UNIVERSITY OF OSLO

Oslo VGS, Jevnaker, 20Mar2023

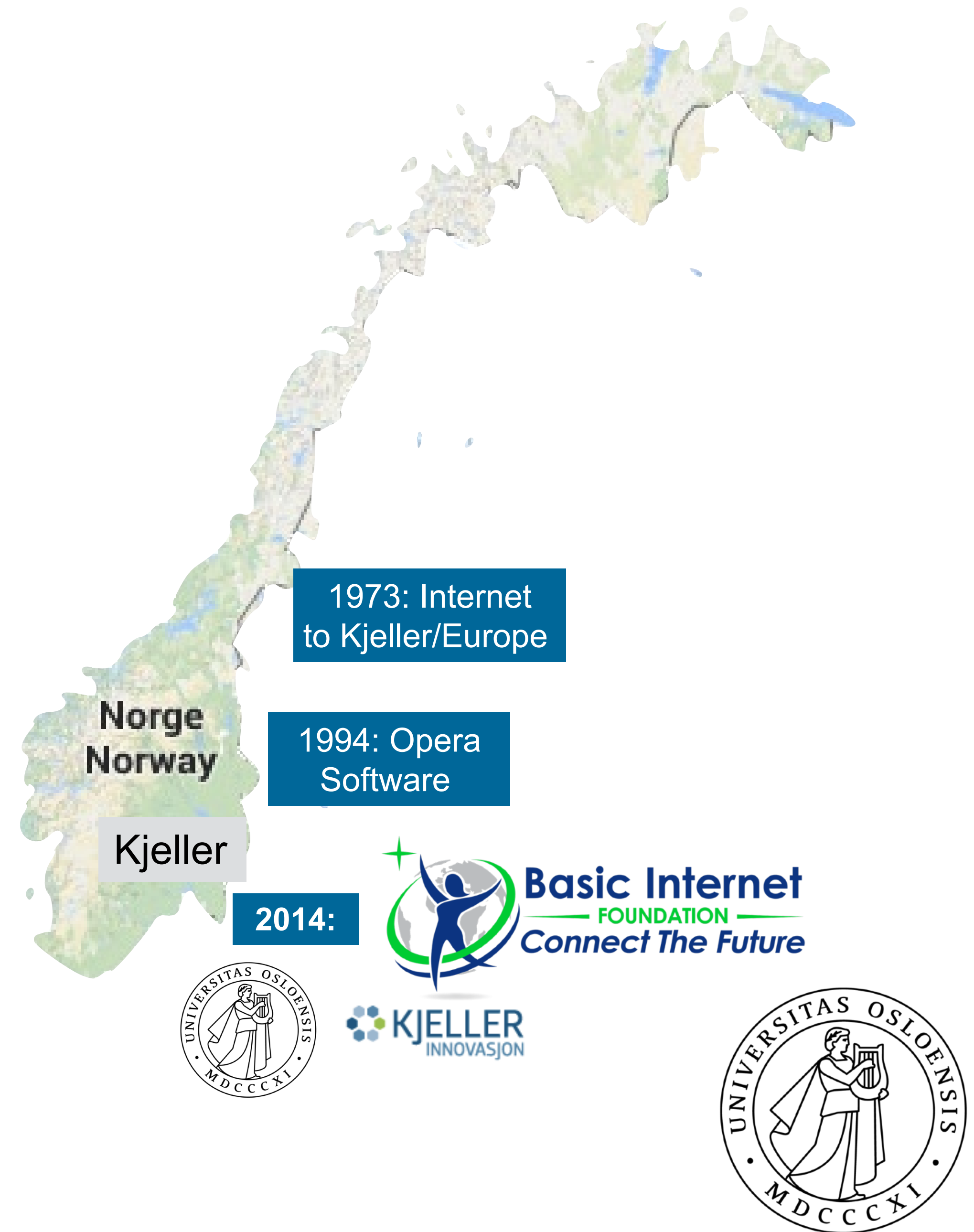# Hvordan kan private hjem bidrar til framtidens energisystemer?

Josef Noll
Professor, Department of Technology Systems
Lead Digital Global Health, Centre for Global Health
Secretary General, Basic Internet Foundation

UNIVERSITY OF OSLO

Norge Norway

Kjeller

1973: Internet to Kjeller/Europe

1994: Opera Software

2014:

Basic Internet
FOUNDATION
Connect The Future

KJELLER
INNOVASJON

Fra Radio til Samfunnssikkerhet
- inkludering og deltagelse

➡ "The German coming to the Nordics"
- **Radio**, Communications, **Remote Sensing**
- Siemens, European Space Agency (ESA)
- Telenor: 3G development (Kjeller)

➡ The Nordics & Baltics
- Internet to Europe (1973), Pioneers: Vint, Paal, Yngvar
- .php, OpenSource, Linux, Skype, Spotify
- OperaSoftware, FAST Search
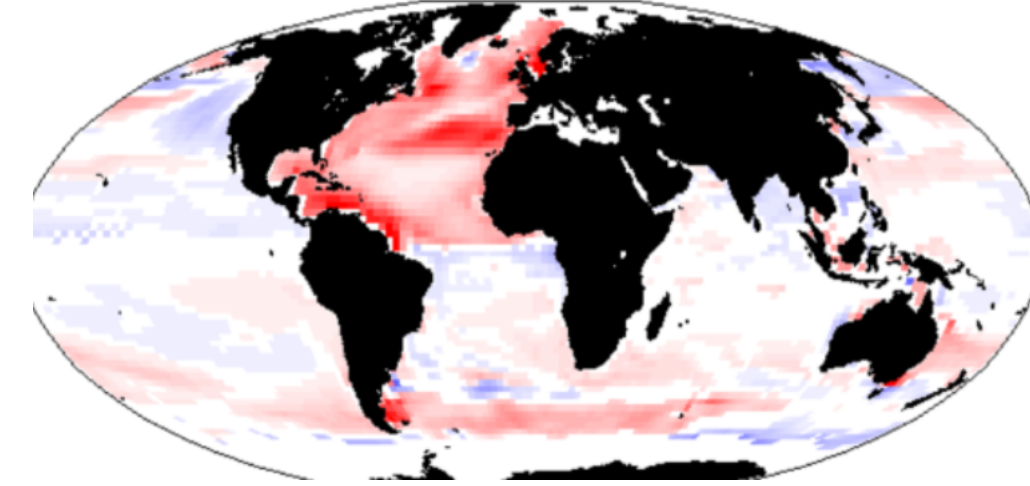- Nokia, Ericsson, Telenor, Telia

➡ "Internet to Africa" (2012)
- Basic Internet Foundation (2014)

➡ Digital- and Energy-Equity (2022)
- Trust, Digital Transformation and Societal Security

1992: "Remote Sensing & Climate Change"

1999: 3G System - Mobile Security

2004: Mobile Payment & Authentication

2006: 4G & IoT - IoT Security

2015: IMSI catcher
- mobile espionage
- **societal security**

2015: Security in IoT for Smart Grids (IoTSec.no)

2019: **Digital Divide** & Societal Security

2022: IoT cybersecurity – Graceful degradation and security by design
https://www.devicechronicle.com/iot-cybersecurity/
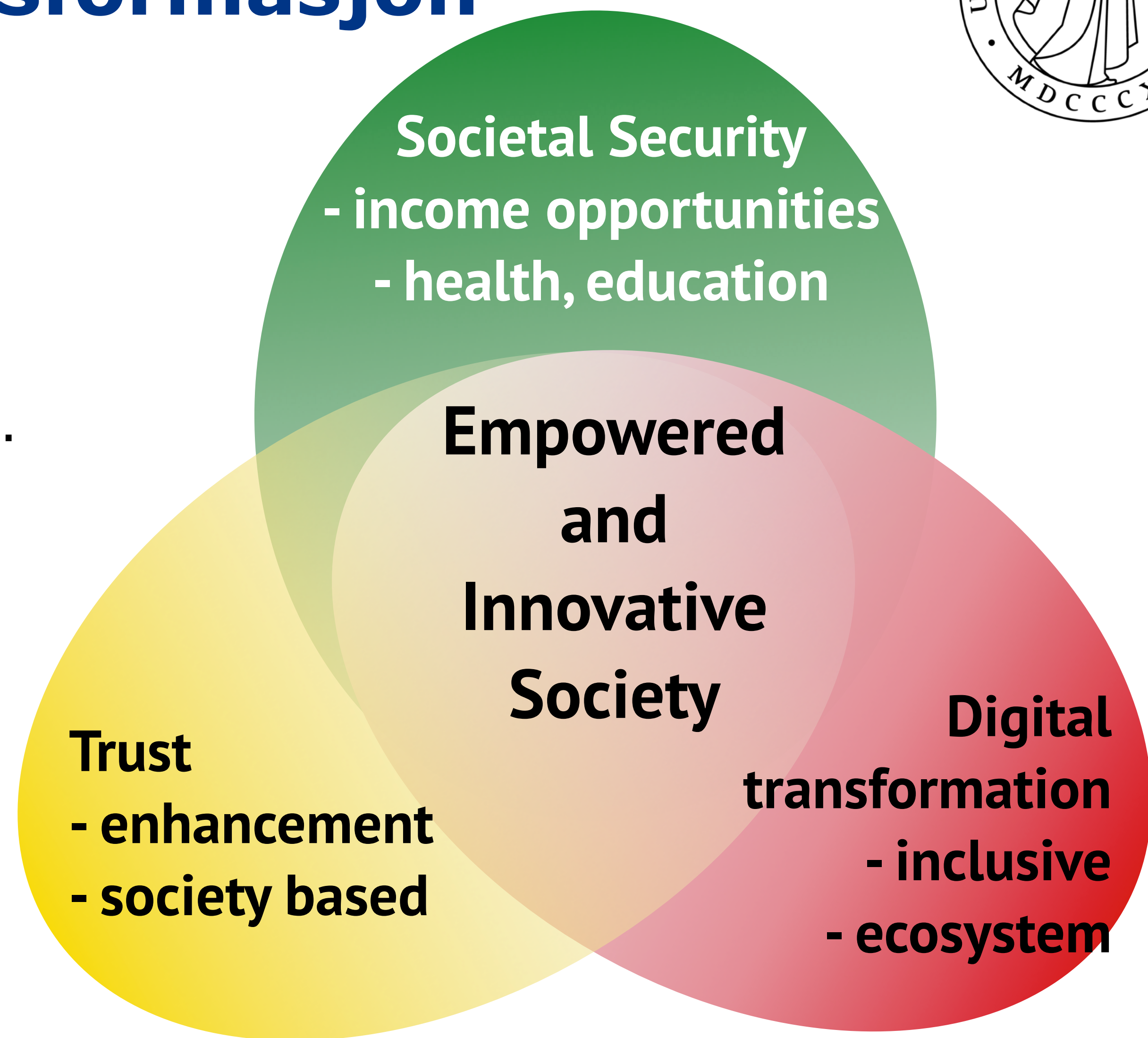
Digital Transformasjon

