Adapting to Climate Change: A key role for satellite observations

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Broadly speaking and without pulling punches




We need to watch this object

.... because there is just one and no substitute is available

Sources: Newsweek, Jane Goodall Institute, Shropshire Star, Flood Guidance, Colourbox

COP26: We need to adapt……we must adapt…

- Adapting to climate change has become a necessity.
- Why is it not just an option?
- **BECAUSE:**
- The heat Impacts of Climate Change are already here (temperatures around 50°C are no longer so rare; ocean circulation weakening; crop yields at risk; permafrost melting releasing methane; wildfires).
- The sea-levels are rising already at 4mm/yr (the rate used to be at or below 1mm/yr; the melt of grounded ice is now rapid).
- The oceans are acidifying (more acid than at any time in the past 50million years).
- The variability in rainfall is causing floods on one hand and droughts on the other.
- **AND**
- A lot of the world is already at 1.5°C above pre-industrial (China, Russia, polar regions) and on average over 1°C has likely been surpassed.
- Billions of people at risk

Global

Sources: Colourbox, Gatwick, Times of India, Sustainable First

Data

Local

Action

Adaptation is the same the world over ….

Data needed	Issues to be addressed	Risks; Actions to be taken; benefits delivered
• **Heat** • **Water** • Land and soil • Oceans • Ice • Woodlands and Forests • Green and blue spaces • Crop yields	Coastal Change	Migration; Adaptive Management; Sustainability and wellbeing of coastal communities
	Urban Design	Deaths and morbidity; Plant trees etc; shading, flood management, wellbeing of urban communities

From COP26: People and Nature

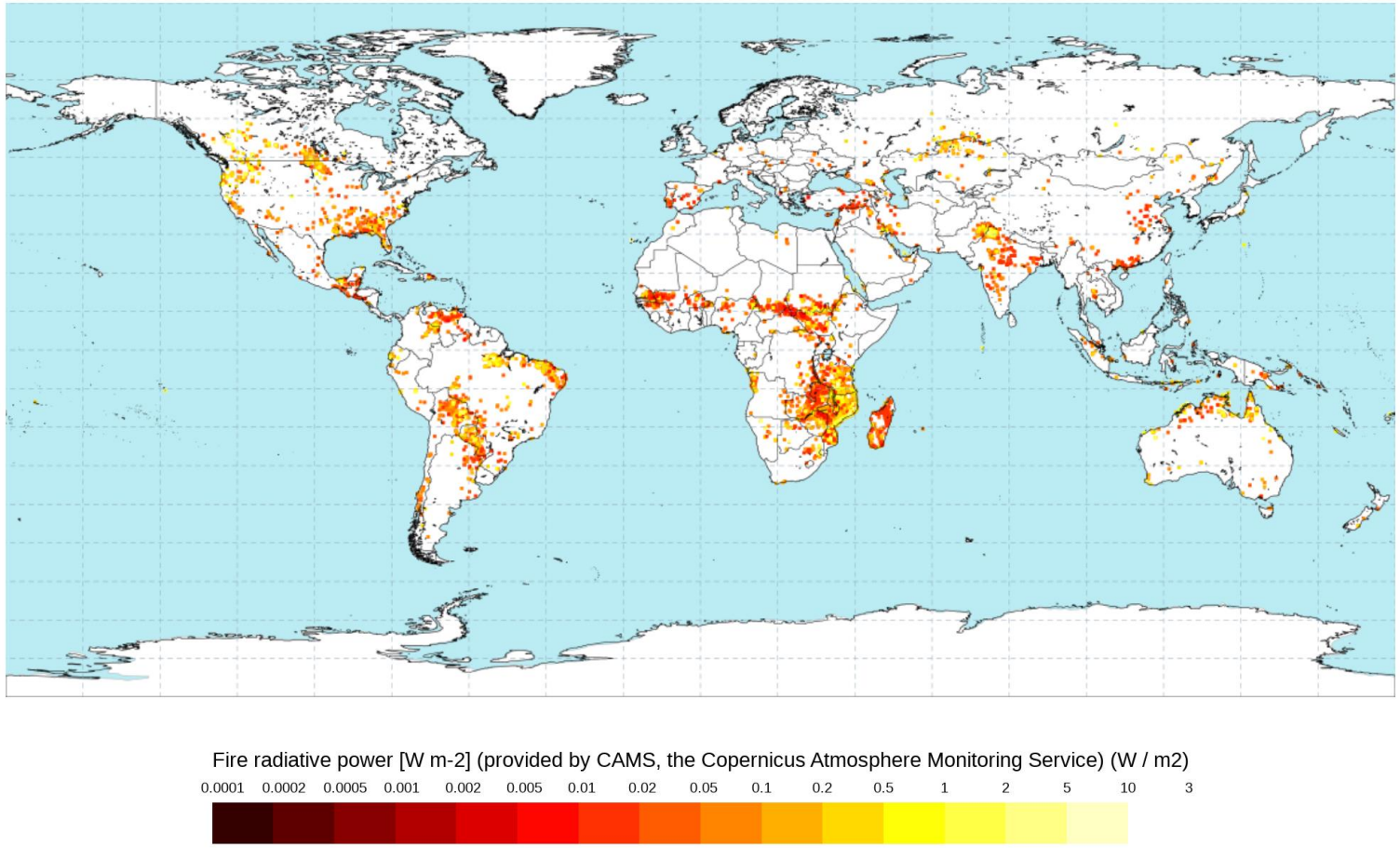
- **Heat**
- **Water**
- **Land and soil**
- **Oceans**
- Ice
- **Woodlands** and Forests
- **Green and blue spaces**
- Crop yields

