The Open Cities AI Challenge:

Building segmentation for resilience

Nick Jones

World Bank / GFDRR

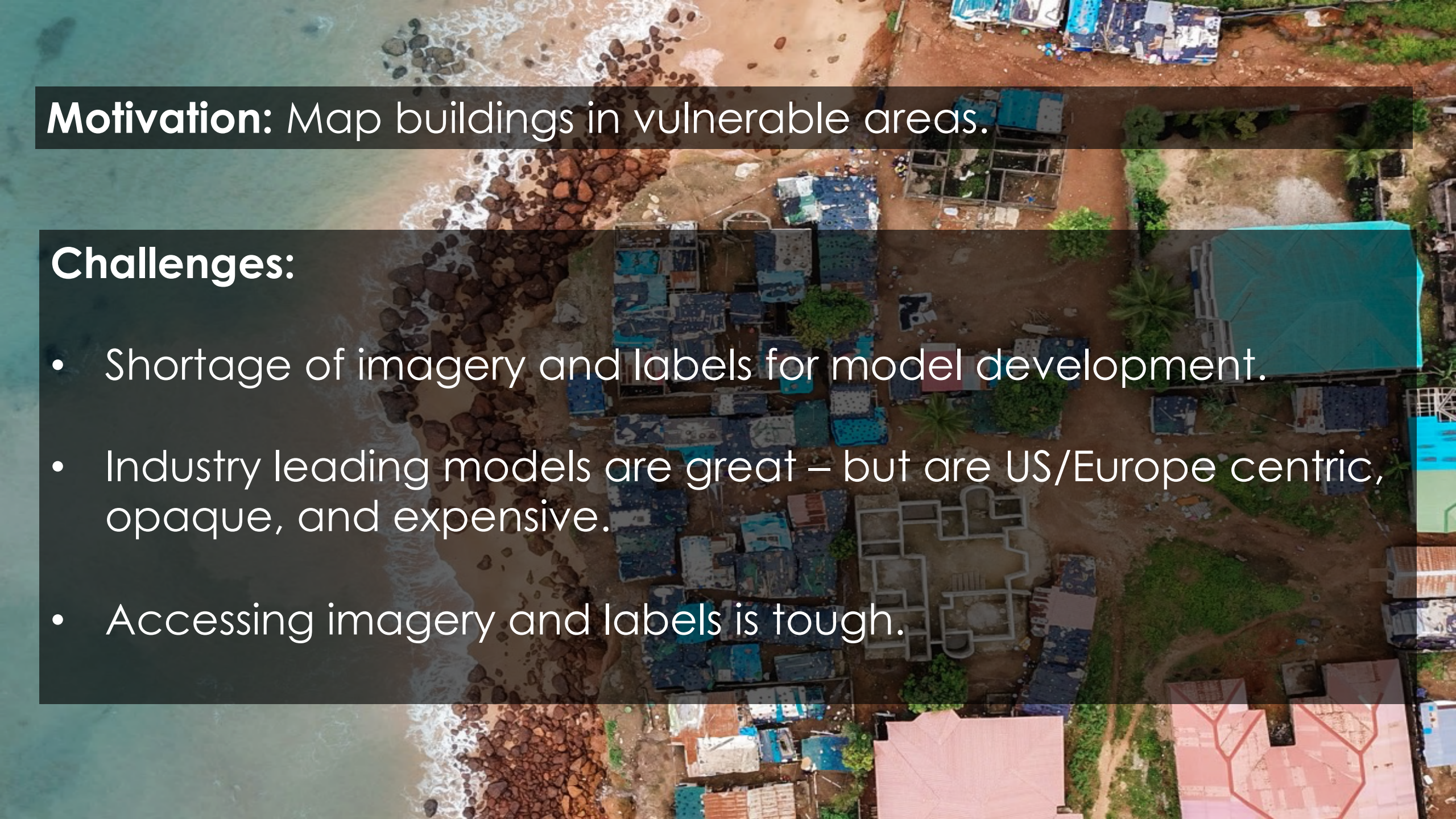
WORLD BANK GROUP

GFDRR

Global Facility for Disaster Reduction and Recovery

https://bit.ly/2O1W9ST

Understanding and quantifying disaster risks requires accessible, detailed, up to date data



Motivation: Map buildings in vulnerable areas.