Tillit

Samfunnssikkerhet

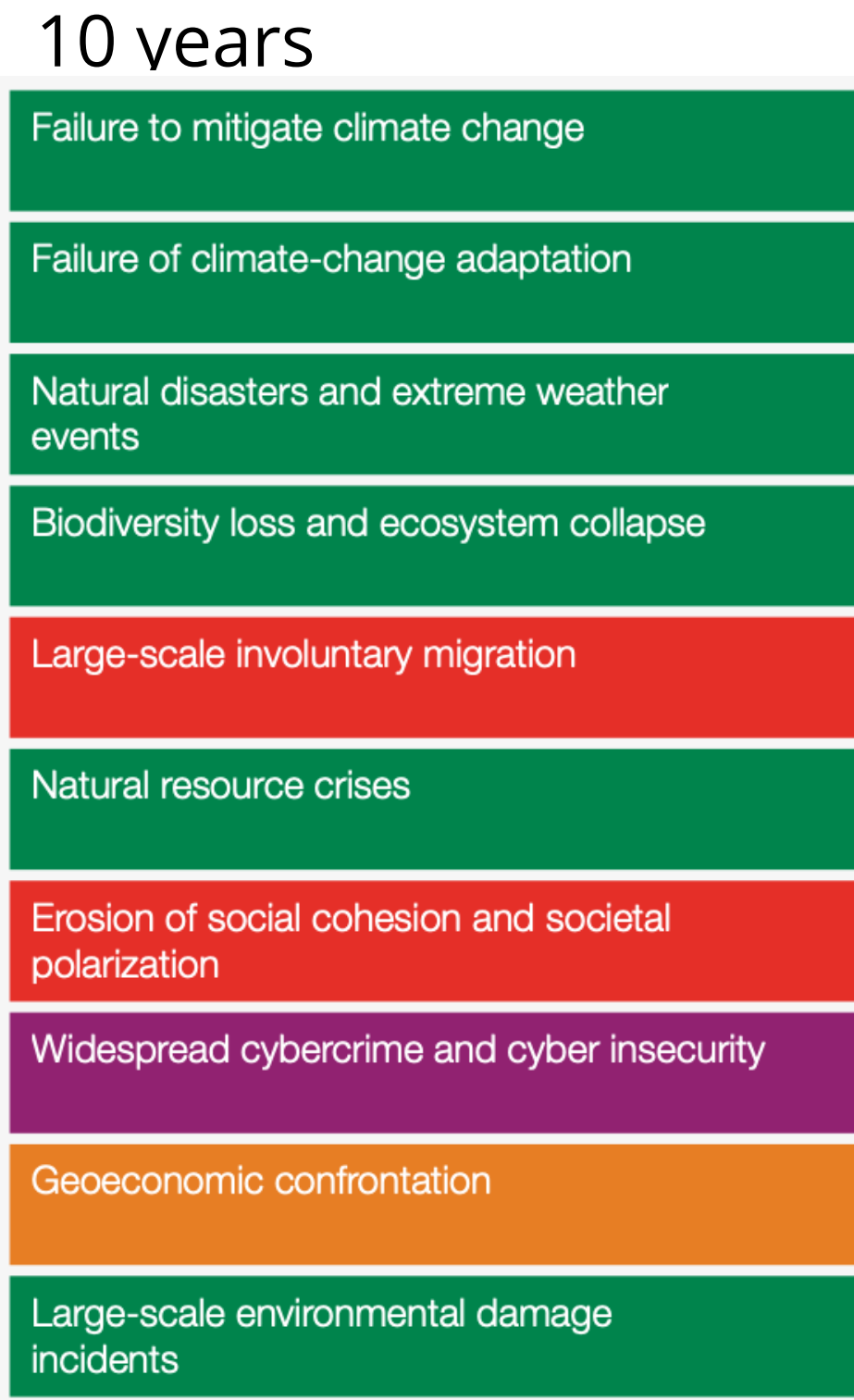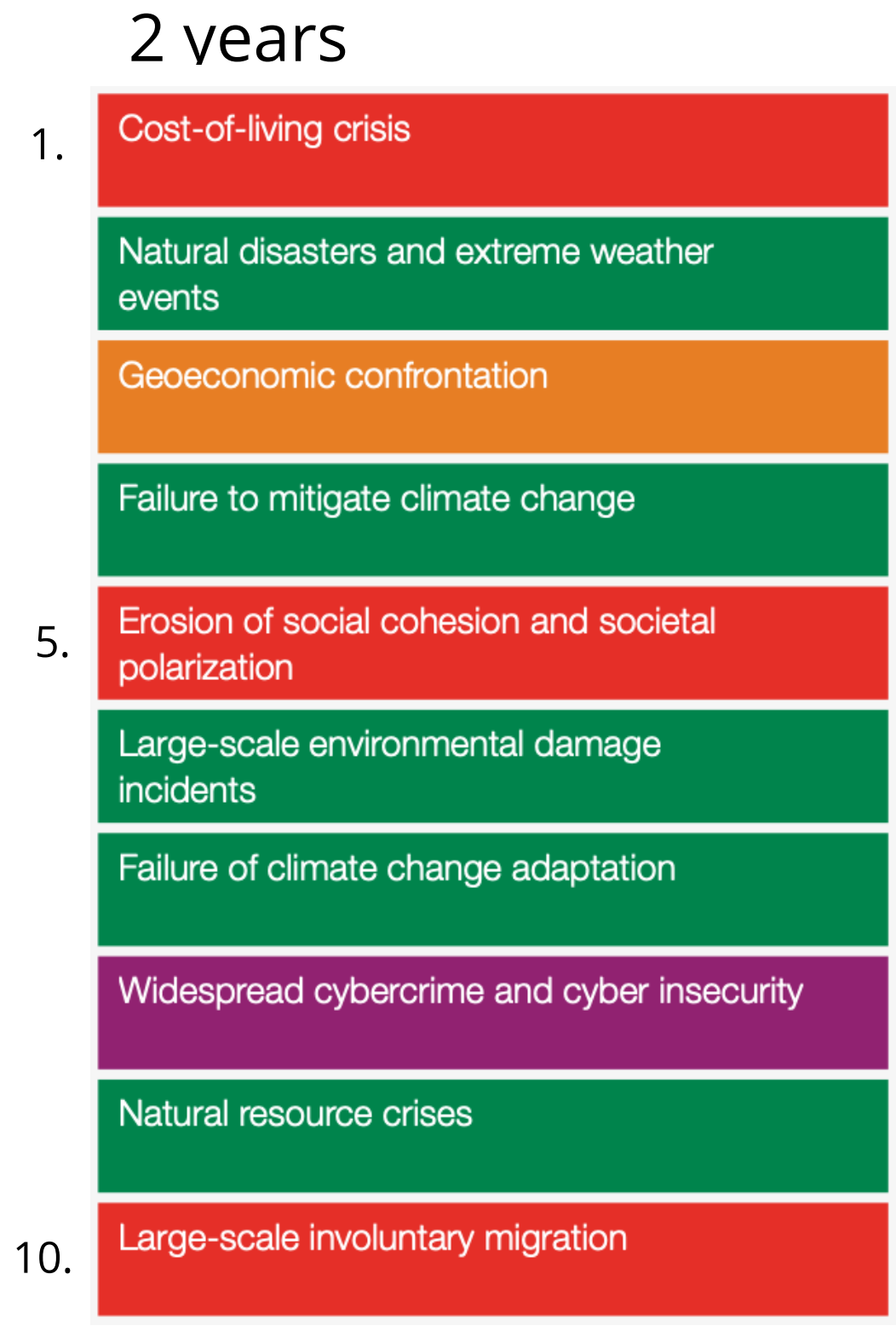# Relasjon tillit – digital transformasjon og samfunnssikkerhet

➡ Global utfordringer
- Klimakrise
- Konflikter i Ukraine, Etiopia, Syria,…
- Materialiser (Litium, Kobalt)
- Digital- og energi-skille

➡ Bærekraftig og inkluderende framtid - nøkkelen for SDGs
- deltagelse i klimaprosesser
- omstilling til fornybar

