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Slavery from Space: Remote Sensing Holds an Important Key to Abolition

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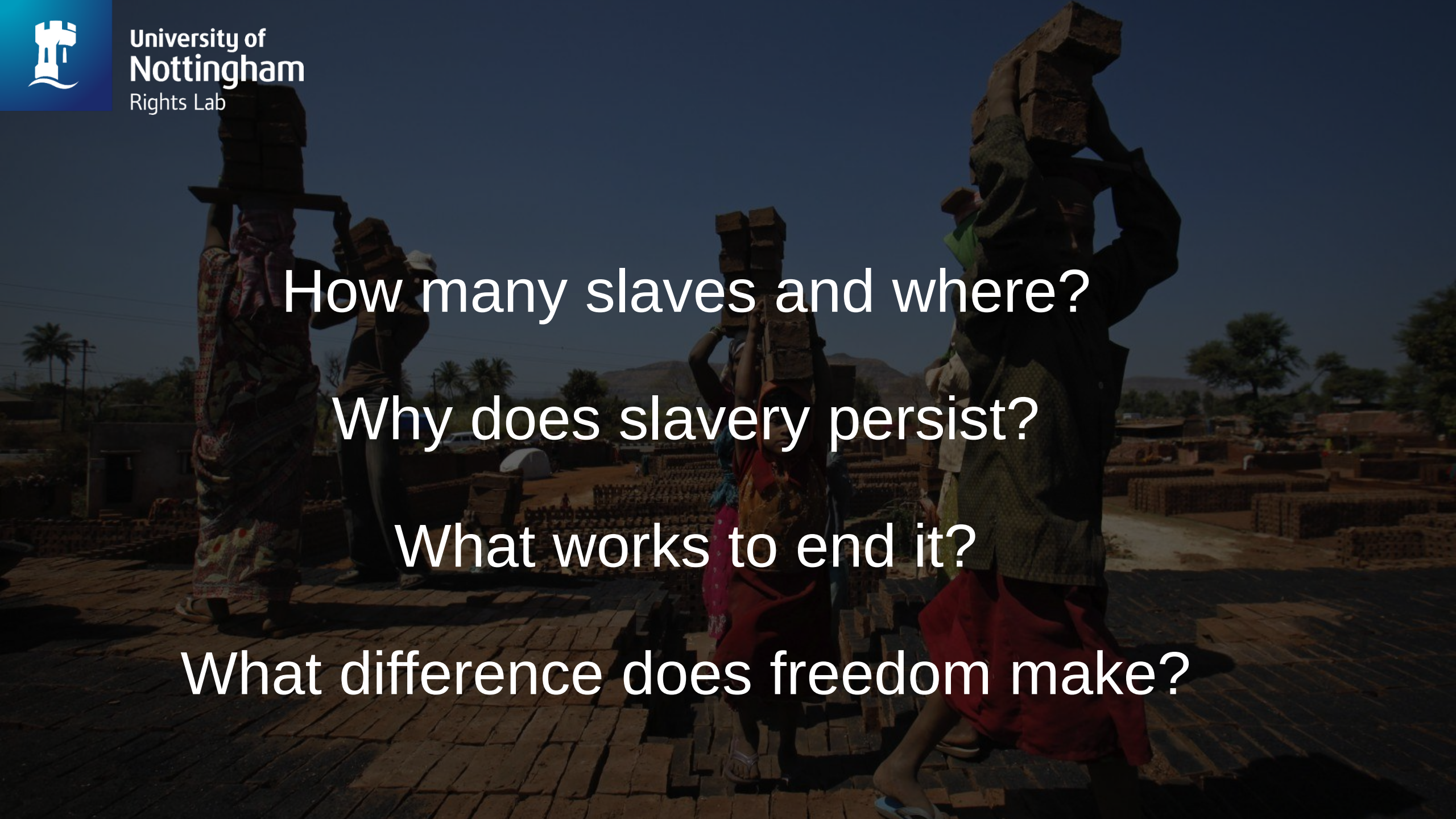
The problem:

Global Slavery Index estimates 40 million slaves worldwide; a UN SD Global Goal to end slavery by 2030, but no global plan for abolition.

