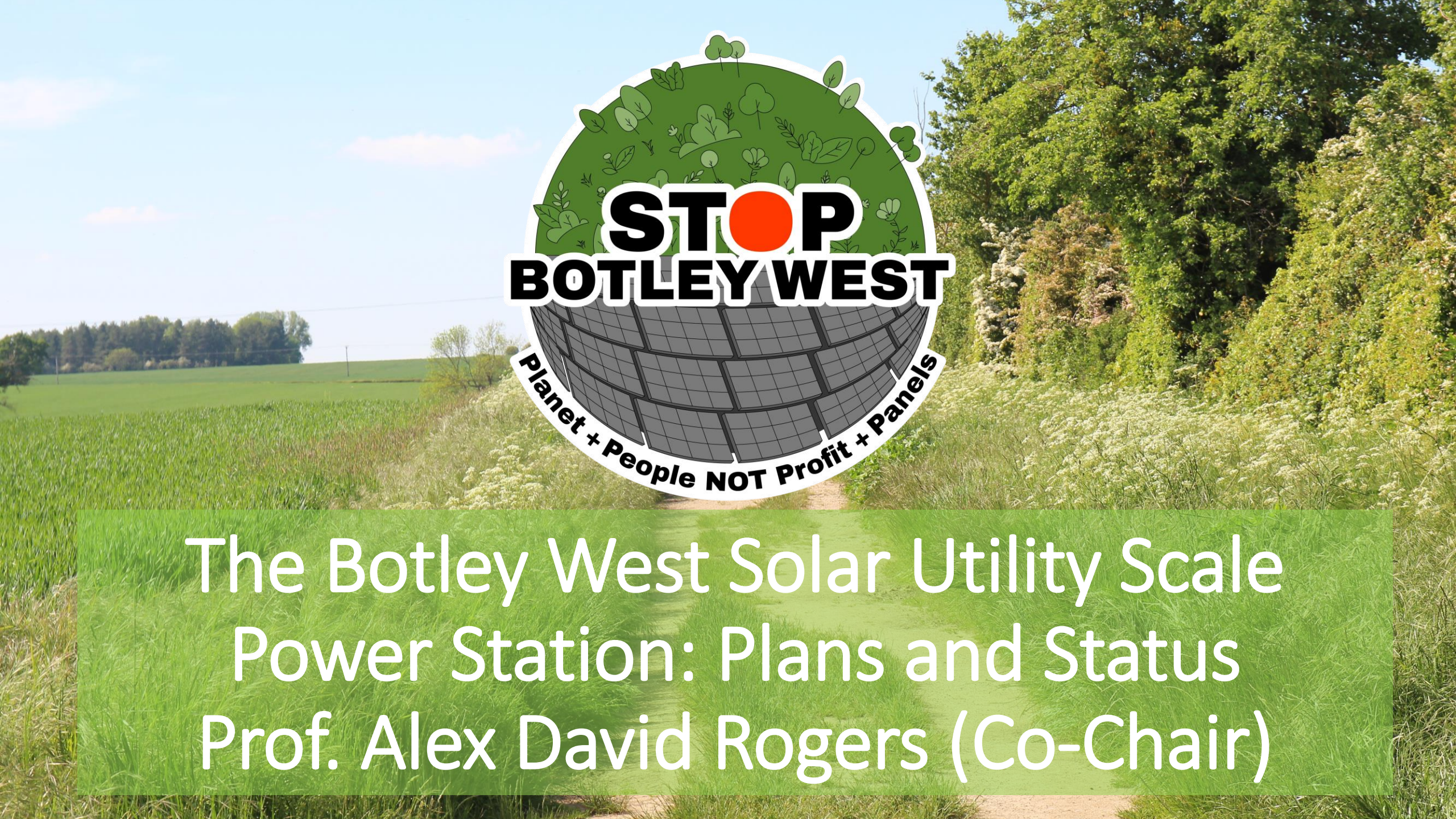
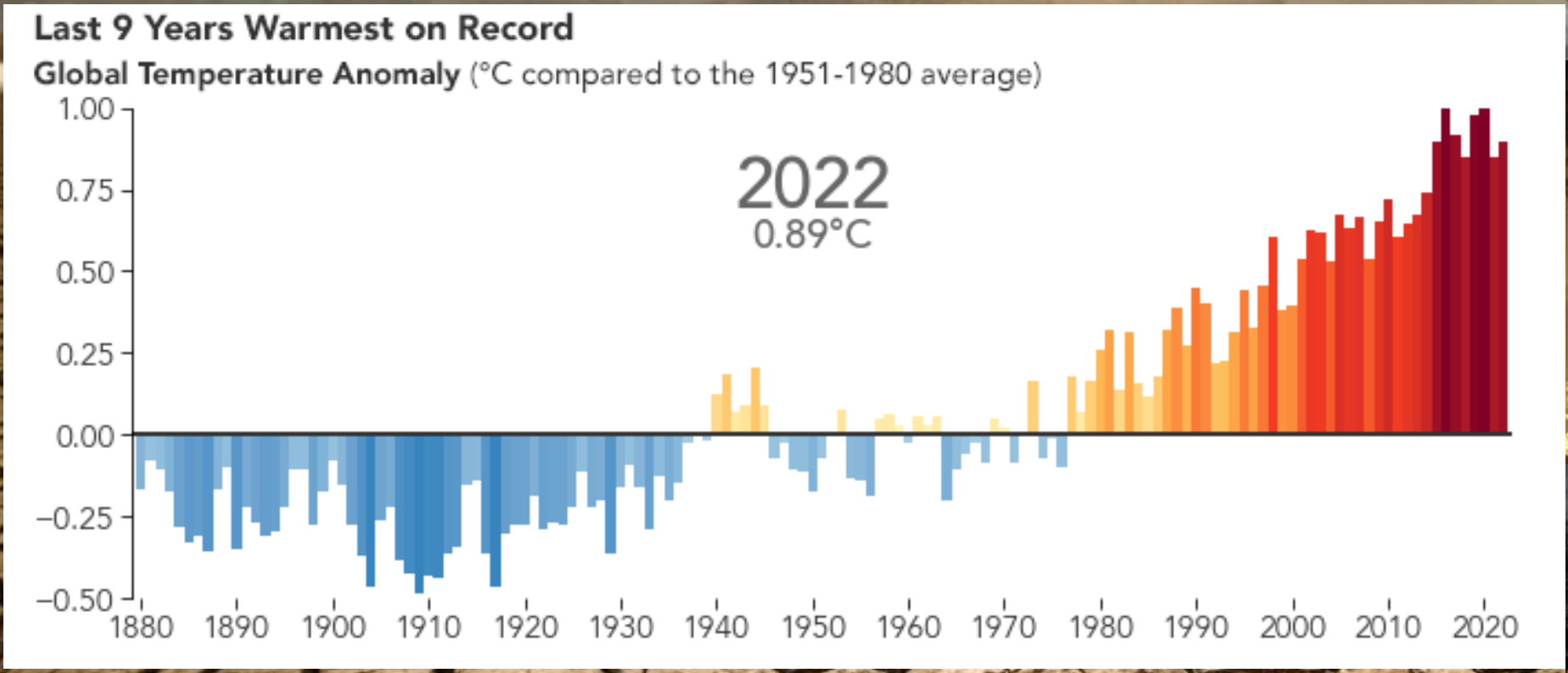


The Botley West Solar Utility Scale Power Station: Plans and Status

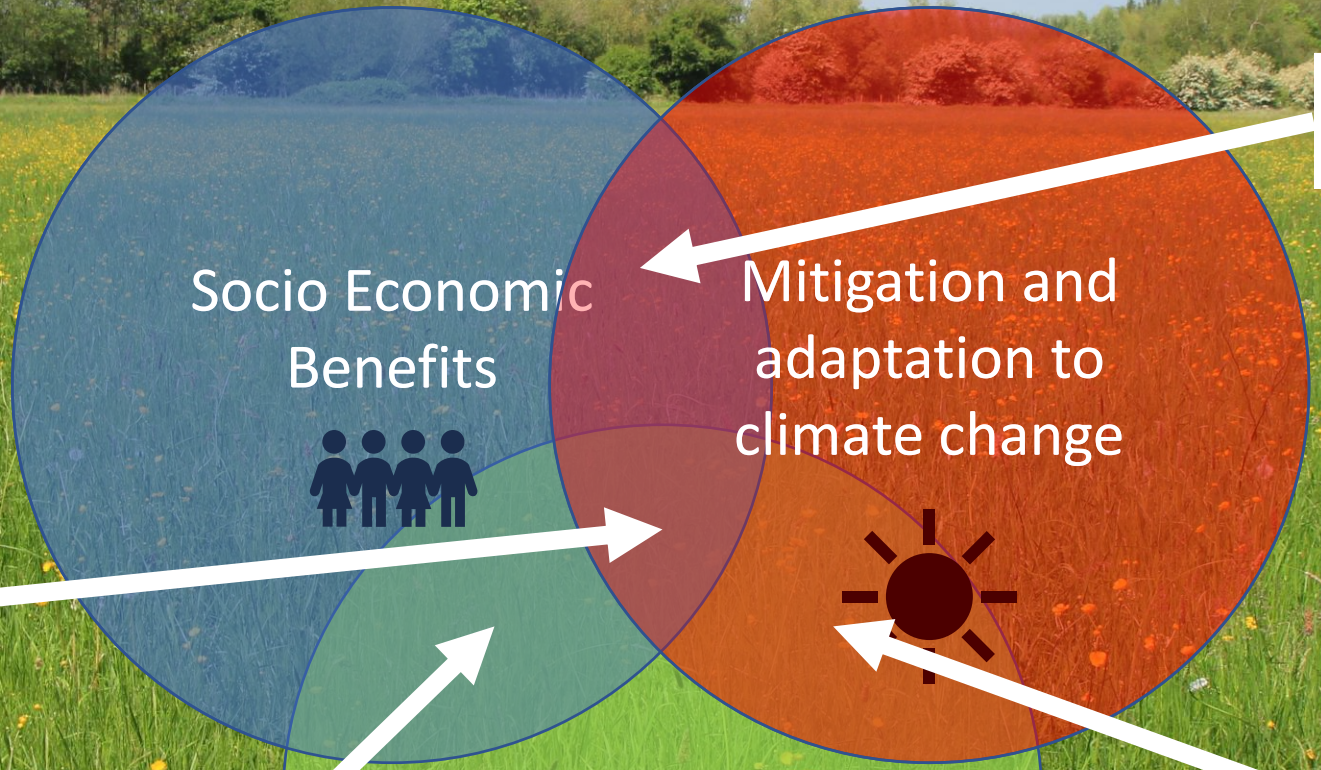
Prof. Alex David Rogers (Co-Chair)

The Climate Emergency



NASA Earth Observatory, Columbia University, National Geographic, Newcastle University

