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NURTURE Seminar, 16-17Sep2024, Hawassa

Connecting the Future for Schools and Community learning & Living Labs

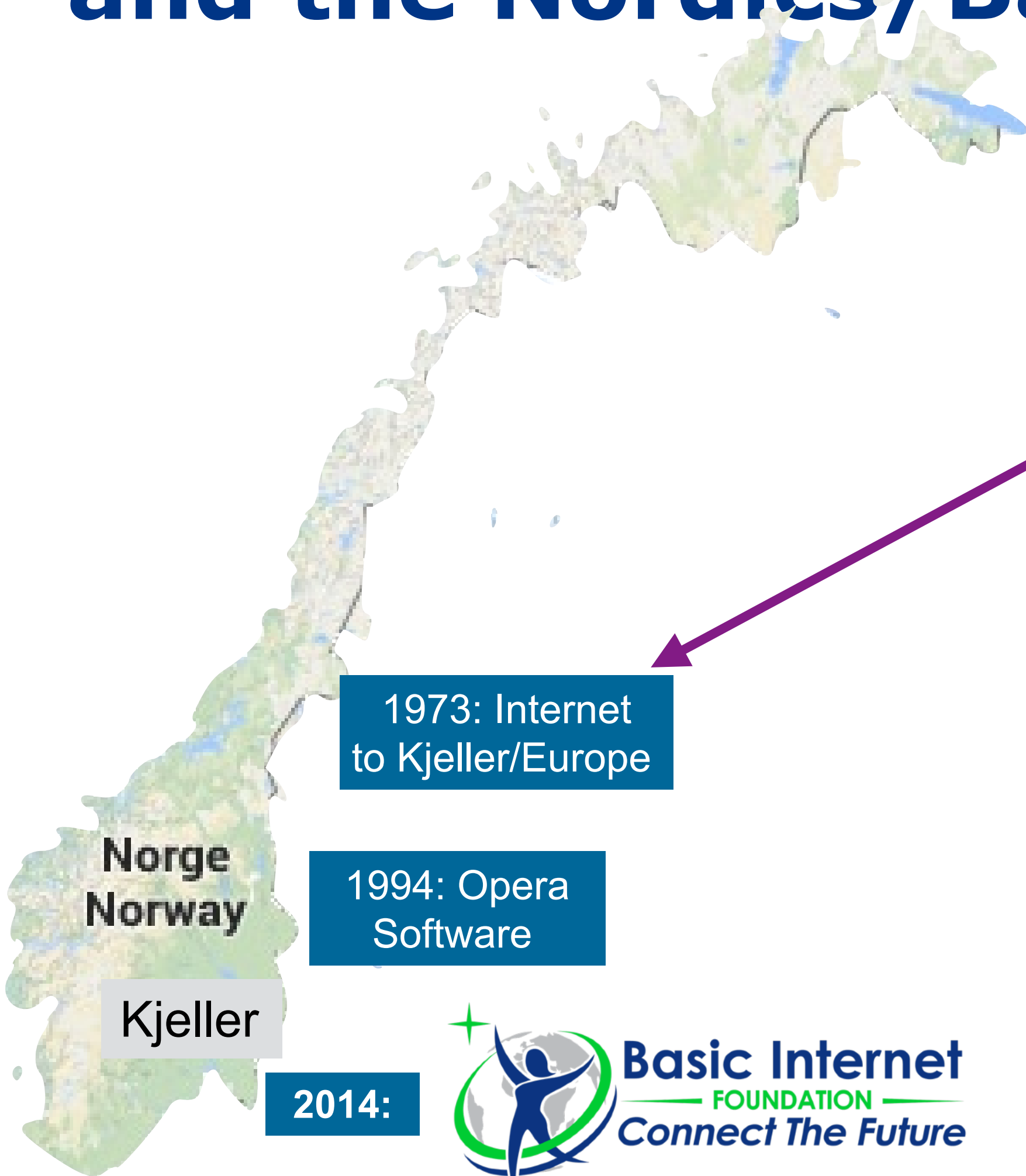
Josef Noll^{1,2}, Catherine R. Kimambo^{2,3}, Sudhir Dixit²,
Wisam A. Mansour², Jonathan Muringani^{1,2}

¹University of Oslo, Department of Technology Systems

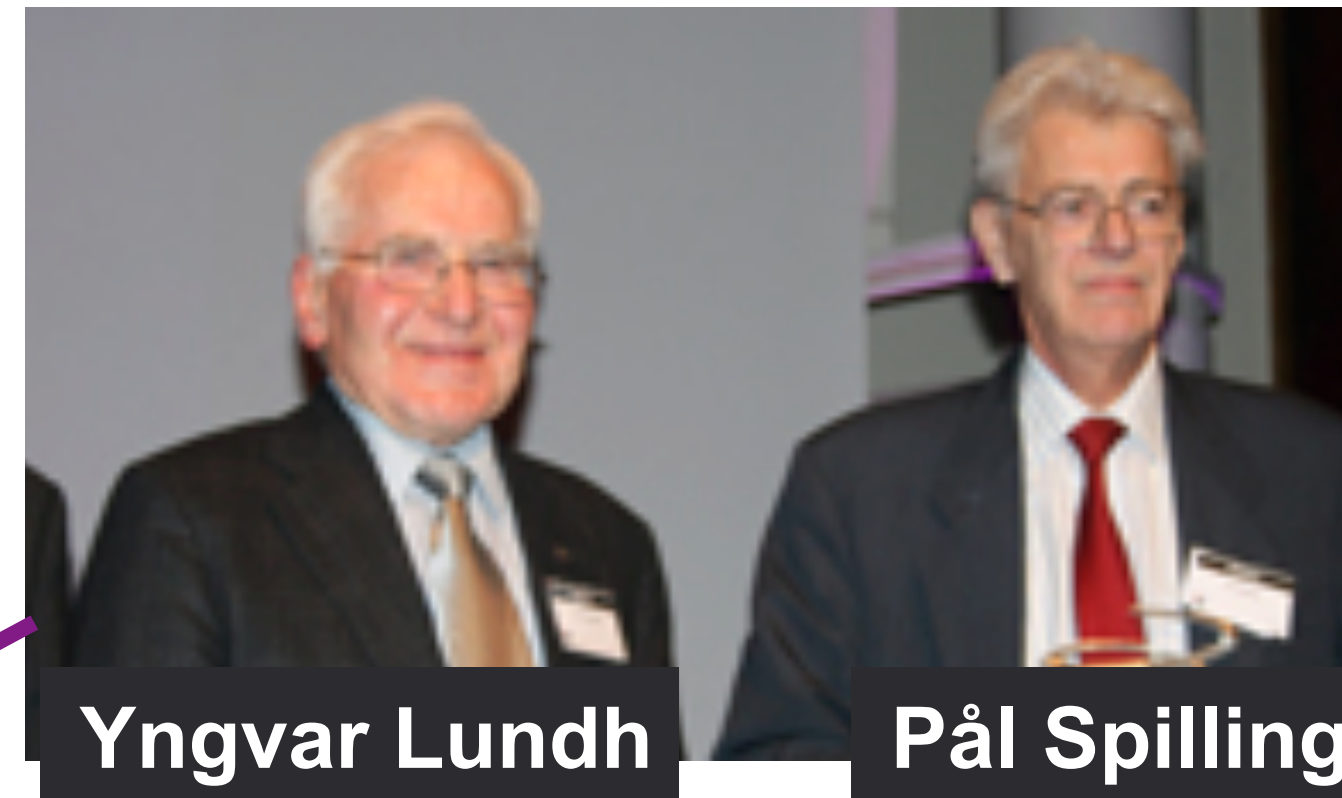
²Basic Internet Foundation, ³African Child Projects

Kjeller, Norway, m: +47 9083 8066, e:
info@basicinternet.org

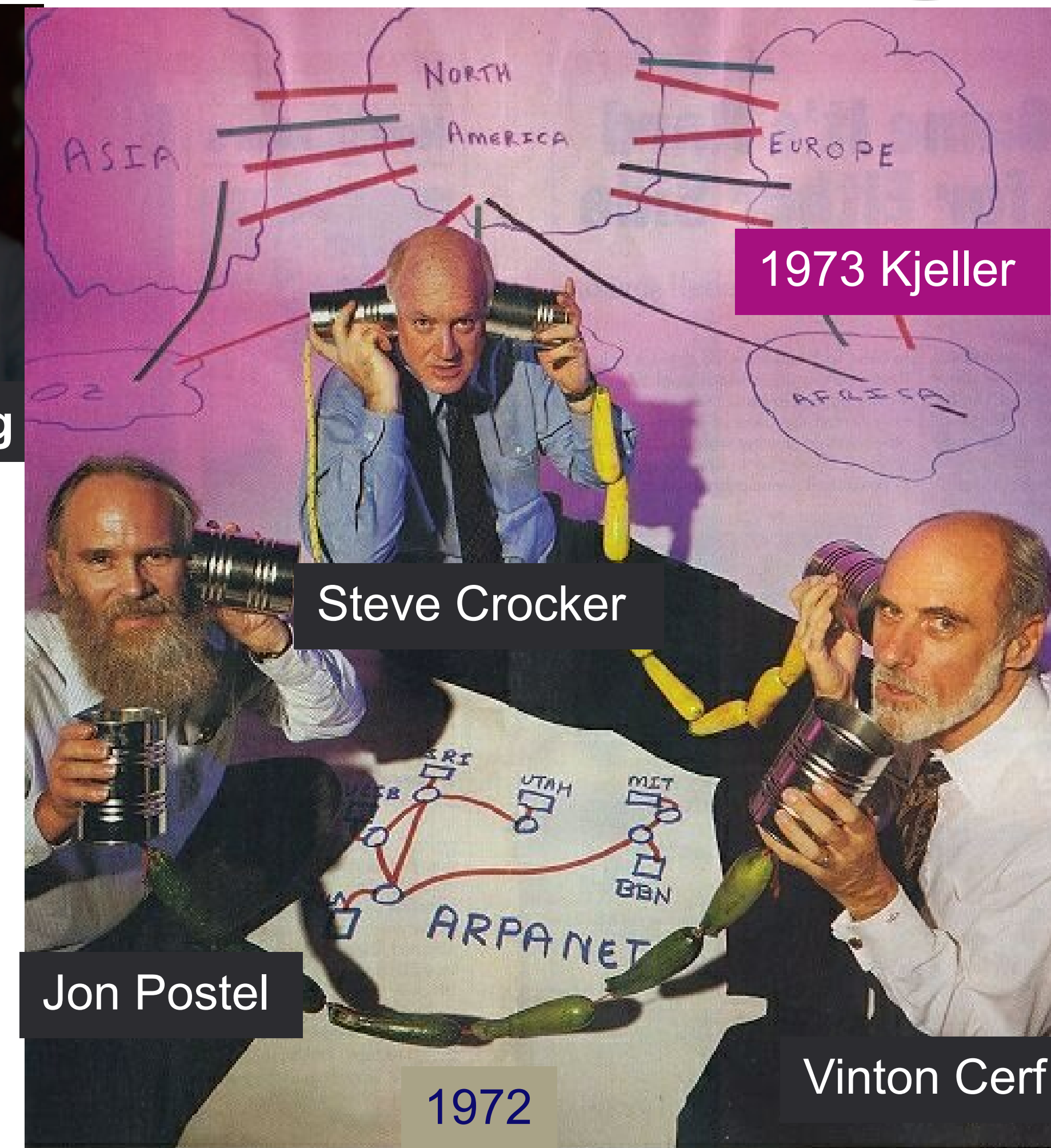
Inclusive digitalisation in Norway and the Nordics/Baltics (N8)



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.php, OpenSource, Linux, Skype, Spotify
Opera Software, FAST search
Nokia, Ericsson
GSM
GovStack.global, X-Roads



Source: <http://www.michaelkaul.de/History/history.htm>

Sustainable Empowerment - what are the catalysts for the SDGs?



