# ZACKENBERG RESEARCH STATION

## *GREEN TRANSITION AND NOW WITH INTERNET*

Torben R. Christensen &
Marie Frost Arndal
*On behalf of many others*

ZACKENBERG

LEFT: COURTESY OF TORBEN R. CHRISTENSEN; RIGHT: DAISY GILARDINI/GETT


Left: Author Torben R. Christensen takes methane-flux measurements in Alaska in 1991. Right: Coastal-shelf processes emit methane in the Laptev Sea.

Christensen, *Nature*, 2014

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Distance ca 20 km

# SOLAR PANELS

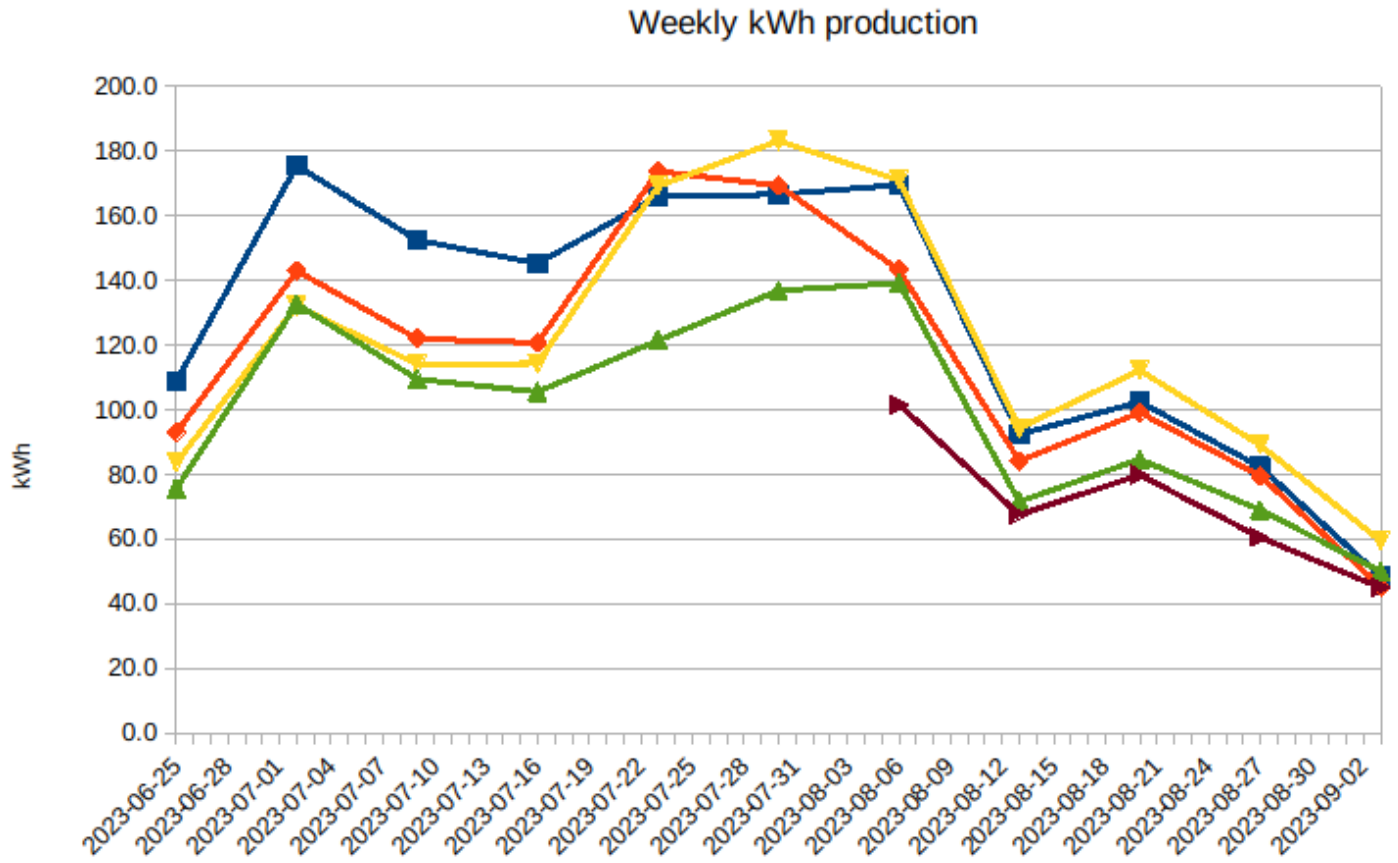
PV main site

- Solar panels with an angle of 15 degrees, installed east and west-facing
- Solar panels with an angle of 45 degrees, installed facing south
- Solar panels with an angle of 90 degrees – including testing of bifacial solar panels (double-sided)