The (Rights Lab) solution:

a Freedom Blueprint,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How many slaves and where?
Why does slavery persist?
What works to end it?
What difference does freedom make?

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Modern Slavery:

Global

Dynamic

Under-studied.

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Modern Slavery:

Global

Dynamic

Under-studied.

A role for:

Remote sensing for Earth Observation;

Link people and pixels?

We are home to the world's leading contemporary slavery experts and have built the world's first large-scale research platform for ending slavery.

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SLAVERY FROM SPACE

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- Based on the ILO's Global Estimates data of 2017, which breaks down the figure of 40 million slaves by industry, we estimate that nearly a third of slavery may be detectible from space.

- It occurs in stone quarries, brick kilns, fisheries, mines, forests and construction sites (rather than in domestic service, food and hospitality services, or sexual exploitation).

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Slavery Observatory

- We compile, synthesise and integrate spatial data to detect and prevent slavery.
- We develop (automated) methods with as much data as possible at as low as possible cost, with known levels of uncertainty.
- We act as a conduit for all observations of slavery activity.

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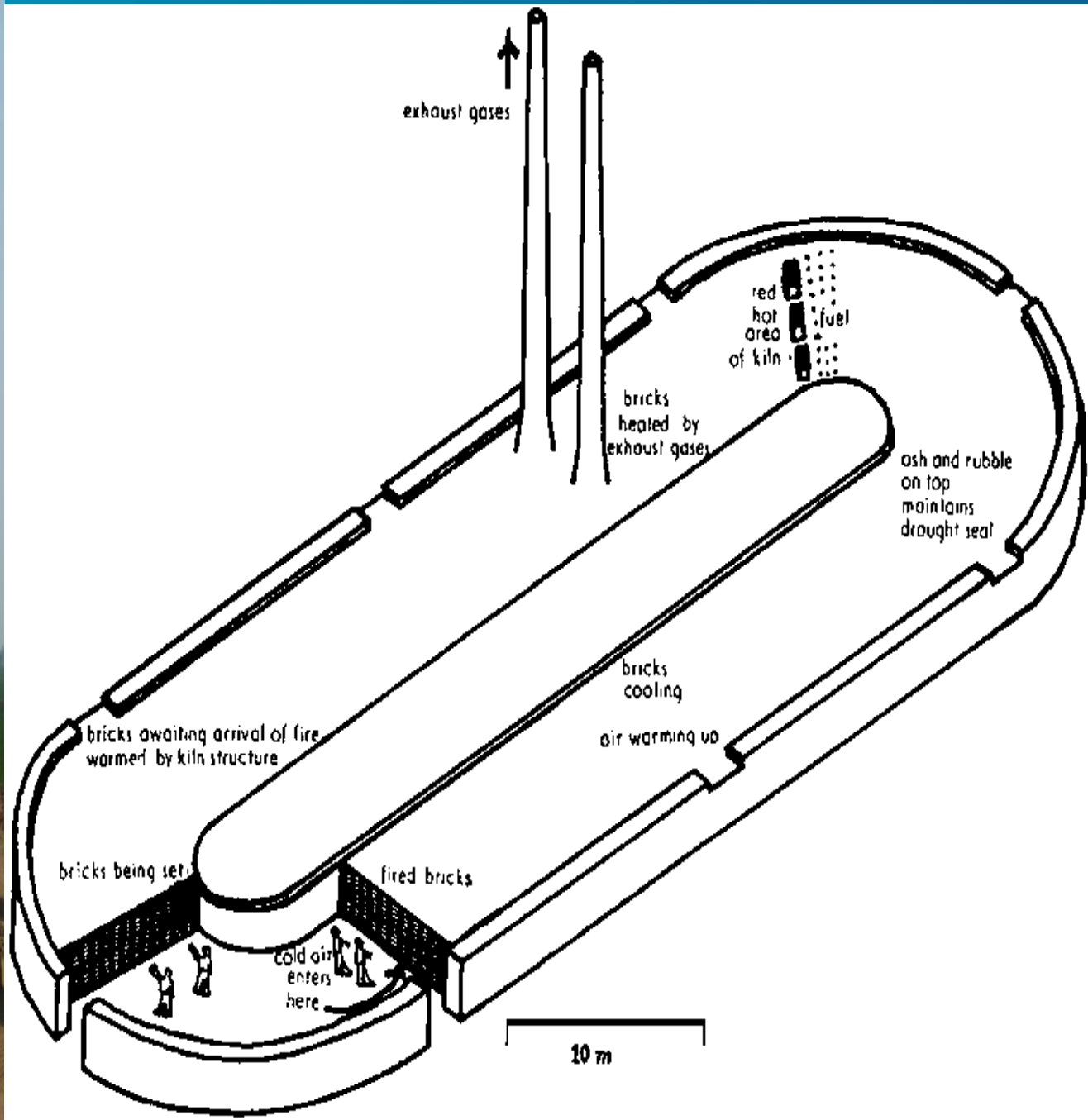
Brick Belt

