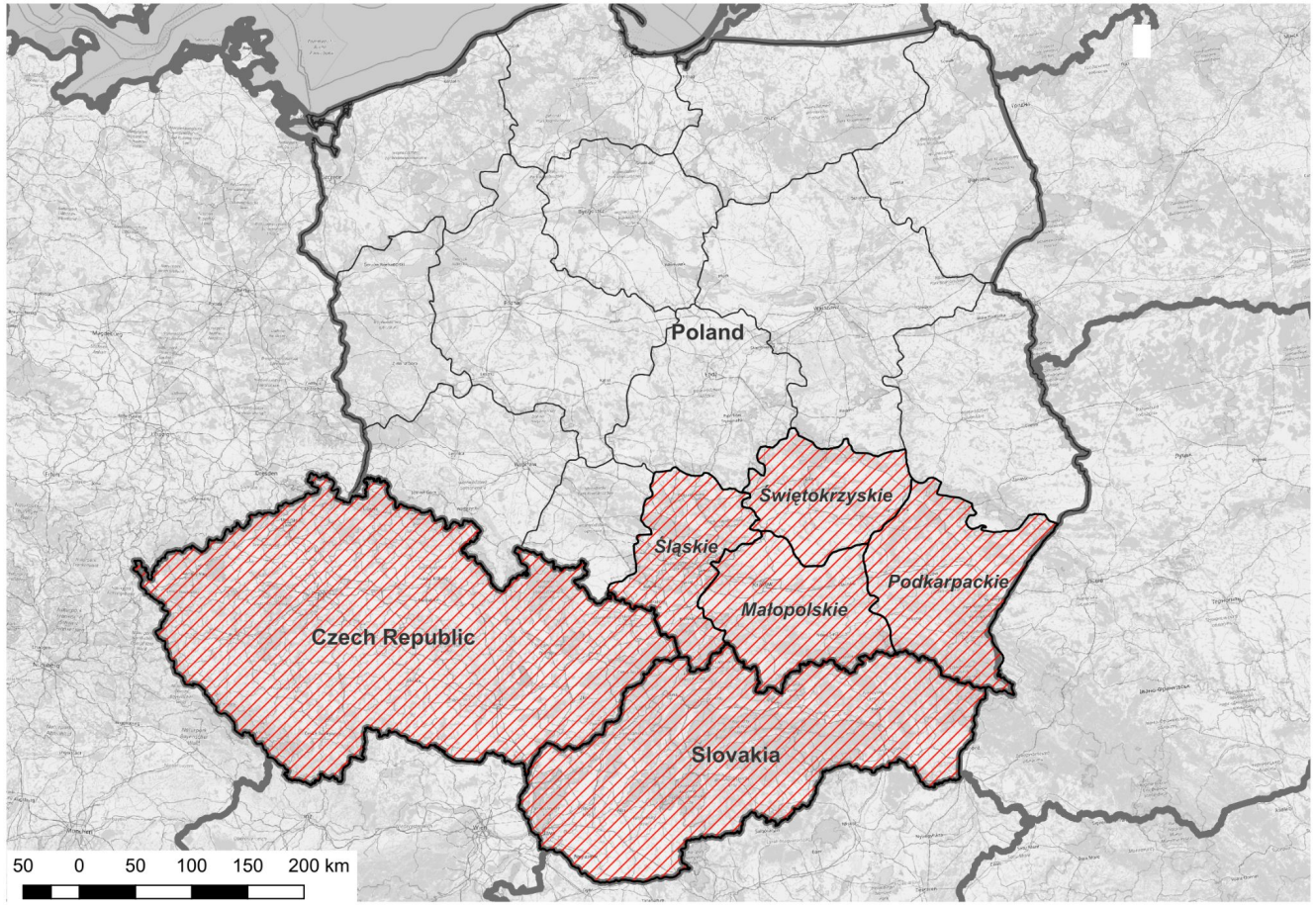
CITISTRA - detector coverage



- Czech Republic
- Slovakia
- Poland - voivodeships:
Małopolskie (Lesser Poland)
Podkarpackie (Subcarpathian)
Śląskie (Silesian)
Świętokrzyskie (Holy Cross)
(PS: travelling not forbidden :-))

Resources:

Background map: © OpenStreetMap contributors

Administrative boundaries: Runfola, D. et al. (2020) geoBoundaries: A global database of political administrative boundaries. PLoS ONE 15(4): e0231866. https://doi.org/10.1371/journal.pone.0231866

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CITISTRA overview - 1st year

- CzechRad detector production (300 pcs) in Czechia
- sociological research (1st round) / selection of potentially suitable users / groups of users
- preparatory workshops
- creating support materials (graphics, web, GIS data etc.)
- preparation / arrangement of infrastructure needed for sharing, storing (+ backup), processing and evaluating measured data

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CITISTRA overview - 2nd/3rd year

- distribution of CzechRad detectors to CZ / SK / PL users
- training of device users, performing field measurements
- field data processing / verification / map visualizations
- sharing all measured data with the public
- user support (technical issues, real/false “hot spots”, education)
- sociological research (2nd round) - evaluation of the experience
- measurements of food, feedstock or objects of daily use monitoring
- measurements of thyroid glands (patients after radioiodine application)