Societal Security
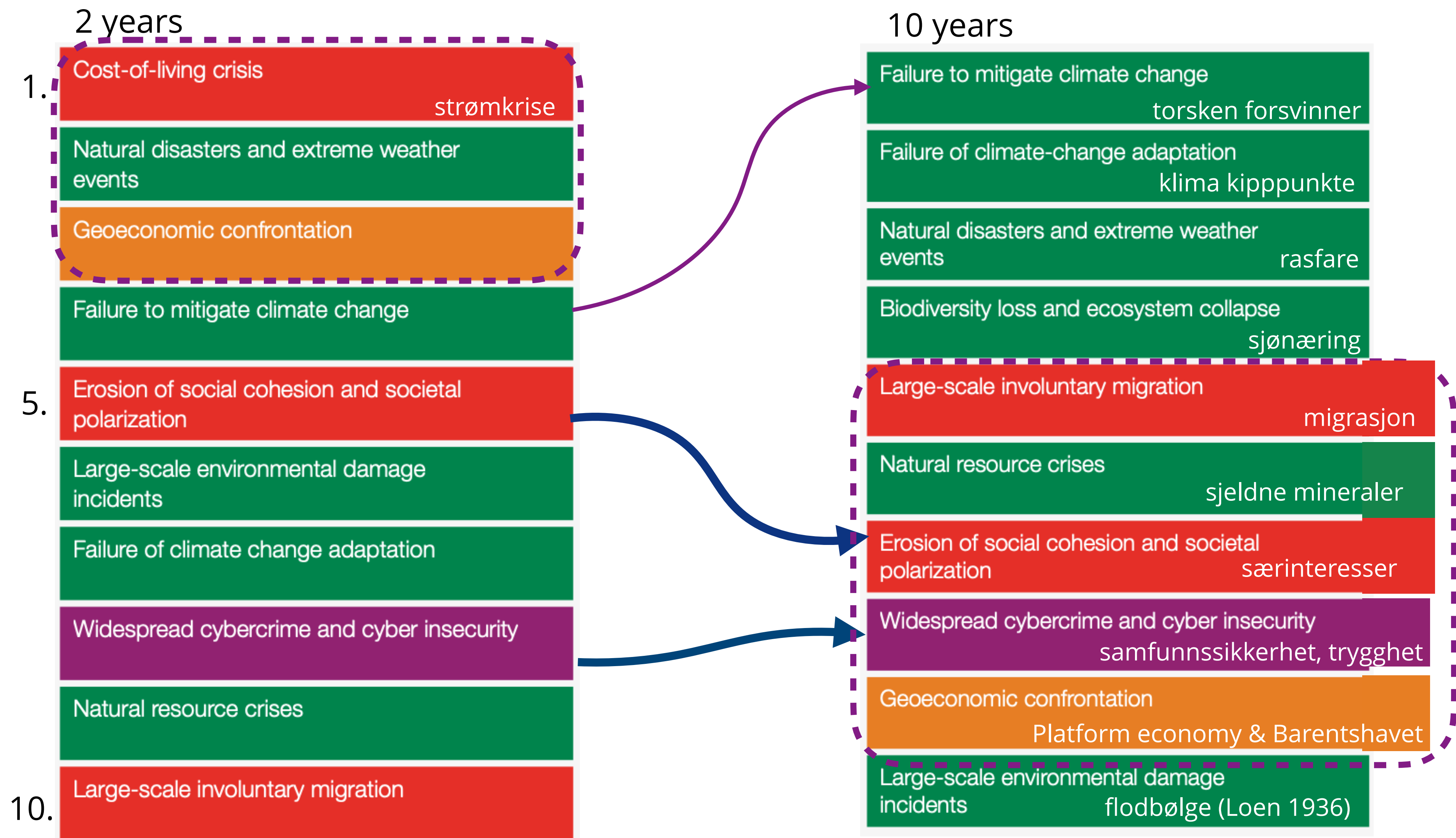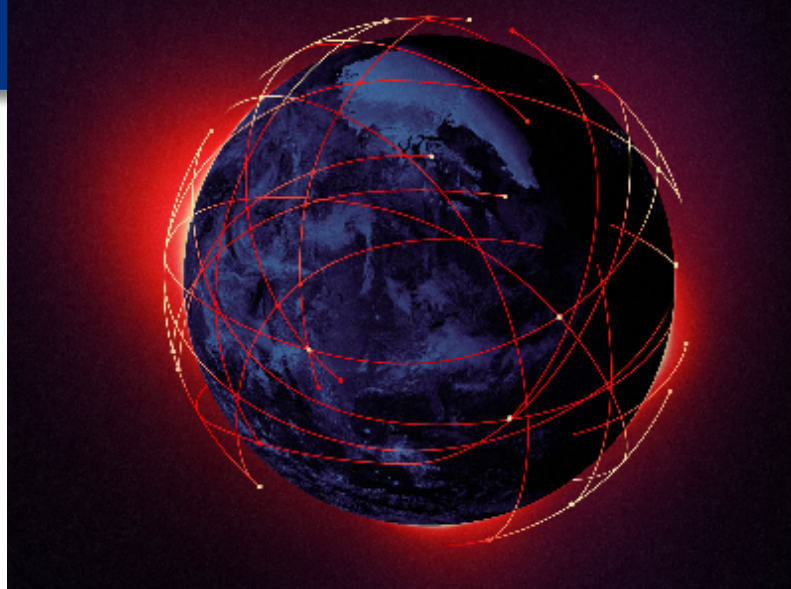**- income opportunities**
- health, education

Empowered and Innovative Society

Trust
- enhancement
- society based

Digital transformation
- inclusive
- ecosystem

Morgendagens katastrofe
dagens kriser, og det vi forventer om 10 år

2 years

1.	Cost-of-living crisis
	Natural disasters and extreme weather events
	Geoeconomic confrontation
	Failure to mitigate climate change
5.	Erosion of social cohesion and societal polarization
	Large-scale environmental damage incidents
	Failure of climate change adaptation
	Widespread cybercrime and cyber insecurity
	Natural resource crises
10.	Large-scale involuntary migration

10 years

- Failure to mitigate climate change
- Failure of climate-change adaptation
- Natural disasters and extreme weather events
- Biodiversity loss and ecosystem collapse
- Large-scale involuntary migration
- Natural resource crises
- Erosion of social cohesion and societal polarization
- Widespread cybercrime and cyber insecurity
- Geoeconomic confrontation
- Large-scale environmental damage incidents

Global risks ranked by severity over the short and long term

https://www.weforum.org/reports/global-risks-report-2023

Globale risikoer og samfunnssikkerhet

2 years

10 years

2 years	
1.	Cost-of-living crisis — strømkrise
	Natural disasters and extreme weather events
	Geoeconomic confrontation
	Failure to mitigate climate change
5.	Erosion of social cohesion and societal polarization
	Large-scale environmental damage incidents
	Failure of climate change adaptation
	Widespread cybercrime and cyber insecurity
	Natural resource crises
10.	Large-scale involuntary migration

10 years
Failure to mitigate climate change — torsken forsvinner
Failure of climate-change adaptation — klima kipppunkte
Natural disasters and extreme weather events — rasfare
Biodiversity loss and ecosystem collapse — sjønæring
Large-scale involuntary migration — migrasjon
Natural resource crises — sjeldne mineraler
Erosion of social cohesion and societal polarization — særinteresser
Widespread cybercrime and cyber insecurity — samfunnssikkerhet, trygghet
Geoeconomic confrontation — Platform economy & Barentshavet
Large-scale environmental damage incidents — flodbølge (Loen 1936)

Global risks ranked by severity over the short and long term

Digital Transformasjon

Tillit

Samfunnssikkerhet

Digital Transformation

→ Economic perspective
  - electrical- and digital-transition
  - platform economy (AMAMA) vs people
  - economical perspective of SMEs

→ Digitisation & Apps
  - TikTok and SocialMedia
  - Hate Speech
  - Deep Fake
  - Artificial Intelligence

→ Ransomware
  - industrial systems (Mærsk)
  - wind-turbiner

→ Energy grid
  - reliable grid
  - empowered customer vs "income AMAMA"

Natural resource crises — sjeldne mineraler
Erosion of social cohesion and societal polarization — særinteresser
Widespread cybercrime and cyber insecurity — samfunnssikkerhet, trygghet
Geoeconomic confrontation — Platform economy & Barentshavet
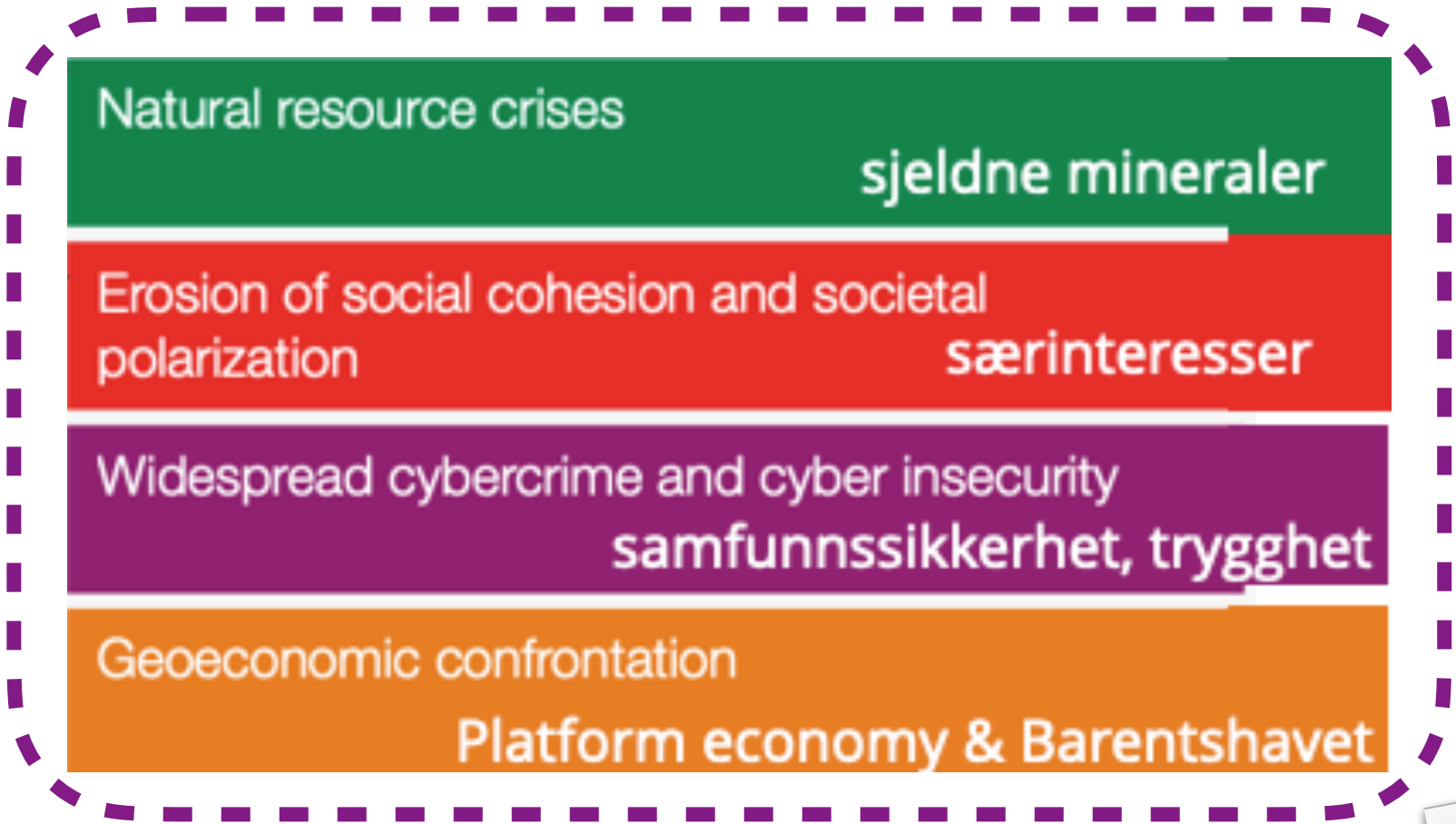
impact of digital on the societal divide

Company	Country	Inflation-adjusted[5]
Apple	🇺🇸	3,000
Microsoft	🇺🇸	2,576
Saudi Aramco	🇸🇦	2,450
Alphabet	🇺🇸	2,000
Amazon	🇺🇸	1,900
PetroChina	🇨🇳	1,472
Tesla	🇺🇸	1,235
Meta	🇺🇸	1,078

https://en.wikipedia.org/wiki/List_of_public_corporations_by_market_capitalization#2022

Digital Transformasjon

Tillit

Erosion of social cohesion and societal polarization

særinteresser

Widespread cybercrime and cyber insecurity

samfunnssikkerhet, trygghet

Samfunnssikkerhet

Tillit til digitale systemer

Erosion of social cohesion and societal polarization	særinteresser
Widespread cybercrime and cyber insecurity	samfunnssikkerhet, trygghet

➡ TikTok and SocialMedia
  ▪ profiling
➡ Hate Speech
➡ Deep Fake
➡ Artificial Intelligence
  ▪ for whom?

