Fibre Sensing NREN Survey Results

Infoshare

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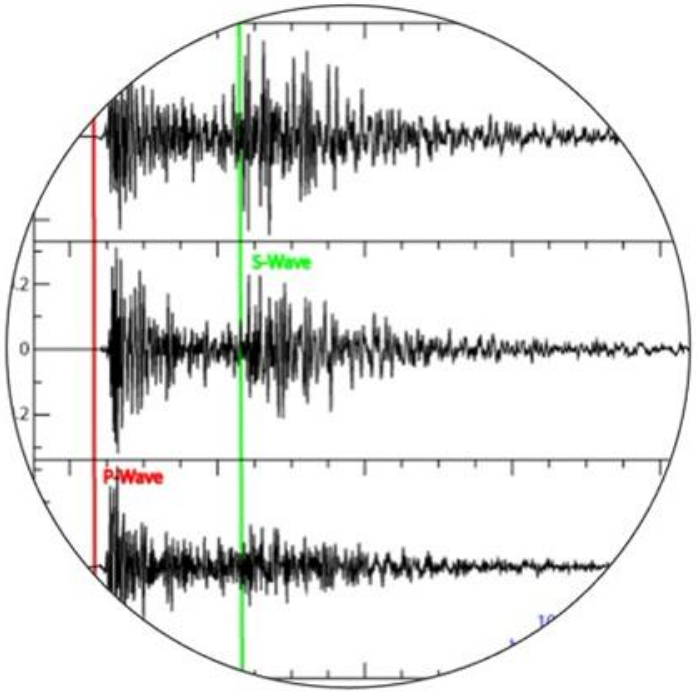
Infoshare, Online