Satellite Challenge – What can be done?

We are better dealing with extremes than with trends

Fire activity analyses

Base time: Tue 09 Nov 2021 00 UTC Valid time: Wed 10 Nov 2021 00 UTC (+24h) Area : Global



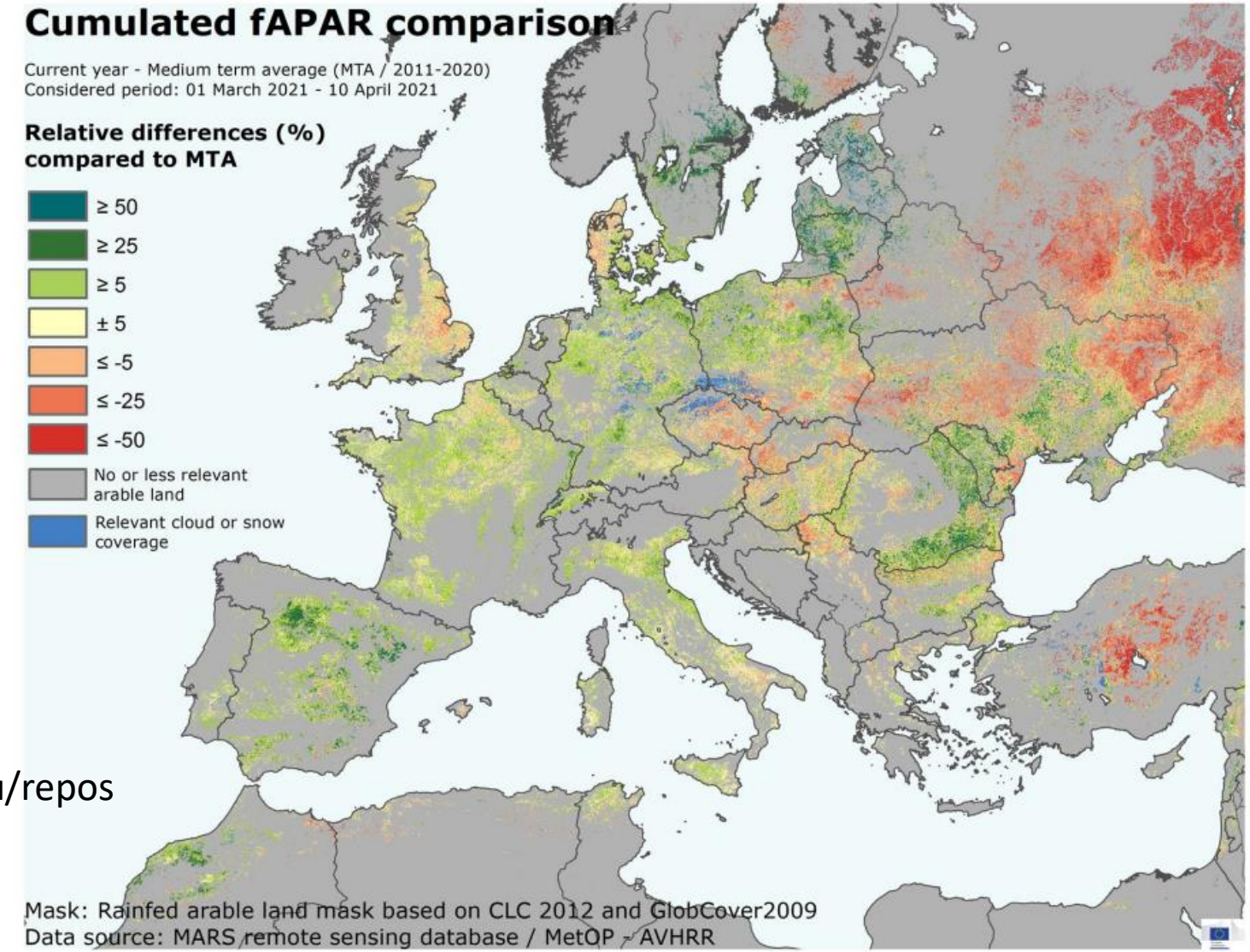
European Commission

Copernicus Europe's eyes on Earth

IMPLEMENTED BY ECMWF

Phenology… biology speaking

- The map displays the differences between the fraction of Absorbed Photosynthetically Active Radiation (fAPAR)
- cumulated from 1 March to 10 April 2021 and the medium-term average (MTA, 2011-2020) for the same period.
- Positive anomalies (in green) reflect above-average canopy density or early crop development while negative anomalies
