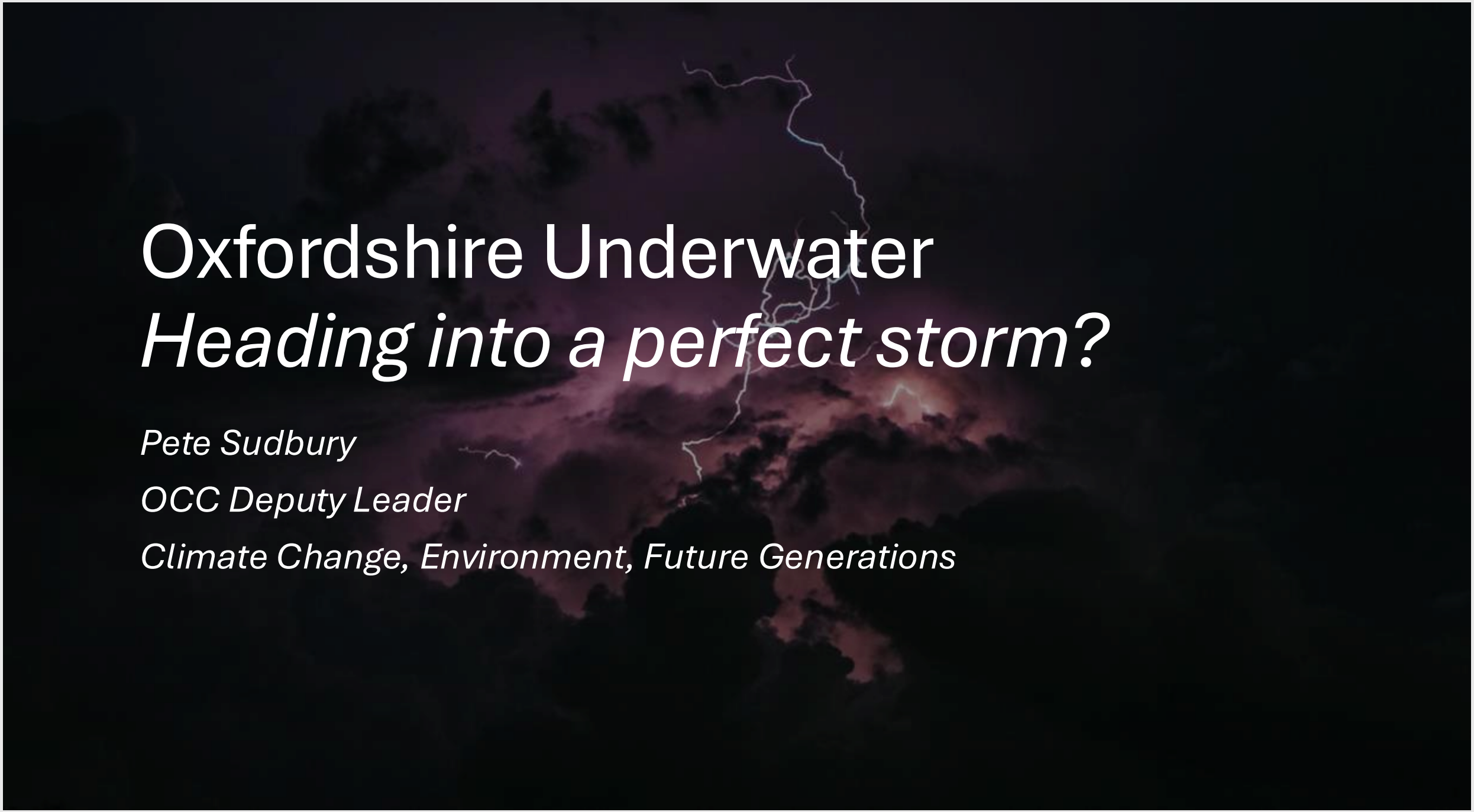
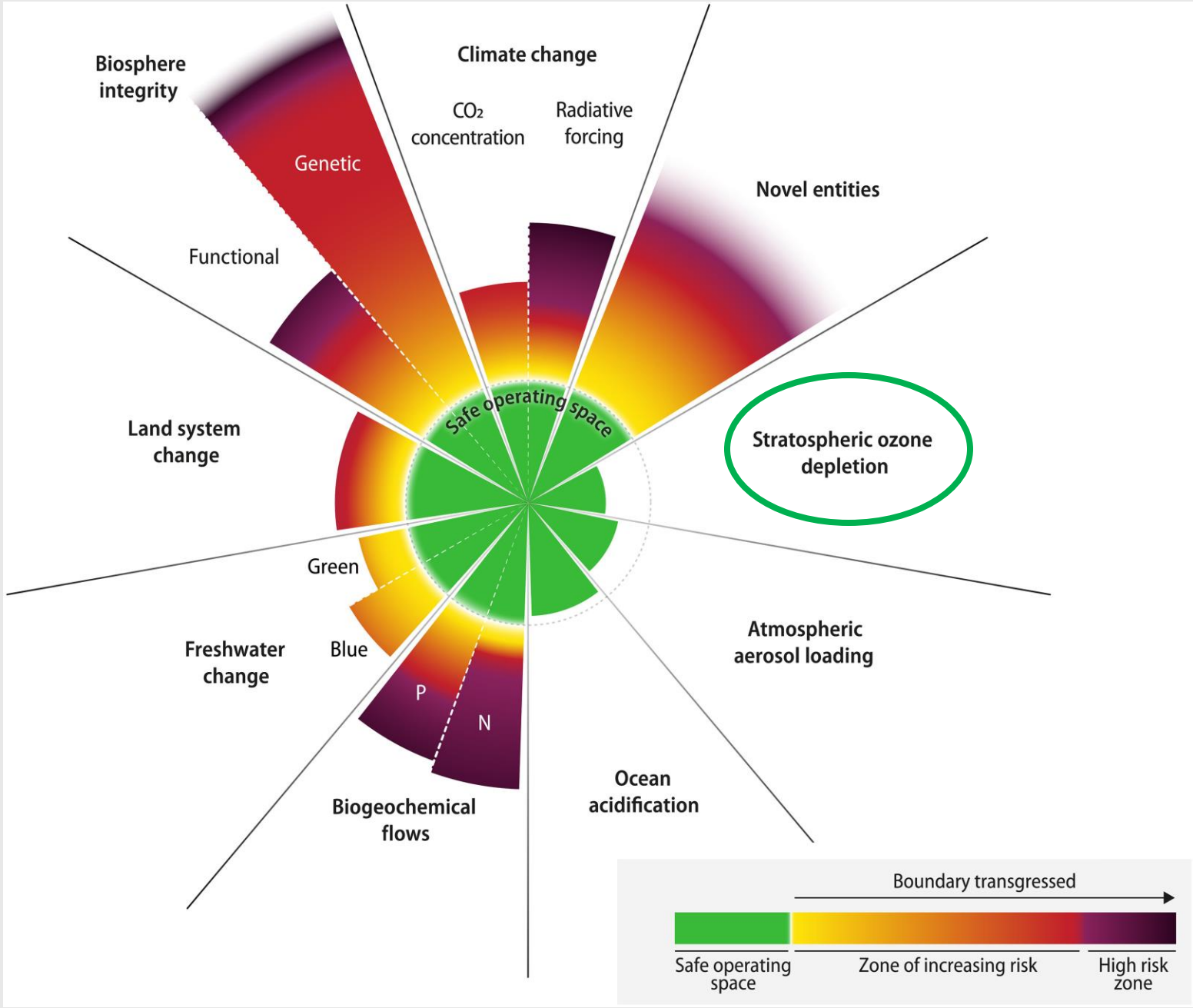


# Oxfordshire Underwater
# *Heading into a perfect storm?*

*Pete Sudbury*

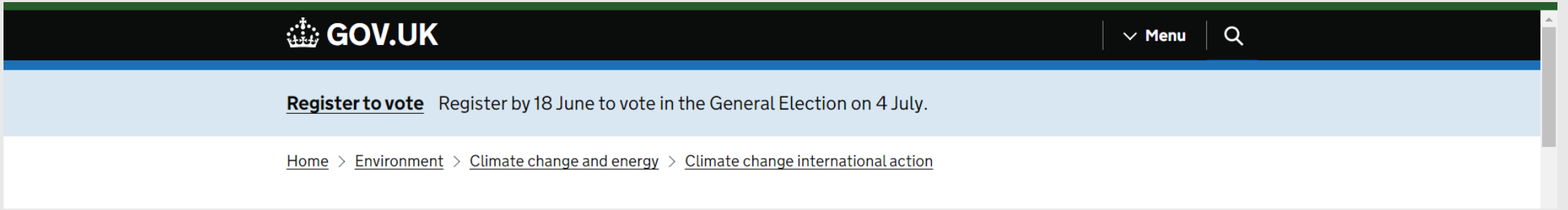
*OCC Deputy Leader*

*Climate Change, Environment, Future Generations*




# The Most Ominous Chart in Human History?

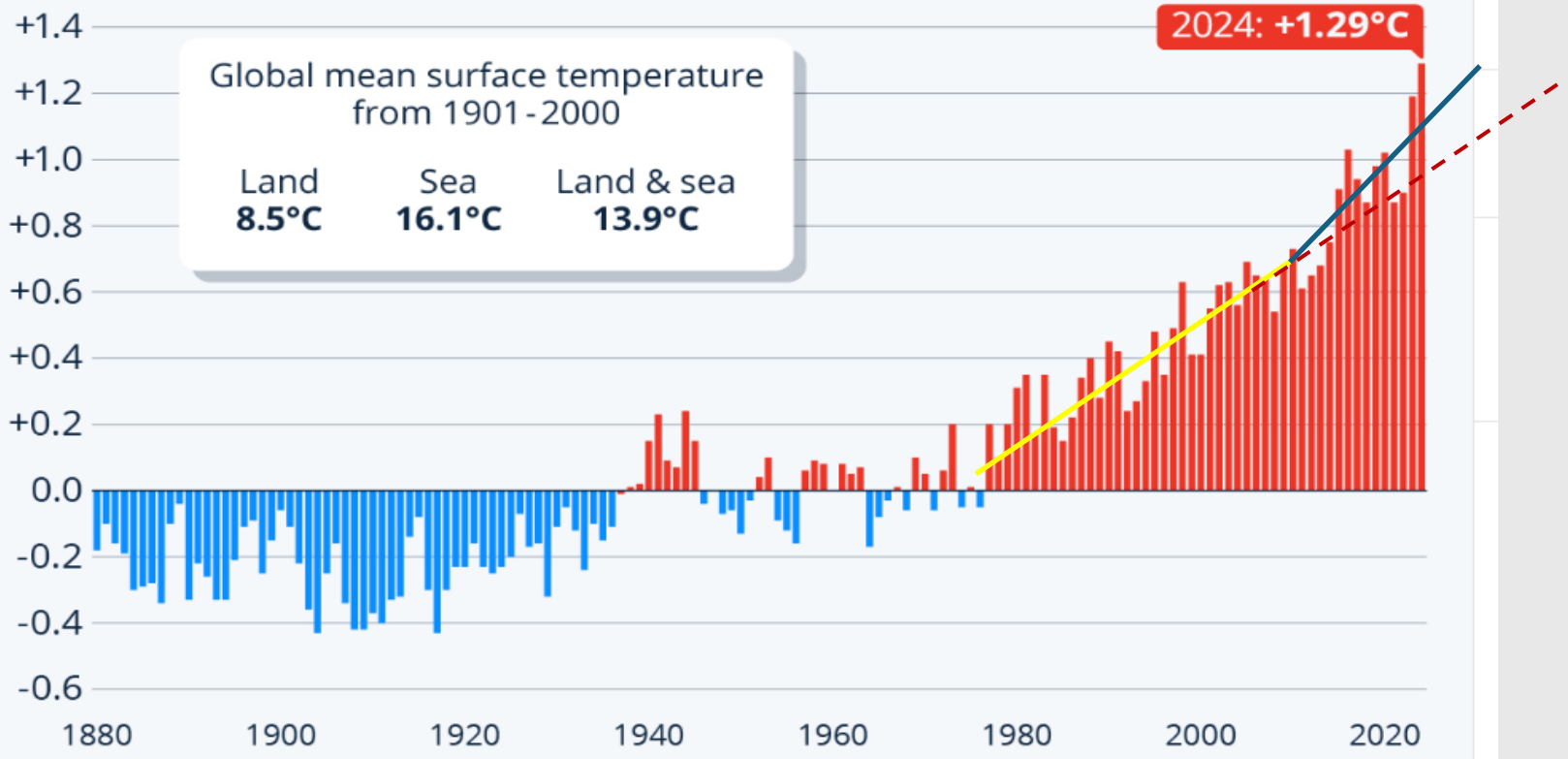
# Climate Scorpion: The Sting is in the Tail



