Volcano Monitoring

World Organisation of Volcano Observatories

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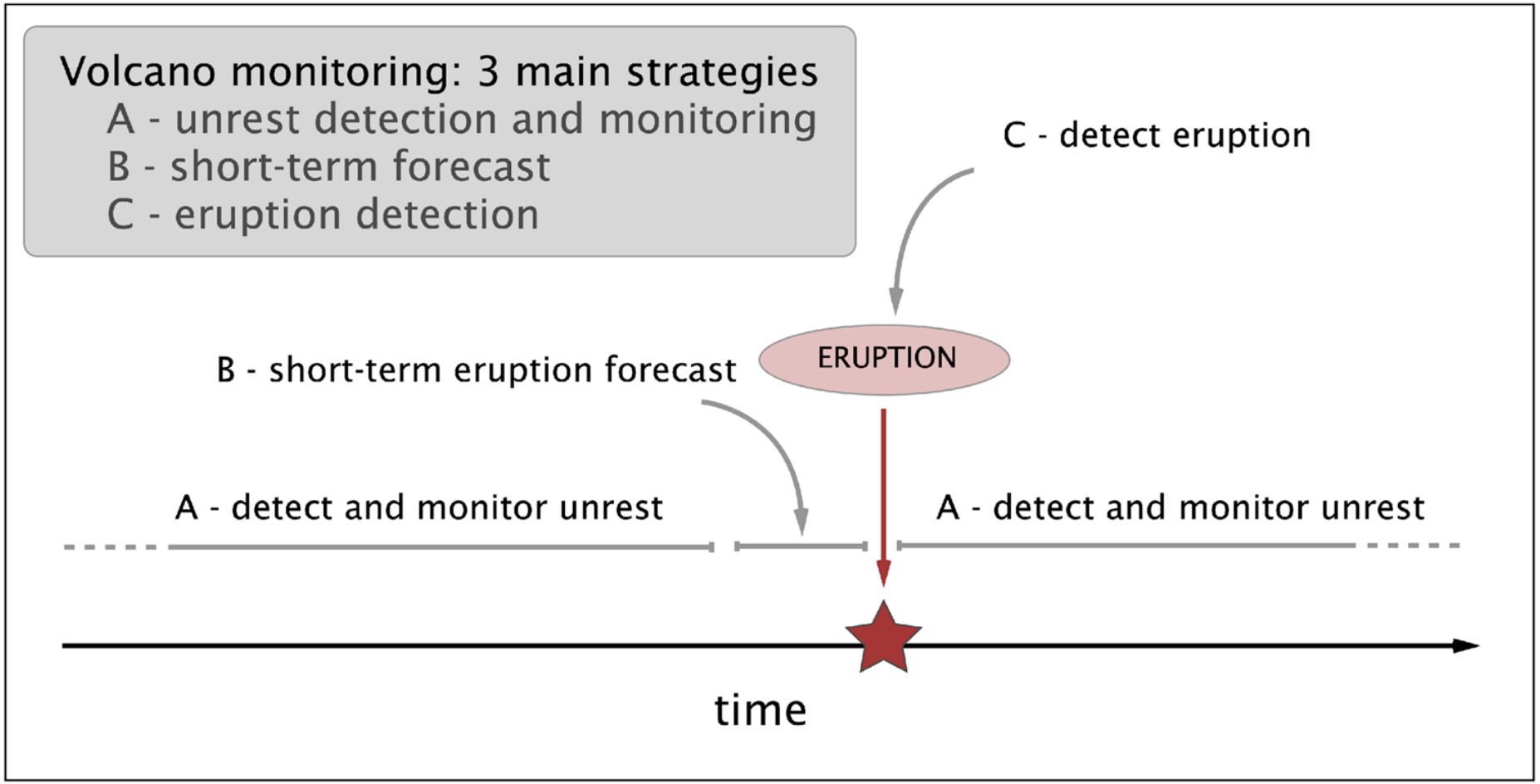
EW4ALL workshop

Geneva 7-9 July 2025

What is Volcano Monitoring?



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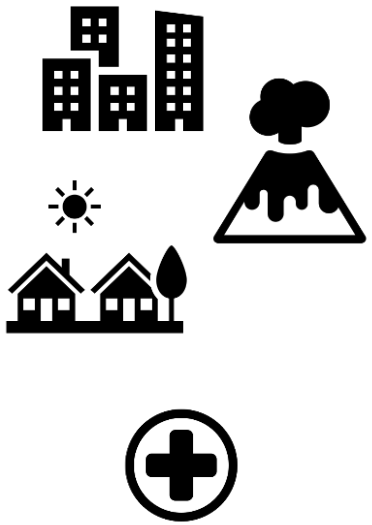
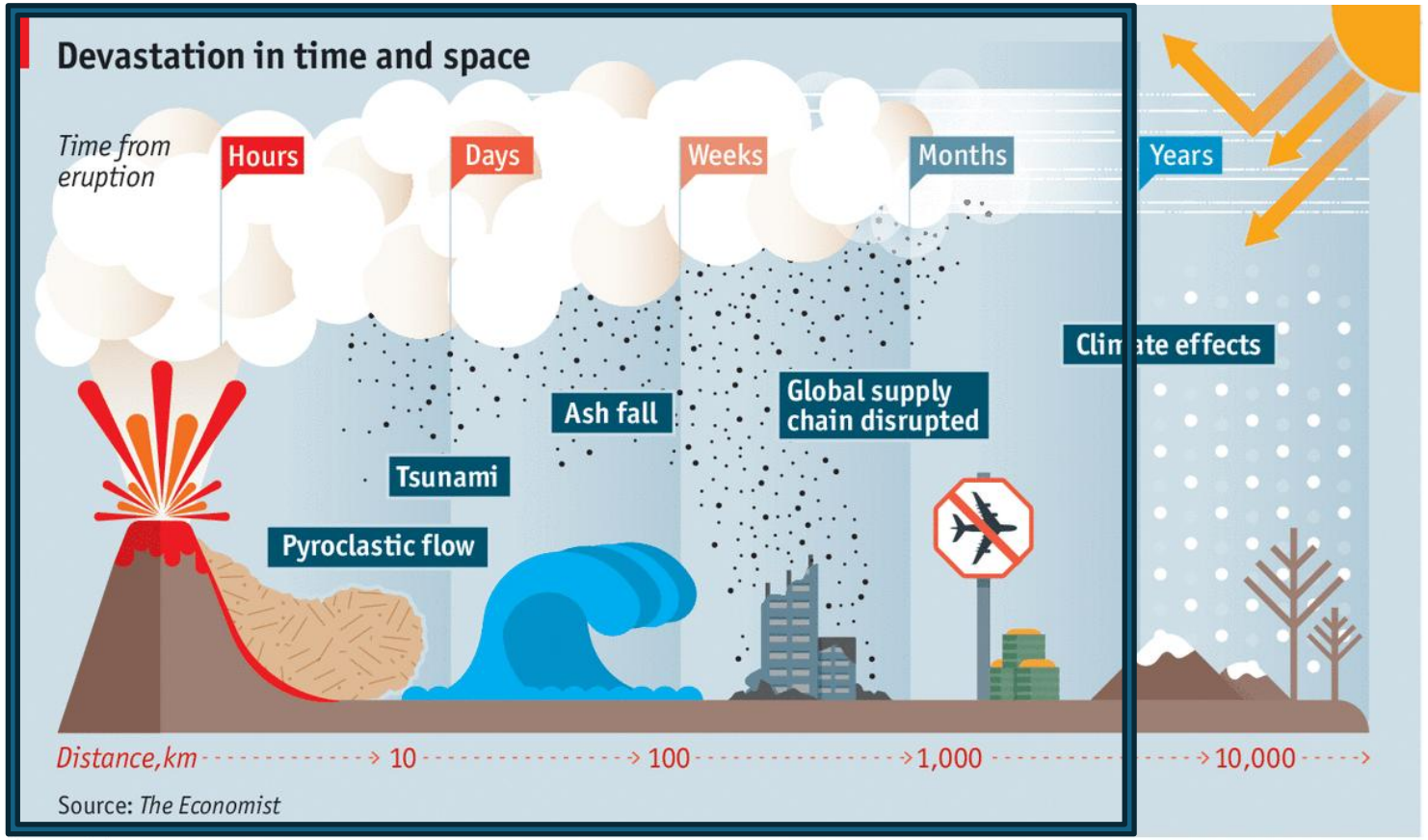
Who benefits from Volcano Monitoring?