SDG 1.4 Equal access to basic services

SDG 4.A Education facilities for effective learning for all

SDG 5.B Use of enabling technologies

SDG 9.C universal and affordable access

SDG 16.10 ensure public access to information

SDG 17 Partnerships for the Goals

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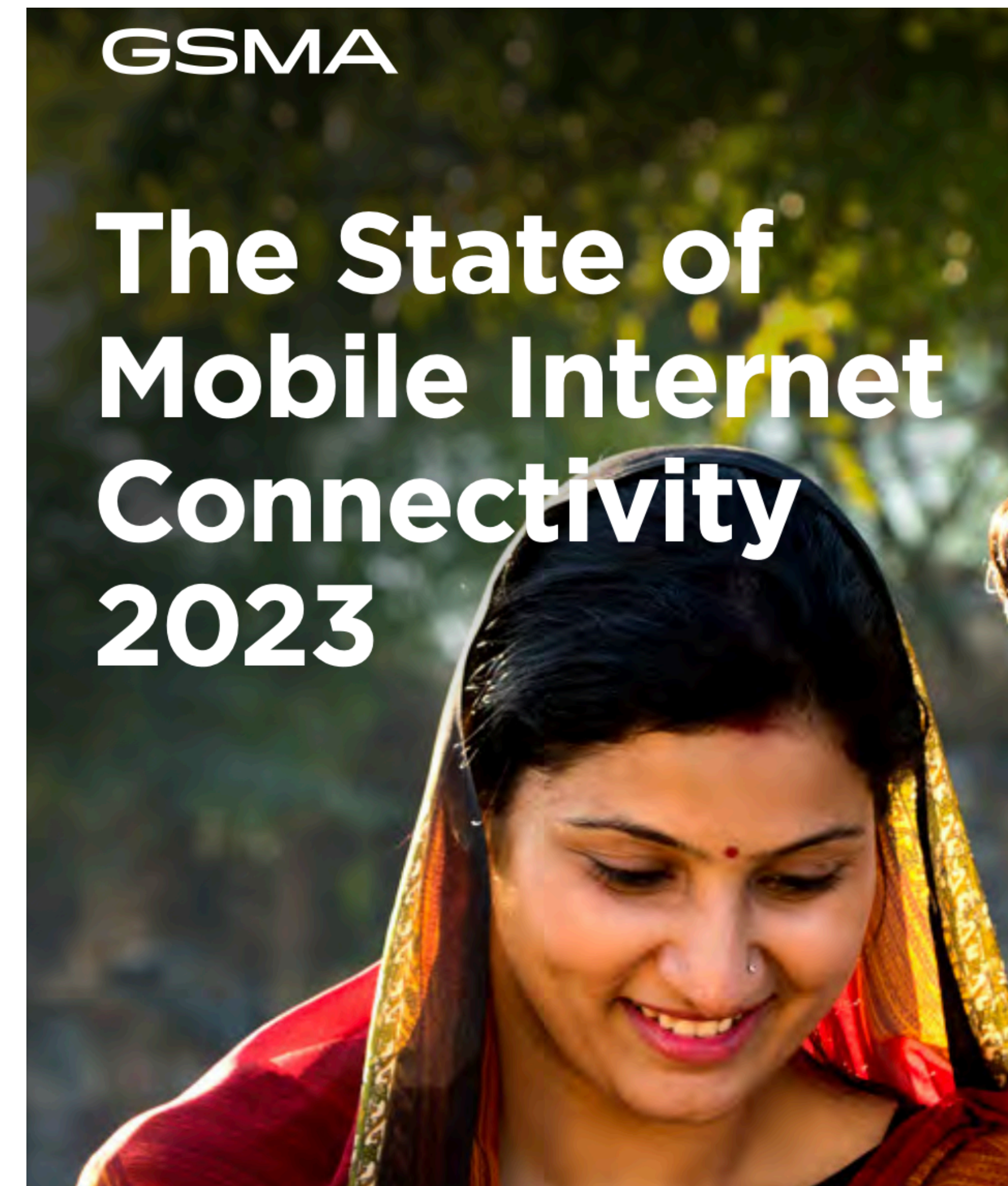


9.c

Significantly **increase access to information** and communications technology and strive to **provide universal and affordable access** to the **Internet** in least developed countries **by 2020**



- **57%** of the global population (4.6 billion people) using mobile internet
 - 30% decline in new mobile broadband (200 million new users in 2023)
 - **95% of unconnected** people in LDCs
- Adults in **rural 29% less likely** to use mobile Internet (compared to urban)
- Gender Gap: **Women 19%** less likely
- 41% South Asia, 36% in SSA



Digital Inclusion?

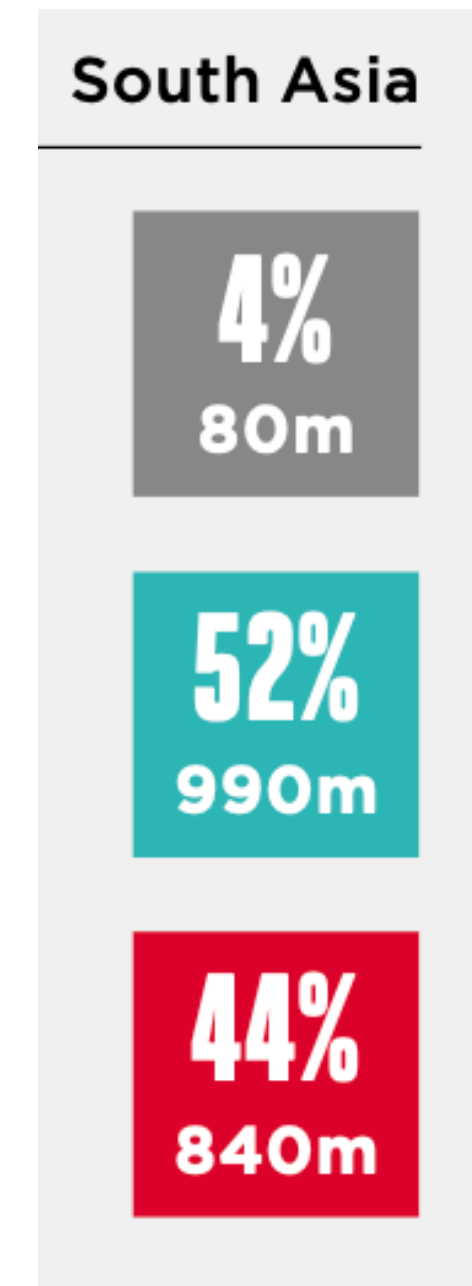
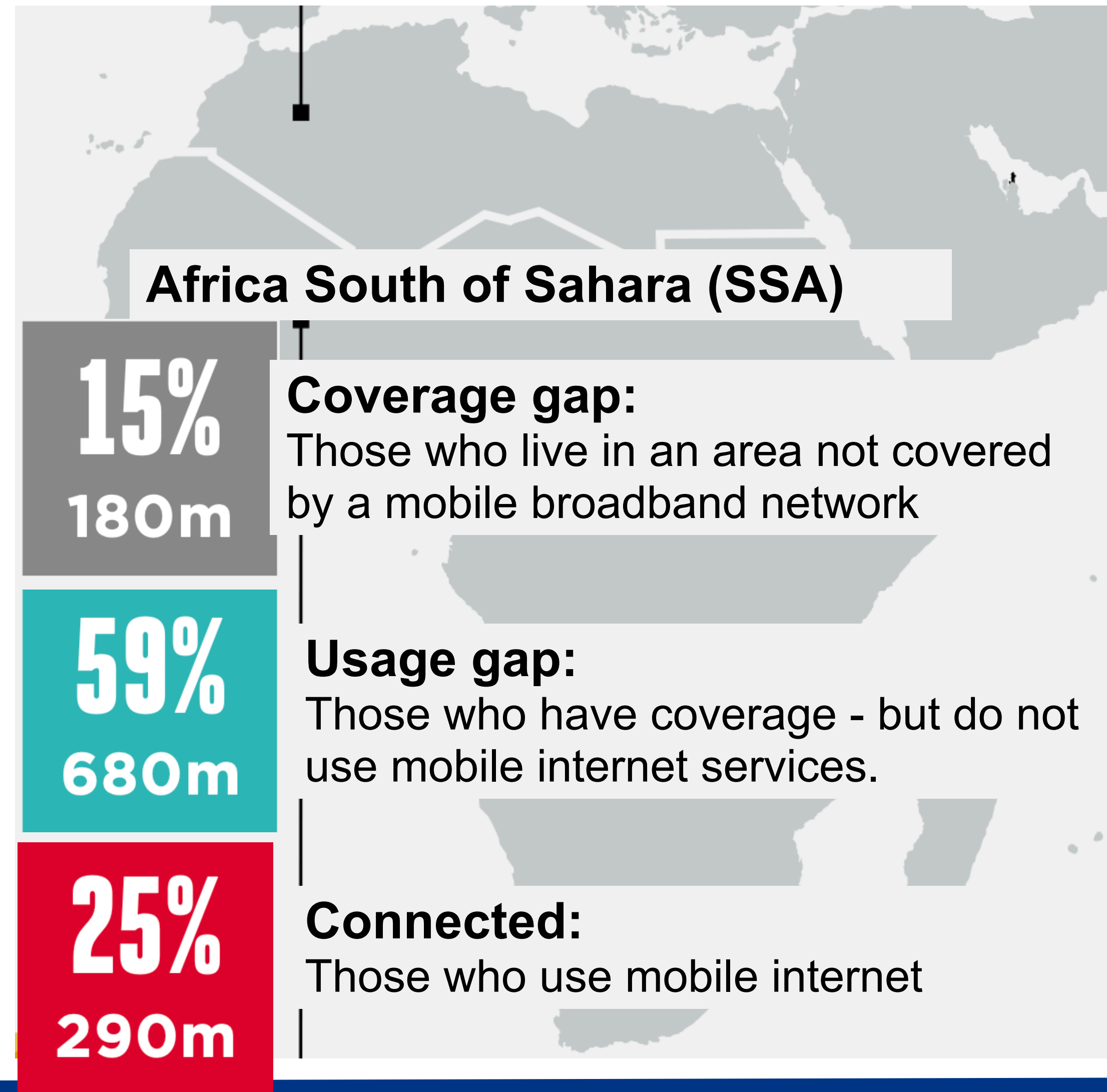


