Operational use of remote sensing in Natural Resources Wales (NRW)

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Who are we?

Formed April 1st 2013

– Countryside Council for Wales (CCW)

– Environment Agency Wales (EAW)

– Forestry Commission Wales (FCW)

– some functions of Welsh Government

April 2015

– Internal Drainage Boards (IDBs)

• Largest Welsh Government sponsored body, ~1900 staff

Yn falch o arwain y ffordd at ddyfodol gwell i Gymru trwy reoli'r amgylchedd ac adnoddau naturiol yn gynaliadwy

Proud to be leading the way to a better future for Wales by managing the environment and natural resources sustainably

Cyfoeth
Naturiol
Cymru
**Natural
Resources
Wales**

Our roles and responsibilities

- **Adviser**: principal adviser to Welsh Government, and adviser to industry and the wider public and voluntary sector, and communicator about issues relating to the environment and its natural resources

- **Regulator**: protecting people and the environment including marine, forest and waste industries, and prosecuting those who breach the regulations that we are responsible for

- **Designator**: for Sites of Special Scientific Interest – areas of particular value for their wildlife or geology, Areas of Outstanding Natural Beauty (AONBs), and National Parks, as well as declaring National Nature Reserves

- **Responder**: to some 9,000 reported environmental incidents a year as a Category 1 emergency responder

- **Statutory consultee**: to some 9,000 planning applications a year

- **Manager/Operator**: managing seven per cent of Wales' land area including woodlands, National Nature Reserves, water and flood defences, and operating our visitor centres, recreation facilities, hatcheries and a laboratory

- **Partner, Educator and Enabler**: key collaborator with the public, private and voluntary sectors, providing grant aid, and helping a wide range of people use the environment as a learning resource; acting as a catalyst for others' work

- **Evidence gatherer:** monitoring our environment, commissioning and undertaking research, developing our knowledge, and being a public records body

- **Employer:** of almost 1,900 staff, as well as supporting other employment through contract work

Sustainable Management of Natural Resources (SMNR) ✔

What are the principles?

Principles of sustainable management of natural resources		
🔄	**Adaptive management**	manage adaptively by planning, monitoring, reviewing and where appropriate, changing action
	Scale	consider the appropriate spatial scale for action
🤝	**Collaboration and engagement**	promote and engage in collaboration and cooperation
👥	**Public Participation**	make appropriate arrangements for public participation in decision-making
🔍	**Evidence**	take account of all relevant evidence, and gather evidence in respect of uncertainties
🌍	**Multiple benefits**	take account of the benefits and intrinsic value of natural resources and ecosystems
🔭	**Long term**	take account of the short, medium and long term consequences of actions
✋	**Preventative action**	take action to prevent significant damage to ecosystems
🌱	**Building resilience**	take account of the resilience of ecosystems, in particular the following aspects: **(i)** diversity between and within ecosystems; **(ii)** the connections between and within ecosystems; **(iii)** the scale of ecosystems; **(iv)** the condition of ecosystems (including their structure and functioning); **(v)** the adaptability of ecosystems

Introducing Sustainable Management of Natural Resources

www.naturalresources.wales

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Natural Resources Wales

Wellbeing ✔

- A globally responsible Wales
- A prosperous Wales
- A resilient Wales
- A healthier Wales
- A more equal Wales
- A Wales of cohesive communities
- A Wales of vibrant culture and thriving Welsh Language

CORONAVIRUS

STAY HOME
PROTECT
THE NHS
SAVE LIVES

Coronavirus
(COVID-19)

Visit Wales. Later.