Communities





Economist.com

Local

Regional

Global

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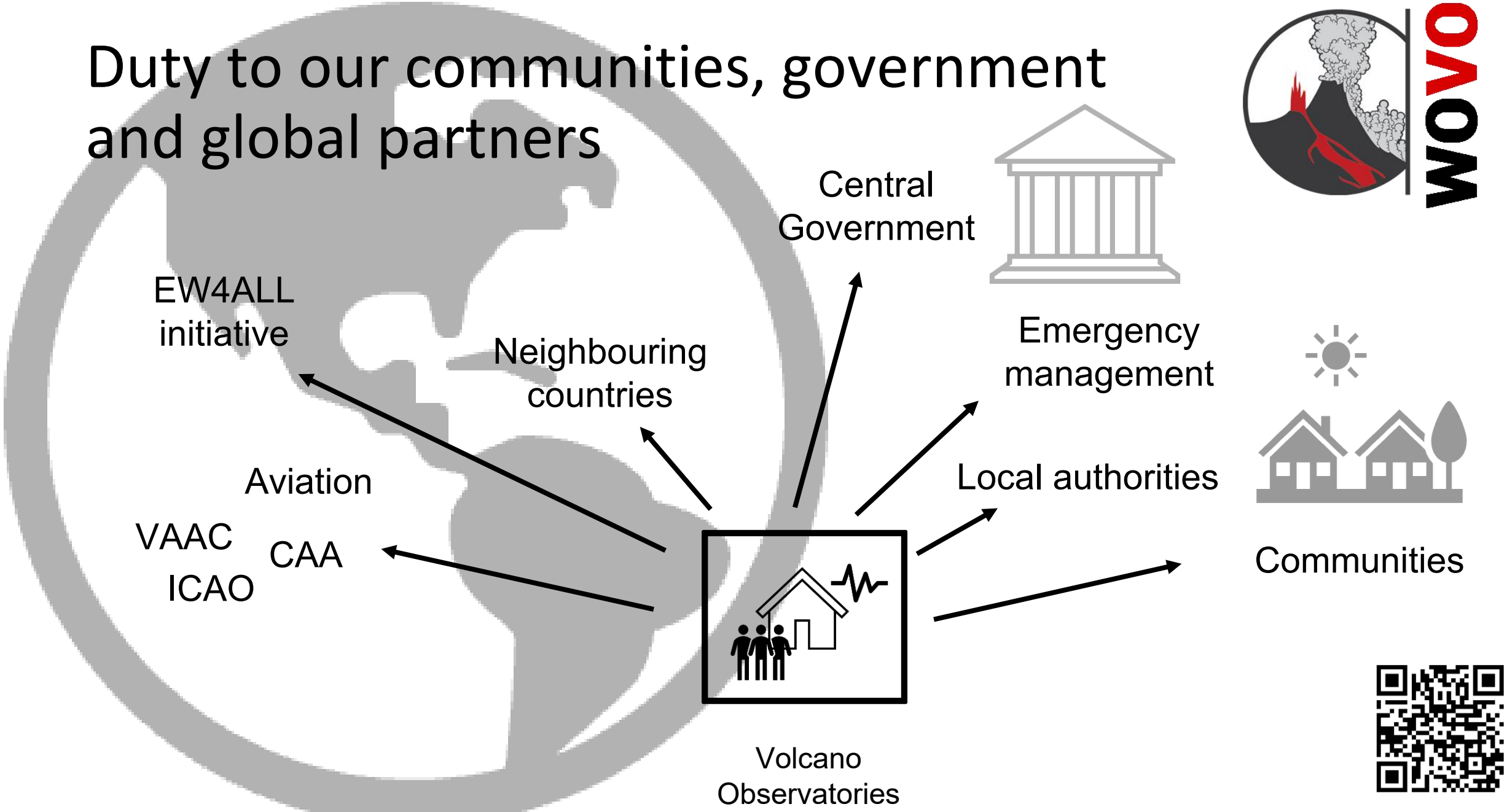
Duty to our communities, government and global partners



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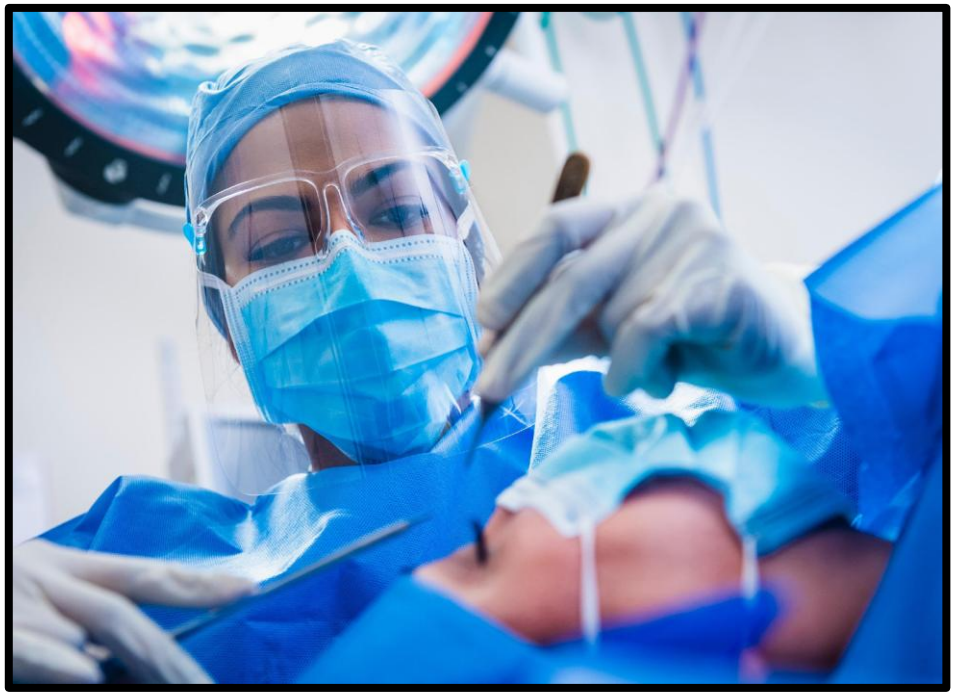
Volcano Monitoring:
Data-supported science **expertise is essential**

vs.