Sustainable Development: People, Climate, Environment



Community-Based Adaptation

Ecosystem-Based Adaptation

Community Based Natural Resource Management

Climate Change---Integrated Conservation Strategies

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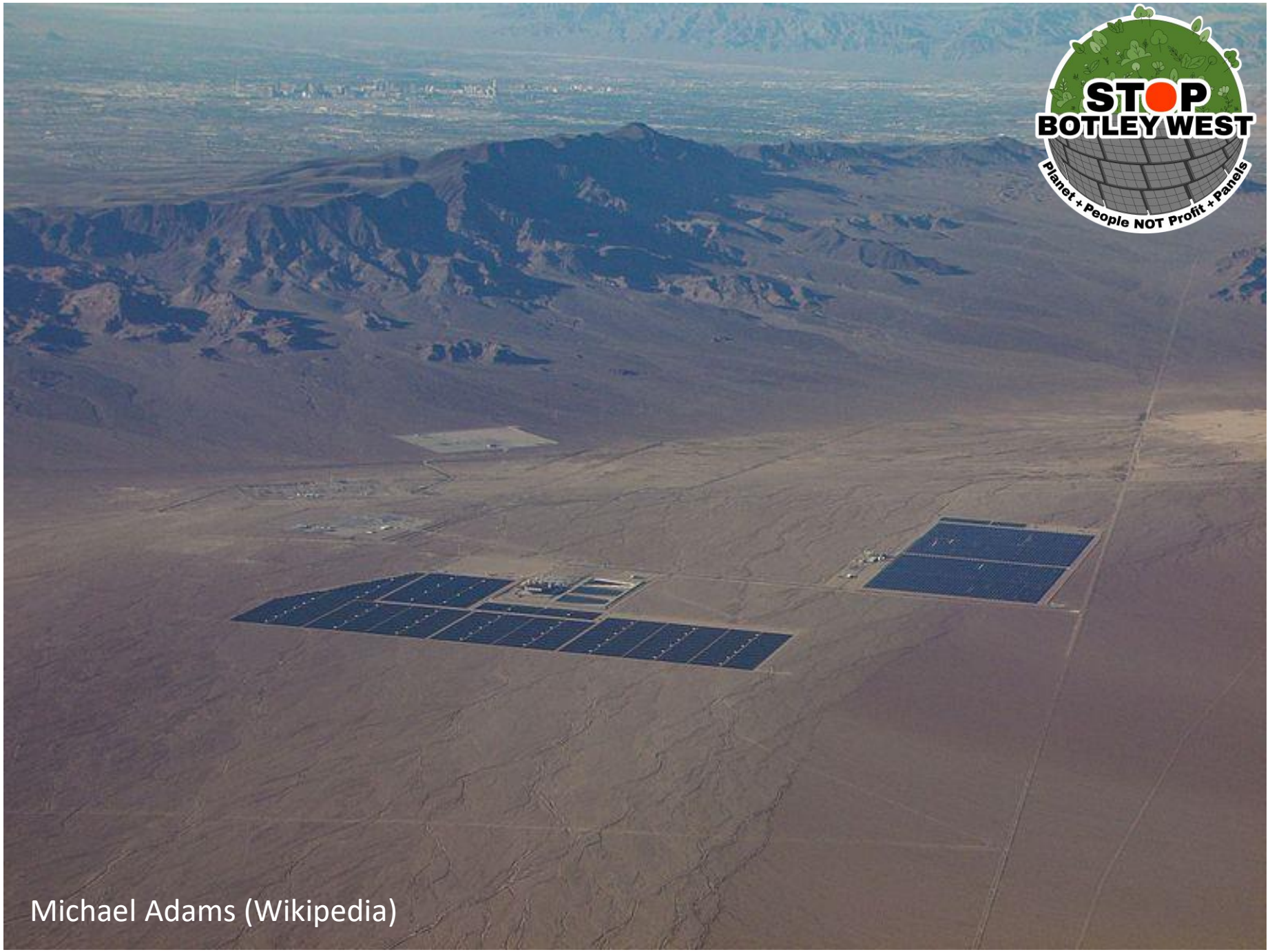
Planet + People NOT Profit + Panels

Midgeley et al 2012

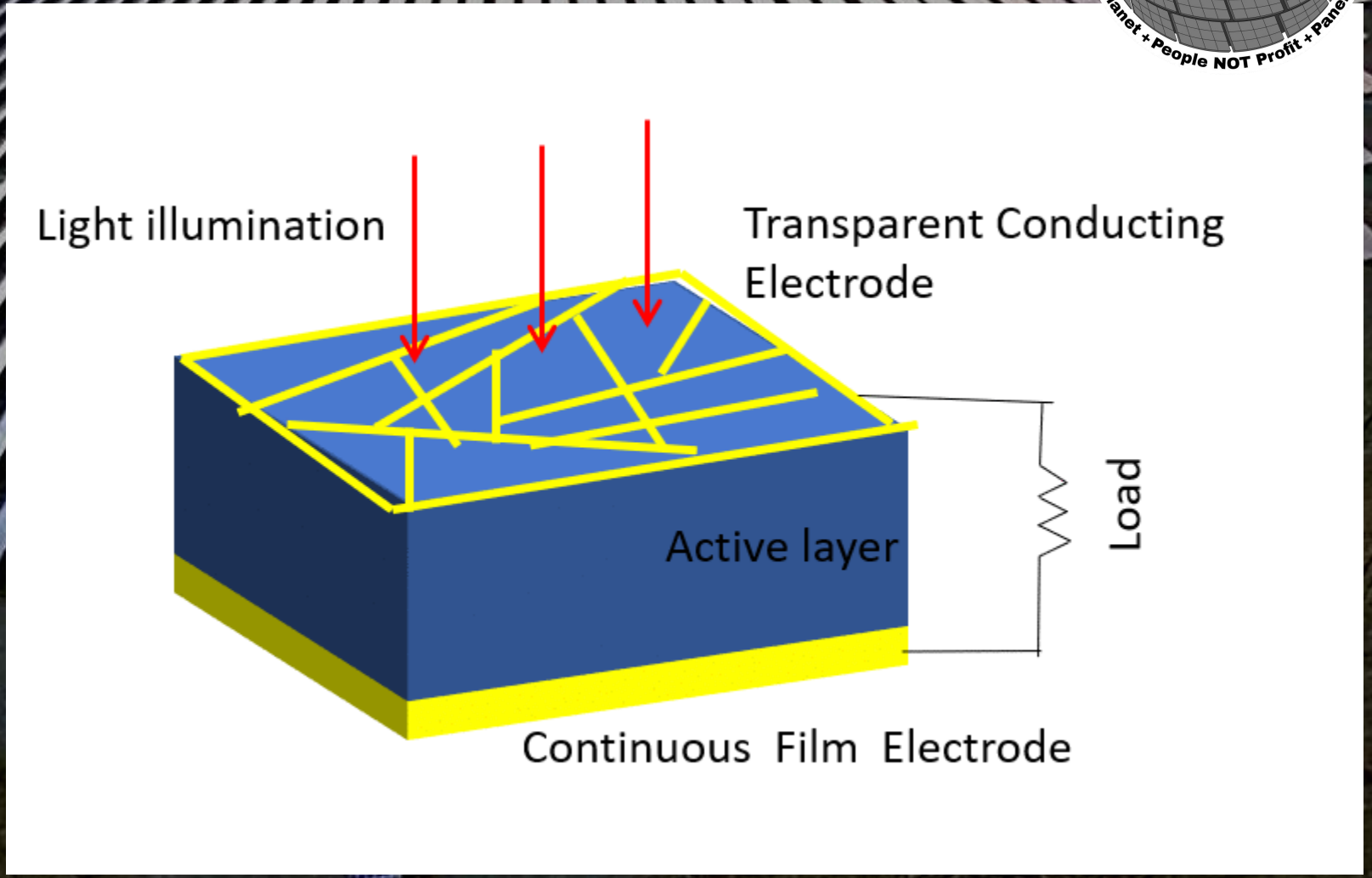
- Botley West is one of the largest solar power stations in the world
- 18 of the other top 20 largest schemes are located in desert / arid land (one other on farmland in Vietnam)
- Few people, high solar insolation, no impact on food production



Michael Adams (Wikipedia)

How a Solar Panel Works

Light transmits through transparent conducting electrode creating electron hole pairs, which are collected by both the electrodes. The absorption and collection efficiencies of a solar cell depend on the design of transparent conductors and active layer thickness.



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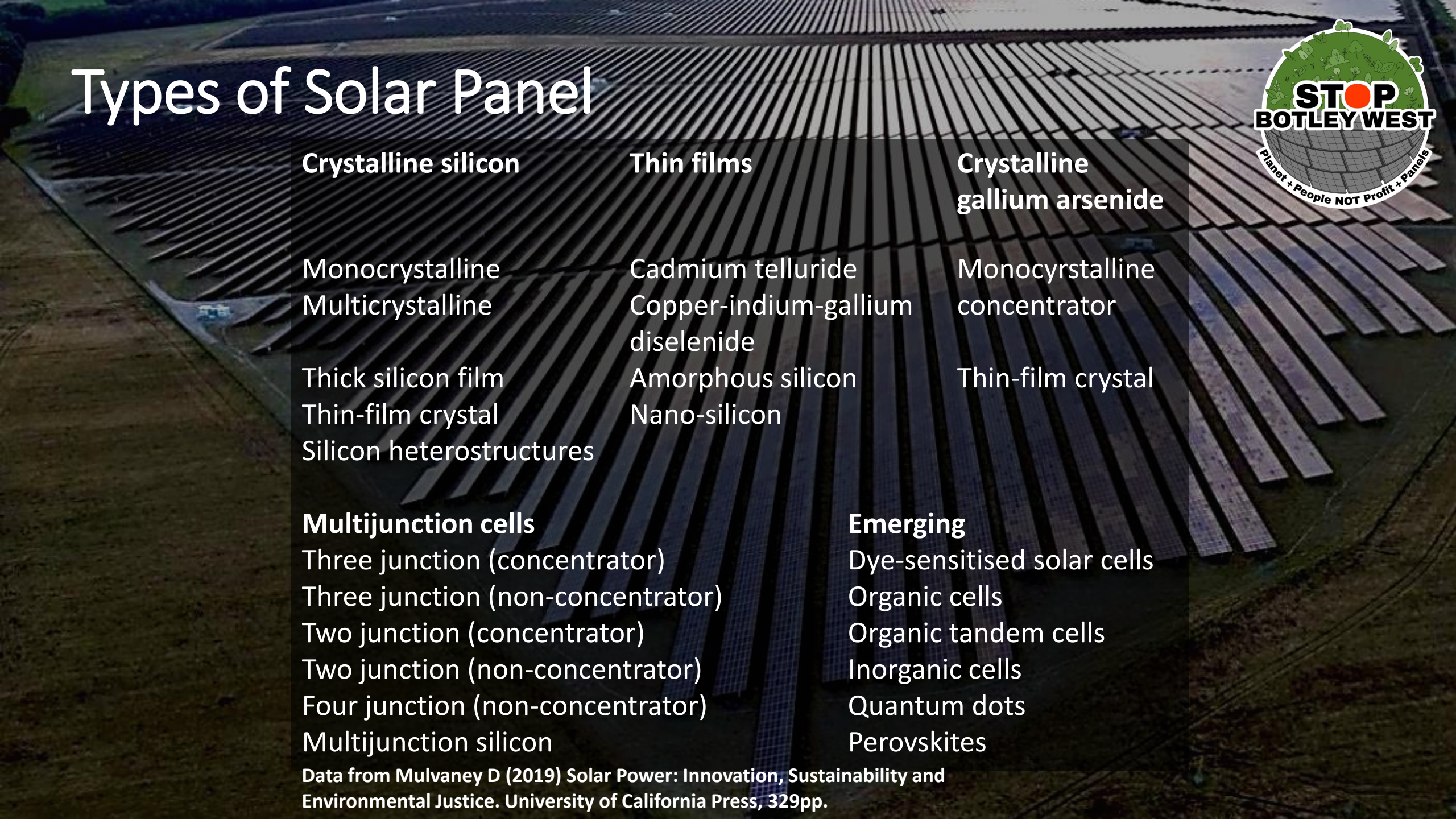
Types of Solar Panel



