Energy Co-operatives Ireland
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Rethink

South West Mayo
DEVELOPMENT COMPANY LTD
Comhlacht Forbartha
Iarthar Mhaigh Eo Teo

# MAYO CLIMATE ACTION AWARENESS WORKSHOPS

LCDC

Rialtas na hÉireann
Government of Ireland

Project Ireland 2040

MAYO.IE

CARO

# Climate Action Awareness Group

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- South West Mayo Development Company Ltd.
- CARO (Climate Action Regional Office)
- Mayo County Council
- Moy Valley Resources IRD
- Mayo North East Development Company Ltd.

South West Mayo
DEVELOPMENT COMPANY LTD
Comhlacht Forbartha Iardheisceart Mhaigh Eo Teo

CARO

Comhairle Contae Mhaigh Eo
Mayo County Council

Oirthuaisceart Mhaigh Eo
Mayo North East

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# OVERVIEW

South West Mayo Development Company, as part of a Climate Action Awareness Group, are delivering a bespoke workshop programme 'Mayo Climate Action Awareness Workshops' in 5 Mayo Towns. These workshops will look at a number of topics related to climate change, the relative impacts and adaptation and mitigation actions that can be taken.

The format of these workshops will allow for educating and creating awareness of climate change issues and for interactive discussion around these issues and associated actions that can be taken individually or as a community. The training material will be a combination of both generic and specifically local information using local case studies directed at communities.

This programme will run over a period of 6 weeks, starting the 4th of February 2020 with 3 workshops running in 5 locations around the county. The first two workshops in each location will be common across all 5 locations, with the final workshop focusing on different themes in each location, but open to participants across the whole county.

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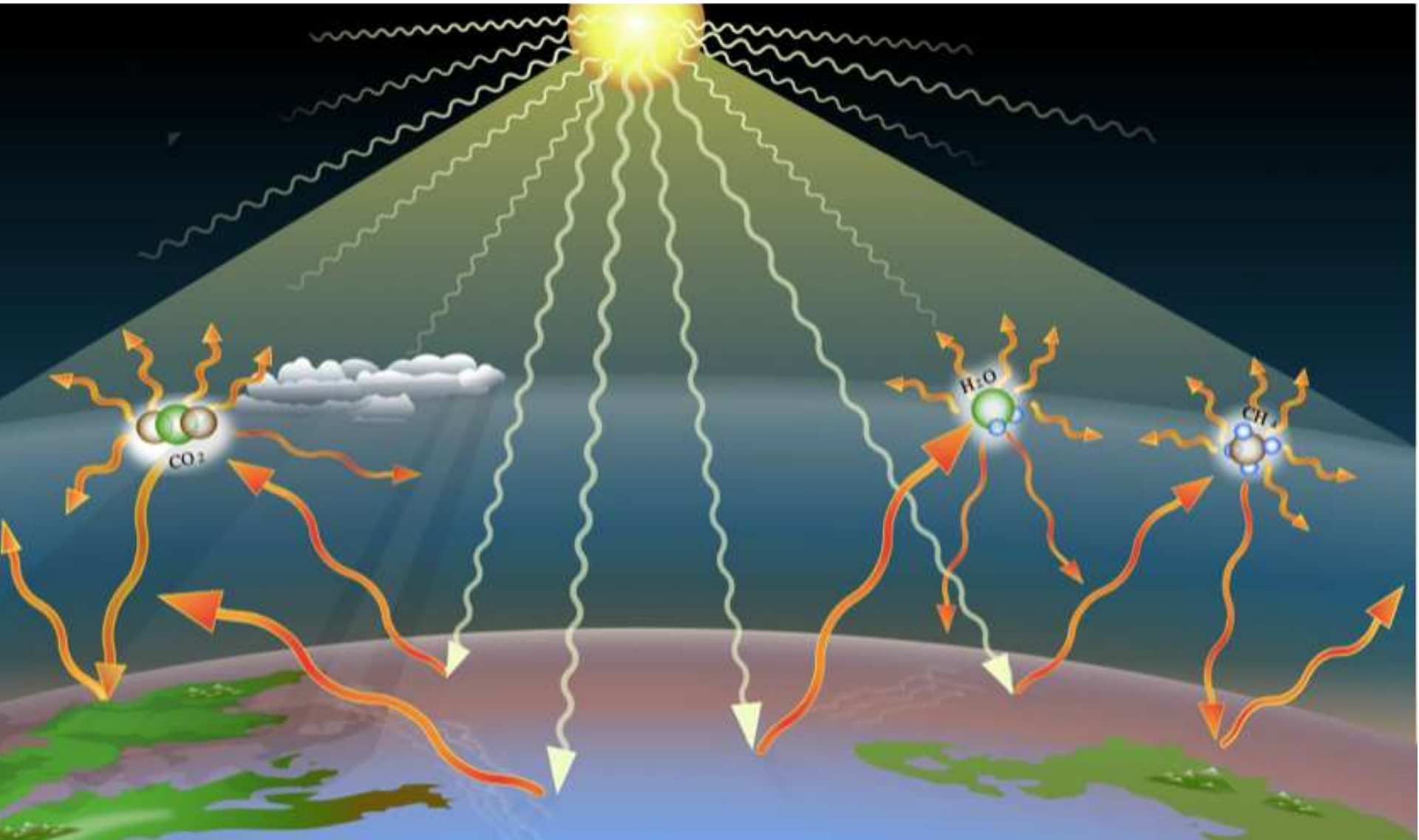
# Workshop 2:
# Understanding Climate Change through Biodiversity, Water Quality and Green Solutions

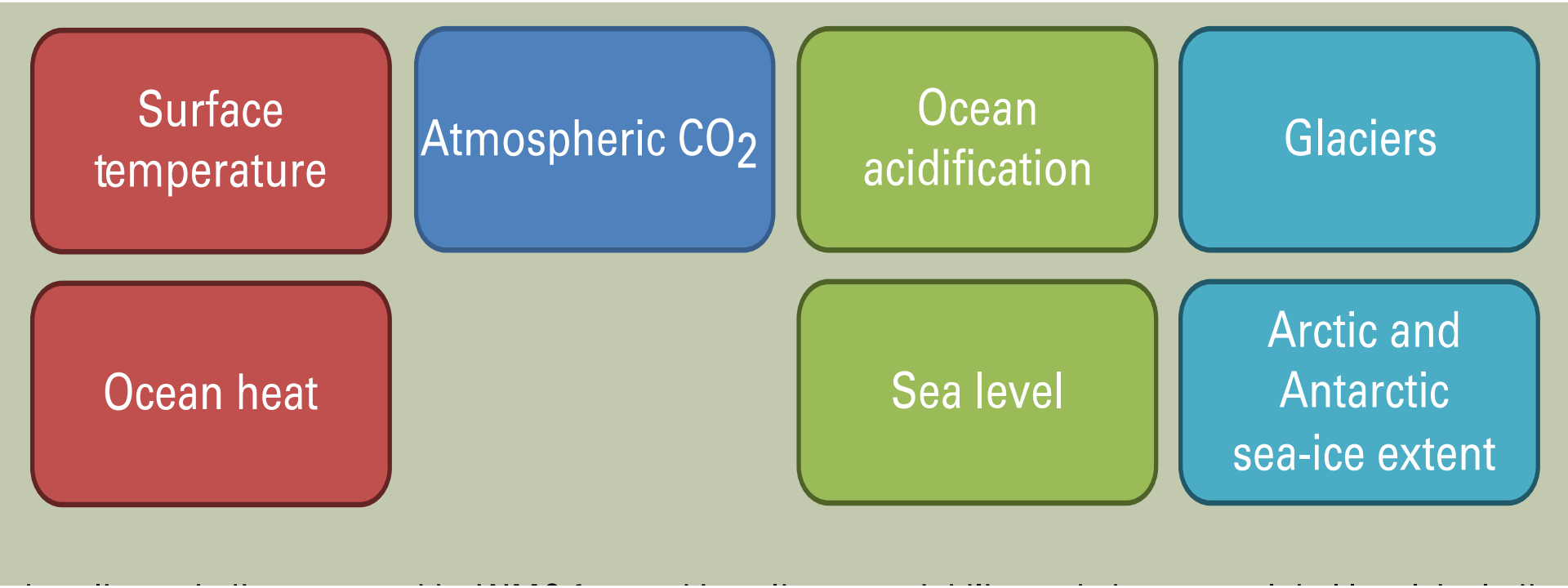
# Global Warming – Greenhouse

Greenhouse Gases collecting in the atmosphere trap heat



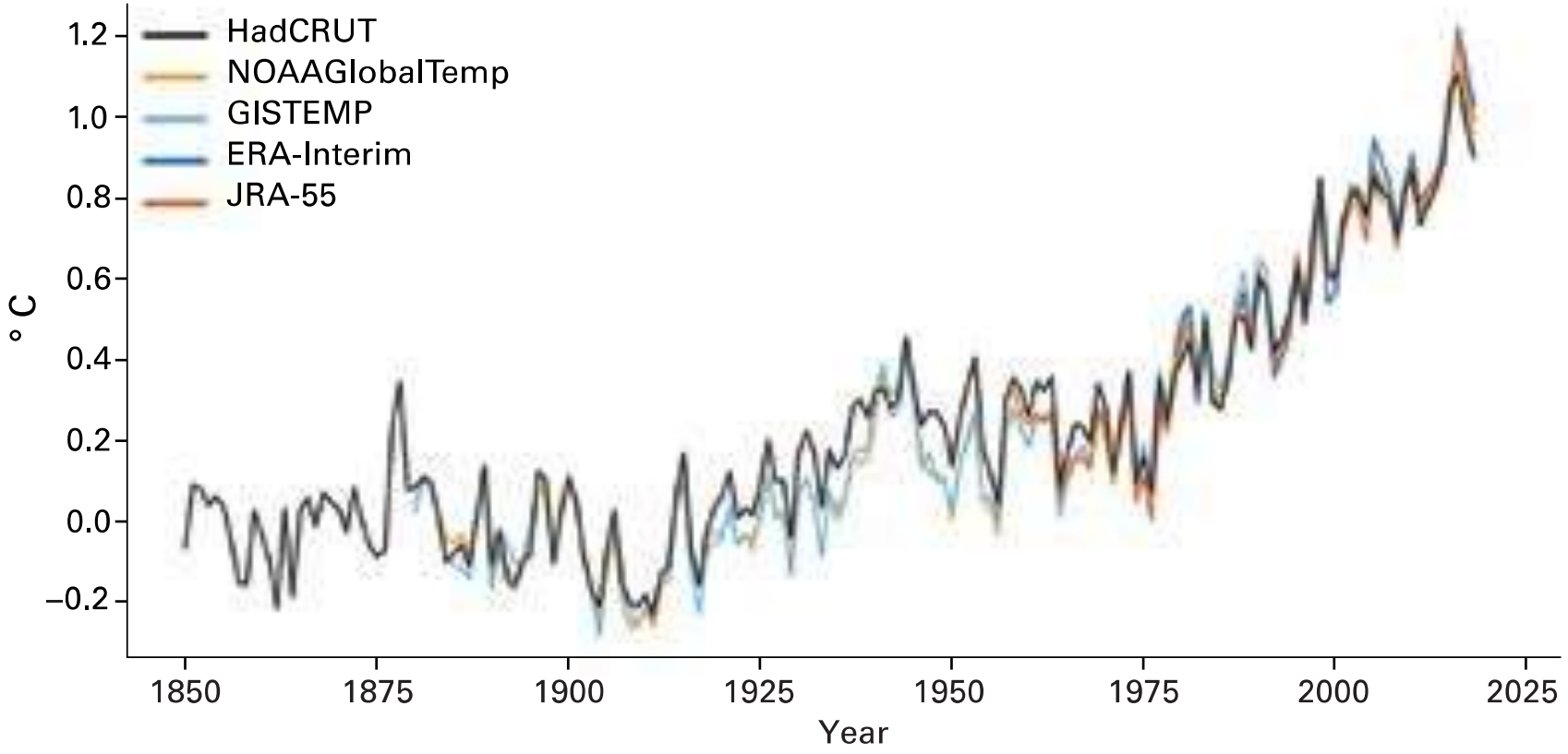
# Global Climate Indicators

Indicators which show the changing conditions which humans are causing




Used by WMO and at https://gcos.wmo.int/en/global-climate-indicat

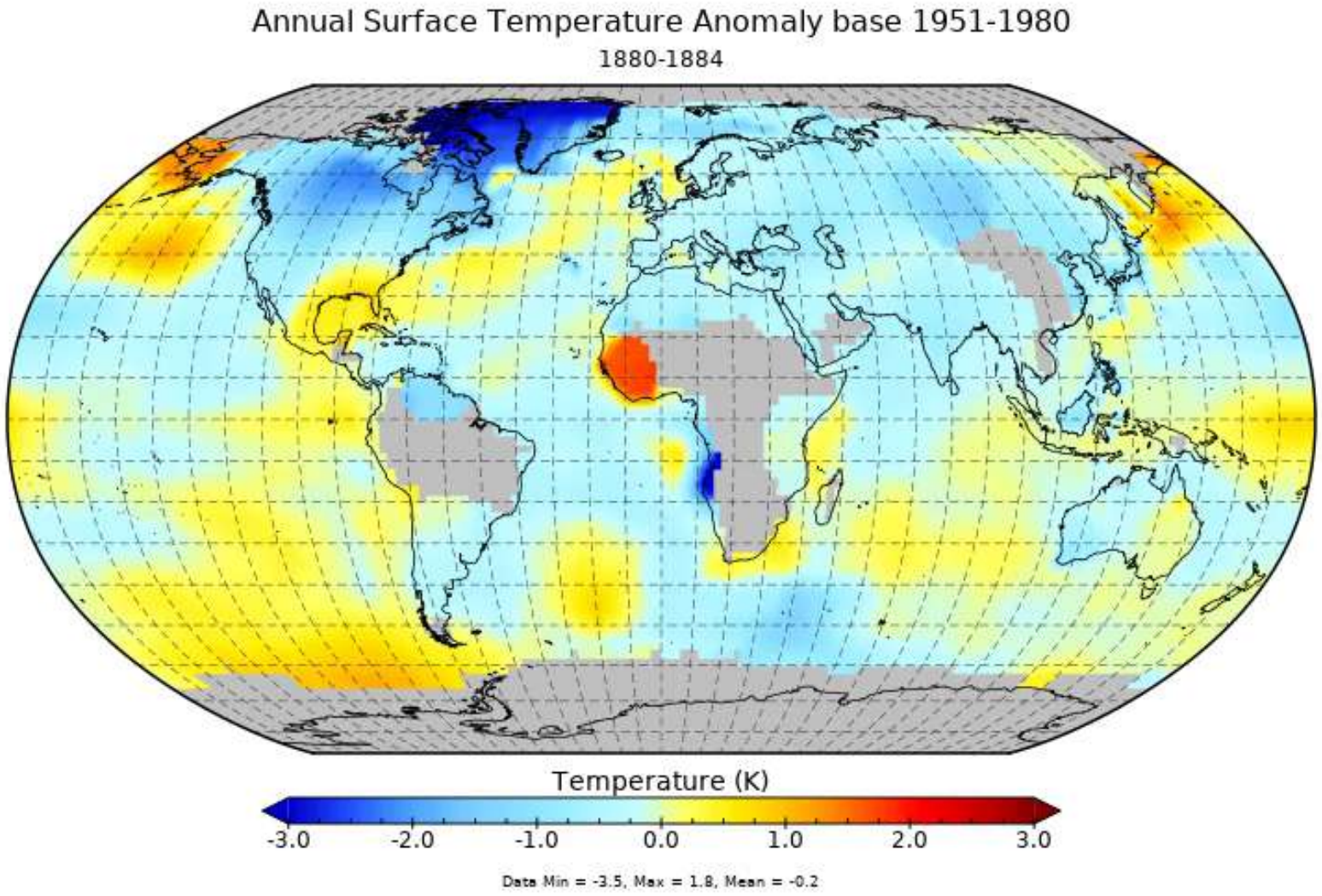
# Global Mean Surface Temperature




- Combines land & marine data
- In 2015 a record level of 1°C higher than in 1850
- Industrial revolution

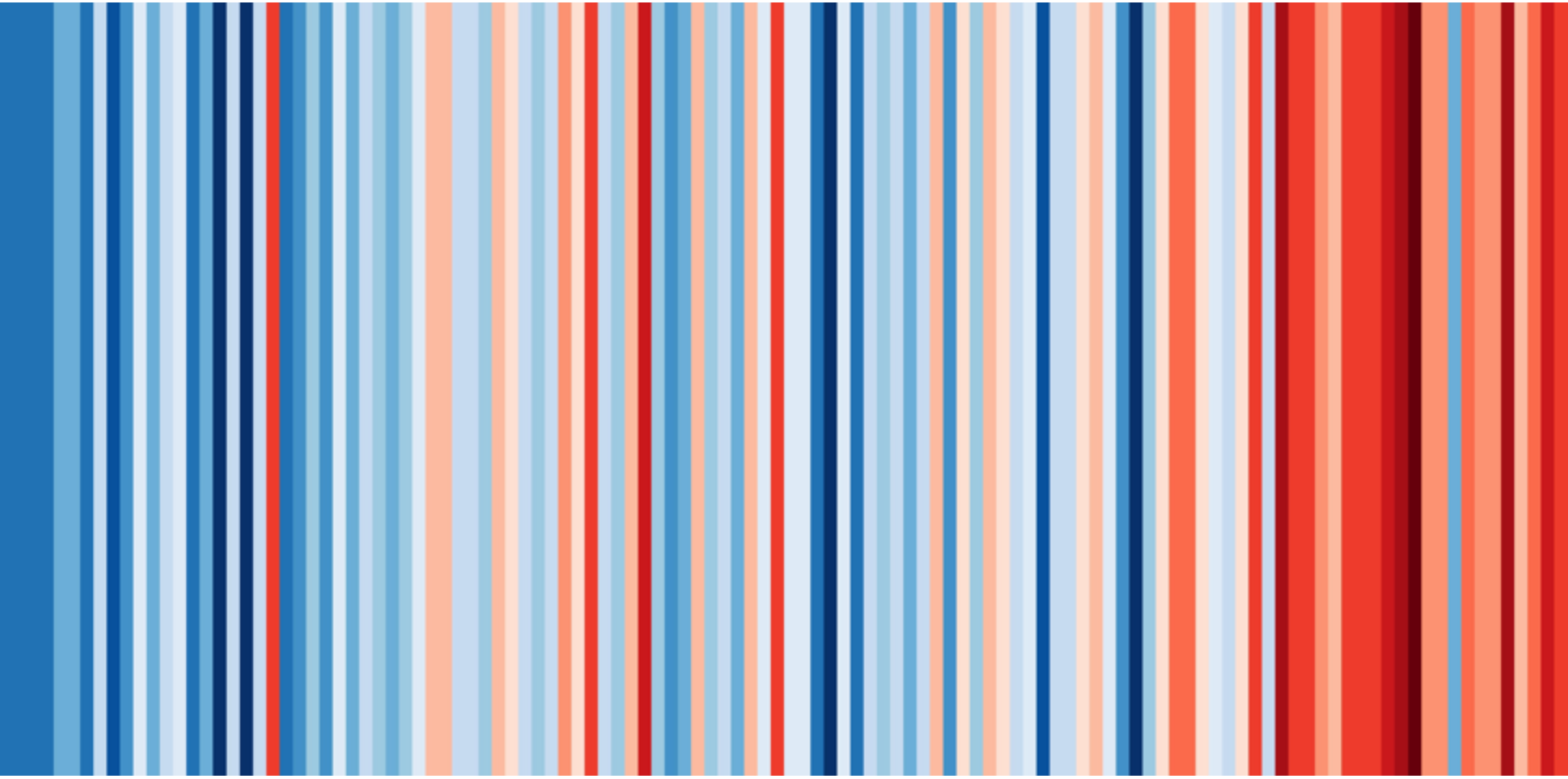
UK Met Office Hadley Centre, WMO (2019), EPA (2016)

# Global Mean Surface Temperature 1880-2017



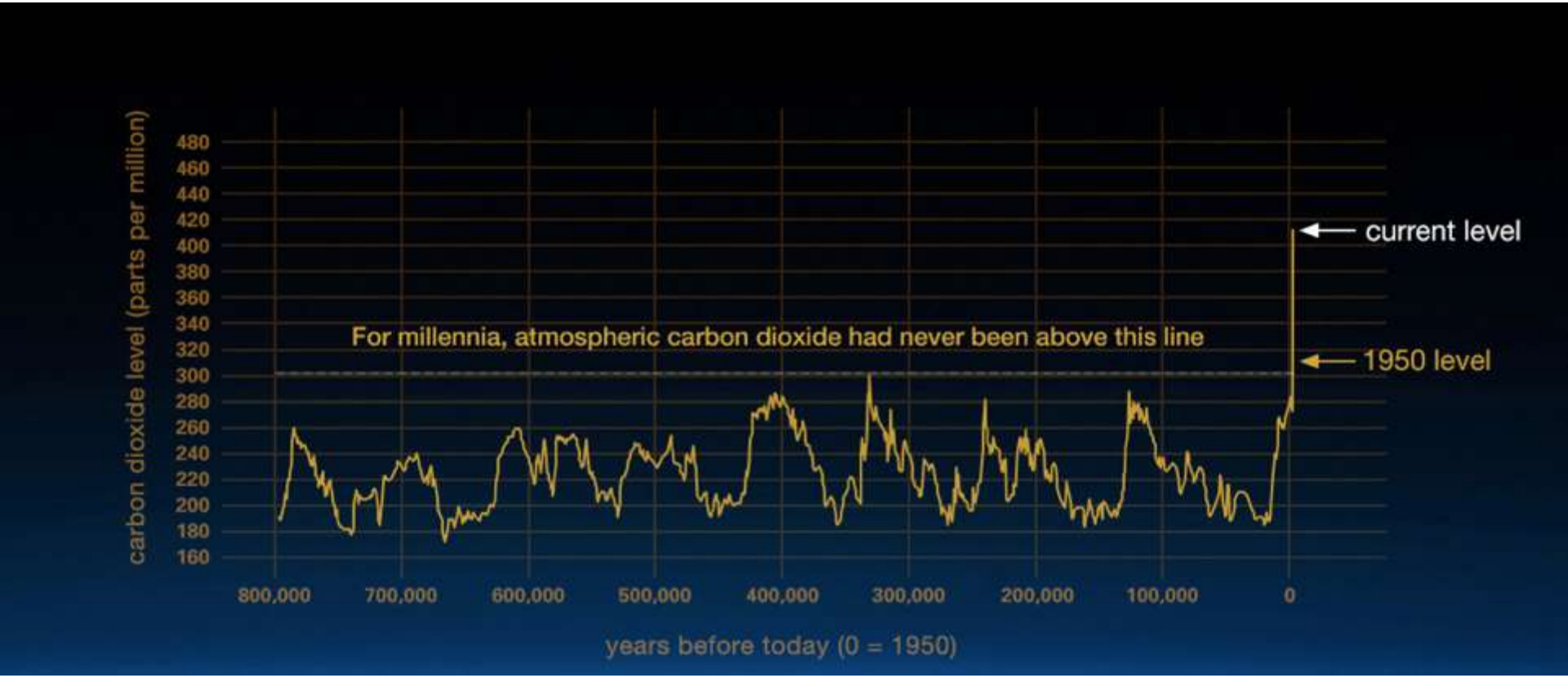

NASA/GSFC Scientific Visualization Studio (2018)

# Annual Average Temperatures for Ireland



- The first line on the left is the temperature in 1801 and the temperatures increases as we move across to the 2018 temperature (far right)
- Berkeley Earth data https://showyourstripes.info/stripes/EUROPE-Ireland--1901-2018-BK.