SSA:
75% not using mobile internet

SSA:
49% rural / urban gap

People in rural are more likely to have **reduced** their mobile **internet use**

Women
900 million don't use **mobile internet** (2/3 living in SSA or South Asia)



[Source: GSMA 2024]

Let's trigger our discussion

→ Please fill in:

<http://EGM.BasicInternet.org>



Drivers for Mobile Internet

Thanks for your help in addressing topics related to mobile Internet access. Your input is used as a basis for an academic study to identify evidence and gaps between mobile internet uptake and the impact on people, businesses, community, and society. For more information, please scroll down to the bottom of this page

Note: all answers are handled anonymously, thus we don't identify you. Your input is used to quality control our assumptions in the study.

josefnoll@gmail.com [Switch accounts](#)



✉ Not shared

your country (TZ, KE, UK... or spell out: Tanzania)

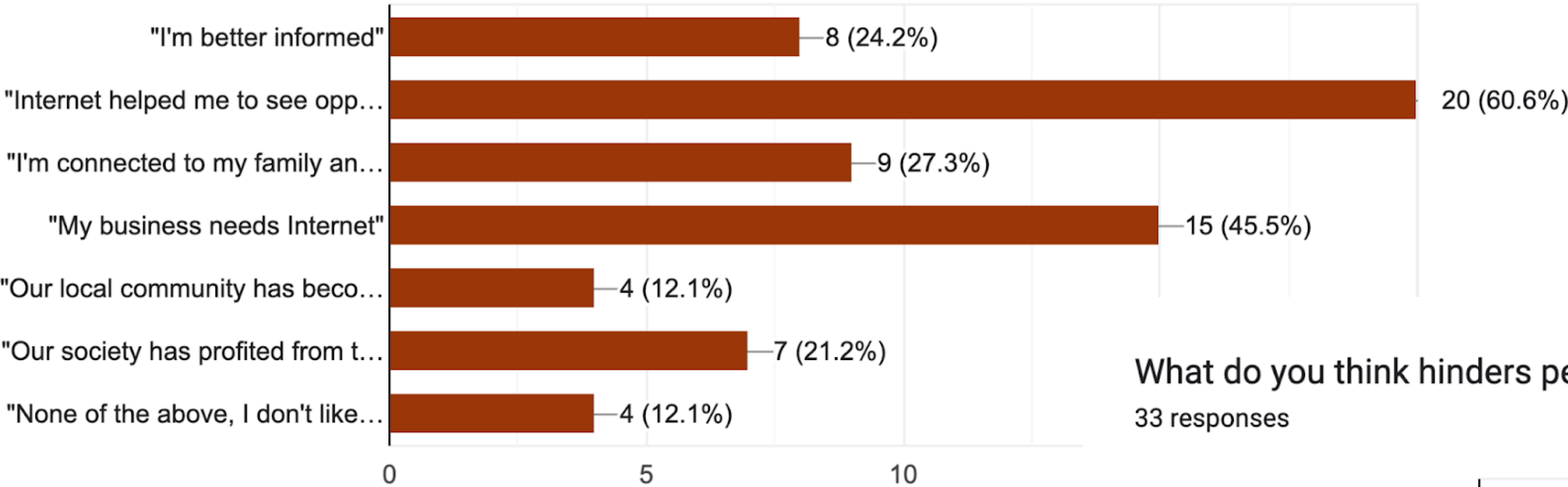
Your answer



Evidence - Gap Map (EGM) Mobile Internet Drivers & hinders

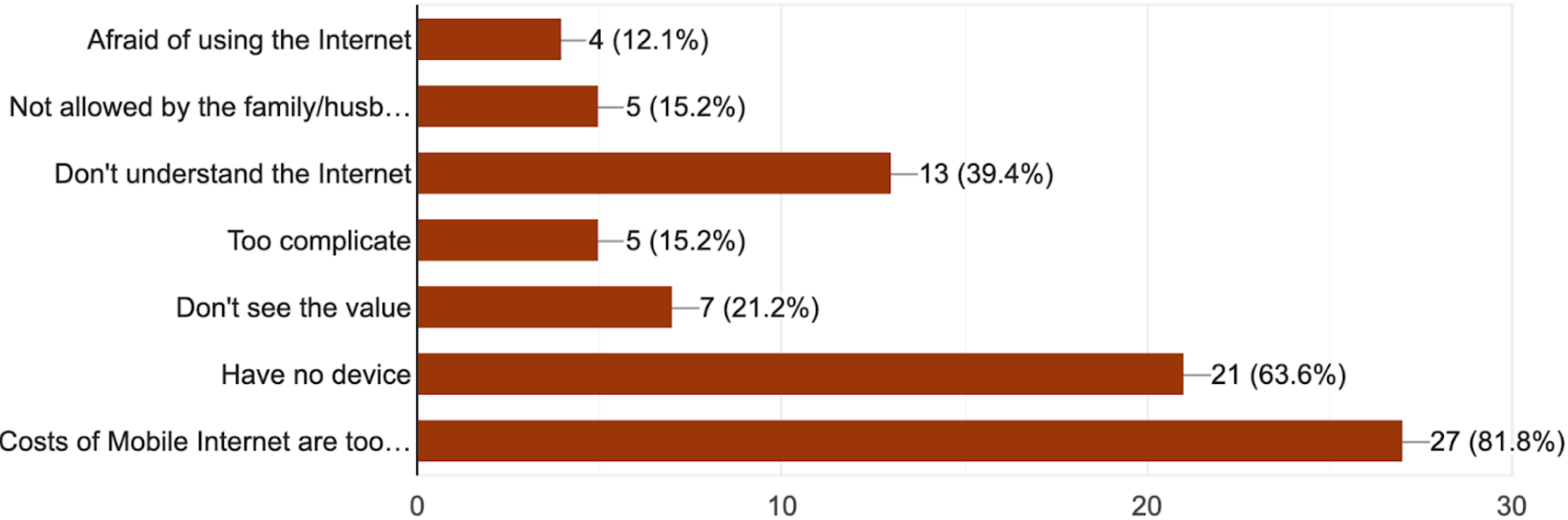
Out of the following statements, which fits for you?

33 responses



What do you think hinders people buying mobile internet? (max 3 answers)

33 responses



Drivers for Mobile Internet

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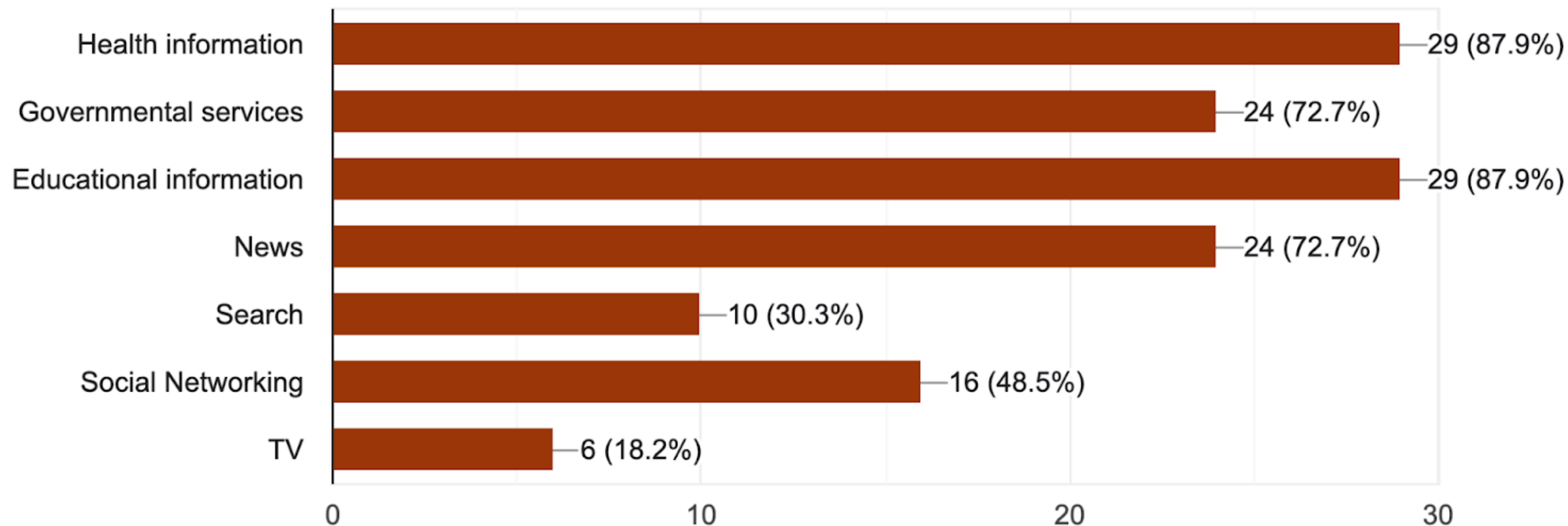
Note: all answers are handled anonymously, thus we don't identify you. Your input is used to quality control our assumptions in the study.

Expectations towards access

Digital Public Infrastructure (DPI)

Which services should be available for everyone?