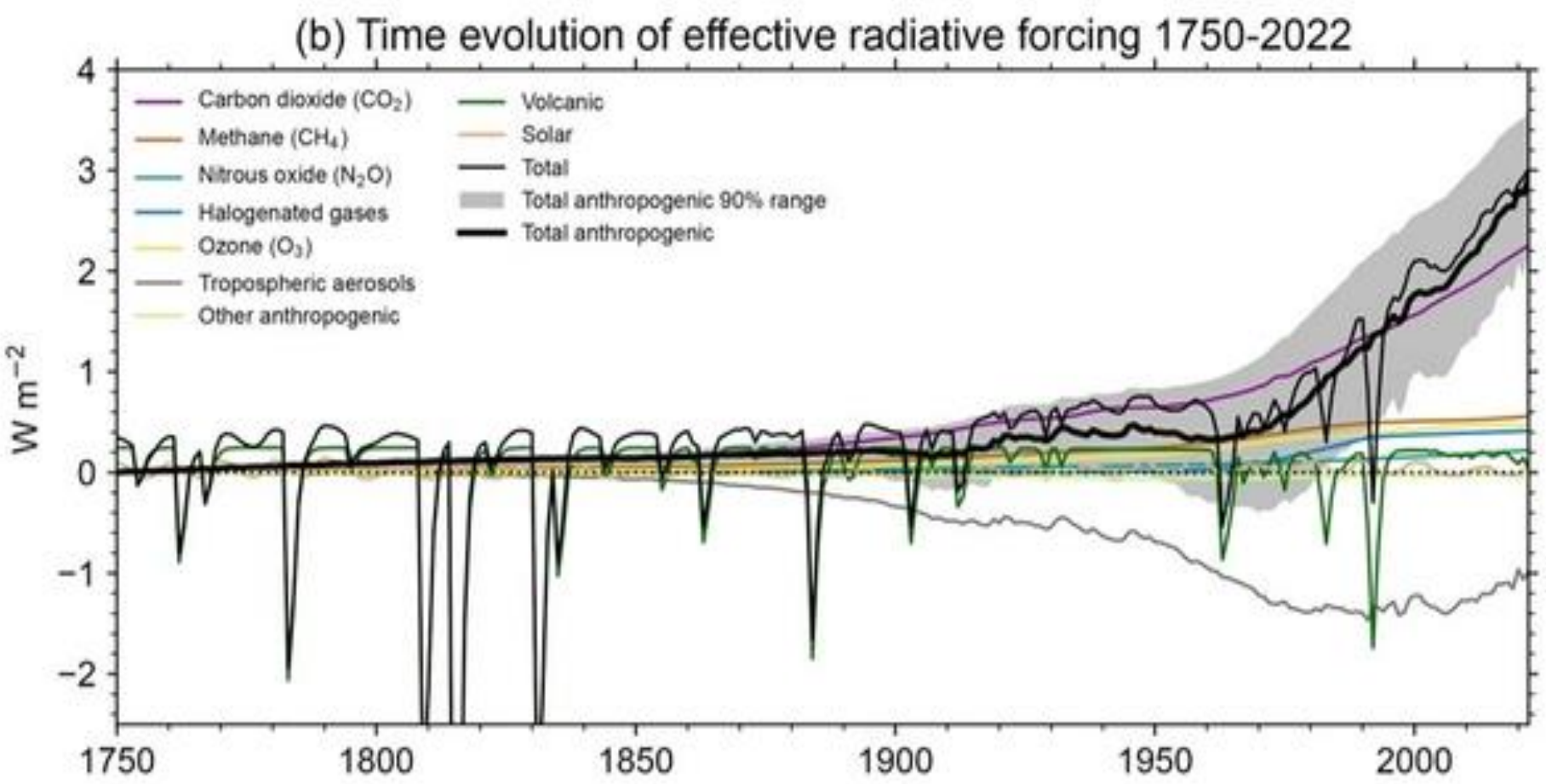

1. **global warming accelerated** in 2023 and may not be temporary
2. increased global warming is now driving **more severe impacts** across the planet
3. it's likely we **will overshoot the 1.5 degrees Celsius** threshold, so we'll need to recalibrate carbon budgets
4. Earth's **climate may be more sensitive to greenhouses gases** than previously thought
5. further warming increases the **risk of triggering multiple climate tipping points**

# 2024 Was the Planet's Warmest Year in Recorded History

Global land and ocean surface temperature anomalies
(in degrees Celsius compared to the 1901-2000 average)



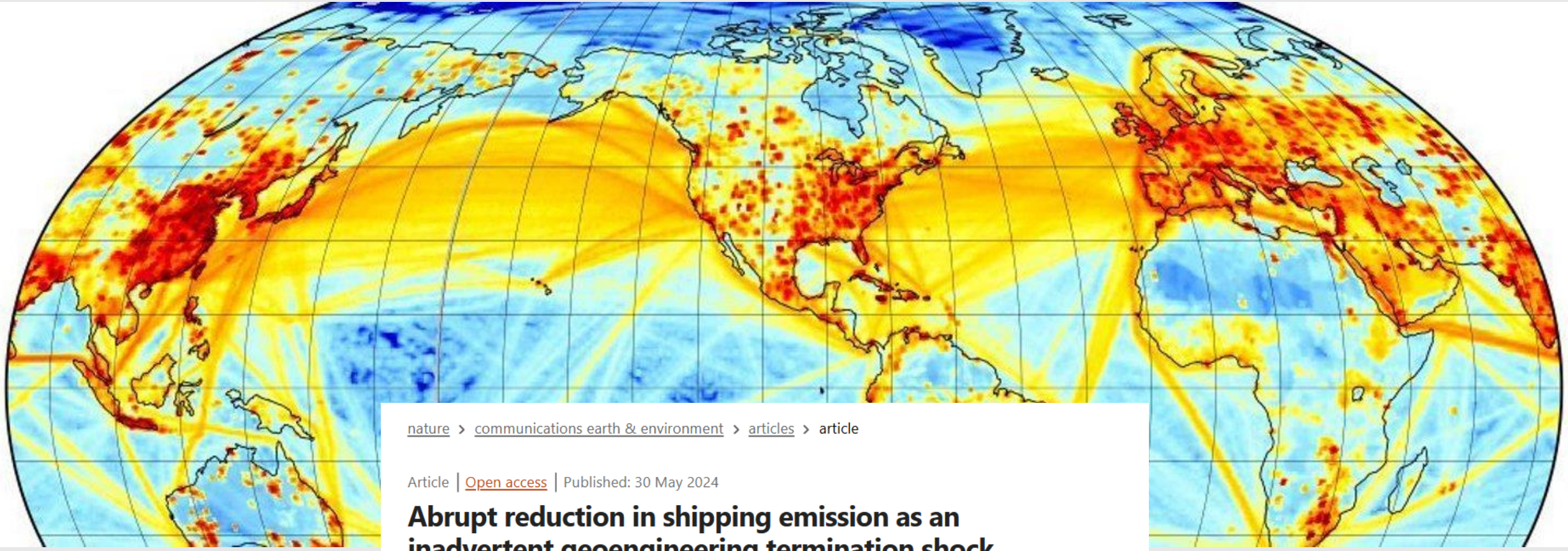

Source: NOAA National Centers for Environmental Information




$CO_2$: Long-lived, pervasive in all sectors, persistent & irreversible global warming

$SO_2$: Short-lived but potent, mitigated for health benefits, reductions accelerate warming

# SO2: The “Faustian Pact”



nature › communications earth & environment › articles › article

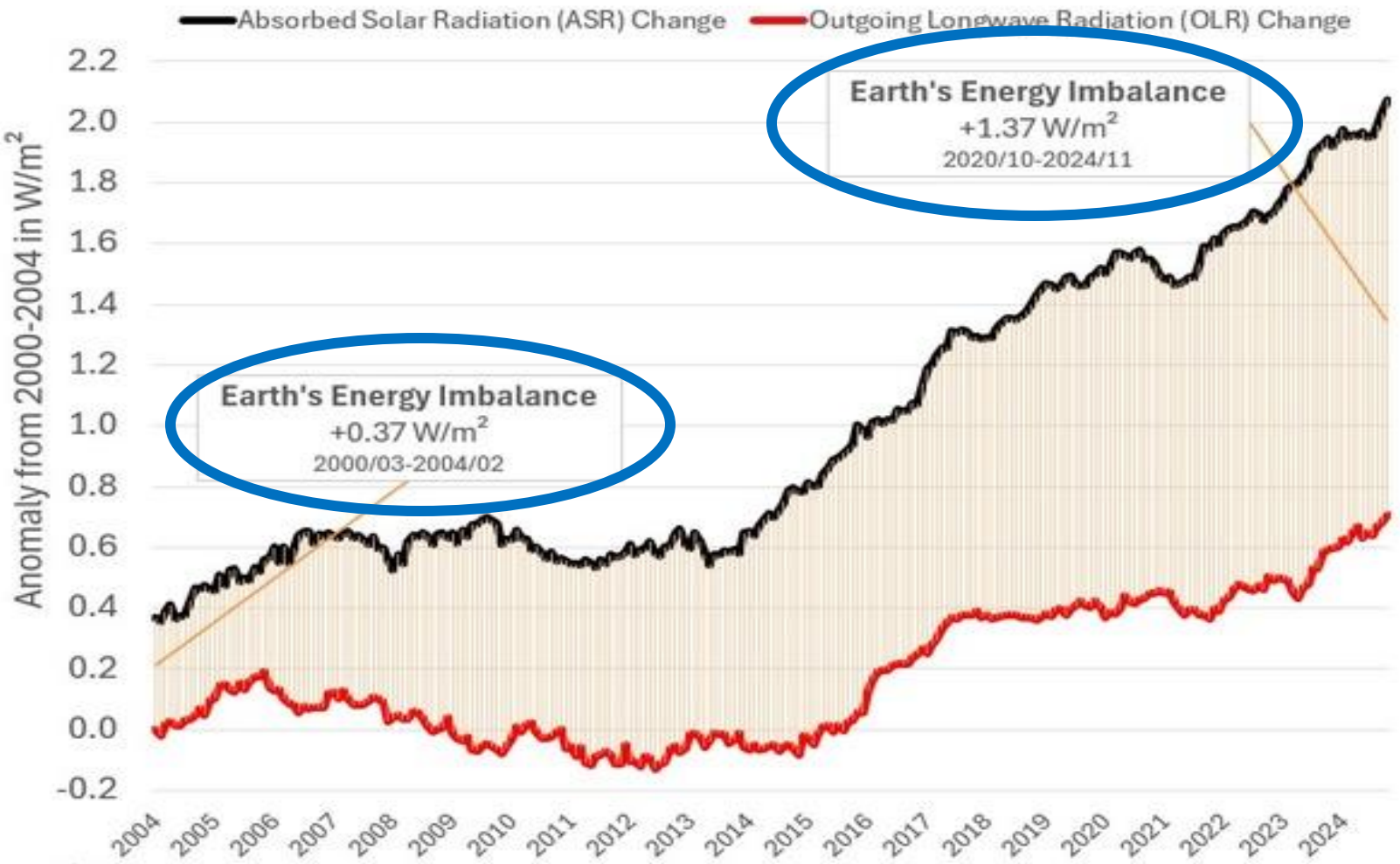
Article | Open access | Published: 30 May 2024

## Abrupt reduction in shipping emission as an inadvertent geoengineering termination shock produces substantial radiative warming

Tianle Yuan ✉, Hua Song, Lazaros Oreopoulos, Robert Wood, Huisheng Bian, Katherine Breen, Mian Chin, Hongbin Yu, Donifan Barahona, Kerry Meyer & Steven Platnick

*Communications Earth & Environment* **5**, Article number: 281 (2024) | Cite this article