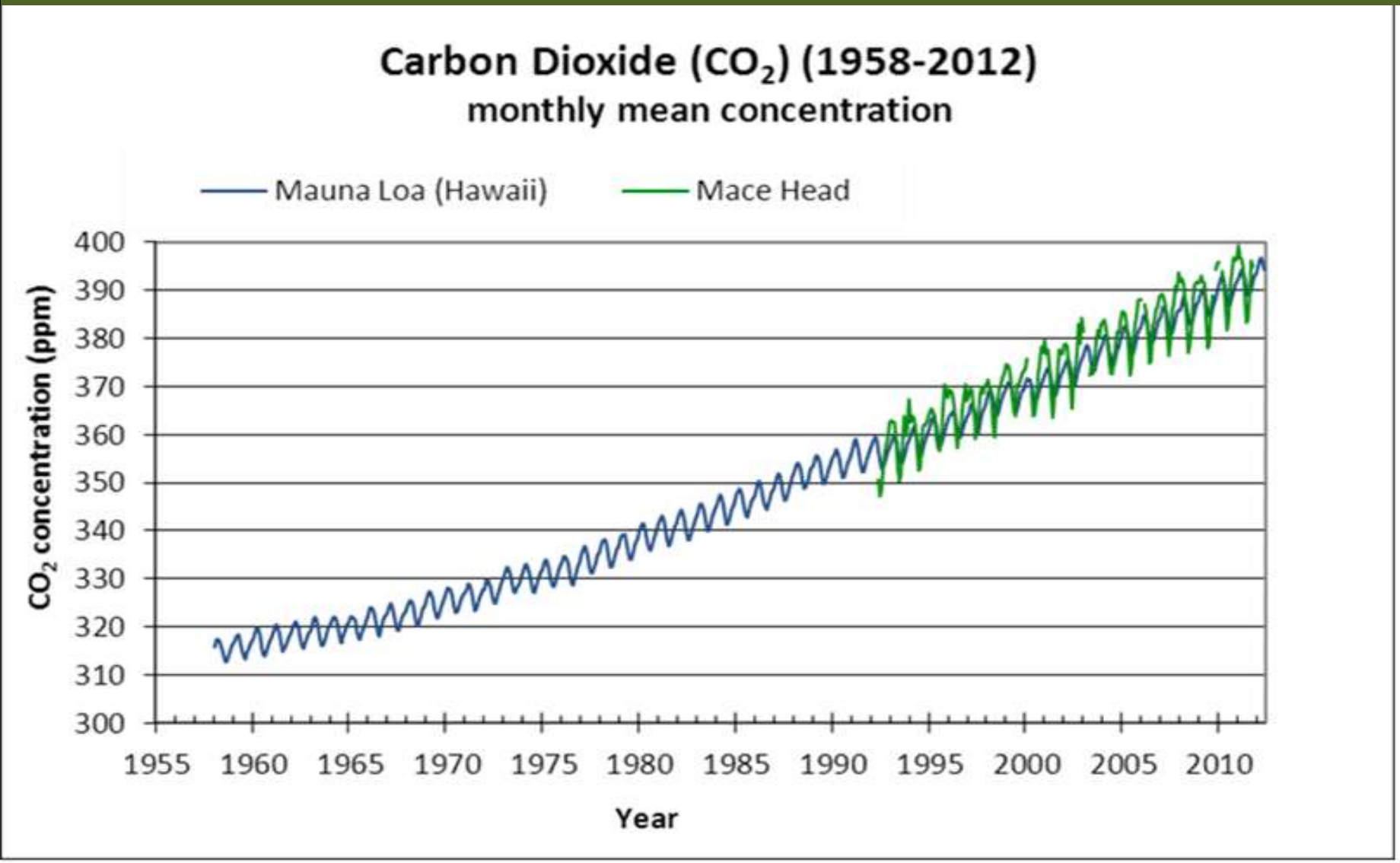
# $CO_2$ Concentration in the Atmosphere




- Graph shows scale of the $CO_2$ spike over 800,000 years
- Record highs >400 ppm
- Other Greenhouse Gases also like: $CH_4$, $H_2O$ and $N_2O$

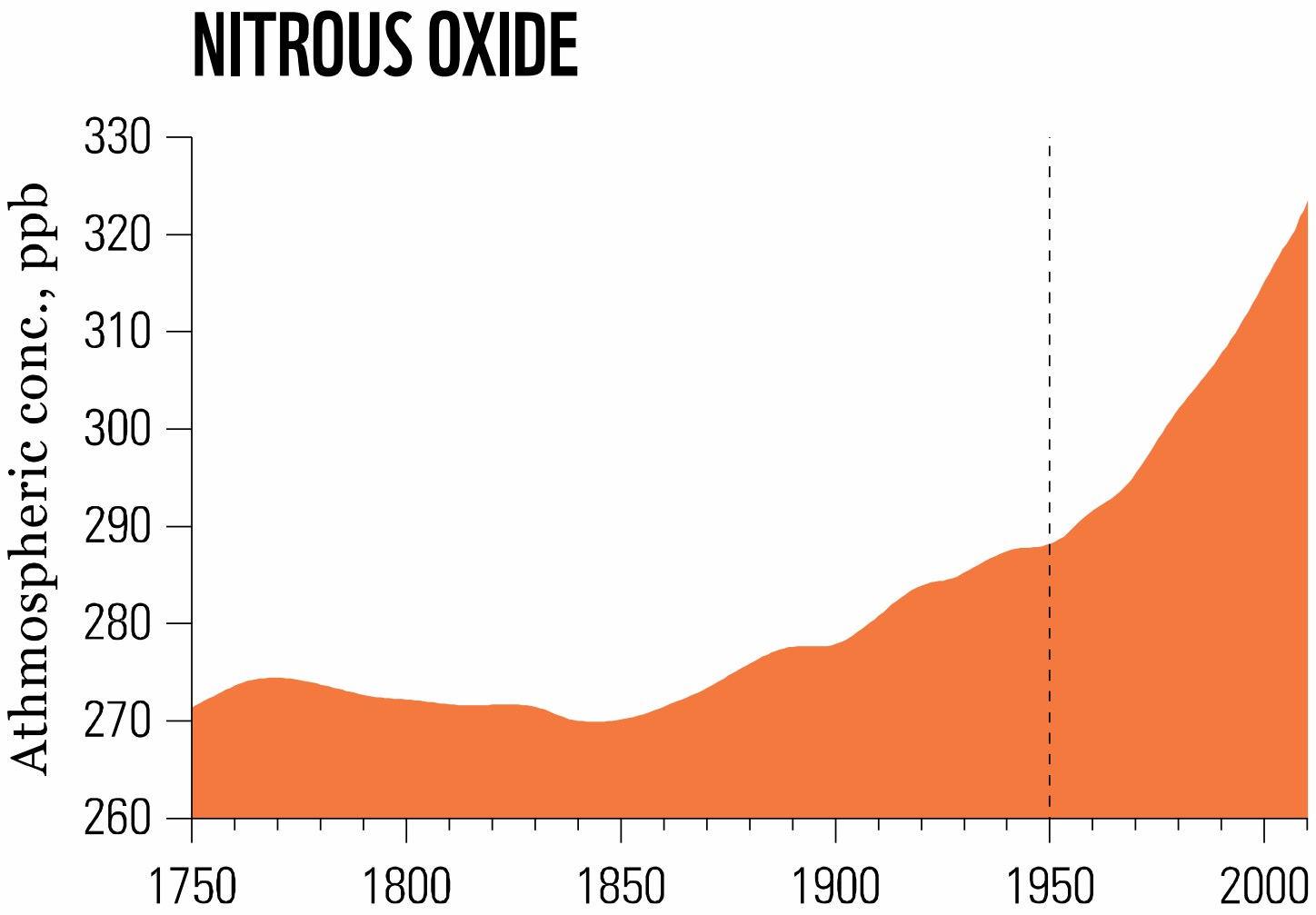
NASA data: https://climate.nasa.gov/evidence/

# Atmosphere CO2 Concentration in Mace Head



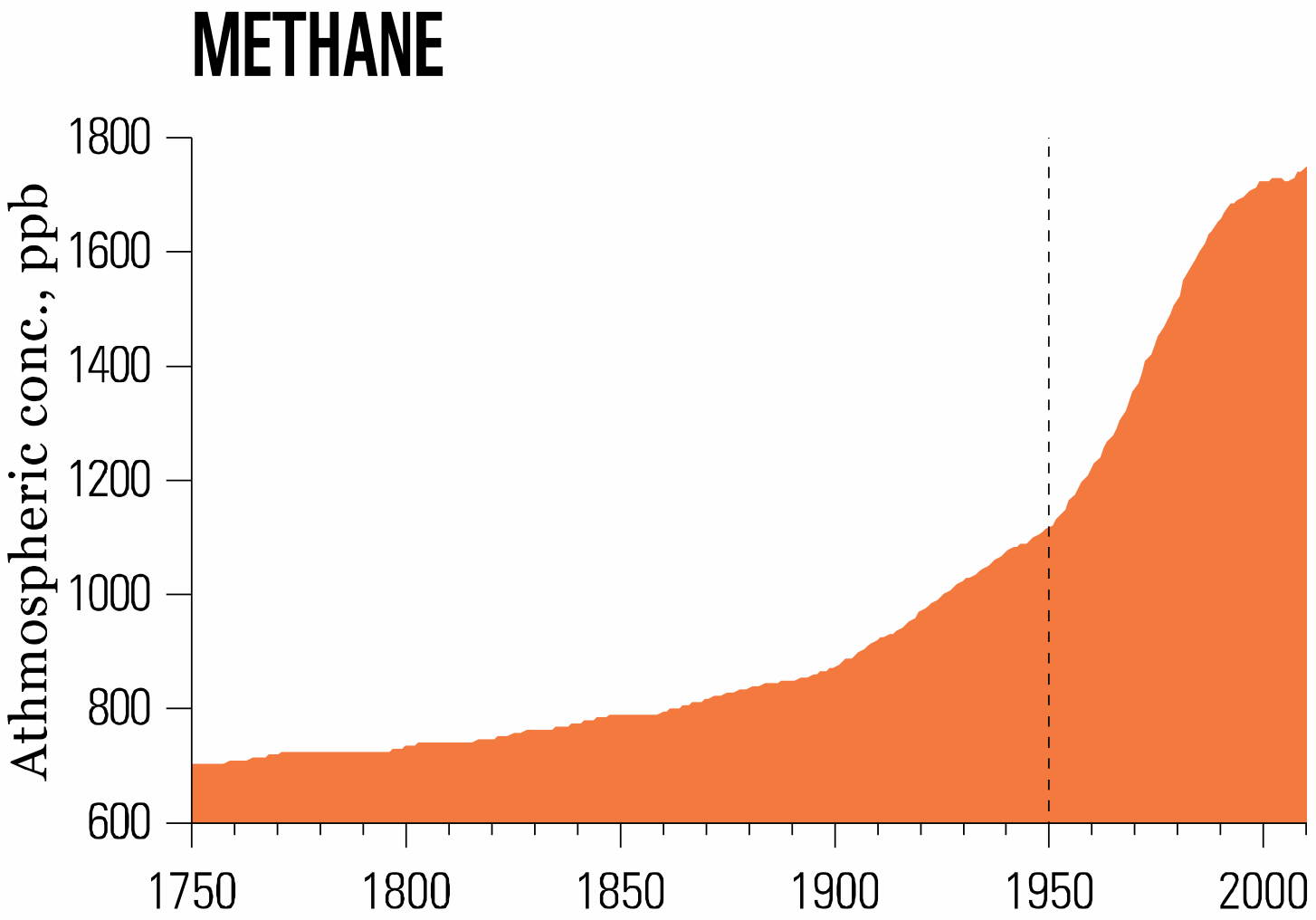

(Dwyer,2013)

# Nitrous Oxide Concentrations in Atmosphere



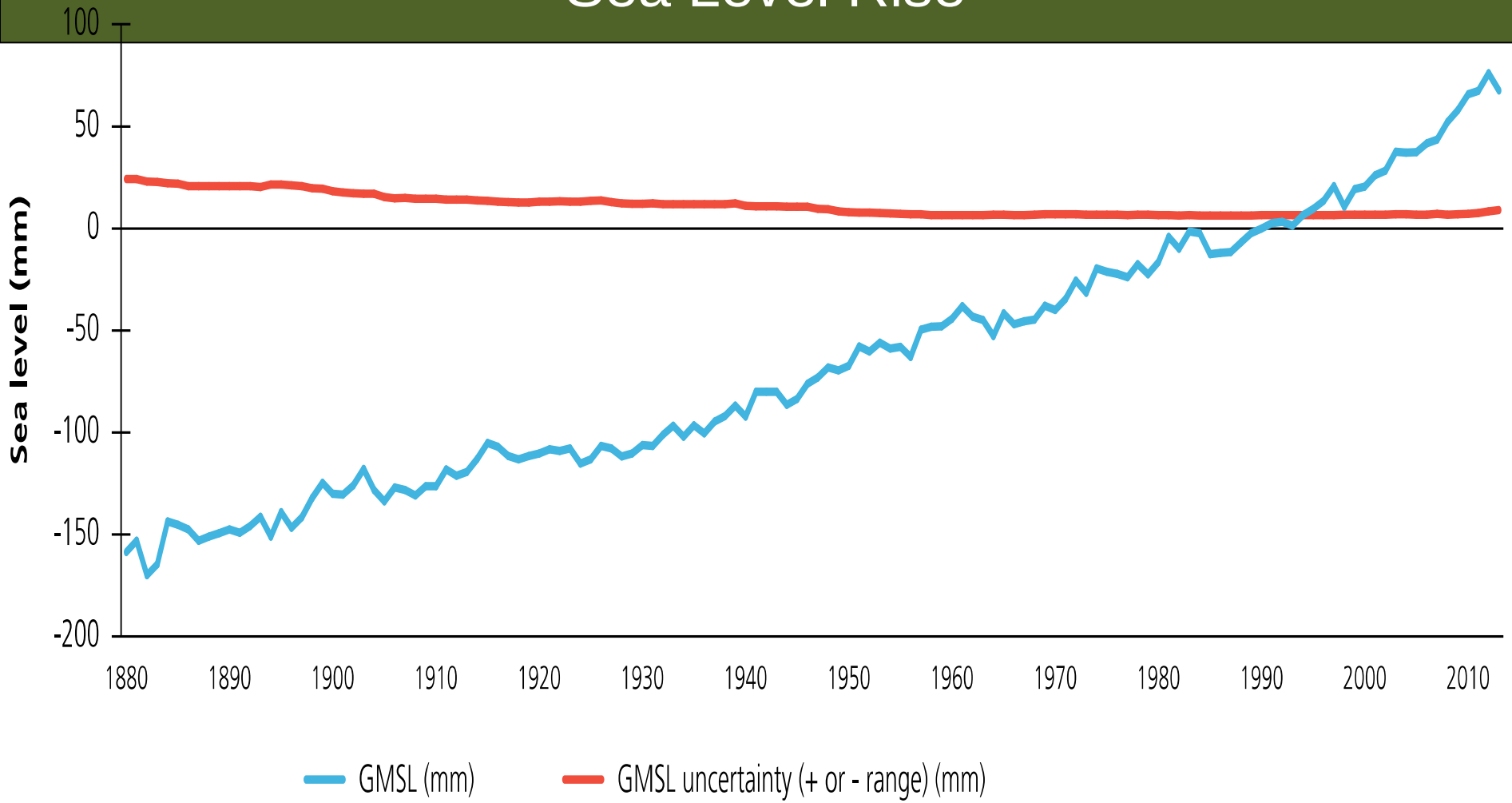

WWF, 2019

# Methane Concentrations in Atmosphere




WWF, 2019

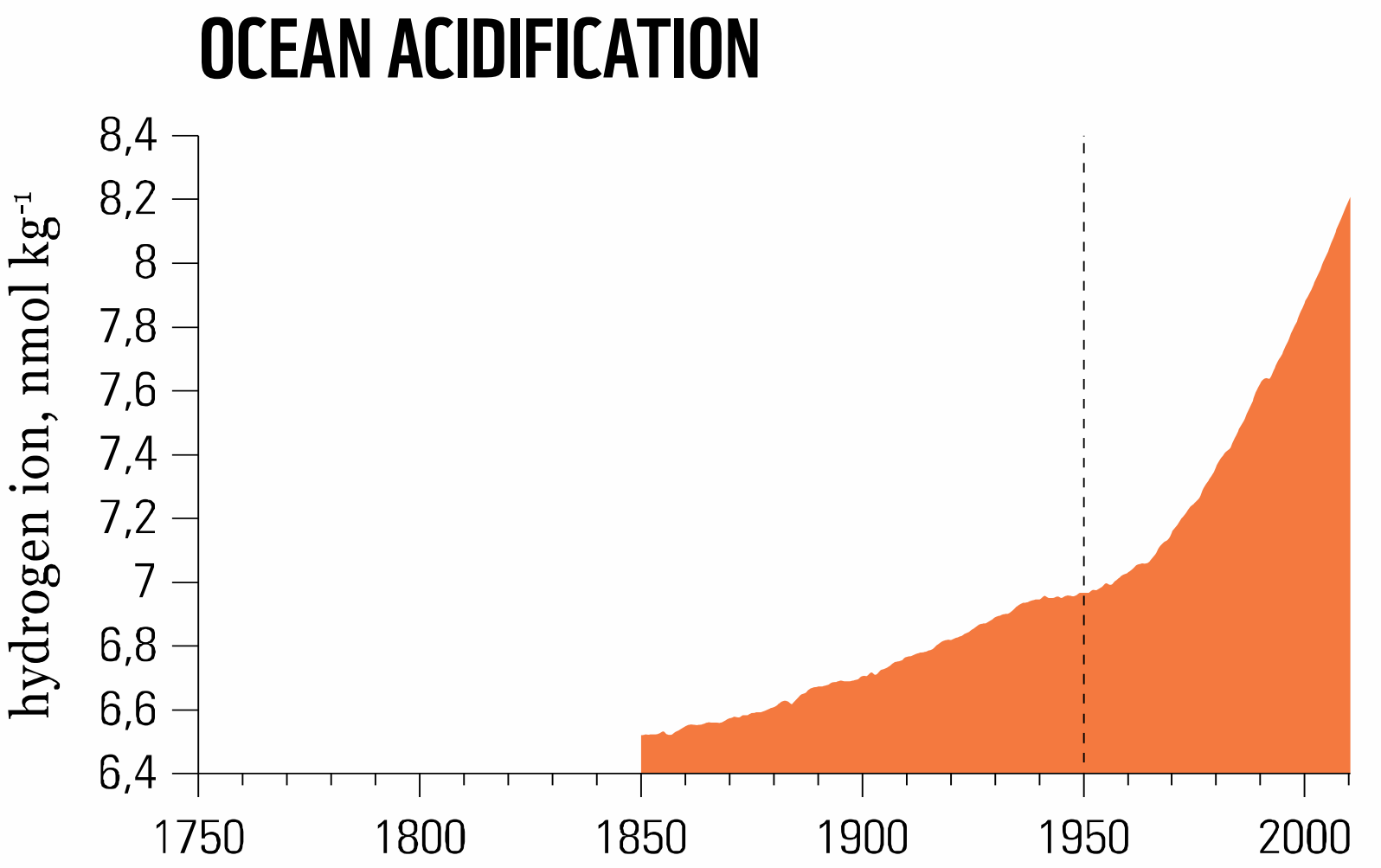
# Sea Level Rise




- Heat trapped by oceans leads to thermal expansion
- Global sea level rise of 2 cm each decade in the last century
- Since 1993, average sea level by just over 3 cm per decade

EPA, 2016

# Ocean Acidification




- CO2 combines with sea water making it acidic

WWF, 2019

# Ice Melt

- Muir Glacier disappears (1941-2004)
- National Snow and Ice Data Centre (link below)
- Photos by W.O. Field and B.F. Molnia

http://nsidc.org/data/glacier_photo/index.html

# Iceland Mourns Loss of Glacier


https://grist.org/article/heres-why-iceland-is-mourning-a-dead-glacie

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# Workshop 2:
# Understanding Climate Change through Biodiversity

CONSERVATION VOLUNTEERS

GALWAY

cvgalway@gmail.com

Comhairle Cathrach na Gaillimhe Galway City Council
Comhairle Chontae na Gaillimhe Galway County Council

Le tacaiocht ó Chomhairlí Chathair agus Contae na Gaillimhe

Supported by Galway City and County Councils

**Enthusiastic amateurs** working typically once a month on various outdoor tasks for public benefit;

- Tree / hedgerow planting
- Seashore clean-ups
- Wildflower meadow development
- Woodland path maintenance

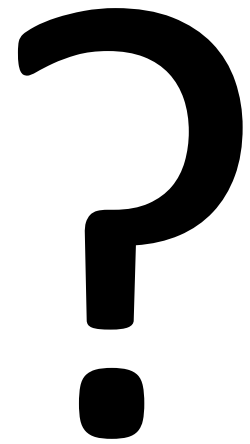
**To Protect, maintain Access to, and promote Awareness of Natural Heritage with Biodiversity value**

Helping to clear invasive Laurel from Roscam wood 2010-2012
This waxy evergreen would eventually completely smother the entire woods if not controlled

2012-2014 Clearing accumulated welly-deep mud from Barna wood lower path after many years of neglect.
Good paths are desirable instead of new shortcuts which disturb birdnest zones

**Seashore clean-up during Winter.** Easier to work around when less vegetation
- **No disturbance to nesting / fledgling birds**