33 responses



“Internet had the ability to dismantle the divide.
Internet failed miserably, the divide is bigger than ever.”
Kate Gilmore, Human Rights, UNOG, 2017



Titan.uio.no
Forskningsnyheter om realfag og teknologi



Digitaliseringsminister Nikolai Astrup (H) og direktør Jenny K. Lindqvist i Ericsson under en pressekonferanse om 5G-teknologi i Telias lokaler i Nydalen i Oslo i oktober 2019. Foto: Håkon

**–5G-nettet er til fordel for teleoperatørene,
ikke forbrukerne**

29Apr2020

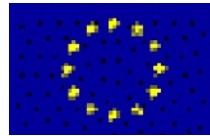


[https://
basicinternet
.org/5g-is-
for-the-
benefit-of-
telecomm-
operators-
not-us-as-
consumers/](https://basicinternet.org/5g-is-for-the-benefit-of-telecomm-operators-not-us-as-consumers/)

The Business Model

Mobile Internet in SSA

→ Western World

- fixed & mobile & work - about 100-200 USD/family
-  17.000 base stations,  EU: 421.000 towers [Statista]

→ Example: Tanzania

- large distances (3 x size of Norway)
 - expensive access
 - negligible fixed broadband
- ability to pay: 10-20 USD/family

→ Europe vs Africa

- 6.8% vs 20% of land area
- 746 million vs 1.3 billion (2018)
- 112 vs 43 people/km² [Worldbank, Statista]

“RoI in Africa is 3% of
RoI in Europe”



https://event.tu.no/filer/insidekonf_v_2019/Eivind_Mikkelsen_Trenger_Norge_100.000_basestasjoner.pdf

“Universities have a vital role in shaping the future of the society” (Session 369)

How can we “Connect The Future”? and what are the roles of the Universities

“Connect the Unconnected
- how can we achieve it?”
Prof Josef Noll, University of Oslo, 2023



Doreen Bogdan-Martin,
Secretary-General ITU

What if ...

We revisit access

We decentralise the Internet

We use Universities to connect

Revisit Access

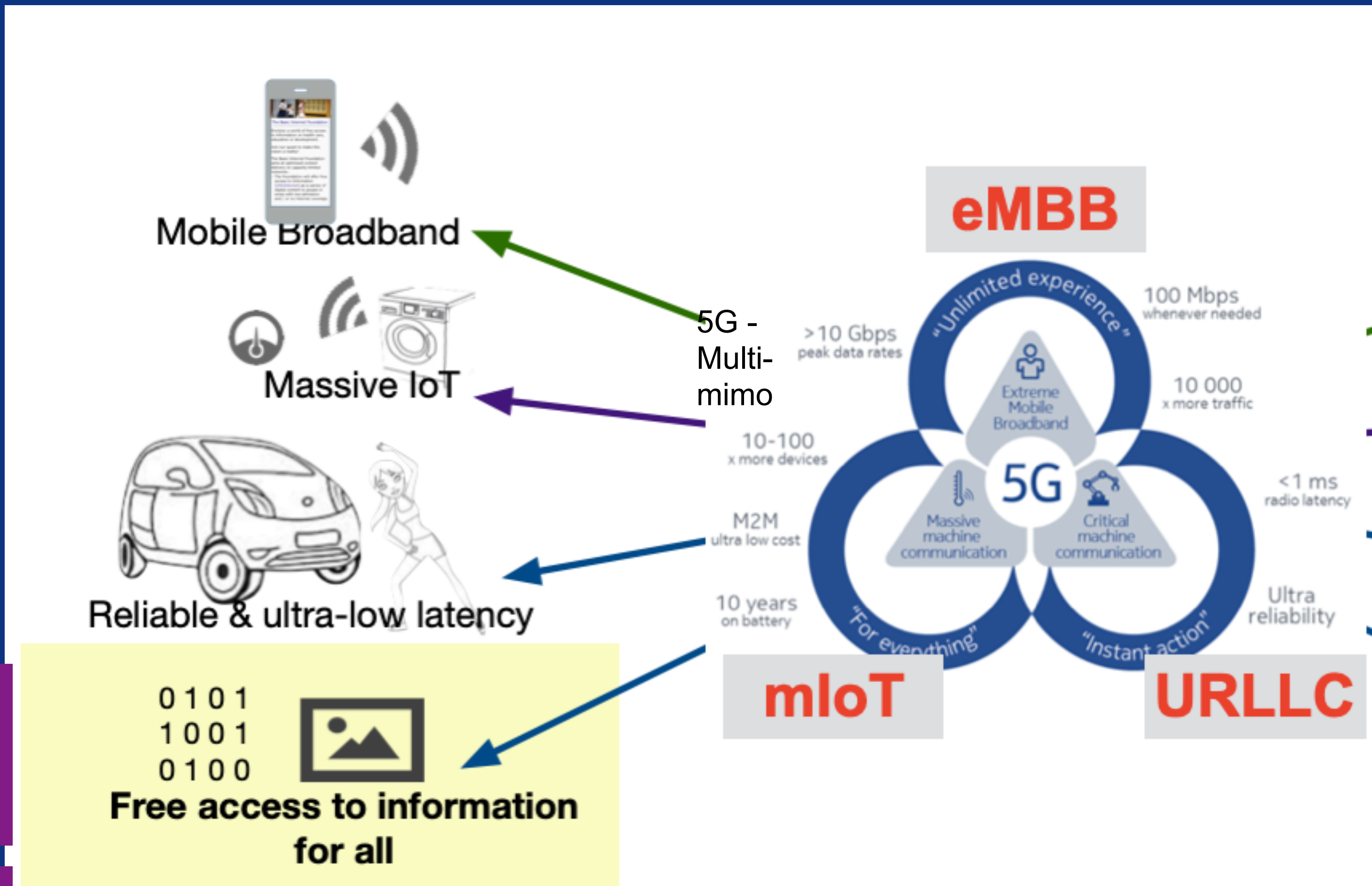
5G lacks digital inclusion

Road model:
pedestrians & cyclists

Digital pedestrians, digital
cyclists vs digital cars
(broadband)

Internet Lite
as a Digital Public Infrastructure (DPI)

& 6G large cells



Digital Public Infrastructure (DPI)

Step 1:



[Source: <https://www.gatesfoundation.org/ideas/digital-public-infrastructure>]

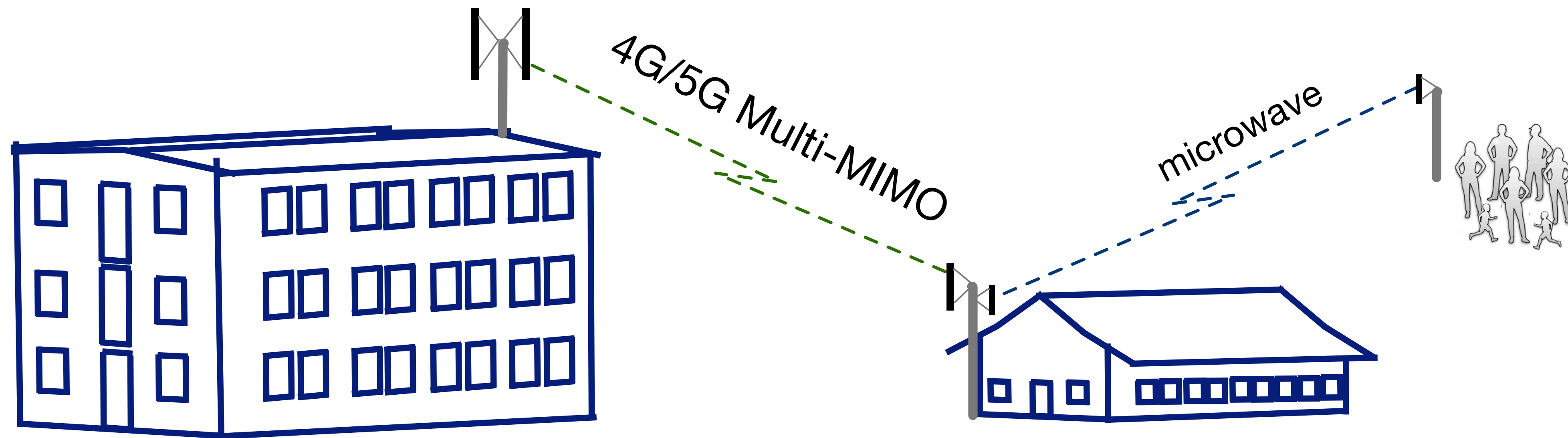
Step 2:





Instantiation of Digital Public Infrastructure

- build: Regional Competence Centres (RCCs)
- connect: Schools & Communities (CL3)
- provide: Non-profitable content



InfoSpots for **CL3**
Community
Learning &
Living
Labs



National Research & Education Networks (NRENs)