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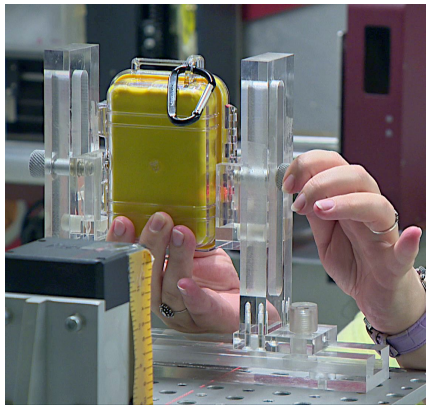
CITISTRA - 1st year

- CzechRad production in progress
- 300 devices getting to be ready at the end of this year

- testing of each device with a Cs-137 source
- detailed laboratory tests of several pieces in SÚRO

X-ray and gamma ray laboratory



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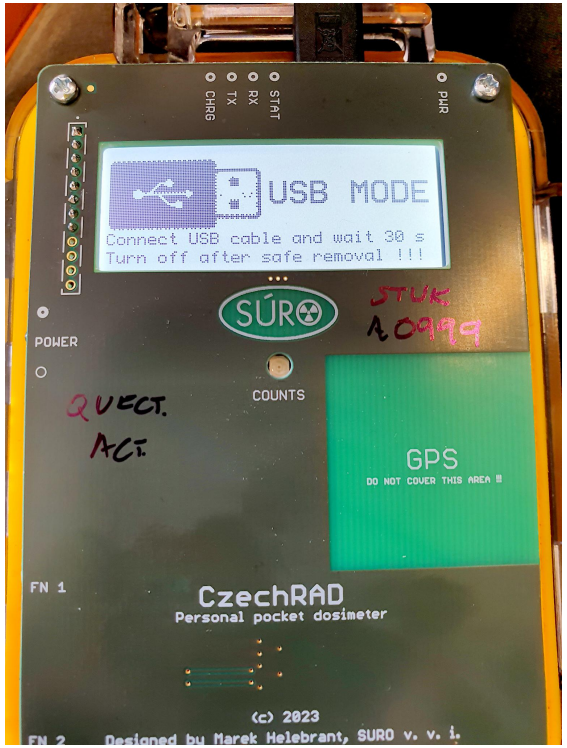
CITISTRA - 1st year - CzechRad production, firmware

- software / firmware development - usb mode for CzechRad (no card reader needed for downloading the data)
- thyroid measurement feature in development etc.



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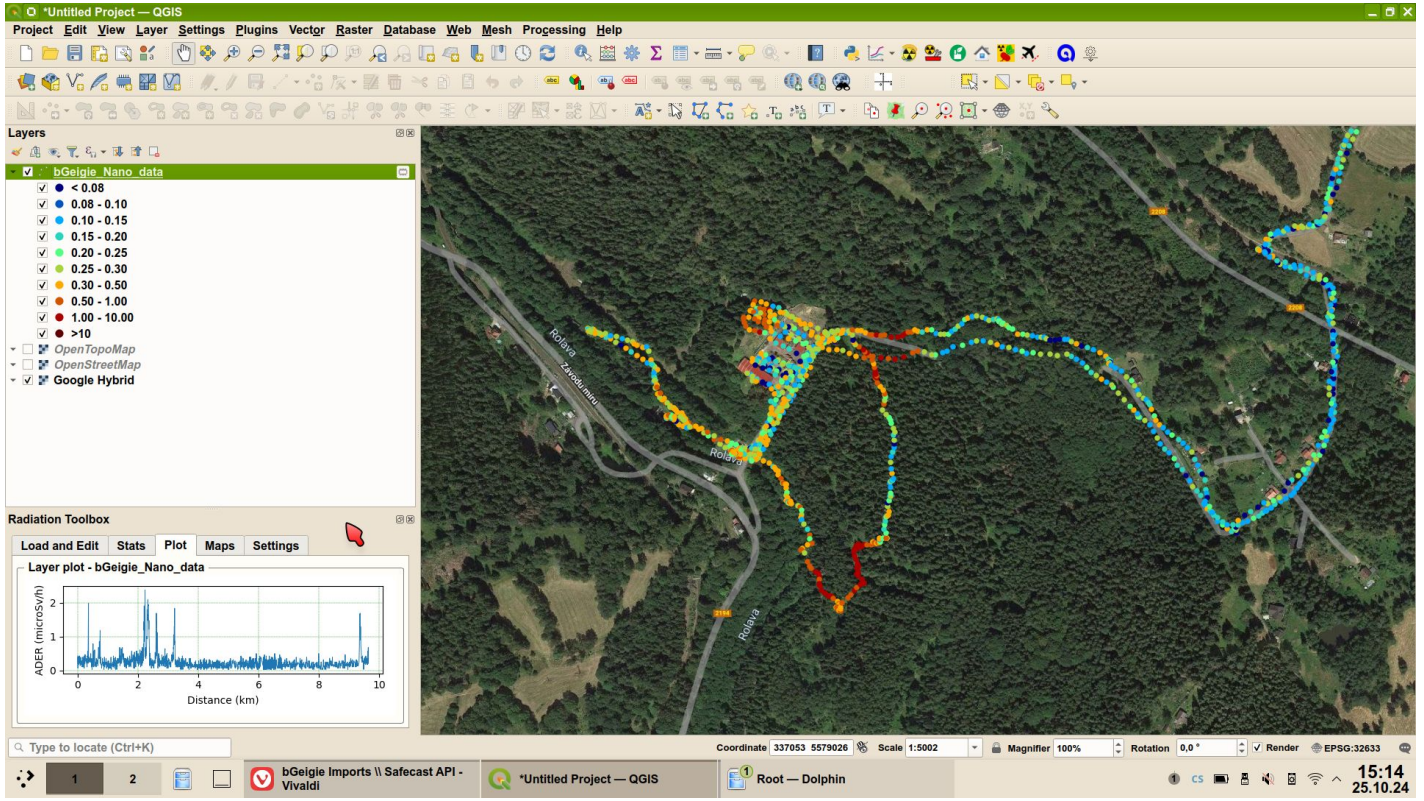
CITISTRA - 1st year - QGIS