- (in red) reflect below-average biomass accumulatio or late crop development.
- Relevant cloud coverage in the analysis period – w unrealistically low fAPAR values – is highlighted in blue on the
- map (Germany, Czechia, southern Poland). Neighbouring regions may also be somewhat affected by undetected clouds.



https://publications.jrc.ec.europa.eu/repository/handle/JRC124849

A small coastal example: Climping, West Sussex

1870

Ordnance Survey

Contemporary

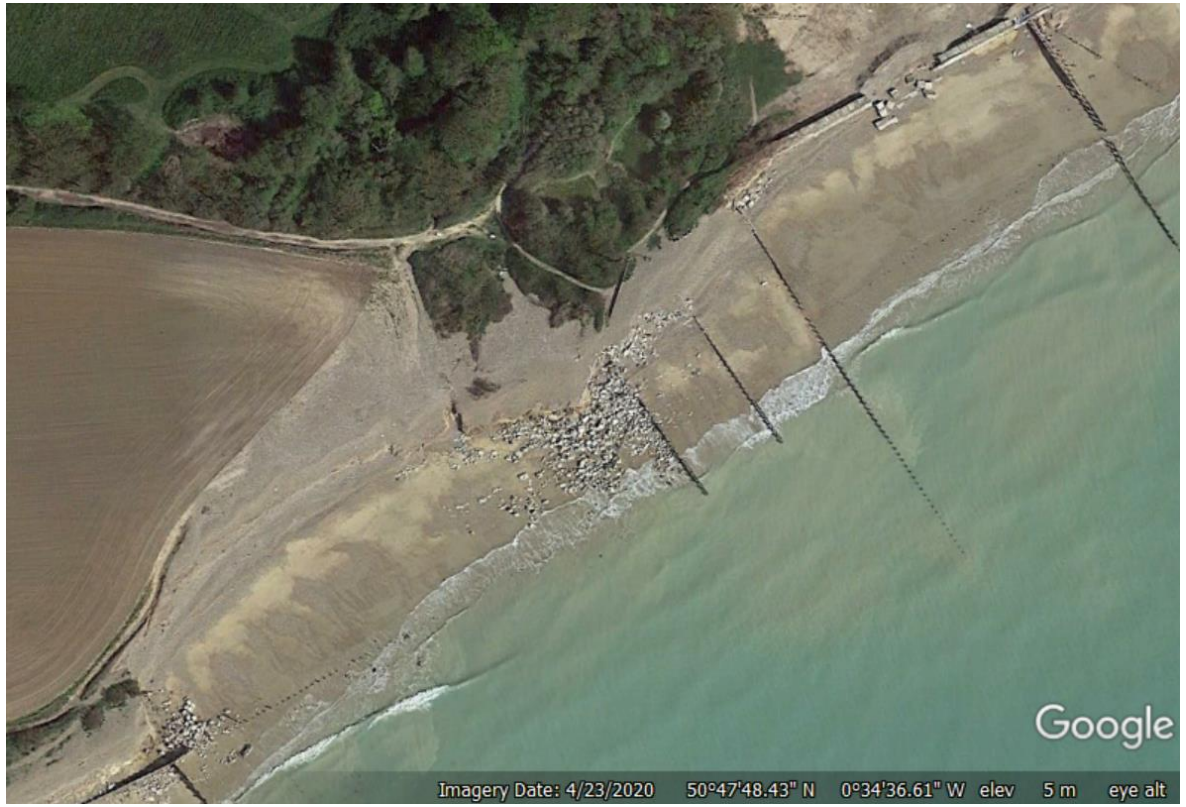
1870 – 810m
Contemporary – 790m
Google Earth – 720m

Google Earth

Closer in……

2001 data - image made in 2021?