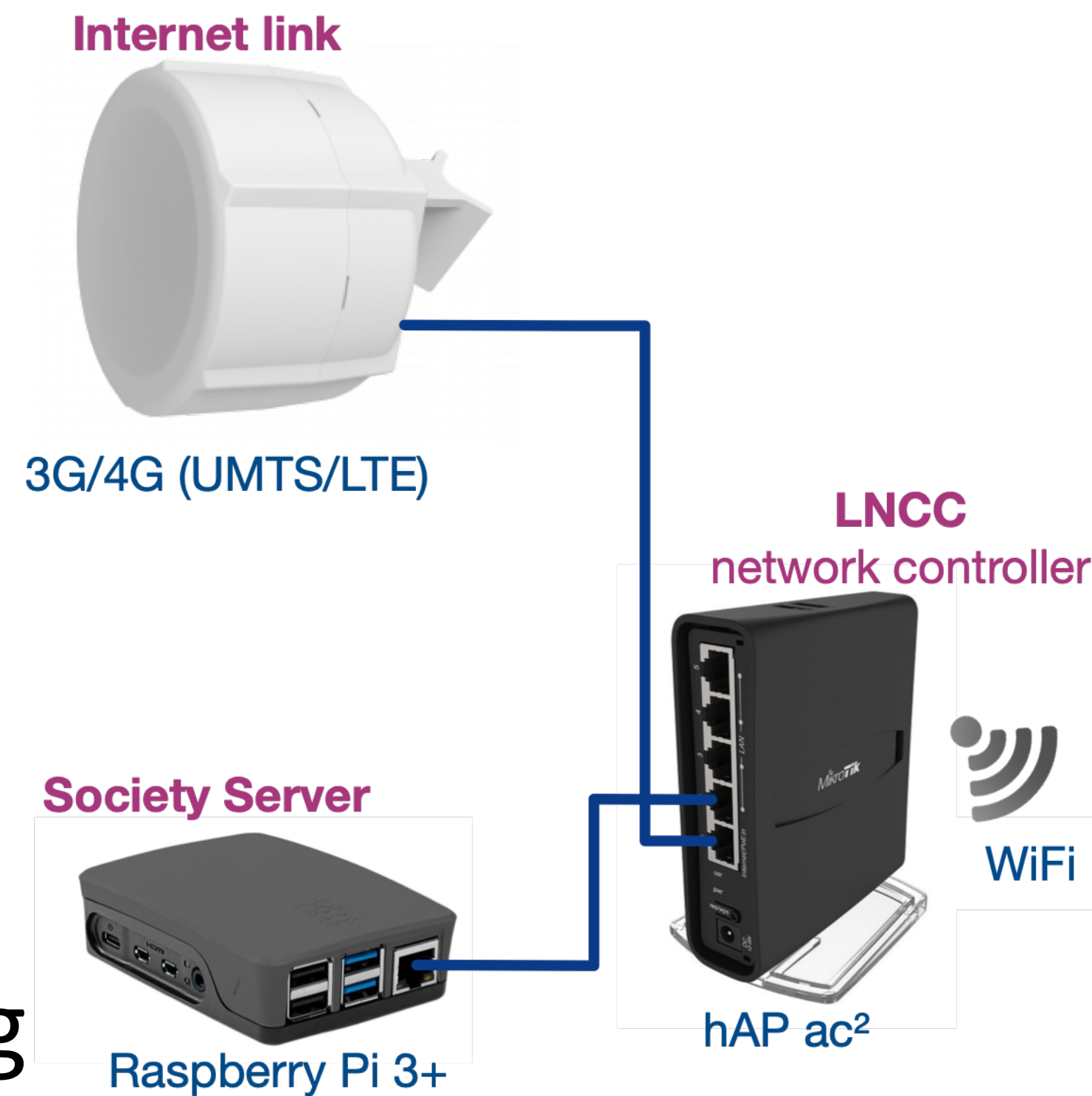
Step 1: Configure & Connect



Rural Internet Access: The InfoSpot



- Reaching out 20+ km to mobile network
- Affordable solution
 - OPEX <20 USD/month
 - CAPEX
 - 420 USD equipment
 - 1200 USD install & training



Regional Competence Centres (RCC)

→ University Collaboration for Connectivity & Digital Transformation







Step 2: Create Content & Involve the users



Digital Health Promotion



Scene from Antimicrobial resistance (AMR) animation



foster Digital Health
Education
DigitalGlobalHealth.eu



UiO : Global Health
DigitalGlobalHealth.no



2) Providing the information through animations

Snapshots from platform, HIV and Cysticercosis animations

[Mwanzo](#)
[Afya](#)
[Kuhusu](#)
[Wasiliana nasi](#)
[Repoti](#)
[Videos](#)

 English
 [Login](#)



Kisababishi ya Tegu



Mnyoo bapa aitwae *Taenia solium*, husababisha binadamu kuugua vibaya sana. Binadamu hupata minyoo hao kwa kula nyama ya nguruwe mbichi au isiyoiva vizuri, yenye malengenge ya minyoo (cysts). Ndani ya utumbo wa binadamu, malengenge hayo hutoka katika nyama na kujishikiza kwenye ukuta wa utumbo na kufanyika minyoo ambao hukua na kutaga mayai.

Dodoso ya Tegu

Tafadhali jaza utafiti kuhusu Tegu

Jinsia yako ni ipi?

☐ A) Me

☐ B) Ke

Je, umewahi kusikia kuhusu minyoo aina ya tegu?

☐ A) Ndio

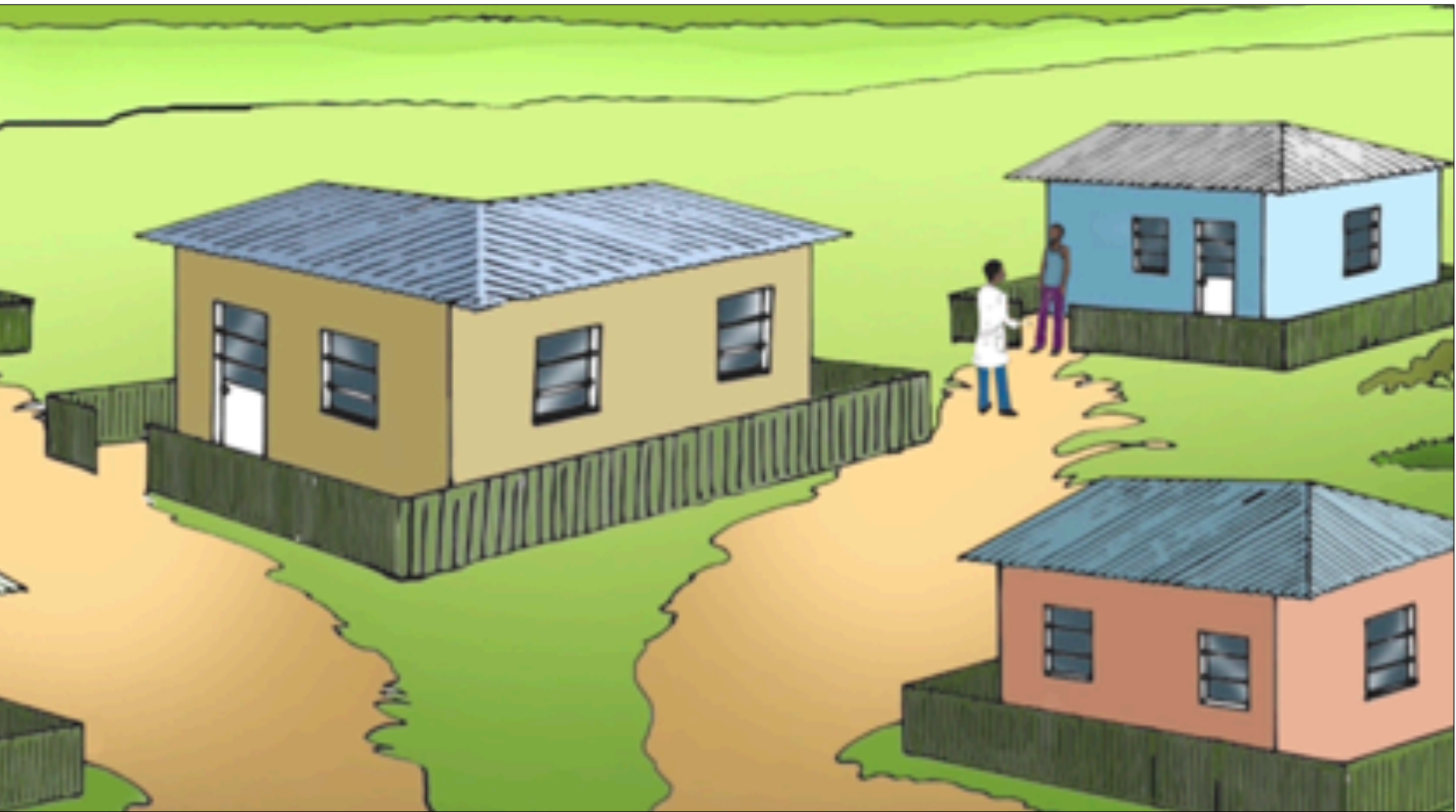
☐ B) Hapana

☐ C) Sijui

Je! Umewahi kusikia kuhusu minyoo ya tegu kwenye wanyama aina ya nguruwe?

☐ A) Ndiyo

☐ B) Hapana



Results: **Knowledge increase** in
 Cysticercosis (TSCT) 60%
 Tuberculosis 30%
 HIV/AIDS 13%

[Source: Christine Holst, UiO (Nov2019)]

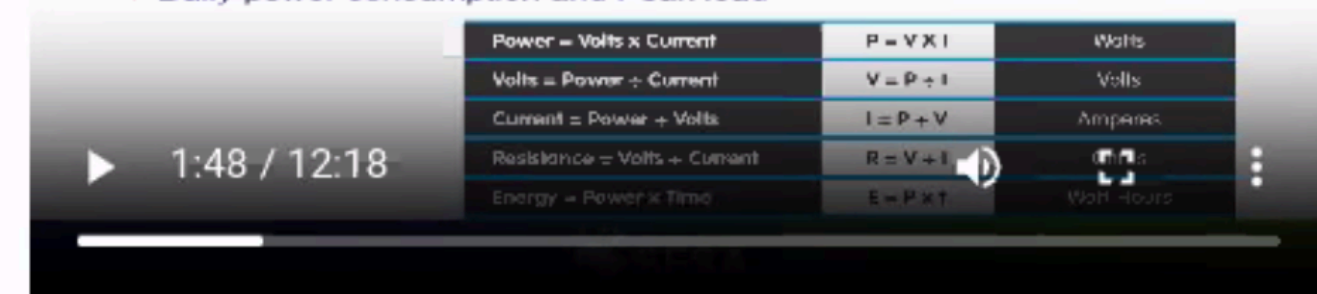
SESA – Smart Energy Solutions for Africa is a collaborative project between the European Union and nine African countries (Ghana, Kenya, Malawi, Morocco, Namibia, Nigeria, Rwanda, South Africa and Tanzania) that aims at providing energy access technologies and business models that are easily replicable and generate local opportunities for economic development and social cohesion in Africa.

EU project

sesa-euafrica.eu

Electricity Basics

- ★ Basic elements of electricity
 - Voltage, Current, Resistance, Power, AC and DC
 - Parallel and Series connection
- ★ Calculation
 - Ohm's Law
 - Power Law
- ★ Wattage and Watt hour
- ★ Daily power consumption and Peak load