# What is Your Understanding of Biodiversity?



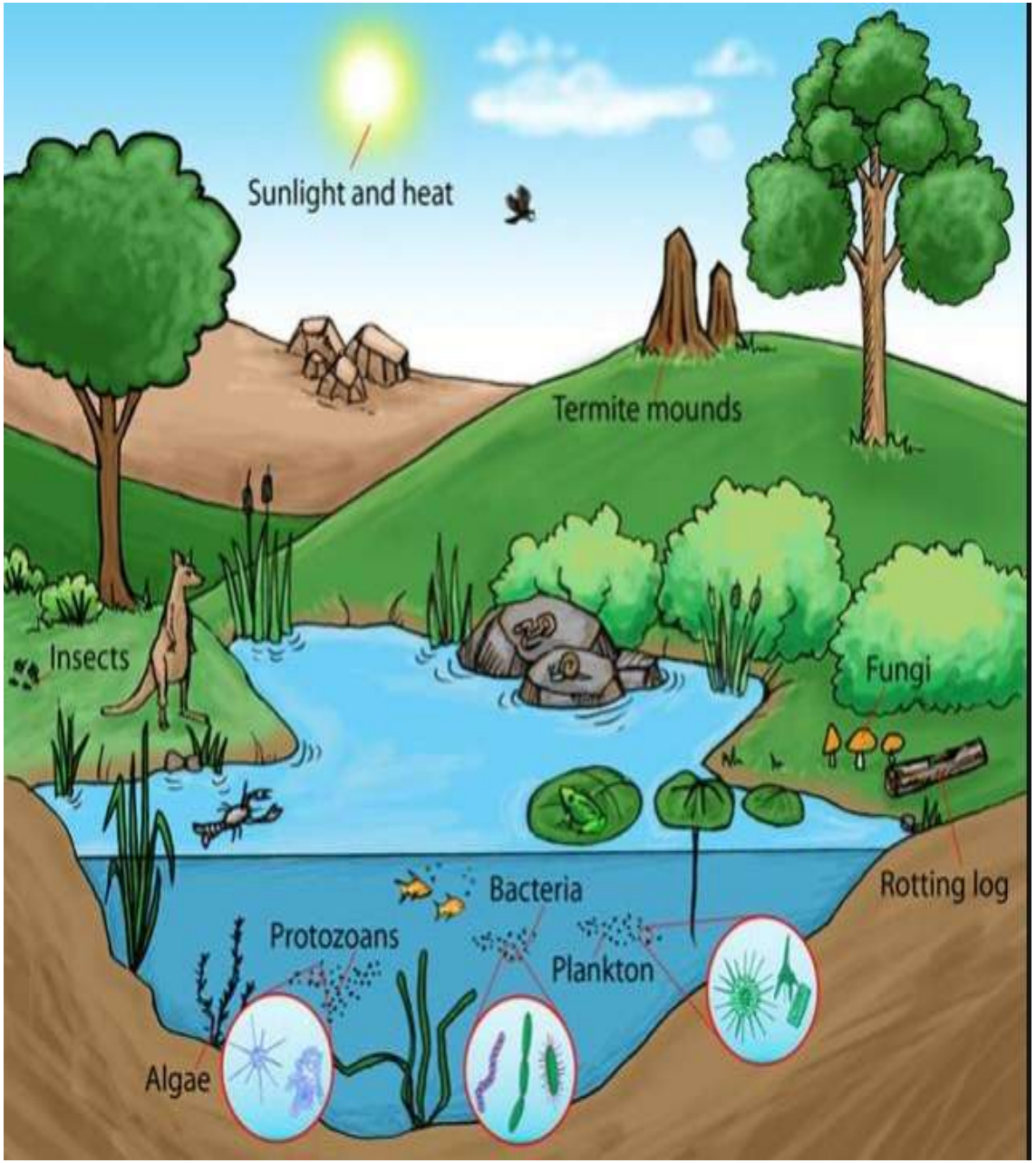
# Biodiversity and Ecosystem Services

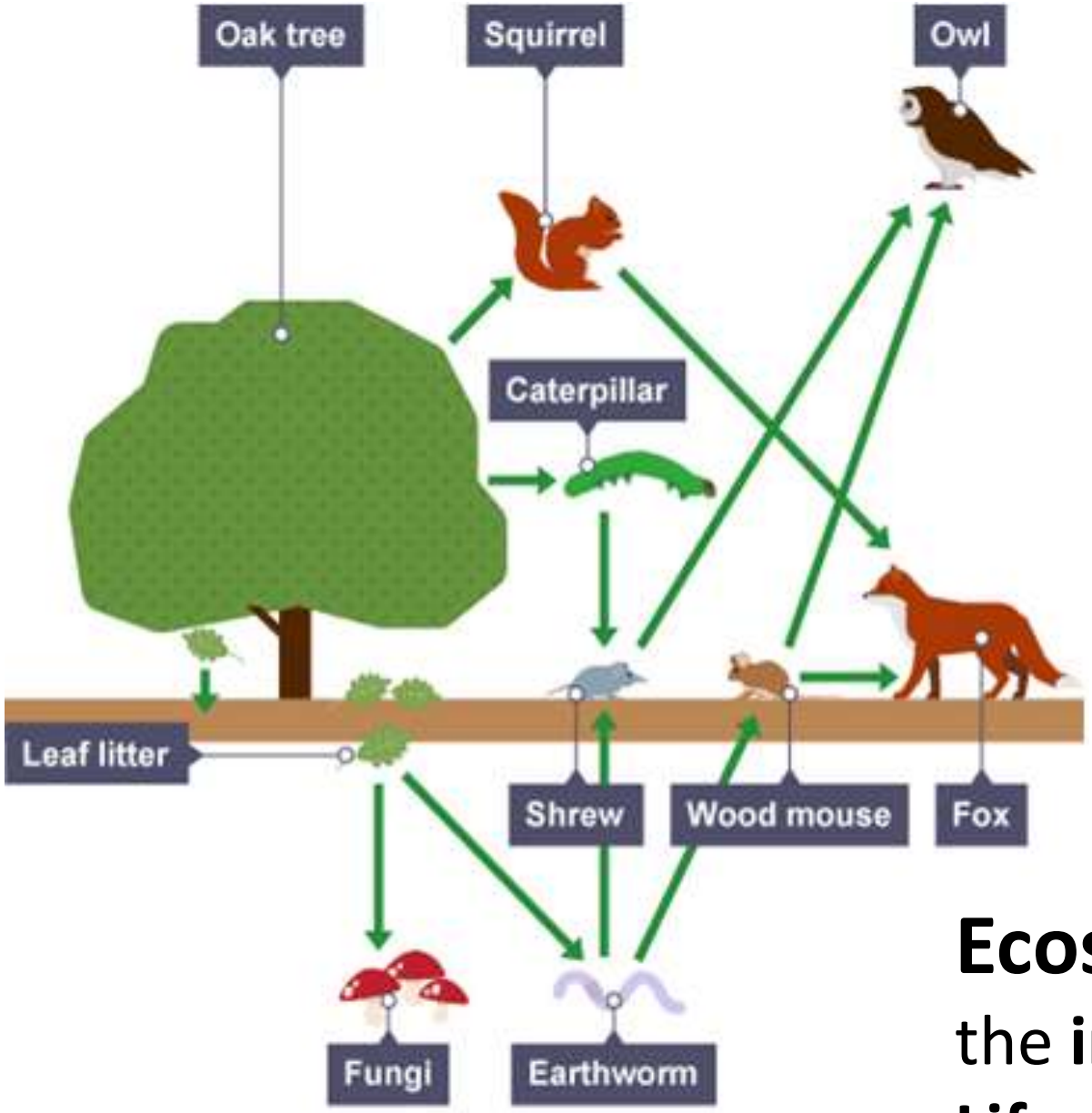
# Biodiversity: The Variety of Life

Plants,

Animals,

Fungi and Micro-organisms.



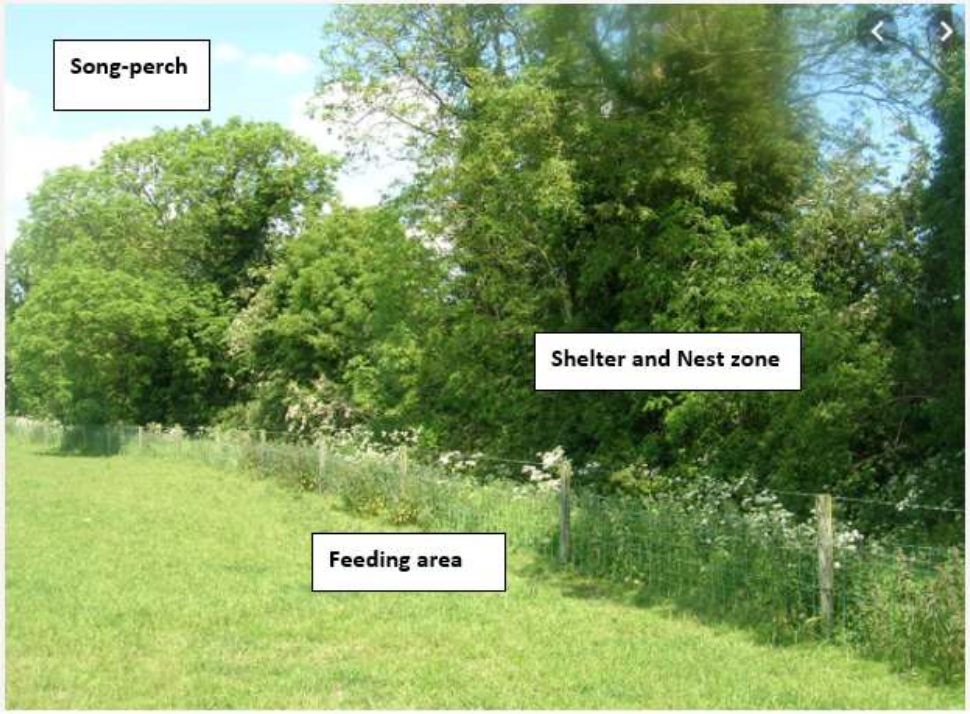



**Ecosystems** are the **interactions of Life** within **Habitats**

# Species requiring Complex Habitat

Some species need several hedge features throughout their lifecycle.

A song thrush nests in the bush shrub, sings from the trees, and eats snails living in the base of the hedge before swapping to hedgerow berries later in the season.




**“Ragged robin” flowers doing very well in damp areas**

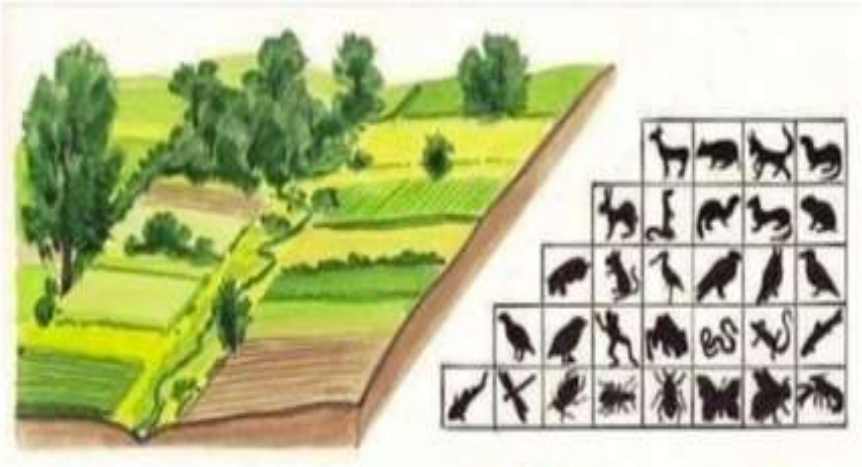
Nectar source for butterflies and long-tongued bees

Slugs and Snails devour the Ragged robin seedlings

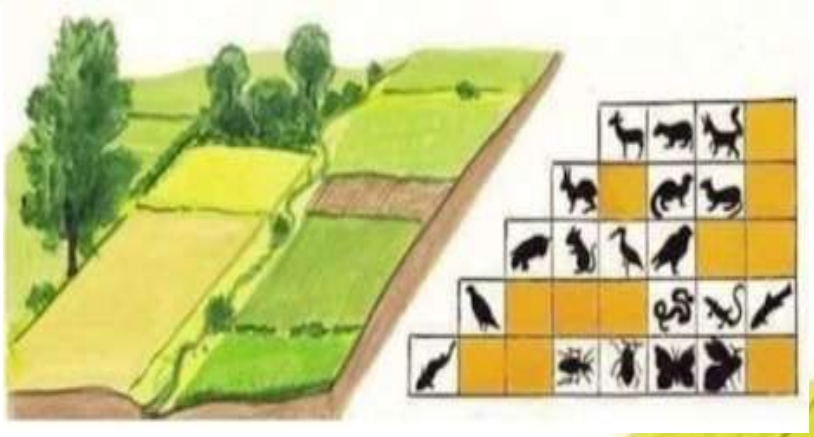
Slugs are eaten by beetles, frogs, and hedgehogs. Snails are eaten by thrushes, blackbirds, hedgehogs, mice and centipedes.

So … Are the above critters helping “Ragged robin” flowers to survive ?

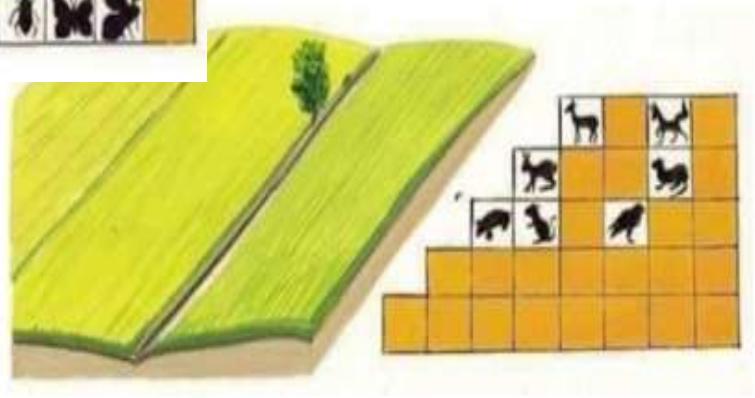
# Ecology



Traditional Countryside



Intensively industrialised Countryside



More 'Efficient'?

**What could go Wrong ?**

# Life on our planet is all inter-dependent.

Conserving biodiversity and fully functioning ecosystems is key to the survival of all species.

So,

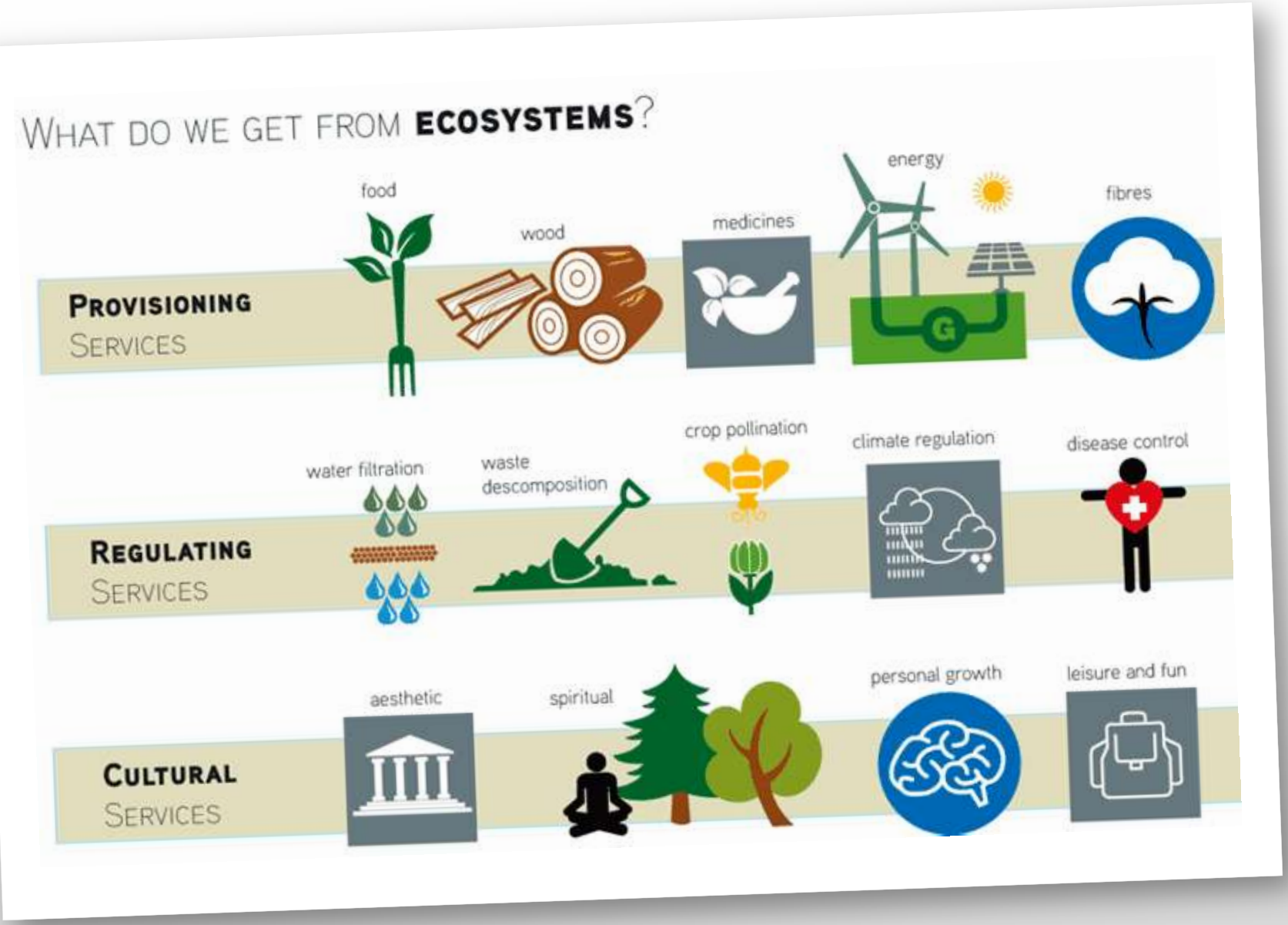
**What does Biodiversity actually do for us?**

**Why and Where is it being lost?**

**…and What can be done to Halt the Decline?**

# Ecosystem Services

What does Nature Do for Us?


WHAT DO WE GET FROM ECOSYSTEMS?
PROVISIONING SERVICES
food
wood
medicines
energy
fibres
REGULATING SERVICES
water filtration
waste descomposition
crop pollination
climate regulation
disease control
CULTURAL SERVICES
aesthetic
spiritual
personal growth
leisure and fun

# Unsung Heroes

Taken for granted ?

Urban Seagulls consume edible street debris

– very little left for rats

Suburban Foxes hunt and deter rats


about
75%
of the world's
crops depend on
pollinators

# USA **Insect Pollinators**

**contribute $ Billions to farms**

▲ Owing to the lack of bees, Chinese farmer have started to pollinate their orchards by hand.

**What went wrong ?**

# 1958 China campaign to eradicate "Four Pests" pests

**Mosquitos** responsible for malaria,

**Rodents** that spread the plague,

… and **Sparrows** – which ate <u>some</u> grain

**Flies**…

After two years of exterminating sparrows

# Rice yields decreased

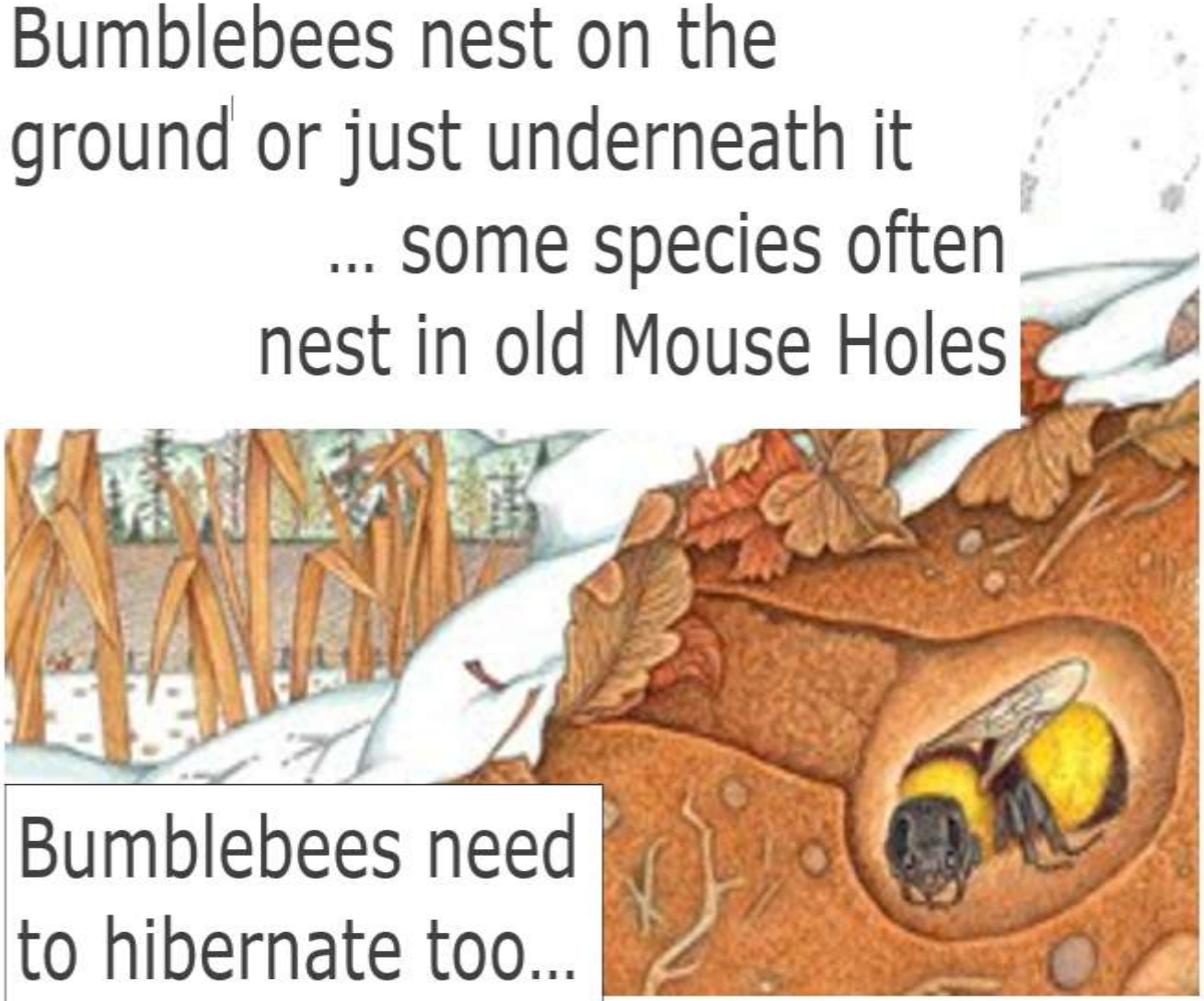
**Insects destroyed crops in the absence of natural predators.**

# Poisons and Pesticides were required

# some region’s Ecologies never recovered.

Bumblebees nest on the ground or just underneath it

... some species often nest in old Mouse Holes



Bumblebees need to hibernate too...

Rough corners not ‘doing nothing’ in winter.
They are accommodating hibernation.

and...