18 May 2026

Potential Scientific Usecases



Seismology

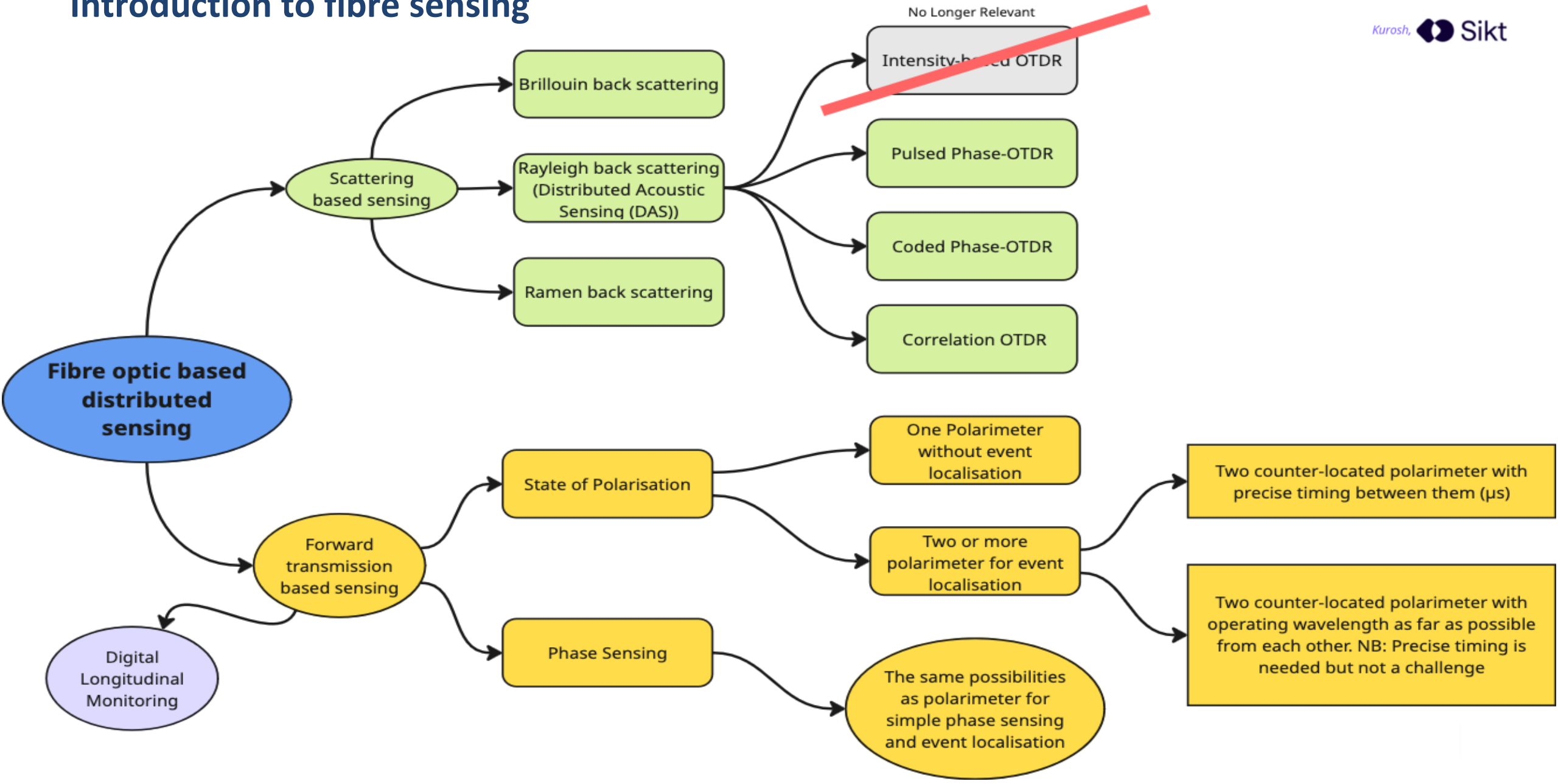
Anthropogenic Movements

Benthic flows

Volcanology

Introduction to fibre sensing

Kurosh, Sikt



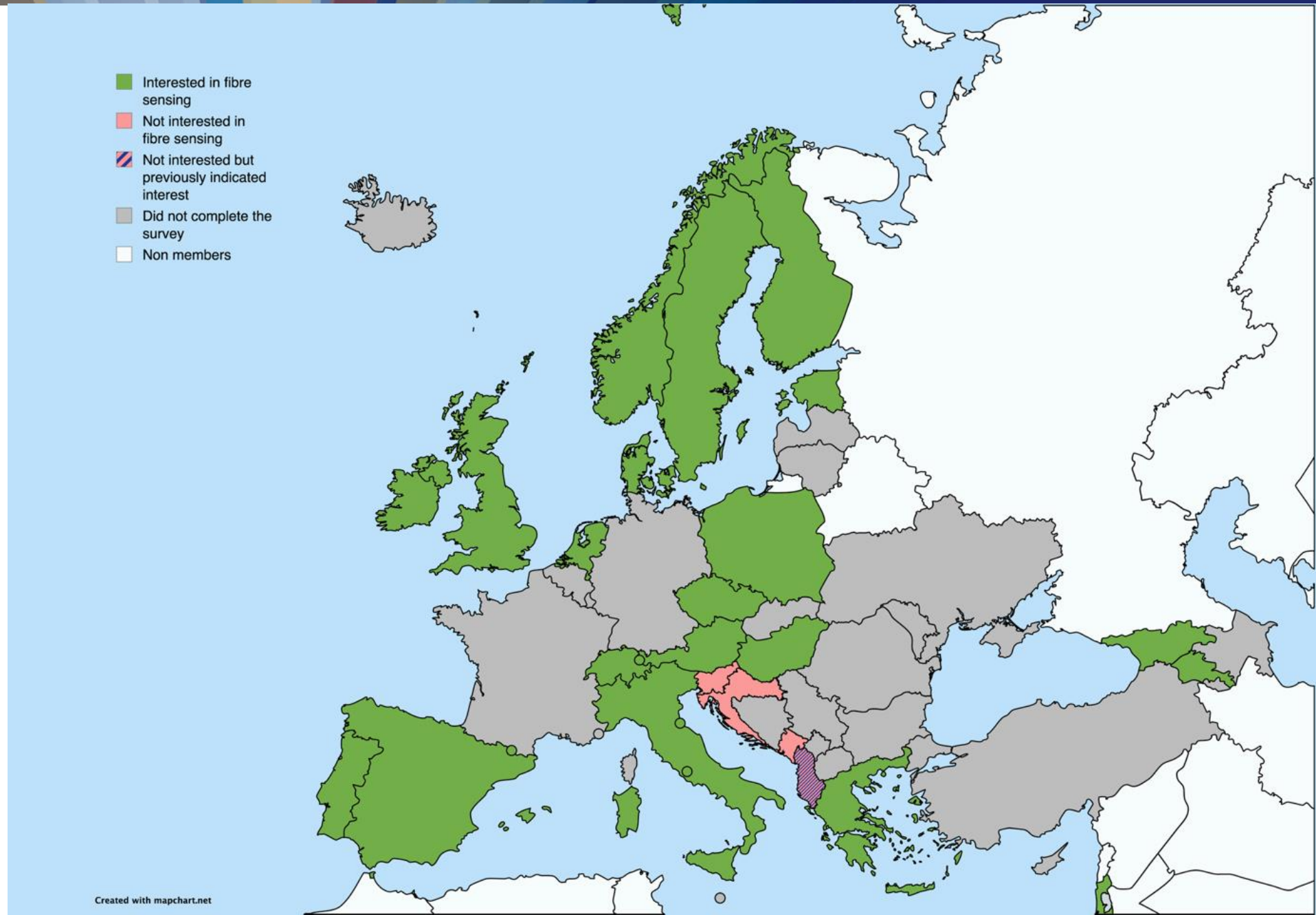
Usefulness to NRENs

What do European NRENs think about Fibre Sensing?
-
Survey results

The survey design

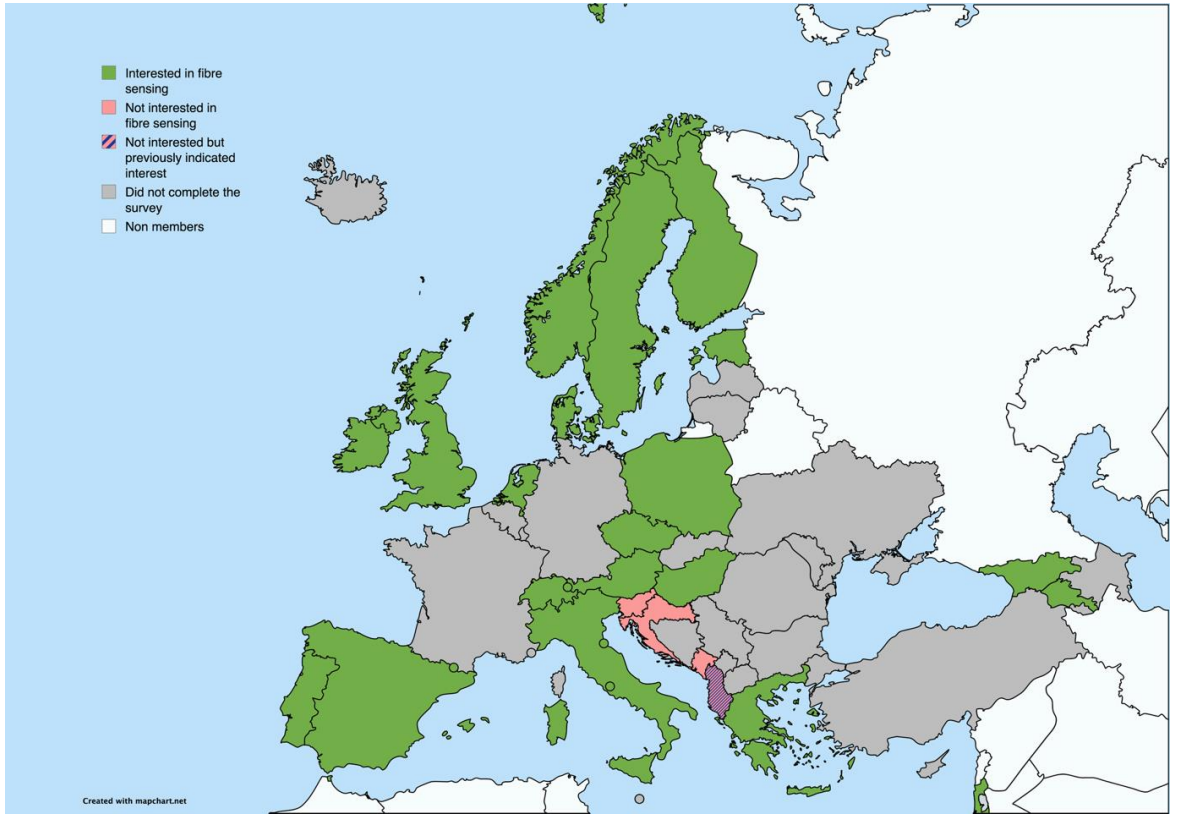
- **General and contact information**
  - identifying the responding NREN and contact person for potential follow-up
- **Interest and current status**
  - assessing ongoing fibre-sensing activities, hardware availability and internal policies
- **Challenges and barriers**
  - exploring technical, operational and organisational difficulties encountered
- **Knowledge and awareness**
  - evaluating familiarity with Fibre Sensing technologies and related research