# NASA CERES Earth's Energy Imbalance

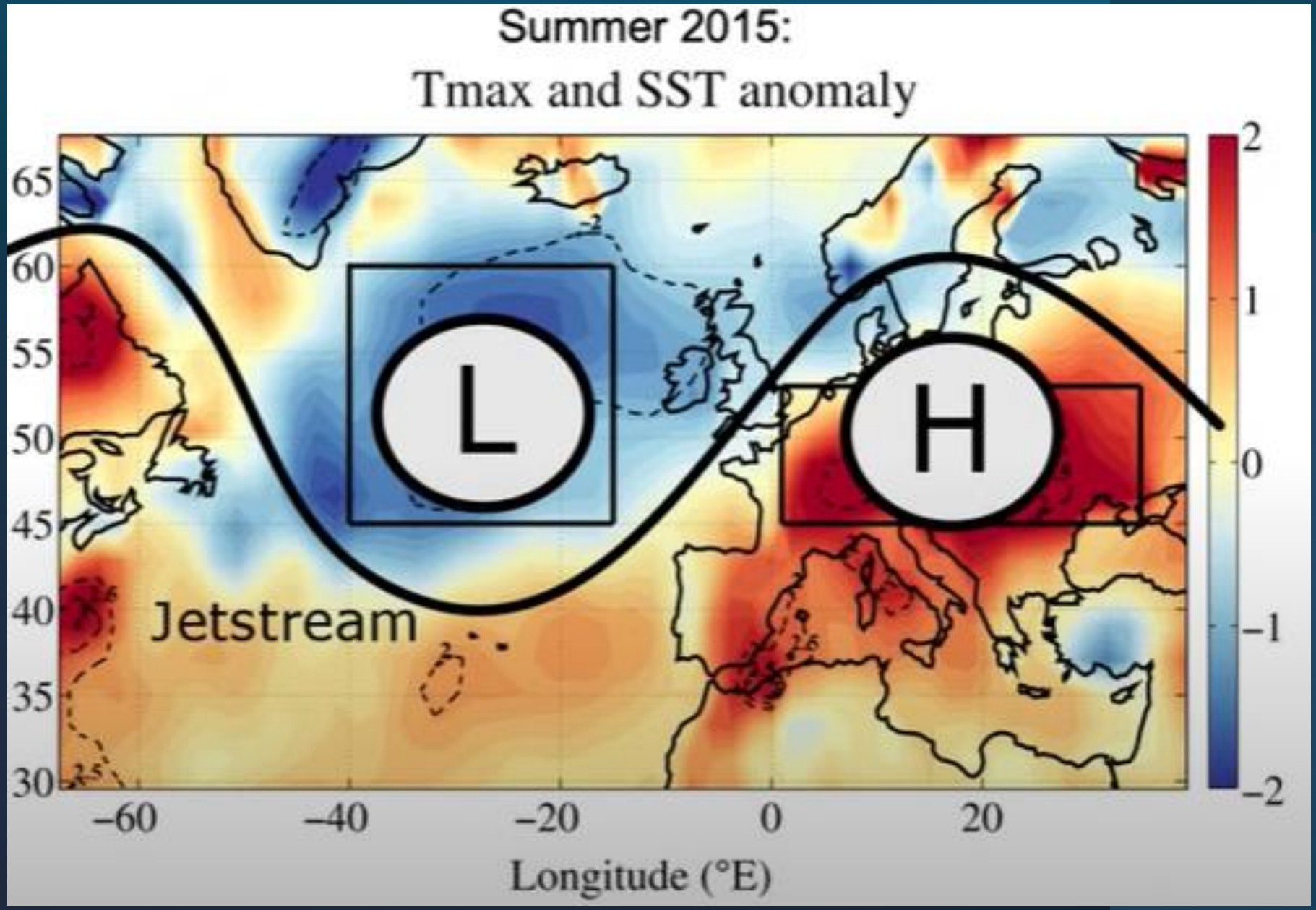



THE CLUB OF ROME The Netherlands Association

©Leon simons - Data source: **NASA CERES** EBAF-TOA All-sky Ed4.2.1, 2000/03-2024/11
48-month running mean relative to 2000/03-2004/02, Area = 510 M km², **100% Earth's surface**

| | Near term, 2021–2040 | | Mid-term, 2041–2060 | | Long-term, 2081–2100 | |
|---|---|---|---|---|---|---|
| Scenario | Best estimate (C) | *Very likely* range (C) | Best estimate (C) | *Very likely* range (C) | Best estimate (C) | *Very likely* range (C) |
| **SSP1–1.9** | 1.5 | 1.2 to 1.7 | 1.6 | 1.2 to 2.0 | 1.4 | 1.0 to 1.8 |
| **SSP1–2.6** | 1.5 | 1.2 to 1.8 | 1.7 | 1.3 to 2.2 | 1.8 | 1.3 to 2.4 |
| **SSP2–4.5** | 1.5 | 1.2 to 1.8 | 2.0 | 1.6 to 2.5 | 2.7 | 2.1 to 3.5 |
| **SSP3–7.0** | 1.5 | 1.2 to 1.8 | 2.1 | 1.7 to 2.6 | 3.6 | 2.8 to 4.6 |
| **SSP5–8.5** | 1.6 | 1.3 to 1.9 | 2.4 | 1.9 to 3.0 | 4.4 | 3.3 to 5.7 |

AR6 assessed warming projections for each of the five core emissions scenarios in the near-, mid- and long term. Source: IPCC (2021) Table SPM.1


Summer 2015:
Tmax and SST anomaly
L
H
Jetstream
65
60
55
50
45
40
35
30
−60
−40
−20
0
20
Longitude (°E)
2
1
0
−1
−2

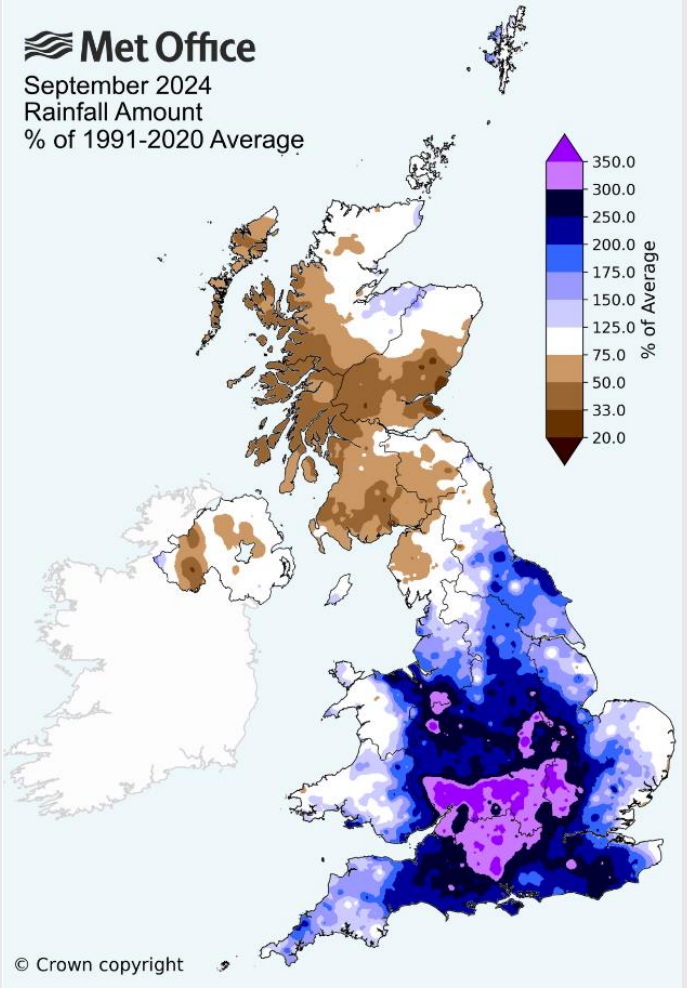
# Oxfordshire: Peak River Flow Projections

Table 3.

Table 3- Peak River flow allowances for Oxfordshire Management Catchments

| Allowance | Total Potential Change (2020s) | Total Potential Change (2050s) | Total Potential Change (2080s) |
|---|---|---|---|
| ***Cherwell and Ray*** | | | |
| Central | 6% | 4% | 15% |
| Higher | 11% | 10% | 25% |
| Upper | 24% | 27% | 49% |
| ***Cotswolds*** | | | |
| Central | 11% | 13% | 30% |
| Higher | 17% | 21% | 43% |
| Upper | 31% | 43% | 82% |
| ***Gloucestershire and the Vale*** | | | |
| Central | 11% | 11% | 26% |
| Higher | 17% | 19% | 41% |
| Upper | 33% | 43% | 84% |
| ***Thames and South Chilterns*** | | | |
| Central | 12% | 14% | 31% |
| Higher | 17% | 22% | 43% |
| Upper | 30% | 42% | 76% |
| ***Upper and Bedford Ouse*** | | | |
| Central | 5% | 4% | 19% |
| Higher | 10% | 11% | 30% |
| Upper | 24% | 30% | 58% |
| **Peak rainfall** | | | |

# The Future is Here: it’s just not evenly distributed

# Disaster = “Business as Usual”

## 5y, 10y floods => Flood Season

### Recent flooding September 2024

**Section 19 flood investigations – 16 in total**

***South*** - Priory Mews, Wallingford S19 (August flooding), Wheatley (Farm Close, Bell Lane, High Street), Didcot (Moorbrook Park & Harriers Park) addendum, Thurne View, Didcot, Tiddington, Pheasant Walk

***Vale*** - Stockham Primary School, Nash Drive/Chaunterall Way addendum

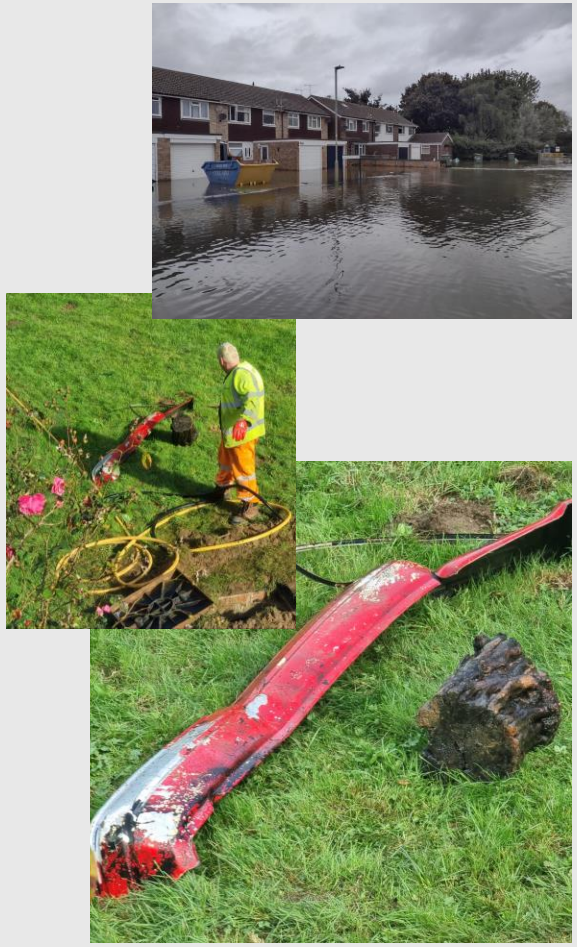
***WODC*** - Middle Barton Primary School (August flooding), Woodstock

***CDC*** – Kidlington, Yarnton, Lower Heyford, Hornton Primary School, Manor View, Bucknell

***Oxford City*** - Campbell Rd, Lobelia Road, Oxford

**Outstanding storm Henk S19s**

- A417 S19 (SODC), Whitchurch-on-Thames (SODC), Sunningwell addendum (VWHDC), Osney Mead Industrial Estate (Oxford City), Marston Court Feb 2024 flooding (Oxford City)



Courtesy of C Edwards

# Lord Deben

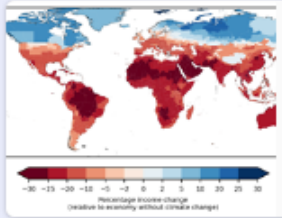
- *"We really should be on a war footing, because this is going to act like war.*
- **...we are heading for something between two and three degrees' increase.**
- ***When you think of what that means, it is really appalling..."***