Image from 2020 data



Some of this is management, some the tidal cycle on top of rising sea-levels, some storms, but all increasingly hard to separate from the impacts of climate change – **there is change here that needs quantifying so that people can get adaptive management plans in place. In just these two images there is loss of very good farmland, a business under threat, amenity land lost and cultural heritage undermined… and of course coastal defences swept away.**

On the ground things are “unrecognisable” to some local people

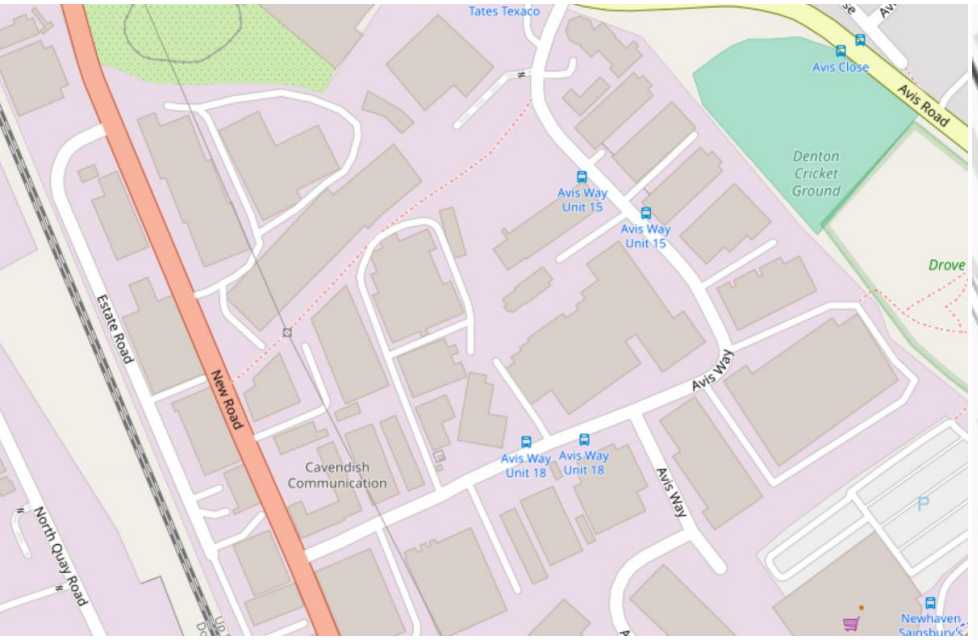
What should be measured and projected and why?

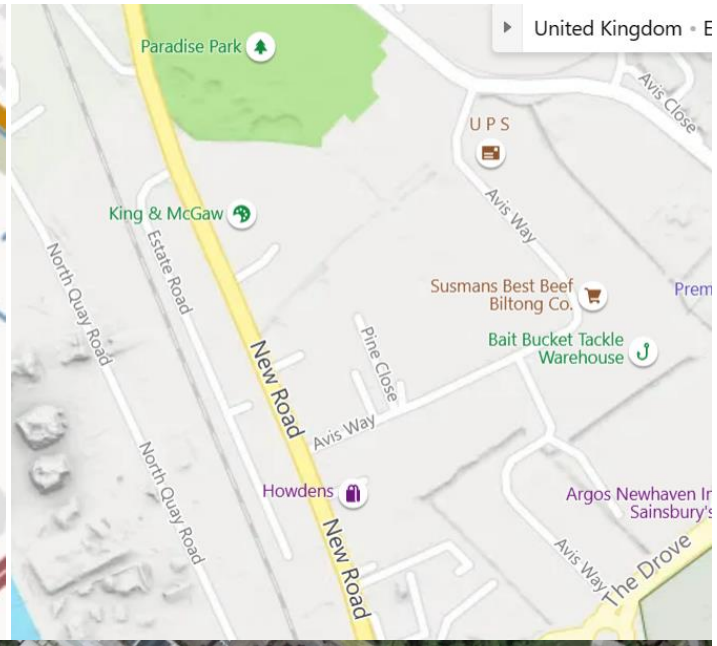
What would doing that enable?