- QGIS plugin “Radiation Toolbox” undergoing a code redesign (additional development planned for next year)
- implemented support for CzechRad detectors (for proper ADER calculation etc.)



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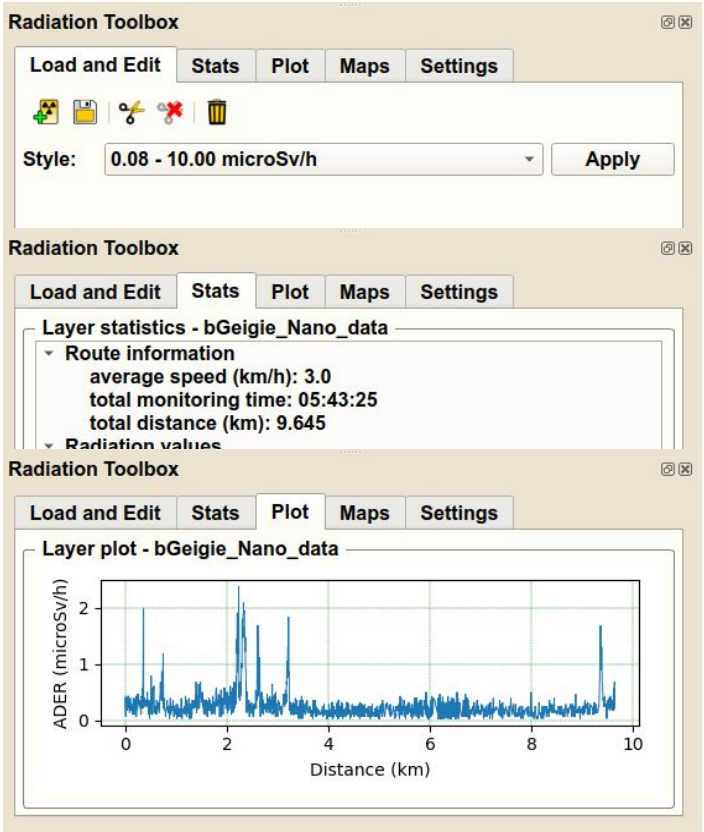
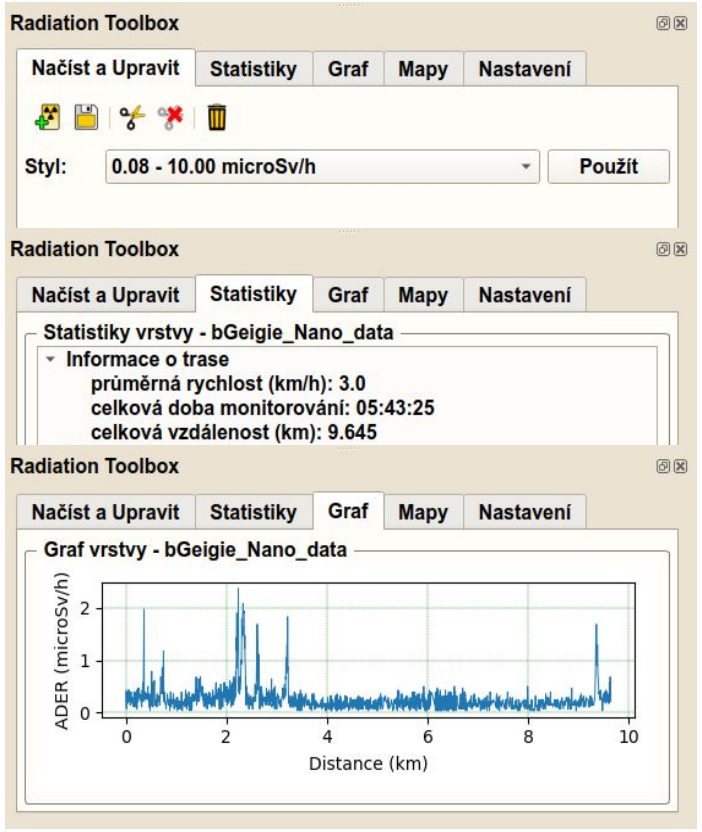
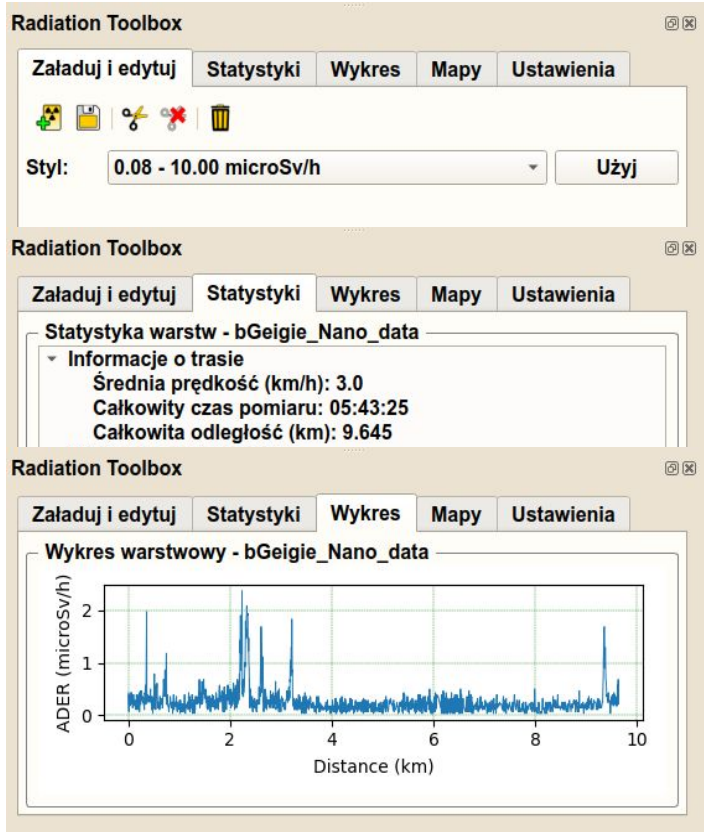
CITISTRA - 1st year - QGIS