Challenges:

- Shortage of imagery and labels for model development.
- Industry leading models are great – but are US/Europe centric, opaque, and expensive.
- Accessing imagery and labels is tough.

OPEN CITIES AFRICA

- Community mapping initiative: **12 cities** simultaneously
- **500,000** features mapped

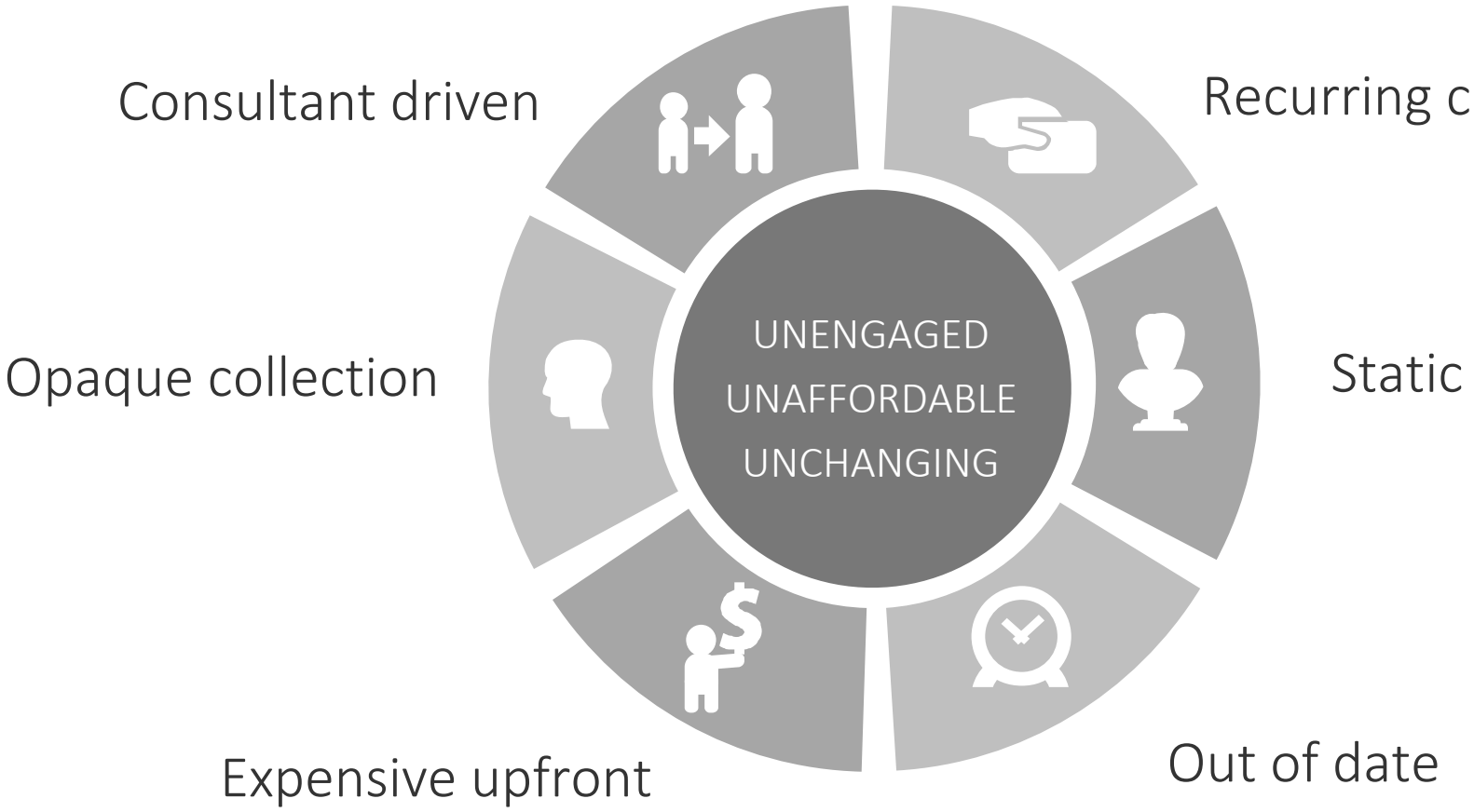
DIGITAL SKILLS

- **500 people** trained on digital cartography
- At **41% female participation** rate