**Study suggests bees aren't the be all and end all for crop pollination**

by University of Queensland

Whatever it is,

if it lands on a flower to feed on nectar...

some pollen will probably stick regardless of intention

**Nightshift - Moths**

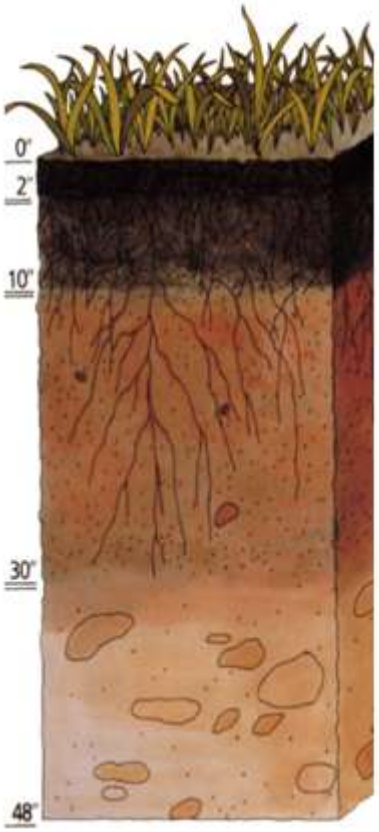
The season never stops

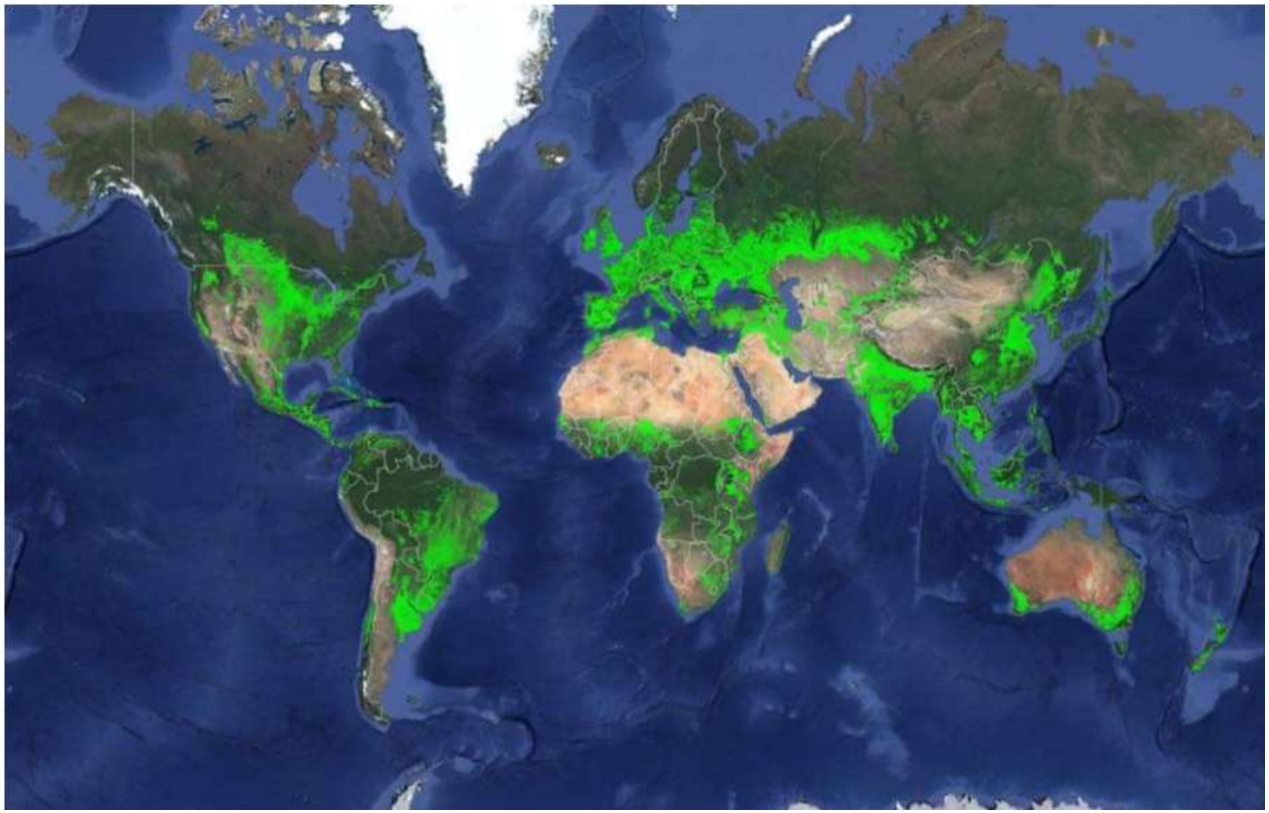
Basically,

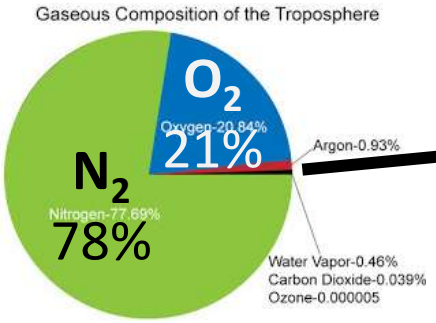
Bees can go out of their way to find flowers within a few KM radii.  But also need to rest each day after all that effort

Other insects operate within a smaller local range of approx. 50 to 150 meters

# Arable Topsoil

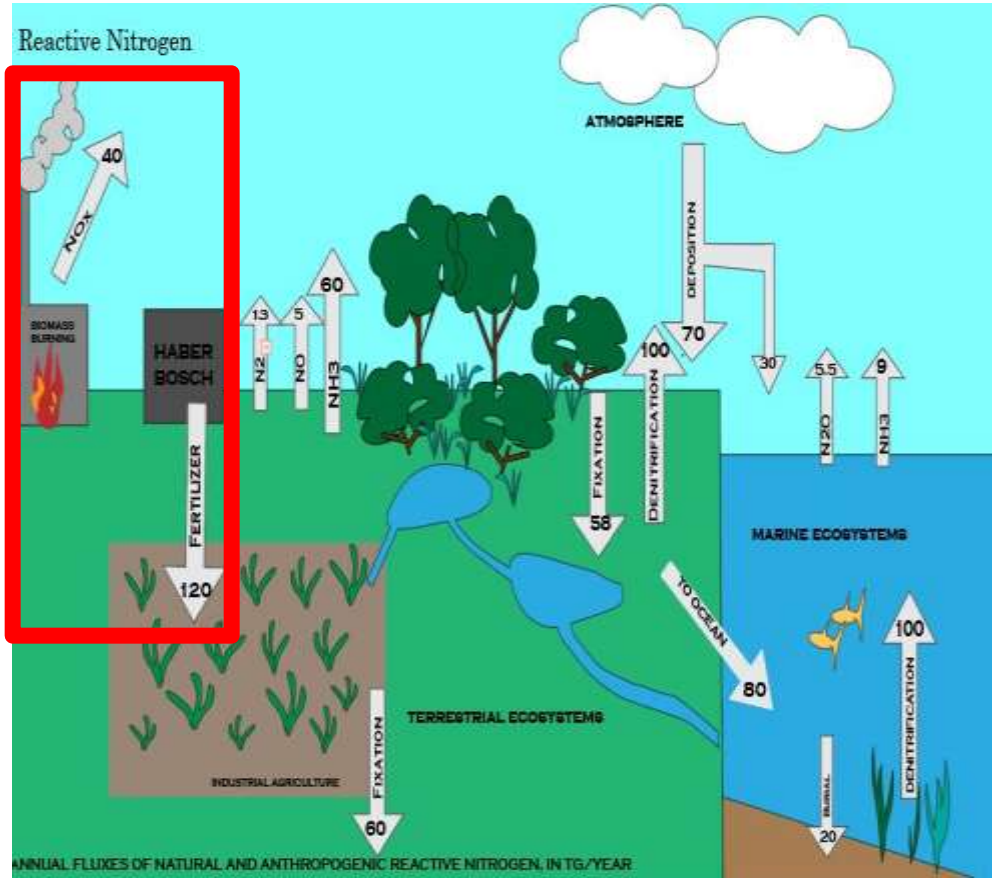


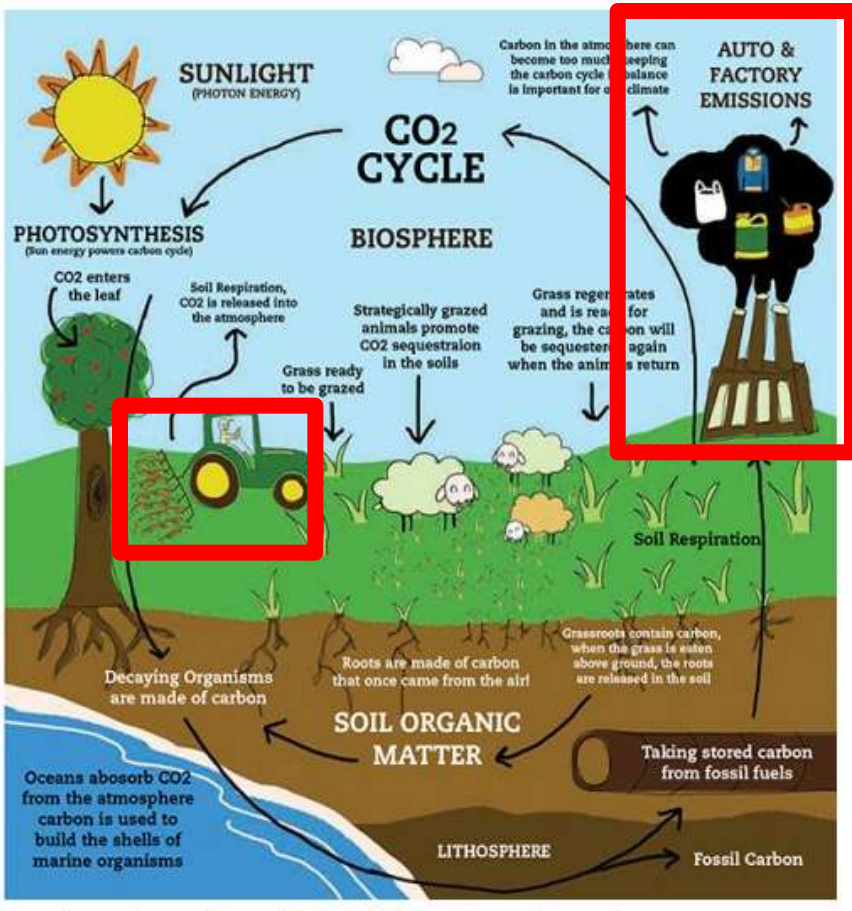






$CO_2$ >400ppm
(increasing)

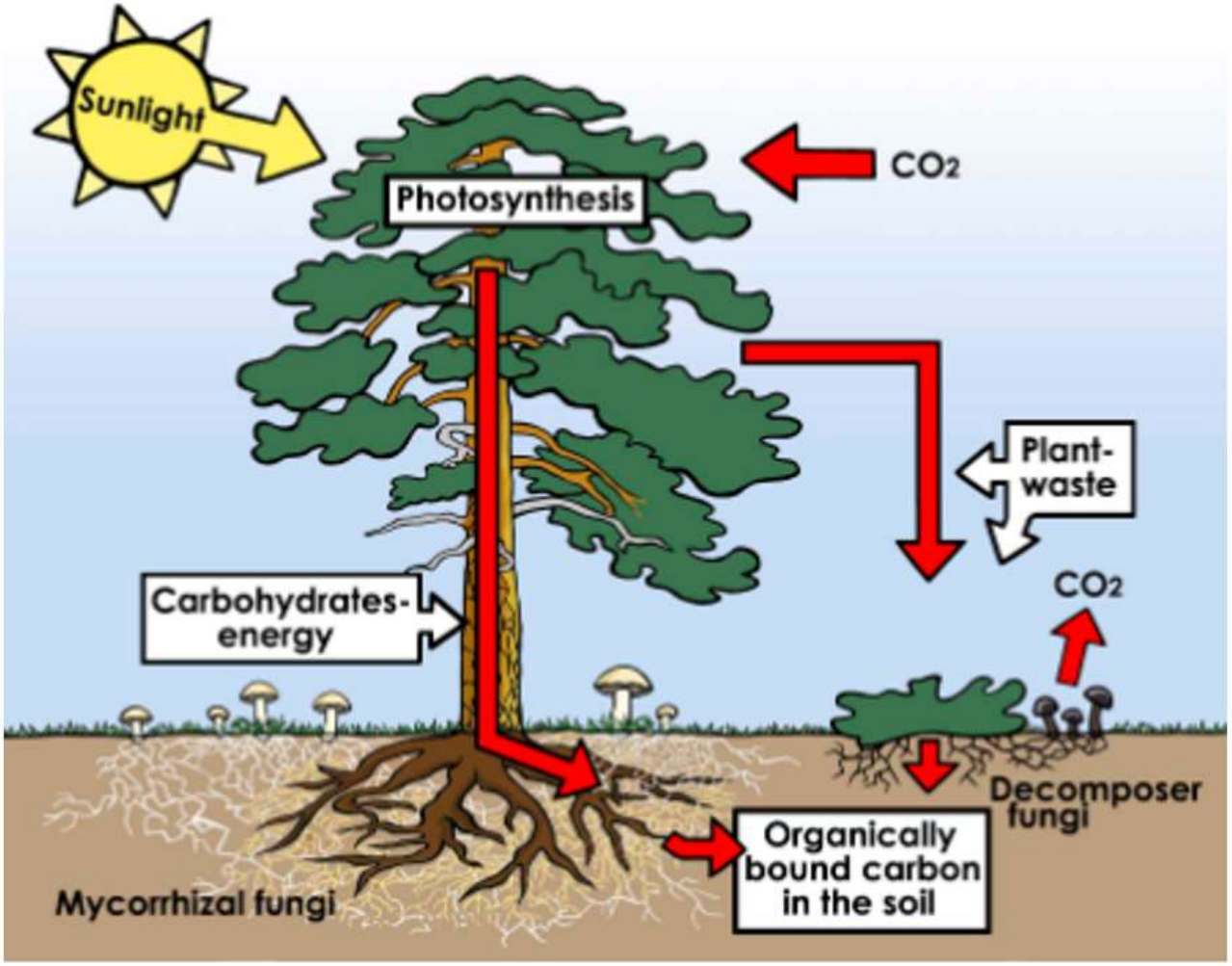
# Nitrogen and Carbon Cycled in and out of the Air & Soil



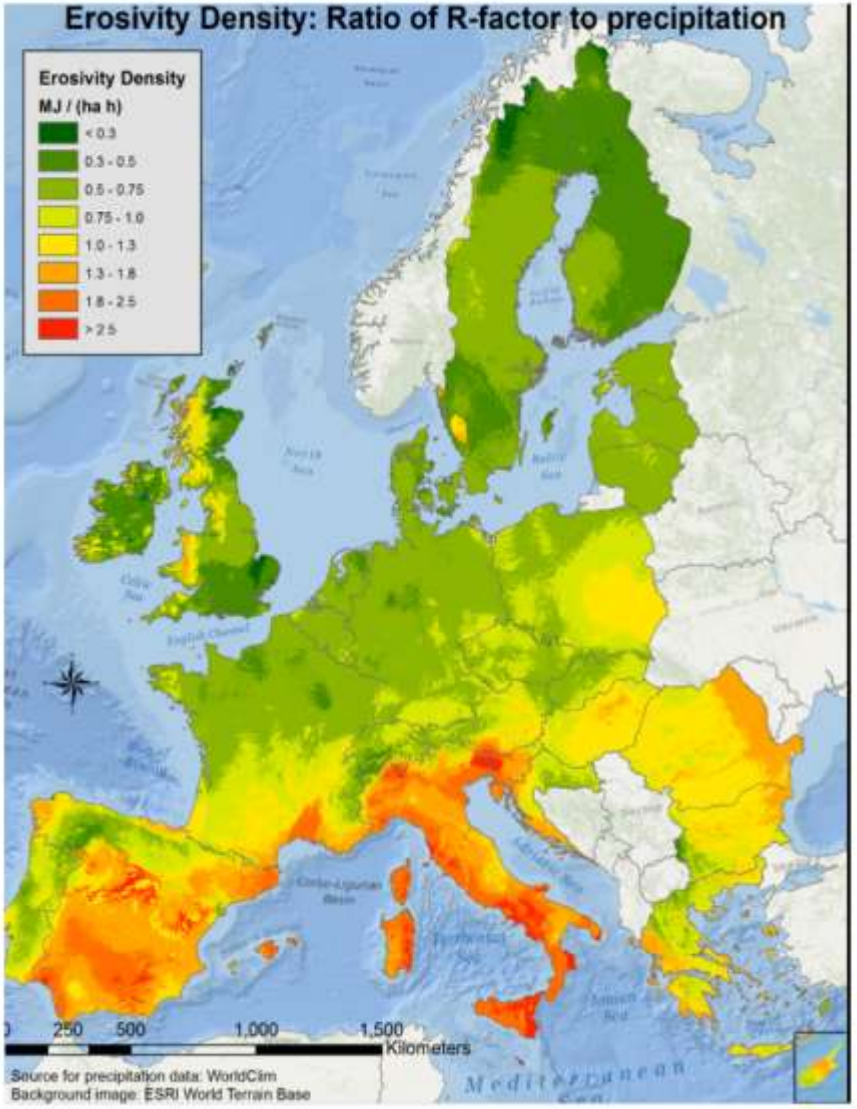
**Natural soil Regeneration –**

Encroachment onto a pathway




## Carbon sequestration

We all know that **forests pull in carbon dioxide** and "breath" out oxygen**.**
But instead of finding most of the newer ‘C 14’ within leaves debris on forest floors, **Scientists** in Sweden **found** most of the **newer Carbon deposits <u>deeper</u> in the soil,** because of trees pulling carbon down to roots and further **sequestered by into the soil by Fungi .**
https://phys.org/news/2013-03-fungi-responsible-carbon-sequestration-northern.html




# Ireland lucky so far

# Most of our soil is still quite good

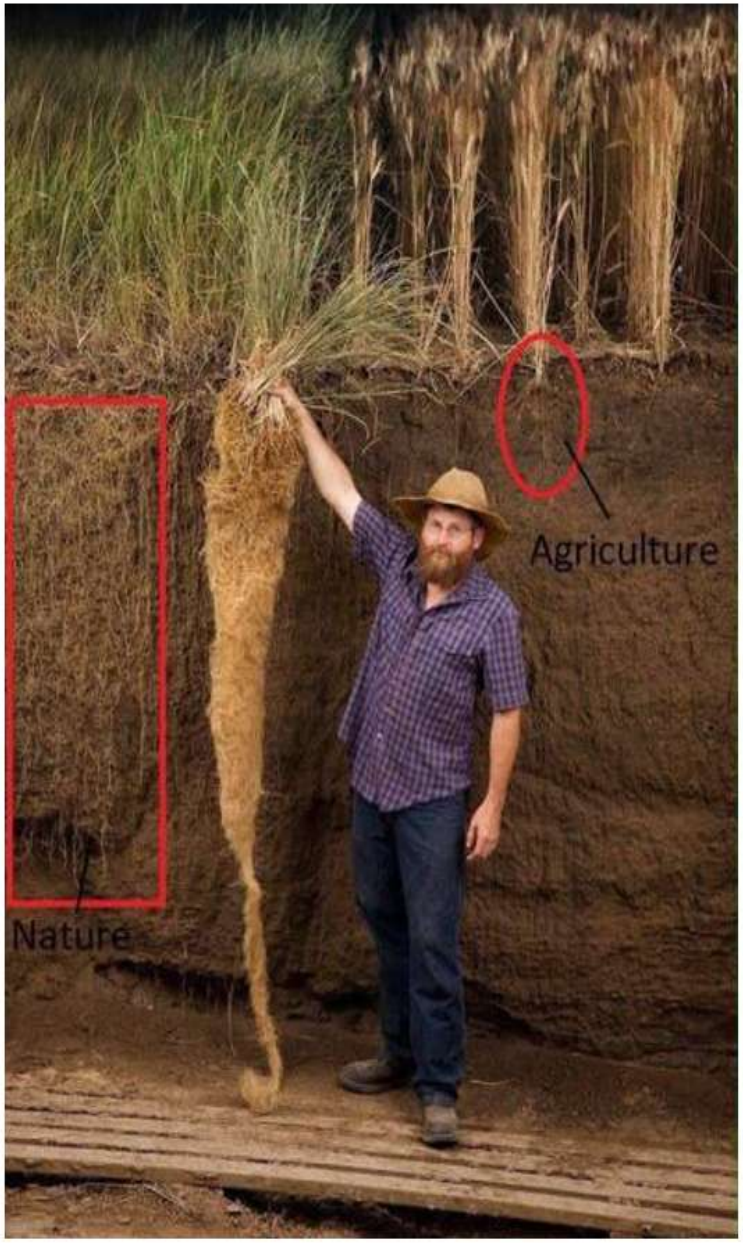
https://esdac.jrc.ec.europa.eu/content/soil-erosion-water-rusle2015

https://esdac.jrc.ec.europa.eu/public_path/Fig3-RD2_crop.png

But what is happening elsewhere? …and Why ?

# 1930s Dust bowl USA


Tens of thousands of families abandoned their farms in Oklahoma, Nebraska, Kansas, Texas, Colorado, and New Mexico 1934, 1936, and 1939–1940

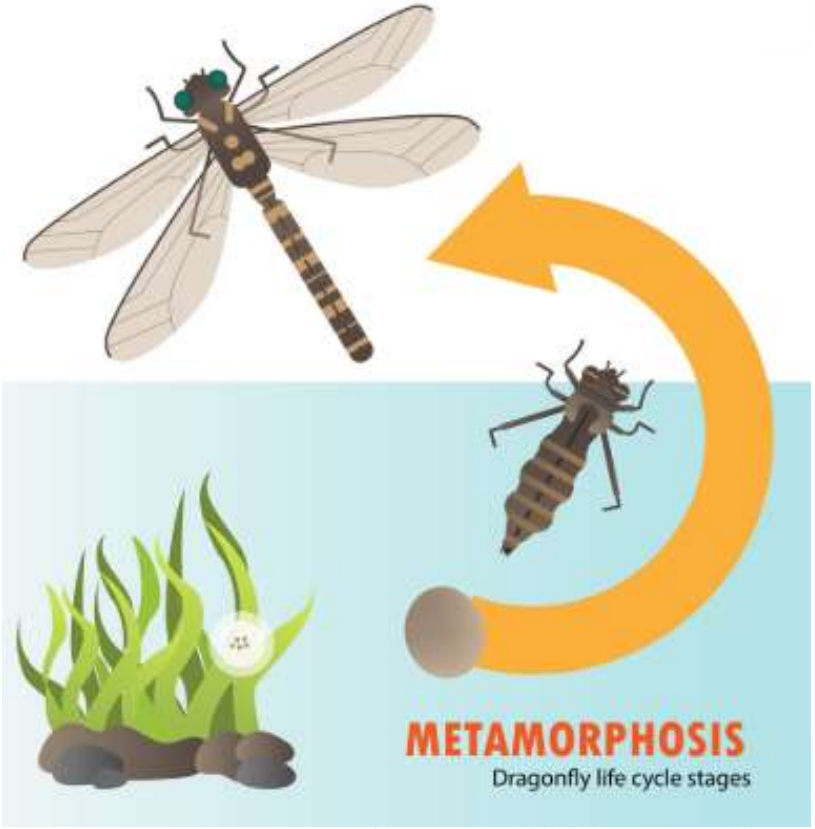



Poor understanding of ecology. By 1930s **ploughing displaced deep-rooted native prairie grasses** that previously **retained soil and moisture during Droughts**