- The brick kiln industry is one of the world's highest users of slavery: 70% of those in Indian brick kilns are estimated to be enslaved.
- Prominent practice in 14 nations (including Pakistan, India, Nepal and Bangladesh).
- Informal industry – often seasonal and unregulated.
- Slavery in the digging of clay, shaping of bricks, firing of bricks, transport of completed product.


exhaust gases
red hot area of kiln
fuel
bricks heated by exhaust gases
ash and rubble on top maintains draught seal
bricks cooling
air warming up
bricks awaiting arrival of fire warmed by kiln structure
bricks being set
fired bricks
cold air enters here
10 m

N
Image © 2017 DigitalGlobe
191 m
2003
Google Earth
Imagery Date: 11/15/2014 26°55'09.08" N 75°57'03.13" E elev 369 m eye alt 1.20 km

N
Image © 2017 DigitalGlobe
232 m
2009
Google Earth
Imagery Date: 12/5/2015 27°09'47.27" N 77°15'06.71" E elev 199 m eye alt 1.20 km

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First ever insight into number and distribution of kilns across the Brick Belt

- Approach 1: Statistical Inference via random sampling of high resolution data and visual interpretation
- Approach 2: Mapping locations using machine learning (Convoluted Neural Network)
- Approach 3: Citizen Science – can we trust them?