Crystalline silicon

Monocrystalline
Multicrystalline

Thick silicon film
Thin-film crystal
Silicon heterostructures

Thin films

Cadmium telluride
Copper-indium-gallium diselenide
Amorphous silicon
Nano-silicon

Crystalline gallium arsenide

Monocyrstalline concentrator

Thin-film crystal

Multijunction cells

Three junction (concentrator)
Three junction (non-concentrator)
Two junction (concentrator)
Two junction (non-concentrator)
Four junction (non-concentrator)
Multijunction silicon

Emerging

Dye-sensitised solar cells
Organic cells
Organic tandem cells
Inorganic cells
Quantum dots
Perovskites

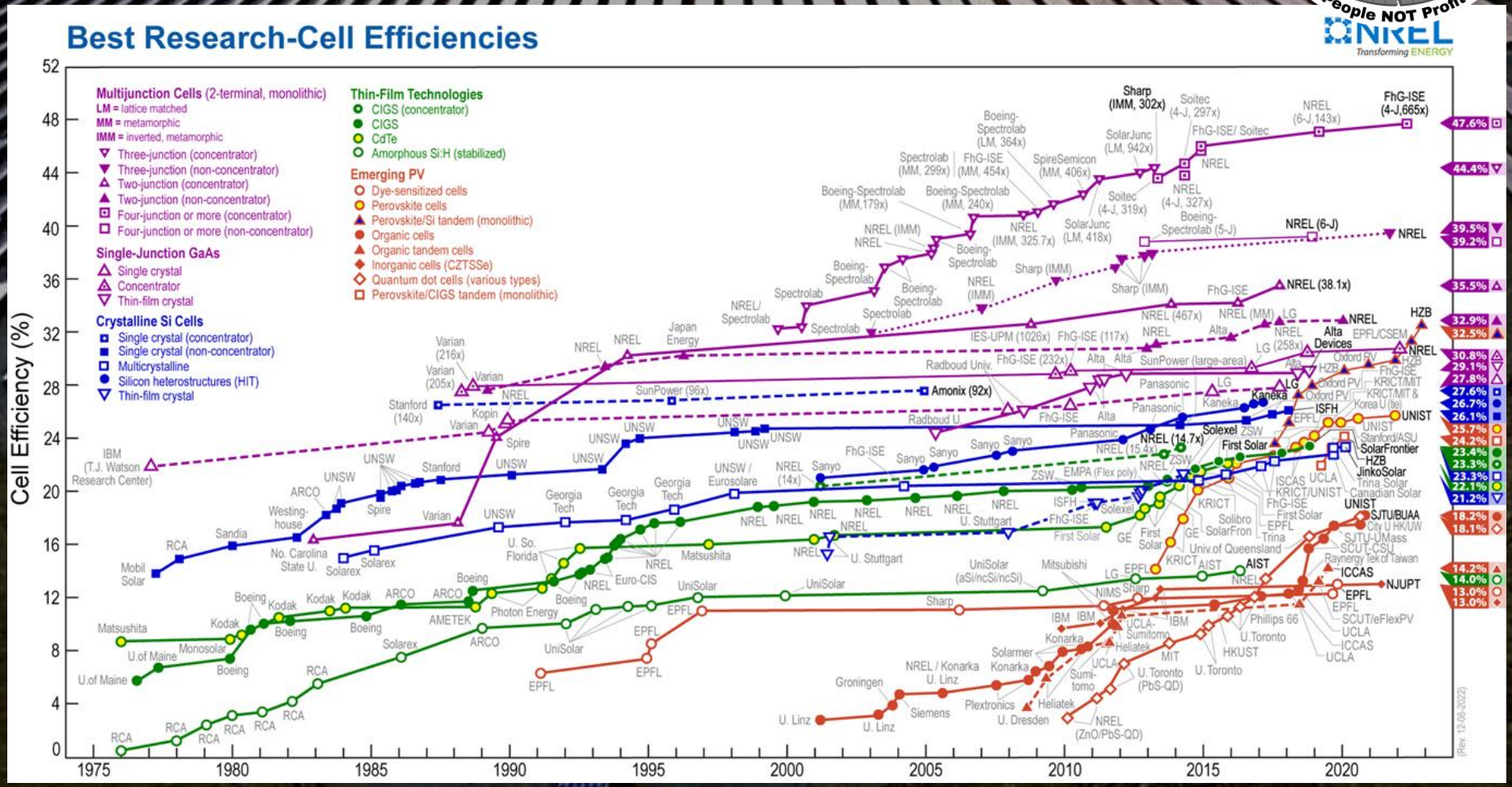
Data from Mulvaney D (2019) Solar Power: Innovation, Sustainability and Environmental Justice. University of California Press, 329pp.

Solar Panel Efficiency

Solar panel with 20% efficiency and an area of 1m² will produce 200kWh/yr at standard test solar irradiance (1000W/m²)

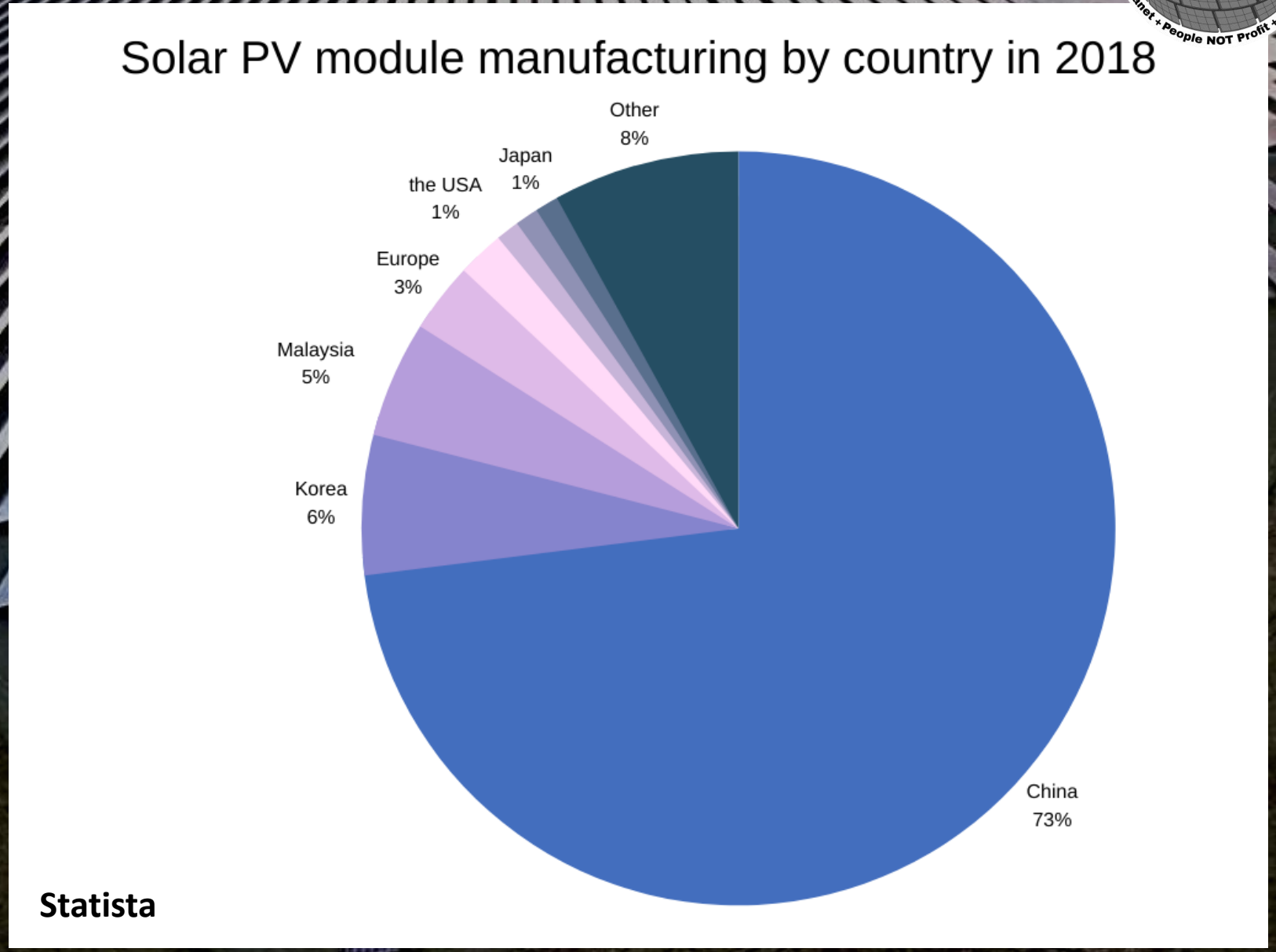
High yield solar irradiance area (e.g. central Colorado) a panel will produce 400kWh/yr energy

In an area like the southern UK you could expect 175kWh/yr



Solar Panels: The Human Rights Issues

- Currently more than 70% of solar PV modules are made in China
- There is a significant human rights issue in solar panel supply chains as a result of forced labour from the Uyghur population in Xinjiang
- Up to 95% of the silicon ingots and wafers are made in China and up to 97% of solar panels could contain materials made by Uyghur forced labour (Unison, 2022)



Solar Panels Contain Toxic Materials (But....)

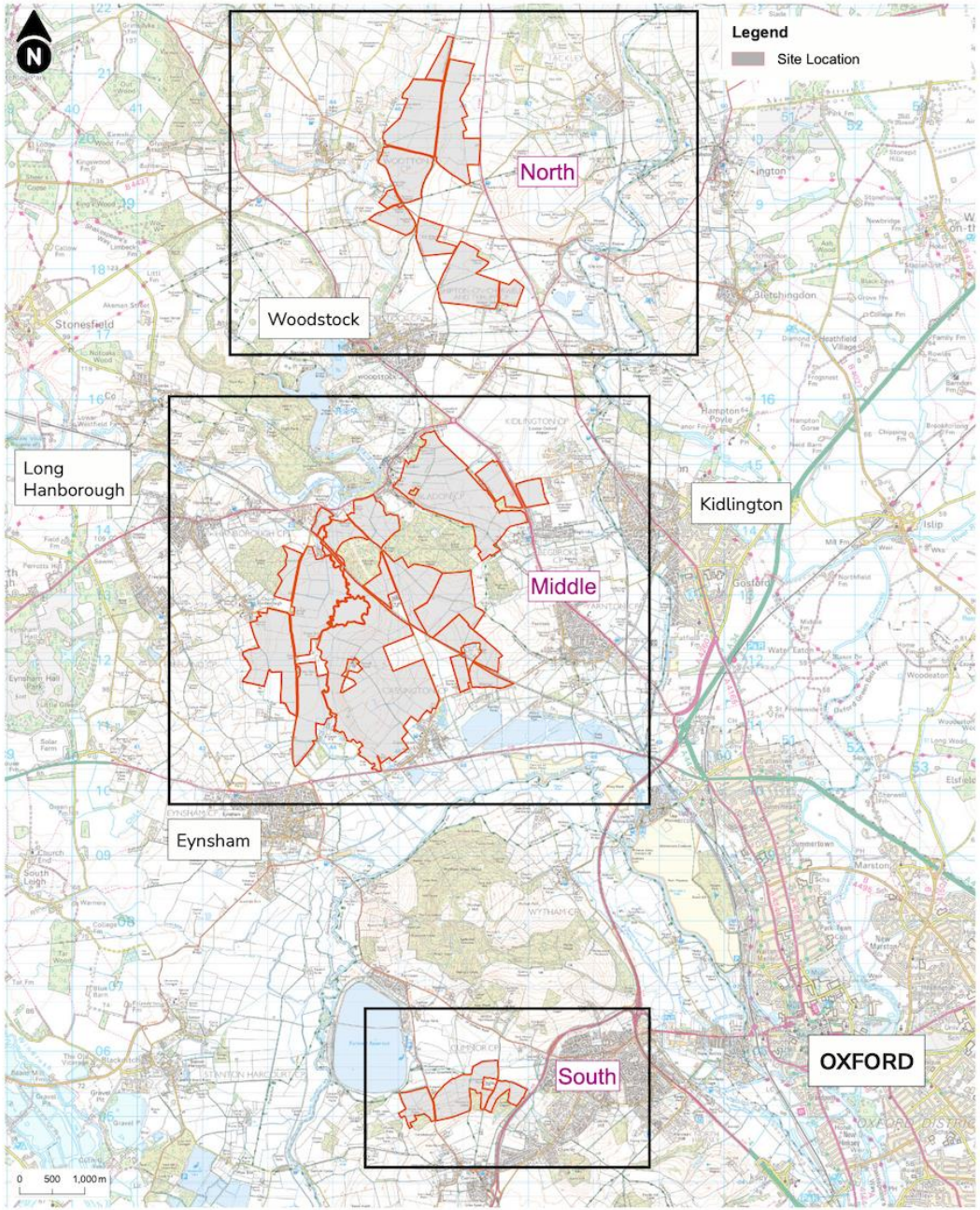
PV Type	Chemical Hazards
Crystalline silicon	Silicon tetrachloride waste, lead in solder and metallization pastes, strong acids (HF, HCl), caustics (NaOH), solvants, dopants, pyrophoric gases (silane)
Amorphous silicon (a-Si)	Pyrophoric gases (silane), solvents, indium tin oxide
Cadmium telluride (CdTe)	Cadmium compounds, solvents
Copper-indium-gallium selenide (CIGS)	Cadmium, selenium and indium compounds
Gallium arsenide (GaAs) crystalline	Arsenic compounds, phosphine gas, trichloroethylene
Polymer/organic	Ruthenium, indium compounds, nanoparticles
Dye-sensitised	Indium compounds, nanoparticles, ruthenium