➡ Social empowerment & societal benefit

➡ Trust enhancement
  ▪ Framework for open AI
  ▪ Protection of society

"On the Internet, nobody knows you're a dog"

[New Yorker, 1993]

profiling (TikTok)
"Everyone knows you are a dog"

2023

Framtidens energiinfrastruktur og -kontroll

➡ Digitale Energisystemer

- sentralisert vs desentralisert
  - sentralisert kontroll (tibber…)
  - security, privacy

➡ Energisystemmodellering

- fra hjem til bygg til naboskap
  - naboskapsstrøm
- industrielle systemer
- Norge, Norden og EU

Our grid in 2033?

➡ Massive increase in demand

➡ Distributed renewables

➡ Unpredictable future

➡ Distributed & decentralised

➡ IoT attack & Cybercrime

➡ Knowledge for investment

PV

wind

H2

Monitoring & Control
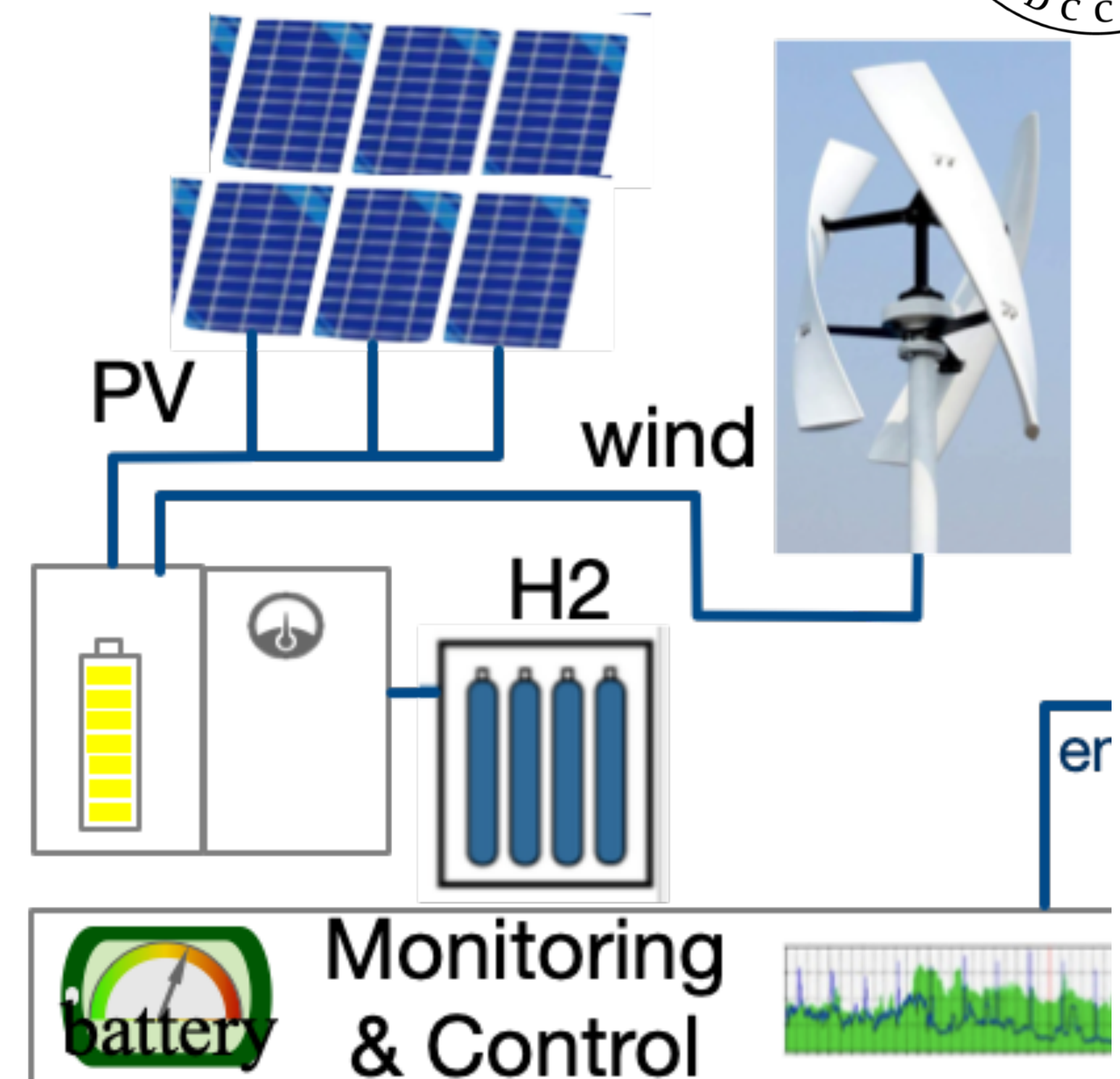
battery

EnerX: Geothermal, New batteries

Digital Transformasjon

Tillit

Samfunnssikkerhet: El-nett

Secure the Internet of Things?

BSSN's Website Gets Hacked; Cybersecurity Expert Comments

25Oct2021

Translator: Dewi Elvia Muthiariny
Editor: Markus Wisnu Murti

25 October 2021 20:37 WIB

Hacking illustration. Shutterstock

TEMPO.CO, Jakarta - The National Cyber and Encryption Agency's (BSSN) website *www.pusmanas.bssn.go.id* got hacked and hit by a defacement attack. Cybersecurity expert Pratama Persadha said the attack was posted on Wednesday, October 20, by Twitter account @son1x777.

➡ Verkada (Mar2021) sw clients; live feed of 150 k cameras

➡ WD Digital MyBook - remote factory reset

➡ QNAP NAS - hack of QNAP cloud -> private homes/SMEs had storage encrypted "ransomware"

➡ BotenaGO - Netgear & LinkedIn routers

➡ ....

Conflicts/Emergency

➡️ Graceful degradation?

21 Hacked Cameras, DVRs Powered Today's Massive Internet Outage
OCT 16

A massive and sustained Internet attack that has caused outages and network congestion today for a large number of Web sites was launched with the help of hacked "Internet of Things" (IoT) devices, such as CCTV video cameras and digital video recorders, new data suggests.

Earlier today cyber criminals began training their attack cannons on **Dyn**, an Internet infrastructure company that provides critical technology services to some of the Internet's top destinations. The attack began creating problems for Internet users reaching an array of sites, including Twitter, Amazon, Tumblr, Reddit, Spotify and Netflix.