Llywodraeth Cymru
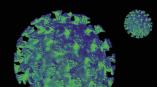Welsh Government

GIG
CYMRU
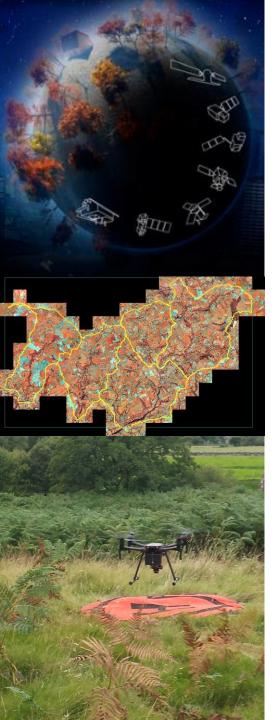NHS
WALES
Iechyd Cyhoeddus
Cymru
Public Health
Wales

What's classed as essential travel?

✓
- To shop for **basic necessities**
- **Exercise** - alone or with members of your household
- A **medical need** or to care for a vulnerable person
- Travelling **to and from work** when **working from home** is absolutely not possible

✗
- Attending **social gatherings** with friends
- **Meeting friends and family** from other households
- **Shopping** unless it is for food

CORONAVIRUS
STAY HOME. PROTECT
THE NHS. SAVE LIVES.

Satellites

Aerial photography/ Lidar

Drones

Increasing resolution

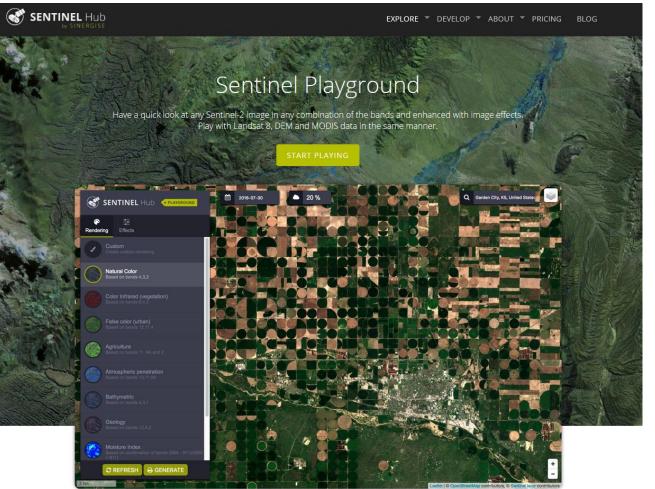Increasing data storage/ computational power needed

Increasing study area size

Drones

Waste Crime

Sentinel Hub

https://www.sentinel-hub.com/

https://www.sentinel-hub.com/explore/sentinel-playground

https://www.sentinel-hub.com/explore/eobrowser/

Sentinel Hub – paid account

Paid account:

- **Direct feed into NRW GIS**

- **Access to commercial data – Planet, Pleiades, SPOT**

Free	Exploration Non-Commercial / Research	Basic	Enterprise S	Enterprise L
0€	25€ / month (billed 300€ annually)	83.25€ / month (billed 999€ annually)	416.67€ / month (billed 5 000€ annually)	833.33€ / month (billed 10 000€ annually)
Download analytical data with EO Browser Community support Non-commercial use	All free features + OGC standard WMS / WCS / WMTS / WFS API for advanced features Configuration Utility tool	All Exploration features + Commercial use	All Basic features + Priority email support	All Basic features + Priority email support
Processing units 30 000 / month 300 / min	Processing units 30 000 / month 300 / min	Processing units 70 000 / month 500 / min	Processing units 400 000 / month 1 000 / min	Processing units 1 million / month 2 000 / min
Requests 30 000 / month 300 / min	Requests 100 000 / month 300 / min	Requests 700 000 / month 500 / min	Requests 600 / min	Requests 1 200 / min
Creative Commons Attribution-NonCommercial 4.0 International License	Creative Commons Attribution-NonCommercial 4.0 International License	Creative Commons Attribution 4.0 International License	Individual license	Individual license
	Free Trial	Free Trial	Free Trial	Free Trial

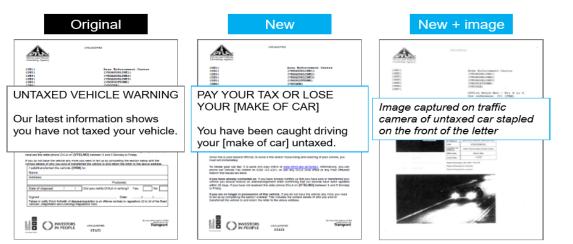Value added tax (VAT) not included

Planet Scope

155€
per package

Package contains a total of 100 km² of orders.