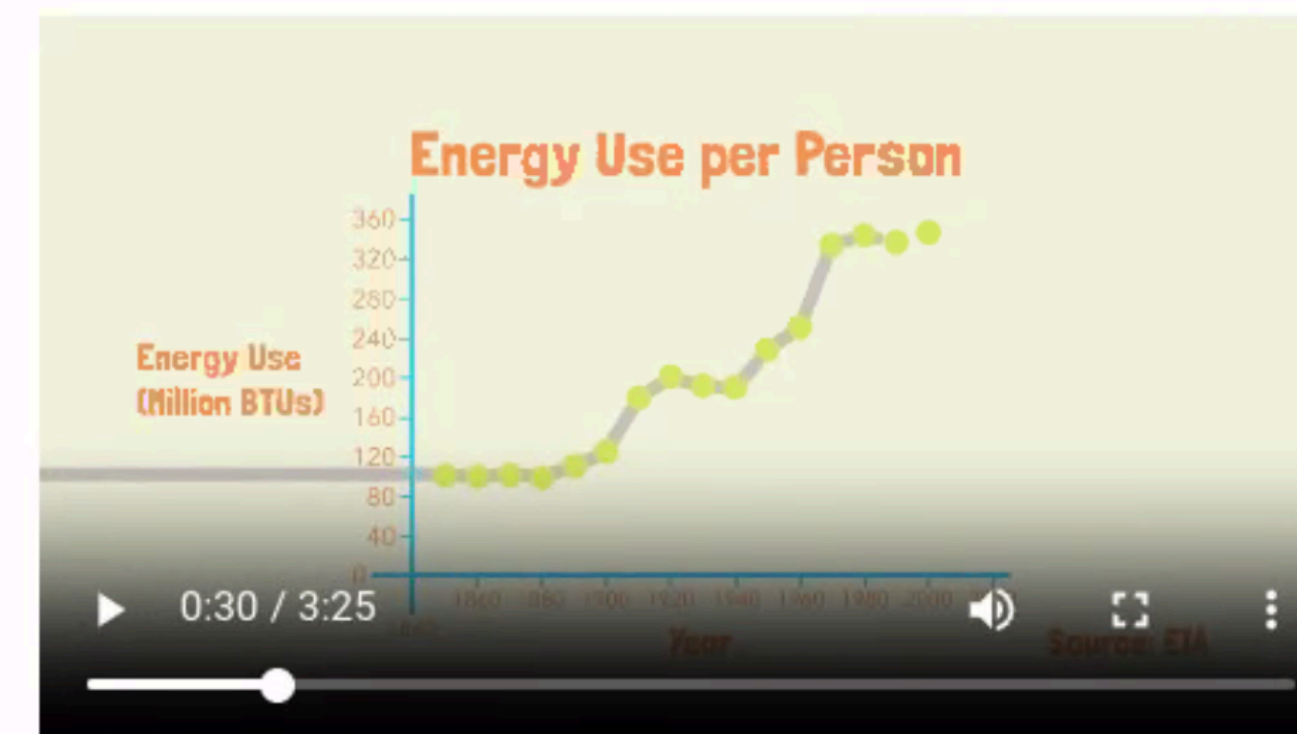


01-Basics of Solar Systems

To kick off this course, we start from the very basics. This video will provide you with a better understanding of how electricity is measured, an overview of the solar energy technologies existing, what to consider about sun power, the key component of a PV system (including batteries) to finally touch upon the pros and cons of solar PV technology.

See [the slides \(.pdf\)](#)

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Introduction

- Sizing is an art of determining solar PV systems components needed to run a certain load requirements



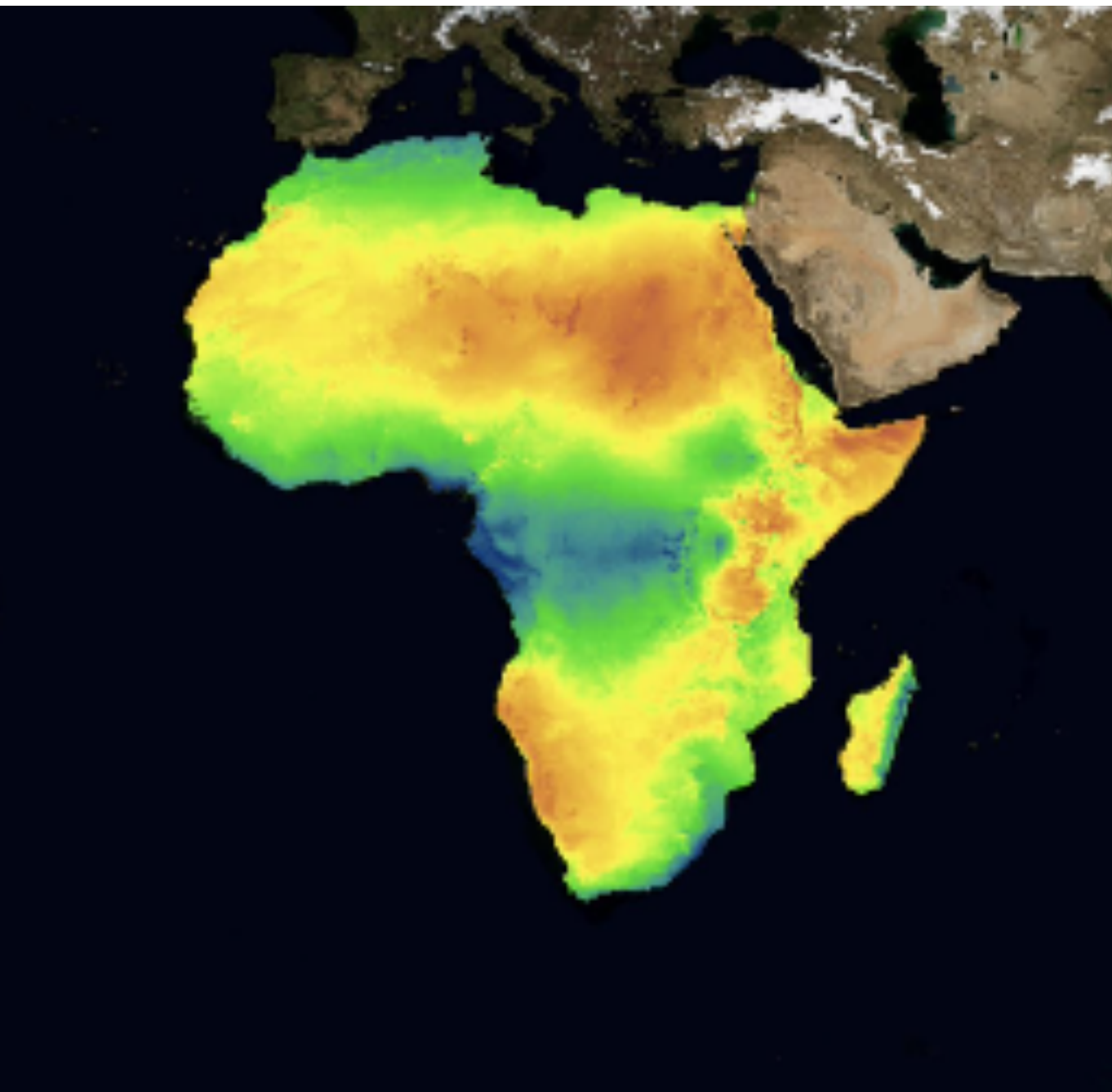
02-Sizing Solar PV Systems

How much power would you need for your site and what size of equipment (batteries, module/panel, charger controller, inverter) would you need for that? The answer is in the video.

ugh
ses.



Suitable Conditions, and Examples of Solar Power installations



Suitable conditions for Solar Power

Calculations of electricity needs

A house has the following electrical appliance usage:

- Two 15 W lamp used 5 hours per day.
- Two 40 W fan used for 4 hours per day.
- One 68 W 19-in TV used 5 hours per day
- One 17 W satellite used 5 hours per day.

→ Design a solar PV standalone system to meet the load requirement

Assumptions:

- Location: Kumasi, Ghana
- PV module specification: $P_m = 110 \text{ Wp}$; $V_m = 16.7 \text{ Vdc}$;
- $I_m = 6.6 \text{ A}$; $V_{oc} = 20.7 \text{ A}$; $I_{sc} = 7.5 \text{ A}$



[Source: toolbox.SESA-euafrica.eu]

From Energy Information to Energy Monitoring & Control



- Models for solar production forecast
- Weather forecast
- Energy Monitoring
- Empower through knowledge

Solar production forecast

⚡	Now estimated power producti...	8 157 W
⚡	This hour energy production	7,7 kWh
⚡	Next hour energy production	7,8 kWh
⚡	Remaining today energy prod...	24,5 kWh
⚡	Tomorrow estimated energy ...	14,0 kWh
🕒	Today Highest power p...	11 minutes ago

Sunny

Forecast Home ho...

12,6 °C

14,9 °C / 13,5 °C

13:00

13,5°

14:00

14,5°

15:00

14,9°

16:00

14,9°

17:00

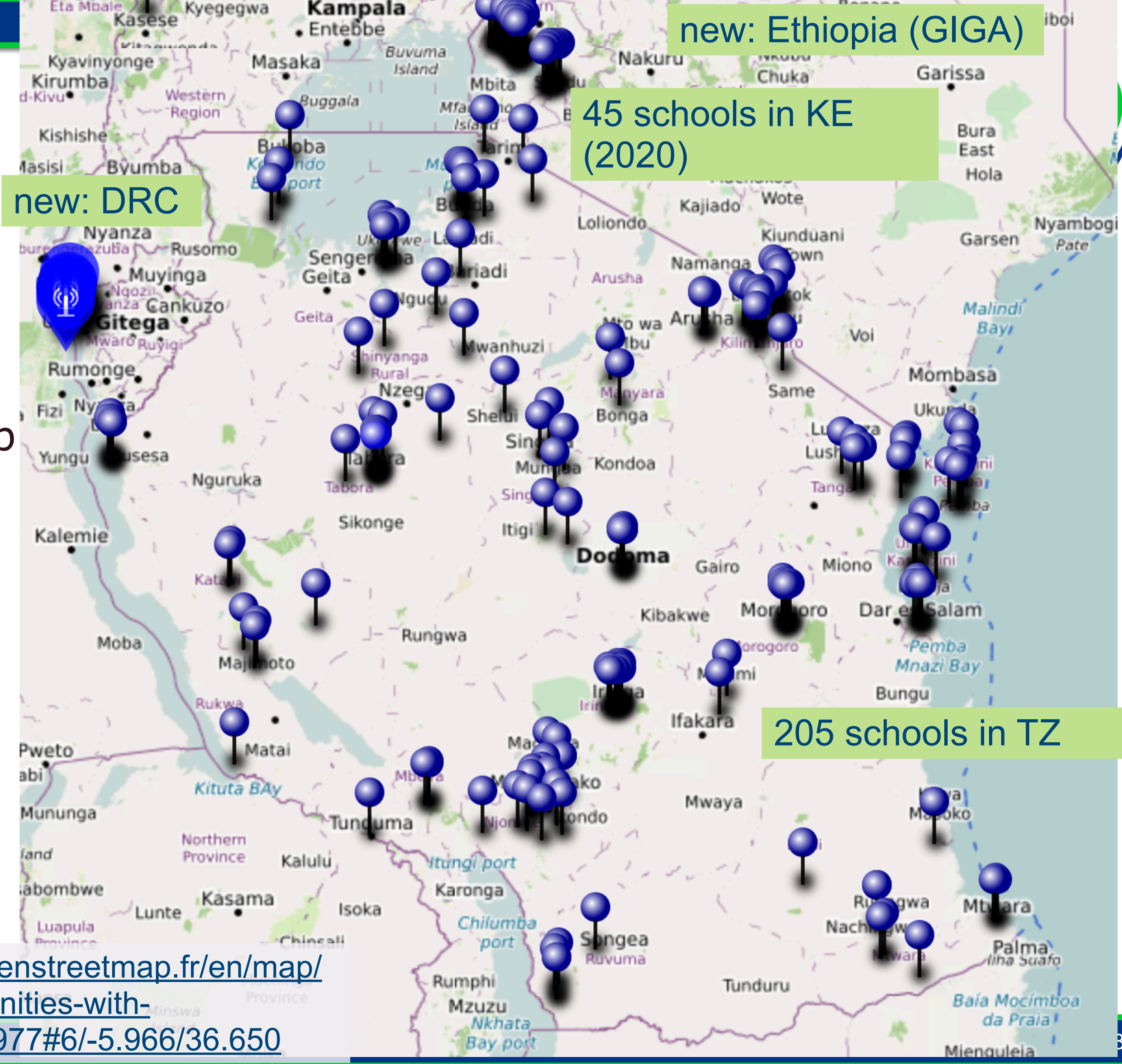
14,7°

⚡	energy today	20,9 kWh
⚡	lifetime energy	9 575,8 kWh
⚡	current power	7 104,9 W

6G societal vision

- Connectivity everywhere
 - ★ every school (GIGA)
 - ★ Community Learning & Living Lab (CL3)
- Affordable access
 - ★ "5 for 50" (5 Mbps for 50 kTZS = 20 USD)
- Digital Public Infrastructure (DPI)
- Join us: BasicInternet.org

https://umap.openstreetmap.fr/en/map/schools-communities-with-infospots_1011977#6/-5.966/36.650