internet comes from a dish on a roof

wifi access point
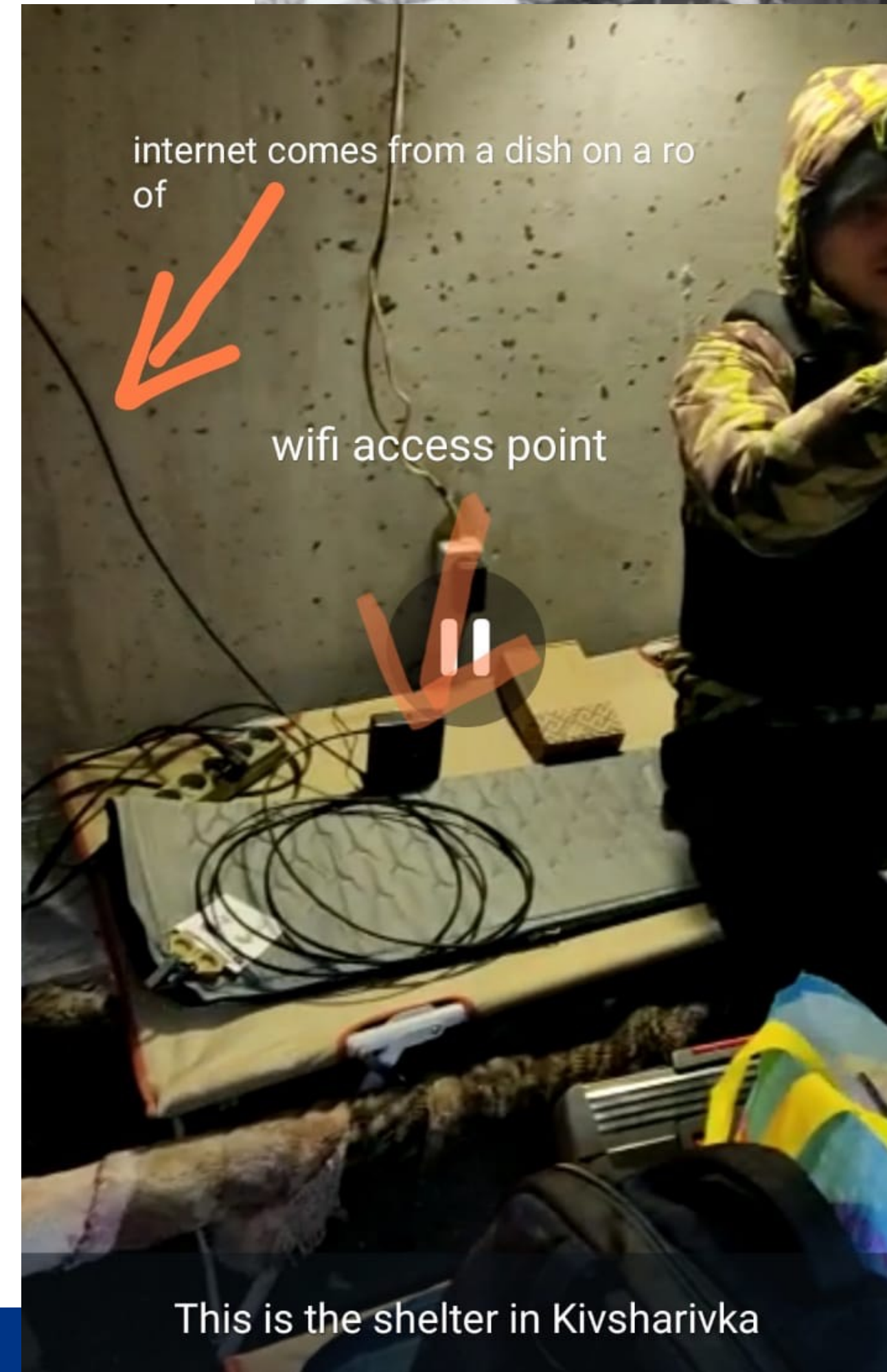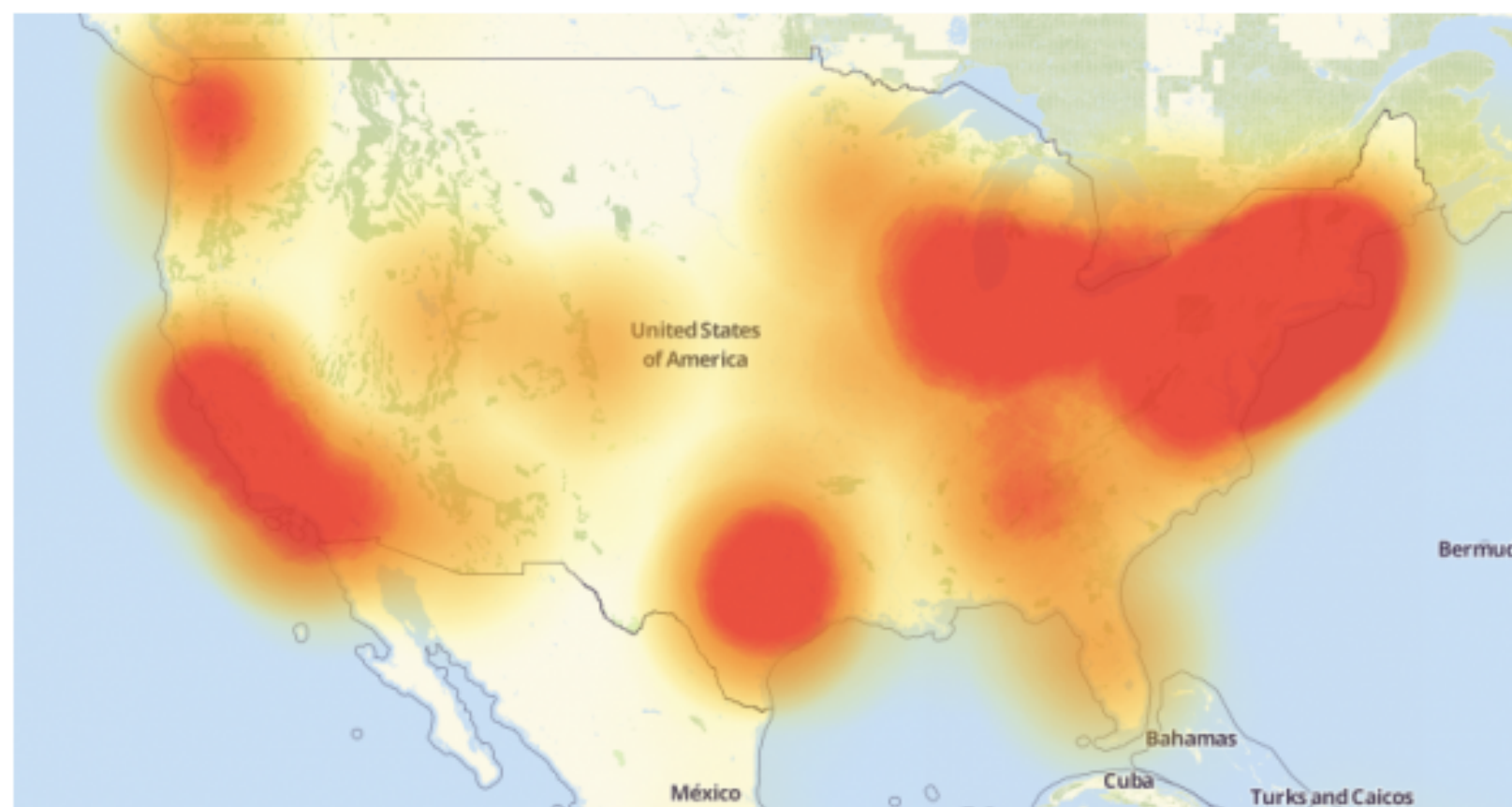
This is the shelter in Kivsharivka

This is a tv tower where antennas were installed.
On right Conner there is a rest of C-300 rocket

Security for the Grid

➡ **A**vailability

➡ **I**ntegrity

➡ **C**onfidentiality

➡ "homes are hacked"

- IoT threats
- Ransomware on operations
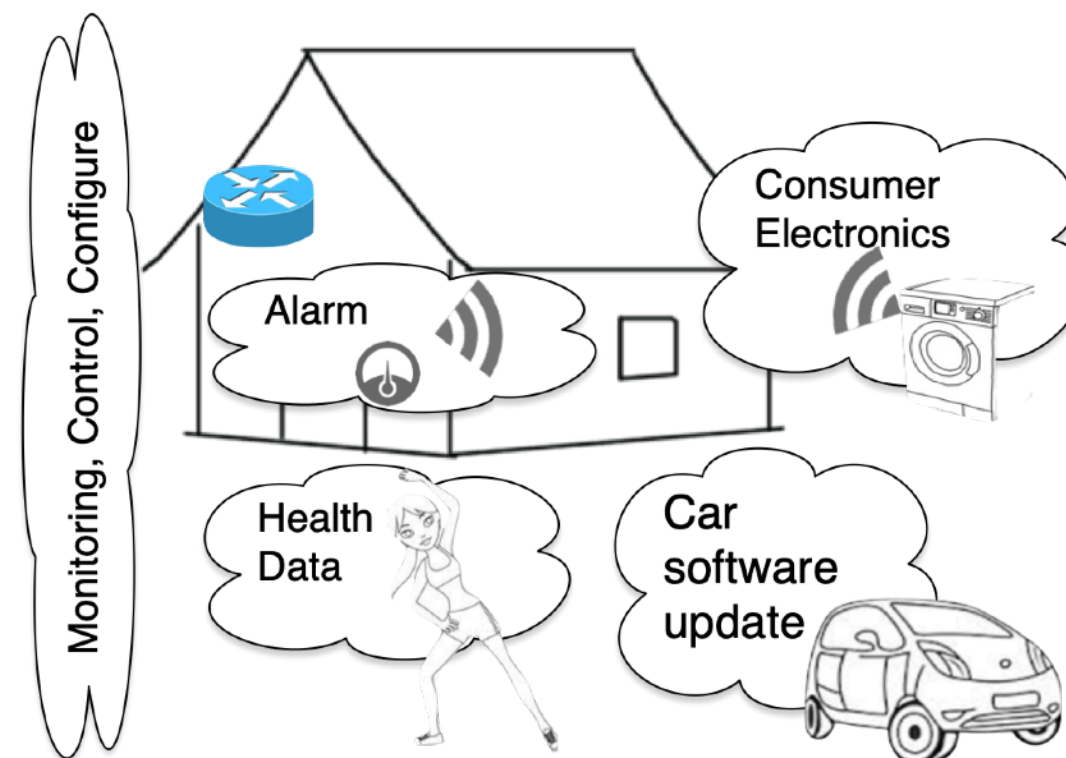
Confidentiality

- How secure is the information?

- How secure does the data need to be?

- Best methods
  - Physical Protections
    - Locked doors, fences, security guards, security cameras, safes, …
  - Electronic Protections
    - Encryption (storage and in transit), passwords, firewalls, two-factor authentication, …

Failure of confidentiality occurs if someone can obtain and view the data

Security (CIA) Triad

Integrity

- How correct is the information?

- Has the data been modified during retrieval, in transit, or in storage?

- Best methods
  - Hashing of files and information
  - Checksums during data transmission

= 79054025 255fb1a2 6e4bc422 aef54eb4

- Failure of integrity occurs if someone modifies the data being stored in or transit

Availability

- How much uptime is the system providing?

- Is the data accessible by users at all times?