Data and tools

Subject matter expert with data and tools

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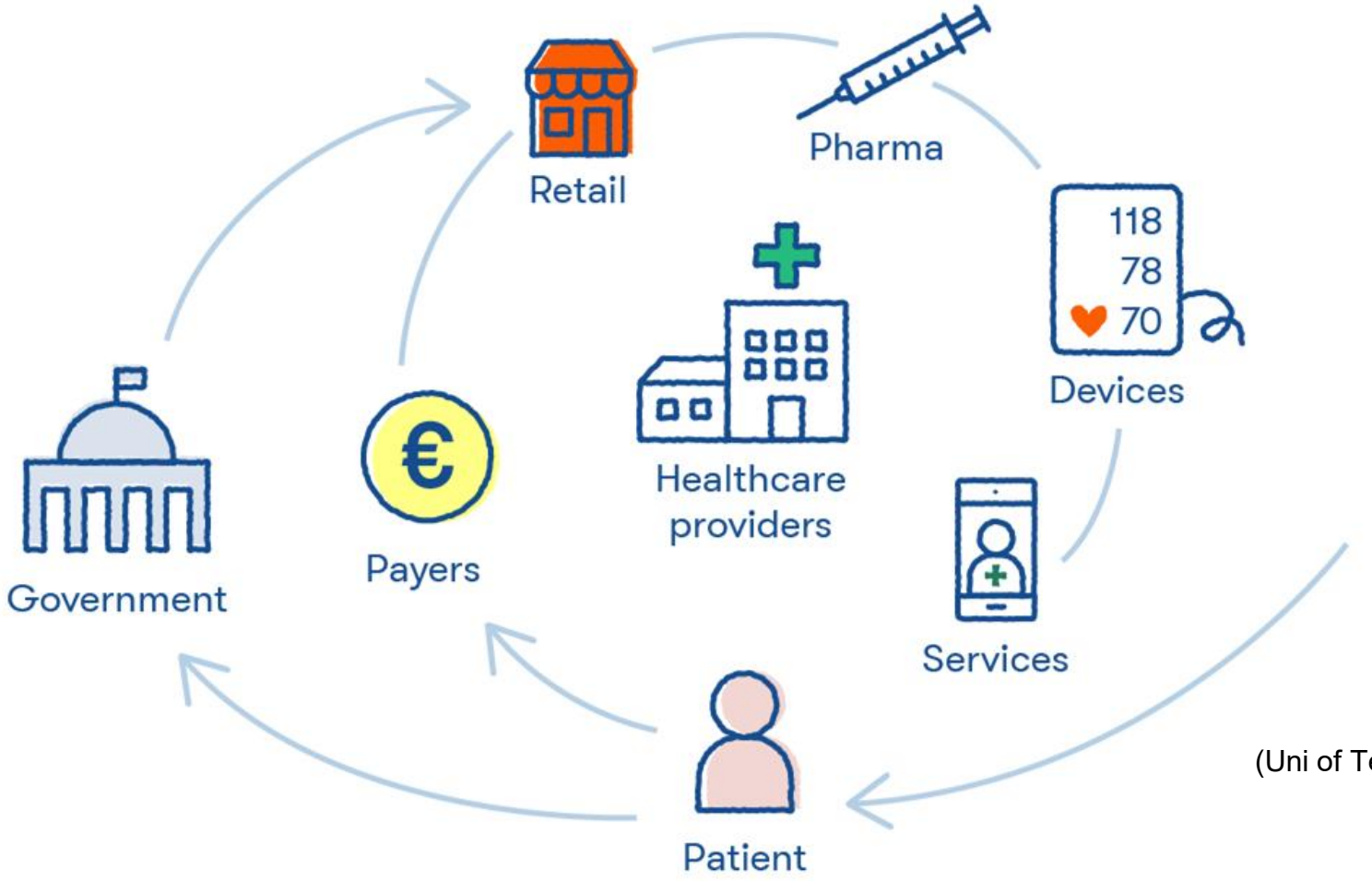
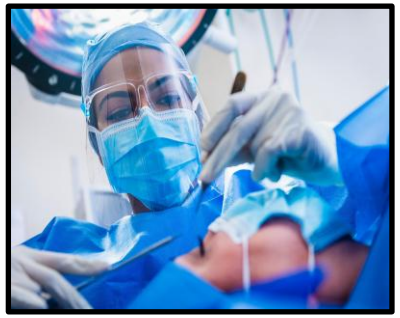
Effective risk management requires a well **connected, supporting framework**





(Uni of Texas)

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Effective risk management requires a well **connected, supporting framework**

(N Banks, USGS)

Nevado del Ruiz 1985

(Frank Fournier, CPI)

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Volcano monitoring – state of play

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Two facets for EW4ALL

Volcano monitoring **capability** and **efficiency**

Volcano monitoring **effectiveness**

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Two facets for EW4ALL

Volcano monitoring **capability** and **efficiency**

Volcano monitoring **effectiveness**

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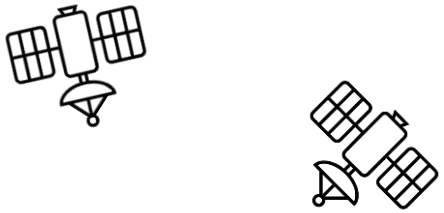
Ideally, combine both **local** and **remote** monitoring tools and strategies

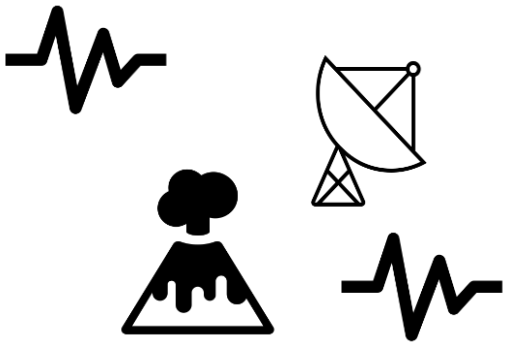
Remote



Pros: Great spatial coverage

Cons: less real-time info; requires ground truthing
Potential disconnect between obs and global groups

Local



Pros: Realtime, continuous information. Long history of volcanic activity

Cons: limited spatial coverage

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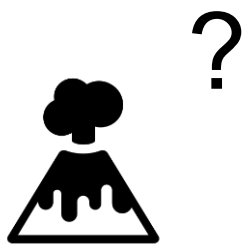
Monitoring **capability** varies enormously worldwide

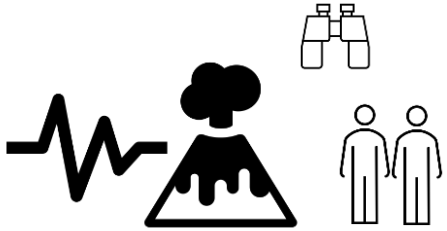
No/sporadic monitoring data
Usually poor eruption history
No and limited notifications

EXAMPLE:
- Countries with large number of volcanoes vs. resource ratio
- Remote
- Submarine



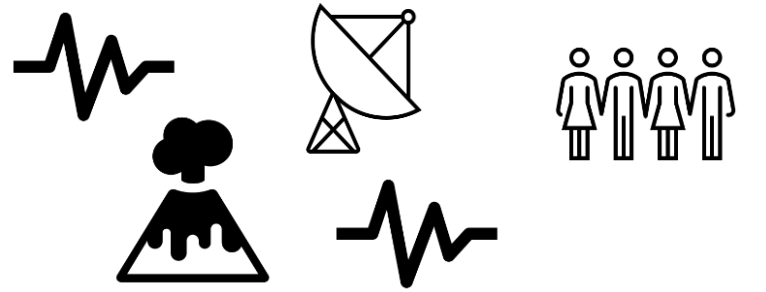
Limited data, mix of sporadic and real-time data
Usually delayed notifications

EXAMPLE:
- Developing countries with limited resources
- Less active volcanoes



Mostly real-time monitoring and notification

EXAMPLE:
- Many “western” countries



Continuum

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Monitoring **efficiency** varies enormously worldwide

“Forecastability” of eruptions

Not a 1:1 relationship with observatories **capability**

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Monitoring **efficiency** varies enormously worldwide

Whakaari / White Island 2019

(Maggie Grace photography)

Grindavik, Iceland

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Eruption forecasting for short-term early warning remains **elusive**

Few, volcano-specific success stories

Vast majority of observatories cannot provide usable short-term eruption forecast for early warning systems