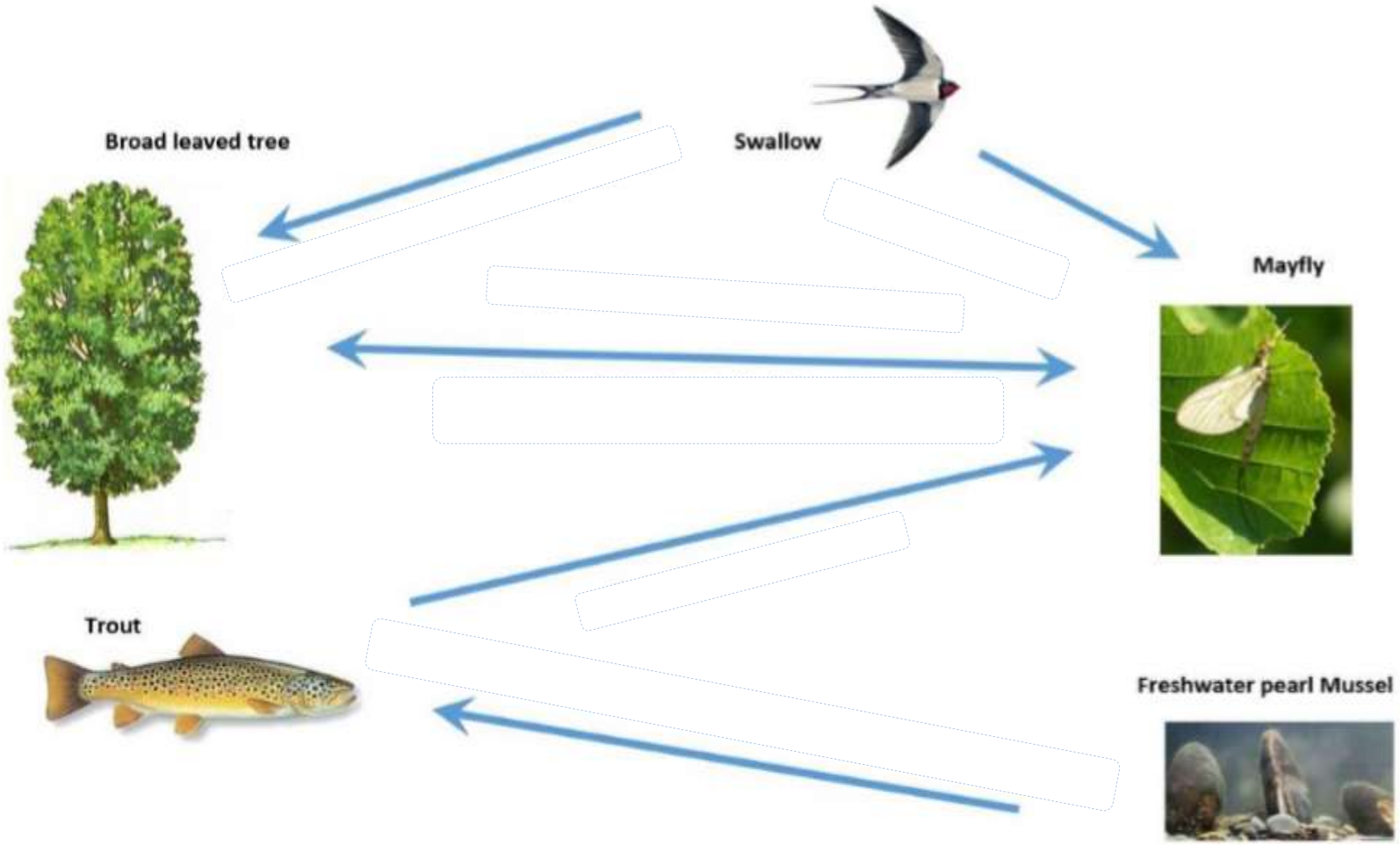
Undisturbed Roots Filter this pond, to Keep the Water Clean

emerged Adult Dragonfly

average **cruising speed 16 km/h** ensures a wide hunting area



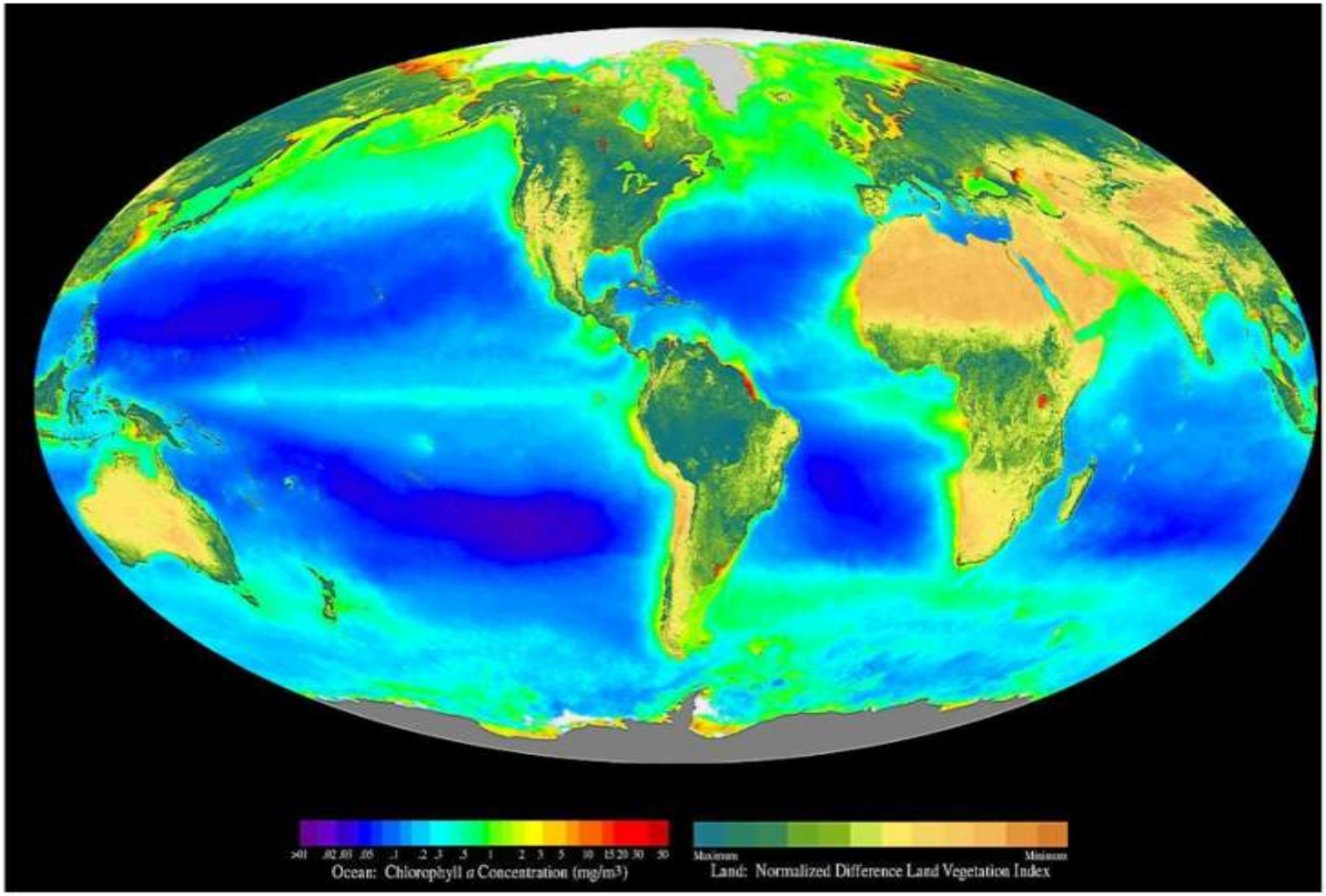

Larvae in ponds generally eat anything else smaller than themselves




Just a few (from many) relationships of Lough Corrib

# What are the impacts of Climate Change on Biodiversity?

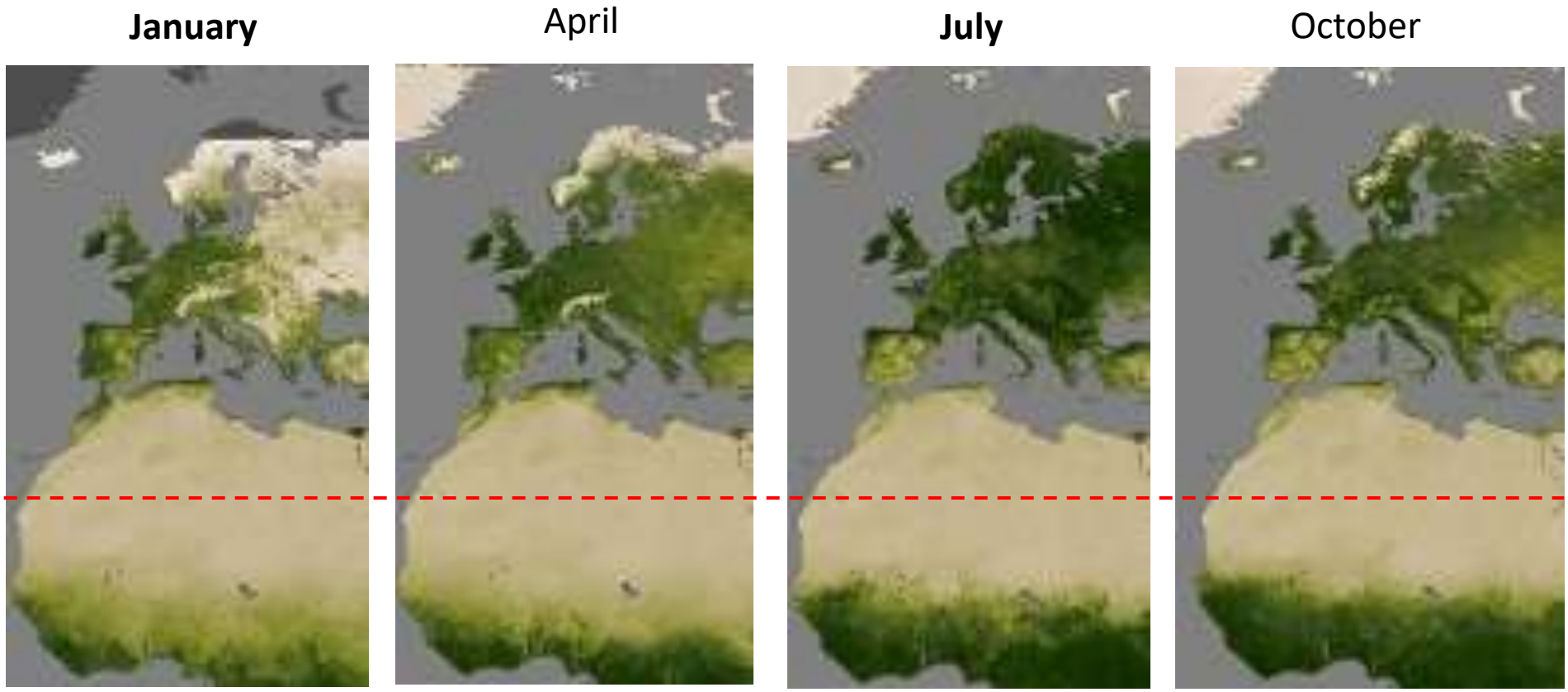

Why worry ?




**Life on this planet – already concentrated into the viable zones**

**Vast areas are Barren Deserts and Empty Deep Ocean**

# and much of our World has **Severe Seasonal Limitations on Life**




*NASA earth observatory (Vegetation)* https://earthobservatory.nasa.gov

# Impacts of Climate Change on Biodiversity.

**Each species has a 'Goldilocks' Habitat.**

Not too hot

Not too cold

Not too dry

**Not too wet**

**And each species depends on other species only present if**

Not too hot

Not too cold

Not too dry

**Not too wet**

Net photosynthesis of Potatoes
Optimal at approx. 24°C

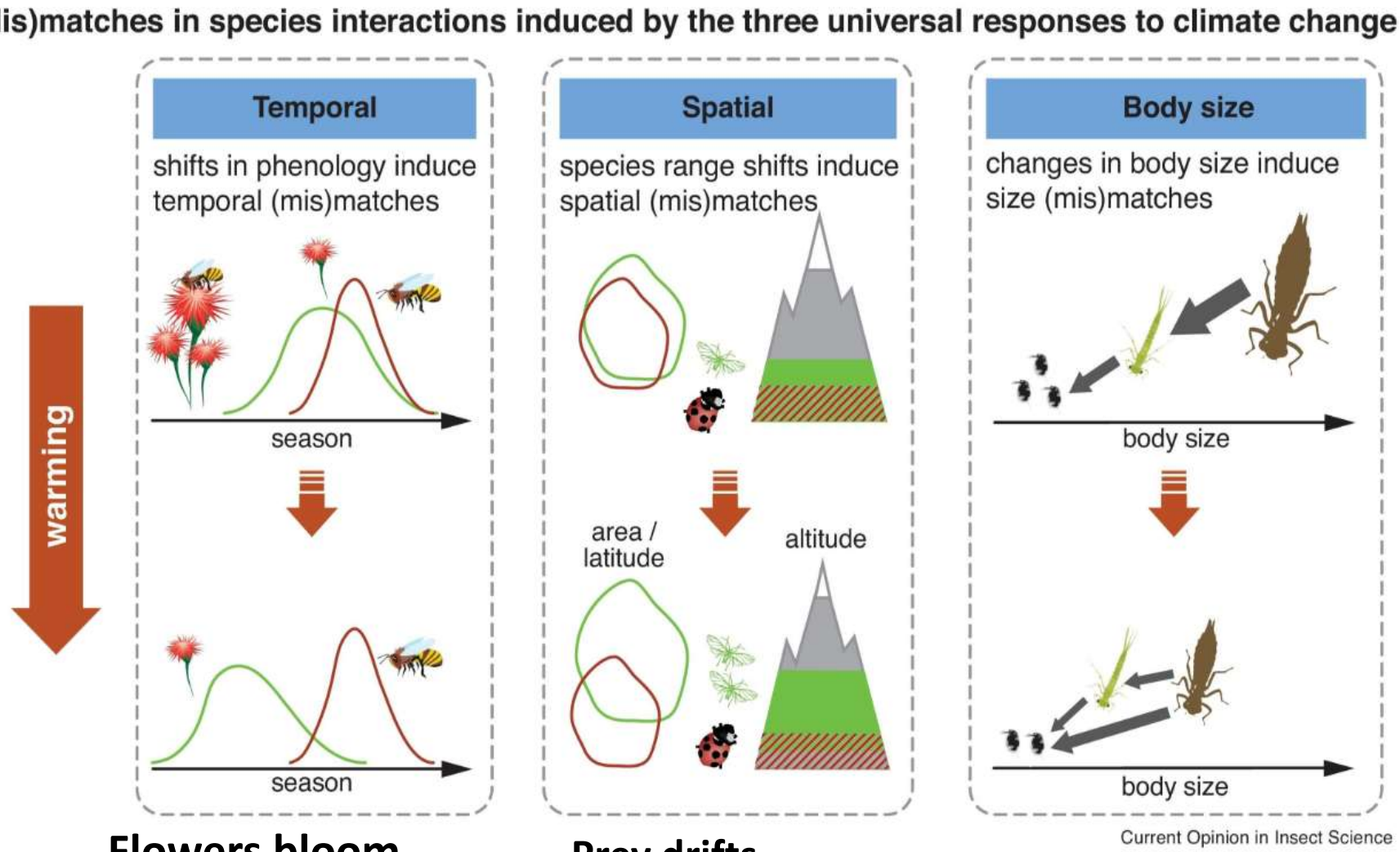
but rapidly decreases above that.

(Ku et al., 1977; Leach et al., 1982; Ghosh et al., 2000; Timlin et al., 2006)

# Phenology

The study of Seasonal Timings in the lives of Animals, Birds, Insects & Plants

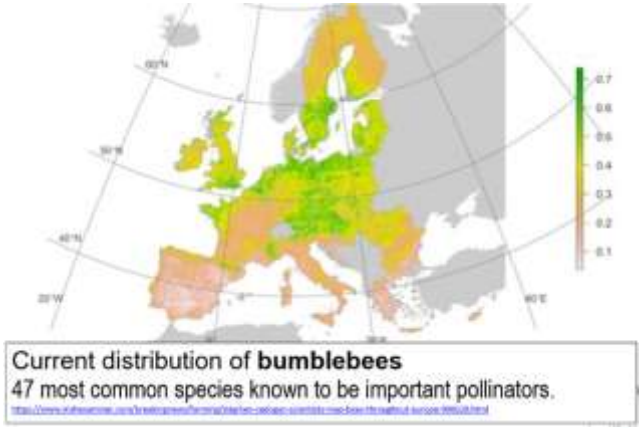
Now used to Monitor Trends of climate change impacts on the natural world




**Flowers bloom too early**
Before bees emerge

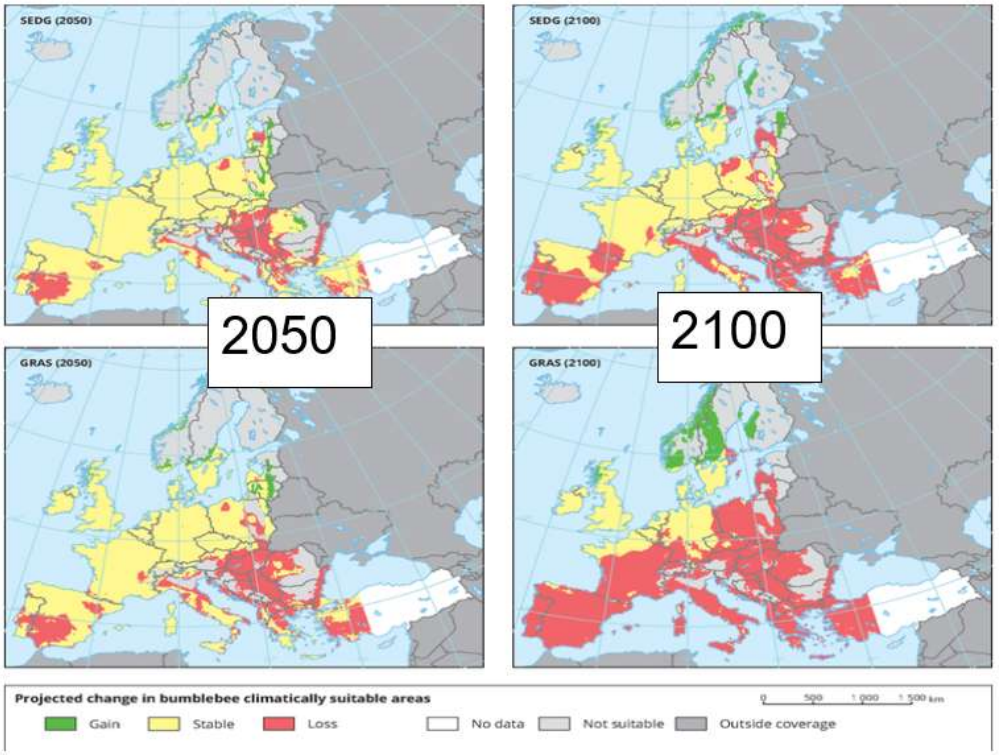
**Prey drifts further North**
Predators can't catch up

**some Species stunted**
by water Acidification?
and/or less oxygen in water ?

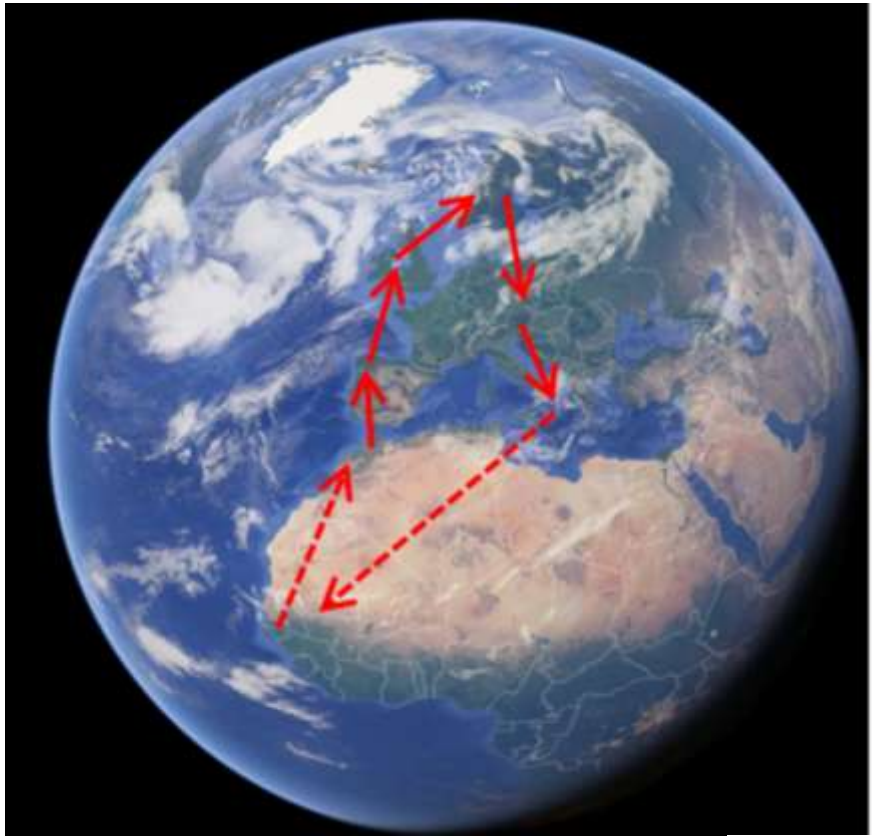


Current distribution of **bumblebees**
47 most common species known to be important pollinators.

# Projected change in Bumblebee climatically suitable areas

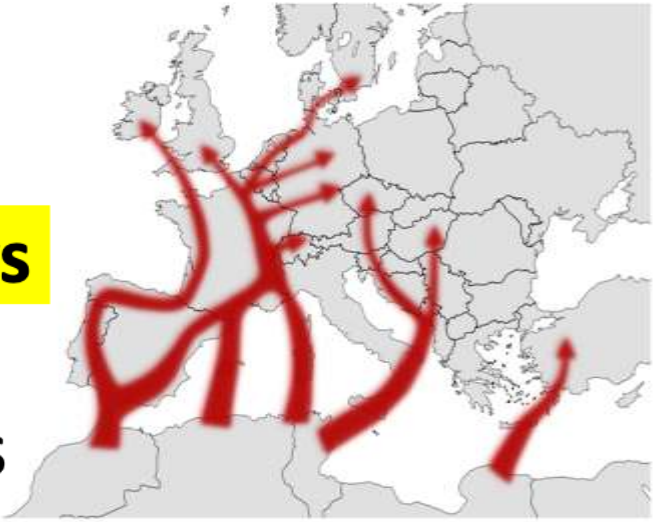



https://www.eea.europa.eu/data-and-maps/figures/projected-change-in-bumblebee-climatically

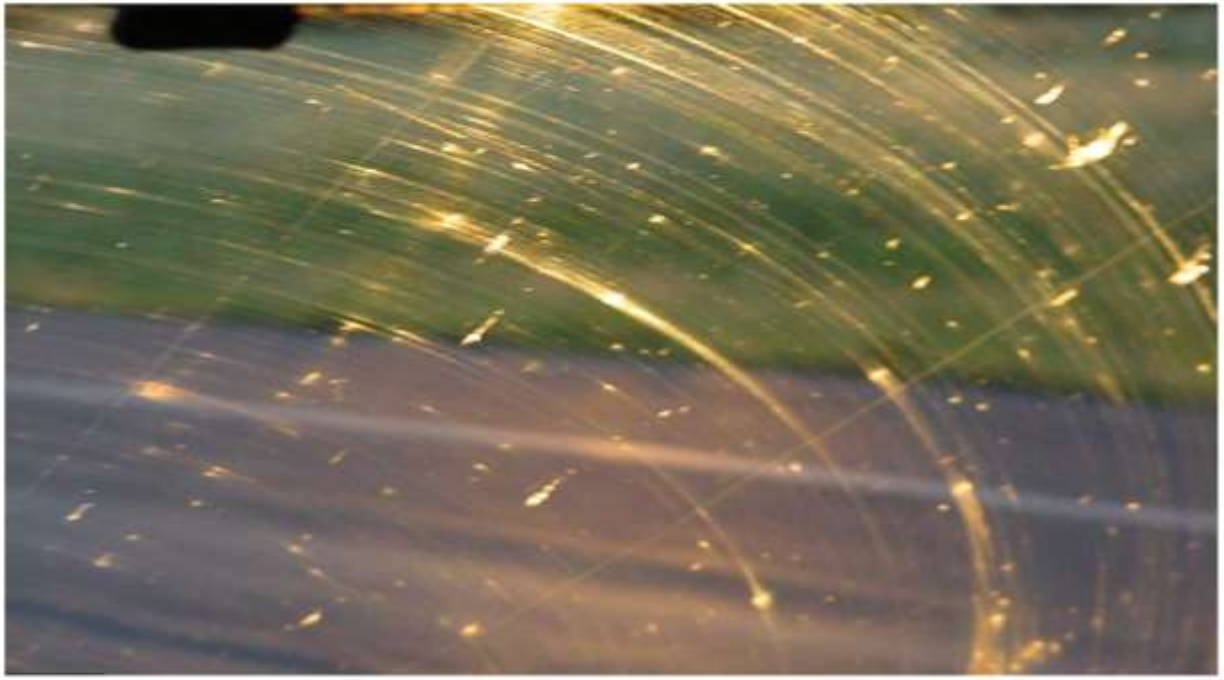


Long-term continuity depends on stages of migrations

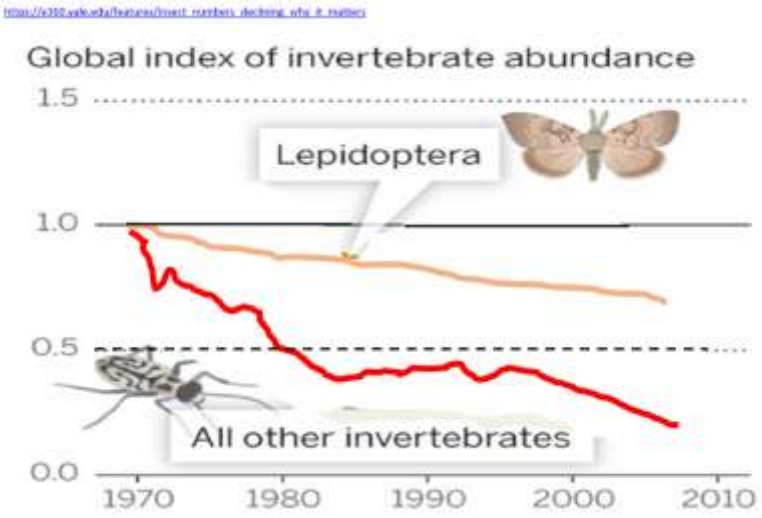
Delicate Migrating Flyers mightn't survive **Longer Hotter Journeys** over changed terrains without enough weeds