**The Macroeconomic Impact of Climate Change: Global vs. Local Temperature***

Adrien Bilal† *Harvard University*
Diego R. Känzig‡ *Northwestern University*

May, 2024

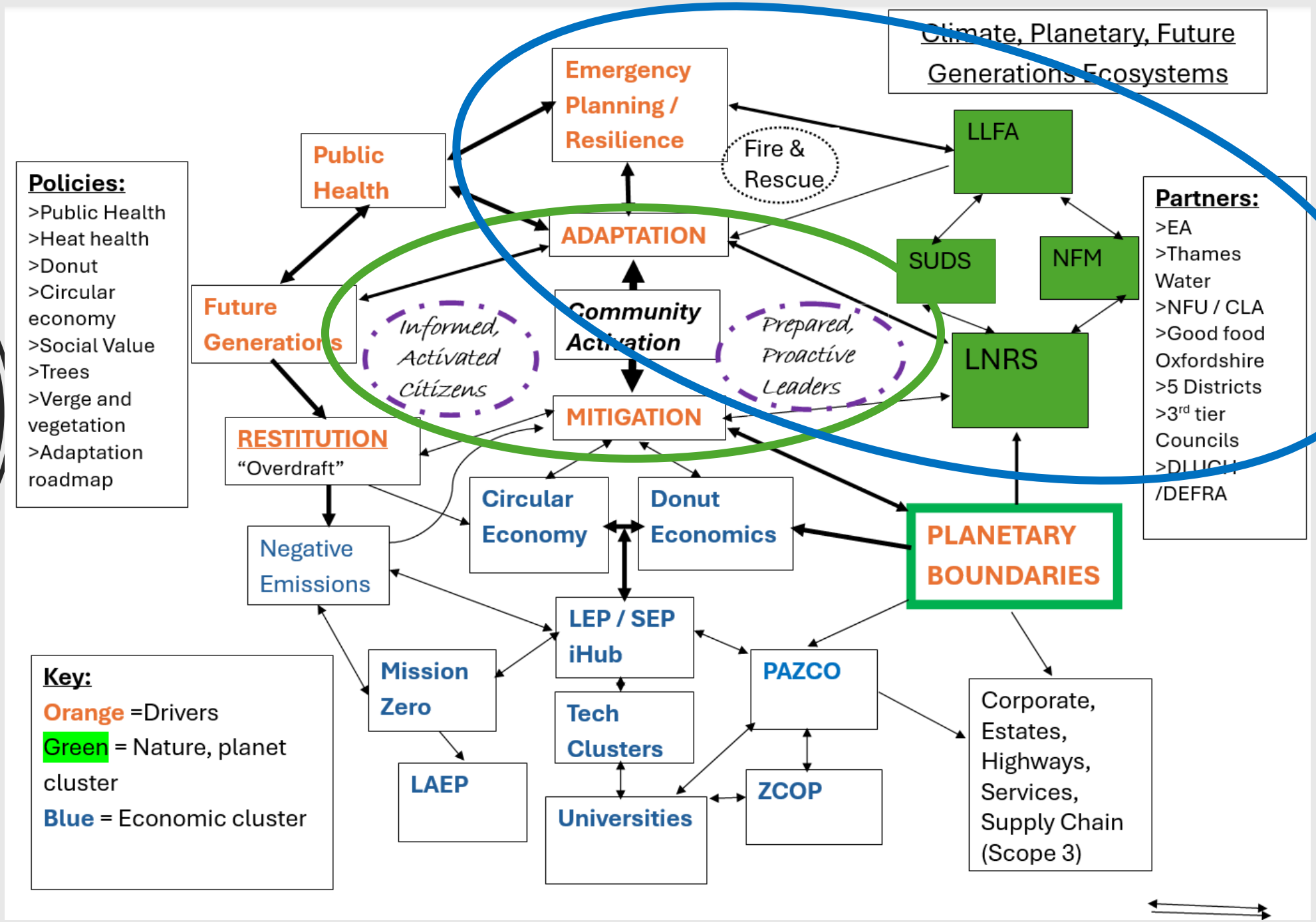
"...These magnitudes are comparable to the economic damage caused by fighting a war domestically and *permanently*..."



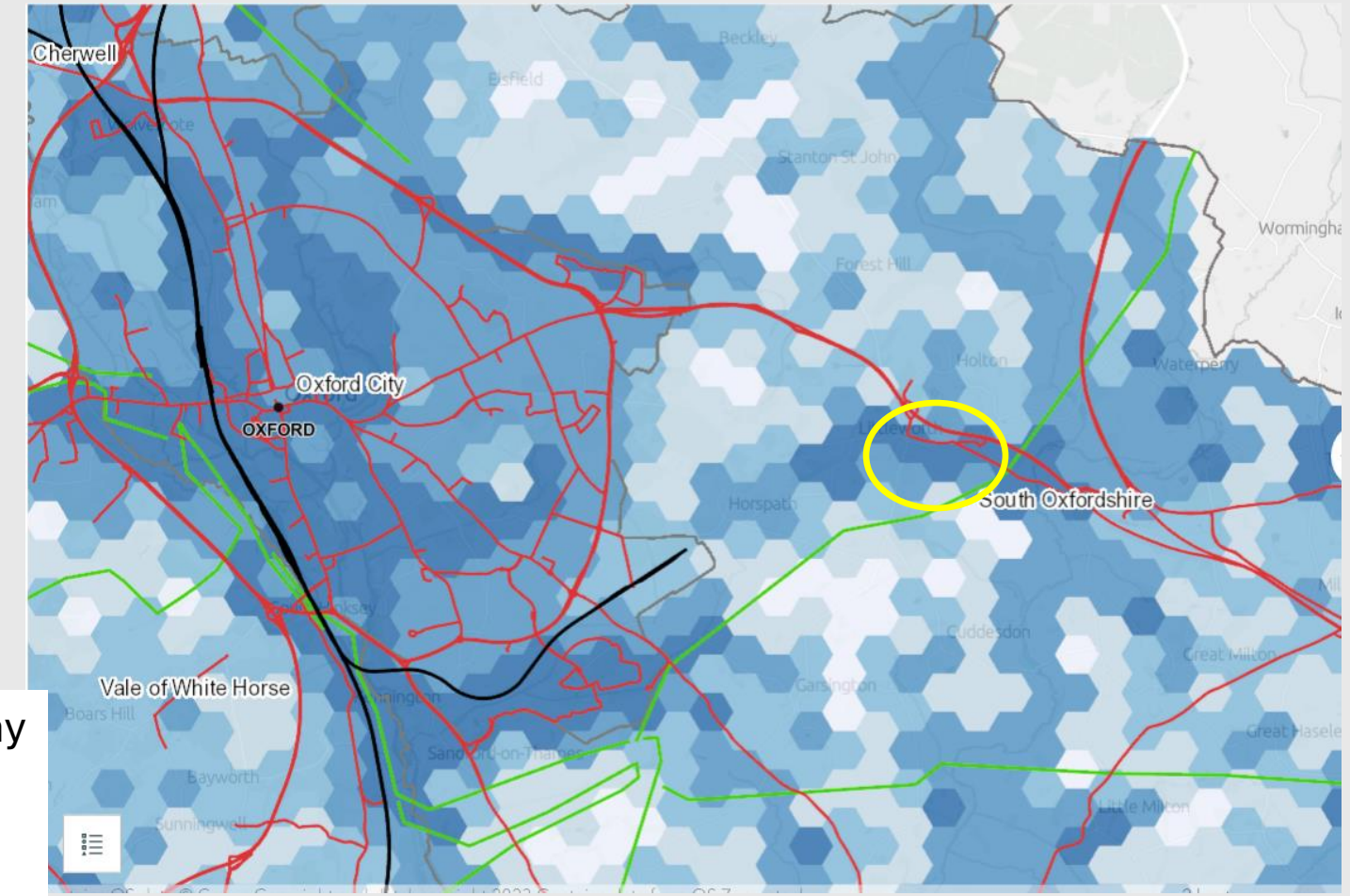
38 trillion dollars in damages each year: W...
04/17/2024 - Even if CO2 emissions were to be drastically cut down starting today, the world economy is already...
www.pik-potsdam.de

SCC (social cost of carbon) of $1,056/tCO2 and a 31% welfare loss from a moderate warming

