

Network of CzechRad mobile gamma radiation detectors in Poland

- infrastructure for determining the local as well as spatial
distribution of dose rates in threats
due to armed conflict or natural disasters

Renata Kierepko

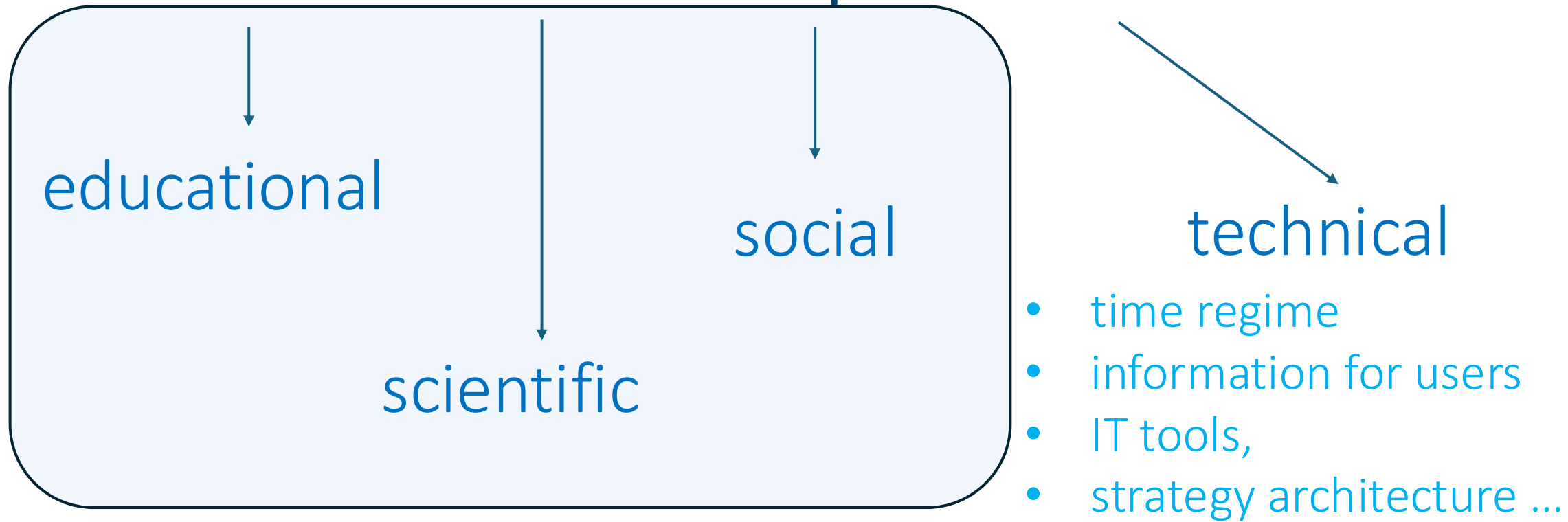
Mateusz Krzysiek, Anna Mrozik, Paweł Olko, Agnieszka Szumska



Instytut of Nuclear Physics
Polish Academy of Sciences
(IFJ PAN)

CITISTRA

essential components



CITISTRA in Poland

project area

- 5 administrative divisions = voivodeships
- ~84 000 km²
- southeastern Poland

project participants

- 5 professional groups:
 - firefighters of the state and volunteer fire departments
 - employees of sanitary and epidemiological stations
 - soldiers of the Territorial Defense Forces
 - employees of municipal offices
 - foresters



created in QGIS, background map: © OpenStreetMap contributors, administrative data: CZ: CÚZK, [2024], CC BY 4.0; PL: GUGiK, CC BY 3.0; World: Administrative boundaries by geoBoundaries.org (CC BY 4.0)



CITISTRA in Poland

Main goals:

- detector user training (16 multi-hour training sessions)
 - distribution of 200 detectors (contracts with 78 institutions)
 - teaching users how to work in network (timeliness, cyclicity)
- 15th May – 6th November 2025

FF – firefighters

TDF – soldiers

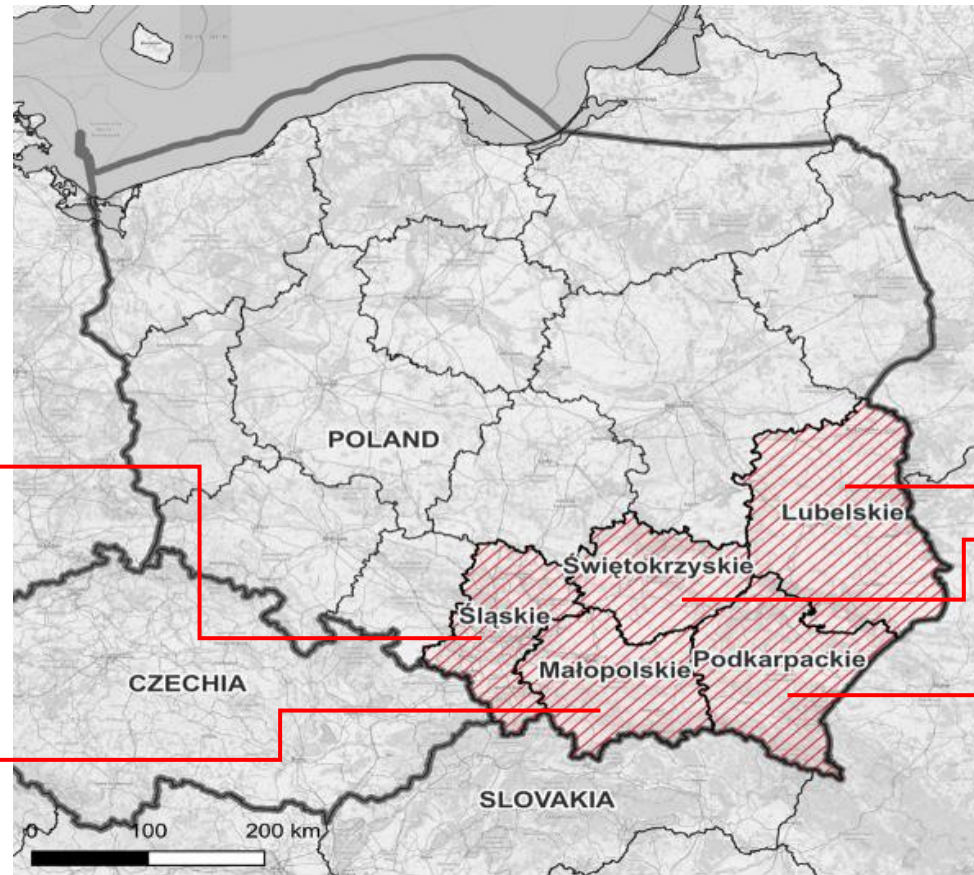
MO – em. of municipal offices

SES – em. of sanitary and epidemiological stations

F – em. of forest district

41 detectors
(20 TDF, 21 SES)

72 detectors
(70 FF, 2 SES)



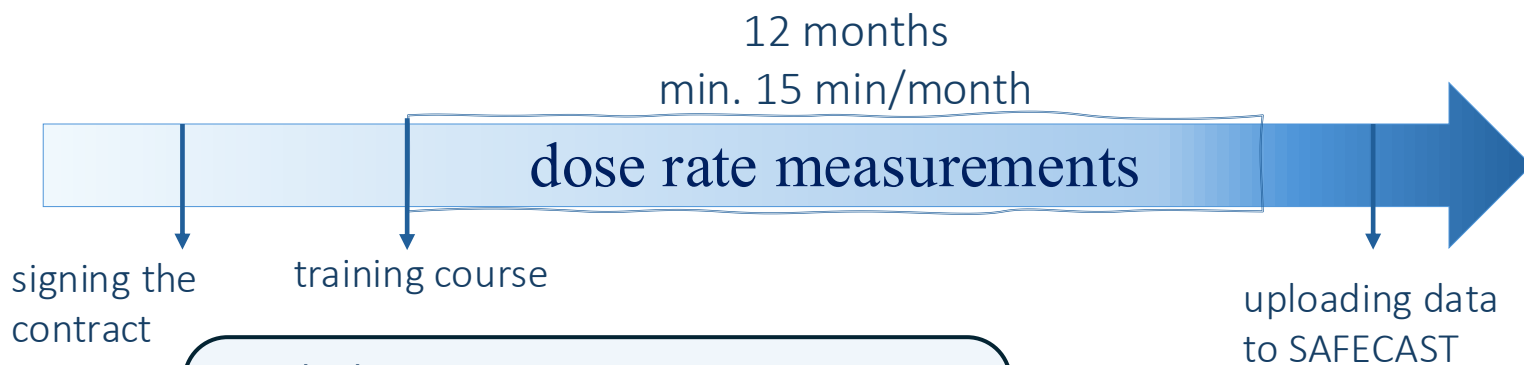
30 detectors
(1 FF, 20 TDF, 6 MO, 3 F)

21 detectors
(1 SES, 20 TDF)

36 detectors
(2 FF, 6 SES, 20 TDF, 4 MO, 4 F)