Respondents



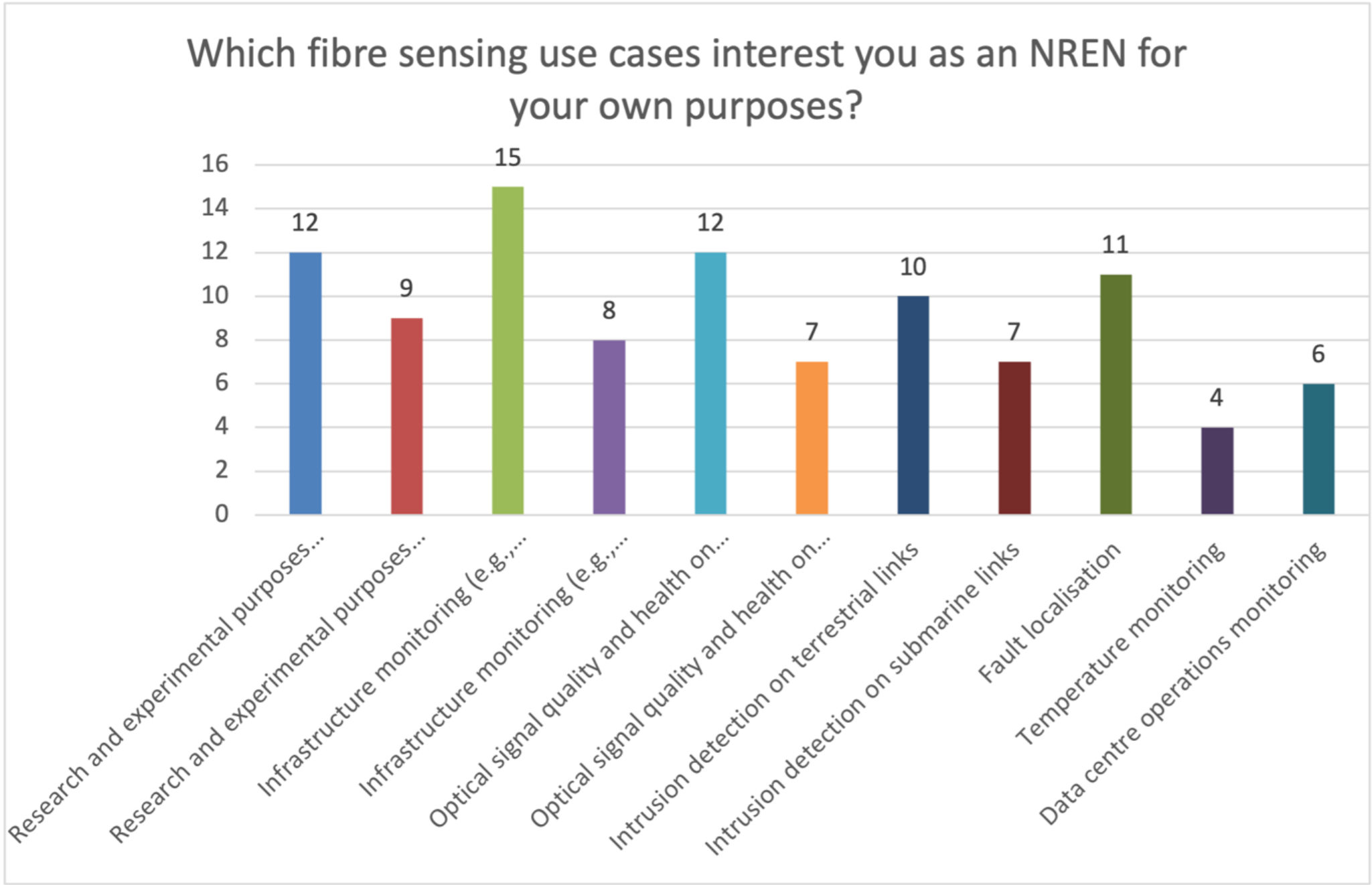
Main takeaways from the survey

- 22/26 NRENs are **engaged** with fibre sensing
- 15 NRENs are interested in **terrestrial sensing**, 8 are interested in submarine sensing
- Main interest from NRENs is to **support research** and **infrastructure monitoring**
- Main instruments used: **DAS** and **SoP**