Operational since August 2022

- Whole station supplied from batteries
- New generators are integrated and in use only when needed

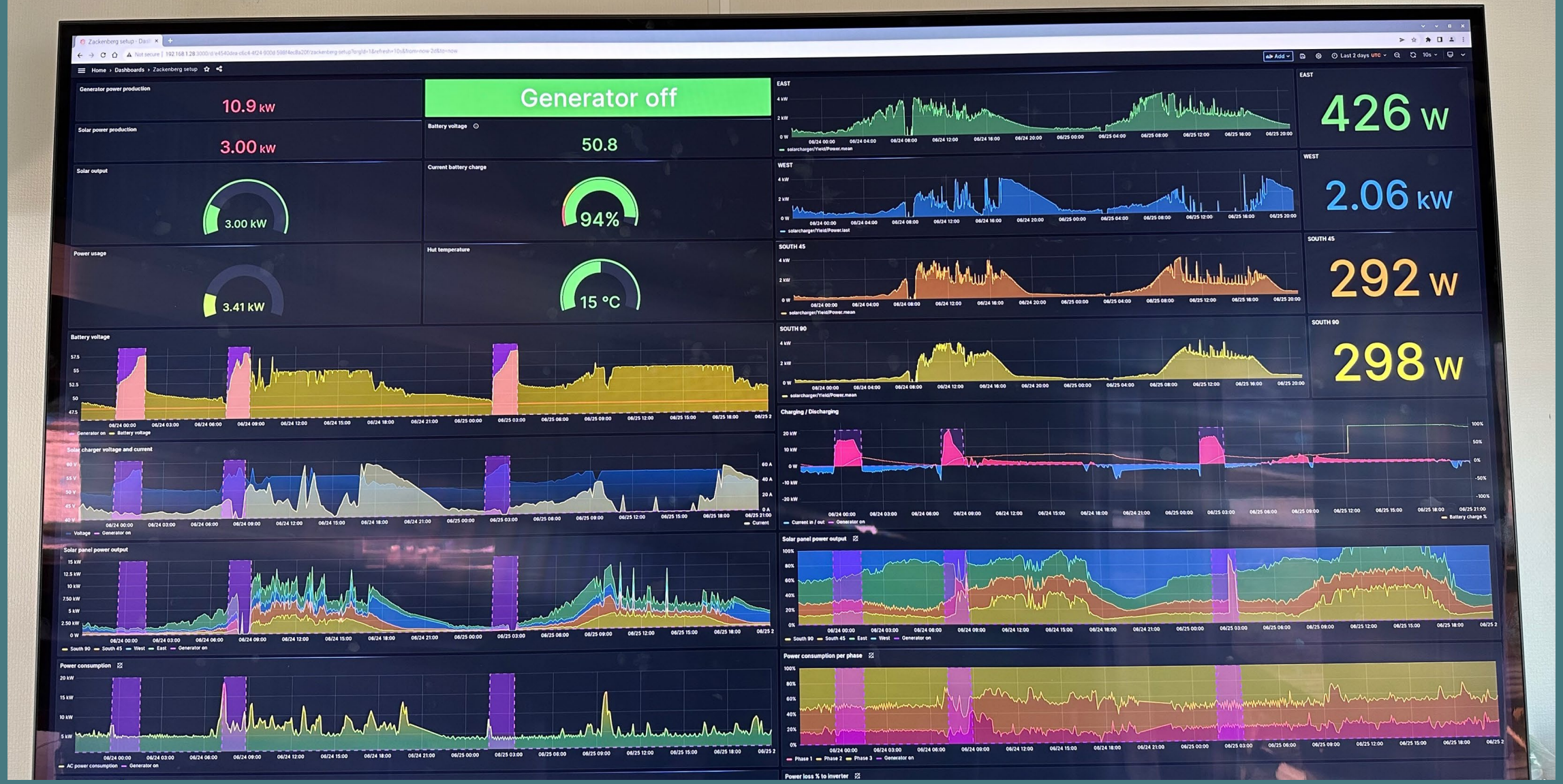
# 2023




- From 06.22 to 08.31.:
  - Total output of all panels:
    - 5300 kWh
  - Panel outputs (% of total):
    - East 26.3%
    - South 45° 24.7%
    - West 23.8%
    - South 90° 20.5%
    - South 90° II 4.7%
  - Generator use down by 80%
    - June 14%
    - July 20%
    - August 22%
    - On average, generator is in use 4.5 hours each day

Compiled by Eero Koskinen

- On the right:
  - Live graphs of the output of all solar panels
- On the left:
  - Power produced by generator in 24h
  - Total power produced by solar in 24h
  - Last solar production reading