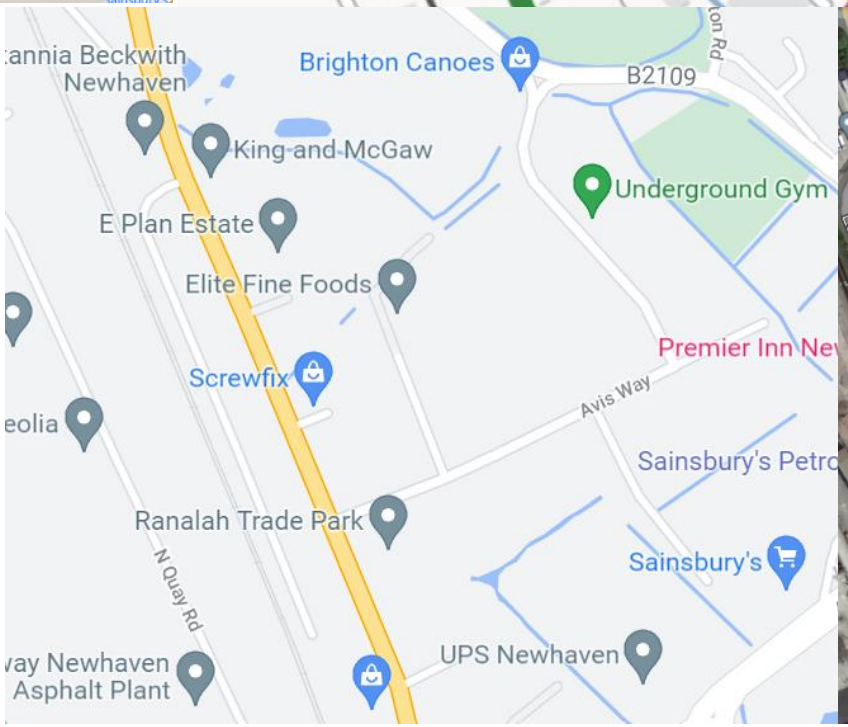
- Land and sea “relative elevation” as sea level rise (SLR) is not uniform across the globe and the land is not still – needed to provide really local SLR data, especially to vulnerable communities
- Rate of erosion or roll-back of the coastline on a sufficiently frequent basis (even hard cliffs collapse) to project the trend of land loss or help make “adaptive management” plans at local scales – current approaches are insufficiently certain to encompass the need to relocate
- **Estimate the real economic, social and environmental value of all assets at risk**
- **Better risk assessment and better risk management through development of adaptive management plans, working with nature in so far as is possible**
- **Engaging multiple stakeholder groups and local community in taking action on adaptation – <u>make sure people know what they’ve got before its gone</u>**