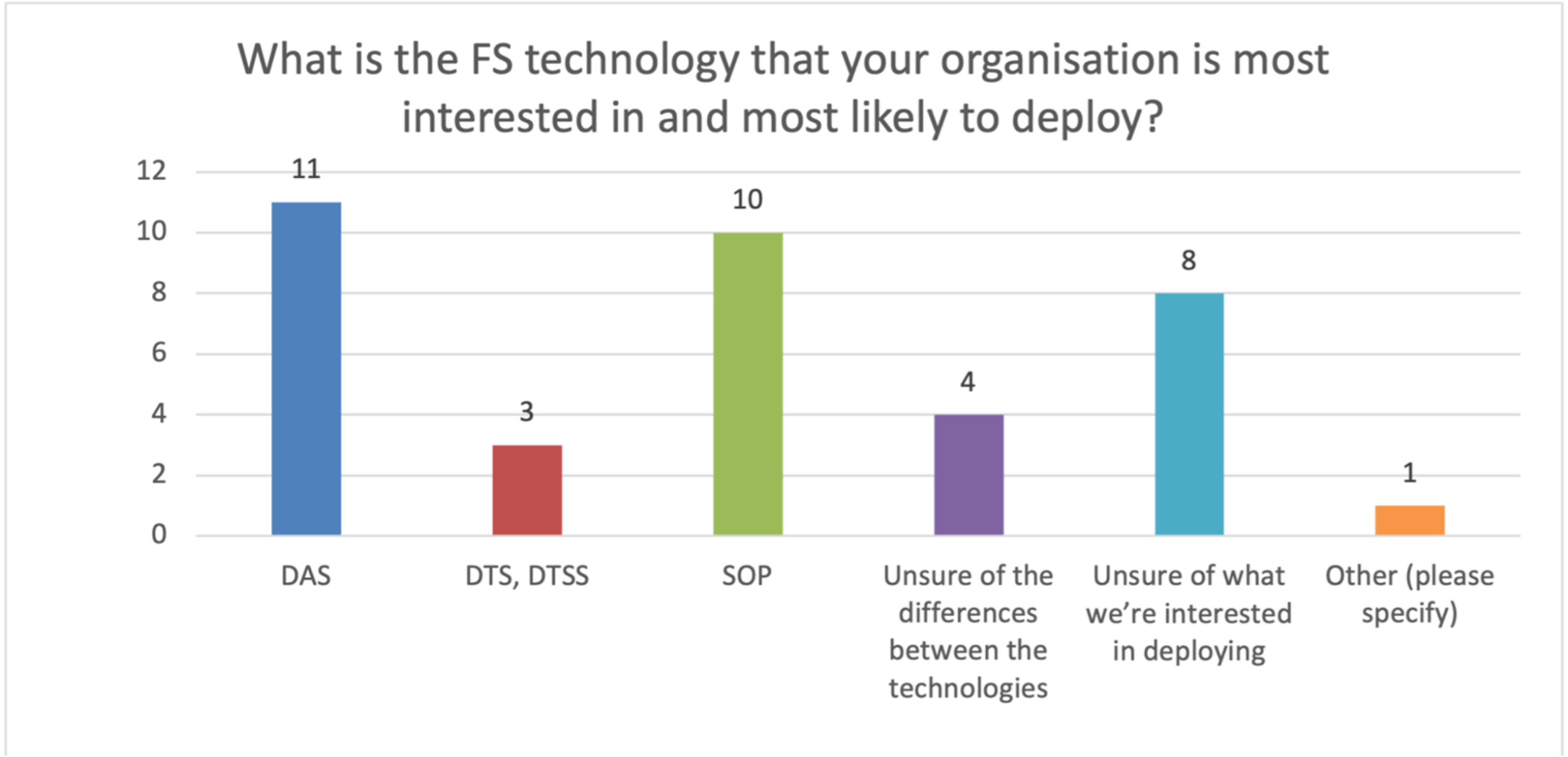


Main research fields involved in fibre sensing

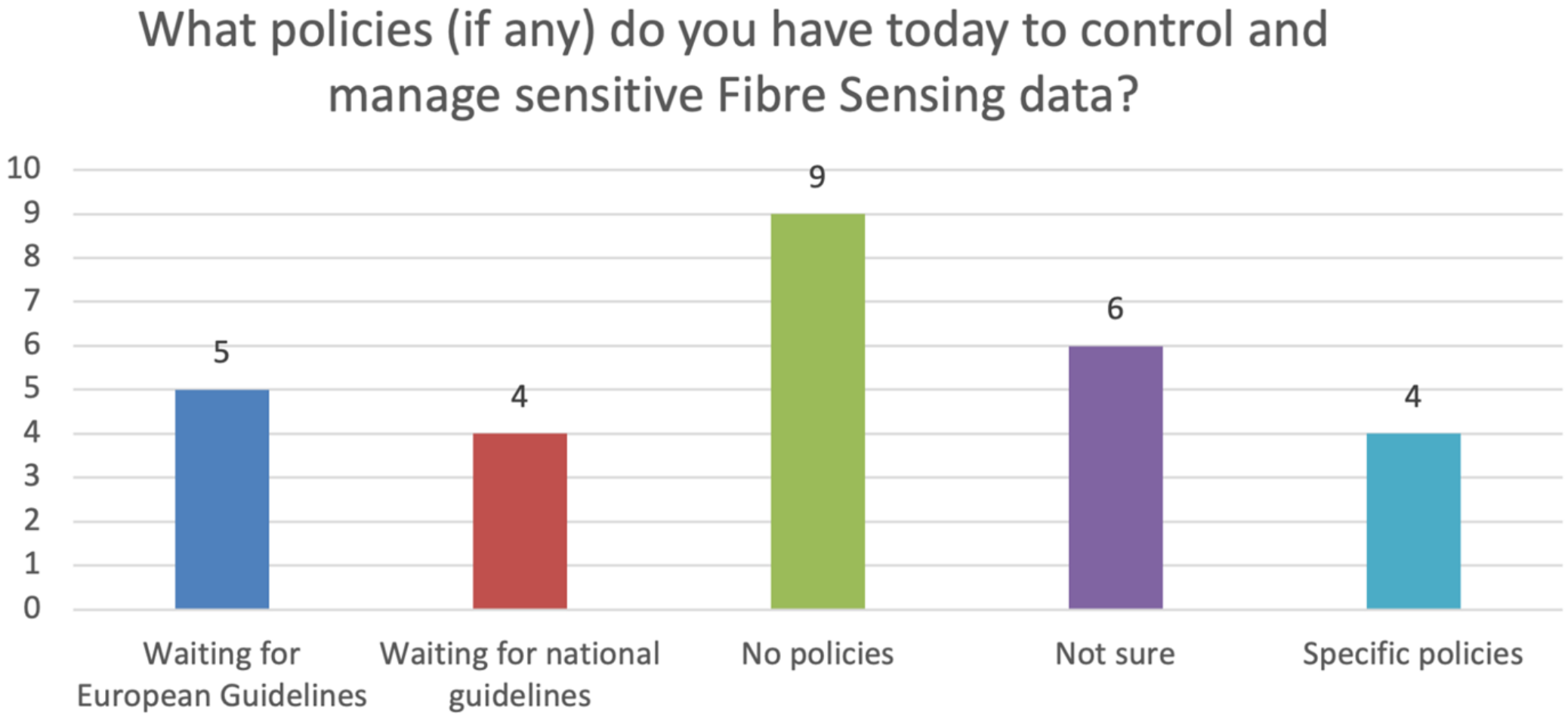
NRENs own interests



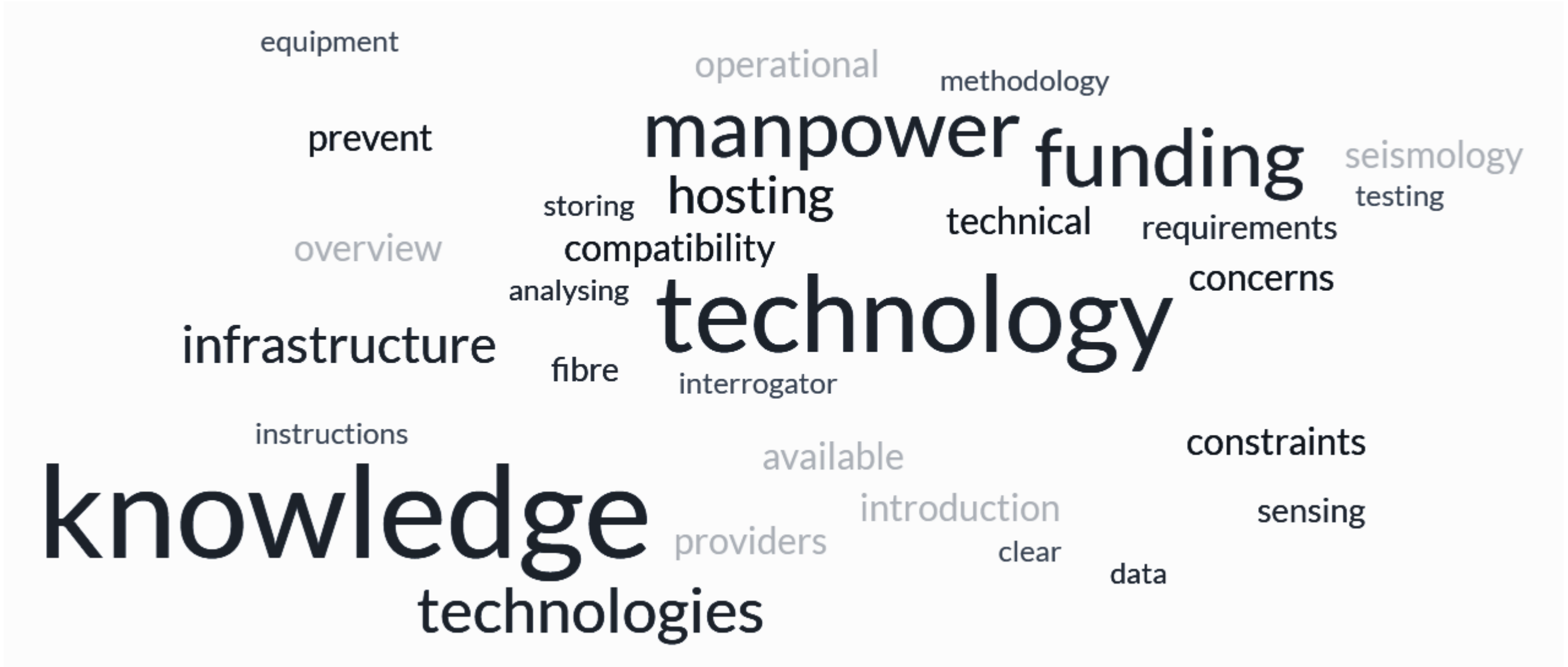
Technologies



Policies


What policies (if any) do you have today to control and manage sensitive Fibre Sensing data?
10
9
8
7
6
5
4
3
2
1
0
5
4
9
6
4
Waiting for European Guidelines
Waiting for national guidelines
No policies
Not sure
Specific policies