  - Last power consumption reading
  - Current battery charge
  - Current battery voltage
  - Live view of the voltage in the batteries
- Not pictured
  - Graph of power consumption by phase
  - Graph of the combined output of all the solar panels
  - Graph of power loss to inverter

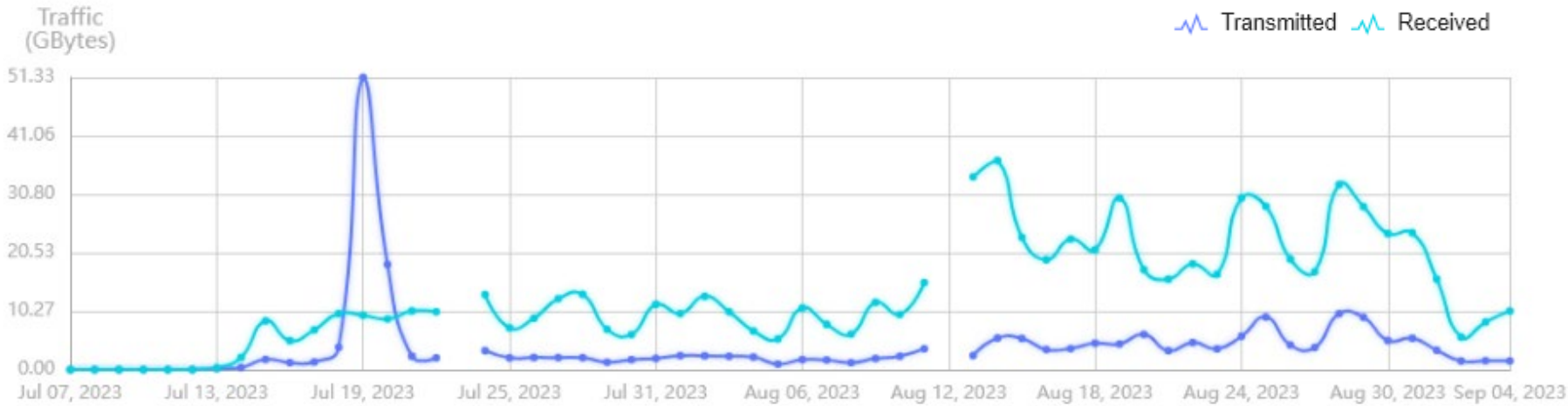

Generator power production
10.9 kW
Generator off
Solar power production
3.00 kW
Battery voltage
50.8
Solar output
3.00 kW
Current battery charge
94%
Power usage
3.41 kW
Hut temperature
15 °C
EAST
426 W
WEST
2.06 kW
SOUTH 45
292 W
SOUTH 90
298 W
Battery voltage
Solar charger voltage and current
Charging / Discharging
Solar panel power output
Power consumption
Power consumption per phase
Power loss % to inverter