Master with Purpose

by Ingvild Oftedal

“Stable Energy for Tumaini Open School”

with support from Ingeniører uten grenser (IUG, “Engineers without borders”), Traineeé, Basic Internet Foundation

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Master's Thesis

Distributed Photovoltaic Systems for Sustainable Rural Development

An Assessment Framework Illustrated with a Case Study of Tumaini Open School in Tanzania

Ingvild Oftedal

Renewable Energy Systems

60 ECTS Credits

Department of Technology Systems

Faculty of Mathematics and Natural Sciences



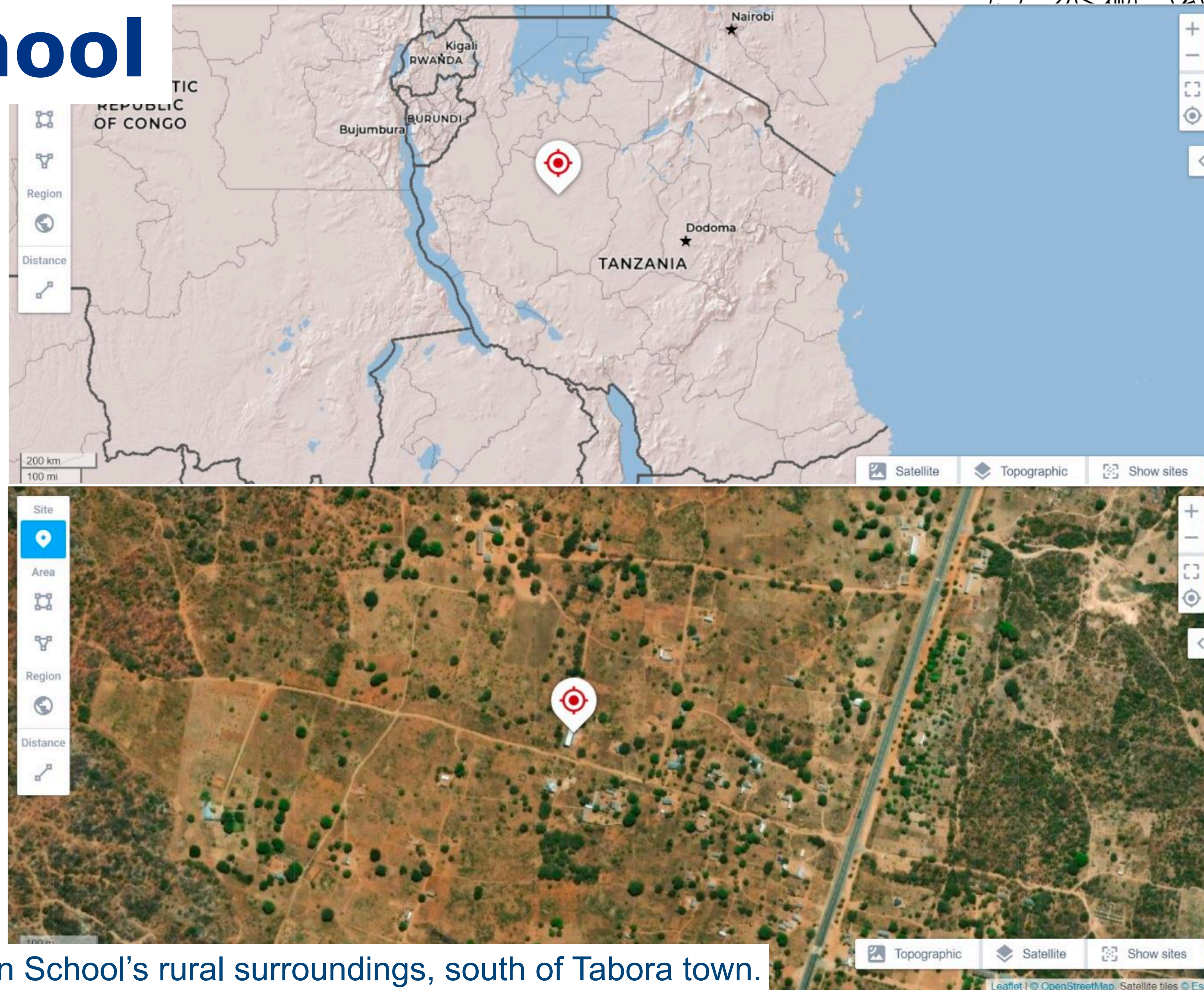
Tumani Open School

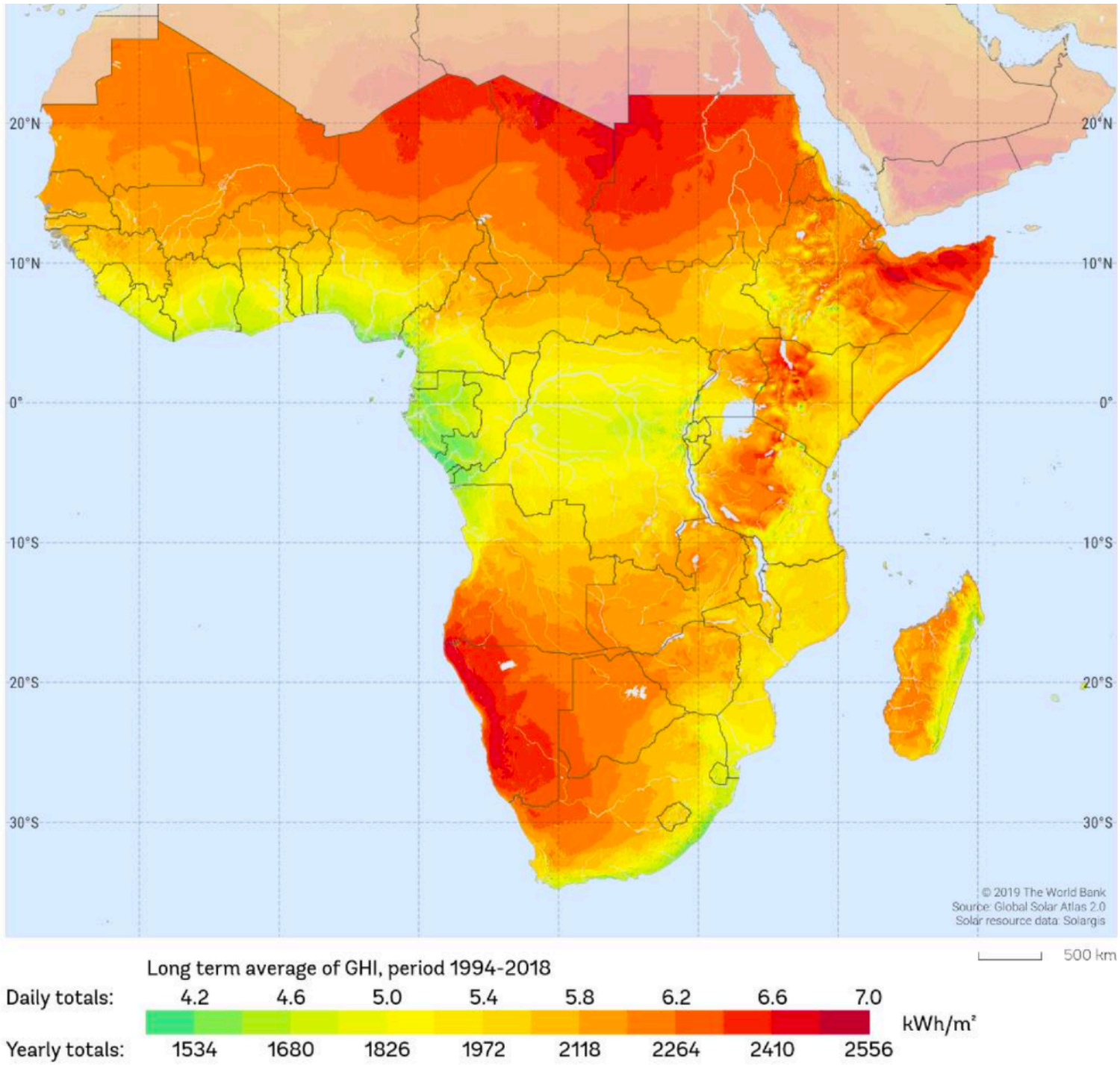
- School for teenage mothers
- unstable grid
 - chicken breeding <25% success
- Solar, Internet, Battery installation

Credit: Satellite

tiles © Esri, © OpenStreetMap contributors.

Tumaini Open School's rural surroundings, south of Tabora town.