- Minimum area per order is 0.01 km².
- Existing Planet users can use the data through Sentinel Hub using their own credentials.
- Any unordered package area expires 12 months after purchase.

Letters to persistent non-payers of road tax

THE BEHAVIOURAL INSIGHTS TEAM

Original

New

New + image

UNTAXED VEHICLE WARNING

Our latest information shows you have not taxed your vehicle.

PAY YOUR TAX OR LOSE YOUR [MAKE OF CAR]

You have been caught driving your [make of car] untaxed.

Image captured on traffic camera of untaxed car stapled on the front of the letter

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Natural Resources Wales

"It is clear from earlier research studies that those being monitored generally do not know the extent of the monitoring capability"

© Behavioural Insights ltd

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Natural Resources Wales

Landowner / Contact
Address
Address
Post Code

Ein cyf/Our ref:
Eich cyf/Your ref:
Dyddiad/Date:

Dear Landowner / Contact,

(INSERT ACTIVITY ADDRESS)

Natural Resources Wales has detected a suspected waste deposit / burning of waste / land disturbance / movements of waste, at or near to this address:

Example - Insert Image Here

Anyone who imports, produces, carries, keeps, treats, disposes or has control of controlled waste must be authorised to do so by Natural Resources Wales. Anyone failing to hold the proper authorisation connected with these activities could be prosecuted.

If you are engaging, or are allowing anyone else to engage in any waste activity without holding the appropriate authorisation you must stop. You can get advice on how to comply with your legal obligations from our website or by phoning our customer contact centre on 0300 065 3000

Please note that Natural Resources Wales has the capability and technology to remotely monitor activities and changes to the environment, including waste activities. This can involve the use of satellite data, aerial imagery and unmanned aerial vehicles (UAVs are commonly referred to as drones). Please be aware that where necessary we may instigate this monitoring without prior

notification.

You should also be aware that any illegal waste activity which results in an unauthorised disposal of waste may also be subject to an Unauthorised Rate of Landfill Disposals Tax. This tax is collected and managed by the Welsh Revenue Authroity (WRA). Natural Resources Wales may share information with the WRA for the purpose of assisting the collection and management of the tax. Further information on Landfill Disposals Tax can be found on the WRA website

If you have any further questions please don't hesitate to contact me on Officer email

Yours sincerely

Direct dial
Direct e-mail   XXXX@cyfoethnaturiolcymru.gov.uk

i See Schedule 1 to the Controlled Waste (England and Wales) Regulations 2012 to check if your waste is controlled waste
ii https://naturalresources.wales/permits-and-permissions/waste-permitting/?lang=en
iii unauthorised disposals rates
iv https://gov.wales/unauthorised-disposals-and-landfill-disposals-tax

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Natural Resources Wales

Check a permit or licence   Cymraeg

Flooding   Permits and permissions   Evidence and data   Guidance and advice   Days out   About us   Report an incident

Home > About us > News and events > News

Socially distant but always on duty - using technology to catch waste criminals

06 May 2020

Natural Resources Wales (NRW) is using high-tech surveillance techniques to tackle unscrupulous waste operators seeking to take advantage of the Coronavirus crisis.

Government guidelines on social distancing mean NRW officers are unable to use their usual investigation methods. As such, they have turned to sophisticated drone technology and satellite cameras to help in the tracking of waste criminals.

The new approach includes:

- Using drone footage to investigate illegal waste disposal
- Participating and benefiting from research and tools created in partnership with the Scottish Environment Protection Agency through the Life SMART Waste Project.
- Trialling the use of satellite imagery obtained from the European Space Agency, as well as high resolution commercial satellite data.