CITISTRA in Poland - background

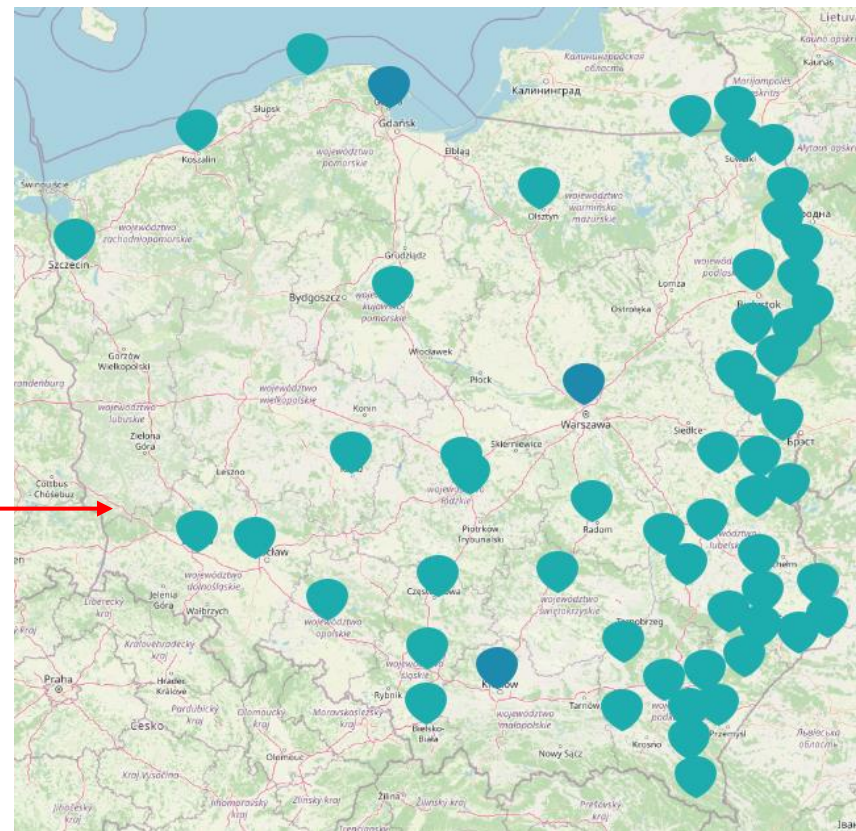
- **Poland** is a country without NPP yet
- geopolitical situation: war in Ukraine (beyond the eastern border of **Poland**)
- network of stations for early detection of radioactive contamination in **Poland**: 65 stations
- participation in the CITISTRA project in **Poland** is an additional commitment for detector users = routine activities for 12 months



Polish society:

- lack of authorities
- lack of a sense of security

NERIS, Paris, 28-30 April, 2026



SOURCE: <https://monitoring.paa.gov.pl/maps-portal/>

	Distance [km]
Min	0.51
Max	171.90
Average	43.91

CITISTRA in Poland

how we would like CITISTRA to be perceived

a credible project

CITISTRA resistant to false alarms

reliable data analyses

CITISTRA supporting detector users

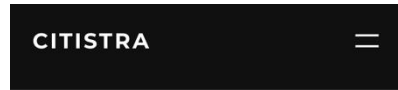
educational project

a project combining the activities of scientists/experts
and citizens who are not specialists

a project providing a sense of security

measurements enabling terrain mapping with a
resolution better than before achieved

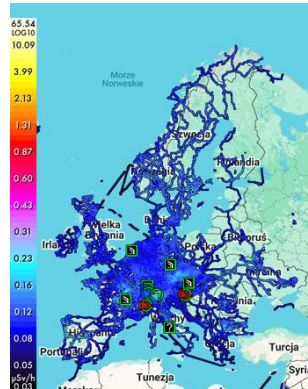
CITISTRA in Poland strategy architecture



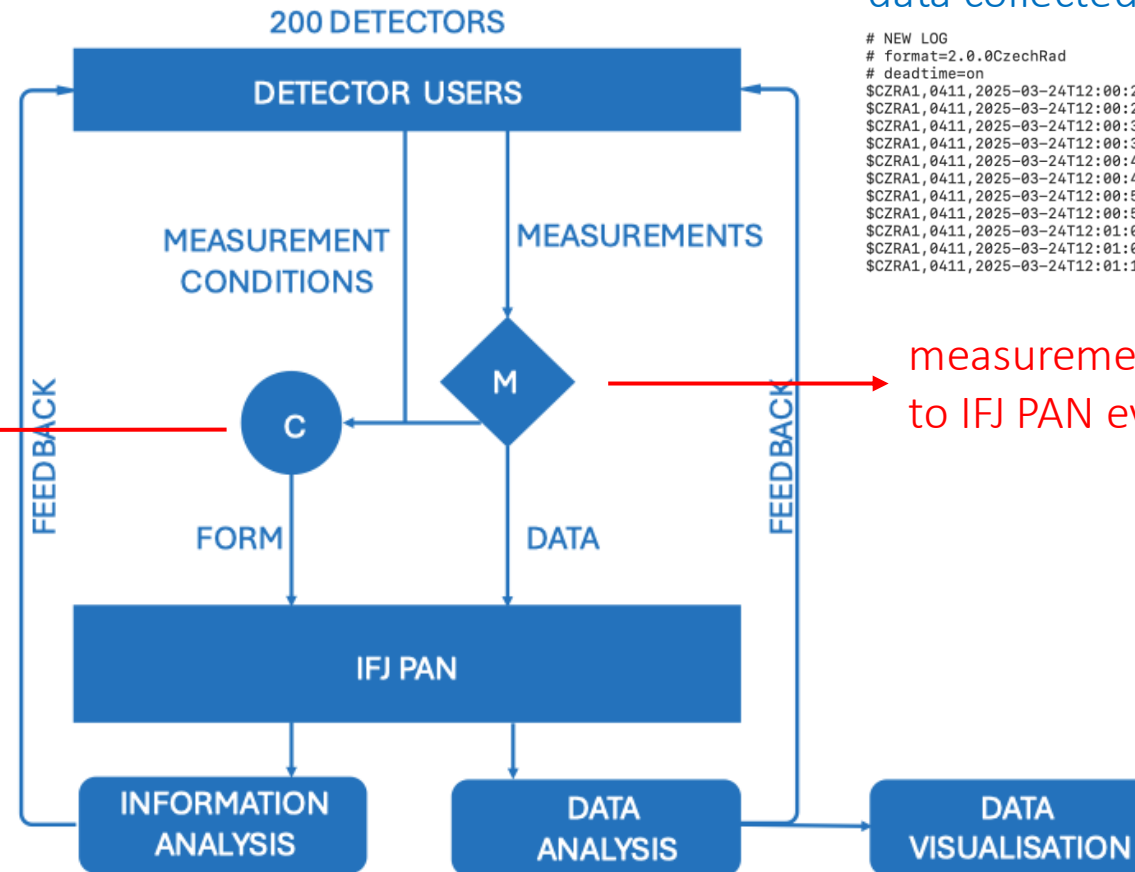
Szczegóły pomiaru wykonanego
detektorem CzechRad – 0411

1. Data pomiaru *

info about meas. conditions sent
to IFJ PAN after each
measurement



metadata for the SAFECAST
database



data collected every 5 s

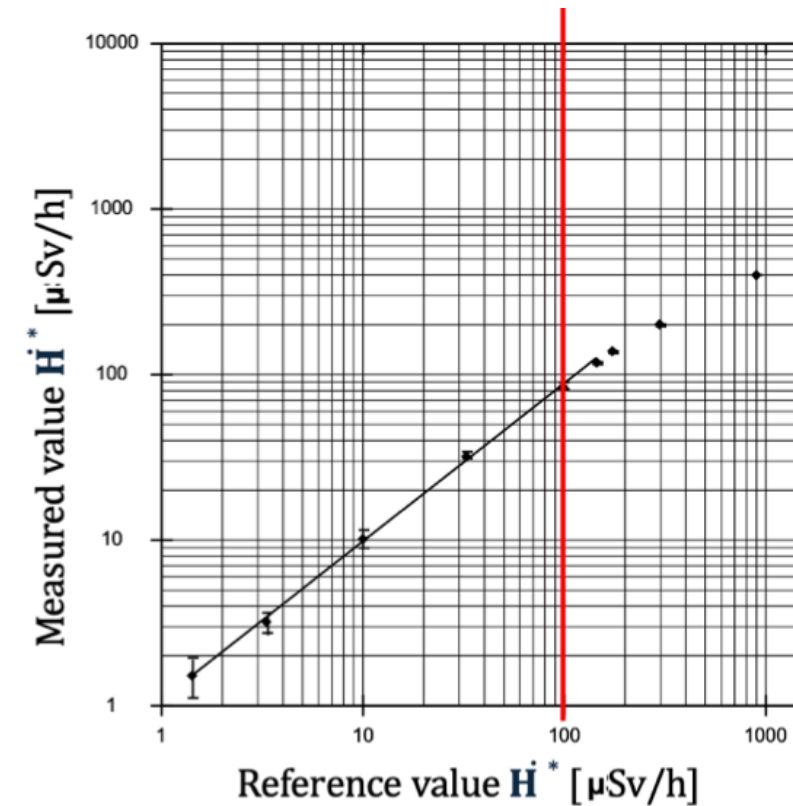
```
# NEW LOG
# format=2.0.CzechRad
# deadtime=on
$CZRA1,0411,2025-03-24T12:00:20Z,34,2,31,V,5005.4224,N,01953.3643,E,274.23,A,3,392*32
$CZRA1,0411,2025-03-24T12:00:25Z,33,0,31,V,5005.4277,N,01953.3650,E,286.43,A,4,1783*f
$CZRA1,0411,2025-03-24T12:00:30Z,40,8,39,V,5005.4248,N,01953.3633,E,271.13,A,4,1825*8
$CZRA1,0411,2025-03-24T12:00:35Z,42,3,42,A,5005.4238,N,01953.3632,E,266.45,A,4,1868*15
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$CZRA1,0411,2025-03-24T12:00:50Z,41,4,51,A,5005.4194,N,01953.3628,E,243.95,A,4,2012*12
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$CZRA1,0411,2025-03-24T12:01:05Z,36,3,62,A,5005.4111,N,01953.3612,E,222.37,A,4,2180*15
$CZRA1,0411,2025-03-24T12:01:10Z,40,4,66,A,5005.4092,N,01953.3604,E,214.10,A,4,2242*13
```