- plugin also in Polish now :-)







(QGIS is already available in all needed languages)

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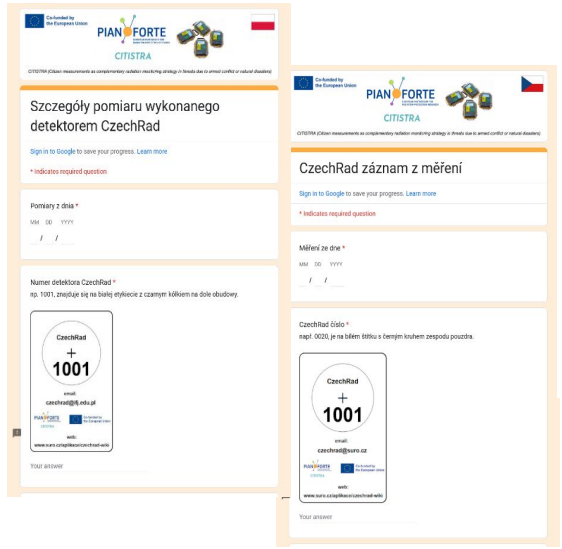
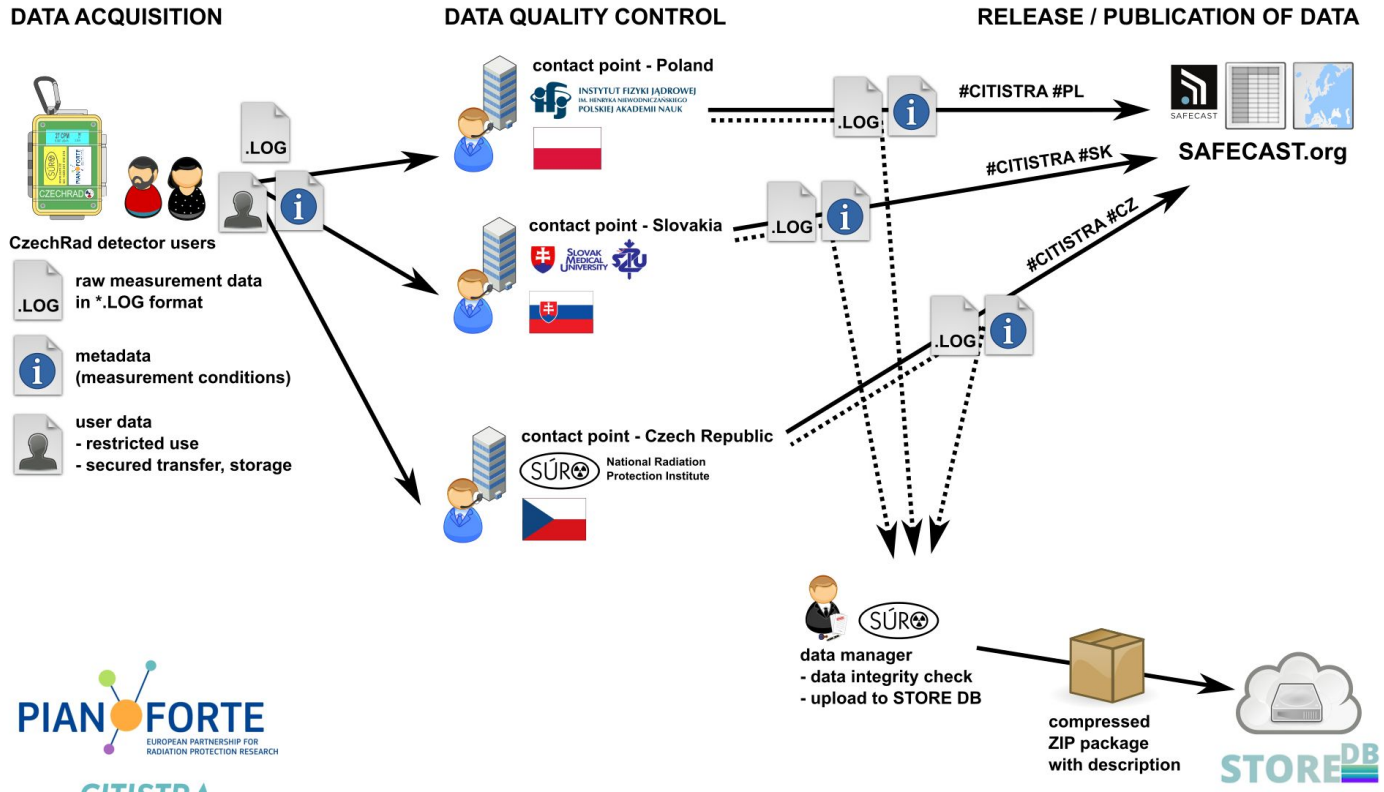
CITISTRA - 1st year