Green and blue space

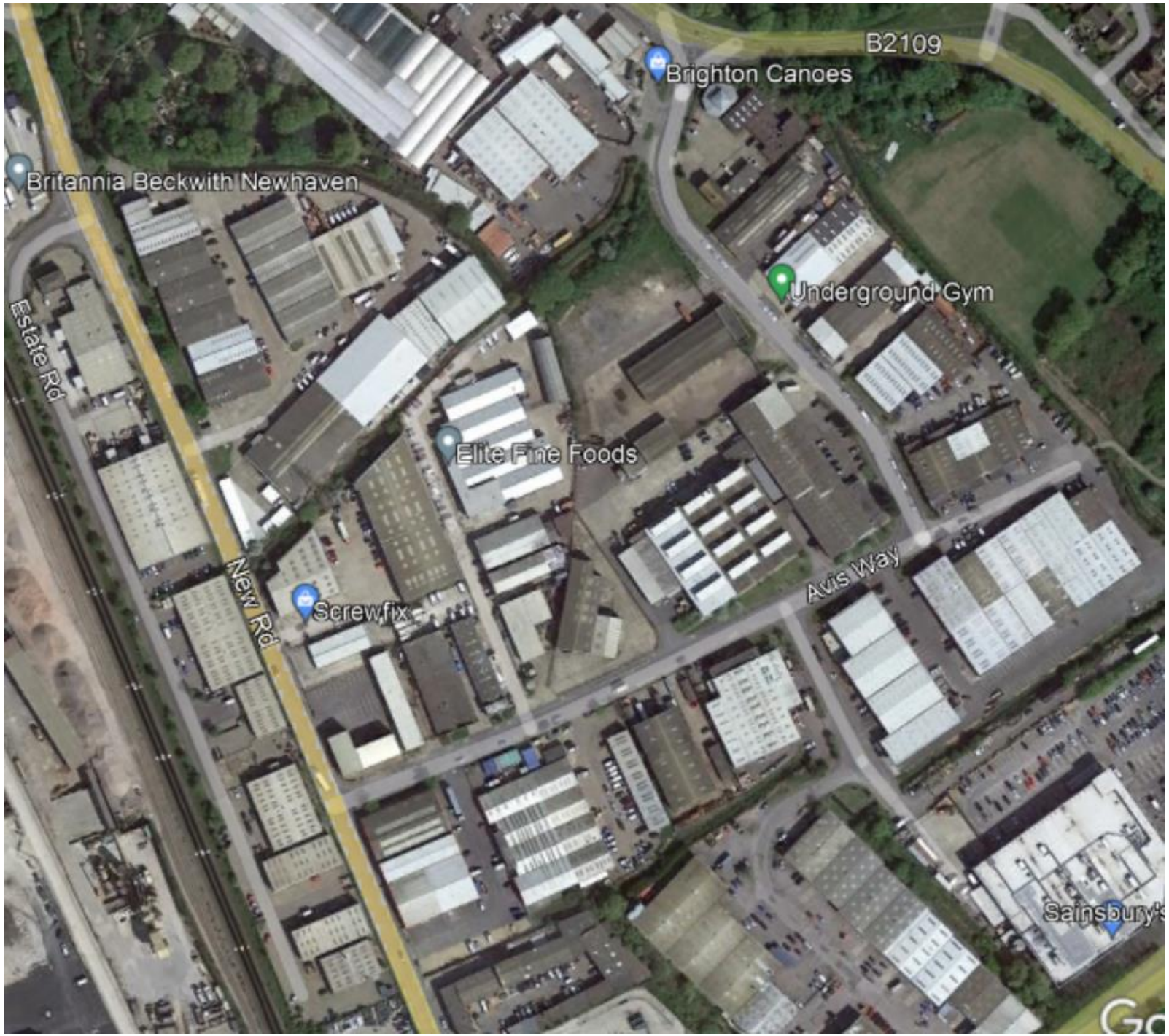
Clockwise from top left:
OpenStreetMap
Ordnance Survey Contemporary
Bing maps
Google maps
Google Earth