measurement data sent
to IFJ PAN every month

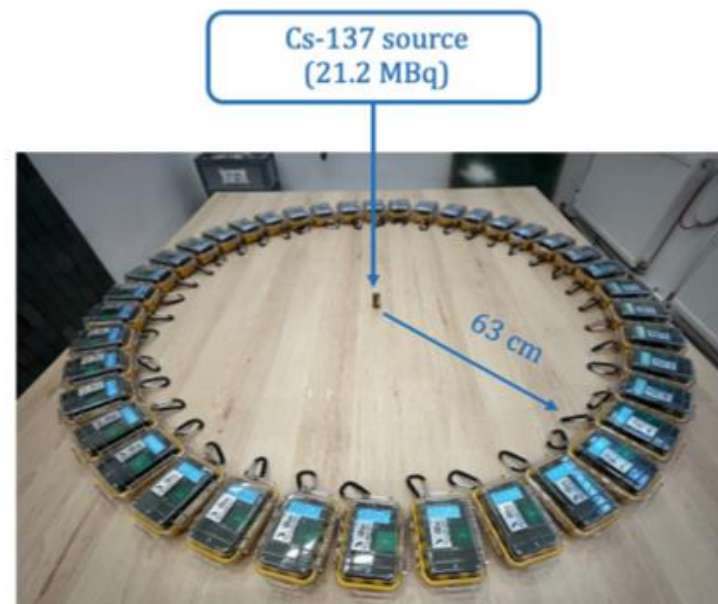
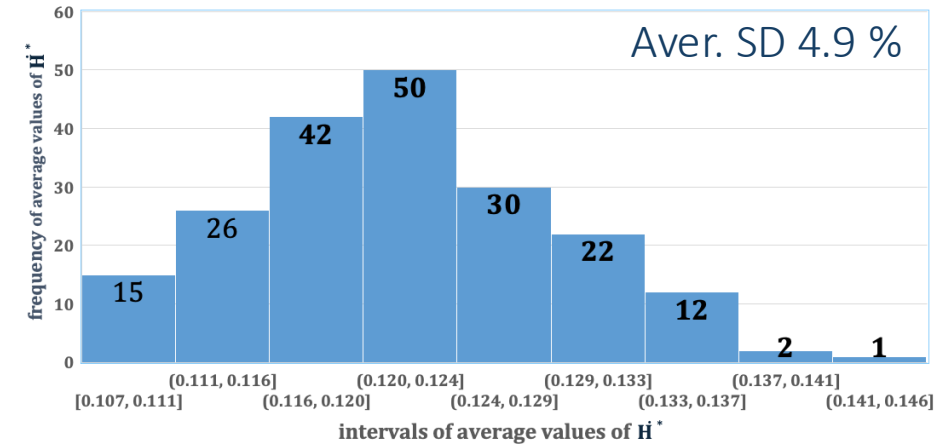
in-depth analysis of
initial conditions vs
measurement data

CITISTRA in Poland methodology – uncertainty budget

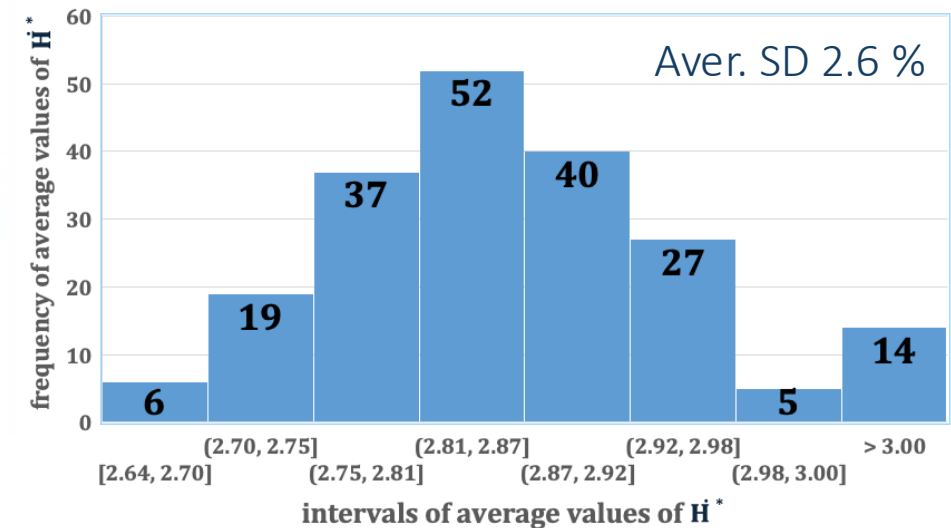
Linear range of detection



Distribution of $\dot{H}^*$ average values (10 measurements of background for each of 200 detectors)

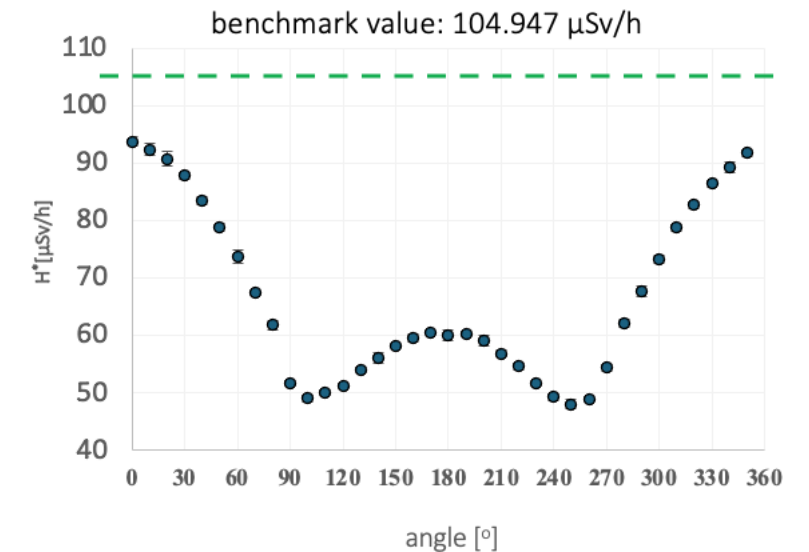
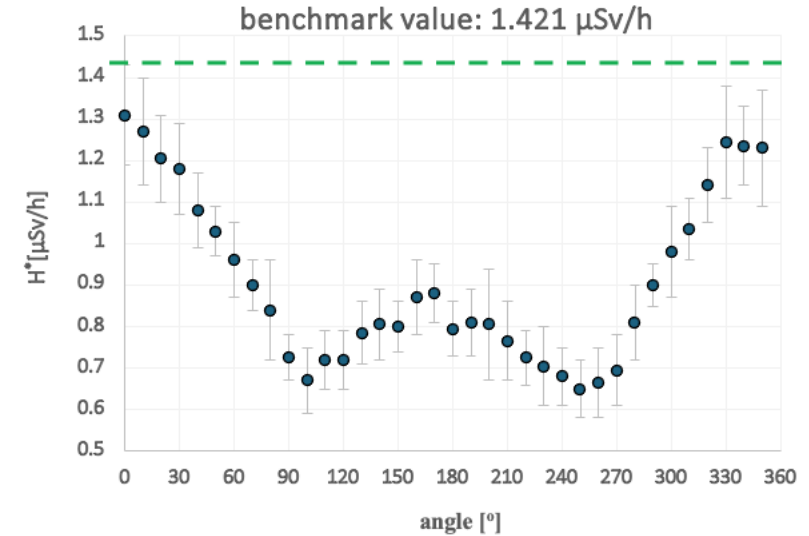
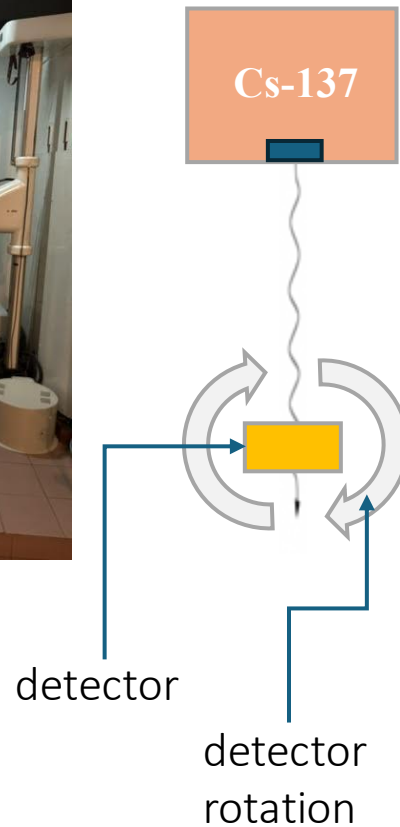
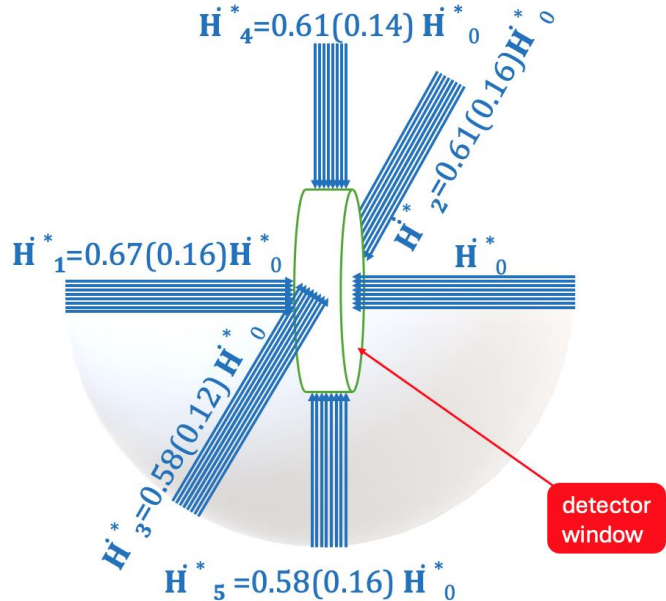