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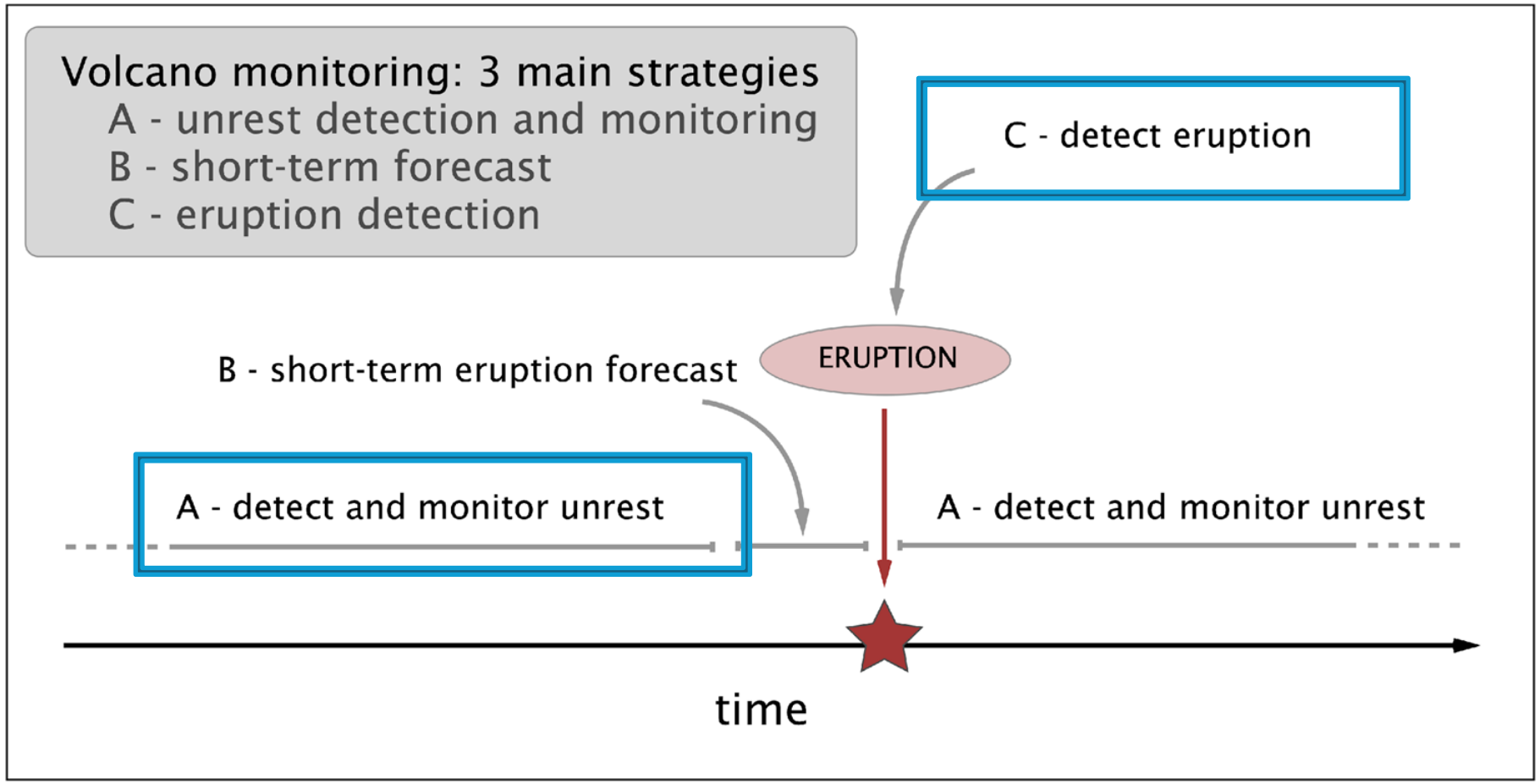
Focus on early **unrest notification** & rapid **eruption detection** and **impact** forecasting



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Two facets for EW4ALL

Volcano monitoring **capability** and **efficiency**

Volcano monitoring **effectiveness**

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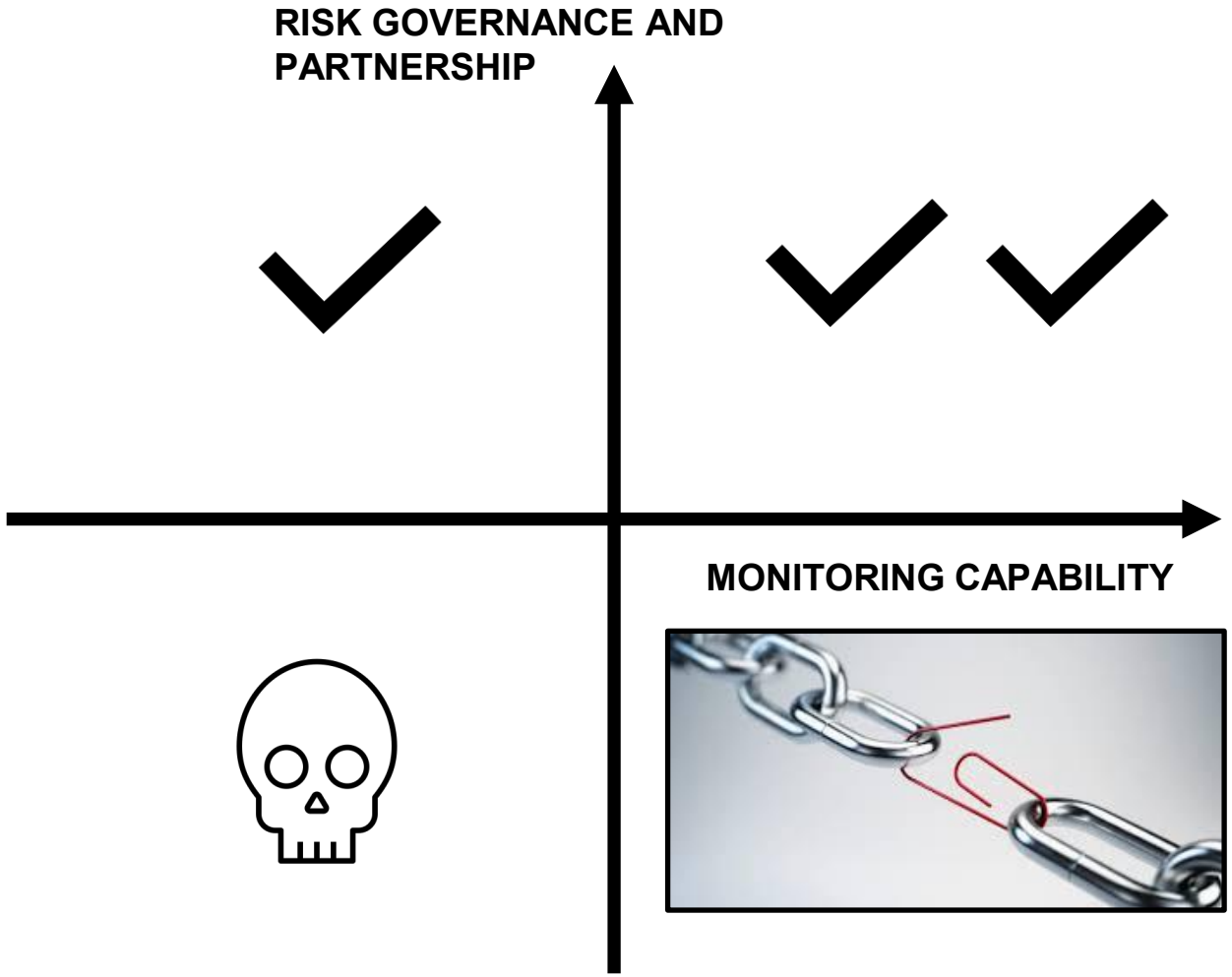
Monitoring **effectiveness** varies enormously worldwide