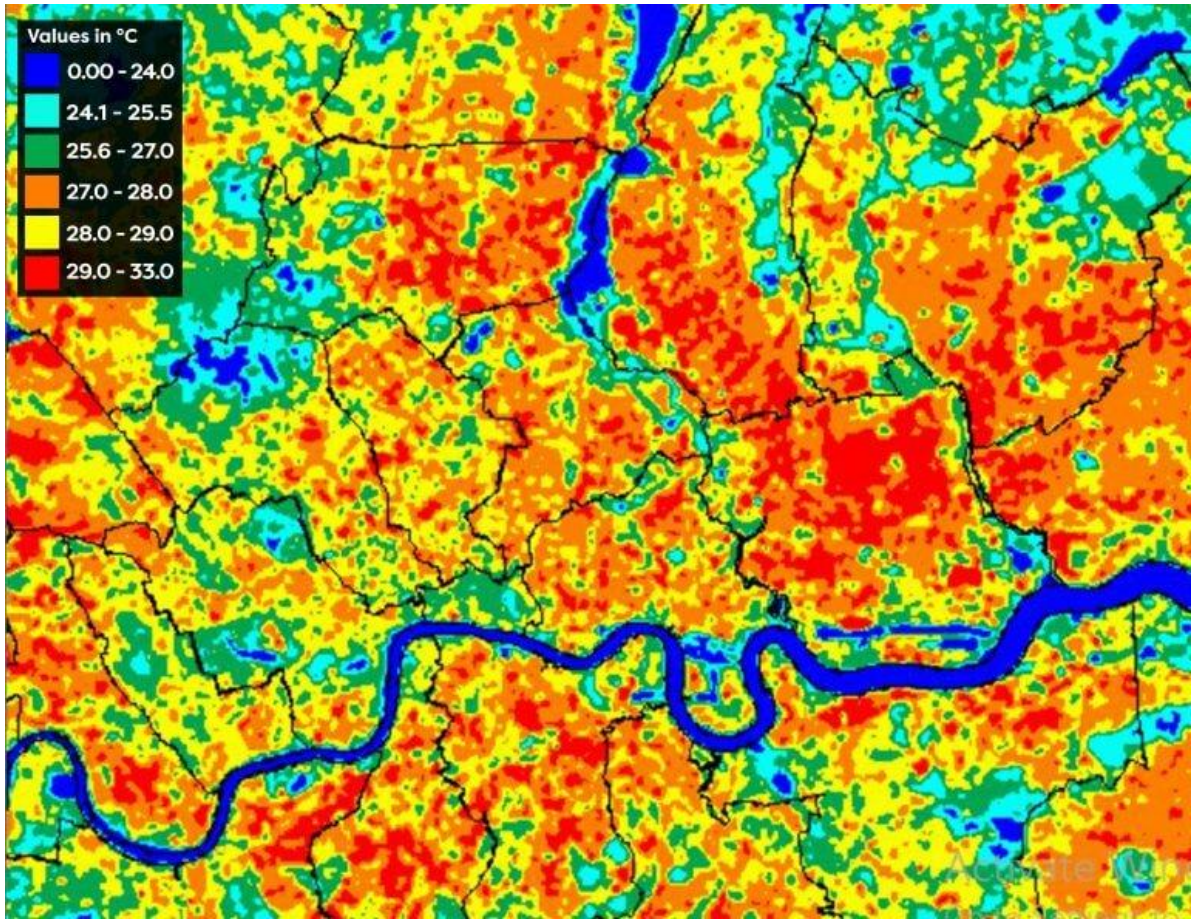


Identifying, Measuring and Assessing Assets within urban areas



London Urban Heat Island Effect: Heat does kill

From the Geospatial Insight website, work by Janet Nicholl, Sussex Uni



Extract from Landsat 8 OLI Thermal infra-red band of Path 202 Row 24, on 25th July 2019, at 10.58 am GMT. Overlay shows London Boroughs. Image is converted to LST (°C) and emissivity and atmospherically corrected. Output pixel size is 30 m

Greenfield management – Develop and lose nature to concrete or adapt to work with nature?

Billingshurst, West Sussex in 2001 and likely extent by 2040 (in yellow; from Google earth and Local Plans)

What assets are being lost?

Can we afford it?

Rewilding and regeneration – how long does it take and what is being delivered?