Distribution of $\dot{H}^*$ average values (10 measurements in the presence of Cs-137 source for each of 200 detectors)



CITISTRA in Poland methodology – uncertainty budget

Systematic errors – continuous source of ionizing radiation



for further analysis

- dose rate angle distributions for the remaining detector rotation axes
- the influence of atmospheric conditions
- tests of detector operation in low radioactive background conditions

CITISTRA in Poland

preparation of materials for detector users

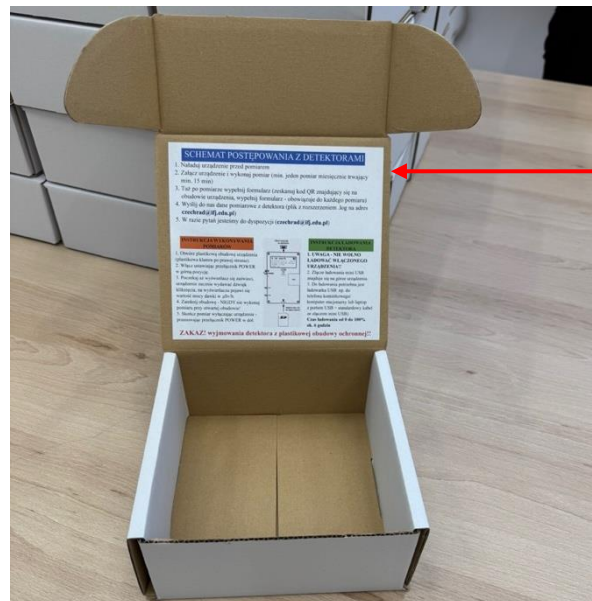
The quality of prepared materials makes sense!



suggestions for positioning the detector during measurement

instructions of:

- measurement
- sending info about measurement condition to IFJ PAN
- sending measurement data to IFJ PAN
- detector charging



Additionally:

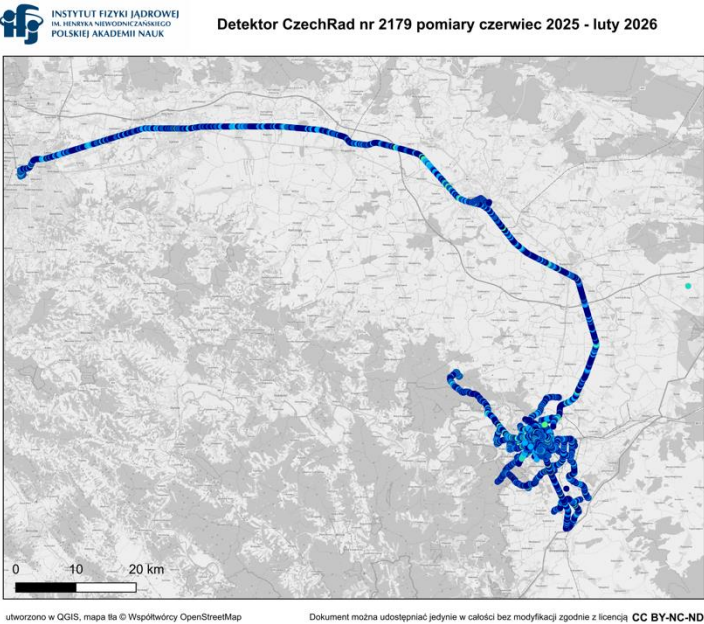
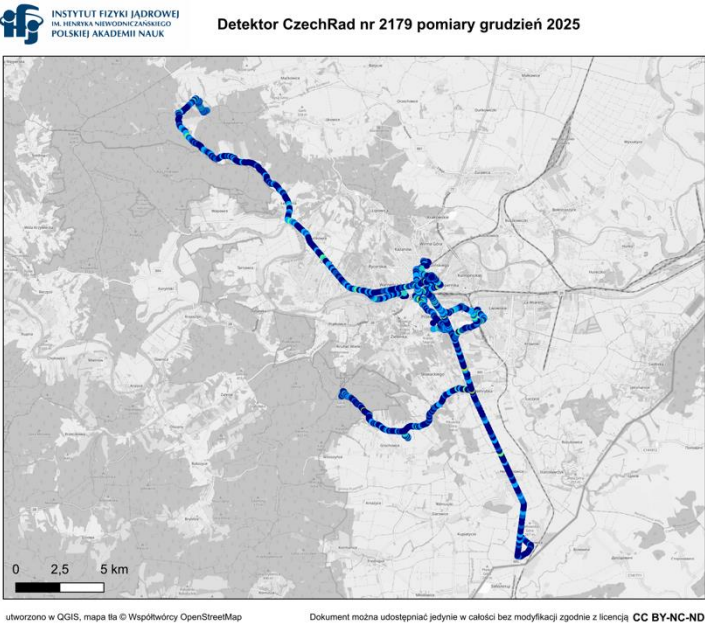
- permanent access to training course presentations
- webpage with news, FAQ, maps of the entire network (www.citistra.ifj.edu.pl)
- Contact with CITISTRA team: e-mail, phone

CITISTRA in Poland visualisation of measurement data

1 month

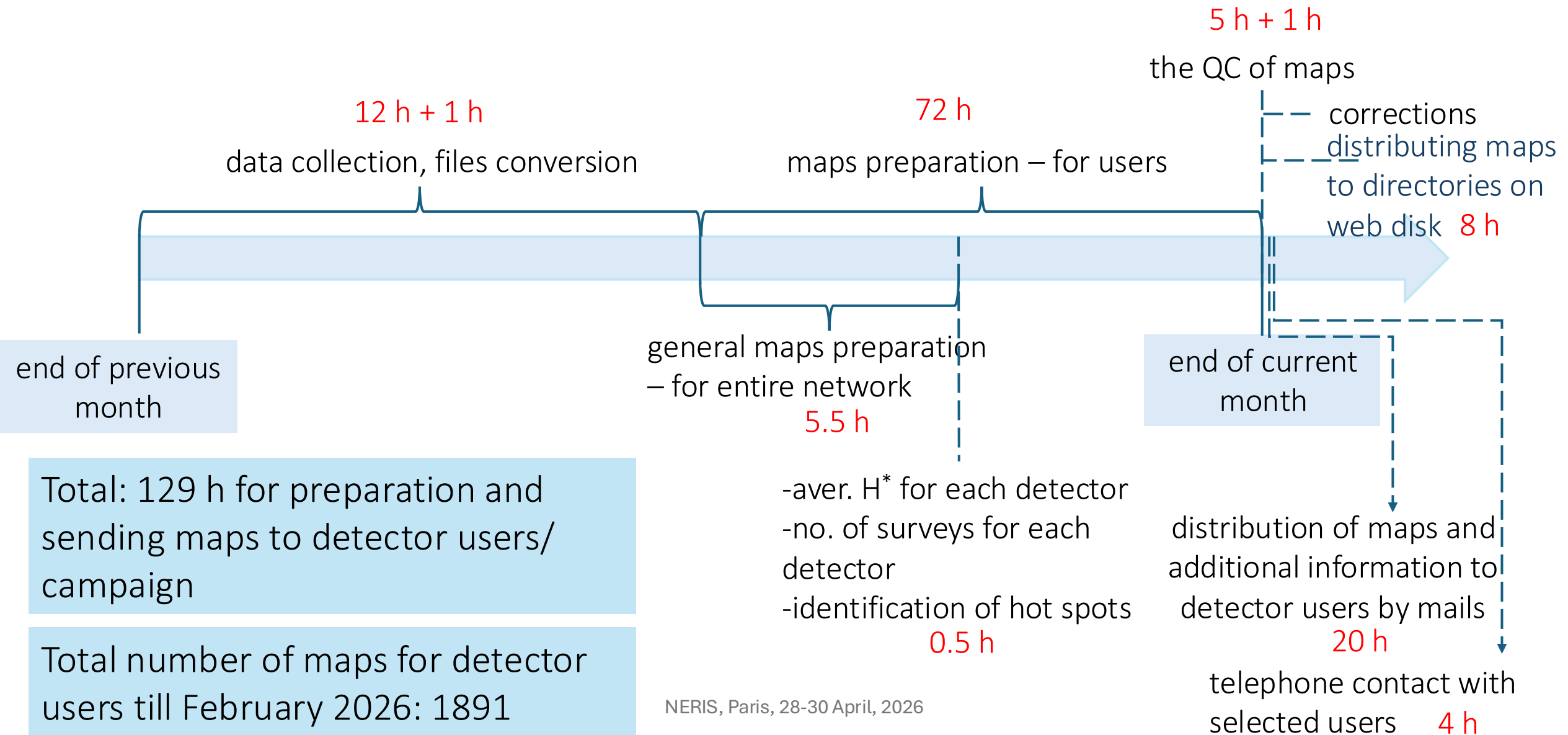
from the joining the project

additional information



month	no. of data files	no. of surveys	Aver H* [μSv/h]
June 2025	2	3	0.10
July 2025	27	38	0.10
August 2025	20	17	0.10
September 2025	26	41	0.10
October 2025	24	24	0.11
November 2025	15	6	0.10
December 2025	13	0	0.11
January 2026	14	13	0.10
February 2026	23	17	0.10