# MIND MAP OCC Wider Climate Ecosystem

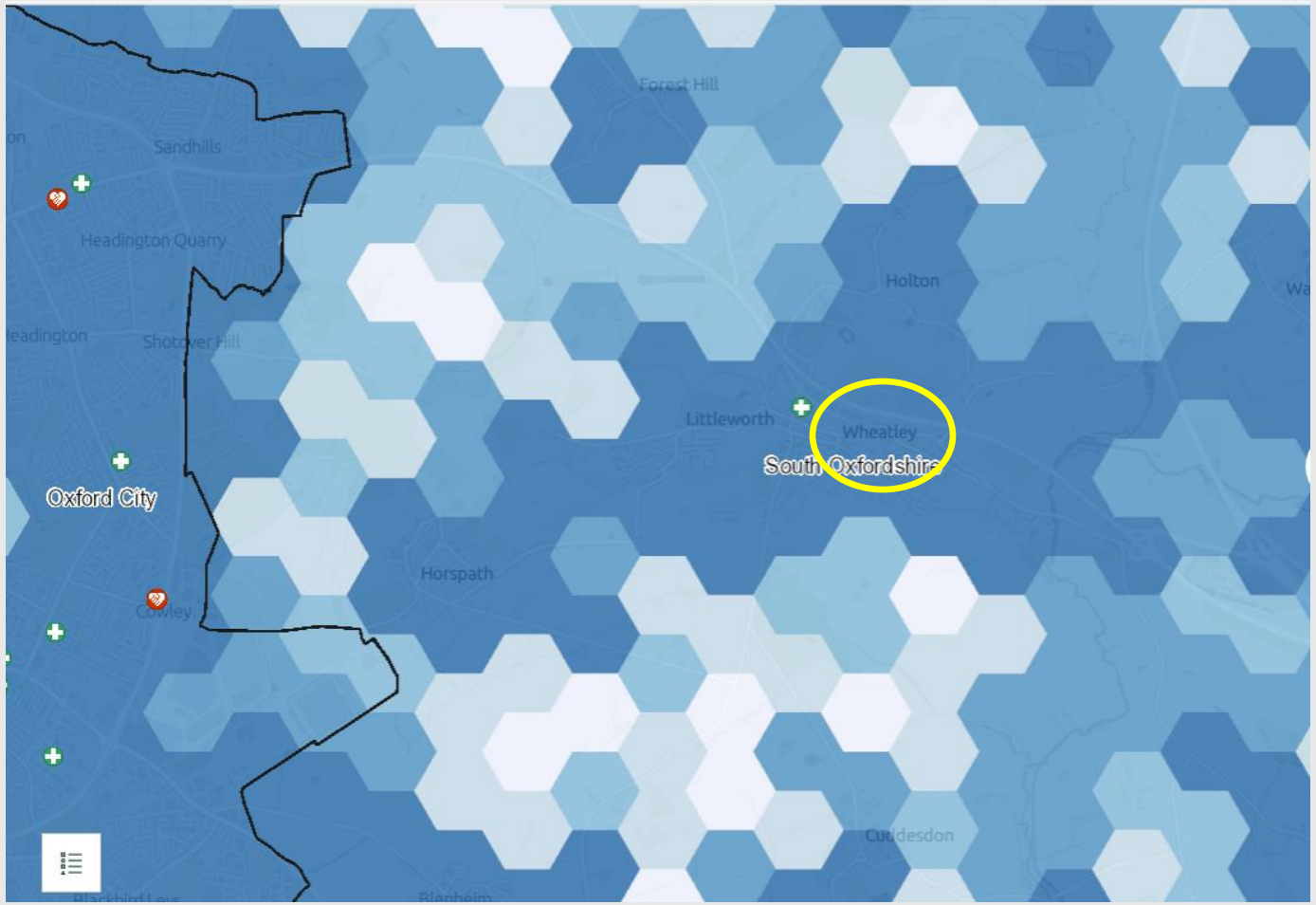


# Current Flooding Hazard, Climate Vulnerability Assessment

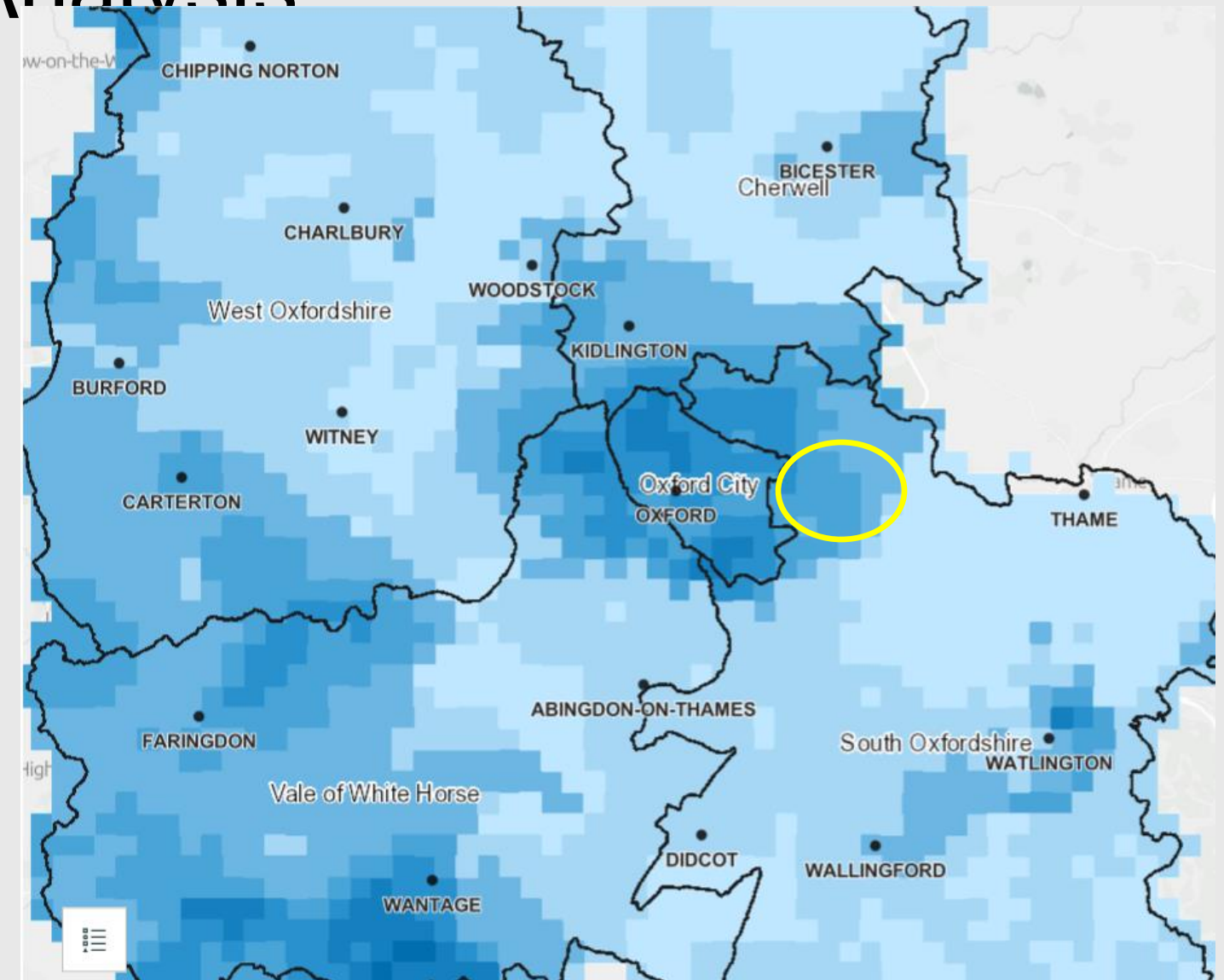



Red – Highway
Green – Electricity Transmission Line

# Future Flooding Hazard in 2050 (4C), Climate Vulnerability Assessment



# Extreme Rainfall in 2055 (RCP4.5), Extreme Value Analysis



# How do we fix this?

**“Oxfordshire Underwater” Summit. Dec 2024**

County, District, EA, Thames Water, Farming cluster, Pressure Groups, Flood groups, Insurers, (Developers)

**Getting ahead of the curve**:

What would “good” look like for flood prevention?

**Unifying our efforts for greatest effect**

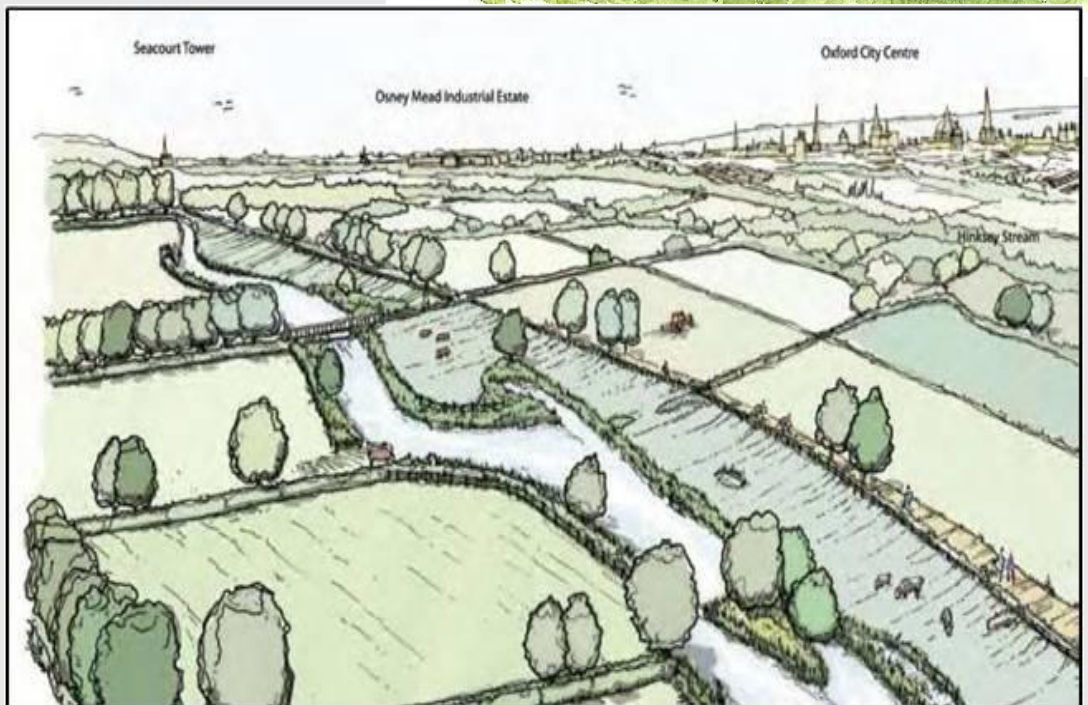
How do we maximise our impact?

“Strategic Flood Risk Management Group”: ToR? Execute the above.

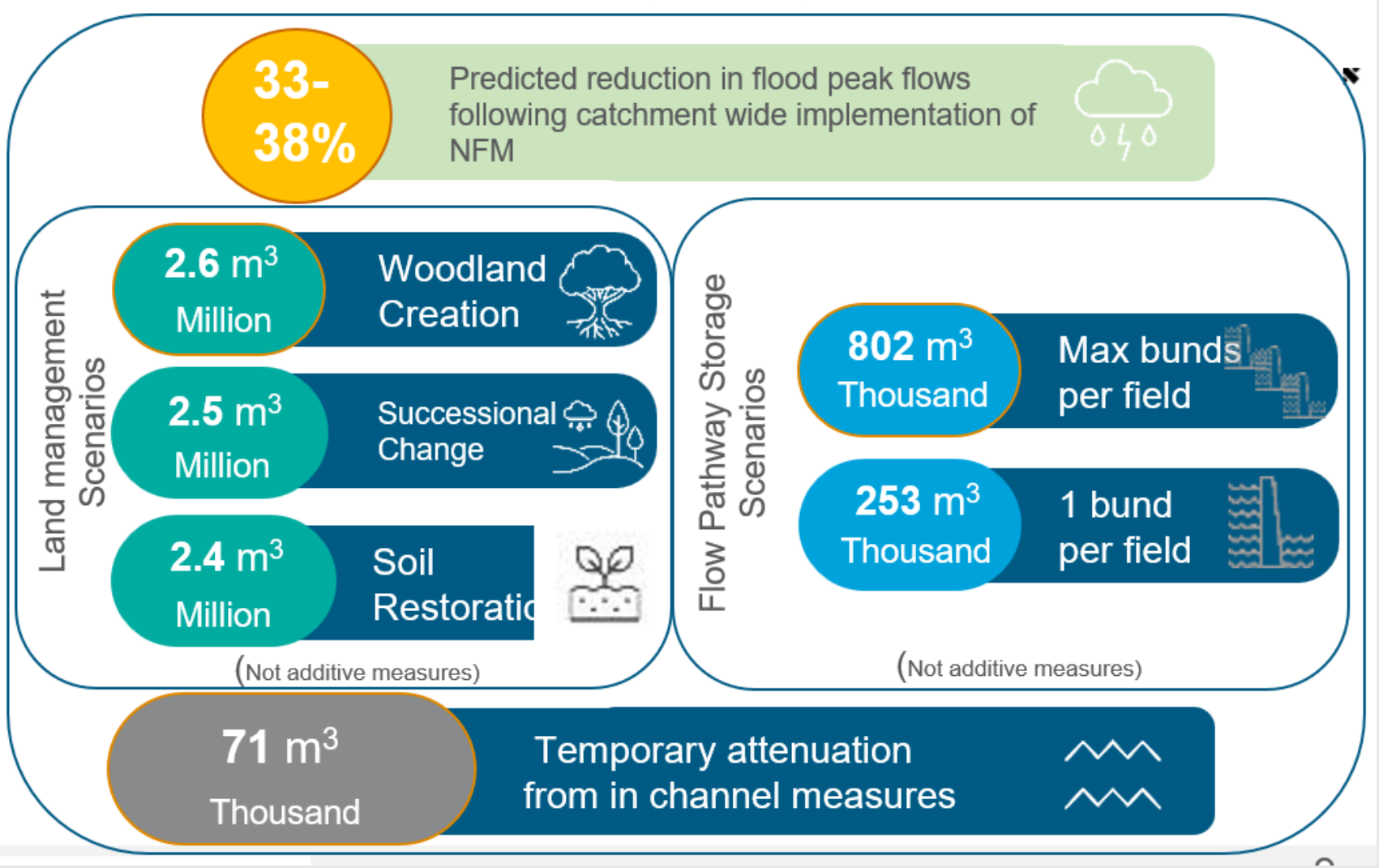
Jan: BBC Rebranding ***“Flooding Taskforce”***

# The traditional approach

# A new approach



# Holding Water



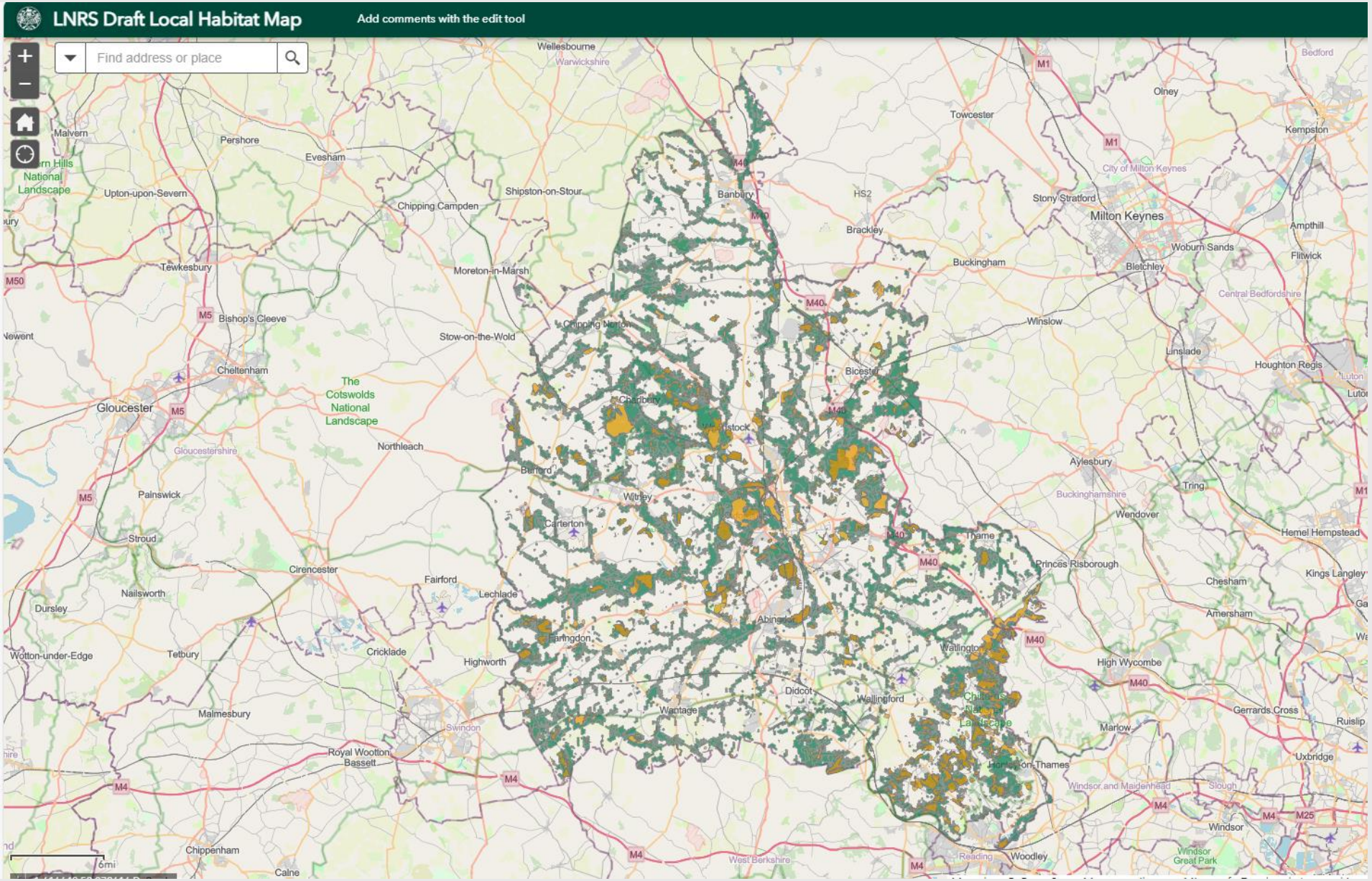
# Case Studies 3 – Practice Change for one field (Denchworth soil type - slowly permeable, clayey soils )