REGIONAL NETWORK

- Online training platform with over **100 participants**

TRADITIONAL APPROACH TO DATA COLLECTION

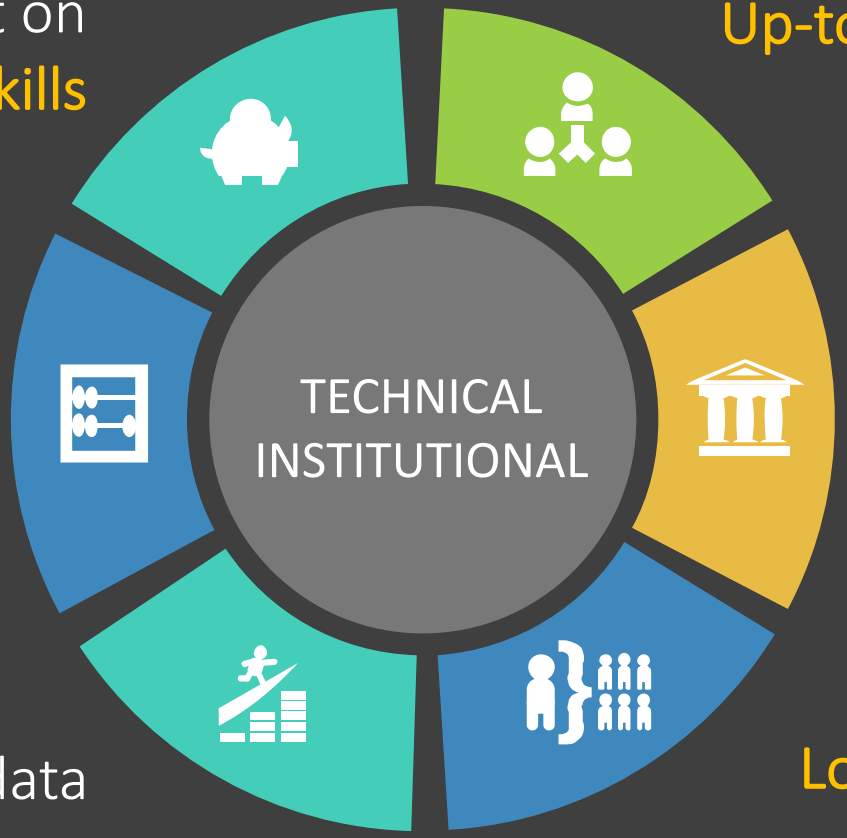


DISRUPTIVE TECHNOLOGY AND HUMAN CAPITAL

COLLABORATIVE APPROACH TO GEOSPATIAL DATA COLLECTION

Resources spent on **building skills**

Up-to-date - local data



Open - scalable approach

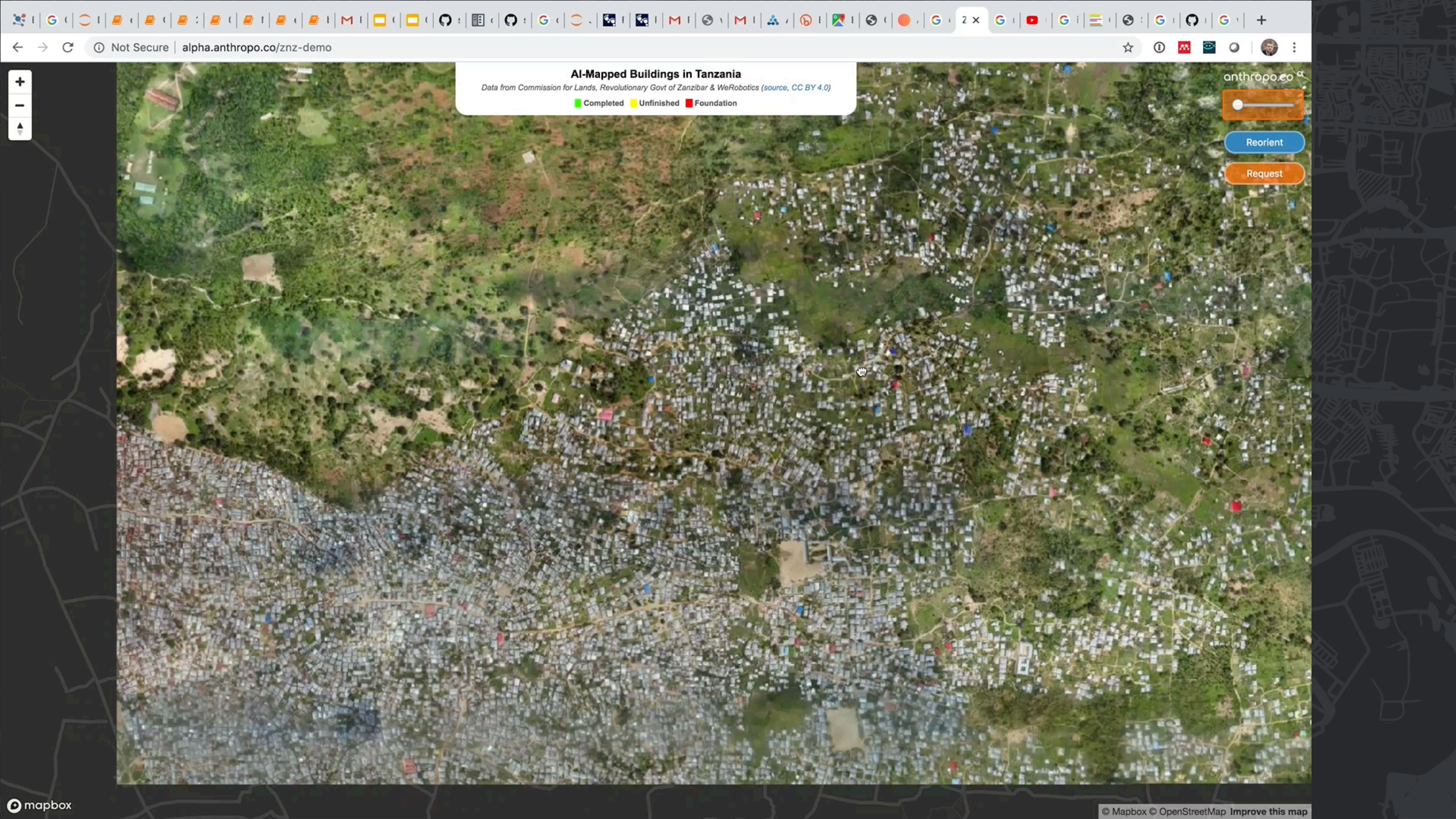
Community awareness of risk

Re-use of data

Local ownership & trust in data

Geospatial Market growth from
US$ 9.8 billion in 2017 to
US$ 17.5 billion by 2023

Geospatial data and services
generate US$ 400 billion
in global revenue


Not Secure
alpha.anthropo.co/znz-demo
AI-Mapped Buildings in Tanzania
Data from Commission for Lands, Revolutionary Govt of Zanzibar & WeRobotics (source, CC BY 4.0)
Completed
Unfinished
Foundation
anthropo.co
Reorient
Request
mapbox
© Mapbox © OpenStreetMap Improve this map

Open Cities Africa dataset

A novel labelled dataset of drone imagery and building footprints.

Collected via participatory mapping:

- Open Cities Africa
- Dar Ramani Huria
- Zanzibar Mapping Initiative.