- Best methods
  - Redundancy in the system design, including components and data paths
  - Backup strategies and disaster recovery plan

UPTIME

- Failure of availability occurs if the data cannot be accessed by the end user

Security (CIA) Triad

Monitoring, Control, Configure

Alarm

Consumer Electronics

Health Data

Car software update

Challenges to be addressed

1. Stable, resilient and participatory distribution grid

2. Emergency-prepared grid

3. Climate preparedness and EnerX
   - Heavy wind
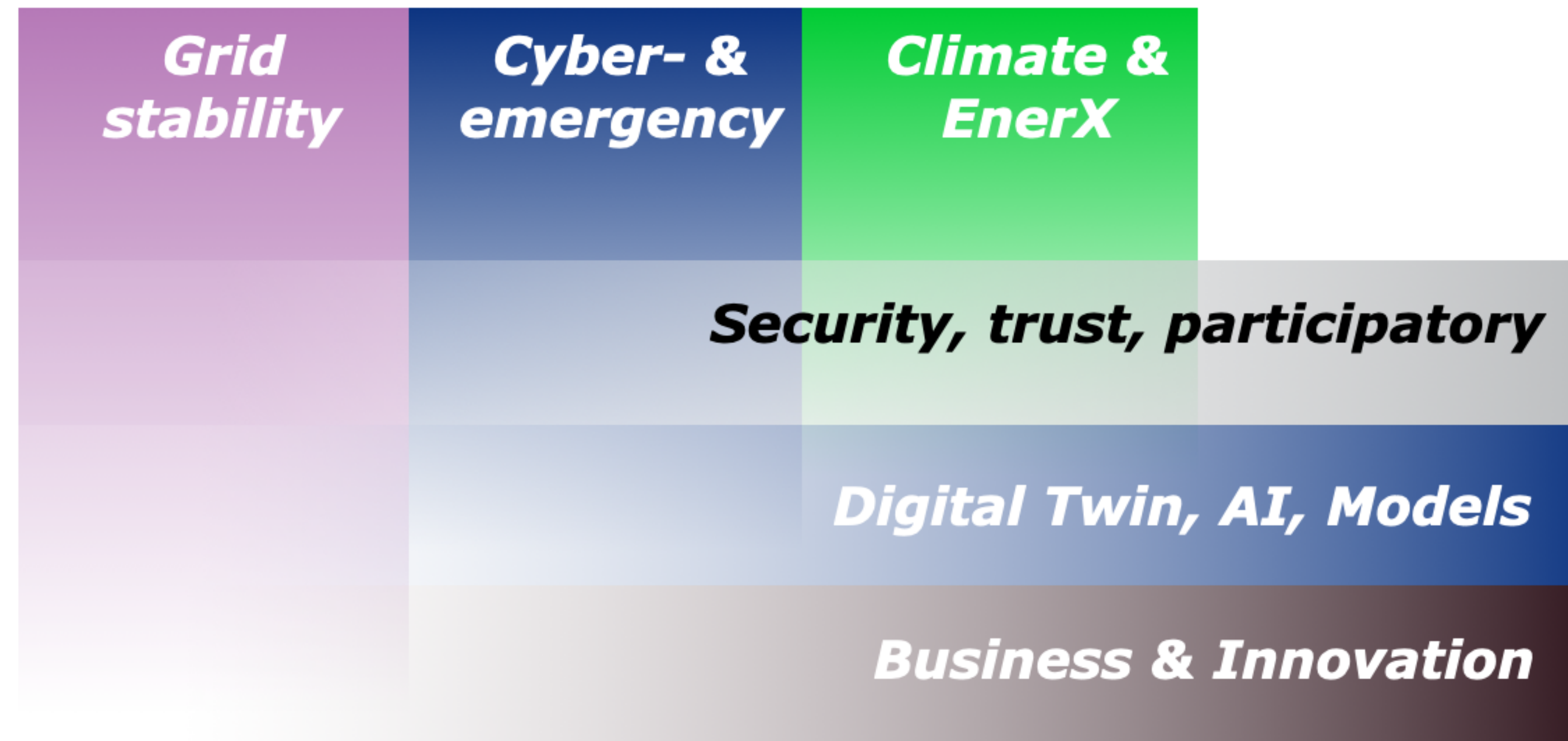   - Hydrology: From snow to water
   - Land slides (permafrost)

Grid stability & working areas

A. Cyber- and societal security, trust and participatory approaches

B. Digital Twin, models and artificial intelligence (AI)

C. Business & Innovation

Grid stability	Cyber- & emergency	Climate & EnerX

Security, trust, participatory

Digital Twin, AI, Models

Business & Innovation

based on Living Labs

Distributed Energy System and Security Infrastructure (DESSI)

➡ UiO Living Lab

- ▪ Physical infrastructure (PC, H2, wind)
- ▪ Digital Twin (Simulator)
- ▪ ENTRANS scientific database
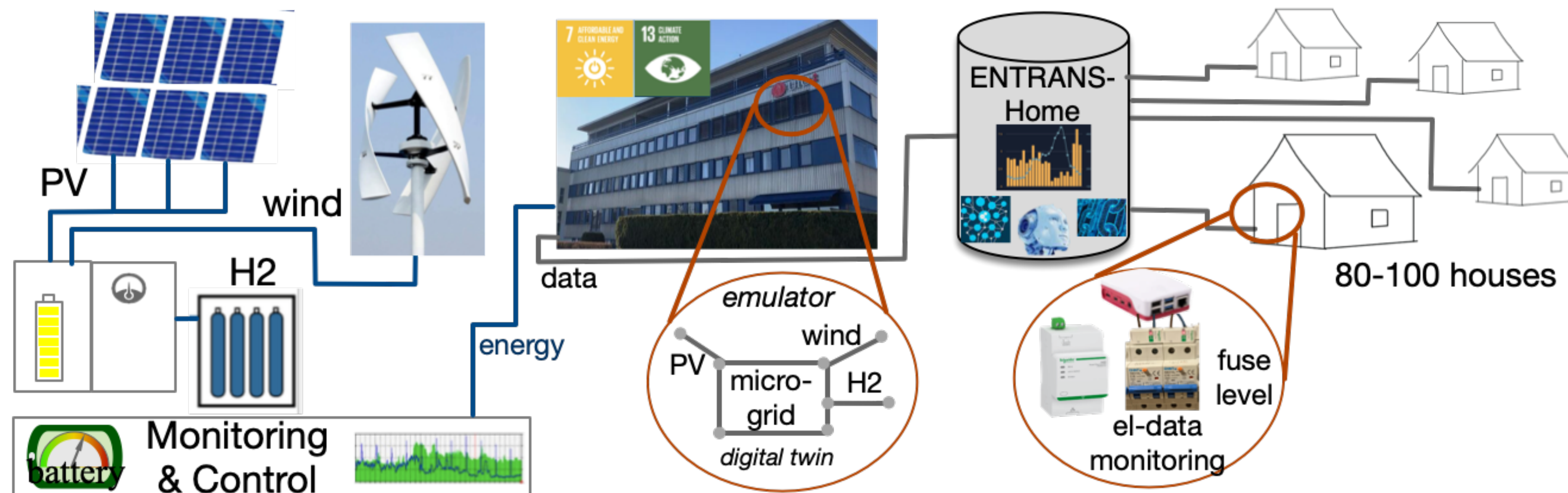
Energy and the connected home

➡ Interconnected devices
- audio, video
- consumer electronics
- heating, ventilation
- car charging

➡ Home User
- Convenience & Security
- Health

Monitoring, Control, Configure

Alarm

Consumer Electronics

Health Data

Car software update
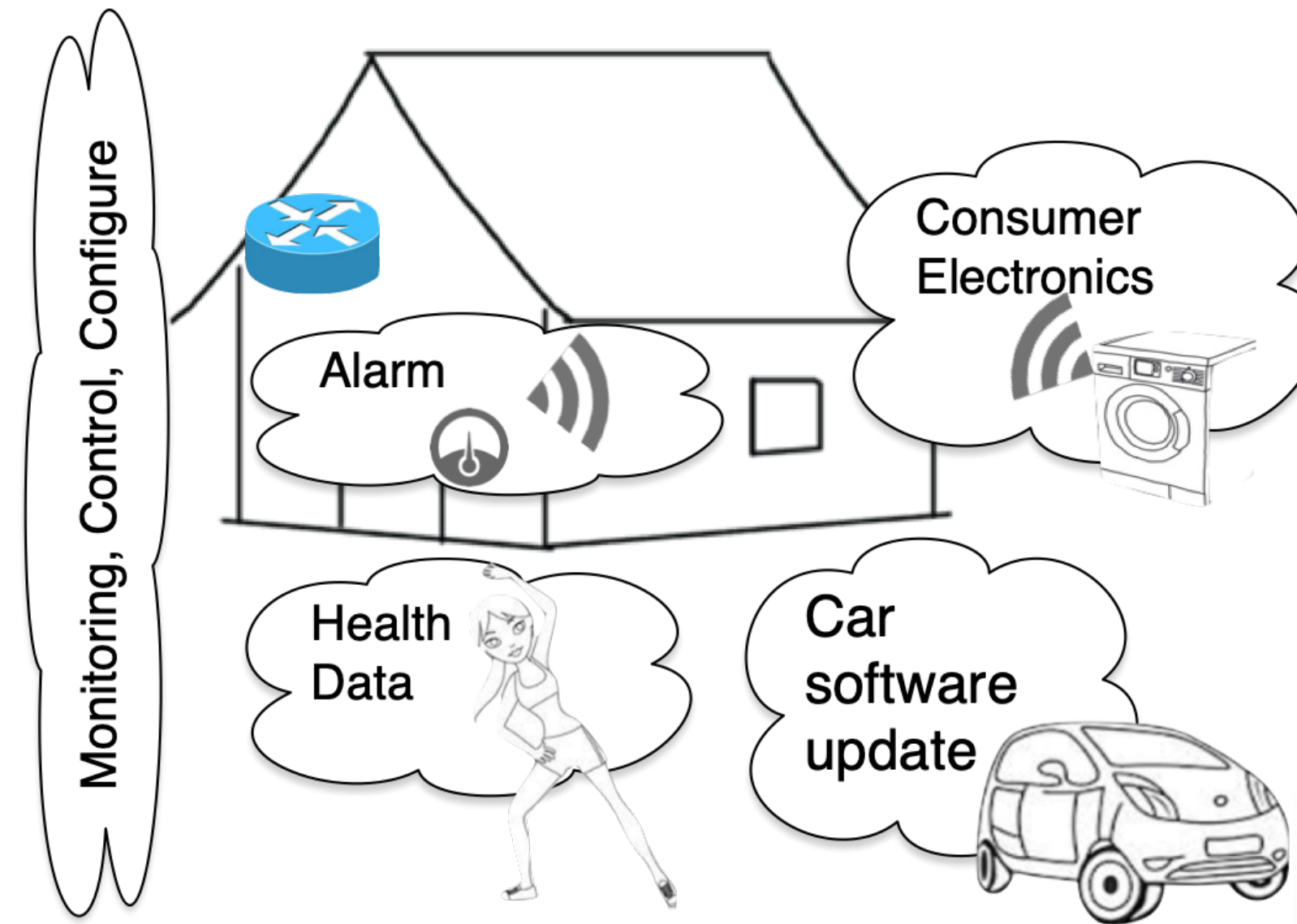
profiling (Tibber, Smartly,...)
"access to my energy data"

"who buys Tibber?"