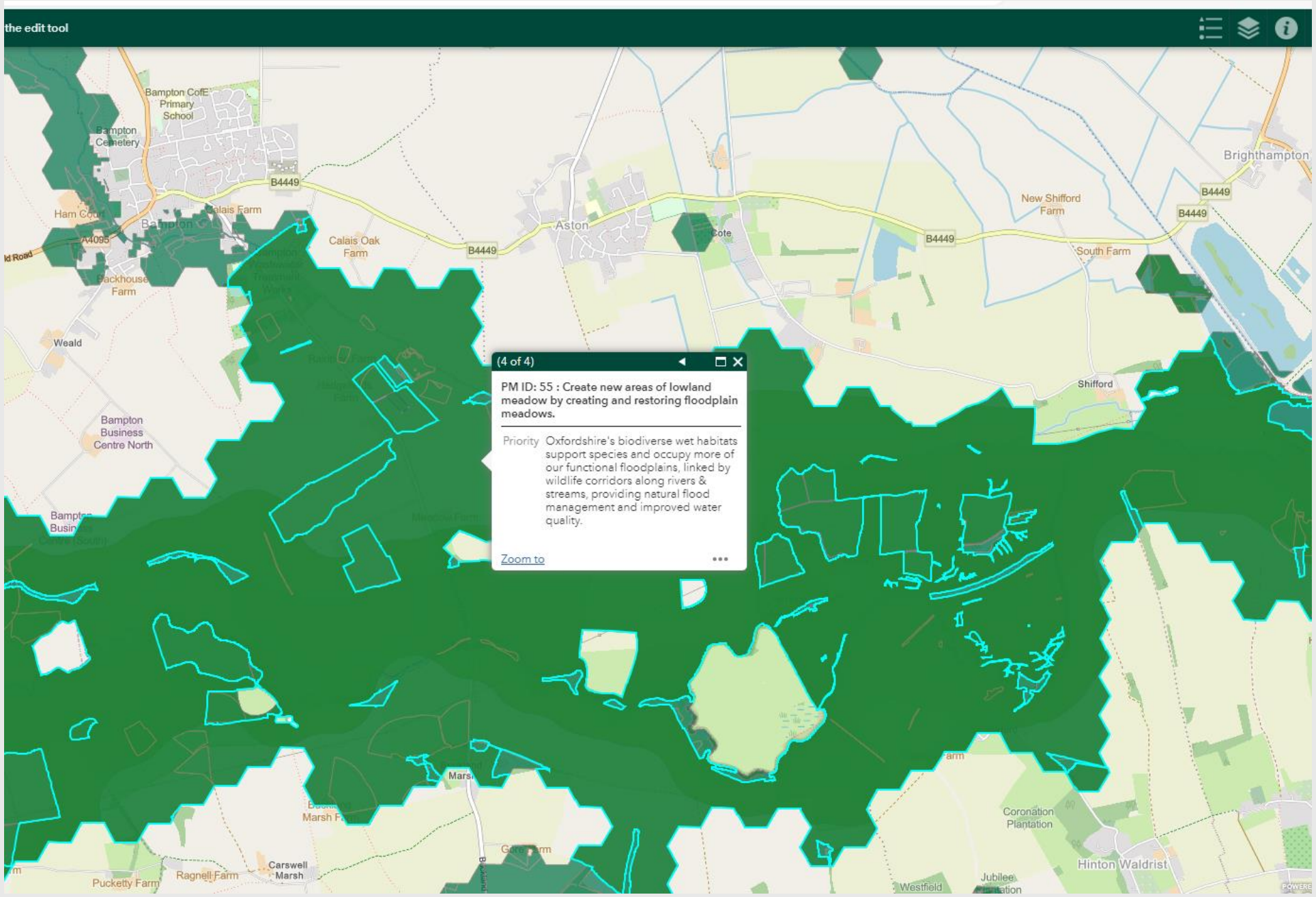
These three examples of practice change are applied to one example field from the North-East Cotswold Farming Cluster to show how our improved hydrology model, combined with Carbon Quester's soil carbon dataset, show modelled uplift in soil carbon sequestration and increased water retention.

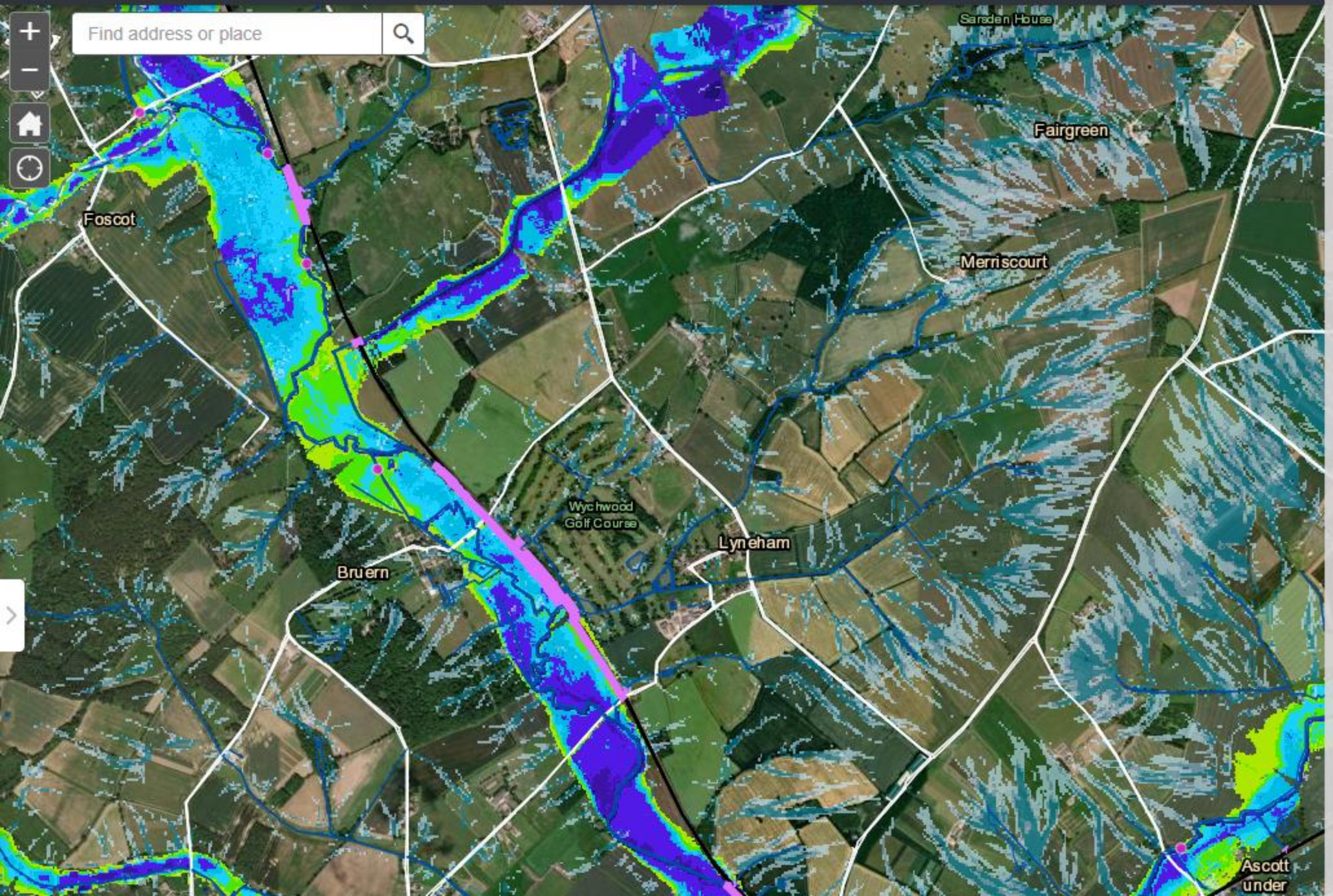
**Field: The Ridings, Sezincote**
**Current Management: Arable**


| | | | | | |
|---|---|---|---|---|---|
| **Floodplain Meadow Restoration** | C | 95 t of C/ha | 119 t of C/ha | 25% | +88.1 $tCO_2e$/ha |
| | | 4,185 m3/ha | 4,307 m3/ha | 5% | +122 m3/ha |
| **Herbal Ley** | C | 95 t of C/ha | 121 t of C/ha | 27% | +95.4 $tCO_2e$/ha |
| | | 4,185 m3/ha | 4,371 m3/ha | 4% | +186 m3/ha |
| **Improved Grassland** | C | 95 t of C/ha | 148 t of C/ha | 56% | +194.5 $tCO_2e$/ha |
| | | 4,185 m3/ha | 4,358 m3/ha | 4% | +173 m3/ha |

THE NORTH EAST COTSWOLD FARMER CLUSTER CIC
Carbon Quester
AtkinsRéalis
Environment Agency
ROTHAMSTED RESEARCH


LNRS Draft Local Habitat Map
Add comments with the edit tool
Find address or place
Wellesbourne
Warwickshire
Bedford
Olney
Towcester
Malvern
Pershore
Evesham
Kempston
M1
City of Milton Keynes
Hills
National
Landscape
Upton-upon-Severn
Shipston-on-Stour
Banbury
HS2
Stony Stratford
Milton Keynes
Chipping Campden
Brackley
Ampthill
Woburn Sands
Fliwick
Tewkesbury
Moreton-in-Marsh
Buckingham
Bletchley
M50
M40
Central Bedfordshire
M5
Bishop's Cleeve
Winslow
Stow-on-the-Wold
Linslade
Houghton Regis
Cheltenham
Bicester
The
Cotswolds
National
Landscape
Gloucester
Northleach
Aylesbury
Gloucestershire
Buckinghamshire
Tring
Palnswick
Wendover
Stroud
Thame
Hemel Hempstead
Princes Risborough
Cirencester
Fairford
Chesham
Kings Langley
Nailsworth
Lechlade
Dursley
Amersham
Wotton-under-Edge
Tetbury
Cricklade
Highworth
High Wycombe
Didcot
Wallingford
Gerrards Cross
Malmesbury
Wantage
Ruislip
Swindon
Marlow
Royal Wootton
Bassett
Uxbridge
Windsor and Maidenhead
Slough
Windsor
Chippenham
Reading
Woodley
West Berkshire
Windsor
Great Park
Calne
6mi


the edit tool
Bampton CofE Primary School
Bampton Cemetery
B4449
Ham Court
A4095
Calais Farm
Calais Oak Farm
Aston
Cote
B4449
New Shifford Farm
B4449
B4449
Brighthampton
South Farm
Backhouse Farm
Weald
(4 of 4)
PM ID: 55 : Create new areas of lowland meadow by creating and restoring floodplain meadows.
Priority
Oxfordshire's biodiverse wet habitats support species and occupy more of our functional floodplains, linked by wildlife corridors along rivers & streams, providing natural flood management and improved water quality.
Zoom to
Shifford
Bampton Business Centre North
Coronation Plantation
Hinton Waldrist
Carswell Marsh
Pucketty Farm
Ragnell Farm
Westfield

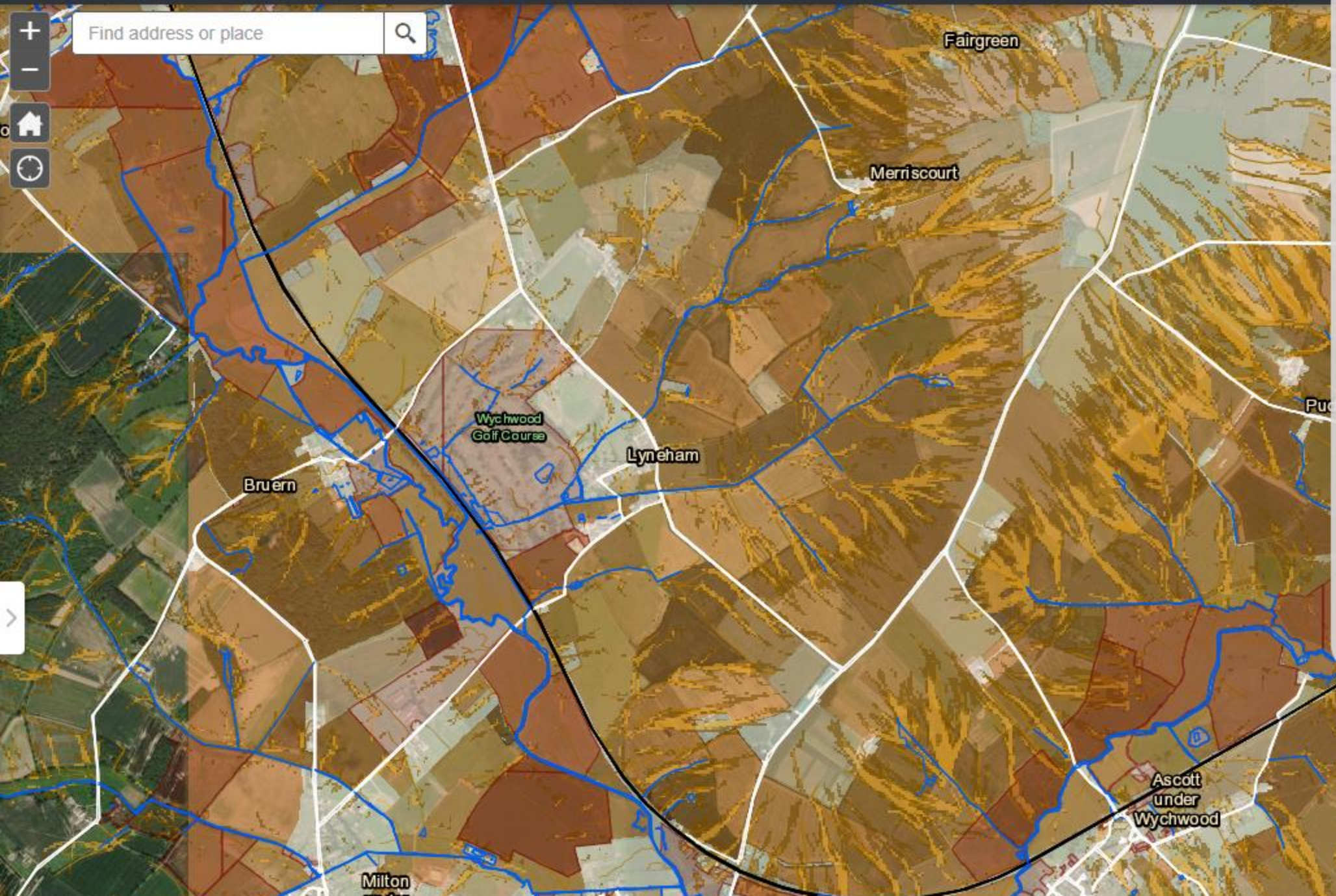



This tab displays outputs from AtkinsRéalis' catchment geospatial analysis of floodplain reconnection potential and wetland creation potential in the Evenlode catchment.