Chemicals are generally used during manufacture. Toxic components in solar cells are sealed off from the outside. Large-scale breakage could be an issue. Disposal must be carefully considered (20-25 year lifetime).

Data from Mulvaney D (2019) Solar Power: Innovation, Sustainability and Environmental Justice. University of California Press, 329pp.

- 1,376 Ha
- 3,400 Acres
- 5 Sq.Miles
- 76% on Greenbelt land
- 2.7 million solar panels
- 111km of fencing
- 306 security camera
- Additional infrastructure
- Cables

Overview Site Location Plan



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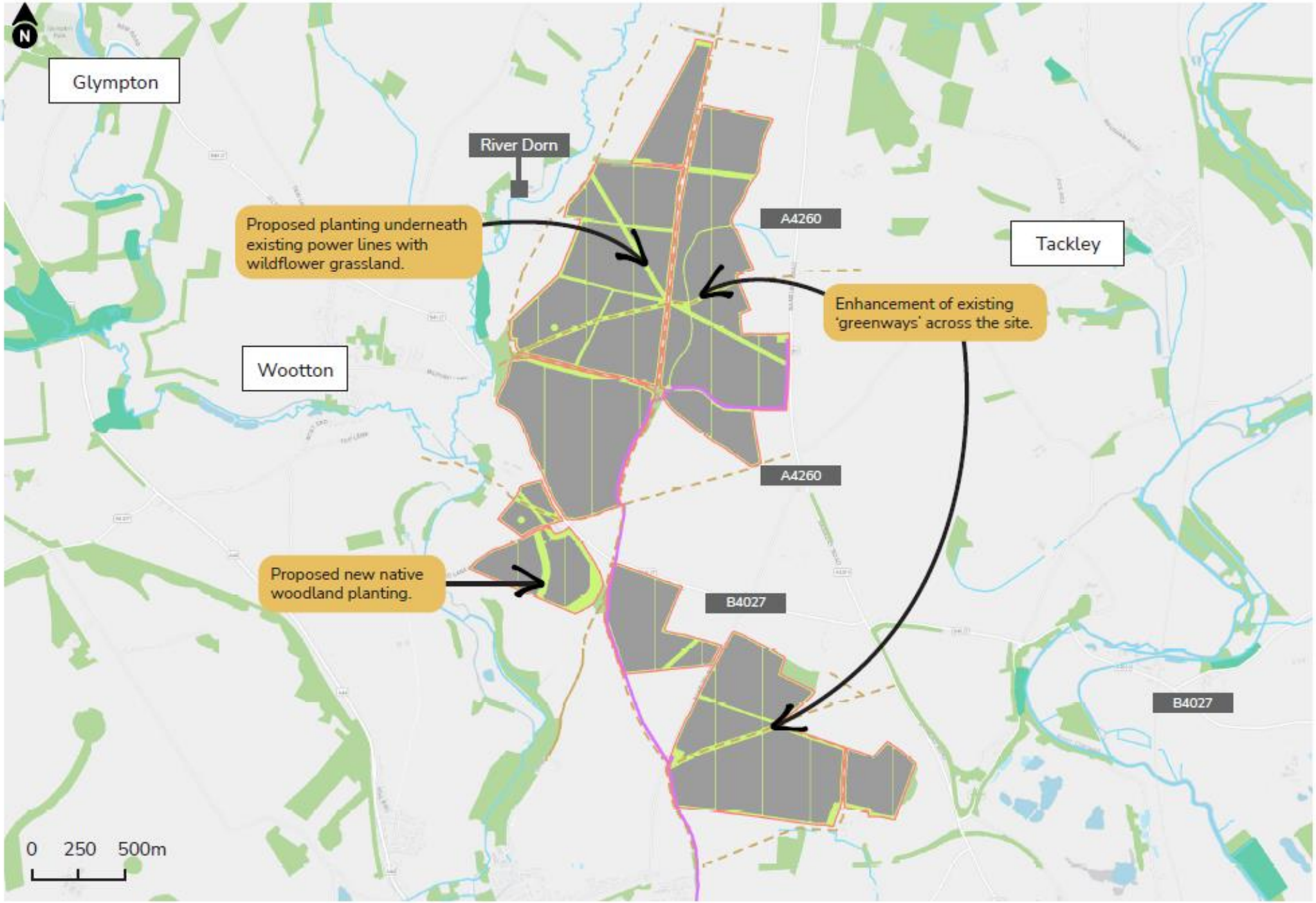

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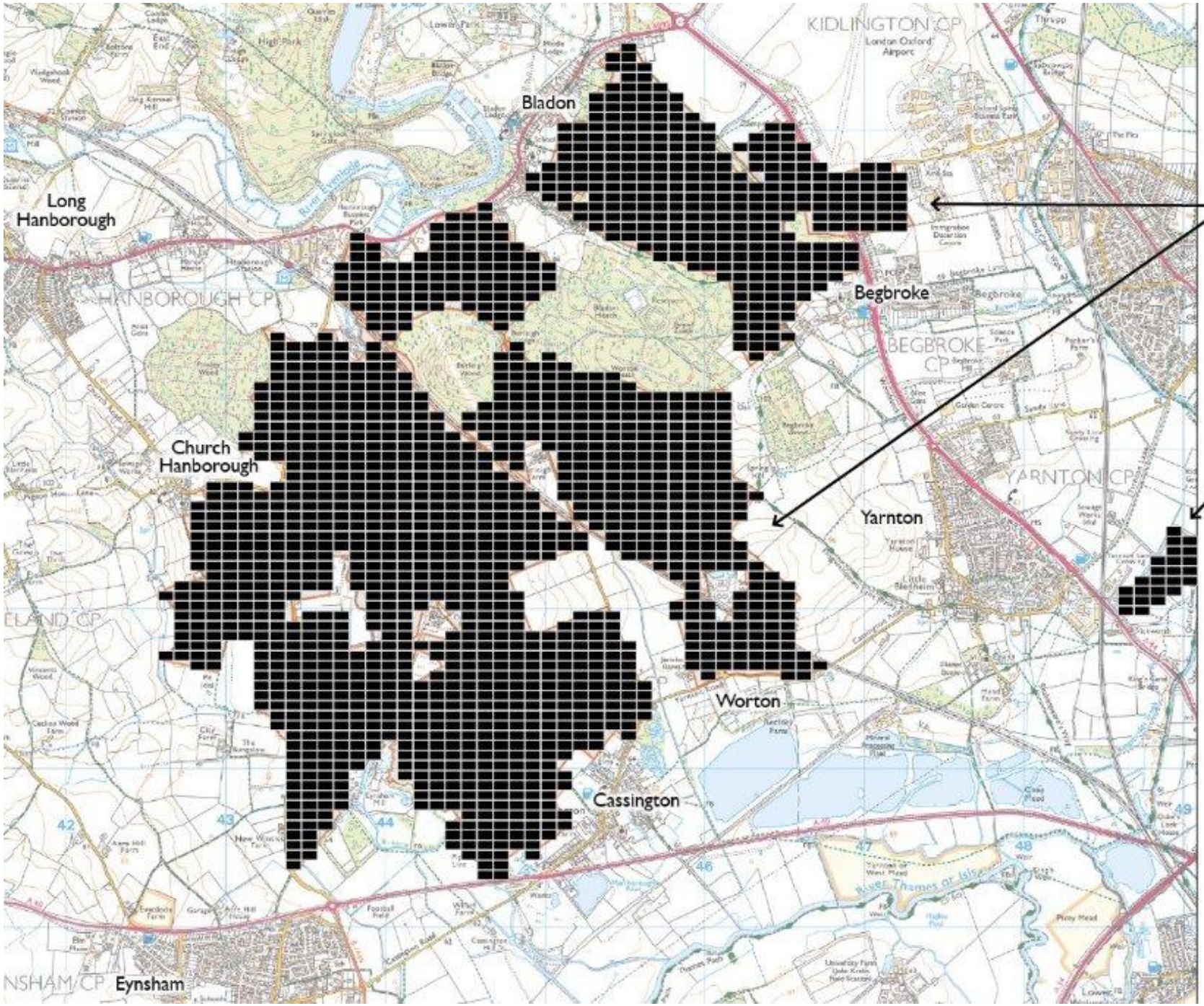
Northern Part of Scheme PVDP Nov 2022



Botley West Solar Farm
Oxfordshire = **3,500 acres**

This is just the middle part, there's more to the north and south!