Random Sampling for Statistical Inference

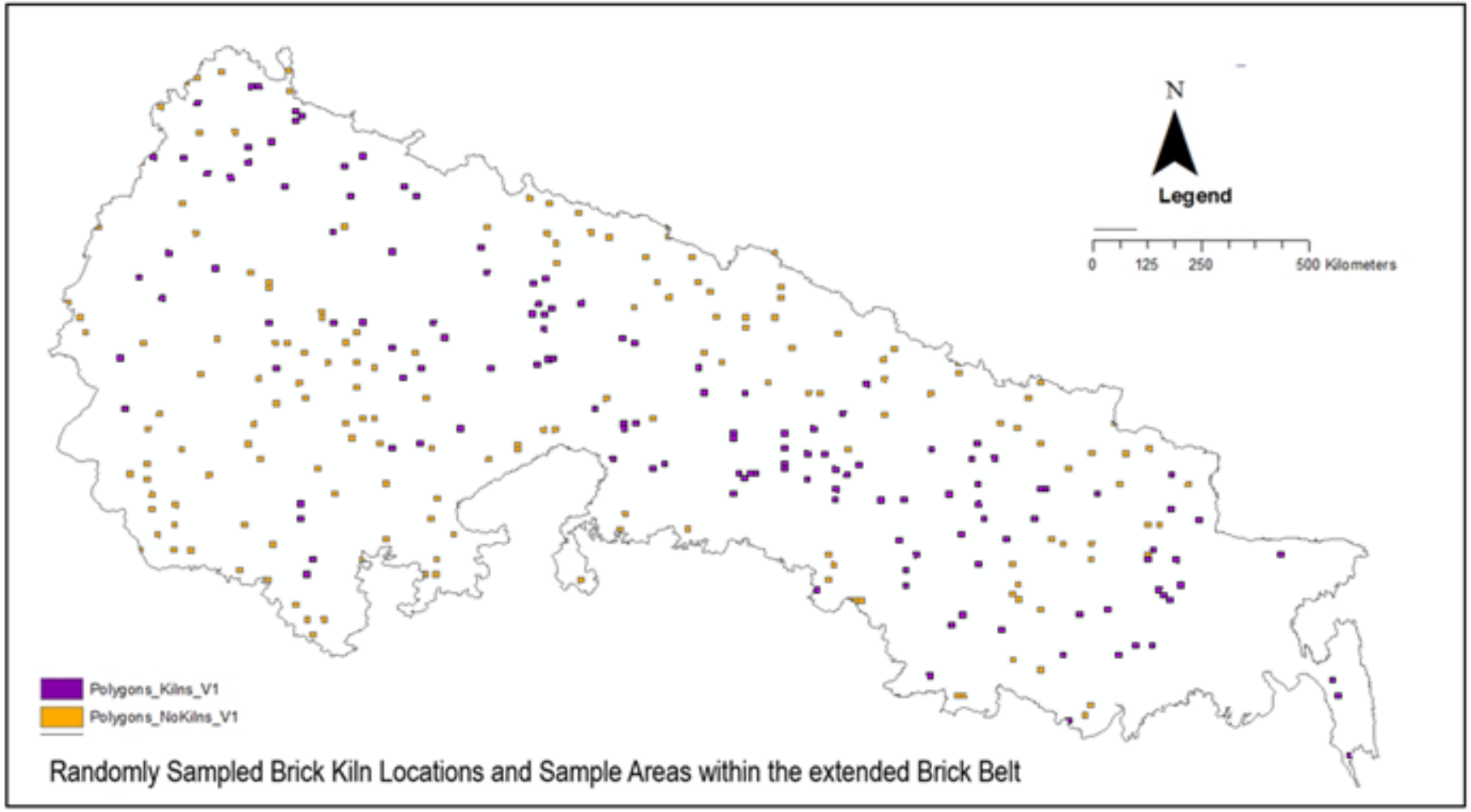

Figure 4: Location of the randomly generated 320 10km^2 sample cells, illustrating which had Brick Kilns and which had none, across the Brick Belt.