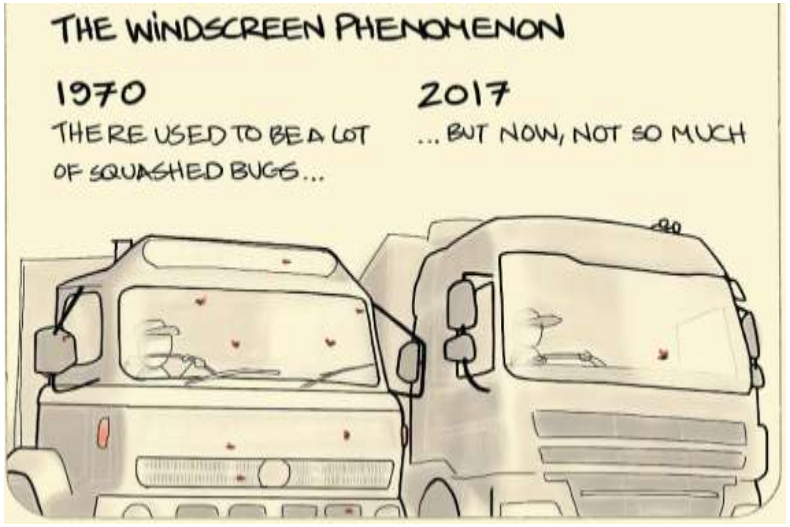


# we Humans are already causing Extreme Damage to Biodiversity



**Less insects on windscreens Nowadays**



*Death by a thousand cuts…*

*seen*

*and*

*unseen*

**Habitat Loss**

**Limited / monotonous floral resources**

*Lack of alternative forage may increase exposure to pesticides*

*Poor diet compromises immunity*

*Immune response energetically costly*

Parasites & Diseases

**Pyrethroids**

**Parasites + Pathogens**

*Fungicides increase toxicity*

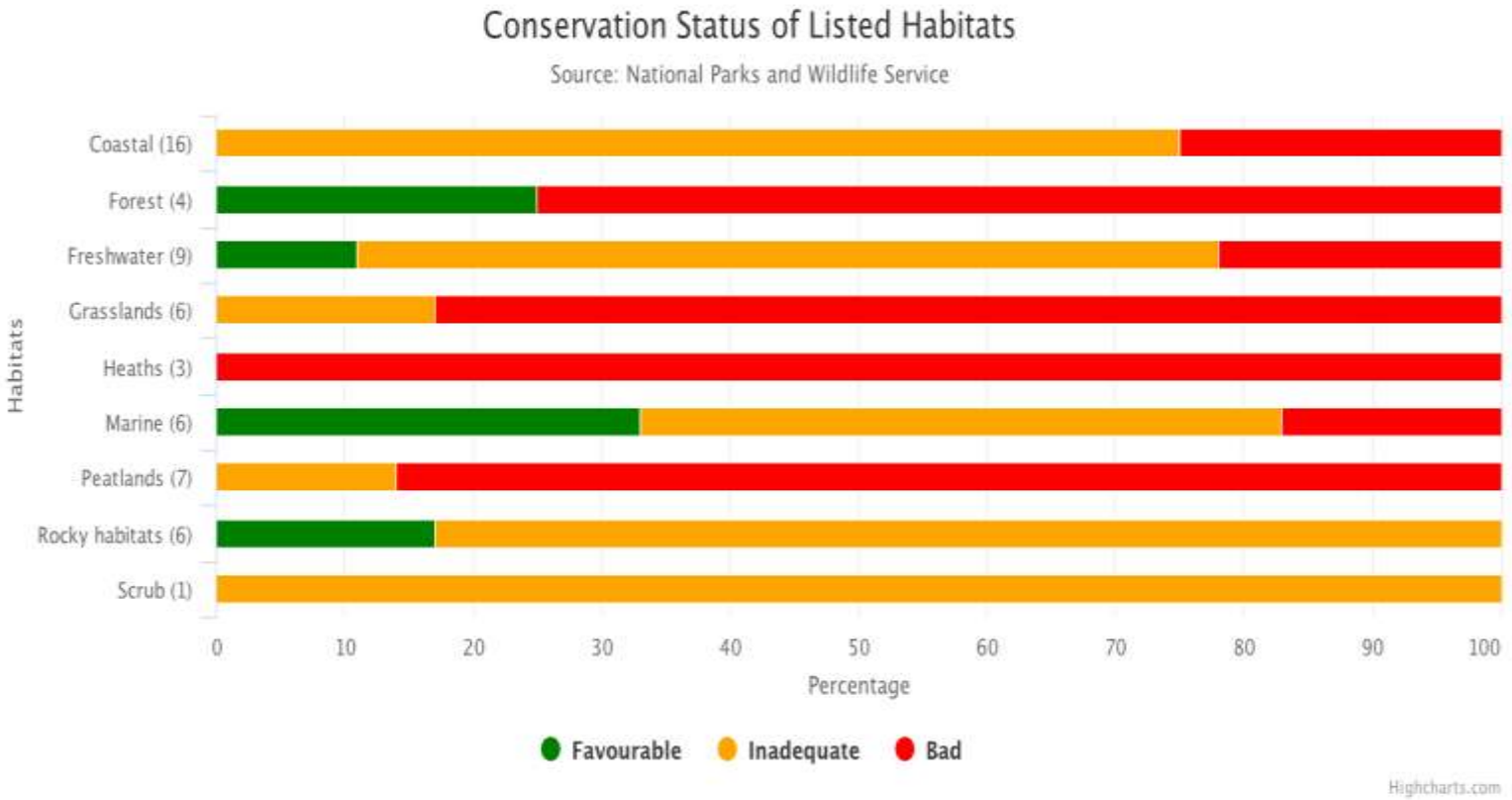
**EBI Fungicides**

**Neonicotinoids**

*Fungicides act synergistically to increase toxicity*

*Pesticide exposure affects disease tolerance and susceptibility*

Complicated **Chemicals** - interacting




**Most of Ireland's habitats** listed under the Habitats Directive were **reported as inadequate or bad conservation status** by 2013.

Only 9 % of listed habitats are in a favourable state.

http://www.epa.ie/irelandsenvironment/environmentalindicators/#climate

# Why do we Destroy Habitat ?

Before we ask, what must we do to save our planet ?

Let us ask, what can we **Stop** doing that Destroys it ?

# Ah Lads!

**‘Public safety’ an excuse cited for heavy-handed spraying here**

Weeds, including Kidney Vetch destroyed

# Kidney Vetch

vital foodplant for Small Blue butterfly's caterpillars

Why so much Effort and Expense to Supress Life ?

Compacted Dead soil

# Wonderful Weeds

Less effort = more results

**Bark-mulch**
**Smothered Dead Zone**

# Wonderful Weeds

Less effort = more results


**Ah Lads,**

**How can any emerging young replacement tree survive this ?**

# is this a 'hedgerow' ?

What is a problem here ?

# Maintaining for Safety ?

**Knowing when to stop ?**

# Natural landscape …or is it ?

**Remnants** of richer natural ecology remain **on isolated islands**

– Safe from livestock overgrazing

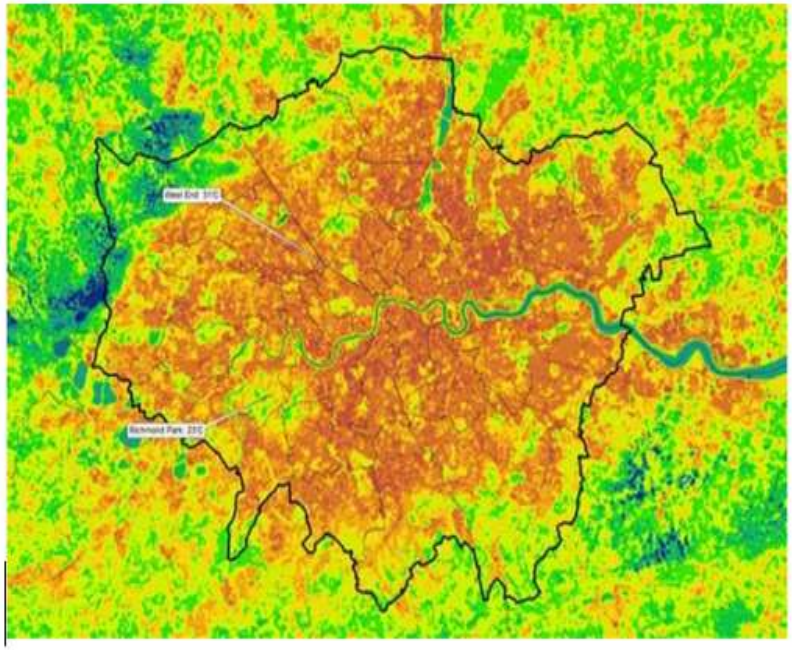
1950s had little or no car culture

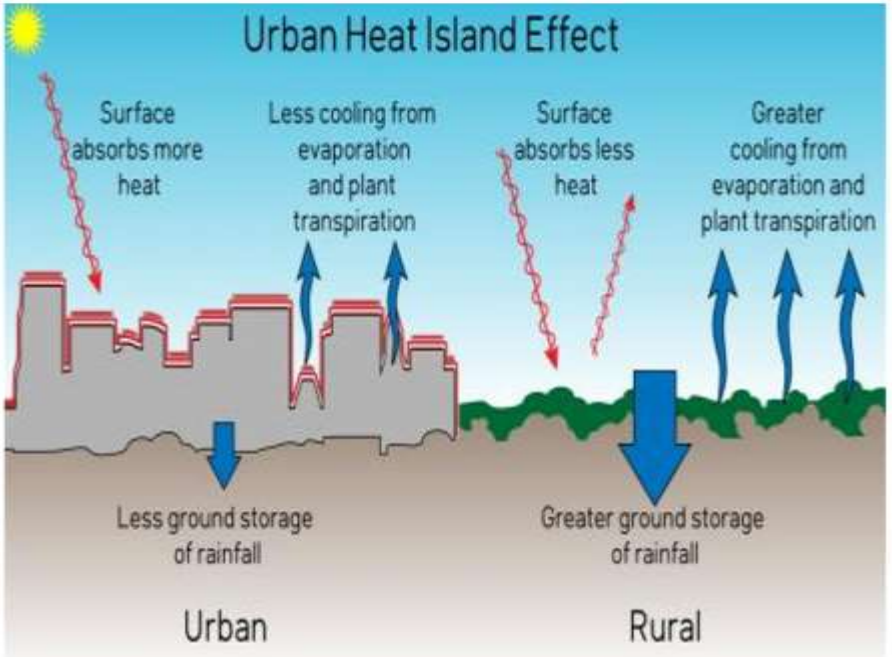
No driveways then

... Now multi car households have big driveways

More new car parking spaces in the same neighbourhood to facilitate modern lifestyles.

**Land being covered by Concrete and Tarmac**





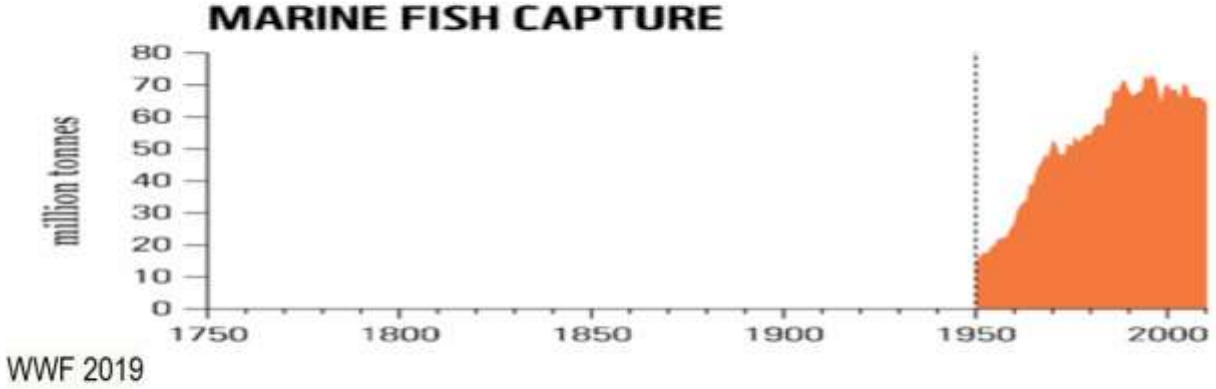

# London's heat spots revealed using space data

## Species 'goldilocks' Zones Affected ?

images show that there could be **up to 6°C difference** between downtown versus rural suburbs

**Overfishing has been bad enough...**

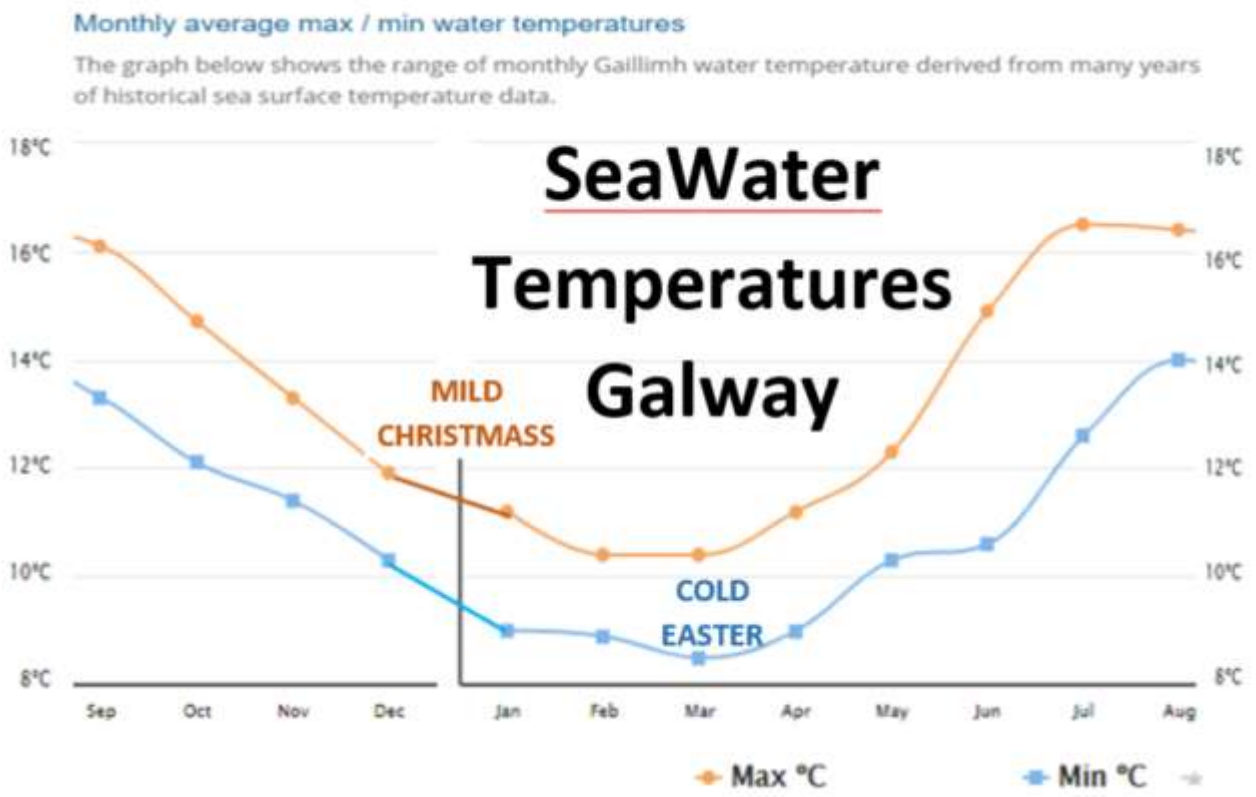
we are already beyond peak fish catches




**and now climate chance is a new worry.**

What's the big deal about a few degrees C ?

Ask these guys



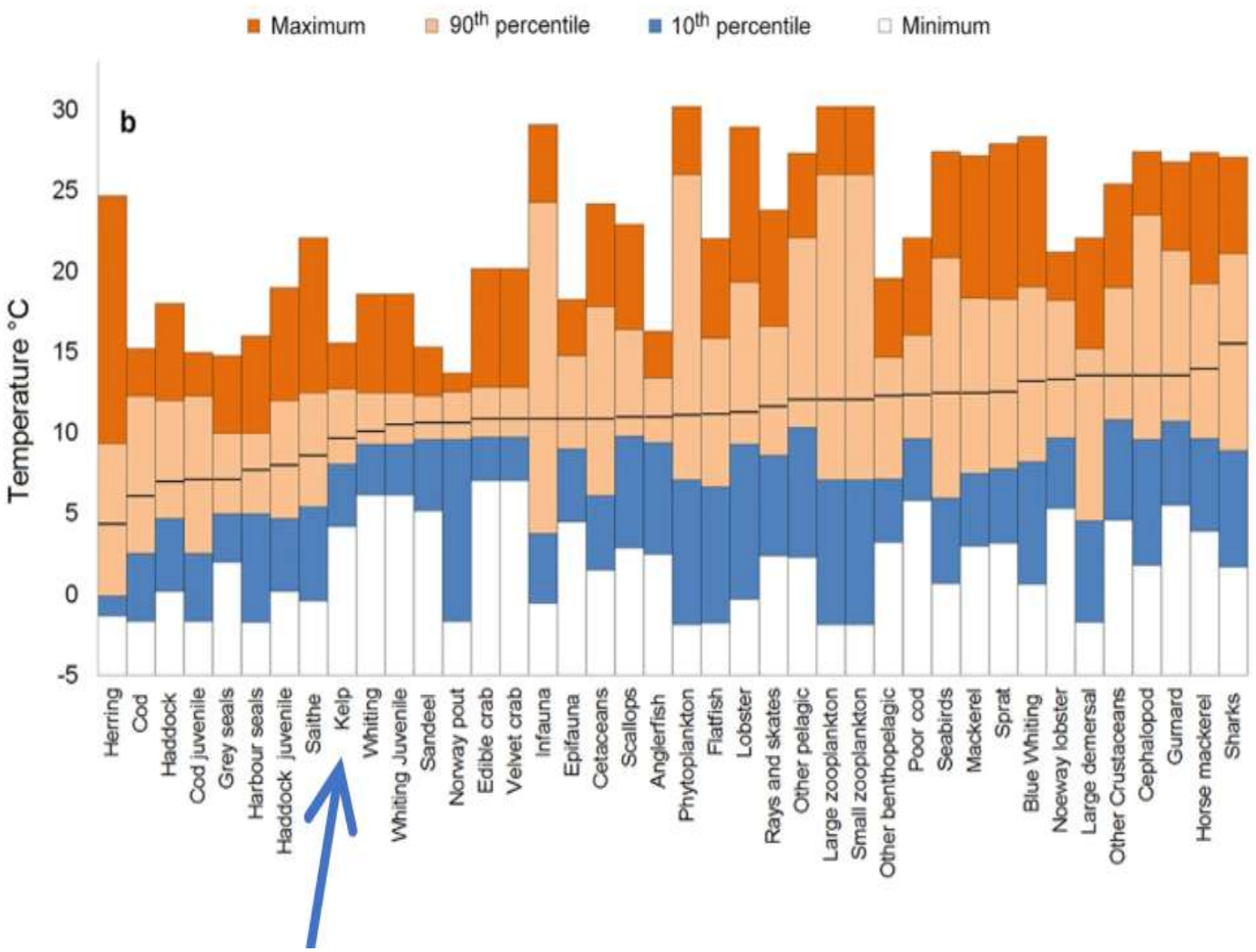
https://www.nature.com/articles/s41598-017-13220-7?proof=trueMay

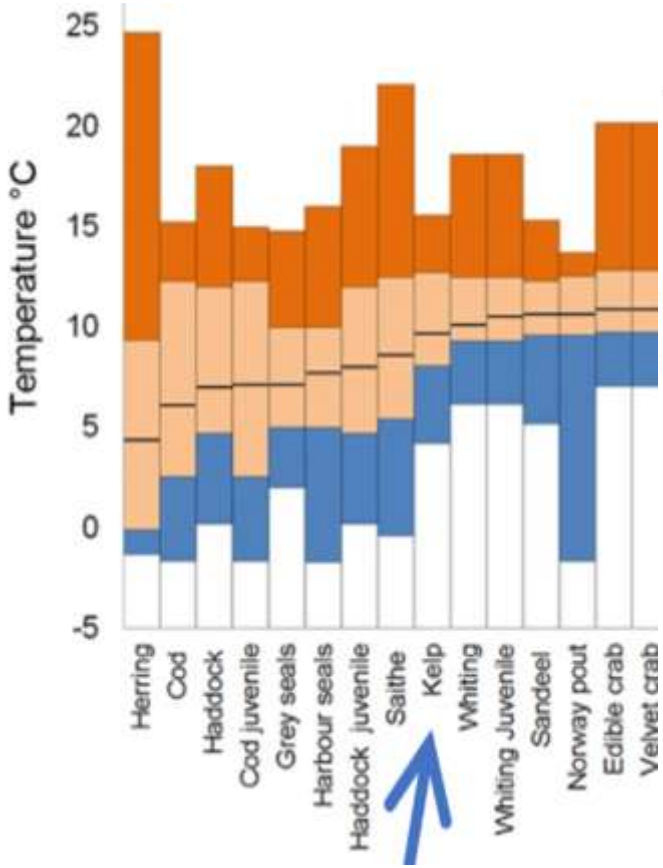
surviving

Thriving

surviving

# Impact of ocean warming on sustainable Fisheries management





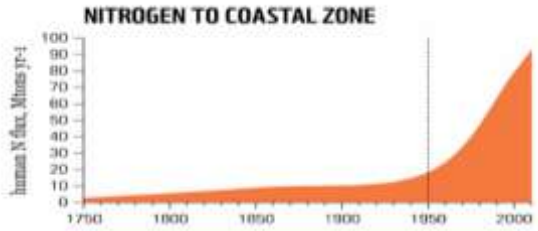

**overfishing** nearshore ecosystems **deregulates** marine **herbivores** and results in **overgrazing of Kelp.** This can rapidly result in barren seascapes.

