Energy, Refugees and the Internet of Things

How success looks like when one's Internet of Things becomes the Internet of lanterns, cookstoves, footfalls and solar systems in harsh environments
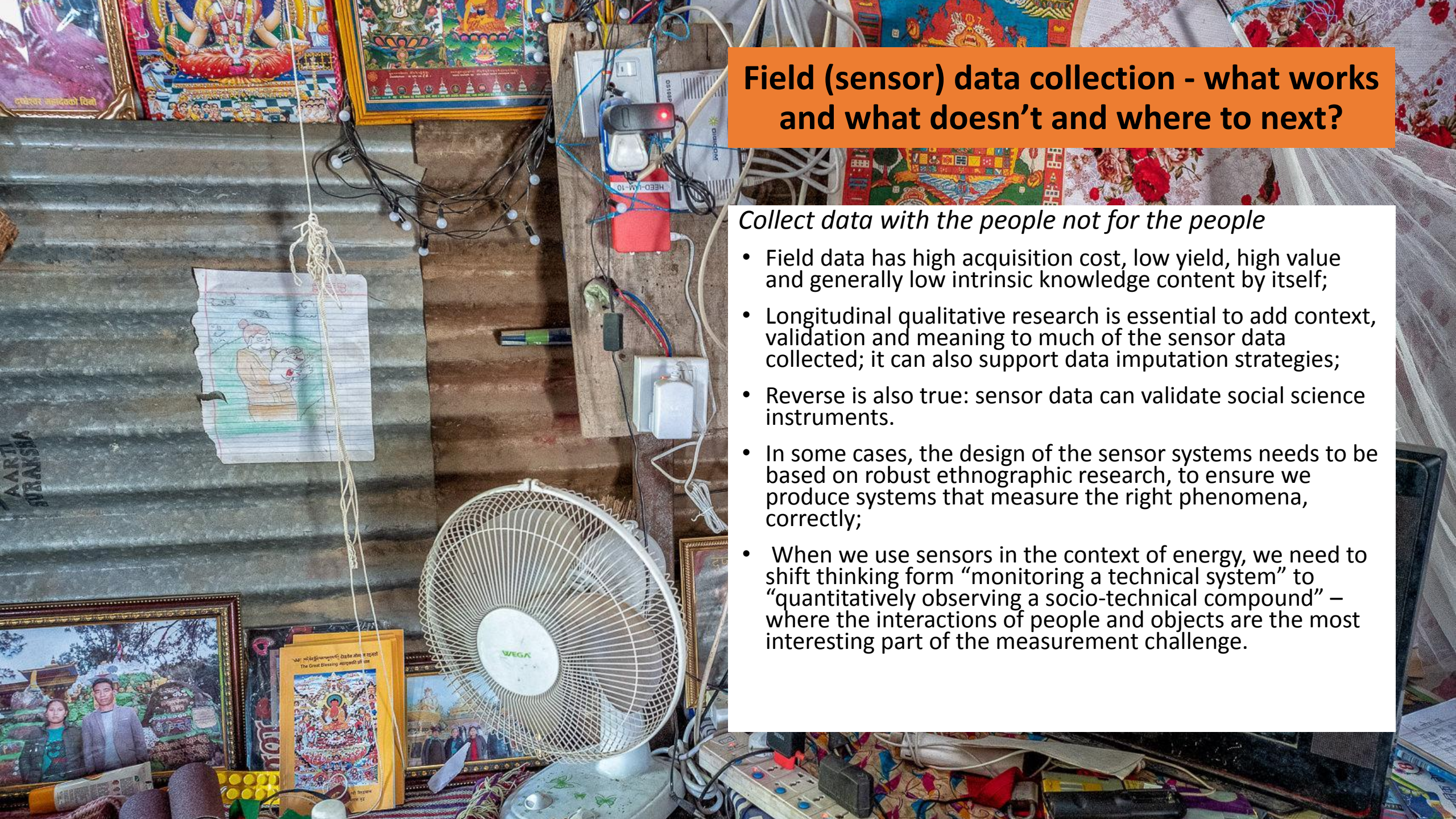
HEED

Coventry University
Practical ACTION
SCENE
EPSRC Engineering and Physical Sciences Research Council

Humanitarian Engineering and Energy for Displacement

© Eduardo Sanrangelo / Coventry University

Sensor based systems

- 100 IAMs in 20 homes

- 20 lanterns, 4 sensor modalities, in 20 households

- 20 cookstoves, 3 sensor modalities, in 20 households

- 7 footfall monitors, 2 sensor modalities, across a whole camp

- total of 13 renewable energy systems with 20 to 100 sensor modalities each

- Deployed and maintained by a mix of scientists, community mobilizers, local electrically skilled refugees and new trainees

- Data gathered wirelessly and on SD cards, in intensive batches (2 weeks) and over long periods of time (1 year)

Field (sensor) data collection - what works and what doesn't and where to next?

Collect data with the people not for the people

- Field data has high acquisition cost, low yield, high value and generally low intrinsic knowledge content by itself;

- Longitudinal qualitative research is essential to add context, validation and meaning to much of the sensor data collected; it can also support data imputation strategies;

- Reverse is also true: sensor data can validate social science instruments.

- In some cases, the design of the sensor systems needs to be based on robust ethnographic research, to ensure we produce systems that measure the right phenomena, correctly;

- When we use sensors in the context of energy, we need to shift thinking form "monitoring a technical system" to "quantitatively observing a socio-technical compound" – where the interactions of people and objects are the most interesting part of the measurement challenge.

Data stories – footfalls, lanterns and cookstoves

Everybody loves data

- Sensor systems can be pathfinders to new technology insertion (adoption of streetlights followed accepting, caring for and securing the footfall monitors);

- Product desirability (lanterns), an understanding of what the data is good for and collaterals of sensor deployments (e.g. internet connectivity) can lead to robust, continuous safeguarding of the data gathering processes and minimal damage and data loss;

- Insights into products use from sensor data should be an invaluable asset to manufacturers and designers;

- Self-report and sensor-data based study results rarely match; sensors based monitoring would uncover unusual individual, community and systems behaviours more often than not.