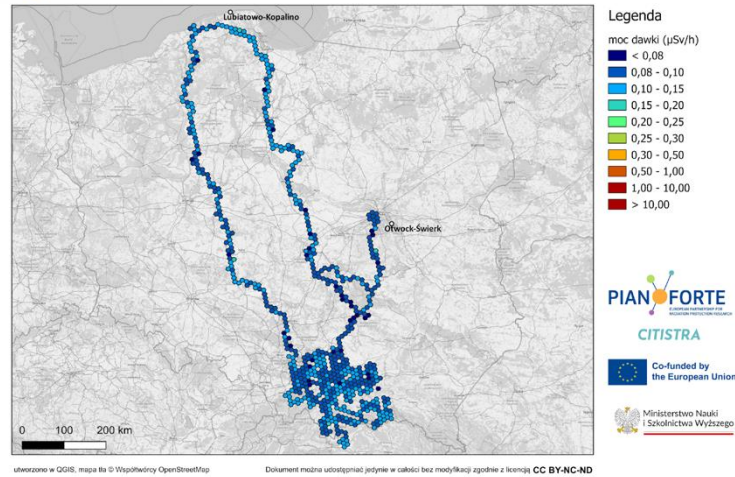
CITISTRA in Poland time scale



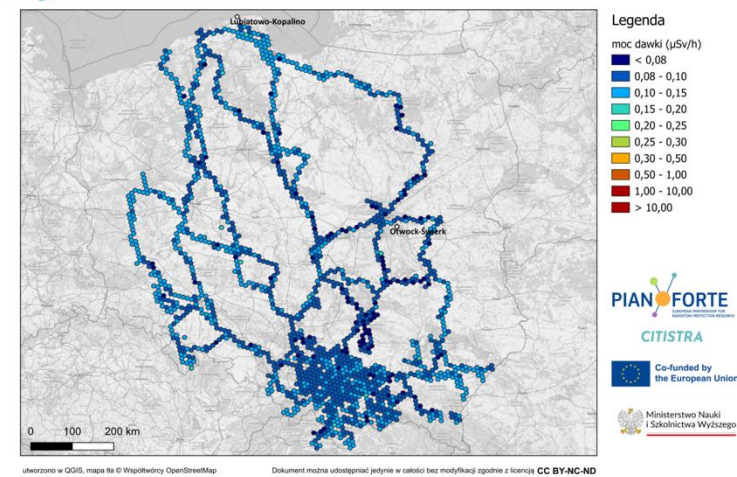
CITISTRA in Poland

how did the number of data grow for entire project?

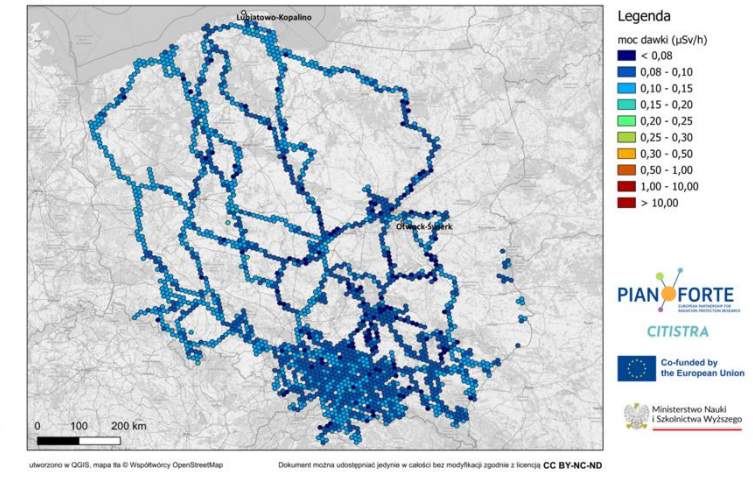
Wyniki pomiarów detektorami CzechRad w Polsce w ramach projektu CITISTRA
(liczba detektorów: 70, okres pomiarowy: maj 2025)



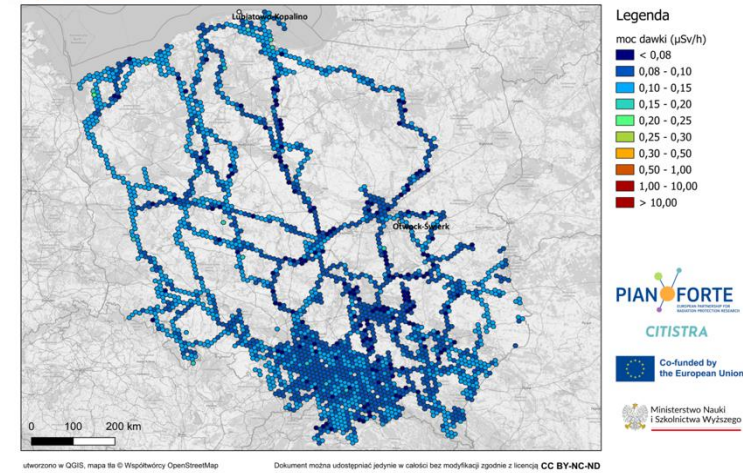
Wyniki pomiarów detektorami CzechRad w Polsce w ramach projektu CITISTRA
(liczba detektorów: 85, okres pomiarowy: maj - czerwiec 2025)



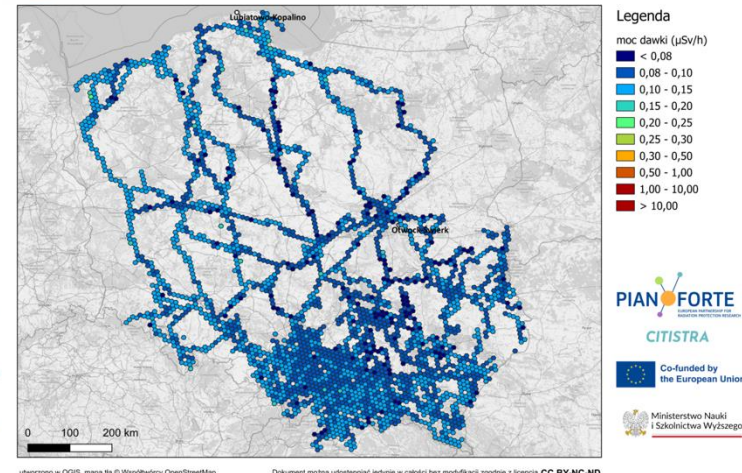
Wyniki pomiarów detektorami CzechRad w Polsce w ramach projektu CITISTRA
(liczba detektorów: 113, okres pomiarowy: maj - lipiec 2025)



Wyniki pomiarów detektorami CzechRad w Polsce w ramach projektu CITISTRA
(liczba detektorów: 193, okres pomiarowy: maj - sierpień 2025)

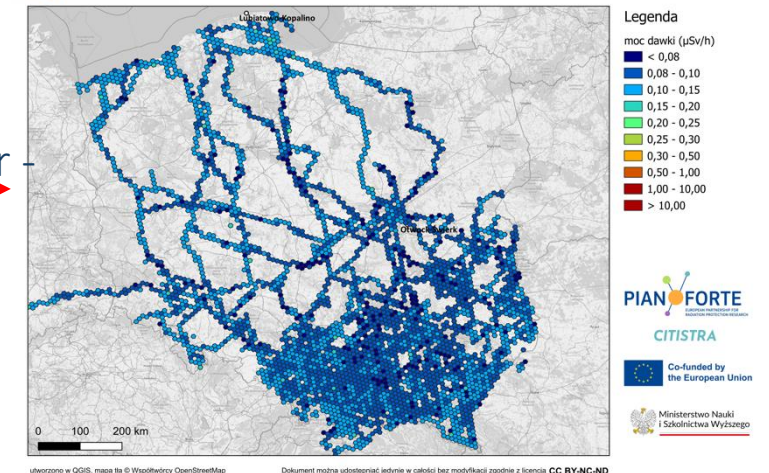


Wyniki pomiarów detektorami CzechRad w Polsce w ramach projektu CITISTRA
(liczba detektorów: 193, okres pomiarowy: maj - wrzesień 2025)



September
February

Wyniki pomiarów detektorami CzechRad w Polsce w ramach projektu CITISTRA
(liczba detektorów: 200, okres pomiarowy: maj - luty 2026)