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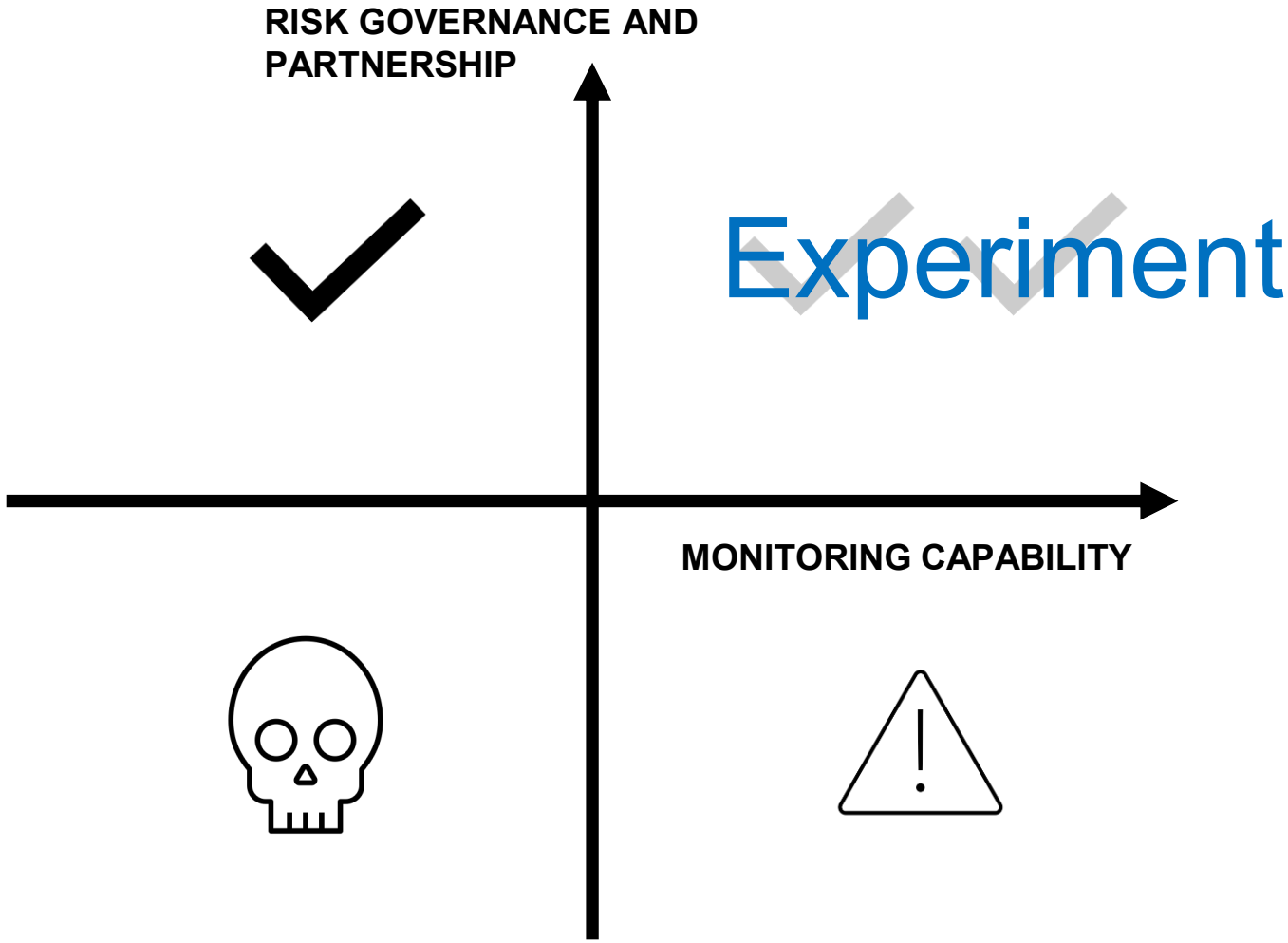
Focus towards efficiency and EW4ALL



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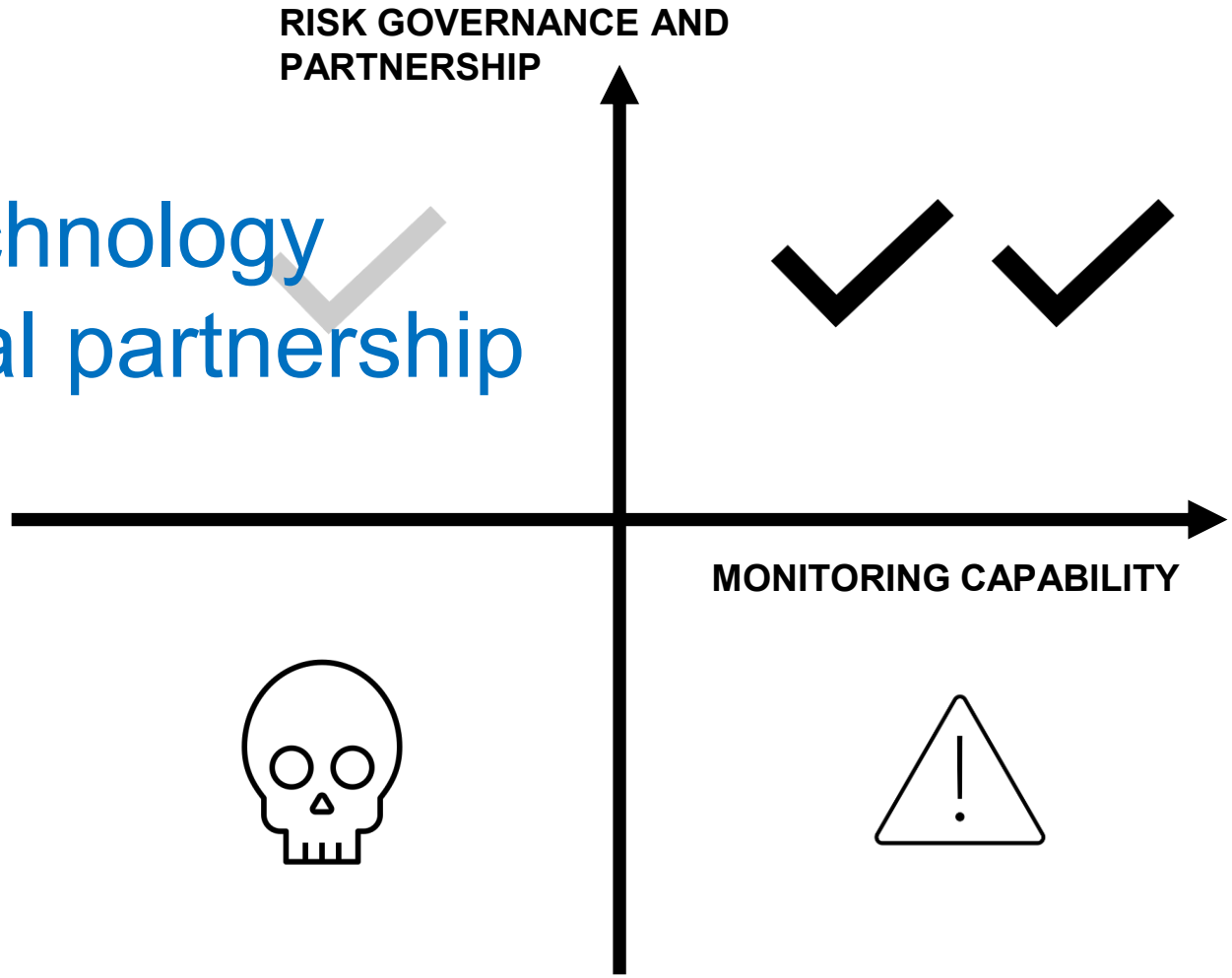
Focus towards efficiency and EW4ALL