Adrian Evans, head of NRW's Tackling Waste Crime initiative, explained:

"Social distancing is impacting on how companies supplying goods and services operate and waste criminals are taking advantage of this.

"We have had to modify our ways of working by developing technological solutions to support our work and ensure that waste operators comply with environmental regulations.

Link

2

Flooding – February 2020

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@NatResWales

👷👷 We're continuing to keep a close eye on river levels on the Wye at Monmouth, after the river reached record-breaking levels earlier this morning.

Severe flood warnings - River Wye

12:38 PM · Feb 18, 2020

♡ 22   See Cyfoeth Naturiol Cymru | Natural Resources Wales's o...

Picture credit: https://www.itv.com/news/wales/2020-02-18/homes-evacuated-and-roads-closed-in-monmouth-as-severe-flood-warning-declared/

Incidents

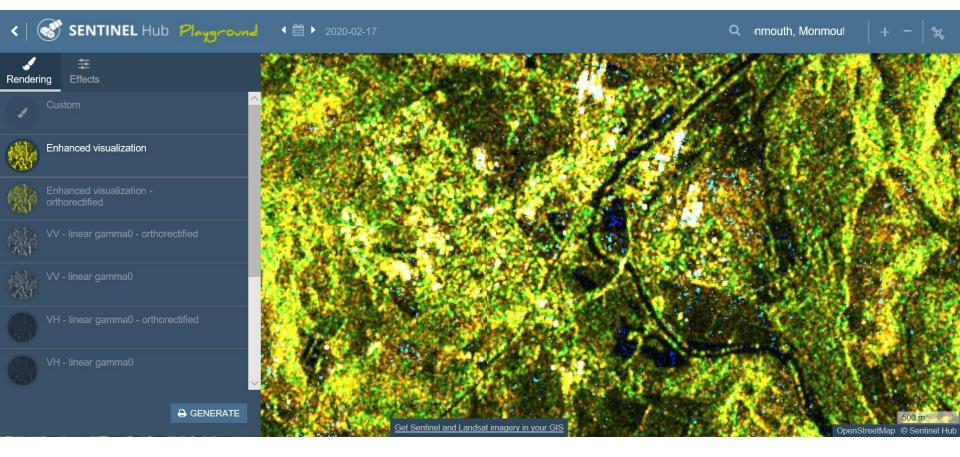**International Charter: Space and Major Disasters**

Copernicus Emergency Management Service (EMS)

Flooding – Monmouth

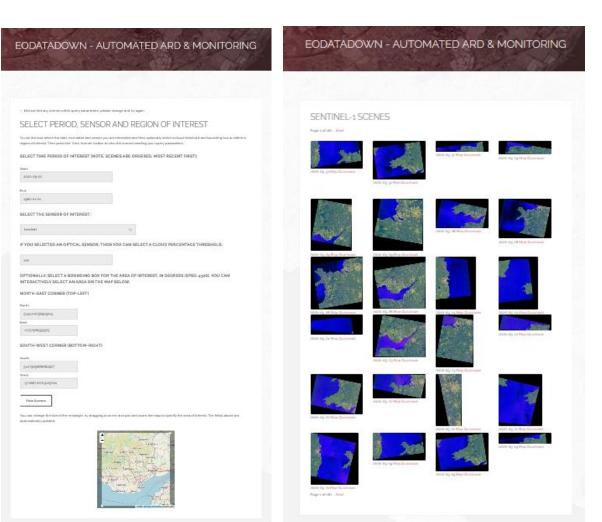**https://www.sentinel-hub.com/**

Analysis Ready Data

Sentinel 1
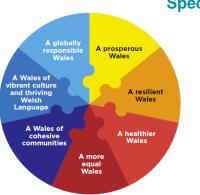
Sentinel 2

Landsat

Processed to ARD standards

The Remote Sensing and GIS Software Library (RSGISLib)