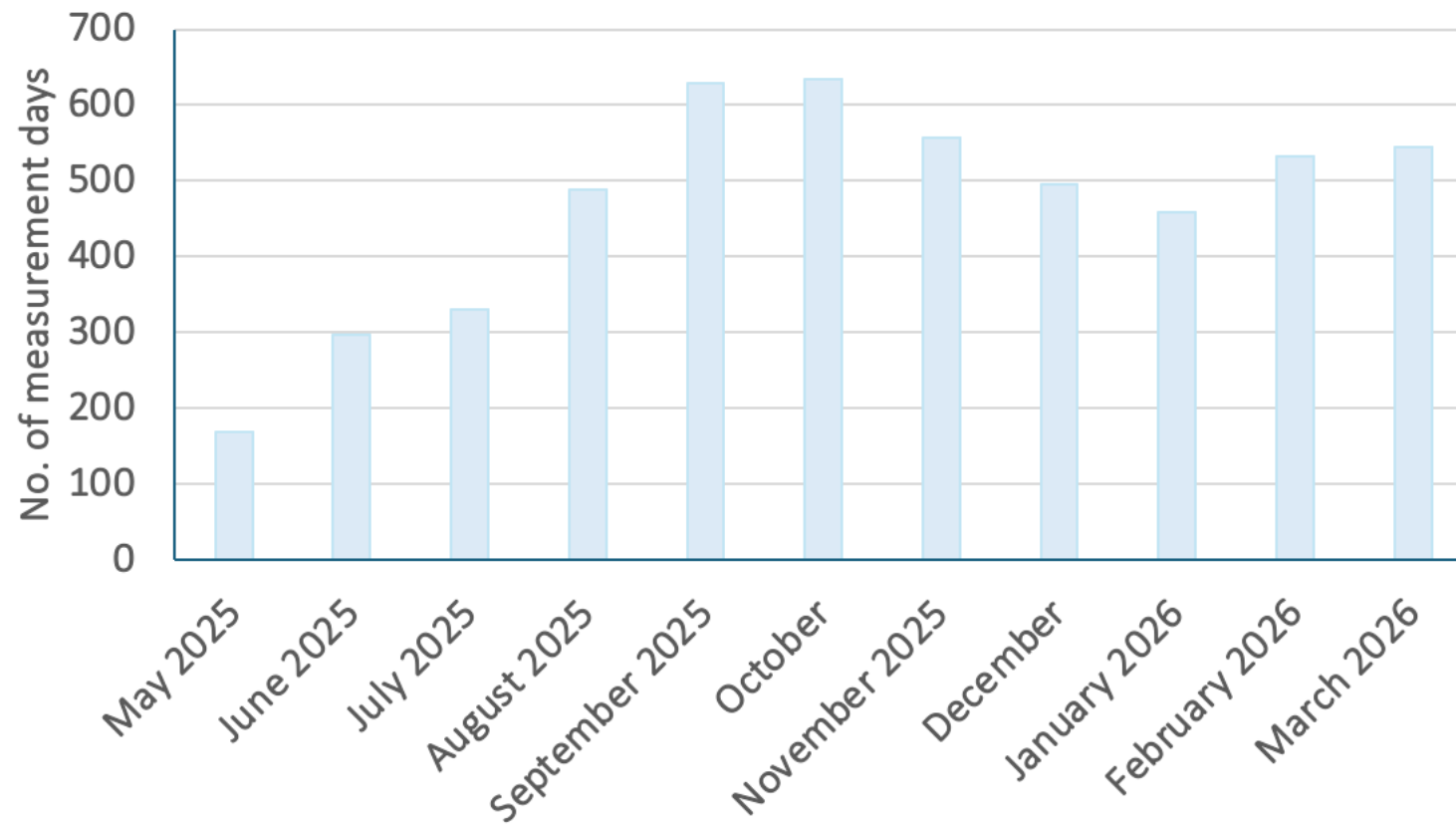


CITISTRA in Poland

how did the number of data grow for entire project?

Total number of measurement days of project till the end of February 2026: 5133

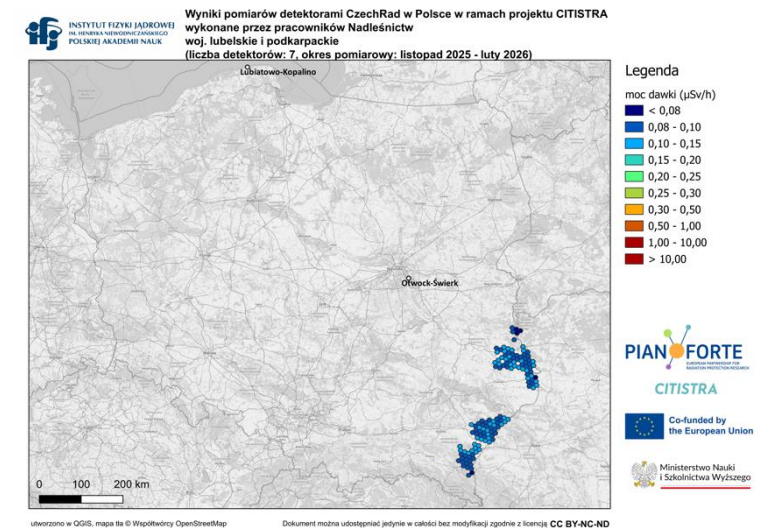
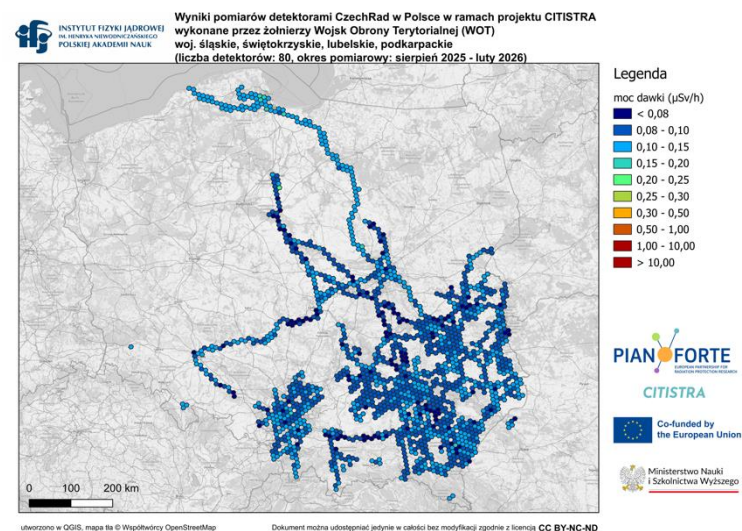
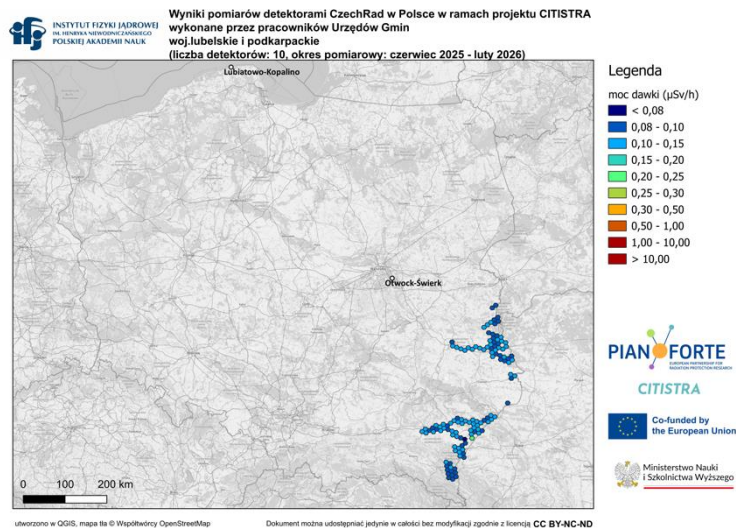
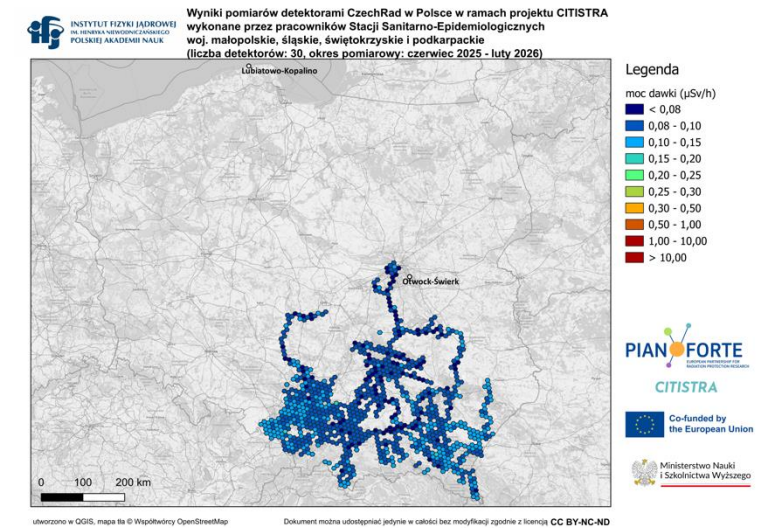
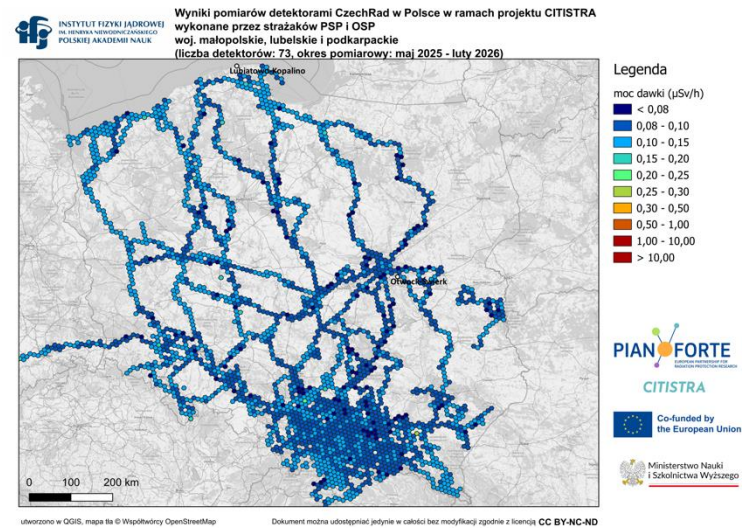
Total calendar days of project till the end of February: 289



CITISTRA in Poland

visualization of measurement data for professional groups (until February 2026)