- creating data management plan
- translating various materials,
  creating online forms …
- preparing educational videos…





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CITISTRA - 1st year - training, workshops

- Citistra devices are not ready yet but we have CzechRads from other project we borrowed to our partners in PL, SK, for getting to know the device, initial training / measurement / data processing

- project was presented during Małopolska Night of Scientists on the 27th of September 2024 in Krakow, Poland

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CITISTRA - 1st year - training, workshops

- project was presented on the conference organised by The Radiation Protection Experts Society, on 8-9 May 2024, Opole, Poland

Current issues in the field of environmental dosimetry, including the measurement of radon in the air, radiotherapy, and nuclear energy - expectations, plans and the role of radiation protection expert

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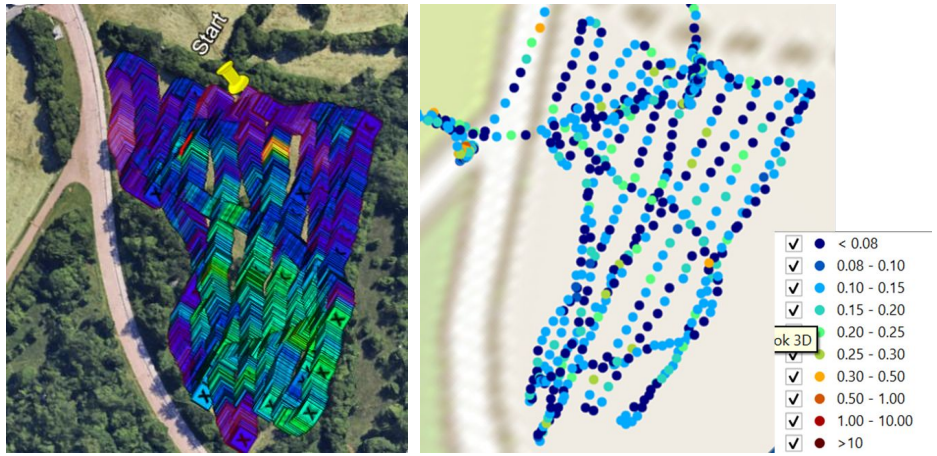
CITISTRA - 1st year - training, workshops

- project was presented and used during field exercises of the Joint ICTP-IAEA Workshop on Advanced Mobile Techniques for Radiation Monitoring and Mapping, (Trieste, Italy, October 2024)

PGIS (Scintilation detector) vs CzechRad (G-M)