Open Cities Africa dataset

City/Region	Data class	Scene count	AOI area (sq km)	Building count	Average building size (sq m)	Building ratio (% area covered)
Accra	train_tier_1	4	7.86	33,585	84.84	0.36
Dar es Salaam	train_tier_1	6	42.90	121,171	99.20	0.28
Dar es Salaam	train_tier_2	31	223.28	571,047	94.16	0.24
Ngaoundéré	train_tier_2	2	12.54	15,792	81.05	0.10
Kampala	train_tier_1	1	1.14	4,056	53.14	0.19
Kinshasa	train_tier_2	2	1.01	2,357	71.29	0.17
Mahe Island	train_tier_2	4	19.40	7,313	206.48	0.08
Monrovia	train_tier_1	4	2.90	6,947	150.71	0.36
Niamey	train_tier_1	1	0.68	634	47.43	0.04
Niamey	train_tier_2	2	2.46	7,444	62.76	0.19
Pointe-Noire	train_tier_1	2	1.87	8,731	72.73	0.34
Zanzibar	train_tier_1	13	102.61	13,407	120.83	0.02
Total		72	418.65	792,484	95.43	0.18

Open-source standards for ease of access

- Images: Cloud-Optimized GeoTiff (COG)
- Dataset: Spatio-Temporal Asset Catalogue (STAC)


```
{
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    "id": "a42435-labels",
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                    }
                ]
            }
```
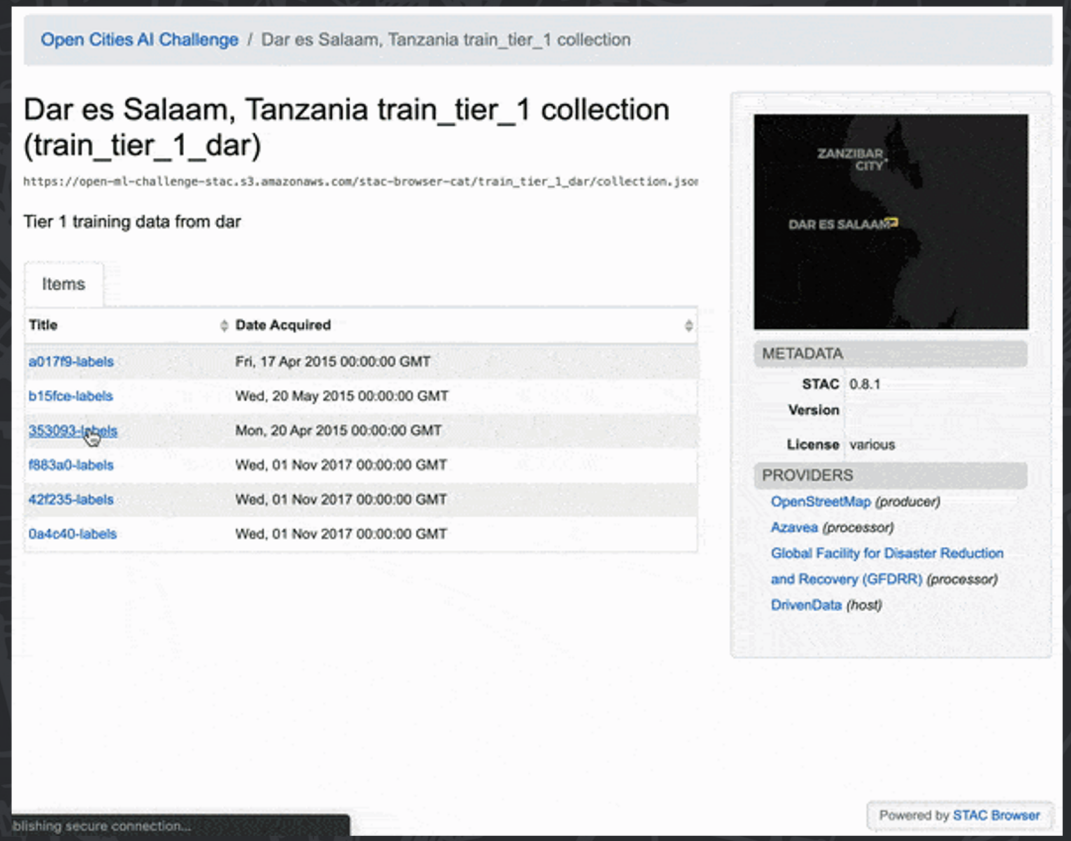


(1) Example metadata JSON for training labels.