ENTRANS scientific database

➡ Unique Scientific database
  ▪ high-resolutions electricity data
  ▪ every 10 s, per fuse
  ▪ commercial actors (tibber, homely,…)
➡ Outcome
  ▪ Collaboration: VGS Oslo-Viken
  ▪ Research:
    ▪ privacy awareness (10 s, 1 min, **15 min, 1 h**…)
   ▪ H2020 unique database
  ▪ Recommendations: "*Nettleiemodell*"
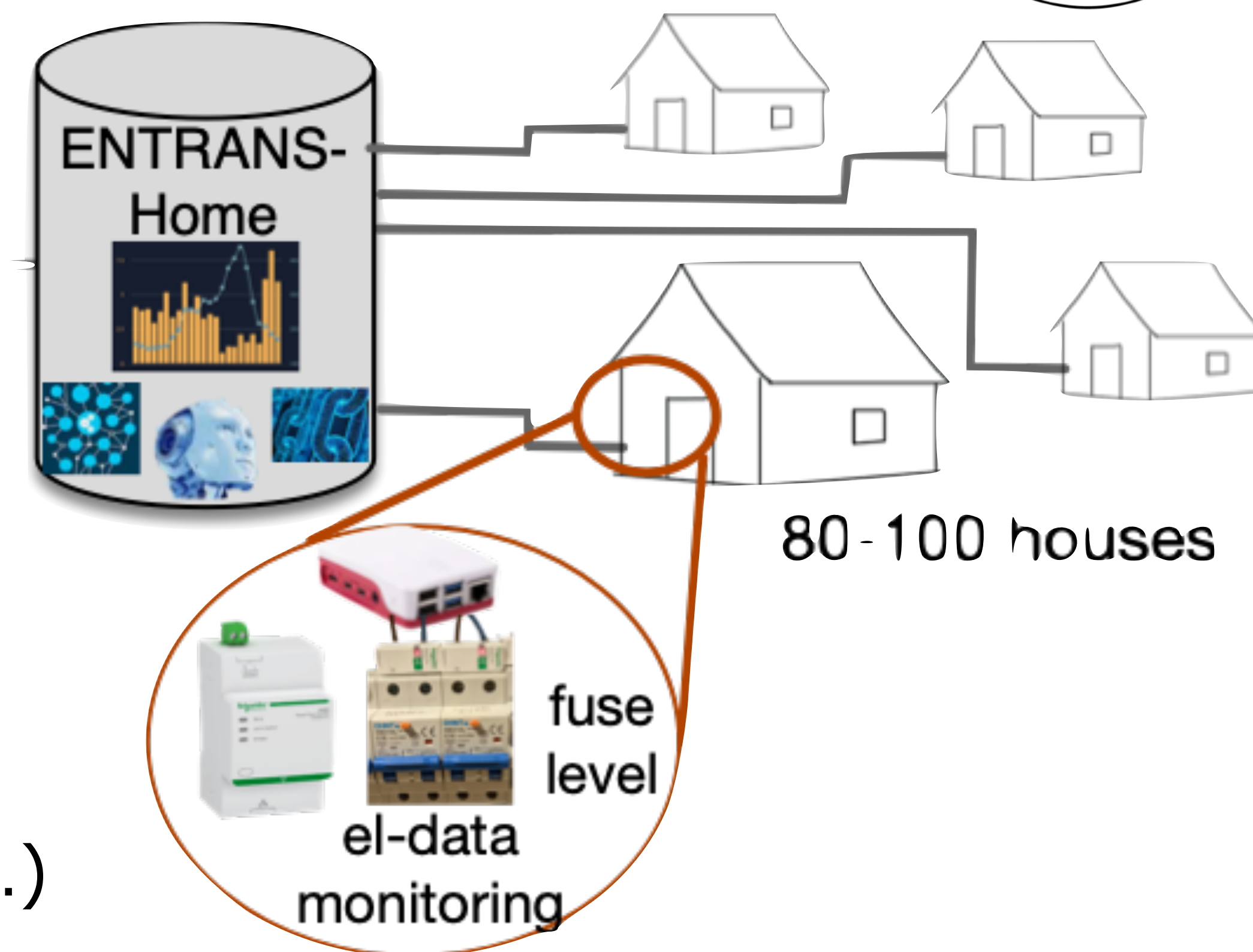
Bruk aldri vaskemaskin, tørketrommel eller andre husholdningsapparater når du ikke er til stede eller sover.

[Source: https://www.elvia.no/nettleie/alt-du-ma-vite-om-ny-nettleie-for-2022/

Oppsummert

➡ Globale utfordringer

  ▪ Klimakrisen

  ▪ Krigen i Ukraina, Etiopia, Syria,…

  ▪ Materialier (Kobalt, Litium)

  ▪ Digital skille (Europe - Afrika)

➡ Samfunnssikkerhet trenger deltagelse

  ▪ tillit gjennom kunnskap

  ▪ desentralisert styring og kontroll

  ▪ "hvor det står .no må det være .no inne"
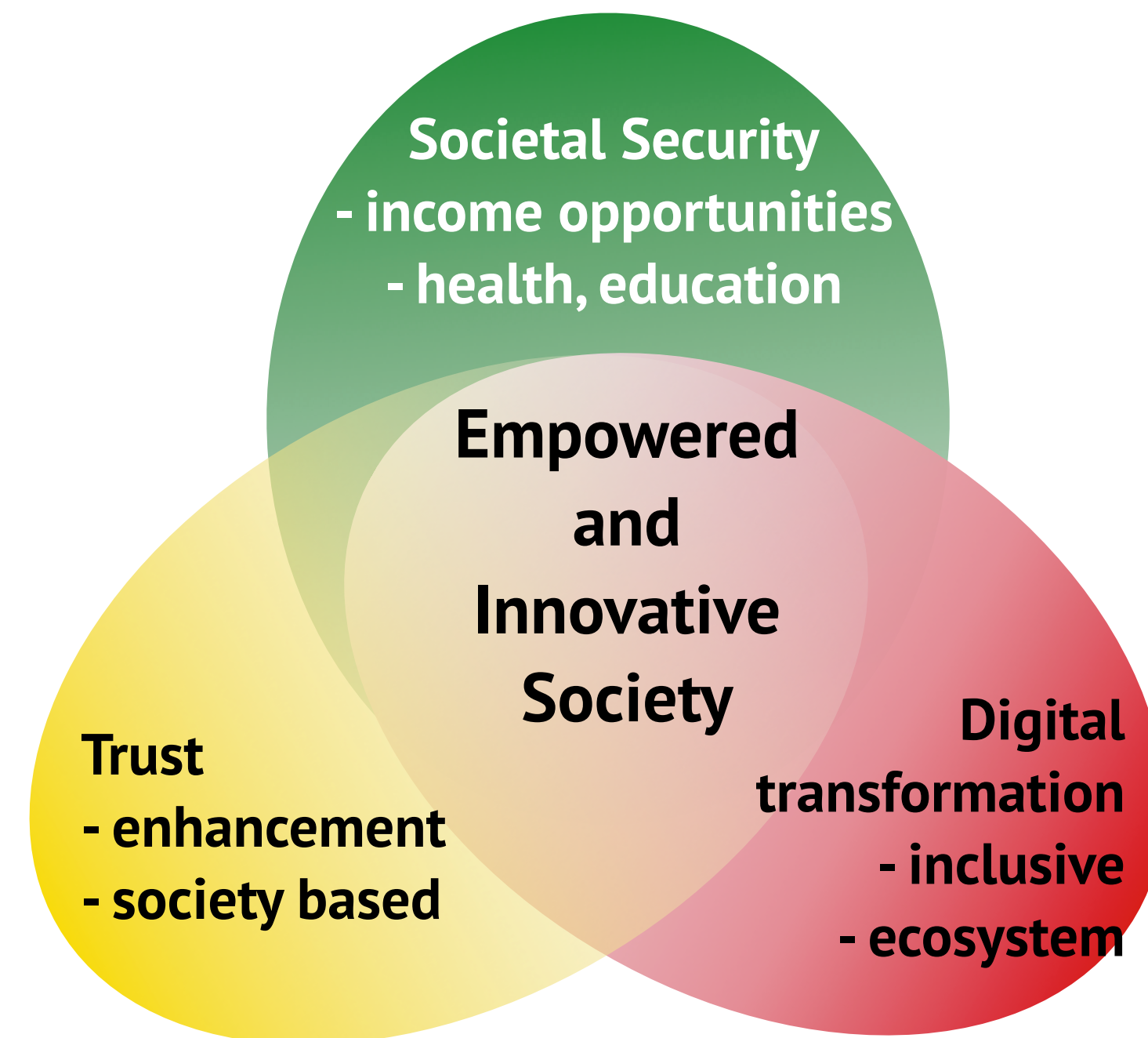
Global Perspective