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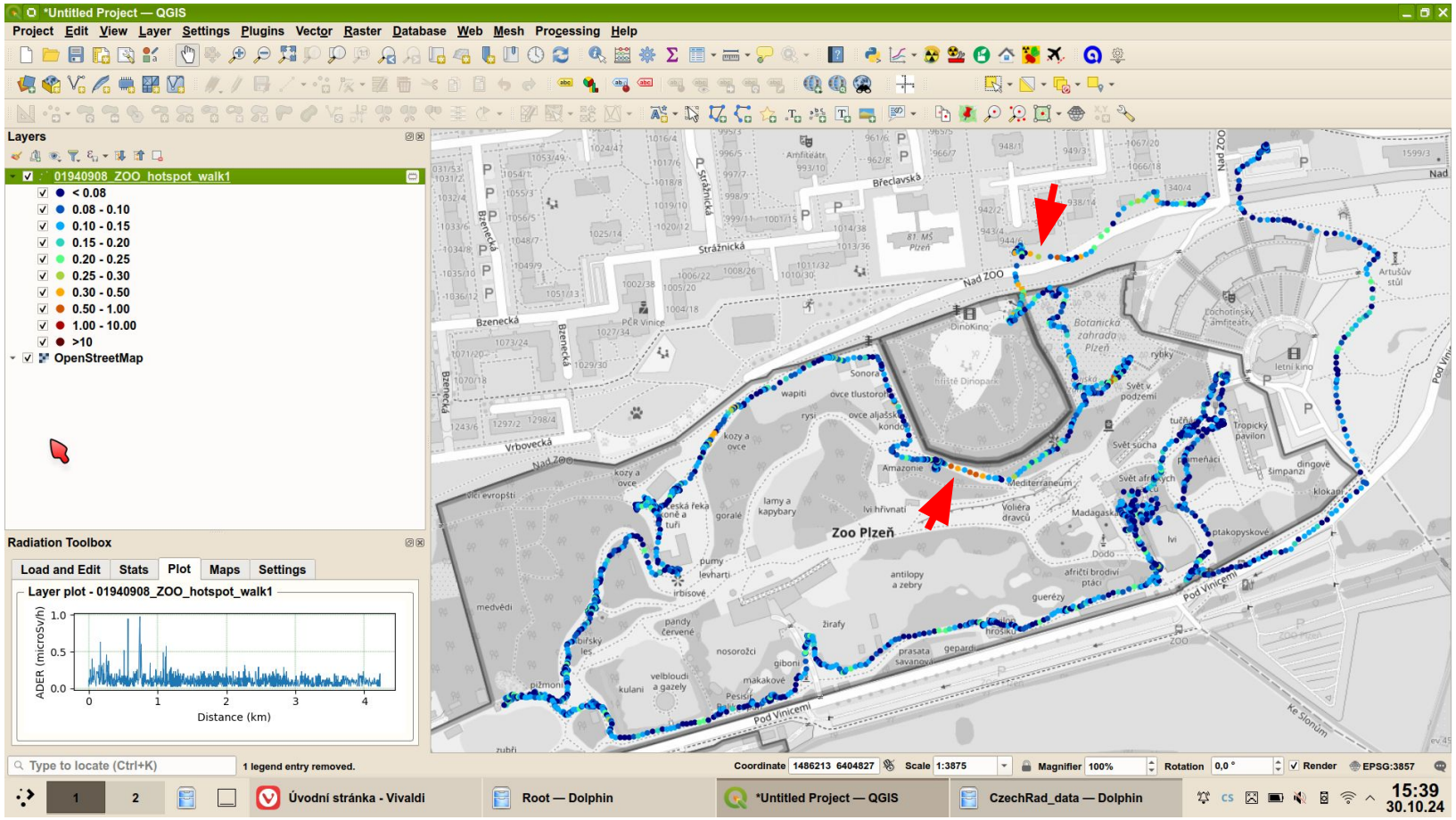
CITISTRA - 1st year - cooperation with the community

Potential “hotspot” in Pilsen ZOO (Czechia)

- seemingly real elevated values (up to 1 microSv/h)
- had similar cases with NORM material used for road underfill etc.
- further investigation needed



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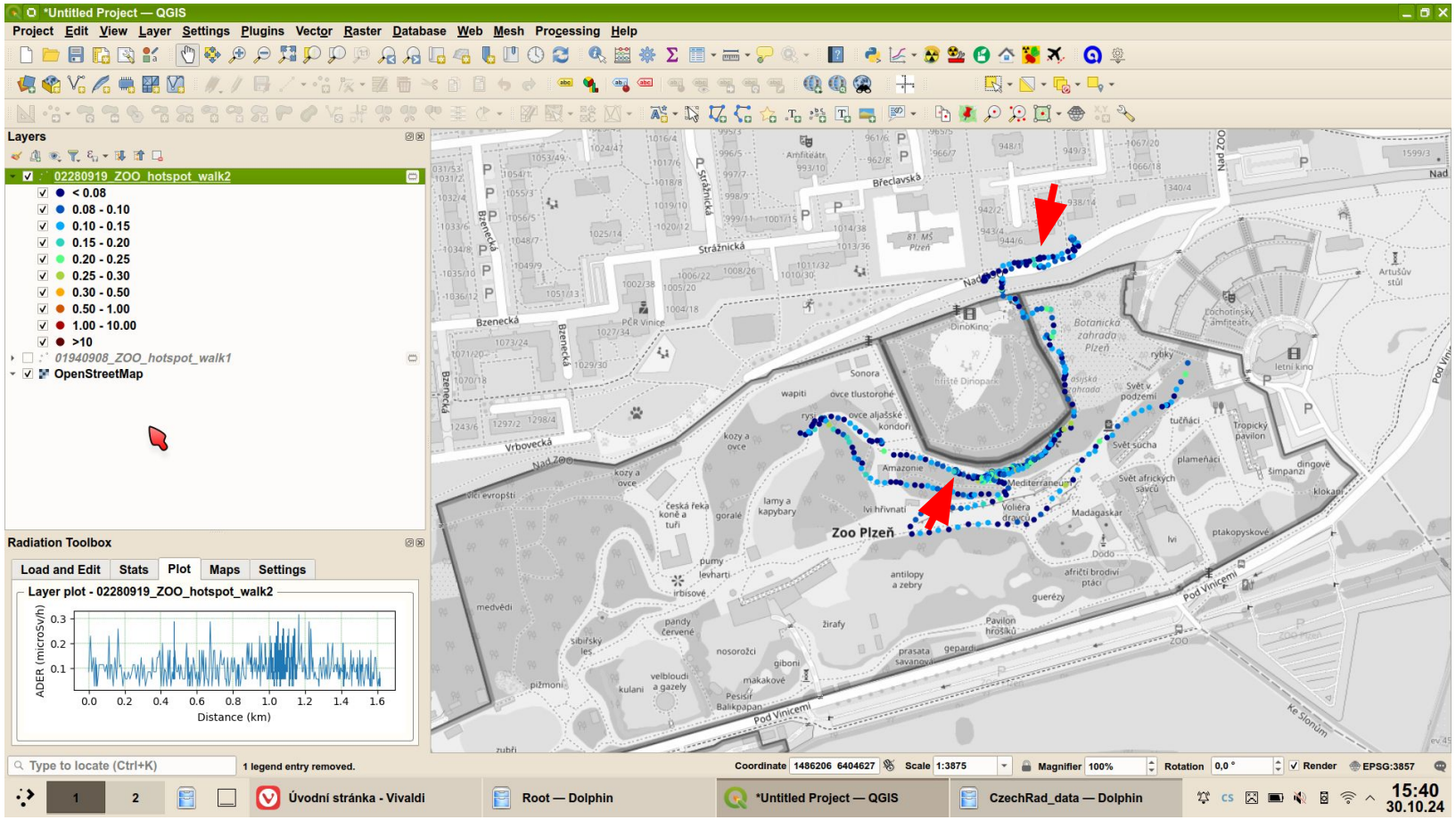
CITISTRA - 1st year - cooperation with the community