Flit Solar Farm, Yarnton just off A44 = **43 acres**

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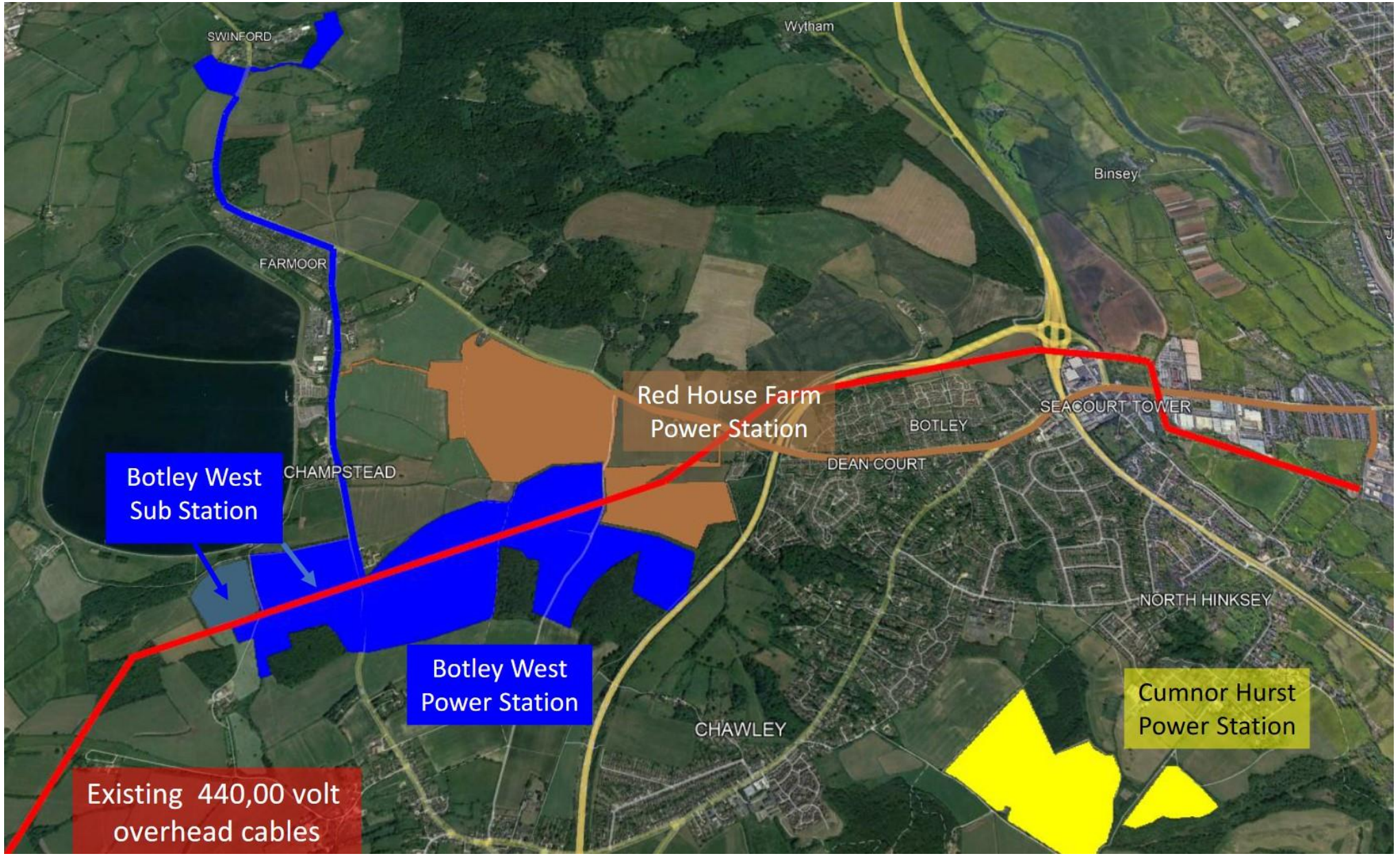
Middle Part of Scheme (Eynsham PC)



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Southern Part of Scheme Cumnor PC Oct 2023

View From Farmoor Reservoir

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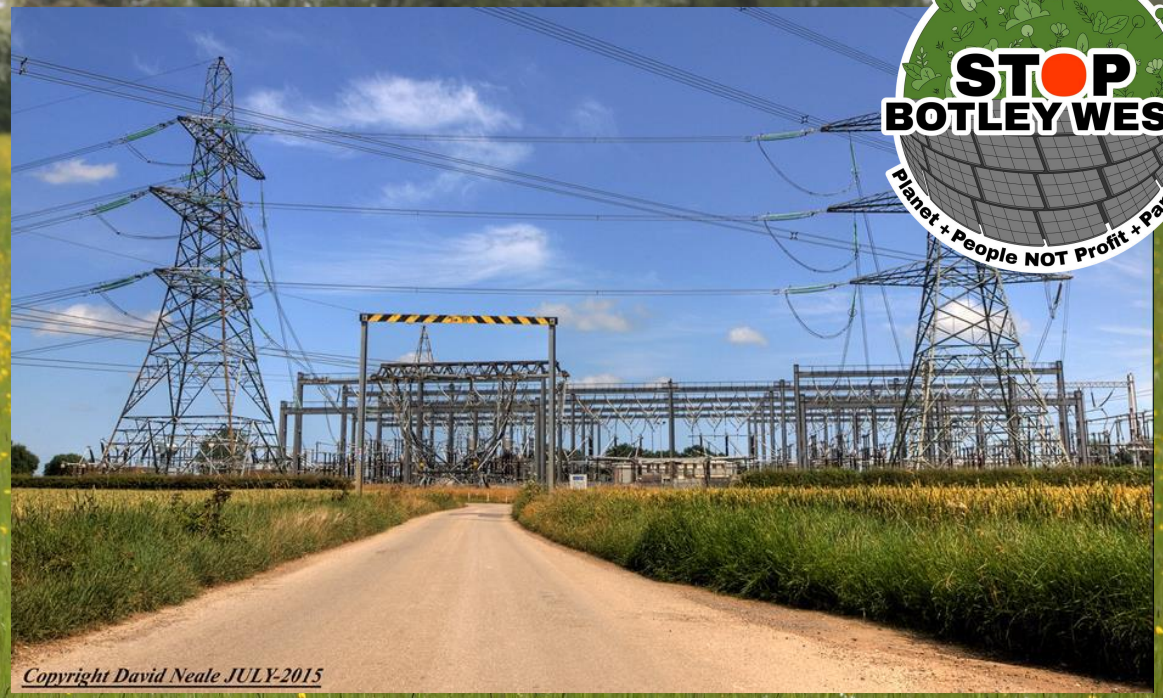
Substation

"A new National Grid Substation, located within or in the vicinity of the site"

Area of 5 football pitches
With substation to a height of 15m (50')
'excluding the connecting tower structures'
covering 3 football pitches

Not this
But
this



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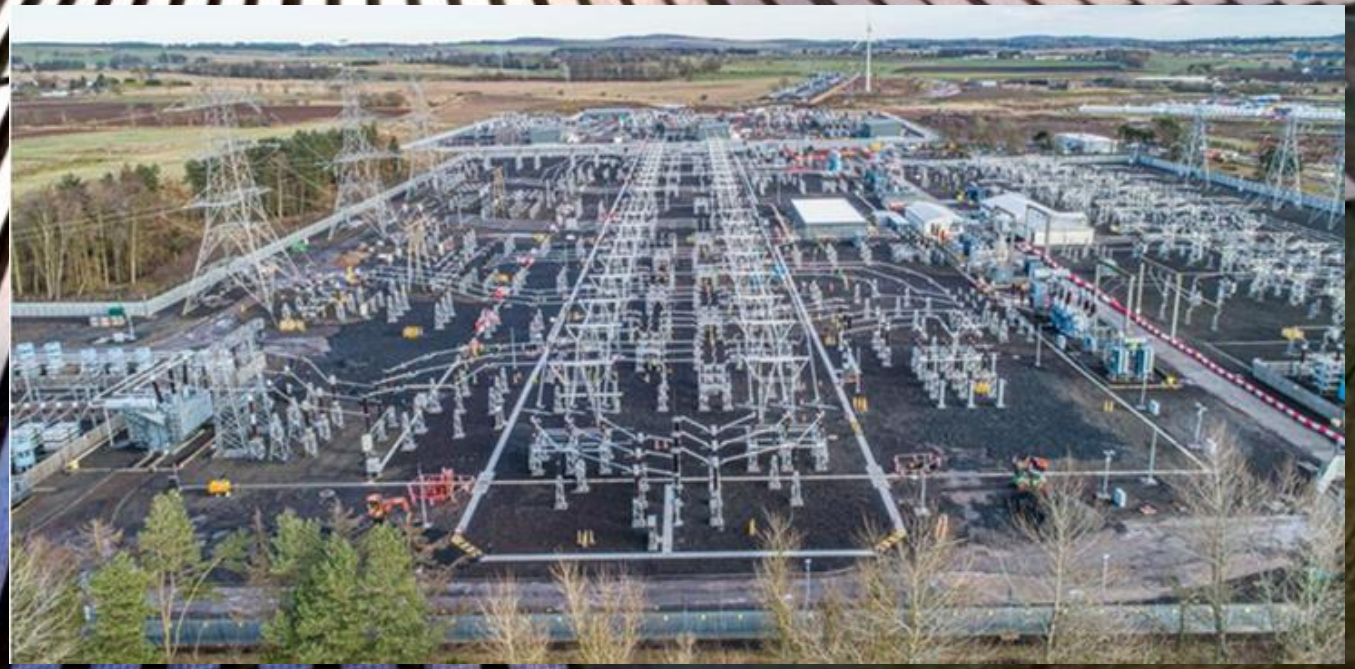
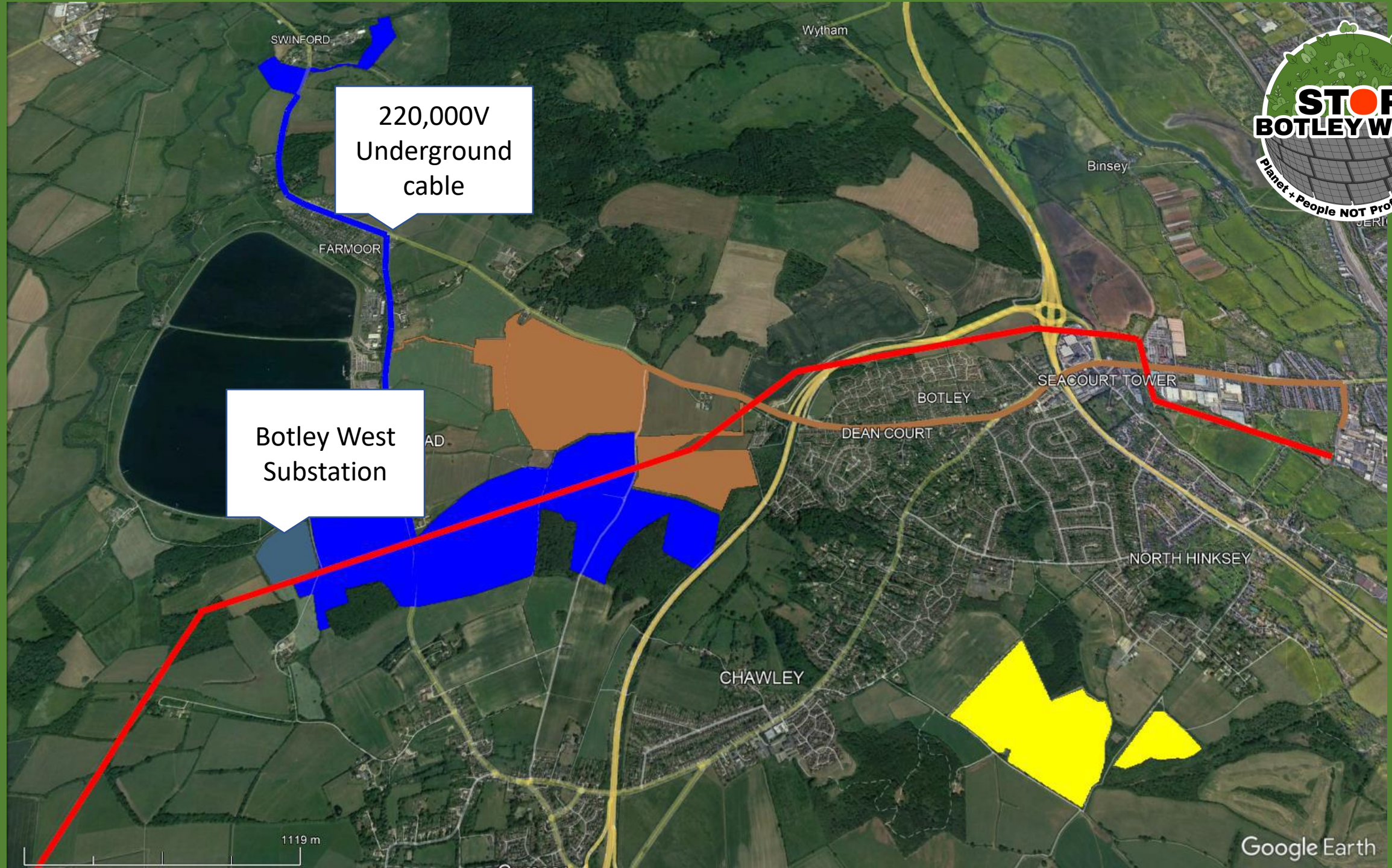
Substation is Likely to be Permanent - Not For 42 years