Support technology
International partnership



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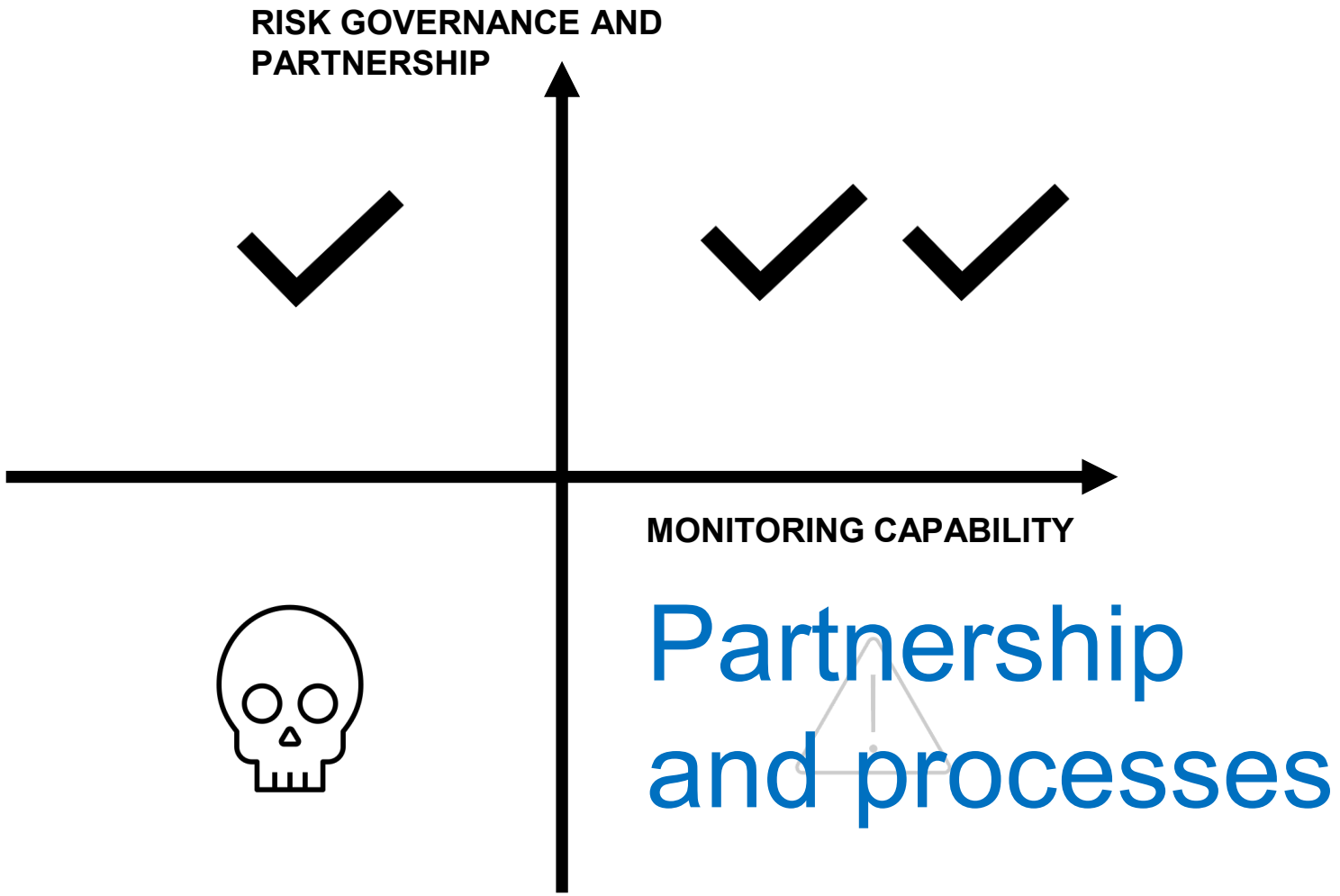
Focus towards efficiency and EW4ALL



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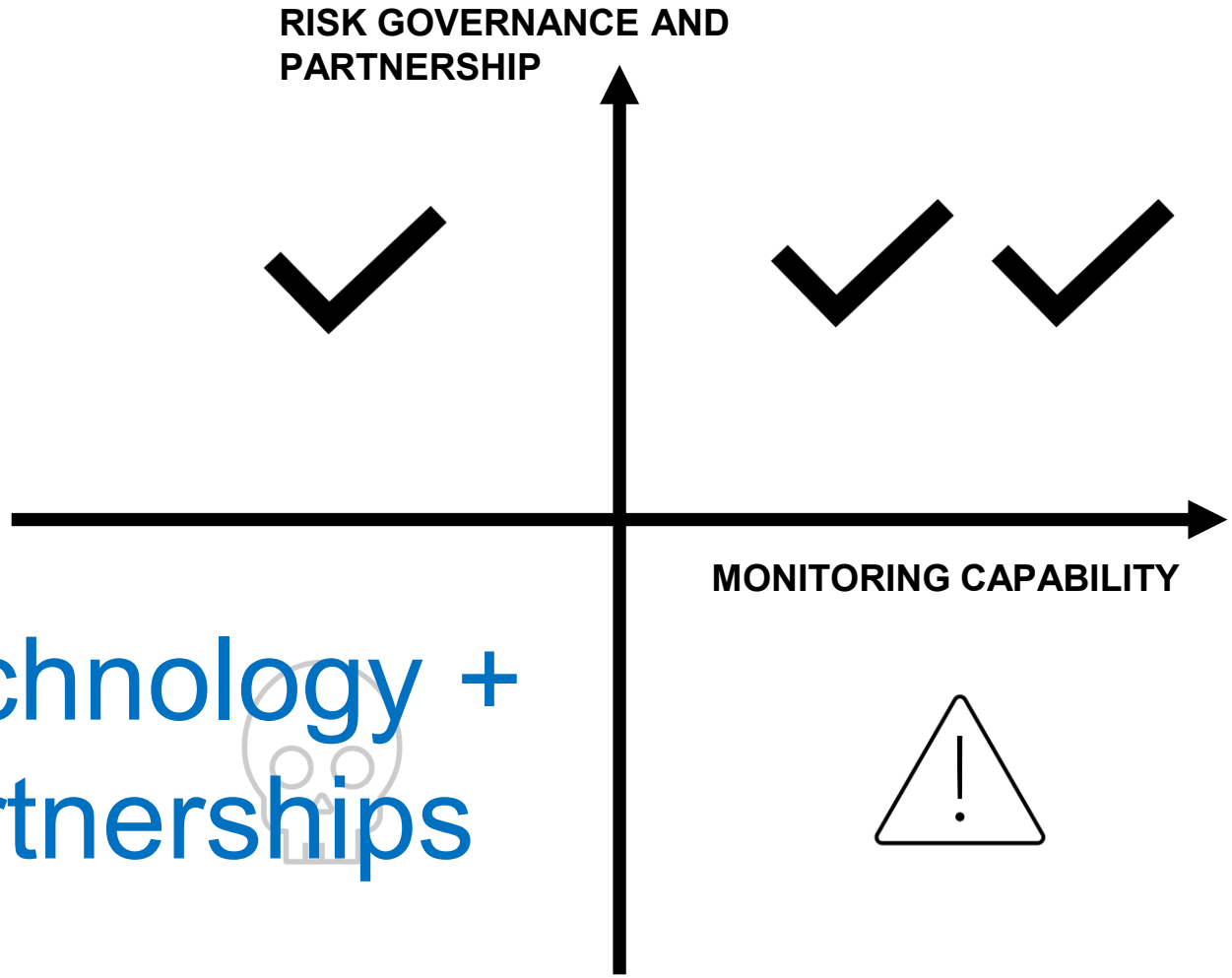
Focus towards efficiency and EW4ALL