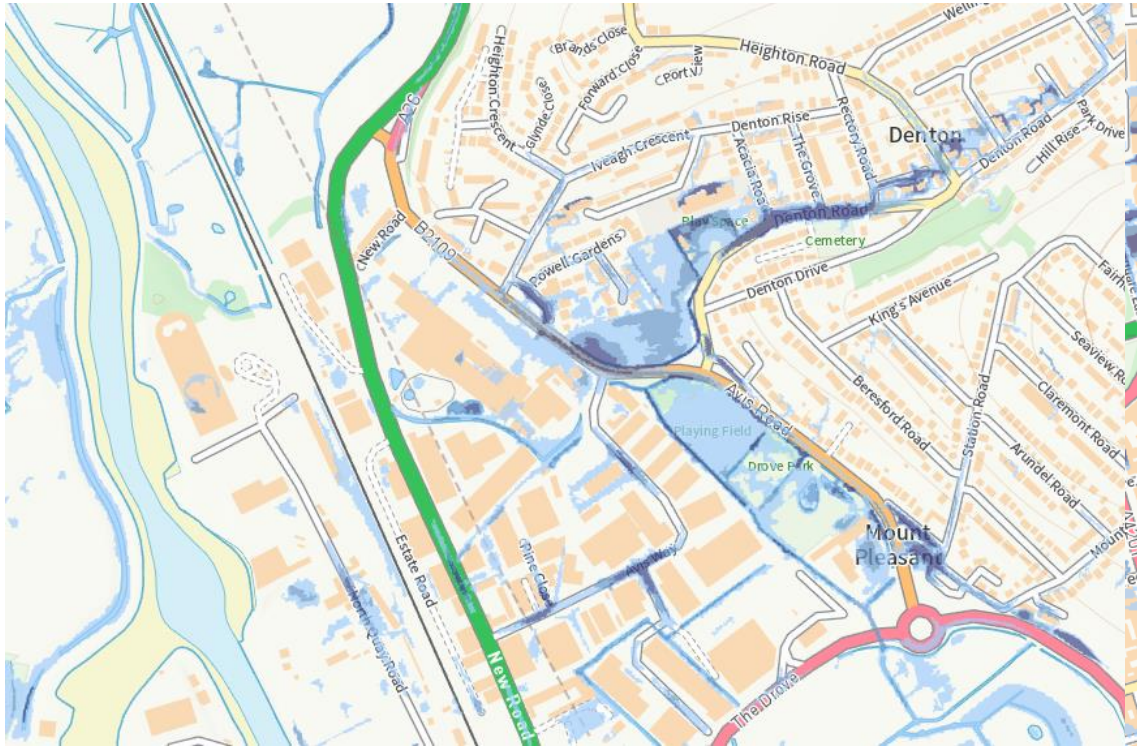
Part Knepp Estate

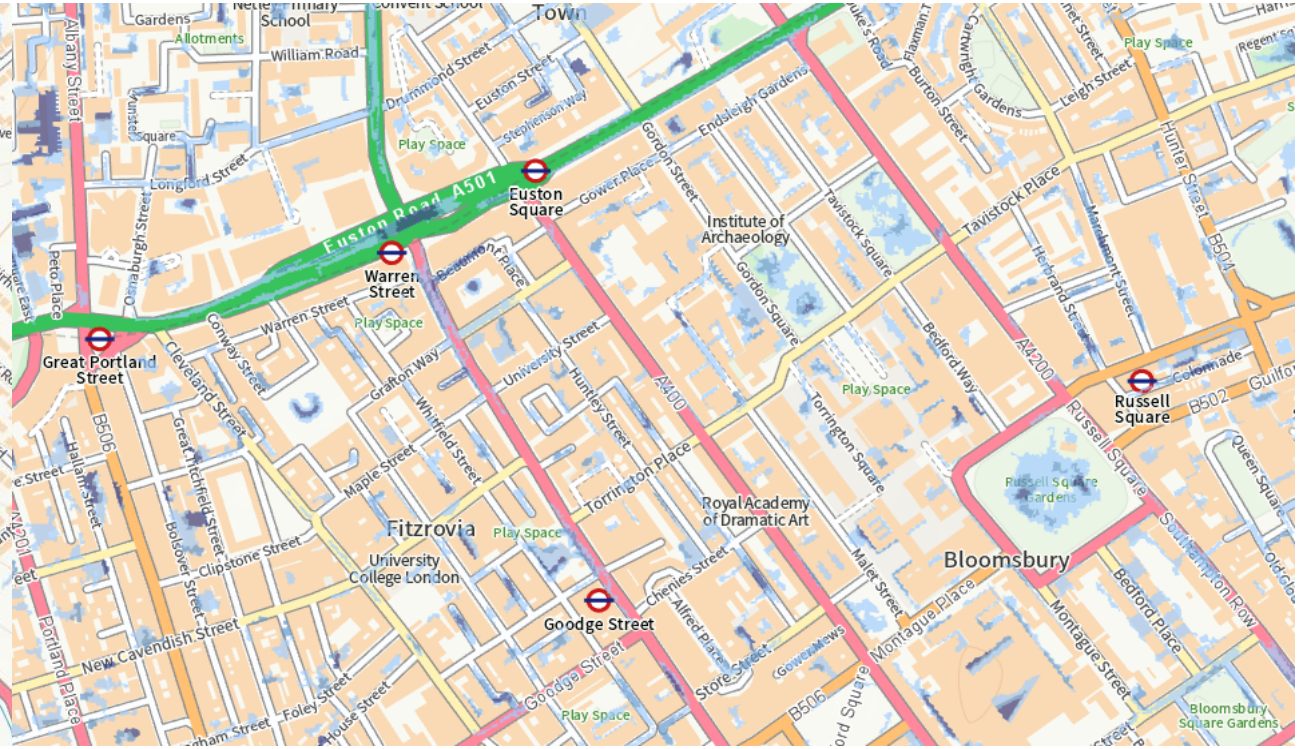
2001

2020

Surface Water Flooding

“Over 3 million properties in England are at risk of surface water flooding, even more than those at risk from rivers and the sea (2.7 million).” - Sir James Bevan, Chief Executive, Environment Agency, 2018





Should also cover…….

- Compliance with laws and international agreements (Paris, Montreal, Convention on Biodiversity and national and regional statutes)
- Tracking changes in emissions and vulnerabilities
- Estimating the capacity to adapt (where could surface water be stored and how? Where can new forests be planted to best effect for people, the planet and biodiversity? What is the best way of defending coasts?)
- Skills of potential users to handle satellite data – tools to make it easy ("Any model that asks a policy analyst to press more than one button might not get used")
- What do people make of this? They will use what they see….
- What is the role of communities in all parts of the world
- How will people respond with actions and behaviours or jujst "blah blah blah"