| | | |
|---|---|---|
| | < -1.0 m | Wetland potential (areas to fill for stage zero) |
| | -1.0 to -0.5 m | |
| | -0.5 to -0.2 m | |
| | -0.2 to 0.0 m | Stage zero potential |
| | 0.0 to +0.2 m | |
| | +0.2 to +0.5 m | Riparian planting potential (areas to cut for stage zero) |
| | +0.5 to 1.0 m | |
| | +1.0 m | Outside of floodplain |

**Floodplain reconnection potential**

Reconnecting a river to it's floodplain requires the natural valley gradient, or Geomorphic Grade Line, to be identified. ***High potential opportunities for stage zero restoration occur where the valley floor is near to the natural valley gradient (+/- 0.2 m above or below).*** These are areas where base-flow would be expected to accumulate and flow across the floodplain if stage zero restoration was implemented under current conditions. Areas lower than -0.2 m may have to be filled to create a multi-thread system to prevent ponding whereas areas over 0.2 m may have to be cut to increase floodplain connectivity. Areas 1 m or more above the natural



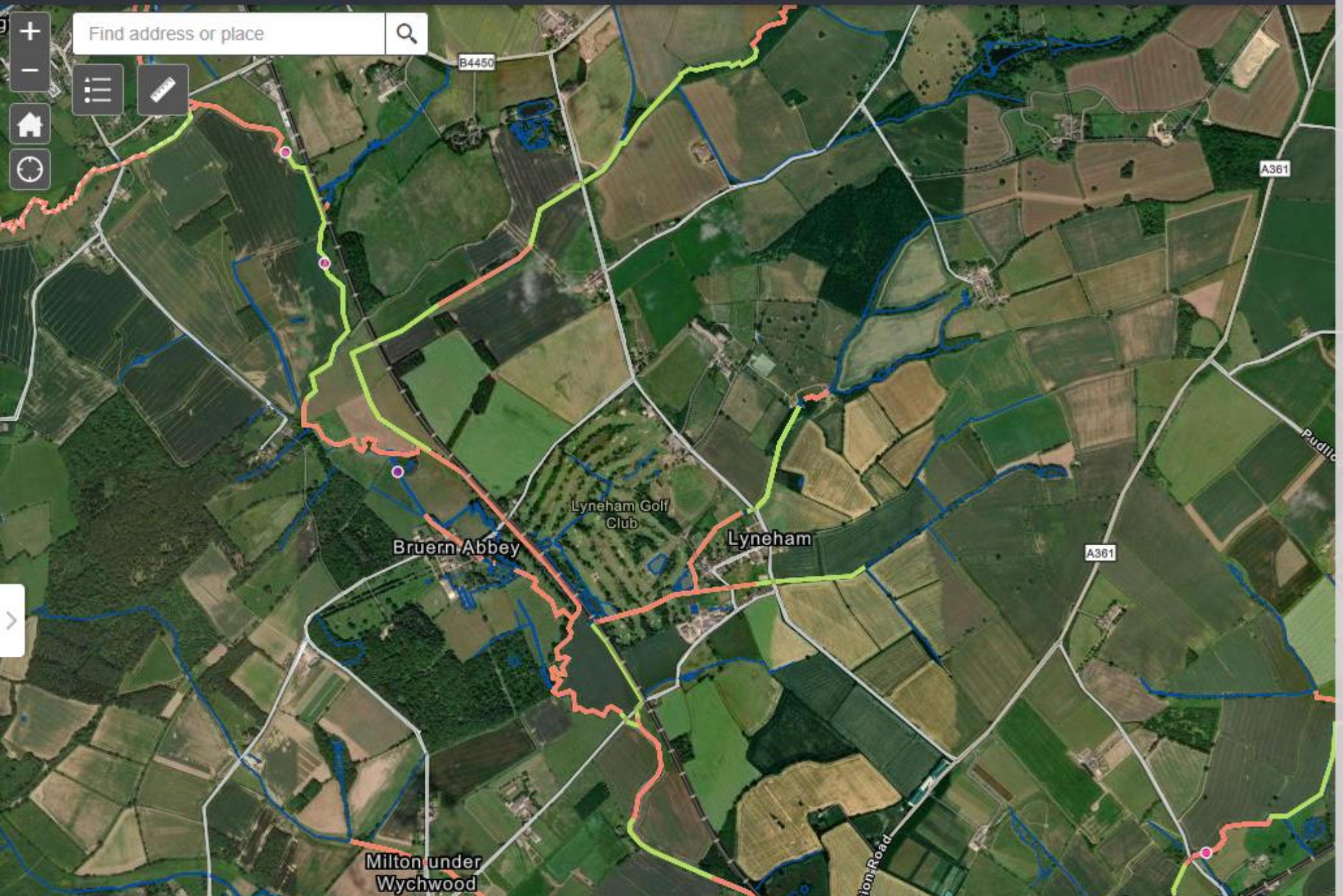

This tab displays outputs from AtkinsRéalis' catchment geospatial tool - **Sediment Studio** - for the Evenlode catchment to identify target areas for soil management opportunities:

**1. Arable land in floodplain** highlights arable fields within the floodplain.

**2. Soil erosion risk map** shows arable fields at risk from soil erosion based on land cover, soils, phosphate loss and catchment topography.

**3. Soil drought risk map** shows the fields in the catchment which are have lower water availability. This is based on several datasets including, annual average rainfall and evapotranspiration, soil type and proximity to surface water.

**Click the ☑ buttons on the left hand side of the screen to turn these maps on and off.**




This tab displays outputs from **AtkinsRéalis new River Restoration Studio tool** that estimates the geomorphic characteristic and modification of reaches from open source remotely sensed and field survey data. The suitability of each measure is assessed based on this information and classified as 'suitable', 'potentially suitable' and 'not suitable' for the following river restoration measures:

***Hard bank removal*** *- removing artificial banks (e.g. concrete, sheet piling etc.) to allow aquatic vegetation and wildlife to recolonise banks. Artificial banks can also be replaced with 'greener' alternatives if there is a risk of erosion.*

***Channel reprofiling*** *- where channels have artificially steep banks and/or are over-deep there is little habitat diversity and high energies of flood water moving downstream. Creating shallower channels, with gentle slopes creates a slower, more diverse habitat.*

***In-channel feature creation*** *- in areas where natural processes that create in-channel features*

# Business Case…

THE NORTH EAST COTSWOLD FARMER CLUSTER CIC

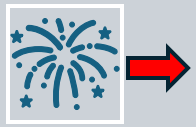
Carbon Quester

AtkinsRéalis

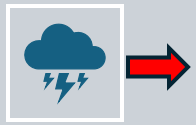
Environment Agency

ROTHAMSTED RESEARCH

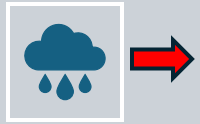
# Adaptation



*“Staying alive, keeping the lights on, for long enough to hit net zero”*



Most challenging and uncertain component of dealing with Climate Change



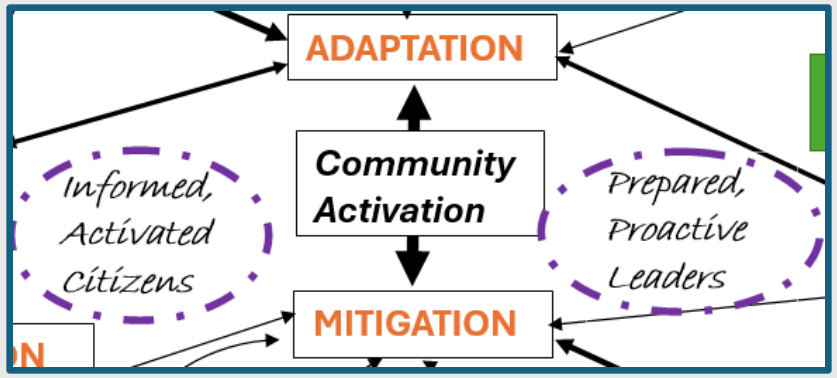
Flooding = Trojan Horse / Dry Run for all threats:

Storm/Flood
Drought/Heat/Wildfire
War, Pestilence, Famine

Failure = Potent threat to trust in institutions, government,
+ *Extreme Future Suffering*

# People: Prepared

Productive Dyad:




Every Citizen:

Knows their (flood) risk

Takes action to mitigate it (legal responsibility)

Every front-line Council (Parish, Town, etc.)

Emergency Plan x Granular Local Knowledge

Local Capability (Flood Warden, flooding groups, etc.)

# (Emergency) Process: *Open, Transparent, Seamless*

Civil Contingencies Act:

Gold, Sliver, Bronze:

Well-ordered

Seamless multiagency working

*Completely invisible*

Front Line.

County, Districts, EA, Thames Water

Shambolic. “Not my pipe”

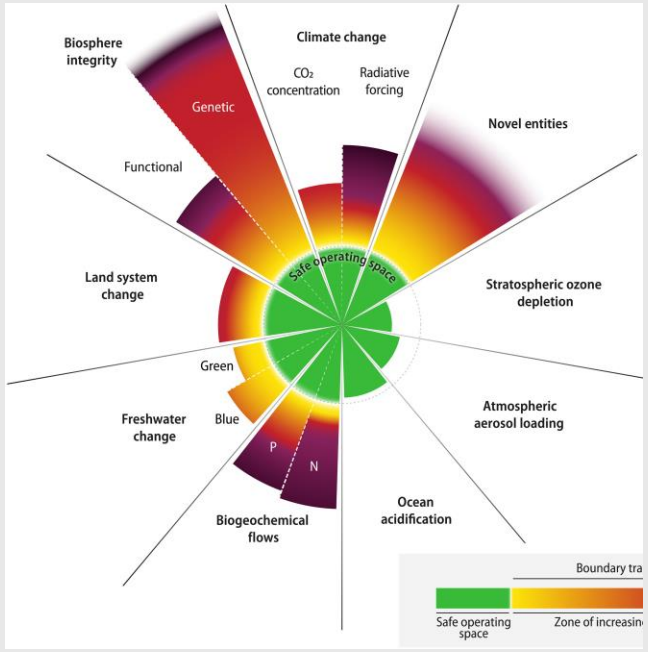
Need co-ordinated, seamless, citizen-centred response.

“Fix it, then work out who pays”.

LIVE (predictive) dashboard.

# Prevention

1. NO agency is responsible for stopping flooding
2. EVERY agency needs to step up
3. “Every raindrop, every field”
    1. Soil (co-benefits for fertility, drought resistance):
        1. biochar
    2. Land use (balance with food production)
4. Every opportunity (flood network):
    1. Every local Plan: STOP BUILDING ON FLOOD PLAINS!
    2. Every Development (housing, industrial…): zero runoff
    3. Every highway repair, agricultural work…
5. Proactive, Data-Driven emergency reaction (Who? Where? What?)