Barriers


equipment
operational
methodology
prevent
manpower
funding
seismology
hosting
storing
testing
technical
requirements
overview
compatibility
concerns
analysing
technology
infrastructure
fibre
interrogator
instructions
constraints
available
knowledge
introduction
sensing
providers
clear
data
technologies

What do European NRENs think about Fibre Sensing?
-
Interview results

The interview design

- **Target audience**
  - Network Operations personnel
  - NREN engineers
  - other stakeholders such as NREN management directly involved in monitoring network performance, maintaining or managing fibre infrastructure
- **Interviewees**
  - **DeiC, ACOnet, EENet, RedIRIS**
- **Candidates who have agreed to answer a few additional questions**
  - 30-60 minutes
- **Limitations**
  - Small sample size
  - Follow up focused on the NREN use cases, not research related use cases
  - Candidates are experts on policy/technical issues

The interview design

- **Definition and scope**
  - how each NREN defines infrastructure monitoring in general and what systems or layers it includes
- **Goals and objectives**
  - expected outcomes such as fault detection, performance improvement or security assurance
- **Tools and data sources**
  - types of monitoring tools, data streams, and visualisation systems currently in use
- **Processes and decision-making**
  - examples of operational situations where monitoring data influenced actions
- **Gaps and emerging needs**
  - limitations of existing approaches and interest in new monitoring or sensing solutions

Main Themes

Theme 1: Fibre sensing operational conceptualisation focuses on infrastructure protection

- **Primary role in research**
  - Fibre sensing is mainly seen as a tool to support research communities.
- **Operational context**
  - Network protection and operational assurance are the dominant themes.
  - Key use cases: fault detection, incident response, and infrastructure monitoring.
- **Examples from interviewees:**
  - Uses sensing to identify time/location of tampering (e.g., manhole cover interference) and generate evidence for post-incident analysis.
  - Focuses on outage localisation and repair efficiency, with precise fibre fault detection speeding up incident resolution.
- **Overall consensus:**
  - Three of four interviewees view fibre sensing as a capability to enhance operational control, reduce repair time, and protect infrastructure—not as a driver for new scientific domains.

Theme 2: NRENs already monitor extensively but this is not perceived as Fibre Sensing

- **Current practices**
  - Participants already use mature operational monitoring
  - These practices are often distinguished from what they consider "Fibre Sensing."
- **Emerging semantic difference**
  - A distinction is emerging between operational monitoring and scientific use of the same data.
- **Focus of NRENs**
  - Provide infrastructure, not direct research into fibre sensing signals.
  - Universities/research groups are the primary users of fibre sensing data.
  - DeiC acknowledged that operational fibre sensing data could also be used by research groups.
- **Fibre Sensing is seen as advanced monitoring**
- **Adoption criteria**
  - Higher temporal resolution
  - Greater spatial insight

Theme 3: The strongest perceived value lies in earlier detection, localisation, and a shared understanding of link degradation

- **Core benefits of Fibre Sensing**
  - Earlier issue detection, precise localisation, root cause analysis of network degradations.
  - Short-lived circuit-level (L2) performance issues reported by all interviewees, where fibre sensing could have an advantage over more traditional monitoring approaches
- **Role of Fibre Sensing**
  - Diagnostic tool, not just fault detection
  - High-resolution, real-time data
- **Better collaboration**
  - Automated, confidential sharing with providers/partners
- **Requirements**
  - Integration with existing tools, minimal operational overhead

Theme 4: Security and tamper detection are meaningful drivers for those who own fibre

- **Security as a use case**
  - NRENs link fibre sensing to physical security and threat awareness
- **Examples**
  - Traditional fibre sensing to classify types of damage, improving risk understanding and building a more accurate threat picture
  - Security as an emerging need to detect tampering or interference with fibres
- **Conditional motivator**
  - Security is a stronger motivator for NRENs that operate their own infrastructure
  - Less prominent where fibre is outsourced or risks are abstract

Theme 5: Structural and organisational constraints strongly shape feasibility, often more than interest