Sources
Top: Creyke Beck n of Kingston upon Hull
Bottom: Tealing substation, Angus, Scotland



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Underground High Voltage Cable

A cable swathe during construction with a single cable trench open

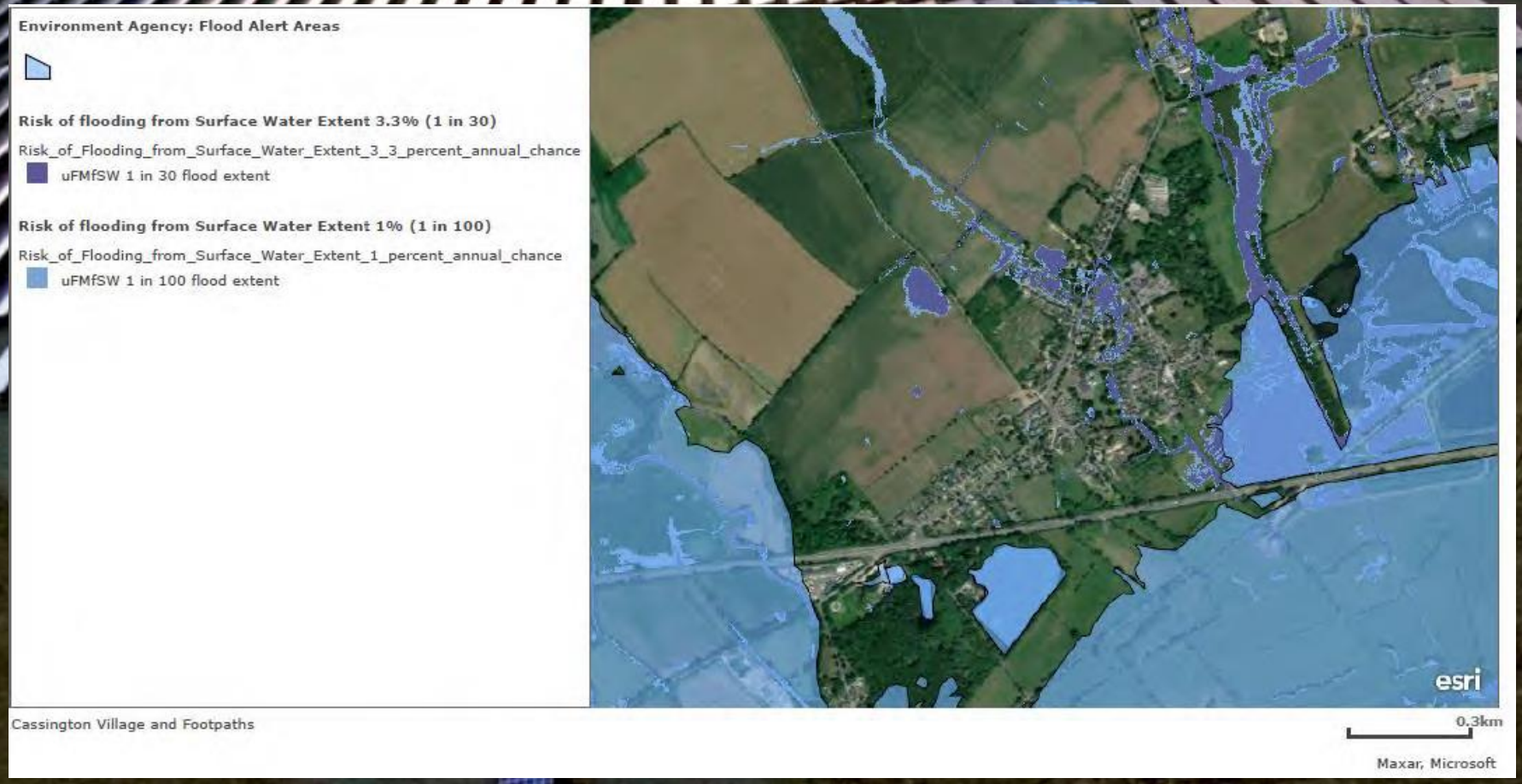
Impacts

- 11,000 households lie within 1.5km of the development
- Agricultural land is good to moderate in quality producing an estimated 7,000t of arable crops
- Flood risks not from rivers but from land runoff
- Loss of amenity (visual impacts from villages, green aspect of footpaths impacted)
- Dark skies (PIR activated lights / cameras)
- Impacts on wildlife / biodiversity (barriers to dispersal, impacts on bats / birds including RSPB red-listed species, grazing)
- Impacts on National Heritage including the setting of Blenheim Palace itself as a UNESCO World Heritage Site

House Prices

- Almost all studies to date on the effects of solar farms show a negative impact on house values
- Generally proportional to the distance to the solar farm and its size
- Already evidence of an impact on people’s willingness to buy in Cassington while the planning process is in progress

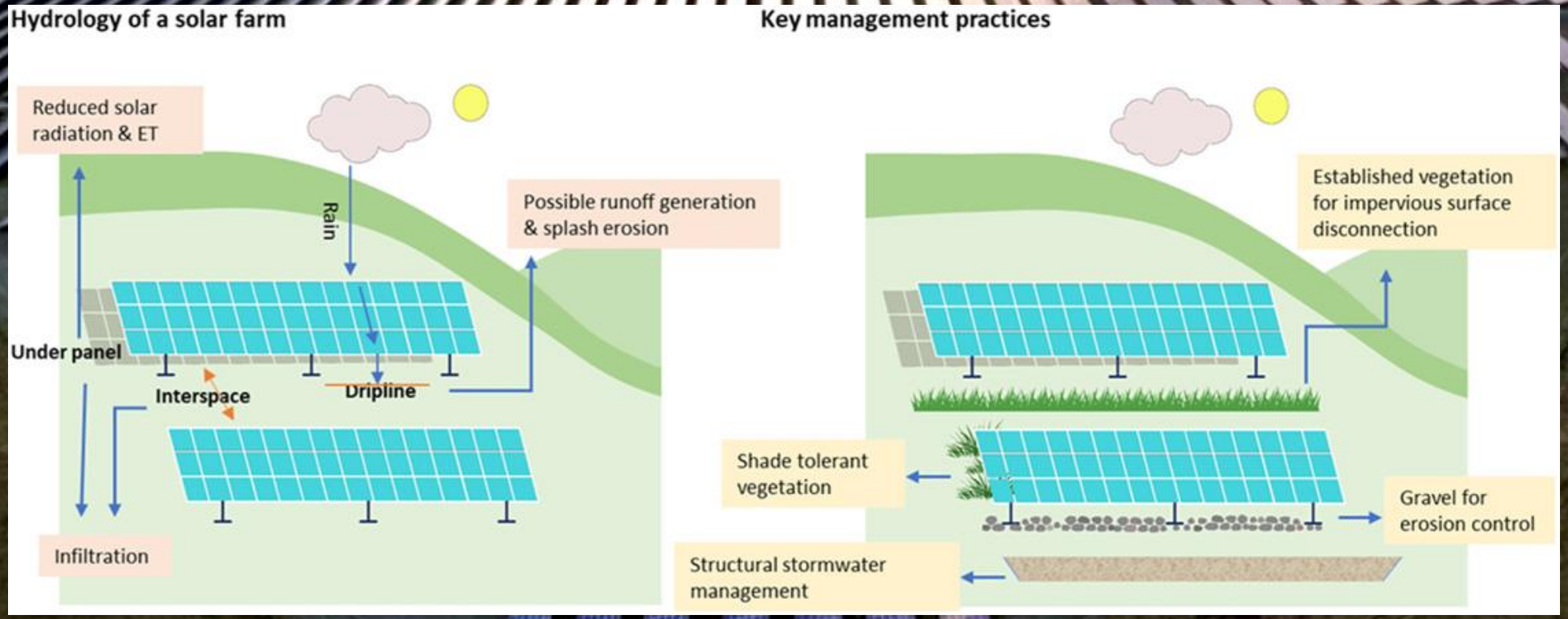
Effects on the Land: Flooding



Cassington, Worton and Yarnton have a history of surface-water flooding

Solar Arrays Affect Hydrology

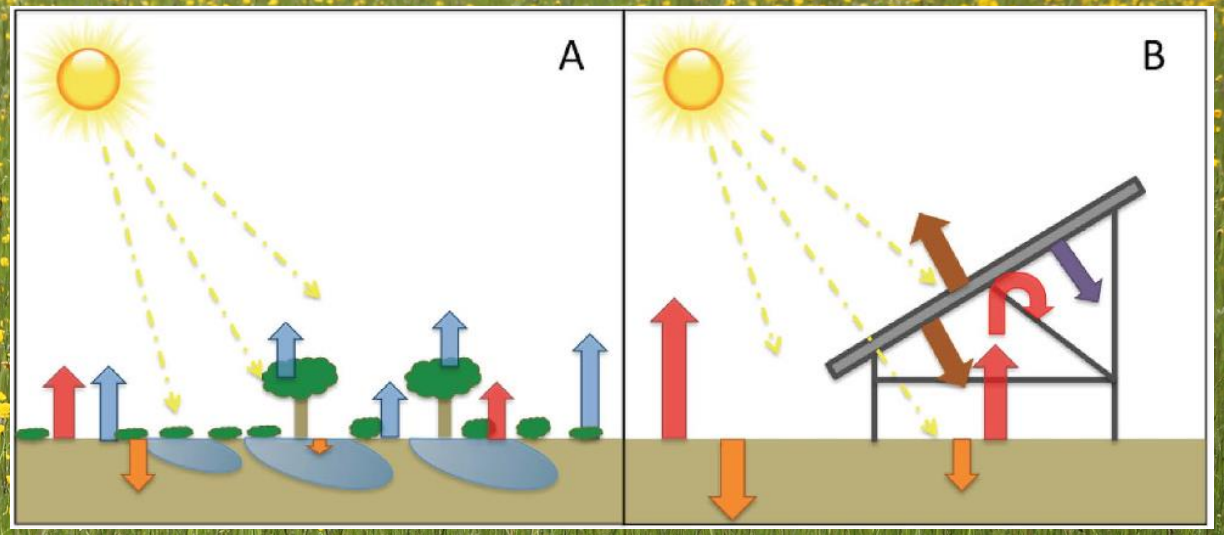
- Changes in soil moisture
- Increased surface water runoff
- Increased erosion?
- Awaiting PVDP's proposals for mitigation



Key effects of solar farms on hydrology (left) and some management practices to reduce stormwater flow (right) Yavari et al (2022) Environmental Research: Infrastructure and Sustainability 2: 032002