# SOLAR PANELS

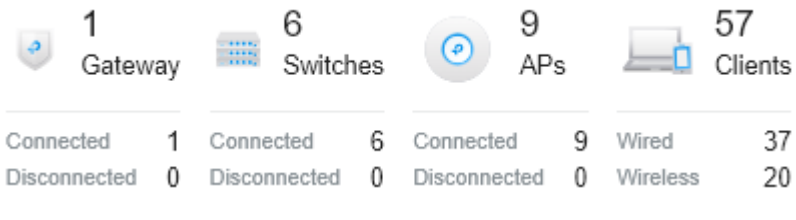
- Are still to evaluate the full annual performance
- Predictions are it will meet expectations of a minimum of 50% reduction in use of diesel

# ZACKENBERG ONLINE

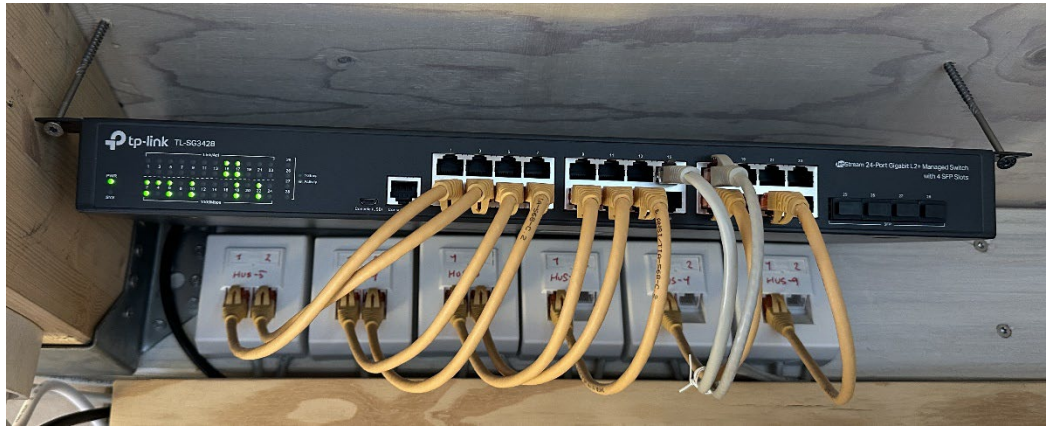
## In 2023 Starlink connection brought Zackenberg to the Internet