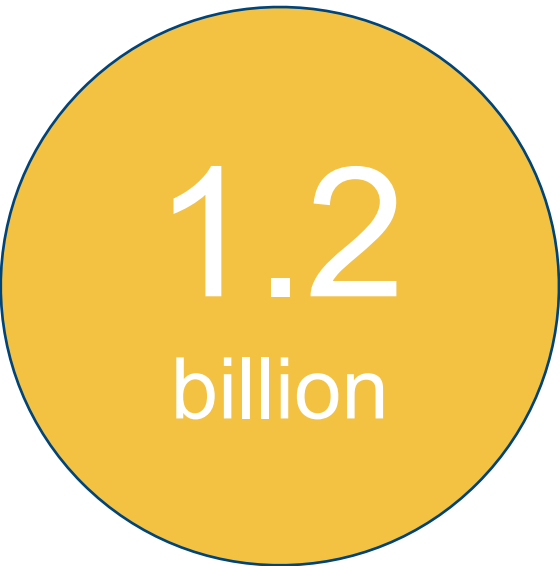# EU-Africa: Energy & Digital & Climate

SDG 7.1 calls for universal access to …. energy by 2030
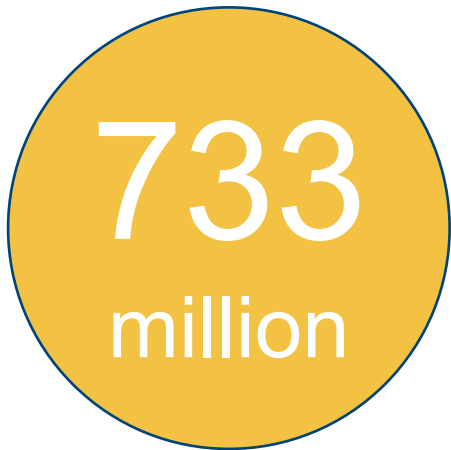
SDG 9c calls for universal, affordable internet access by 2020
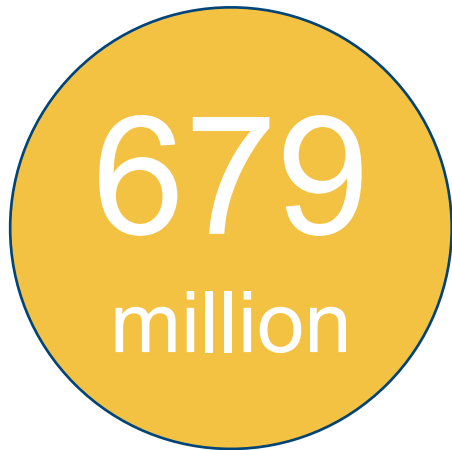
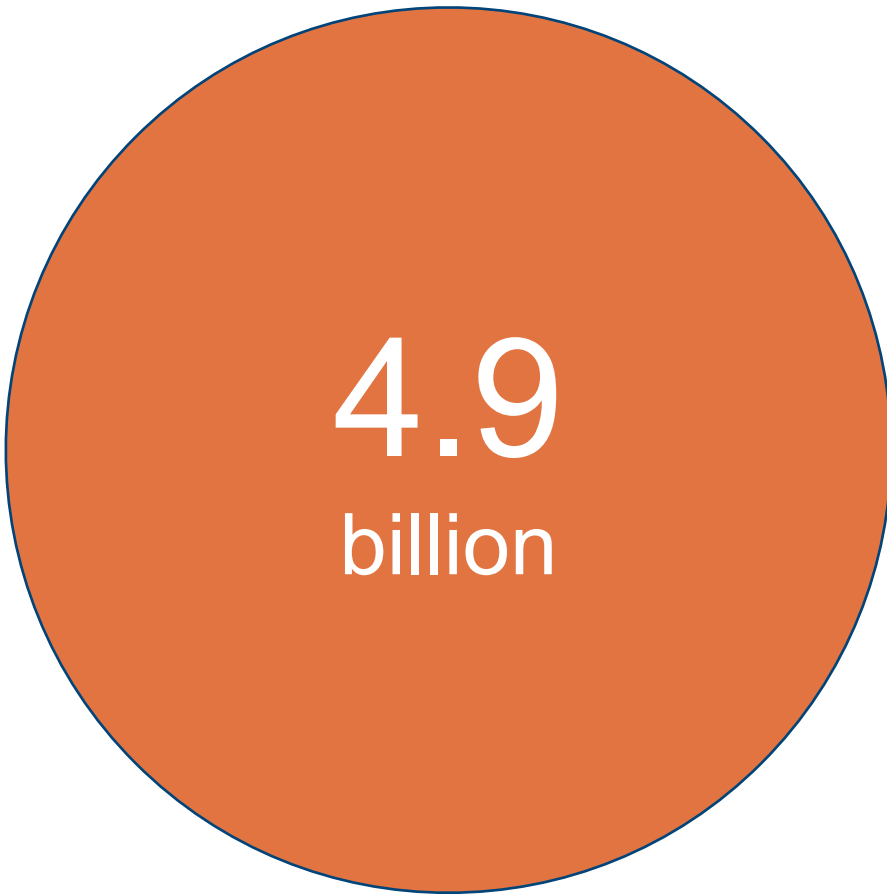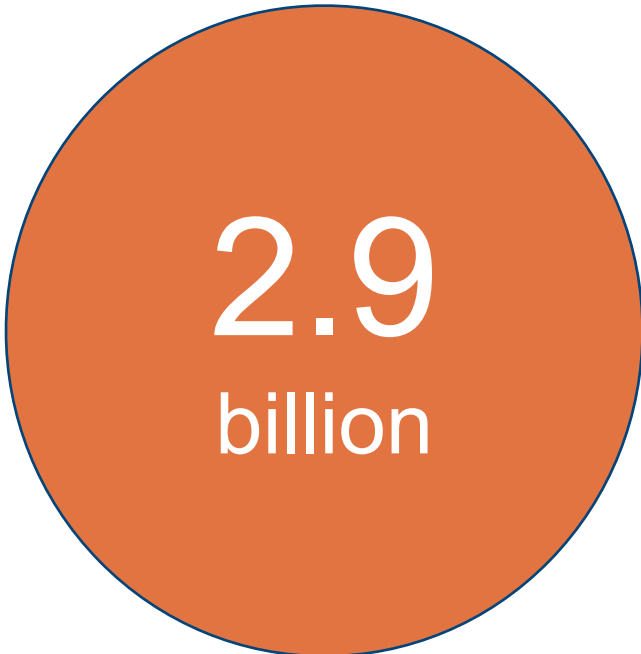**People without electricity**

People not using Internet

1.2 billion	733 million	679 million
2010	2020	2030 (trend)

[WorldBank 2021]
https://www.worldbank.org/en/news/press-release/2021/06/07/report-universal-access-to-sustainable-energy-will-remain-elusive-without-addressing-inequalities

4.9 billion	2.9 billion	0 billion
2010	2021 96% in dev countries	2030 (hope)

WSIS Forum 2022

[ITU 2010, 2021]
https://www.itu.int/hub/2021/11/facts-and-figures-2021-2-9-billion-people-still-offline/
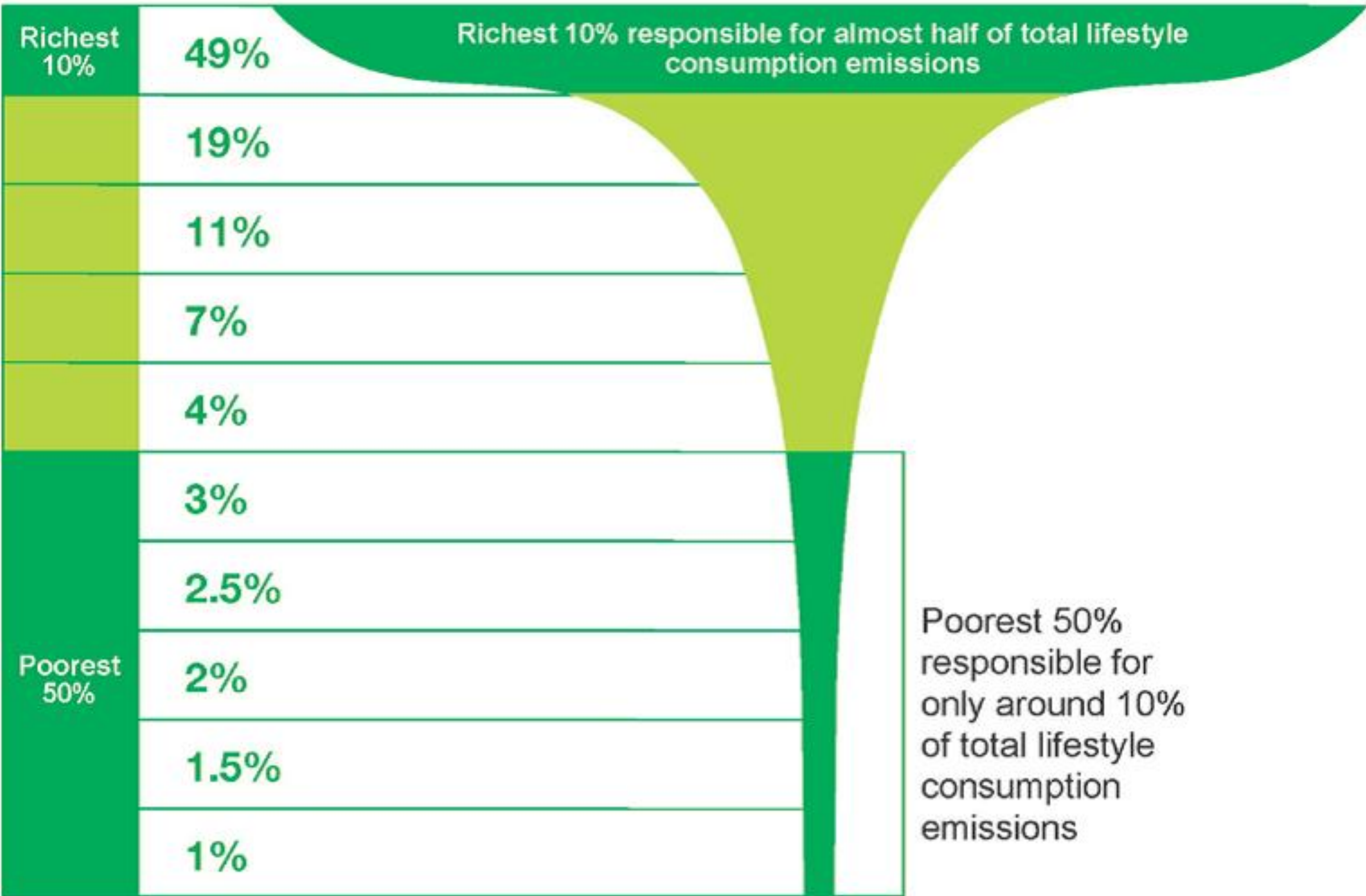
Inequality in Energy & Digital Access

7 AFFORDABLE AND CLEAN ENERGY

Percentage of CO₂ emissions by world population

World population arranged by income (deciles)

Richest 10%
49%	Richest 10% responsible for almost half of total lifestyle consumption emissions
19%	
11%	
7%	
4%	
3%	
2.5%	
2%	Poorest 50% responsible for only around 10% of total lifestyle consumption emissions
1.5%	
1%	

Poorest 50%

[Source: Oxfam.org, 2015]

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

9%

NATIONAL ASSESSMENT FOR MEANINGFUL CONNECTIVITY
(2021, BASED ON PILLARS' AVERAGE)

3%
ESTIMATED TO HAVE 4G SPEEDS

15%
ESTIMATED TO OWN A SMARTPHONE

7%
ESTIMATED WITH UNLIMITED ACCESS

10%
ESTIMATED TO HAVE DAILY INTERNET USE

[https://webfoundation.org/docs/2022/02/MC_Rwanda_FS_Screen_V1.pdf]