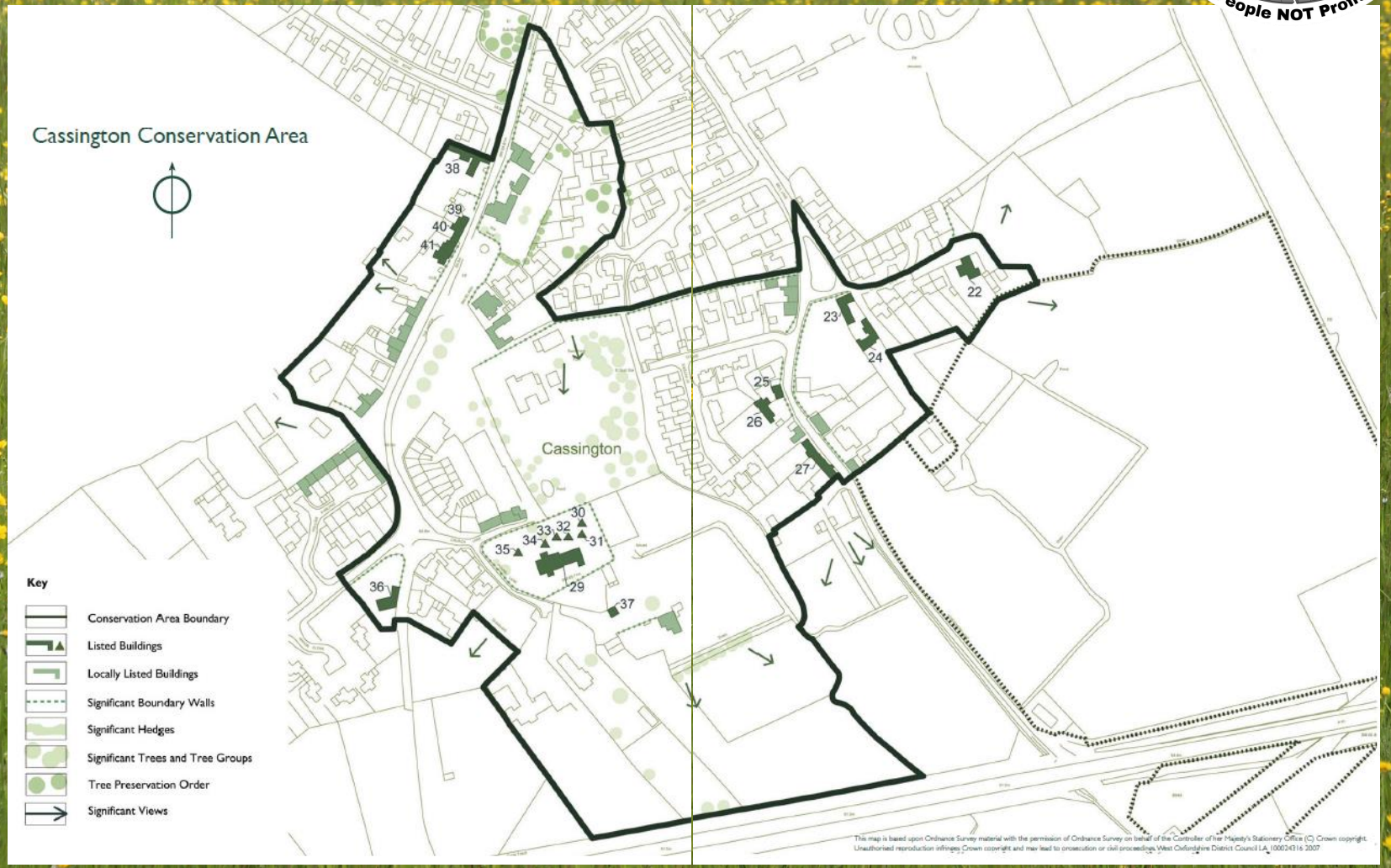
Solar Power Stations: Heat Island Effect

- Measurements undertaken over a solar power station versus surrounding wildlands
- Temperatures over the PV plant regularly 3-4^{o} higher than surrounding wildlands at night
- Significant concern given rising summer temperatures for residents and wildlife

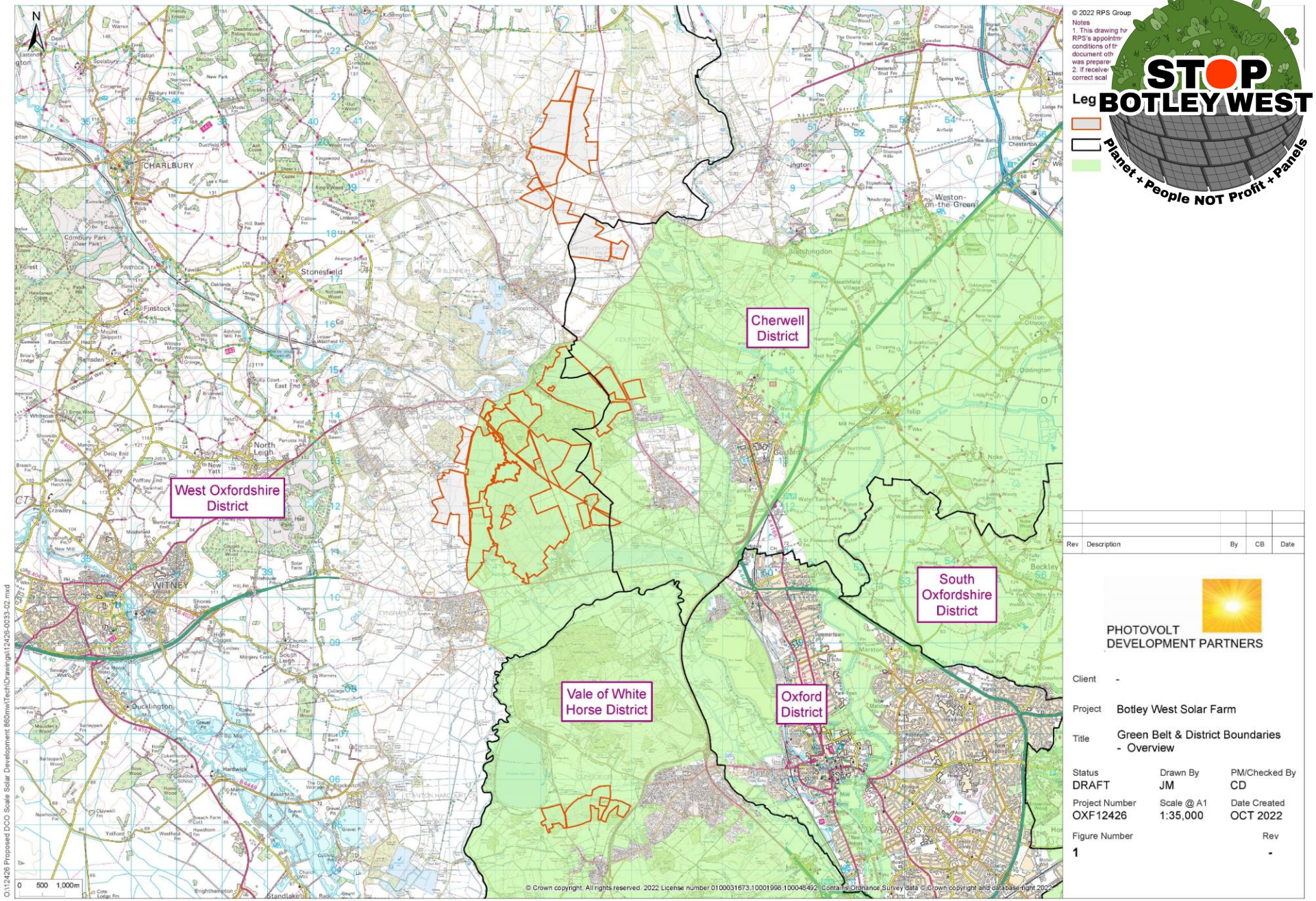


Midday energy exchange in a vegetated ecosystem versus a solar power station shows altered energy fluxes. Vegetation reduces heat capture and storage in soils and evapotranspiration removes energy. These heat fluxes are reduced in solar arrays. Barron-Gafford et al (2016) Scientific Reports 6: 35070

Effects On The Land: Visual Landscape



76% of the Botley West Utility Scale Power Station is on Greenbelt land



Solar Power Stations: The Data Problem

- There is not much information on the impacts of solar farms on the environment or people especially in the UK
- University of Bristol study on bats and solar farms
- Bat activity is reduced over solar farms compared to sites without panels
- Common pipistrelles show a reduction of 40% activity at solar farm edges and 86% reduction in the centre!
- Soprano pipistrelles, noctules, serotines, myotis bats and long eared bats also affected
- Overall bat activity halved at solar farm boundaries and reduced by 2/3rds at centre

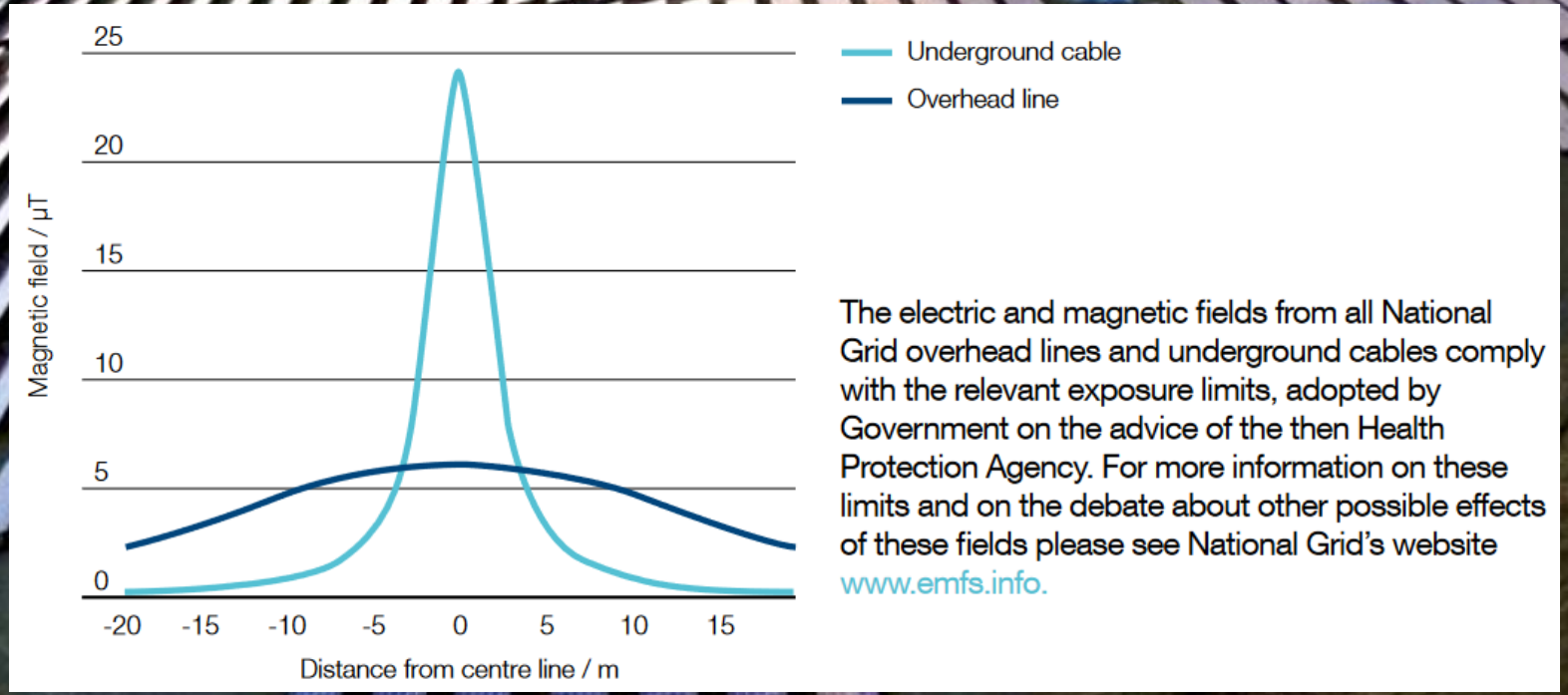
iBat Project

Bird Mortality

- Nature restoration in the Cassington gravel pits and the Thames means that there are high concentrations of aquatic birds present
- In the US studies have shown these mistake panels for water causing high mortality
- Estimates from the US = 11.61 birds per year per MW of installed solar panels
- Equates to 390,000 birds over a 40-year operating period for Botley West