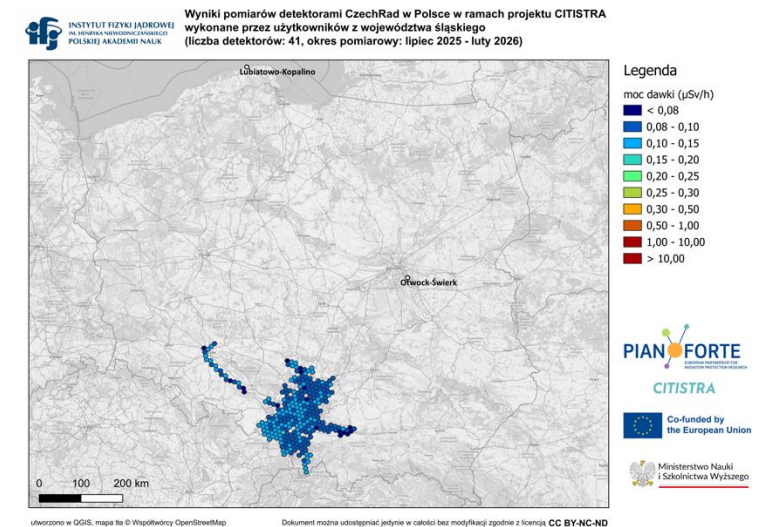
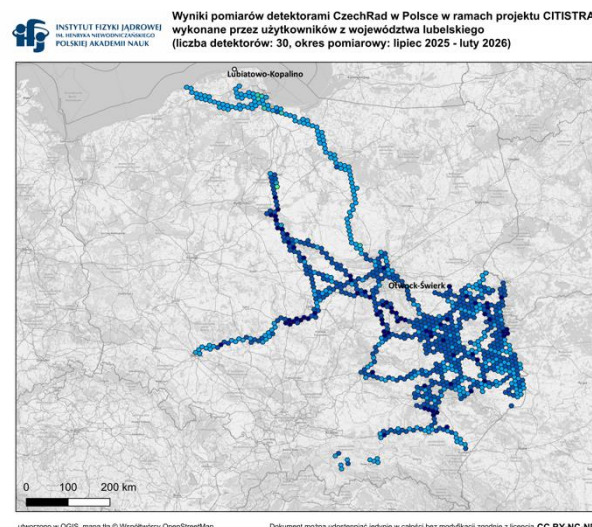
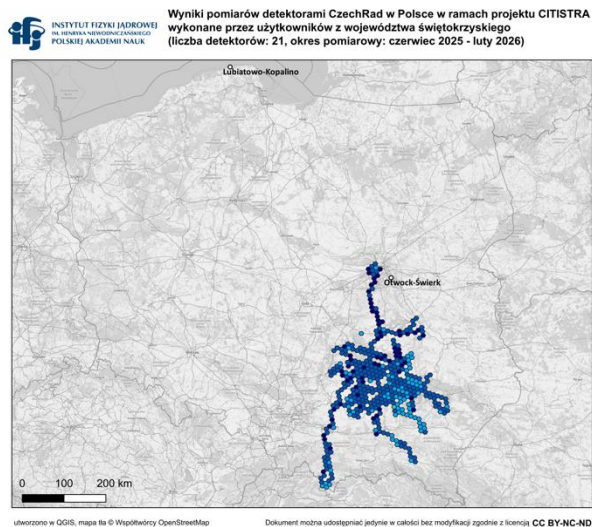
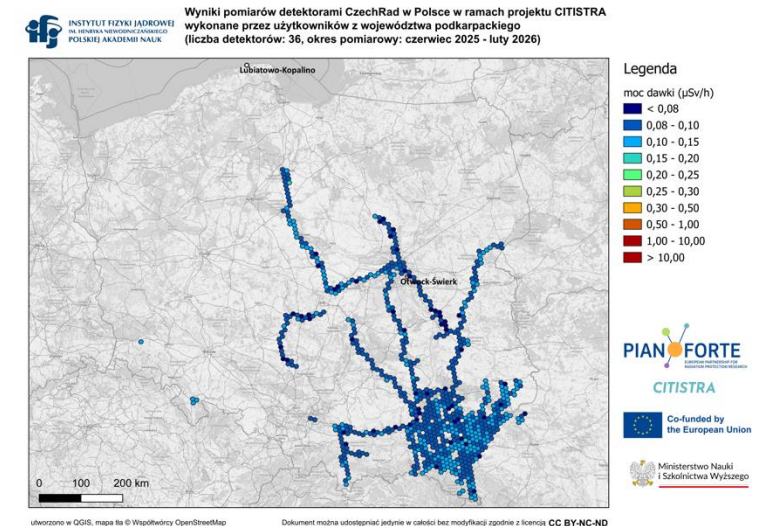
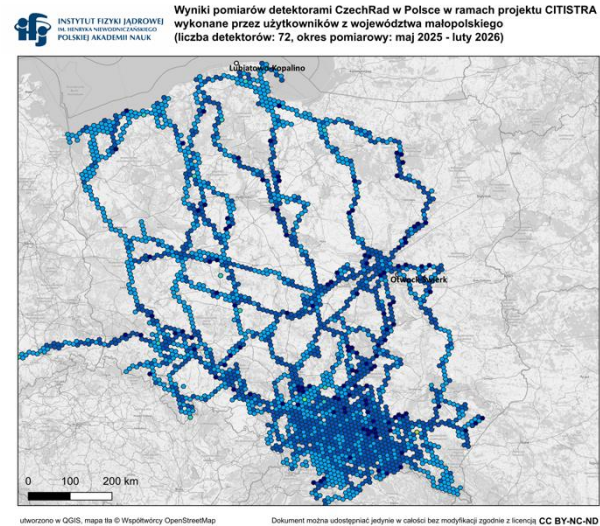
- firefighters of the state and volunteer fire departments - employees of sanitary and 73 det. – May 2025
- epidemiological stations 30 det. – June 2025
- employees of municipal offices 10 det. – June 2025
- soldiers of the Territorial Defense Forces 80 det. – August 2025
- foresters 7 det. – November 2025