- another user from the community managed to perform another measurement few days later, no elevated values detected

- the cause was apparently a visitor - a patient after radiotherapy



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CITISTRA - 1st year - measured data

- although there are not yet any CITISTRA data yet, there are already more than 1200 CzechRad data files (not just from Czechia :-)) available from the Safecast API
- these data are all licensed as CC0 Public Domain so no limitation regarding possible use (comparisons, scientific analyses, students works etc.)

Photo: Marek Helebrant (CC BY-SA)

Photo: Rostislav Novák (CC BY-SA)

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CITISTRA - 1st year - sociological survey

- the tender for a sociological survey in CZ, SK, PL was won by the company MEDIAN, s.r.o. *("a leading research agency with many years of experience in the area of market research, media and public opinion)*

- this company is known, for example, for official opinion / pre-election polls for Czech state institutions, the media, etc.

- survey questions were prepared by CITISTRA team during Prague workshop (scientific part + country specific parts) and then consulted with MEDIAN from the sociological point of view

- final questionnaires (online) will be in national language of each country

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CITISTRA - 1st year - sociological survey

- 1000 respondents in each country (Czech Republic, Slovakia, Poland) will be approached to fill in the online questionnaire
- the final preparations of the questions for the questionnaires are currently underway, so that their distribution to the respondents can begin soon

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CITISTRA - connection with other projects

- experience from the RAMESIS project and Safecast bGeigie Nano devices
- continued development of the QGIS "Radiation Toolbox" plugin originally developed in another project
- possible connection to RRADEW Pianoforte project
- based on our experience, manual processing into maps is too time-consuming in an emergency situation - so we had to consider sort of (semi)-automatic processing - thus the H3Gen software was born (within another project)

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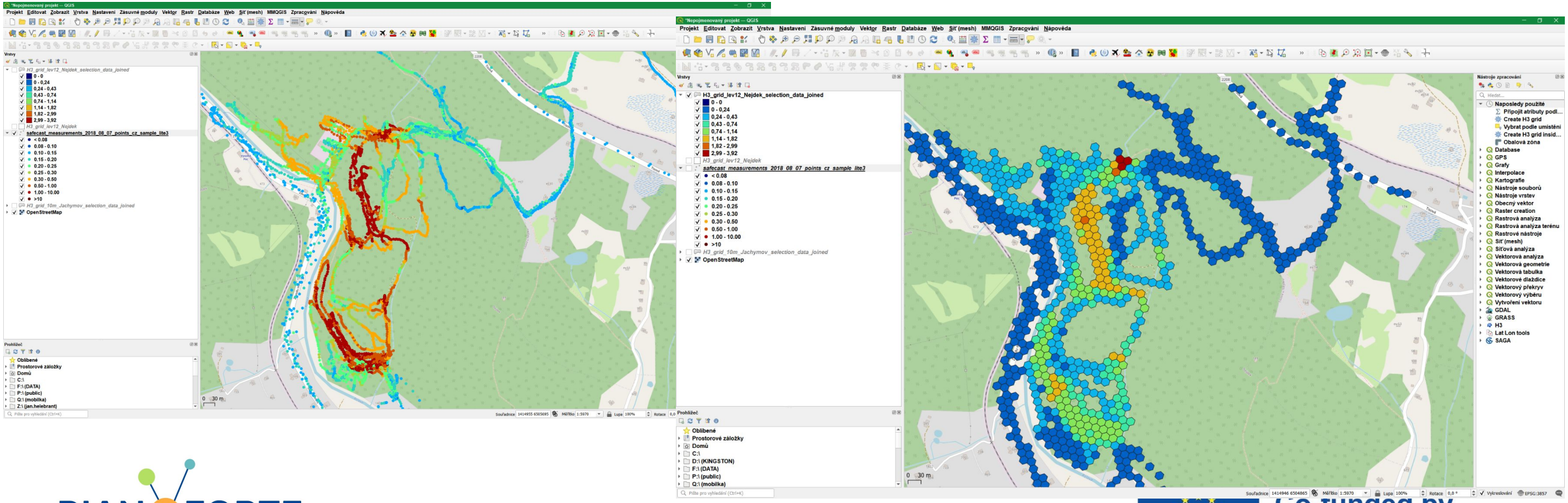
CITISTRA - connection with other projects