Biological Effects of Electromagnetic Fields

- **In underground cables electrical fields are shielded**
- **Magnetic field rapidly declines with distance**
- **UK epidemiology studies indicate no link between magnetic fields from underground cables and childhood leukaemia**
- **There is a significant correlation between EMF and reduced birth weights**



See: Bunch KJ et al (2015) *Journal of Radiological Protection* 35: 695
De Vocht & Lee (2014) Environment International 69: 51-57

Electromagnetic Fields and Wildlife

- Low level EMF can have myriad adverse effects including on: orientation, migration, finding food, reproduction, nest and den building
- Effects observed on deer, bats, birds, insects, reptiles, amphibians and many others
- Honey bees can detect field fluctuations of 26nT against background Earth's magnetic field

Blake Levitt et al (2022) Reviews in Environmental Health 37: 327-406


Lviator


Andreas Trepte


Bat Conservation Trust

The Need for Such a Large-Scale Scheme

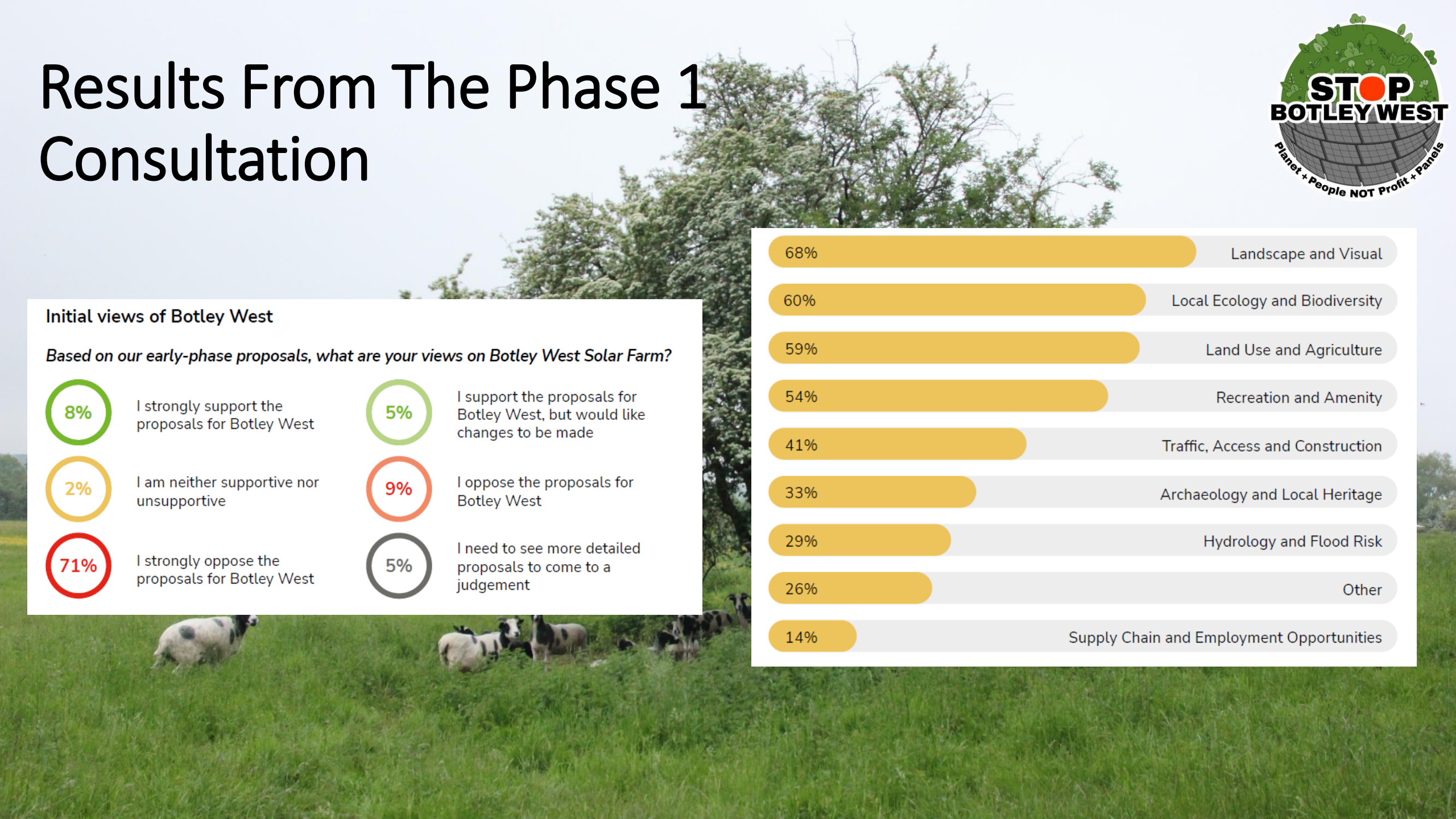
- Oxfordshire already generates 3% of the U.K.'s solar energy (double its share of emissions and 3x national average)
- Already 800MW of capacity installed, planned and approved (CPRE Oxfordshire)
- To maintain 3% share Oxfordshire needs 728-868 MW by 2030 and by 2050 1,679 – 2,253 MW
- Annual solar energy striking rooftops in 2012 was equivalent to 57% of Oxfordshire's energy demand in 2015 – solar on roofs/brown field sites
- Significant increases in the efficiency of photovoltaics so need for land is decreasing
- What about other alternatives (energy saving, wind, water)?

The National Need for Such a Large-Scale Scheme

- New study from University of Oxford's Smith School has estimated the combined wind and solar potential of the UK is 2,896 TWh/yr
- This is nearly twice the maximum energy demand of the UK by 2050 (1,500TWh/yr)
- Offshore wind can provide 2,120TWh/yr so why the need for solar?
- Solar is attractive because it is cheap
- Report is dismissive of solar on roofs and brown field sites (really doesn't consider them)
- Report recommends removing planning barriers to solar and wind which they blame for the slow up take (see Labour policy statements)
- They state: *"Bans on renewable energy installations are out of step with the British public, who overwhelmingly support more renewable energy in the UK in opinion polls."*

How Might We As A Community Address The Need For Renewable Energy?

Results From The Phase 1 Consultation



Initial views of Botley West

Based on our early-phase proposals, what are your views on Botley West Solar Farm?

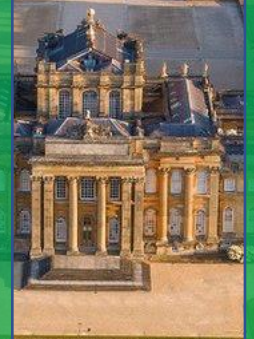
8%	I strongly support the proposals for Botley West	5%	I support the proposals for Botley West, but would like changes to be made
2%	I am neither supportive nor unsupportive	9%	I oppose the proposals for Botley West
71%	I strongly oppose the proposals for Botley West	5%	I need to see more detailed proposals to come to a judgement

68%	Landscape and Visual
60%	Local Ecology and Biodiversity
59%	Land Use and Agriculture
54%	Recreation and Amenity
41%	Traffic, Access and Construction
33%	Archaeology and Local Heritage
29%	Hydrology and Flood Risk
26%	Other
14%	Supply Chain and Employment Opportunities

Who are the Developers?

- PVDP – Photovolt Development Partners
- Owner of Solar 5
- Search for landowners in southern UK
- Essentially speculation (as USA)
- 2 Shareholders
- Yulia Lezhen (aka Lejeune)
  - Wife of Dmitry Glukhov (deceased)
  - Implicated in financial malpractice and under investigation (according to Private Eye)

Blenheim Palace



Blenheim Palace Heritage Foundation

The Blenheim Estate

Blenheim Palace Heritage Foundation

- Charity established in 2015
- Benefits the public and humankind
- For the stewardship of the UNESCO World Heritage Site
- Includes the palace and precious buildings in the grounds
- Open to the public
- Owns two companies (Love Water Ltd.; Blenheim Visitors Ltd.)

The Blenheim Estate

- Private trusts, Ltd. companies, partnerships
- Benefits the Marlborough Family and the Management
- Commercial; land, commercial and domestic buildings, events
- Owns over 30 companies including Pye Homes
- Very complex related party transactions and legal structures
- Has over £164 million in secured and unsecured debt
- £12 million owed to the Foundation (Private Eye 1609)

CEO of both The Foundation and Blenheim Estate

Will "pocket up to £2.5 million if targets for financial returns and asset growth are met"

Private Eye (2023) 1609

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Is this good governance?

Where We Are Now?

1. Pre-Application

- Pre-statutory consultation
- Draft Statement of Community Consultation (SOCC) PVDP to WODC
- Scoping report PVDP to PINS
- Scoping Opinion PINS to PVDP
- Preliminary Environmental Impact Report (PEIR) by PVDP
- SOCC issued by PVDP
- Statutory Community Consultation (November or early 2024?)

2. Acceptance (28 days)

- PVDP submits a Development Consent Order application to PINS
- WODC submits an Adequacy of Consultation Report to PINS
- Application is refused or accepted

3. Pre-examination (3 months)

- PVDP publicises acceptance
- Panel of Inspectors appointed by PINS
- Preliminary meeting held by PINS
- Anyone can register as an Interested Party

4. Examination (6 months)

- Examining Authority examines application
- Interested Parties to submit detailed views
- WODC submit Local Impact Report and Statements of Common Ground

5. Decision (6 months)

- Examining Authority writes recommendation
- Secretary of State makes decision

6. Post Decision (6 weeks)

PVDP or Interested Party can legally challenge the decision

Where We Are Now?

- Merton College have pulled out ~ 5% of the scheme
- Will require some redrawing of plans
- Planning Inspectorate have asked for adjustments to the EIA + further changes to approach to public consultation

Jonas Magnus Lystad

Planning Inspectorate

What Should I do?

- Making yourself fully aware of the proposal and how it will affect you: head over to our Learn More page on the SBW campaign website, which provides a good starting point.
- Preparing for the second round (the 'Statutory' stage) of Community Consultations: what questions do you have about how the proposal will affect you & the Oxfordshire environment, and whether Botley West Solar Park really is the right solution for renewable energy in the UK?
- Volunteering to help the SBW campaign: do you have specific skills to offer or are you a willing campaigner? We are particularly looking for;
  - A suitably experienced Fundraiser
  - A suitably experienced Project Manager
  - Additional administrative support
  - An experienced Social Media operator
- Helping fundraise: fundraising is crucial - it helps the SBW campaign to facilitate a collaborative effort to challenge the development; create access to expertise and information; pool resources to enable an effective, and when necessary, a strong legal challenge. Perhaps you could organise an event to support the campaign?

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Thank you for listening!

https://stopbotleywest.com/home