Technology + Partnerships

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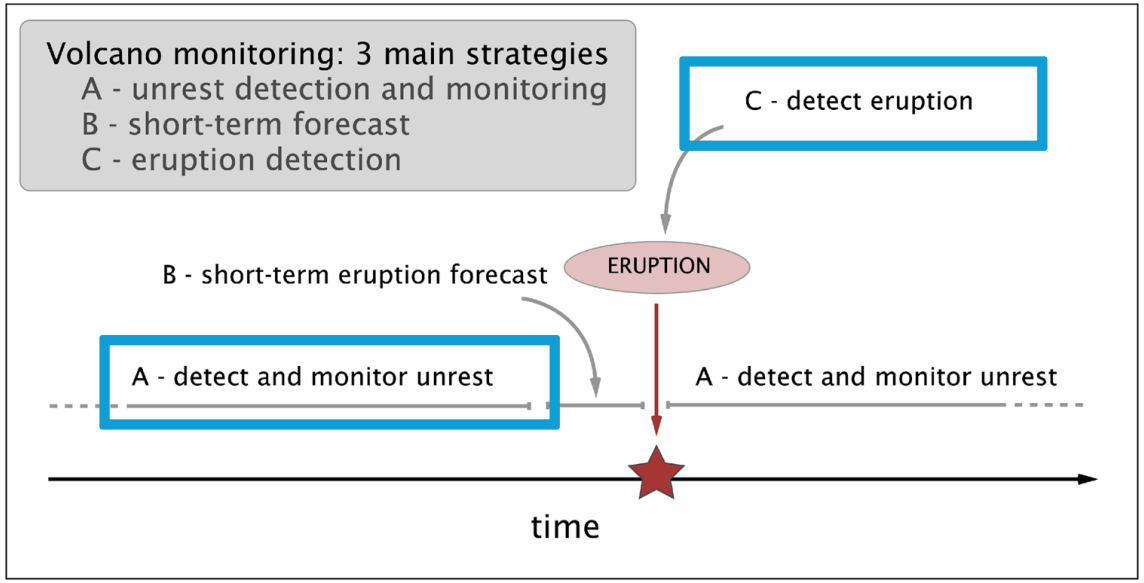
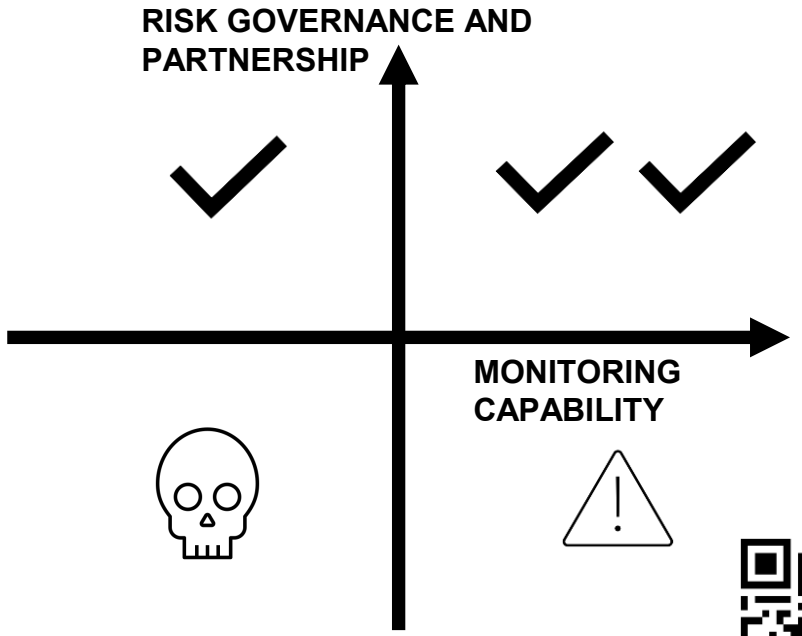
What does this all mean for EW4ALL?

Scientific and technical strategy



Development roadmaps



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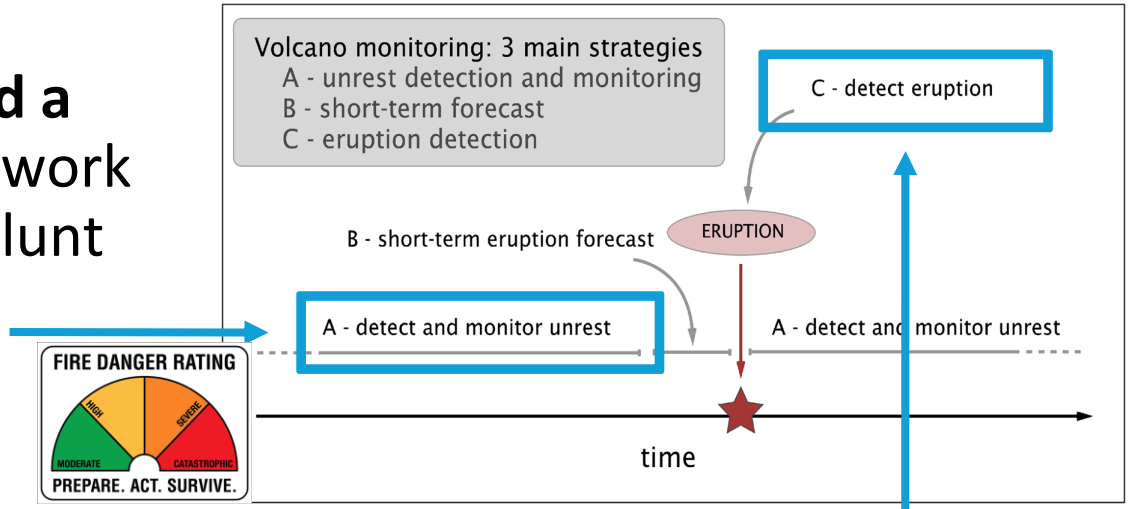
Scientific and technical strategy

Successfully forecasting eruptions remains elusive

Volcanic Alert Level systems can be considered a general EW tool. They provide a general framework for volcanic hazard mitigation. They remain a blunt tool that needs to be complemented by close partnership with end users and other communications products



EW4ALL should focus on Early detection of eruptions and forecasting of impact (like for tsunami) rather than elusive eruption forecasting. **Connection with the VAACs**

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Development roadmaps

Monitoring **capabilities**, **efficiency** and **effectiveness** varies hugely worldwide

Support to observatories needs to include both technology and risk governance framework and processes

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How WOVO can help

WOVO is a IAVCEI network of – and for – volcano observatories worldwide

The objectives of WOVO are to **connect**, **support**, and **advocate** for its members, through three primary programs:

- The **Volcano Observatory Best Practices (VOBP)** workshops to exchange experiences and propose recommendations for optimising operational efficiency and responding effectively to volcanic eruptions and unrest.