CITISTRA in Poland

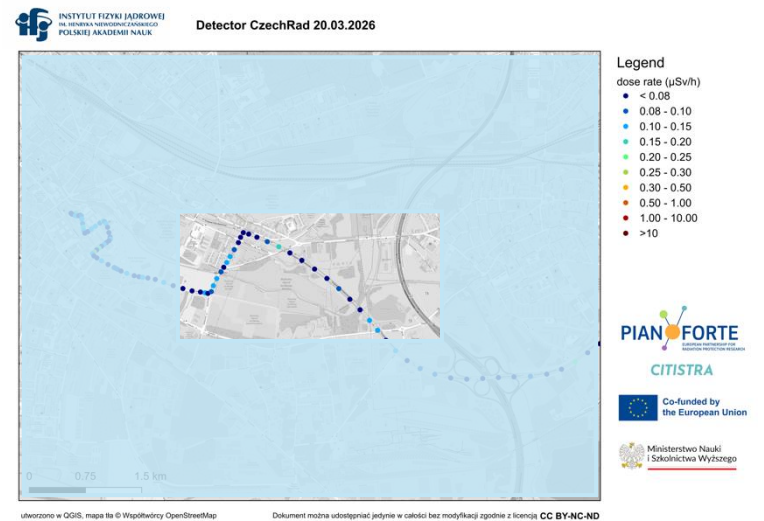
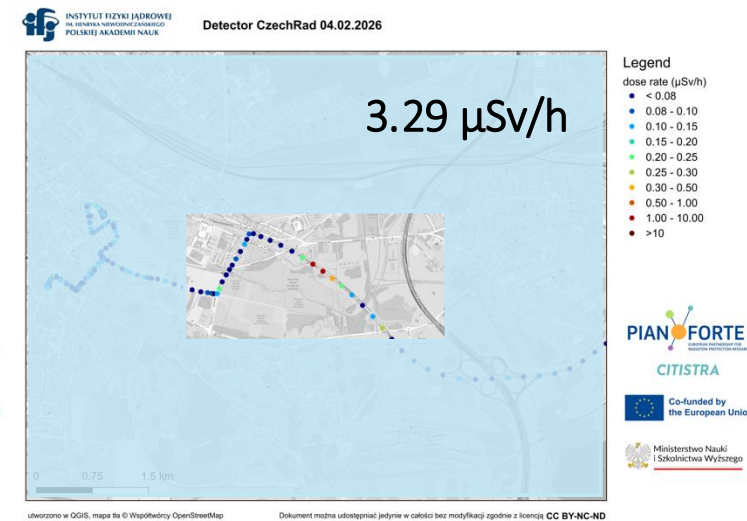
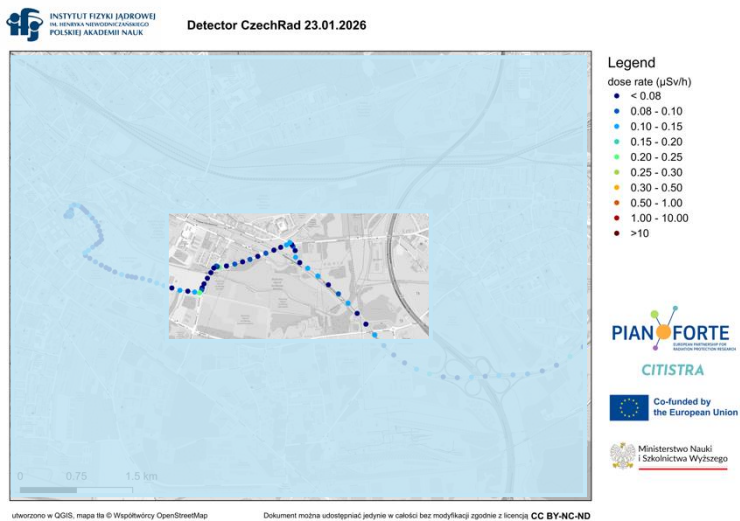
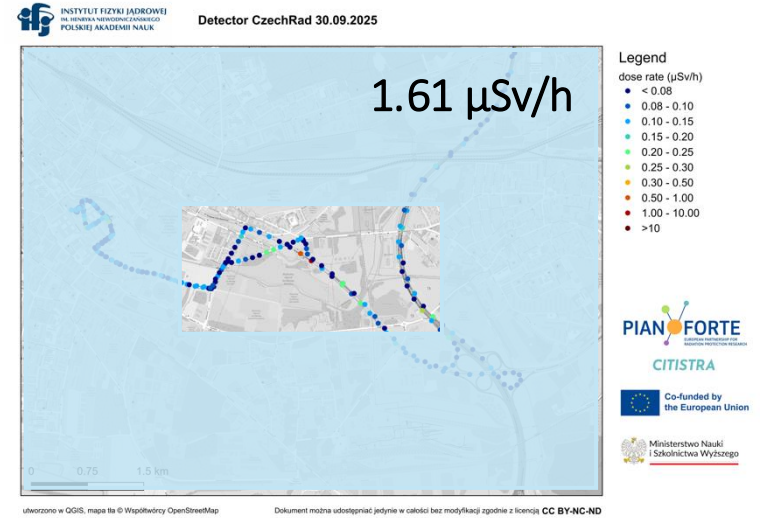
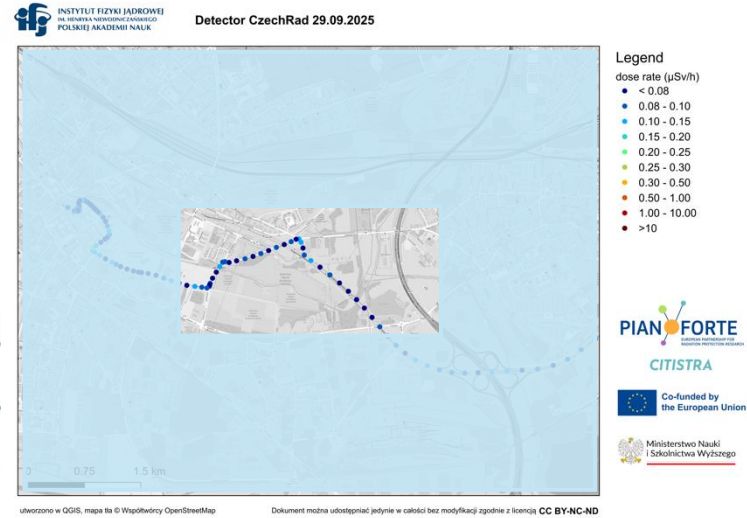
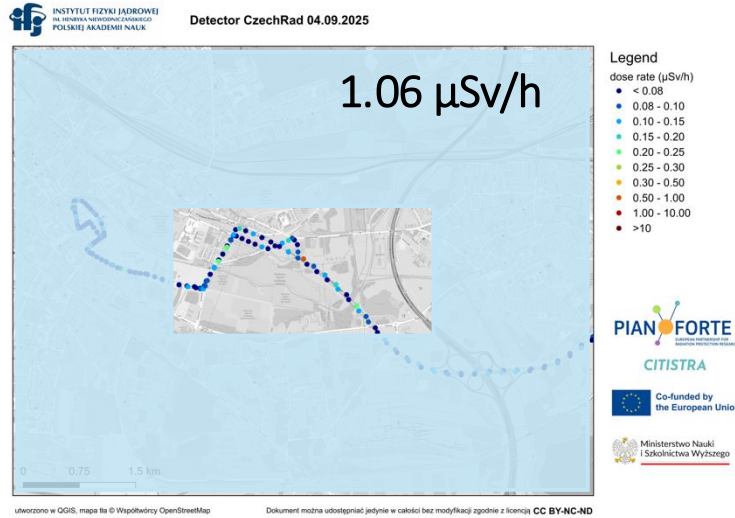
visualization of measurement data users from selected voivodeships (until February 2026)

- małopolskie 72 det. – May 2025
- podkarpackie 36 det. – June 2025
- świętokrzyskie 21 det. – June 2025
- lubelskie 30 det. – July 2025
- śląskie 41 det. – July 2025



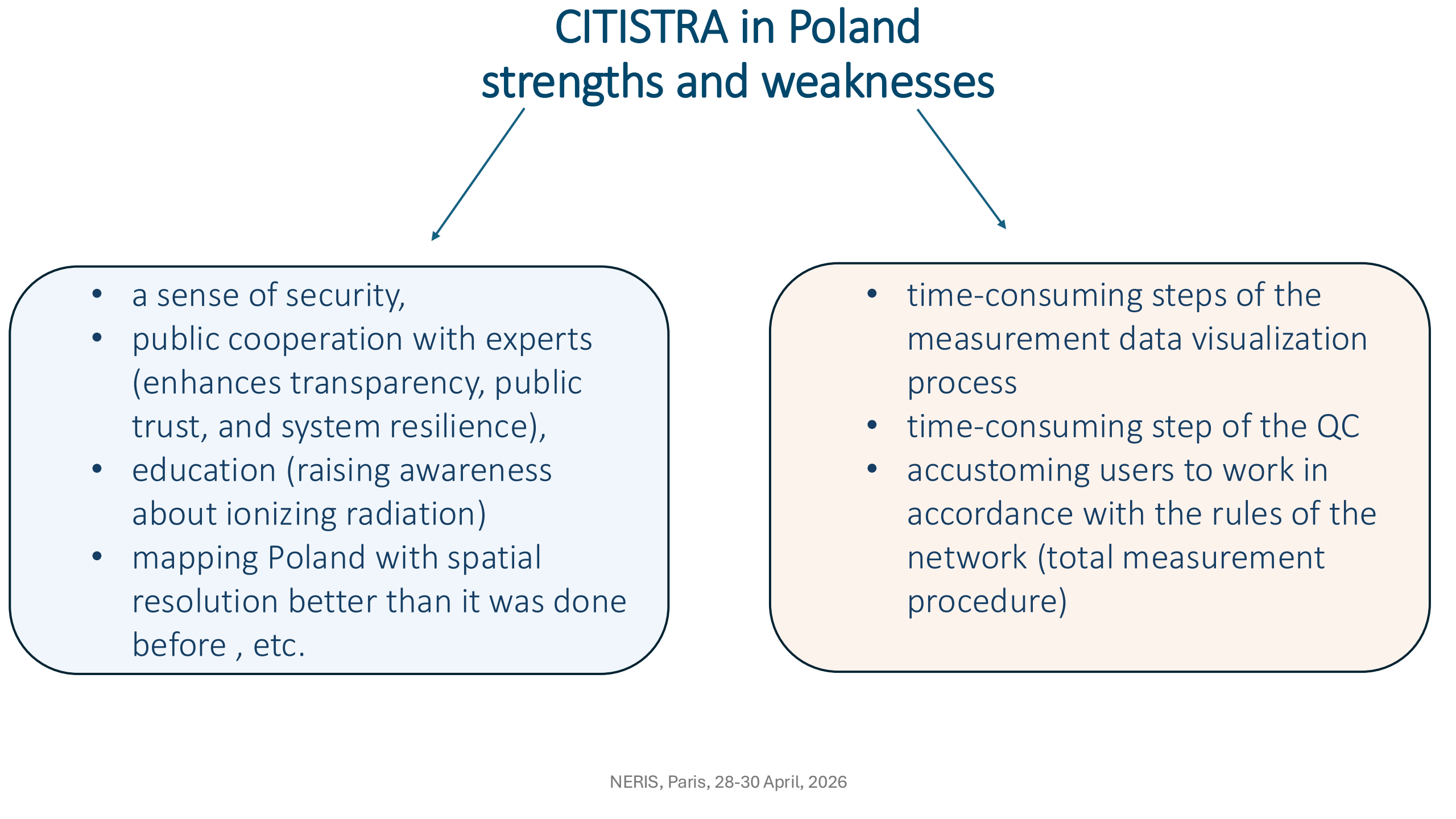
CITISTRA in Poland

Hot – spot (example)



CITISTRA in Poland

strengths and weaknesses



```
graph TD; Title[CITISTRA in Poland] --> Strengths[Strengths]; Title --> Weaknesses[Weaknesses];
```

- a sense of security,
- public cooperation with experts (enhances transparency, public trust, and system resilience),
- education (raising awareness about ionizing radiation)
- mapping Poland with spatial resolution better than it was done before , etc.

- time-consuming steps of the measurement data visualization process
- time-consuming step of the QC
- accustoming users to work in accordance with the rules of the network (total measurement procedure)

CITISTRA in Poland

Future?

- we learned how to work with about 1000 people (1-10 users per one detector=> aver. 5)
- we found out how to communicate the needs of work in network
- we created IT tools and IT infrastructure to increase work efficiency
- we started preparing a list of citizen networks in Europe and their characteristics (anna.mrozik@ifj.edu.pl)
- we are preparing proposals to institutions to support the network's operation in Poland and secure funding

where CITISTRA's experience can be applied



SOURCE: PEJ

- In area around the first NPP in Poland
- in areas where there are no stationary contamination detection stations
- close to the border with Russia, Belarus and Ukraine

CITISTRA

This scientific work has been carried out within the PIANOFORTE partnership from the Euratom2027 program under grant agreement no. 101061037 and in the framework of the international project co-financed by the Polish Ministry of Education and Science, as program „PMW”, contract 6100/HE-EURATOM/2024/2025/2.

Contact: czechrad@ifj.edu.pl



NERIS, Paris, 28-30 April, 2026