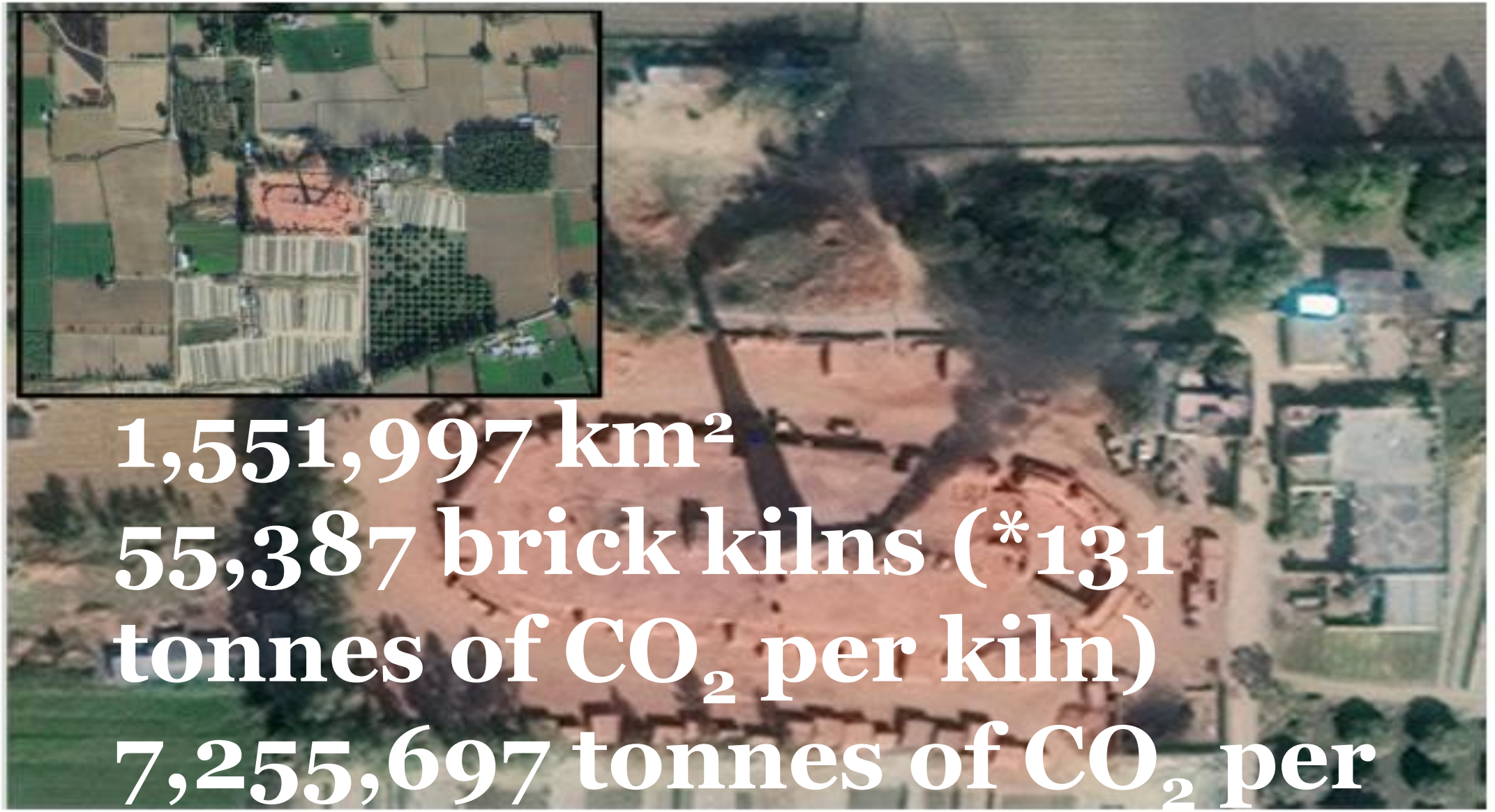

Fig. 7. An example of a Fixed Chimney Bull's Trench brick kiln @31.5385546, 75.9813821 – note the emissions from the chimney stack. From Digital Globe's WorldView-2 satellite system; pan-sharpened natural colour at 50 cm resolution; captured in November 2015. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