Performing the work



Item	Qty	Total cost (USD)
PV module	6	1109
AGM battery	8	2134
Hybrid inverter	1	2179
Battery enclosure	1	333
Racking system	1	222
Installation accessories and materials	1	780
Labor charge	1	370
Grand total (Investment costs)		7127

The InfoSpot at Tumaini

Mounting the directive antenna



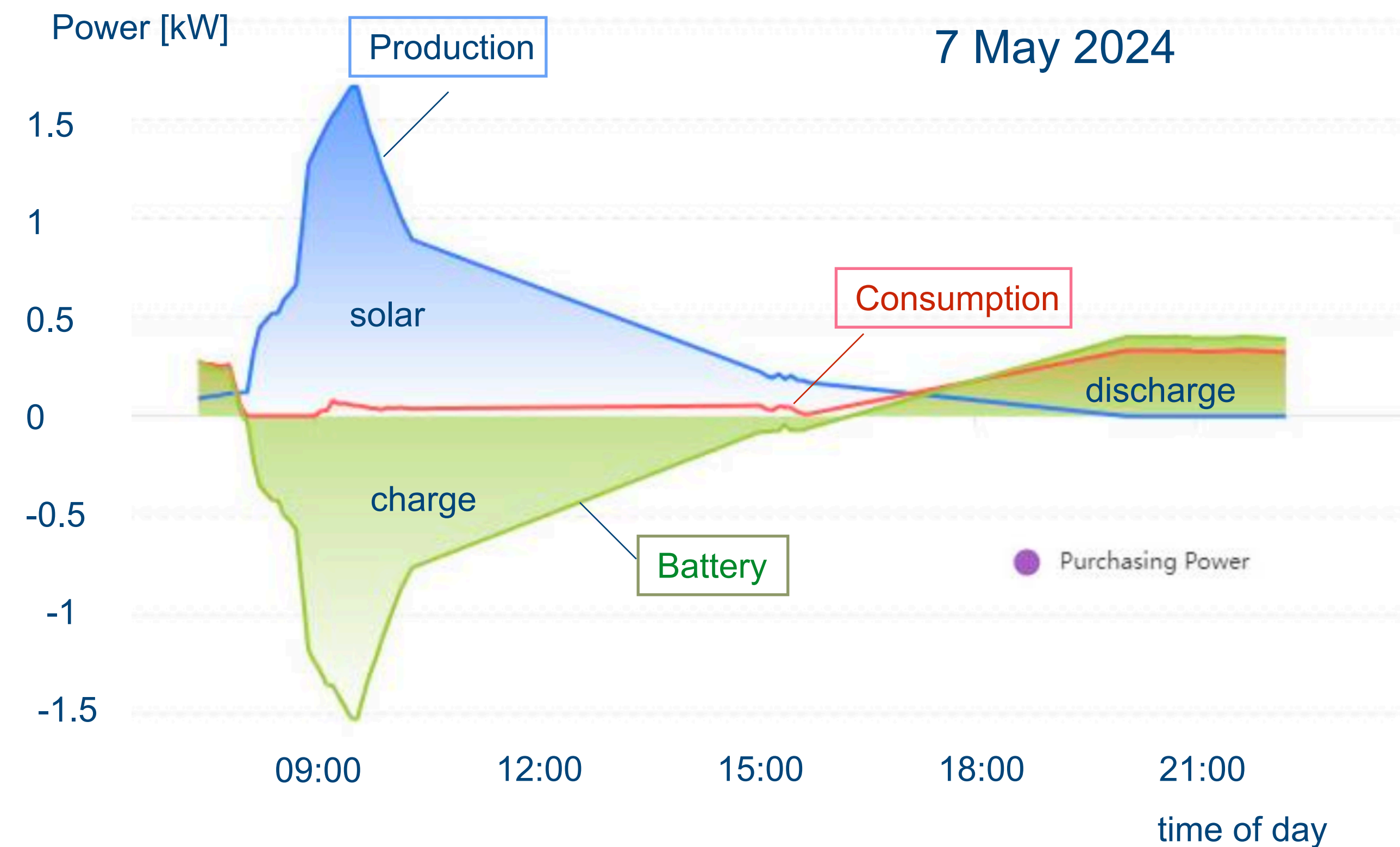
Ingvild
Oftedal

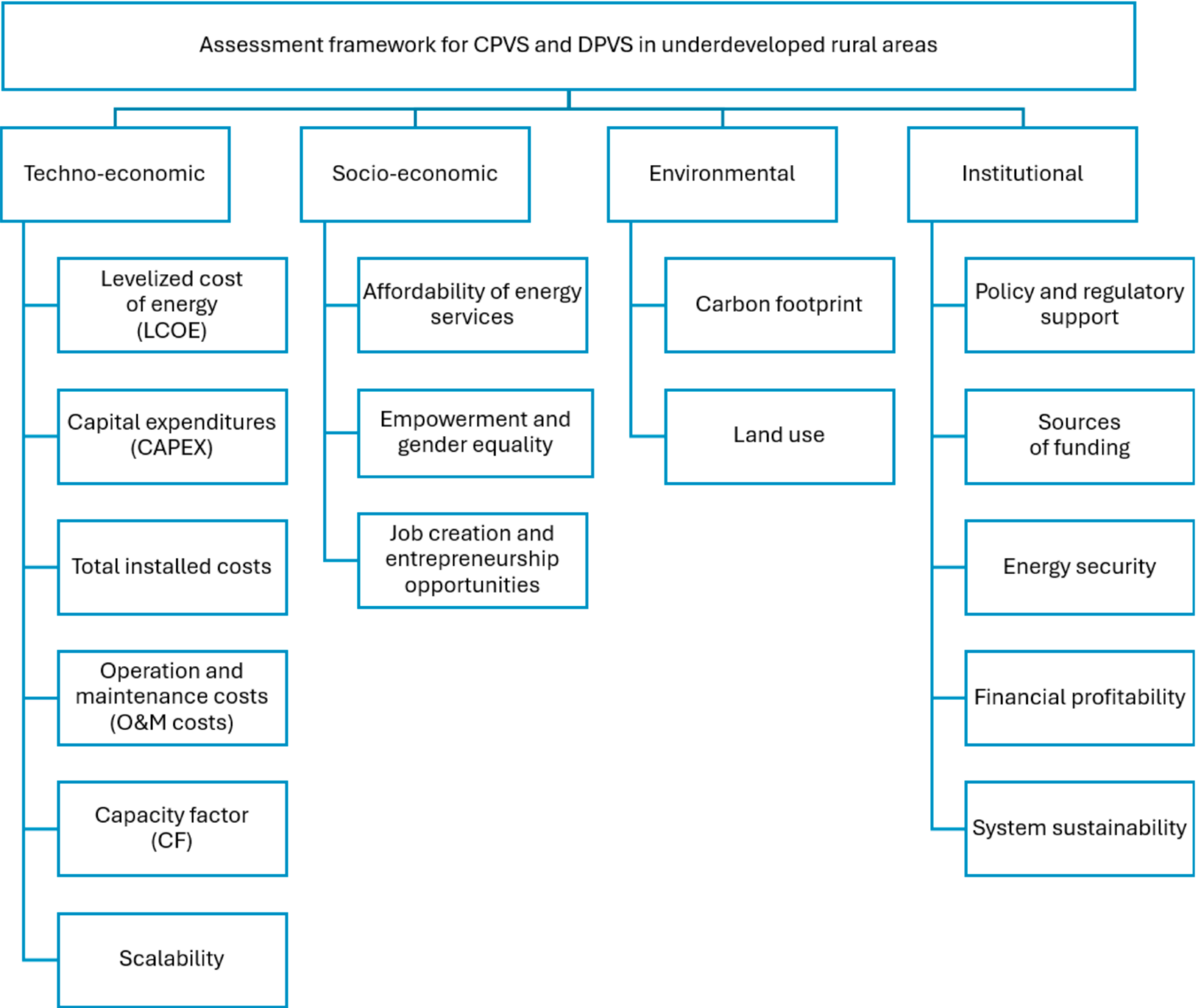
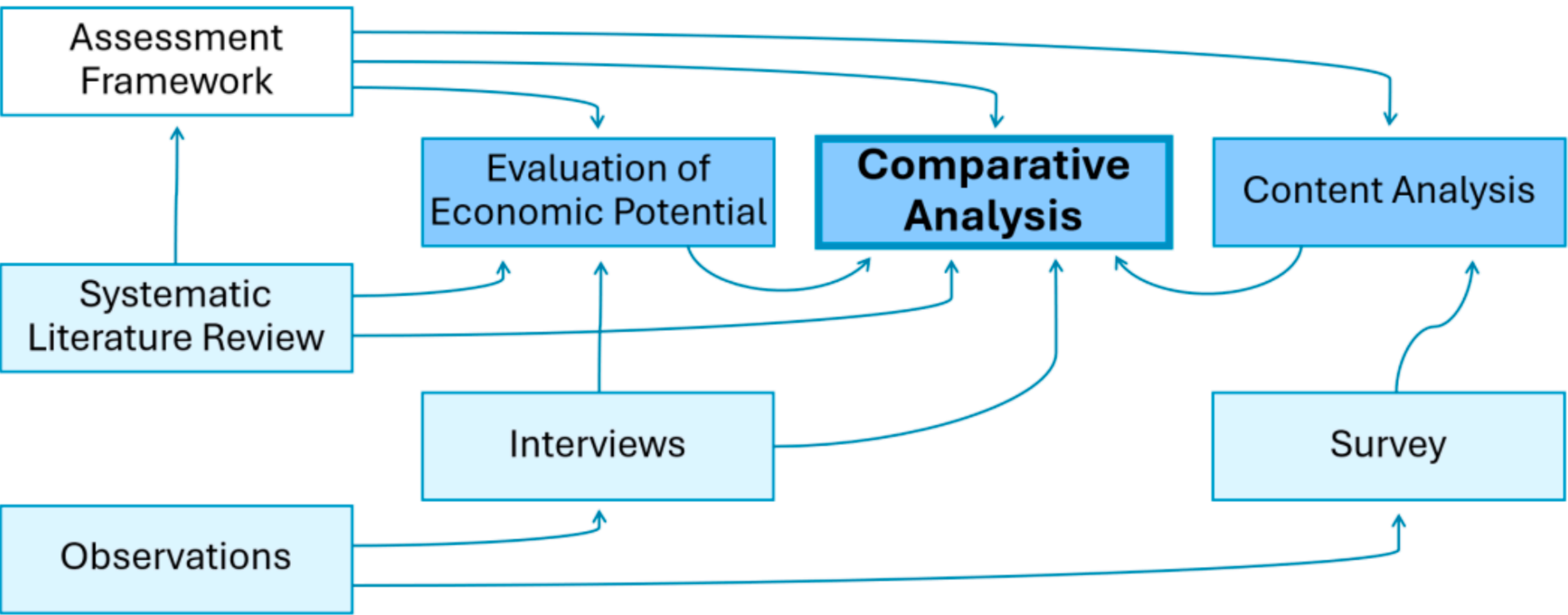


Training with students

Production - Consumption - Storage

- 1. stage well balanced
 - production matches consumption
- modular, expandable
- low consumption during day
- Interaction with the grid
 - law permits,
 - no purchase, no feed-back





PhotoVoltaic (PV) system costs, implications and impact