## …using the existing local network infrastructure




tp-link | omada | OC200_Zackenberg

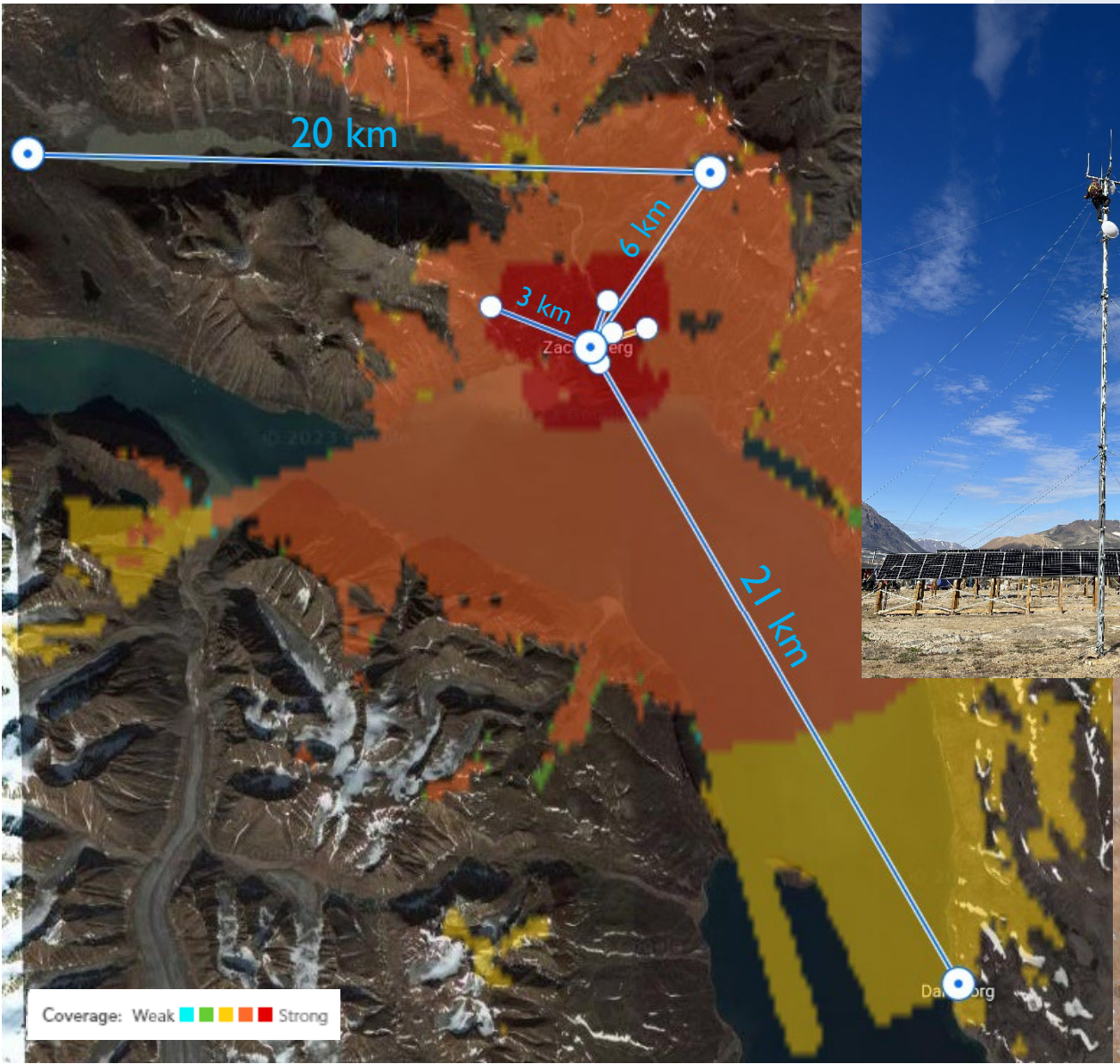


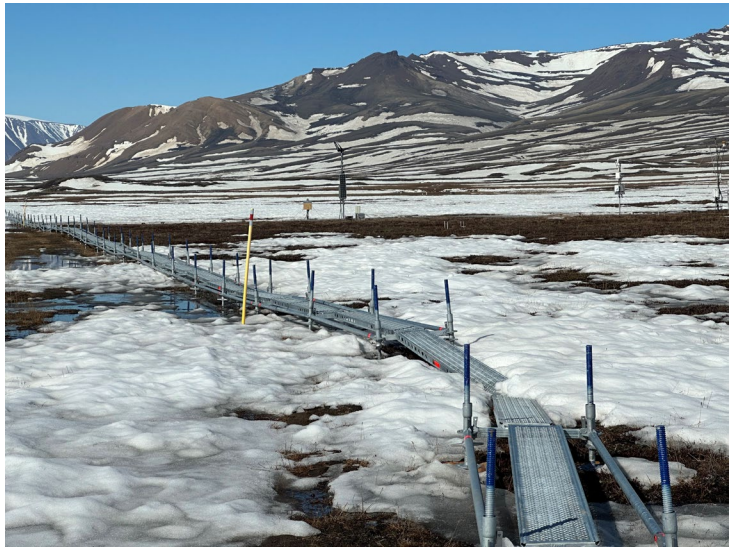
### June – September 2023

- >300 total clients (devices)
- 159 mobile clients (WiFi)
- >5 PB of data exchange

# ZACKENBERG ONLINE

## Long-range Wi-Fi connections to Daneborg and over the Zackenberg valley





# WALKWAYS

Protect approx. 1300 meters of the main road from erosion in the vulnerable monitoring area

# MORE SUSTAINABLE TRANSPORT

Winter

- 2 ARGO 8x8 950TX equipped with wheels and tracks for winter transport of goods
- 2 transporting sledges
- Results of less cargo flying in 2022/2023:
- Operational savings = 80000 kr
- Fuel/$CO_2$ = One third of TWO transport

Summer

- Changed from old heavy fuel consuming Argos to electrical ATV


Thank you