(2) STAC browser to visualize dataset online.

Challenges & opportunities

(1) Images of diverse locations, resolutions, capture conditions:

TIER 1 SAMPLE

Area (abbreviation)	Scene ID	Thumbnail	Resolution	Pixel width x height
Accra (acc)	665946		3 cm	84466 x 150147
Kampala (kam)	4e7c7f		4 cm	39270 x 40024
Pointe-Noire (ptn)	f49f31		20 cm	6605 x 4185
Zanzibar (znz)	aee7fd		7 cm	40551 x 40592

(2) Labels of varying quality:

Tier 1:

Tier 2:

Two-track contest

(1) Semantic segmentation track:

- Pixel-wise binary target (building or no building)
- Evaluated on Jaccard index (IoU)
- $12,000 for top three entries

(2) Responsible AI track:

Notebooks, slides, block, essays, product mock-ups…
Evaluated by judging panel, $3k for top 3 submissions

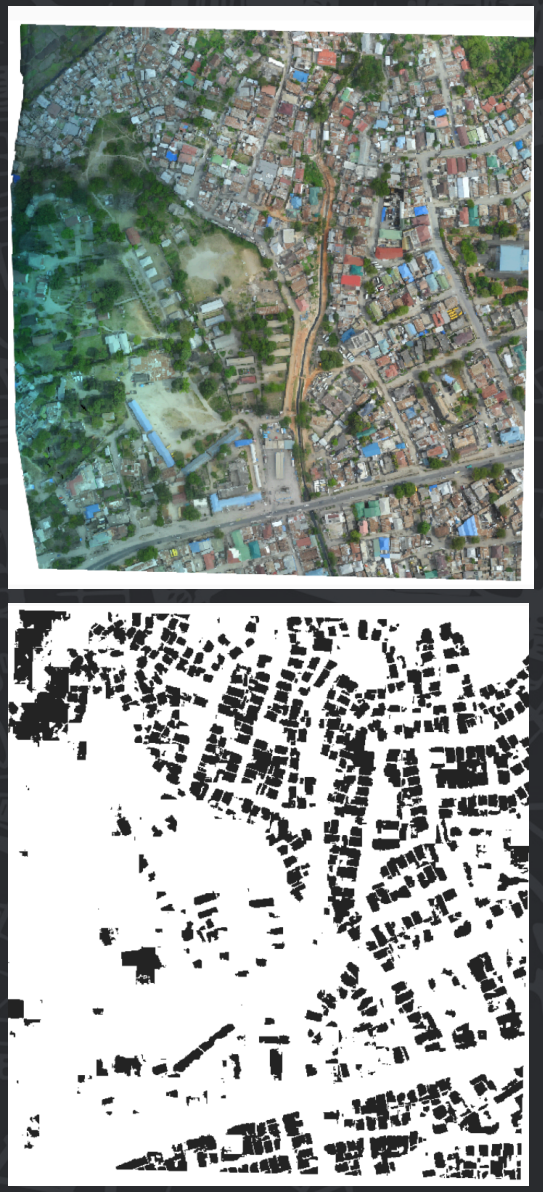


FIGURE: Sample test image and prediction chip

Join the challenge!

Competition live until
March 16, 2020

www.drivendata.org/competitions/60

Presented by:

GFDRR
Global Facility for Disaster Reduction and Recovery

DRIVENDATA

azavea

Thanks! Dave Luo, Vivien Deparday, Axel Blanc, Caroline Gevaert, Cristiano Giovandi, Grace Doherty, Ran Goldblatt, Steven Roubinyi.