- H3Gen automatically processes Safecast / CzechRad (and possibly other device data in future) and uses data binning to convert them into H3 Grid hexagonal cells



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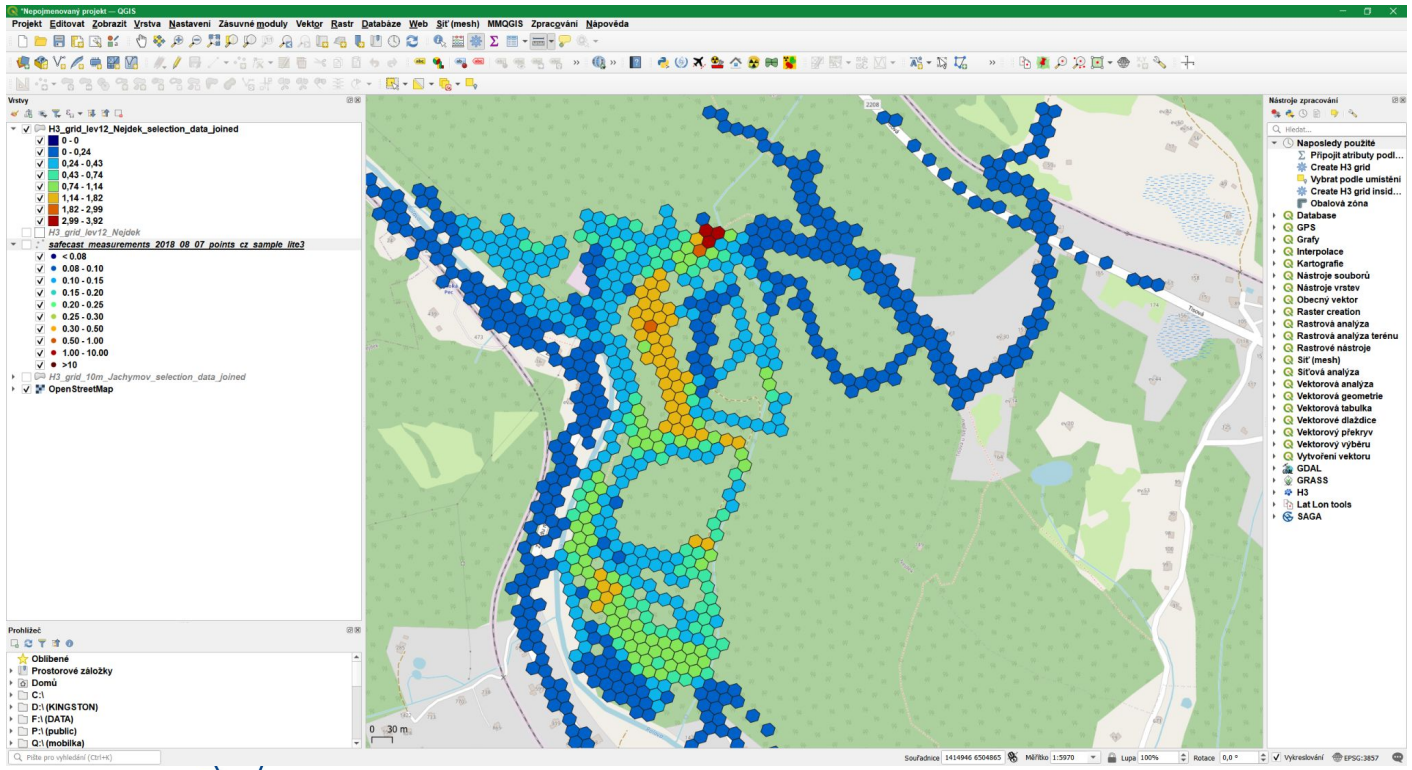
CITISTRA - connection with other projects

- H3Gen is currently under development
- the goal is to have a SW for automatic batch processing of huge amount of data



- data binning into hex cells deals with amount of data, overlapping points etc.
- results - clearer maps, smaller and easier to load GIS files

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CITISTRA - conclusion

The first year of the citistra project was affected by several negative factors that delayed it - various formal paperwork, tenders, delivery delays etc.

However, thanks to the possibility of connection / cooperation with other projects, it was possible to lend some CzechRad devices to our foreign partners in advance so that pilot measurements, familiarization with instruments, etc. could begin.

The sociological survey is in progress and we are working hard to ensure that our foreign partners receive the whole batch of CzechRad detectors - around the end of 2024.

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Thank you for your attention