**And now climate change could affect Kelp,** considering it needs ideal temperatures of 7.5°C to 12.5°C to fully thrive

**Most Kelp Habitat** only occurs where sea is not deeper than 30 meters, and where **Temperature is between 5°C to 20°C**

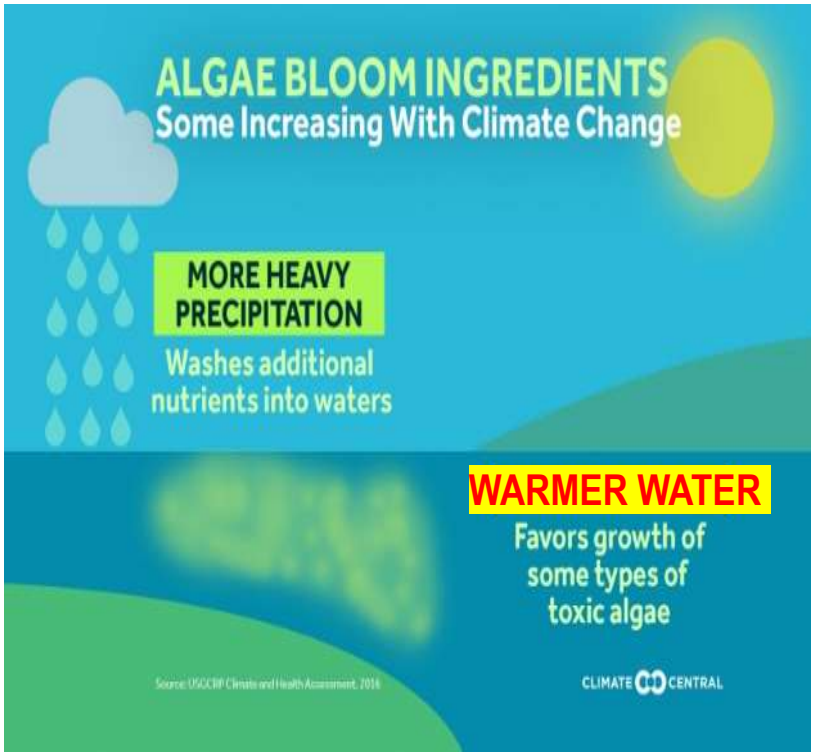
2018 **Oregon coastal Kelp forest destroyed by sea Urchins**

We used to take natural nutrients from the sea

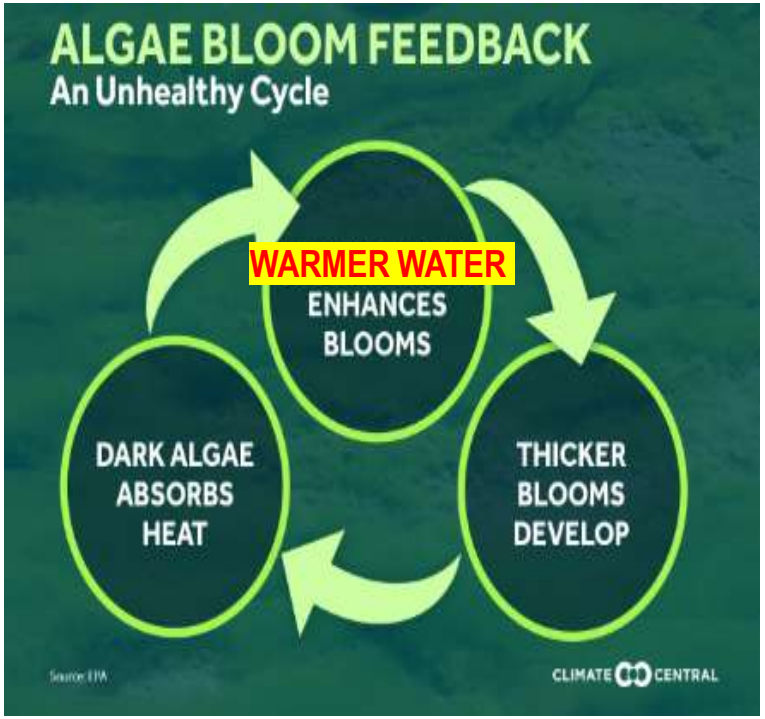



**Now we allow man-made fertiliser run-offs into rivers, lakes and sea**

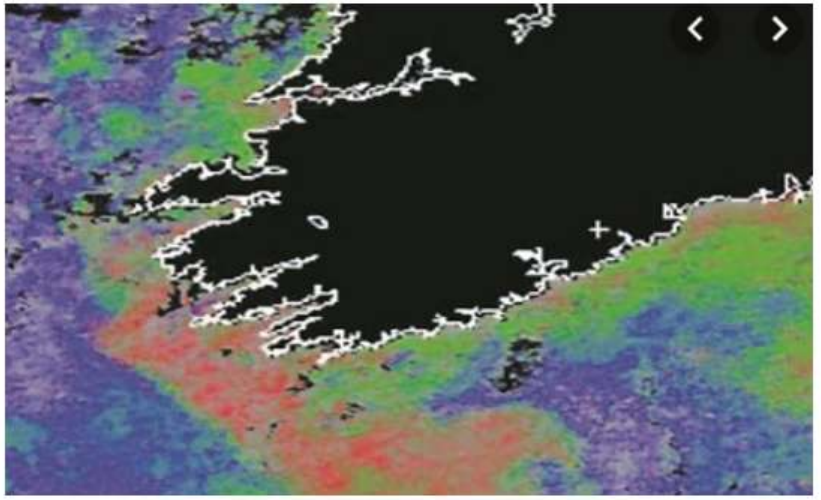

**Climate DOUBLE-WHAMMY**




**Vicious Circle**



# 2015 **Algae Bloom blamed for**



de-oxygenating waters off Goleen in West Cork, leading to the

## destruction of cockles, razor clams and lug worms.

## Jellyfish 'bloom' kills thousands of farmed salmon off Co Mayo

Lorna Siggins

***2013***

Up to 20,000 farmed salmon have been lost due to a jellyfish "bloom" off Clare island, Co Mayo

**Jellyfish in Dundrum Bay, Co. Down**

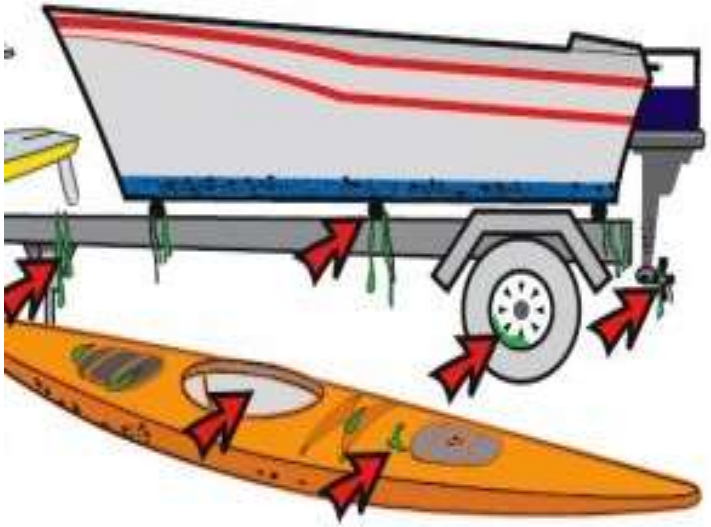
# Invasive species

**are non-native** species that have been **introduced by human intervention**, outside their natural range **and that can threaten our native wildlife and cause damage to our environment**, economy or human health.

**Control, management and eradication can be very difficult and costly**, so early detection and reactive measures are desirable.

Most non-native (also known as alien) species do not cause any harm and only a small proportion are considered to be invasive

# Invasive aquatic species are spread into rivers and lakes unintentionally



**Climate connection ?**

Milder Weather results in more Recreational Activity

## WHITE CLAWED

White clawed crayfish showing pale underside of claw


GOOD

## SIGNAL

Signal crayfish showing red underside of claw.
Claw is paler on female.


BAD

**Signal crayfish's extensive burrows can cause erosion**.

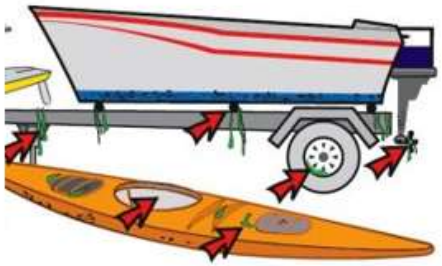
Their burrows displace threatened riverside species such as water vole

**Signal crayfish are bigger, grow faster, reproduce more quickly** and are more tolerant of a wider range of conditions than the native white-clawed crayfish.

**They feed on everything else,** fish and amphibian eggs, tadpoles, juvenile fish, aquatic invertebrates, detritus and aquatic vegetation ... and where present **reduce populations of native species and affect food webs**

Don’t bring leisure-craft to different Catchments

**Think about renting or borrowing boats locally instead**



# Invasive plants

## Achill communities urged to deal with Gunnera spread

09 AUGUST 2016

NEWS

SHARE THIS

**ALIEN PLANTS** Gunnera, an invasive species, being cleared from an area at Kildownet,

**WESTPORT** BIODIVERSITY MANAGEMENT PLAN 2017 **found Invasive Plant Species**

- **Red-osier dogwood -** shrub
- **Rhododendron**
- **Montbretia –** grows from bulbs
- **Pheasantberry** (Himalayan honeysuckle)
- **exotic common Cord Grass** in a saltmarsh
- **Japanese knotweed**

# Identifying Foe or Friend ?

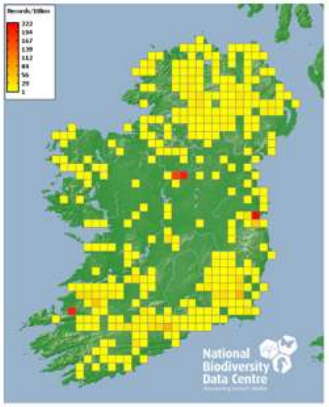
Himalayan balsam

Willowherb

# Himalayan balsam

grows up to 3 Meters high.

It Shades out most of our native species.




Prevalent in Damp areas such as banks of watercourses, where it often forms continuous stands. It can also establish in damp woodland

Seed pods scatter seeds up to 7 metres away from the parent plant.

## Himalayan balsam dies back in autumn, exposing bared river banks to winter erosion.

Displaced silt can then affect fish's spawning riverbeds

## Climate Double-Whammy

Balsam will grow more vigorously in Warmer Summers

And contribute to more Erosion during Heavier Winter RAINFALL

Displaced Silt can then affect fish's spawning riverbeds

Wrong riverside Flowers can affect Fish

# Breakout Session – What are the Local Impacts on Biodiversity?

# Solutions ?

# How Can We Protect our Biodiversity ?

# **Rethinking** (Europe)

Wildflower strips also provide SEASONAL Habitat for pest-killer predators

Carnivorous insects eat aphids and other smaller bugs

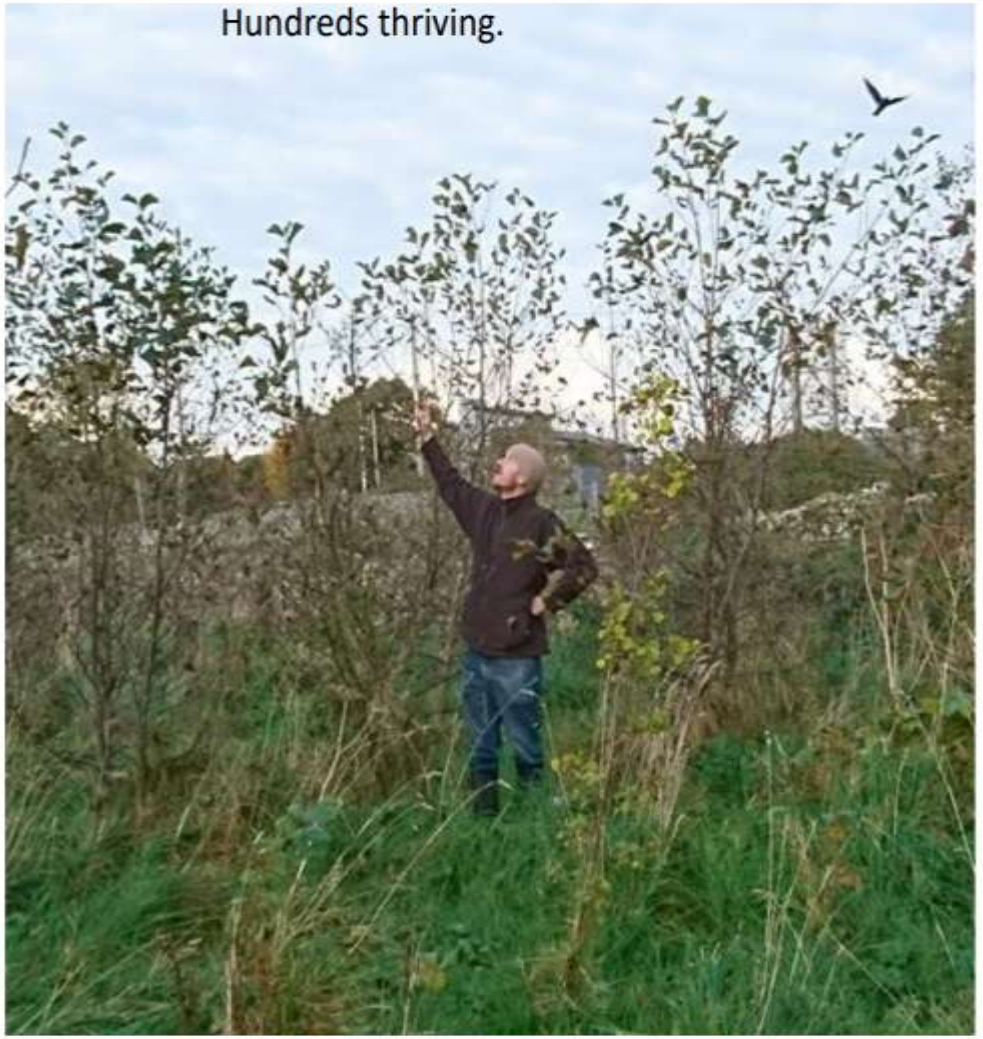
# Local micro-habitat – Doing no harm

Ingredients already here. Vetch, buttercup, daisy, dandelion

If it isn't broke – why 'fix it' ?

**Cappagh park,**
**2012 – planting saplings barely visible in photo**
Alder, Willow, Hazel

**…. Same Location 2016** – Natural growth.
Hundreds thriving.



**No need** to strim or spray

Leave grass as habitat for insects, worms etc.

Organic mulch would be optional. Seaweed compost etc.

We only used brown cardboard squares only as a visual indicator, so the saplings wouldn't be run over by mowers etc.

Thick Hedgerow Treelines proven to Protect Grassland from dry breezes during Droughts.

Example …. Merlin Park meadow
(zero-inputs) Hay Yield consistently the same 2017, **2018** & 2019 Regardless of Drought.

Win-Win

**Weeds catch surface dung etc, preventing drain blockages downhill.**

**downhill**

**on a good day – only minor muck**

When push comes to shove, Feel the burn


# Remember This ?

Backyard Vegetable plots,

a practical family activity

Berry bushes mind themselves

Redcurrant

What do you NOT see here ? no plastic packing

**Plum trees**

frost-hardy varieties now available

In Havana, Cuba 90% of the city's fresh produce comes from Local urban Farms and Gardens

Sustainable "Foodscaping" in Geneva, Switzerland where communities have worked together, neighbours consult and plan what each will grow so they can share and trade food. Imagine if we all did Foodscaping?

# 40% of Russia's Food is from ‘Gardens’

Russian ‘Dacha’ Gardens produced
>80% of Russia’s fruit and berries,
66% of Vegetables,
< 80% of Potatoes
50% of that nation’s milk

2003, Russian government Private Garden Plot Act law, entitling citizens to plots of land, ranged from 0.89 to 2.75 hectares

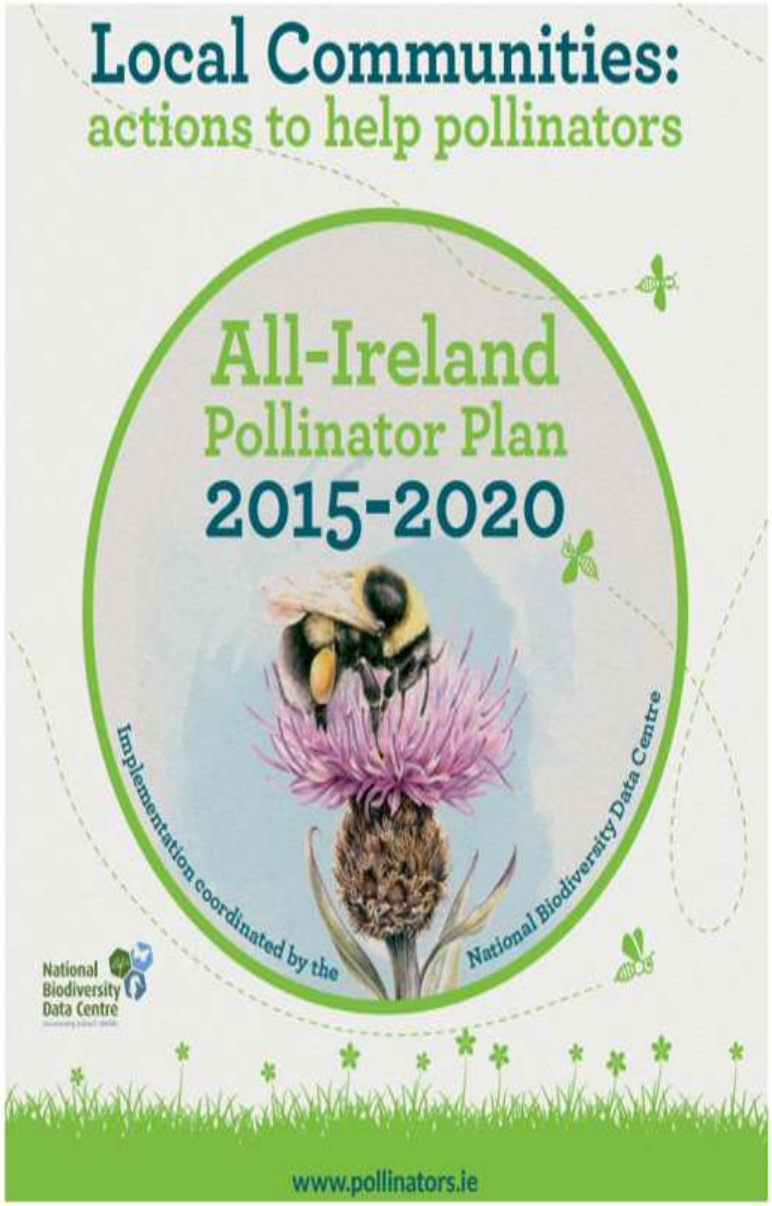
**Industrial agricultural soil is eroded 10 to 40 times faster** than gardening methods

**EDIBLE LANDSCAPE PROJECT,** based in Westport, County Mayo

# Leave space for nature


Appreciate nature

# Allow Time for Nature's Seasons




# Follow Good Advice

Perhaps your town already has a Biodiversity Action Plan ?

# Join and follow Groups

Watch Facebook etc...
for Events / Conferences/ Workshops

**BirdWatch**
**Edible Landscapes**
**Tidy Towns**
**Parish Community Groups**

… or Create your own!

# Use some imagination

# Low-impact Local Lifestyles

Sometimes - when possible

**Suggested Solutions**

- **Relax** Don't Tidy so much

- **Stop Merciless Mowing and Strimming.**
  Leave the edges and corners.
  Allow roadside weeds - where visibility safety is OK
  **Let your lawn grow for two months at a time**
  Use the cuttings as mulch-feed under trees
  **Tolerate Nettles**

- **Stop hedge cutting** - where safety **NOT** applicable
  Install electric fence to protect bases of hedgerows

- **Plant variety of Native Trees and Shrubs** (low-maintenance)
  Only plant ecologically friendly species
  – Not invasive like Laurel, Balsam etc.

- **Stop Spraying**

- **Stop Poisoning**

Stop using slug pellets where Hedgehogs can do the job

- **Rest your motorcar**.

Walk to the shop - instead of driving to the gym.

Consider using a <u>good</u> Push-mower

- **Use your backyard for Growing food**.

Dig by hand when you can. Don't use machines.

Let fruit-shrubs do the work.

- **Pre-plan your Holidays and Leisure**

Fly less frequently, but perhaps stay for longer each time

Don't bring canoes to other Catchments or countries

# Protecting your Local Biodiversity…

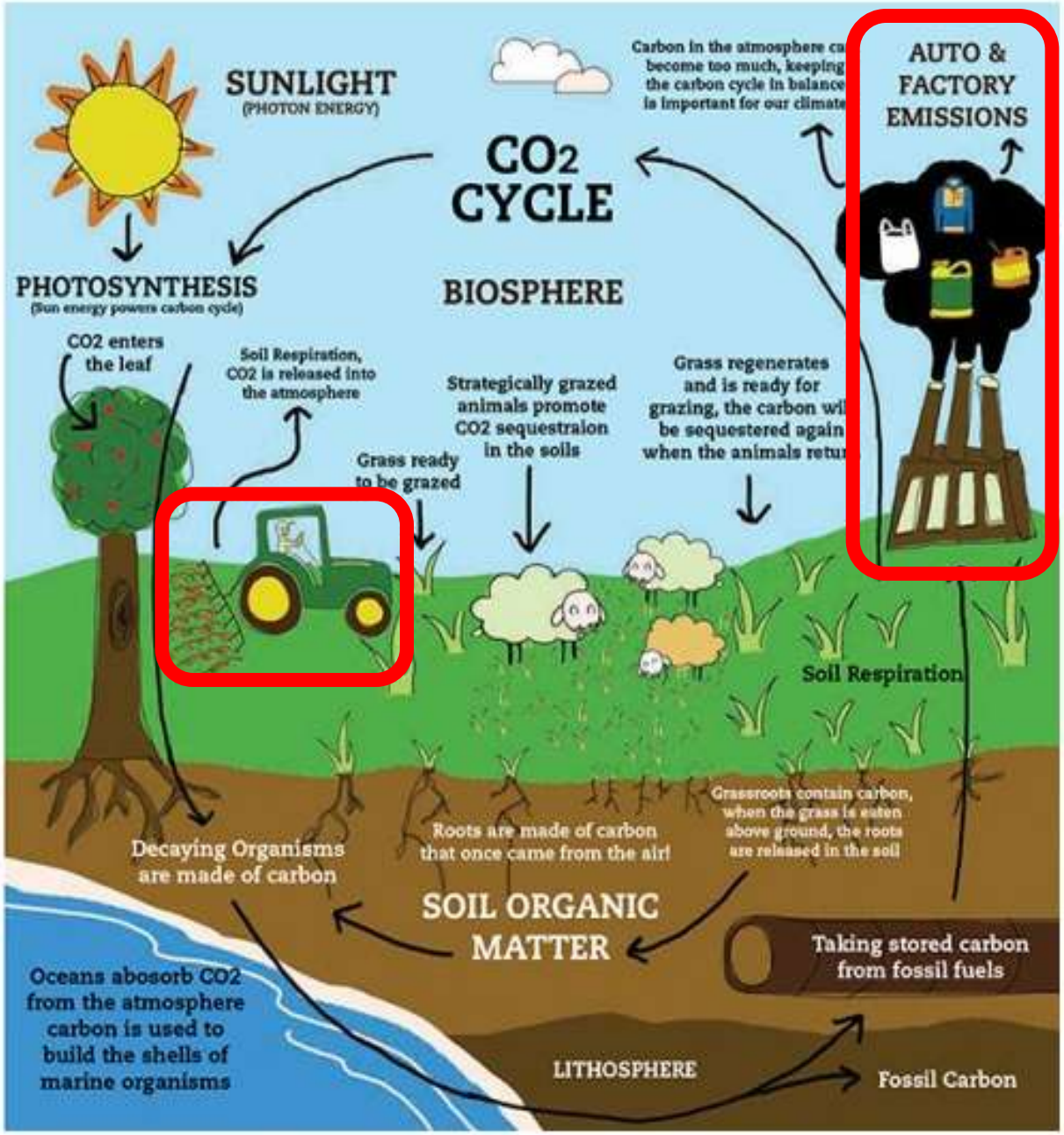
# is also important for Defence against climate change

Plant (native)

- Trees
- Hedge-shrubs
- Perennials

**Balanced Virtuous Cycles** help mitigate emissions

Don’t mow – Let stuff Grow to Regenerate deeper soils



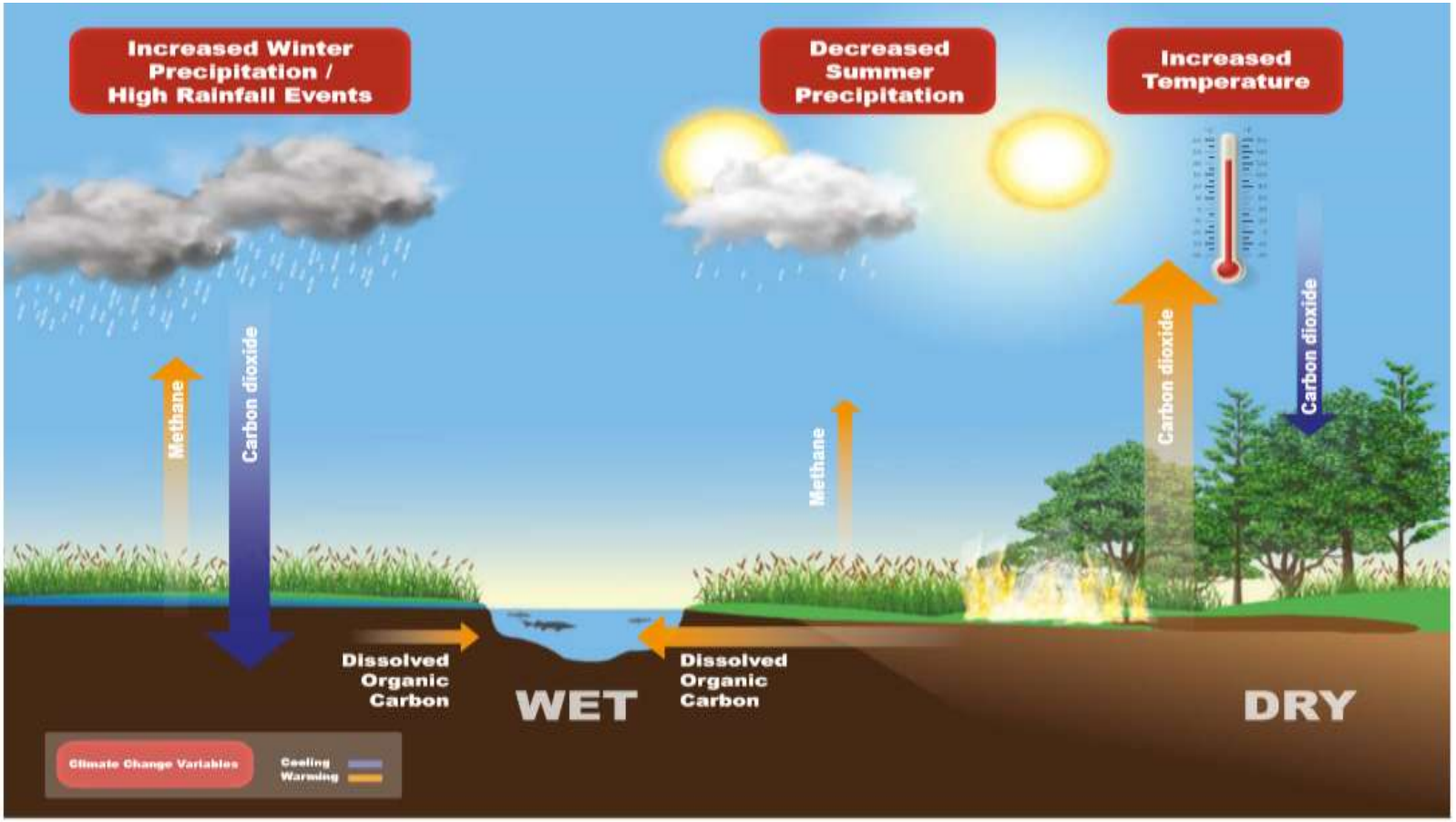



Figure 2.1. Infographic representing the effects of climate change on peatland biogeochemical processes.