- **Constraints of deployment feasibility**
  - Limited fibre ownership
  - DWDM systems controlled by providers
  - Interrogator costs too high
  - Operational capacity
- **This poses the risk of**
  - Fragmented offerings to interested communities
  - Ad-hoc approaches
- **Prevention by**
  - Community coordination of Fibre Sensing service over local deployments

Theme 6: Scientific use cases are present, but NRENs see themselves mainly as facilitators, not operators

- **NRENs see themselves as**
  - Infrastructure providers
  - Equipment hosts
  - Enablers of researchers (system deployment)

- **A more direct operating role**
  - Operational use for sensors in their own network
  - As a by-product: NRENs and researchers can use the same raw data
  - Constraint: this needs to not interfere with operational capacity

Theme 7: A clear, repeated opportunity space exists for GÉANT-led coordination and services

- **Identified gaps & opportunities**
  - Interviewees see potential for coordinated action at the European level (e.g., through the GÉANT project)
  - Values shared learning
  - Need for joint development of tooling
  - Fibre Sensing Special Interest Group as a suitable platform

- **Value proposition of GÉANT projects**
  - Shared interpretation frameworks
  - Reference architectures
  - Training
  - Managed or federated services

Conclusions

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Conclusions

1

Making cutting-edge research possible

Giving Scientists access to large amounts of environmental data spanning potentially around the globe.

2

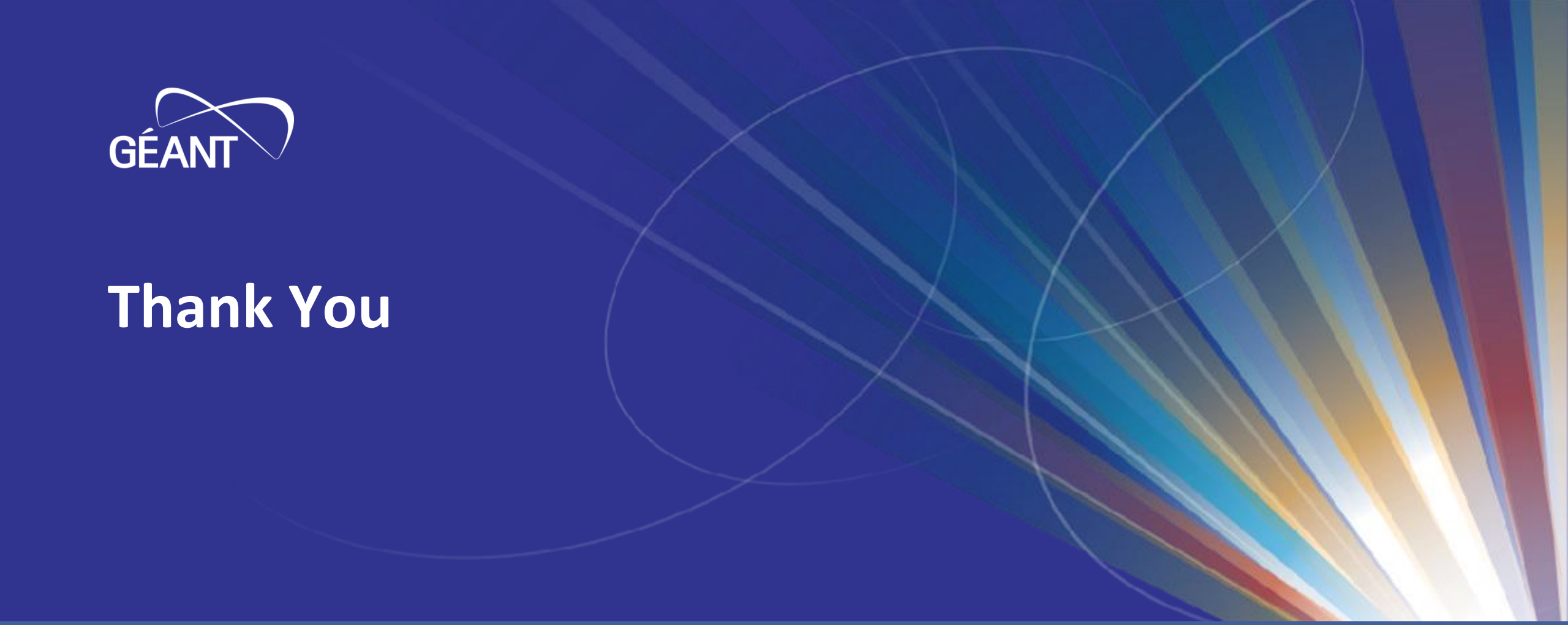
Infrastructure protection

Detection and characterisation of threats and destruction.

3

Infrastructure monitoring

Detection of physical changes in the infrastructure to maintain network health.



Thank You

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