- WOVOdat, a comprehensive global database on volcanic unrest

- Aviation and Early Warning initiatives where WOVO provides representation and advocacy for volcano observatories

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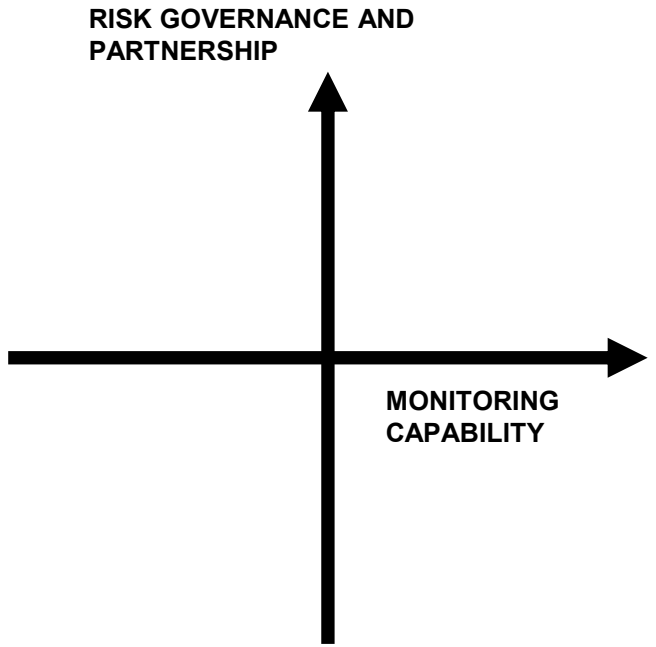
VOBP: Volcano Observatory Best Practice workshop series

- **VOBP workshops** were first conceived to provide an international forum to VOLCANO OBSERVATORIES, to discuss their practical issues and identify internationally shared BEST PRACTICES.

- BEST PRACTICES are neither rules nor prescriptions; VOBP workshops recognise as a value the diversity in culture, education, societal background, access to resources, that characterise volcano observatories throughout the world.

- Rather, **BEST PRACTICES represent a reference**

… come and discuss at the poster!



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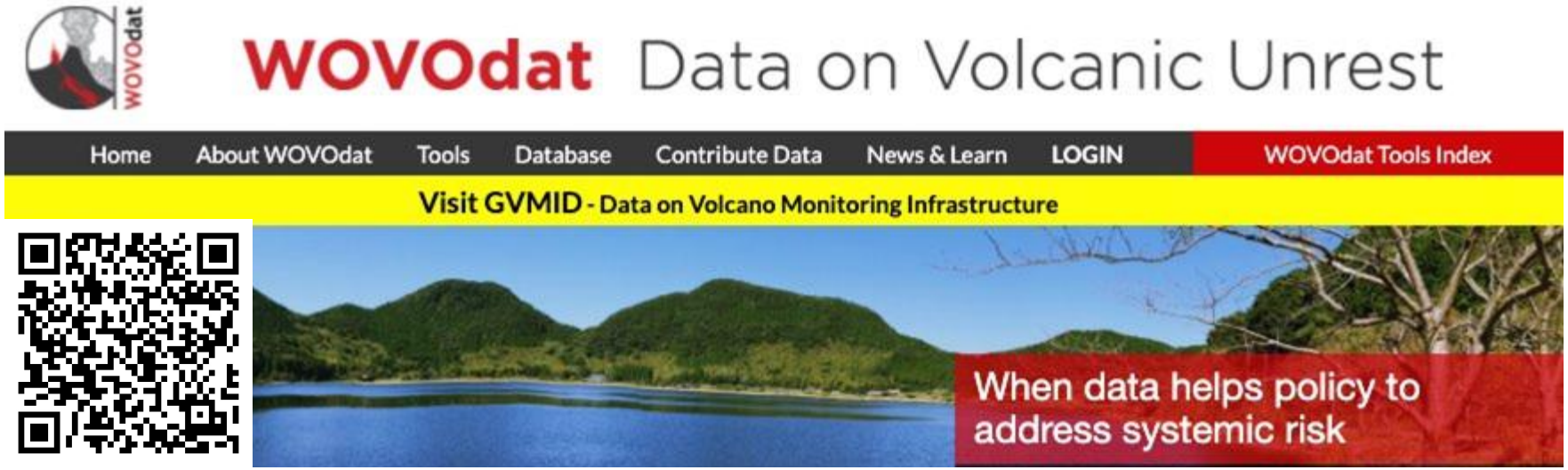
WOVO data:
Access to Global monitoring data

- **WOVOdat** is an open-access, growing global database of volcano monitoring data, developed by the World Organization of Volcano Observatories (WOVO) under IAVCEI and currently hosted by the Earth Observatory of Singapore. It improves understanding of eruptive processes, enhances eruption forecasting, and supports risk reduction through comparative analysis of unrest patterns within and across volcanoes. WOVOdat promotes global collaboration, data sharing, and capacity building to enable transparent, timely, and evidence-based decision-making.



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Volcano Monitoring Infrastructure

- **The Global Volcano Monitoring Infrastructure Database (GVMID)**, part of WOVOdat, documents and advances ground- and space-based volcano monitoring capabilities. It provides insights into monitoring techniques, helping observatories strengthen networks and address gaps with remote sensing and new technologies. GVMID supports improved network design for better eruption anticipation and detection.

About GVMID:

Example of global assessment on magma migration capability:

… come and discuss at poster 41!

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Cross-disciplinary initiatives

The Volcanic Ash and Aviation Hazards (VAAH)

Represents and advocates for observatories within the aviation and meteorological communities

Intended to facilitate and make accessible information from (to) the aviation community (ICAO)

Strong connection with the WMO and the VAACs

A survey is circulating to collect overall competencies and knowledge about SVOs responsibilities

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WOVO can help by

Being a touch-point and connector for and with volcano observatories

For WMO, offering **guidelines on capability, efficiency and effectiveness for EW4ALL**, and **advocating** for observatories

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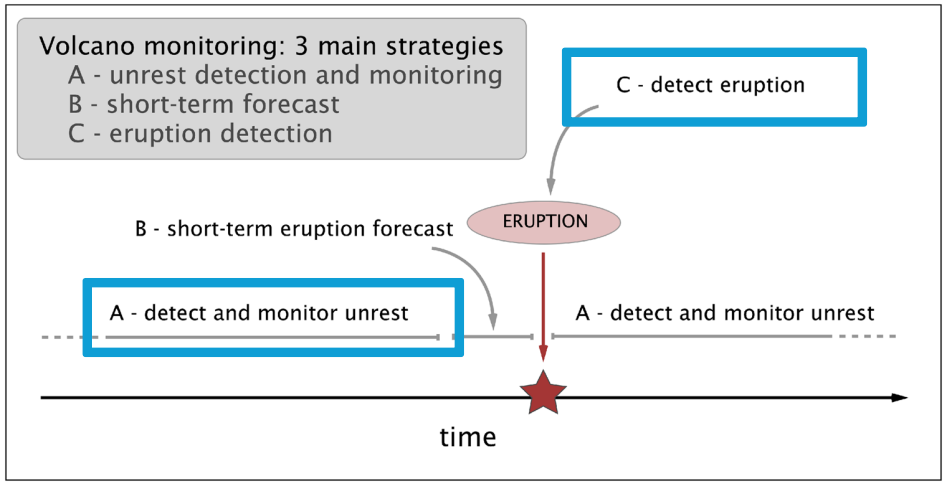
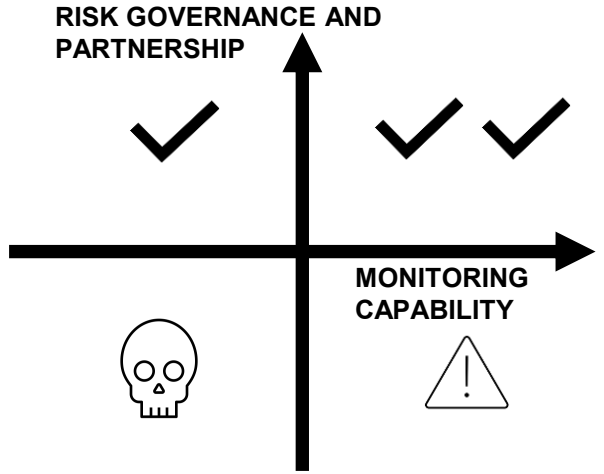


Dual priority focus for EW4All

Take away points



Both capability and risk governance are crucial (for effectiveness)

Connect, support and advocate

Experts are crucial (not just data/tools)

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