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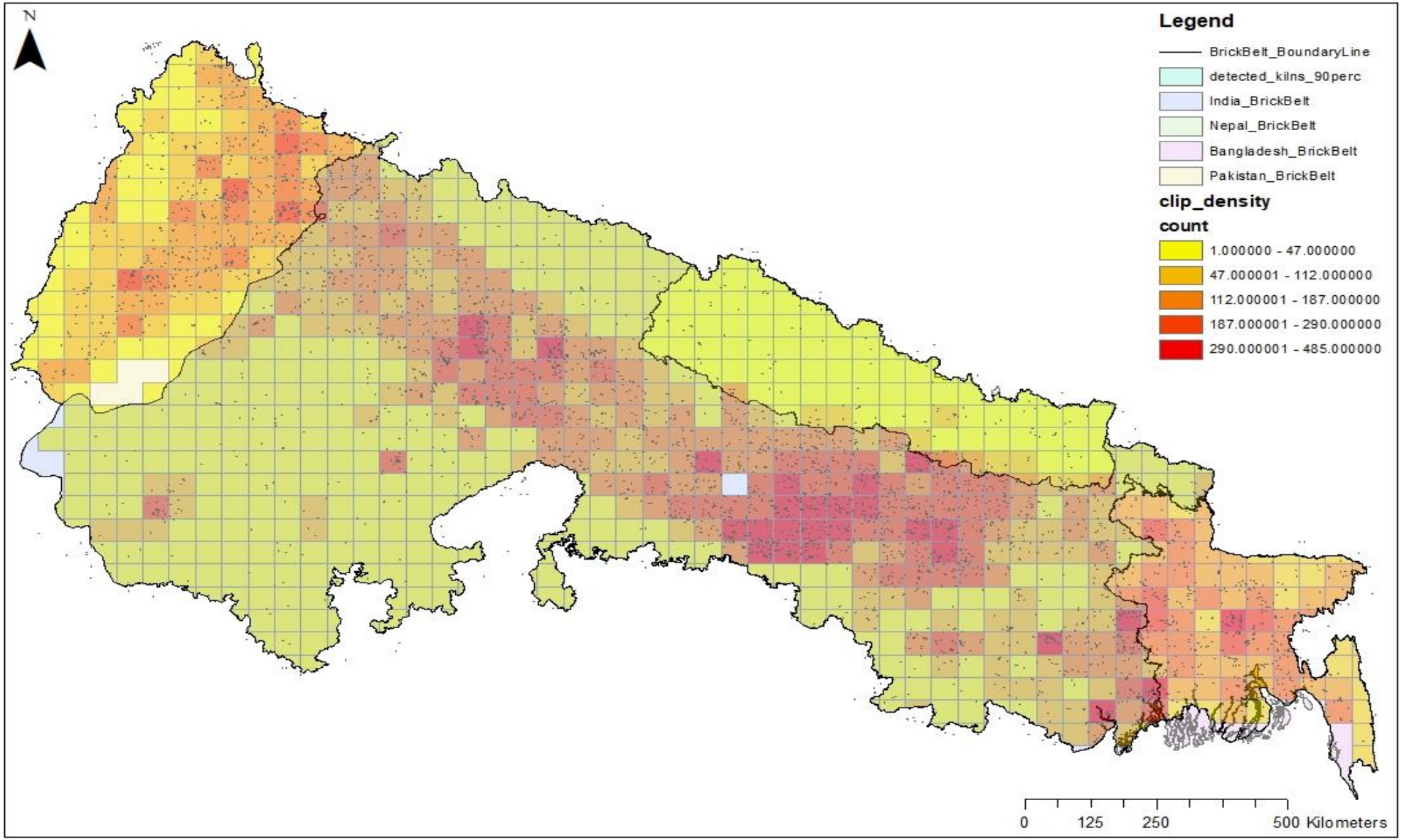
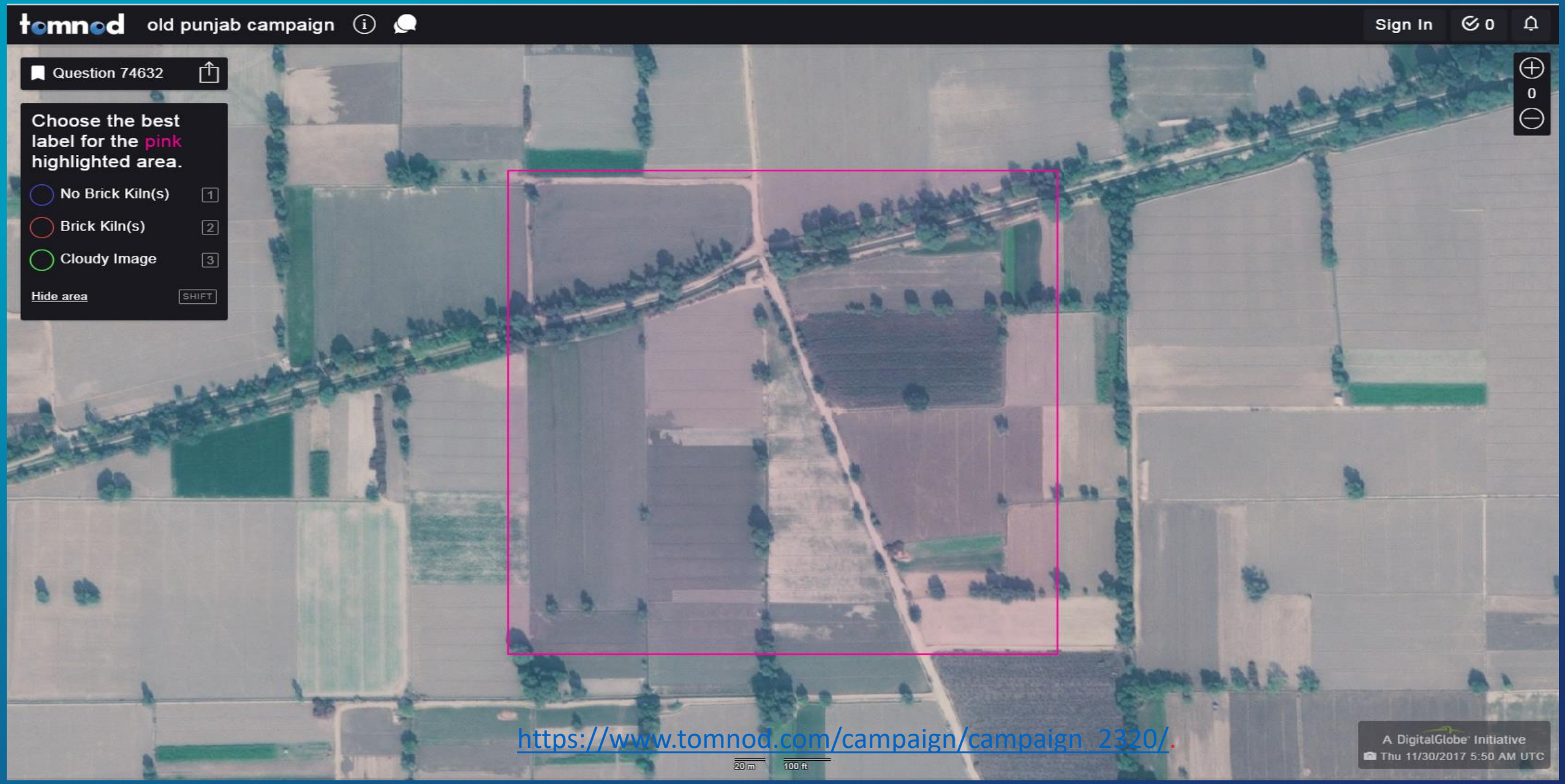
Location of Brick Kilns: High Prevalence of Bonded Labour (Beta version)