# Comms

**Background**

- Evolving (Climate) situation
- Necessary response
- Preparedness
- Progress

**Event**

- Preparation
- Warning
- During Event: timely, useful, accessible
- Recovery: "Flooding Toolkit"

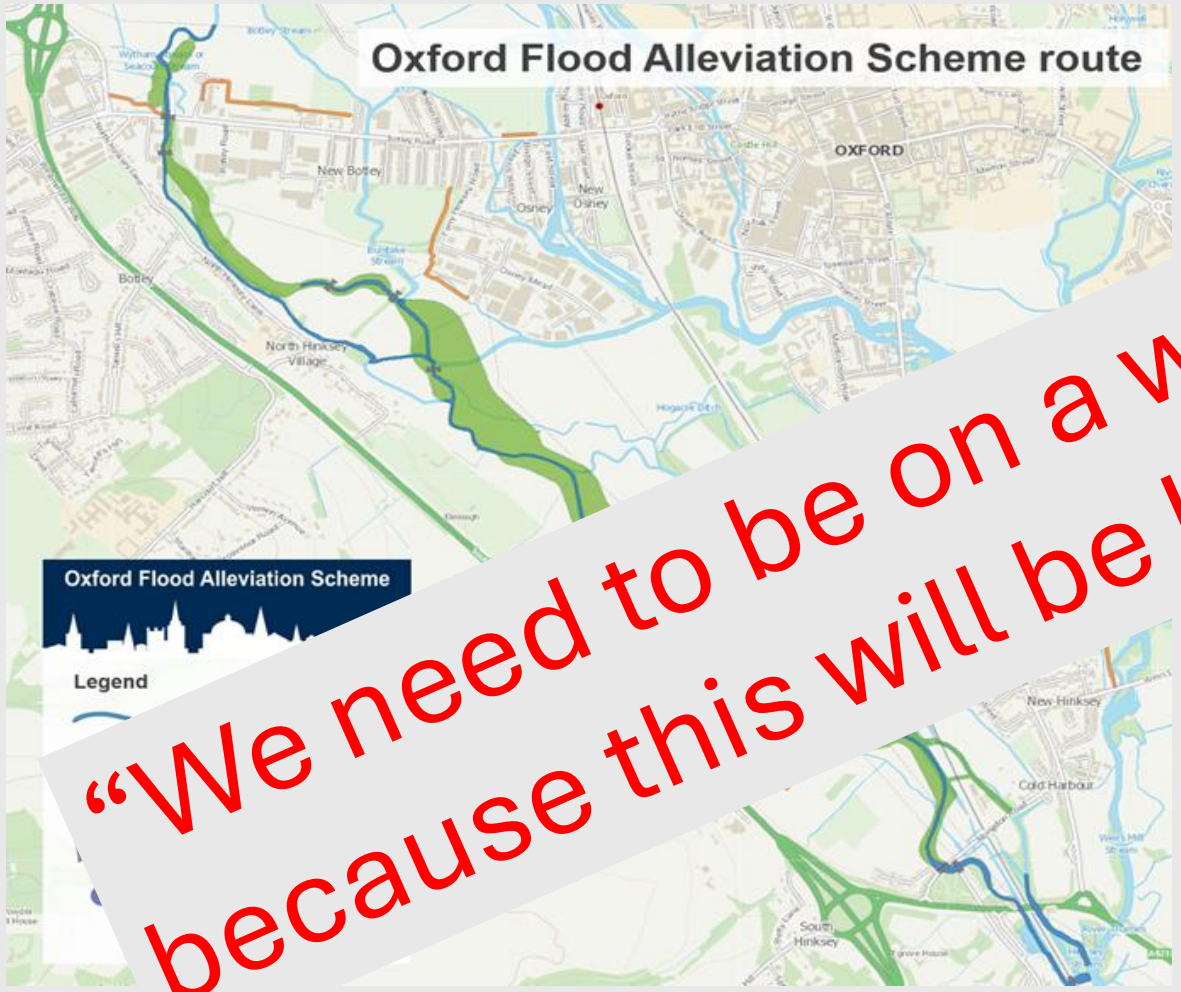
**Open Channels (2-Way)**

- **Statutory**: OCC, Districts, EA, TW
- **Non-Stat**: Scientists, Nature, Farming
- **Citizens**: Flood Wardens, Flood Groups…
- **Community**: Parish, Town, Local Mtg; engage, support

# Strategy: Summary +

1. “Every raindrop, every field”
2. Every opportunity (flood taskforce):
3. Every Parish
4. Every Citizen
5. **Managed Retreat**
6. **Social Justice**
7. **Investment:**
    1. **£1.5m yearly gully clearance**
    2. **£2m “Flooding Fund” (match-funding EA, TW)**
    3. **2wte flood officers**

# Do We Have TIME?

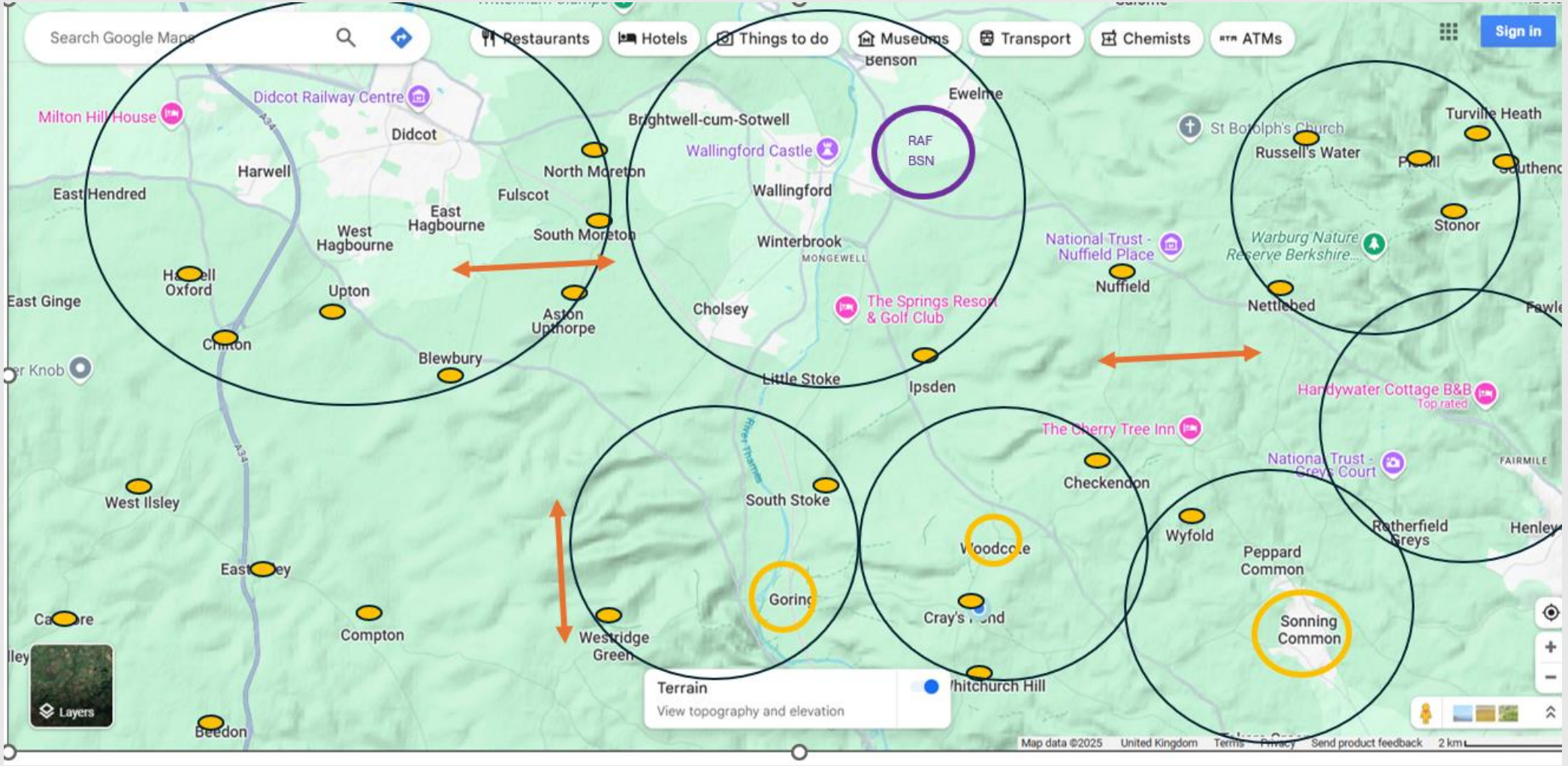



2005 Flood
Plan

on: 0.4% per year.
correctly managed.

"We need to be on a war footing, because this will be like a war..."

# Resilience: Nodes / Clusters / Hubs.



# Epilogue

*"Climate bi[illegible]n will manifest as a series of disasters viewe[illegible]h phones with footage that gets closer and[illegible]o where you live until you're the one film[illegible](ISO)*

NOT ON MY WATCH!

# THE END

This space left blank for your thoughts

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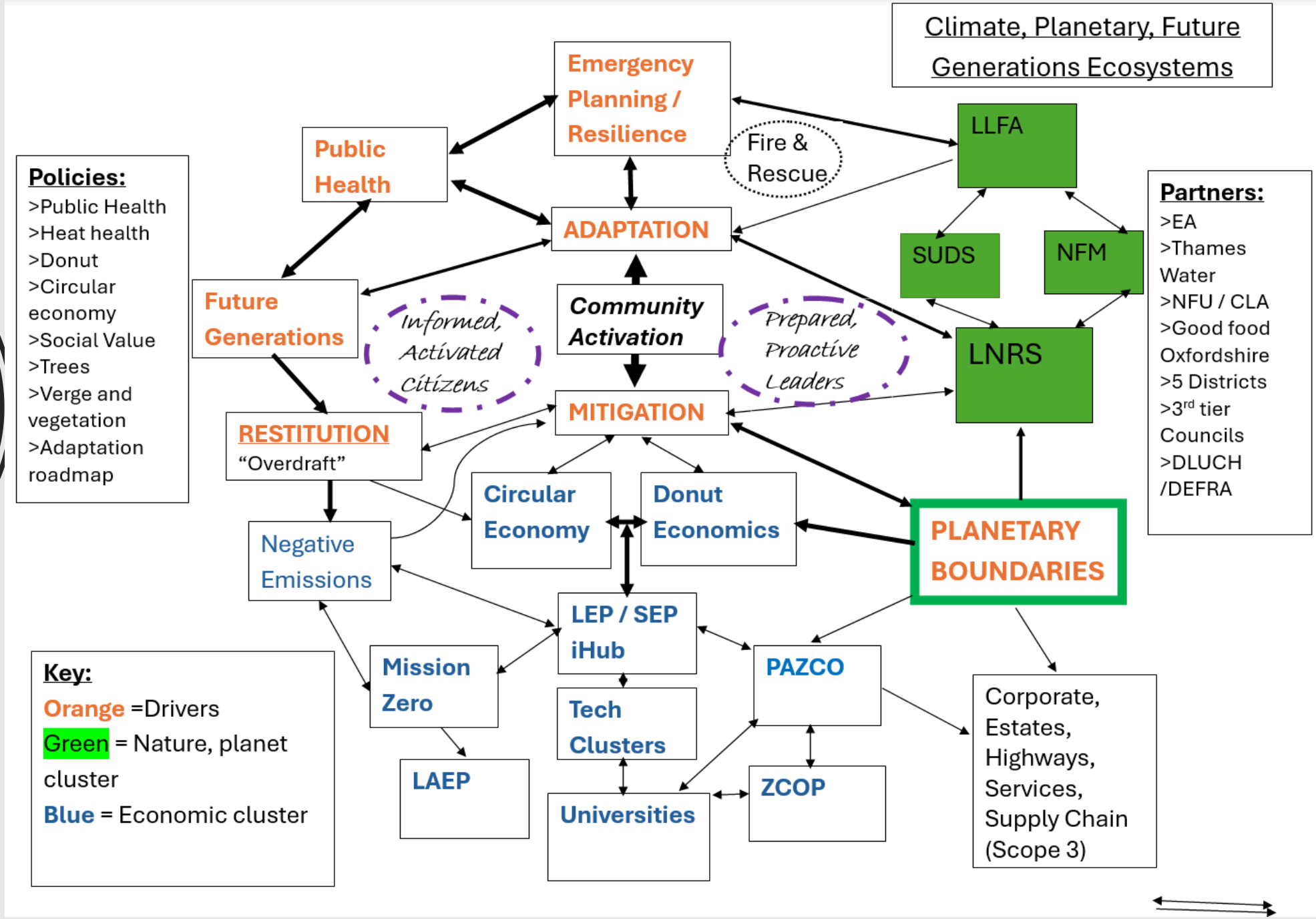
# SPARES

# MIND MAP OCC Wider Climate Ecosystem



# The Most Important Chart in Human History?