https://www.rsgislib.org/

Indicator 43 Well-being of Wales
Extent of Semi-Natural Habitat

Special thanks to Natural England, particularly Richard Alexander

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Natural Resources Wales

NATURAL ENGLAND

A globally responsible Wales

A prosperous Wales

A Wales of vibrant culture and thriving Welsh Language

A resilient Wales

A Wales of cohesive communities

A healthier Wales

A more equal Wales

Phase 1 Habitat Map

Semi-natural   Improved   Possibly improved

Agricultural data from Welsh Government
-    **improved fields?**
= not semi-natural
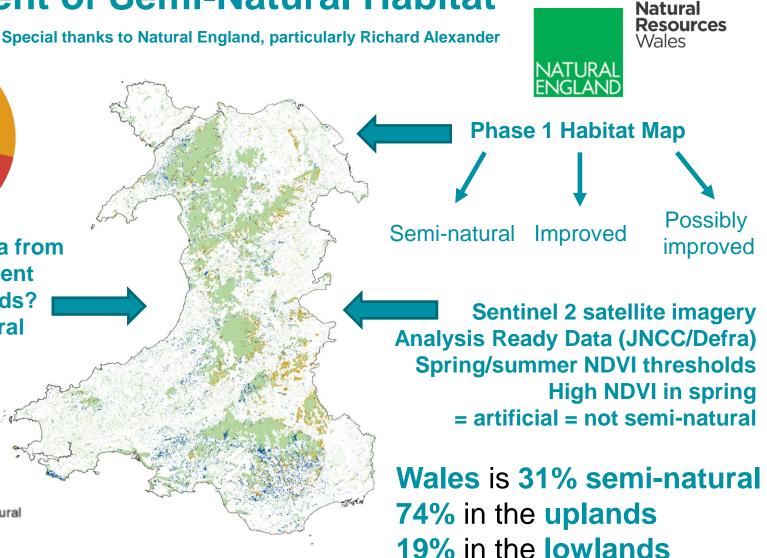
Elevation
Slope
Aspect
Distance North

Sentinel 2 satellite imagery
Analysis Ready Data (JNCC/Defra)
Spring/summer NDVI thresholds
High NDVI in spring
= artificial = not semi-natural

Wales is 31% semi-natural
74% in the uplands
19% in the lowlands

Candidate Semi-Natural

Bracken

Semi-Natural

National Lidar Coverage

- New baseline dataset

- 1m resolution

- Leaf-off

- Planned to be flown next two winters

- All data open including point clouds

Classification Code	Parameters
1 – Default	All points that do not fall within the parameters below
2 - Ground	The algorithms best estimate as to which laser returns are on the ground, based on various parameters that determine if a point can be described as ground i.e angle to its neighbours
3 – Low surface object	0.05 => Ground =< 0.15
4 – Medium surface object	0.15 => Ground =< 5
5 – High surface object	5 => Ground =< 100
8 – Model keypoints	Thinned version of the ground model with reduced point density on flat surfaces and retained point density in areas of relief change.

Pulse classification according to Environment Agency schema

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Challenges

Resource

Costs

ICT

Legal

Commercial data - terms and conditions

Who can I show data to?

Who can I share it with?

Can I use the data in legal proceedings?

Sentinel Hub   Contact details   info@sentinel-hub.com

Documentation   FAQs   API documentation

Drones – General Data Protection Regulation (GDPR)

Webinar – provisionally 15th Oct

5-Agencies ShARE

(Shared Agencies Regulatory Evidence programme)

Have a Safe Flight: drones and the law demystified

Register here

Access NRW data

https://naturalresources.wales/evidence-and-data/access-our-data/

Access Geospatial data for Wales

https://lle.gov.wales/home

Procurement

https://www.sell2wales.gov.wales/

Contact us

www.cyfoethnaturiol.cymru
www.naturalresources.wales

enquiries@naturalresourceswales.gov.uk
0300 065 3000 (Mon-Fri, 9am-5pm)