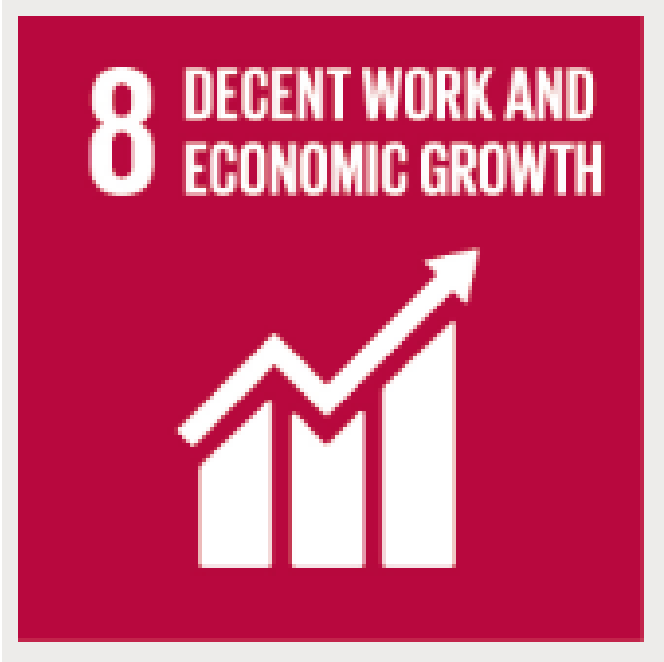


Citizen Science: Tomnod Platform



https://www.tomnod.com/campaign/campaign_2320/.

Links to other UN Sustainable Development Goals (SDGs)



Target 8.7

‘Take immediate and effective measures to eradicate forced labour, **end modern slavery …**’ (UN 2017).

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The Issue: Fish-processing Camps

Image Credit: Nasir Khan

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- "Slavery From Space is a necessary addition to the Global Slavery Index , which focuses on the presence of slavery at the macro level. Slavery From Space, on the other hand, works at micro level, on the ground, and allows NGOs to tackle specific and localized cases of modern slavery. Most companies that operate illegally remain under the radar, but are exposed by Slavery From Space." Terry Fitzpatrick, *Mondiaal Nieuws*, April 4, 2018.

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Ongoing Work:

Free data – Sentinel-2:

Partnerships:

planet.

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Thank you

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