Draining Peatlands ?

is it worth it ?

**Would re-wetting be better** ?

**Sand Dunes -** Natural Protection for Coast-Lands

Please minimise human wear & tear

Allow more Marram Grass growth

Important when storms hit us

There's grassland...

**… and there's 'Grassland'**

**Legume & Herb-rich mixtures**

Increase Protein and mineral content and stay Leafy for longer Digestibility & Palatability.

Diversity of plants spreads resistances to pests disease and weather extremes.

Deep-Rooting clovers and plantains Tolerate Droughts

Legumes can typically 'fix' 100 to 150 Kg Nitrogen nutrient / ha / year from the air.

Autumn Fruition is made possible by All-Year survival of pollinators needing varied habitats

**Coltsfoot** does well in poor soil conditions.

Flowers like dandelion appear very early in springtime when emerging bees need nectar

**February**

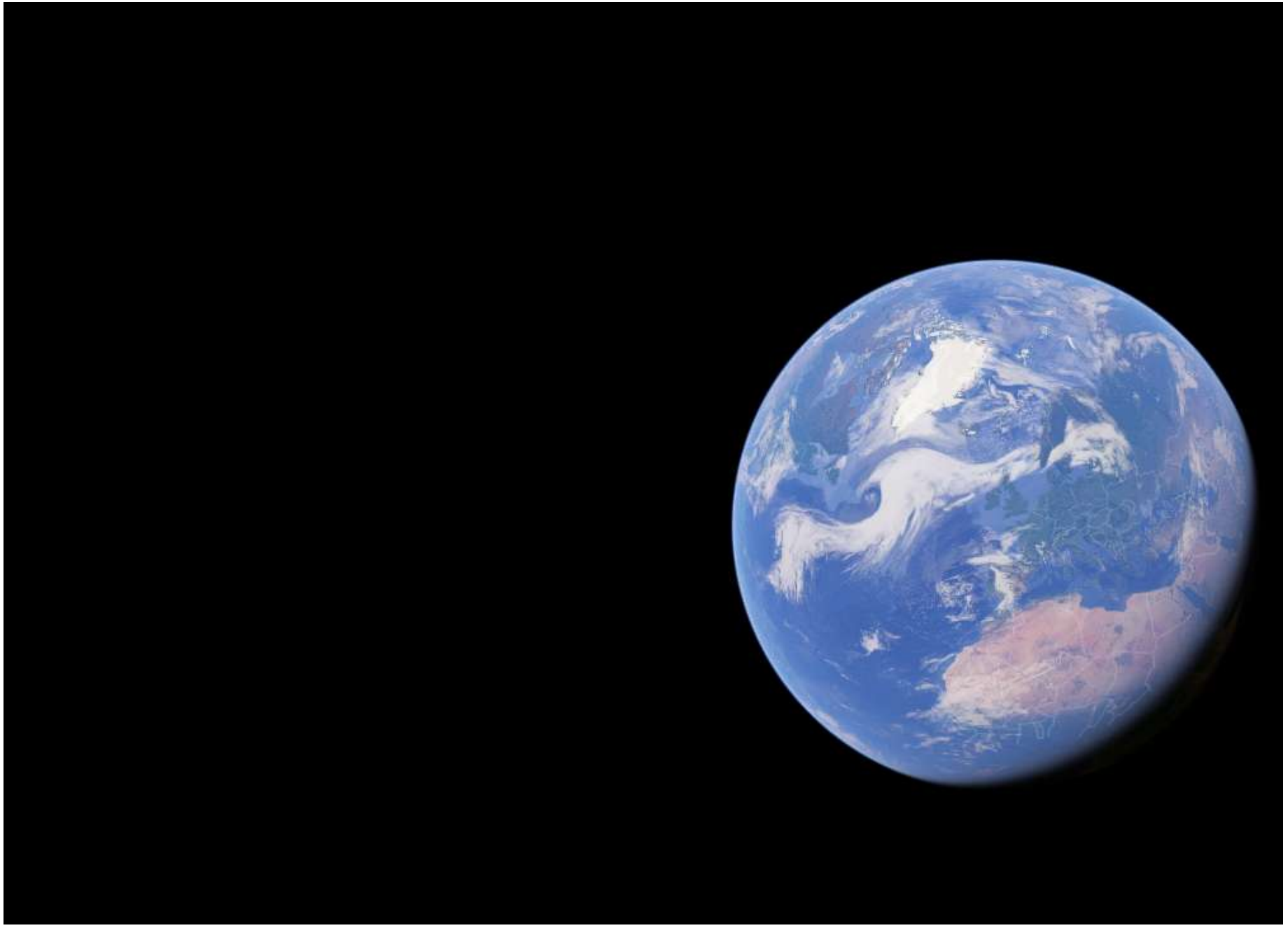
Knapweed

waits until **August** to bloom

A major source of nectar then

**Devil's bit' Scabious waits until September**

**Ivy flowers around Halloween, berries after Christmas**



# Breakout Session, How can your Community protect its Biodiversity?

Energy Co-operatives Ireland
Building community energy networks
energyco-ops.ie

Rethink

# Workshop 2:
# Water Quality and Green Solutions Session

# County Mayo in Context

- 21% of the country's total coastline
- Almost 6,000 areas of archaeological importance spanning over 7,000 years, many coastal
- 78 piers and harbours, 12 blue flag beaches and 7 beaches with green coast awards

https://www.climateireland.ie/#!/ and IPCC AR5

# County Mayo Vulnerability

- These increase vulnerability to climate change, increased rainfall, drought, erosion and rising sea levels.
- Rural areas are expected to experience major impacts on water availability and supply, food security, infrastructure and agricultural incomes, including shifts in the production areas of food and non-food crops around the world.

https://www.climateireland.ie/#!/ and IPCC AR5

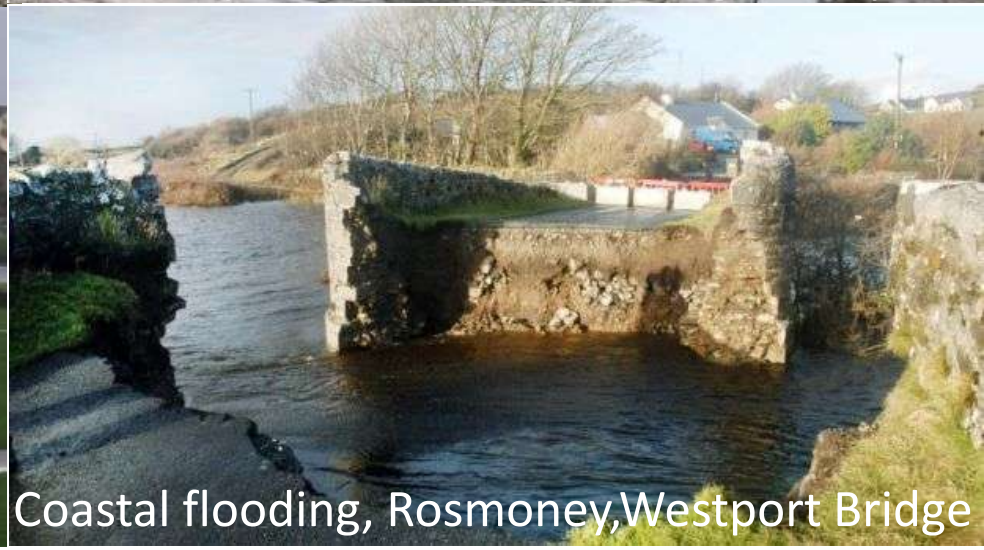
# The Water Cycle

# Types of Flooding


River flooding, destroyed bridge, Leenane


Storm Ophelia, Surface flooding, Westport

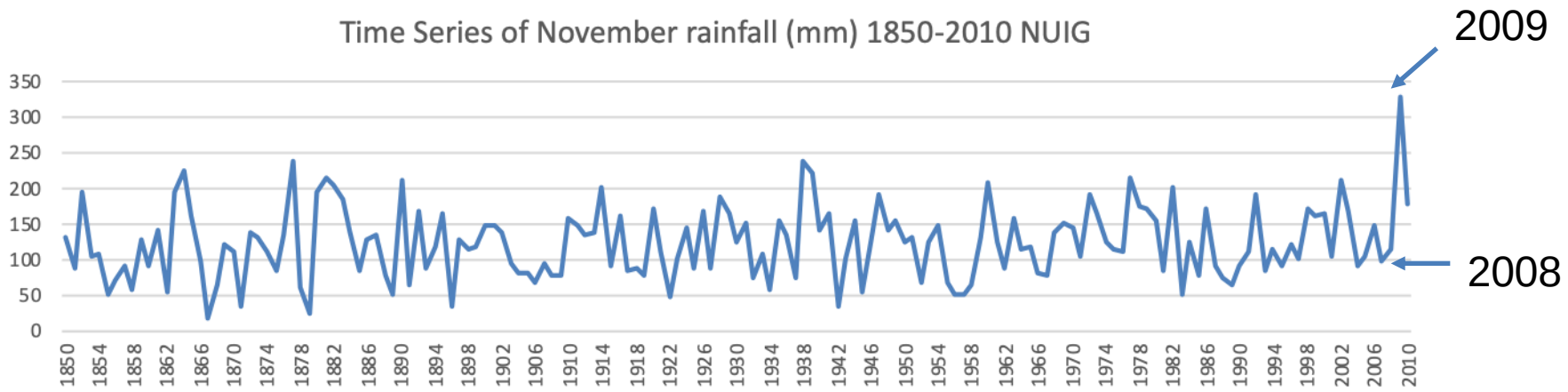

Storm Ophelia – Coastal flooding, Galway

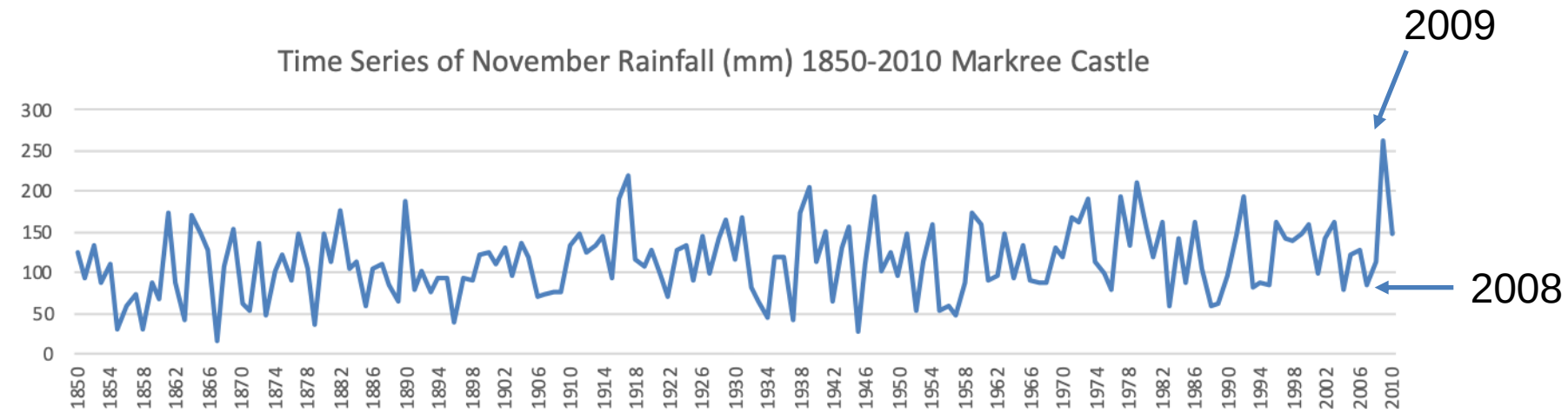

Coastal flooding, Rosmoney,Westport Bridge

- Surface or flash flooding from heavy local rainfall (pluvial)
- River (fluvial), and
- Coastal.

https://www.floodinfo.ie/about_frm/types_and_causes/ and CARO, 2019

# Case Study: Extreme Rainfall, November 2009




Average trendline rainfall 100-130mm

(Met Eireann; Long Term Data)

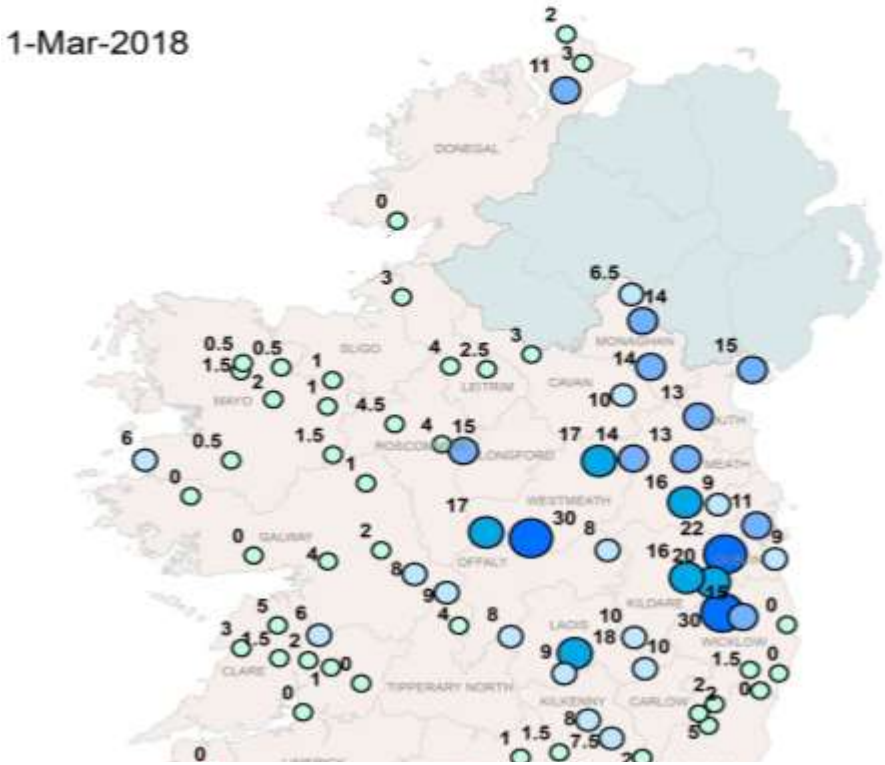
# Case Study: Extreme Rainfall, November 2009


- Significant rainfall: Knock, Newport, Claremorris, Belmullet, Knock
- River flooding: **Crossmolina**, Ballina, Foxford, Westport…..
- Groundwater pollution from slurry & sewerage (storage)
- Damage to private property, critical infrastructure, national and primary routes, animal welfare, stranded cars
- Impacting emergency services, emergency access
- Sand bagging

CARO, 2019

# Case Study – Beast from the East

## Storm Emma; February - March 2018




Met E: https://www.met.ie/cms/assets/uploads/2019/02/EmmaReport2019.pdf and CARO, 2019.

# Case Study – Beast from the East

1. Easterly polar winds, snow showers, air and ground frosts
2. Transport disruption, all roads, rail, and Knock airport
3. Taps were left running to avoid freezing pipes
4. 18,000 people without water
5. Civil defence and emergency services
6. Farm feed and water
7. Snow thaw can cause surface water loading

Met E: https://www.met.ie/cms/assets/uploads/2019/02/EmmaReport2019.pdf CARO, 2019 and https://rew-online.com/2014/02/winter-blast-sends-salt-prices-soaring/

# Case Study: Summer 2018 – Hot and Dry

- Record monthly rainfall & temperatures (mean) across the county
- Knock Airport record sunshine levels and temperatures
- Belmullet records lowest rainfall levels
- Record temperature levels in Newport
- River temperature & low levels impact river flora, fauna and fisheries
- Drought: water conservation and restrictions
- Severe algae blooms on some piers and slipways
- Road surface melt
- Agriculture

Met E: https://www.met.ie/cms/assets/uploads/2018/08/DryWarmWx06072018_SS.pdf, CARO, 2019

# Impacts on Water Quality

- **Increased rain, floods and runoff** from septic tanks, agricultural, forestry, sewerage treatment plants **damage groundwater quality**
- Most Irish urban drains combine wastewater and stormwater in a **single sewer pipe** so intense rain leads to overflow that contains raw sewage, pathogens, toxins, pollutants; Storm Brian - Ringsend
- **1300 urban drain installations** installations are under licence/under application (for settlements greater than 500 population) (EPA, 2018 – EPA Research Report 240). Many such plants in Ireland are looking to increase their storm water storage capacity and Ringsend is one such example
- **Pressure on plant storage capacity**

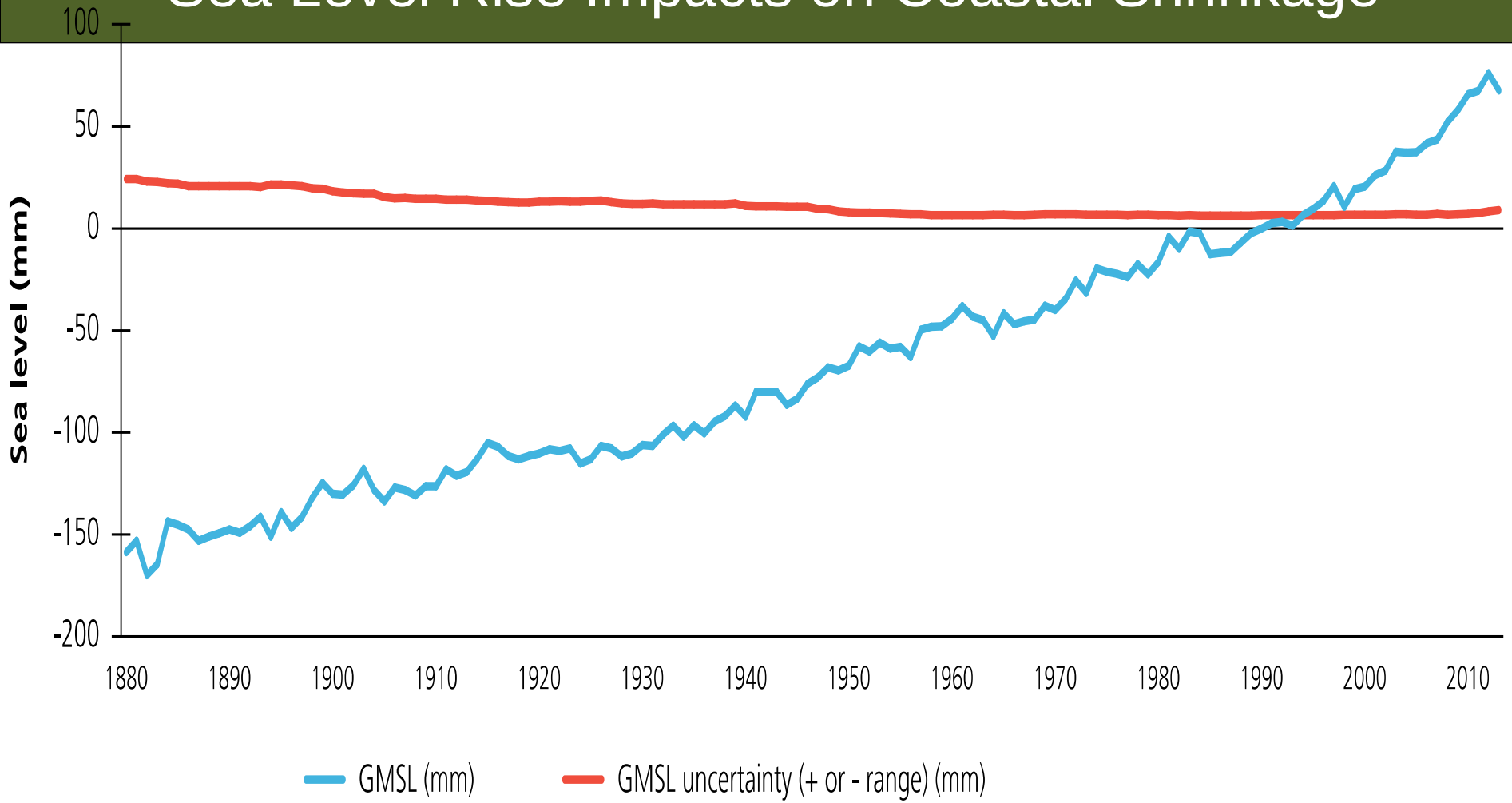
http://www.epa.ie/pubs/reports/research/water/Research_Report_240.pdf CARO, 2019

# Impacts on Water Quality

- Water impacts include contamination of drinking water, beach closures, reductions in chemical and ecological status, impacts on recreation, tourism, angling, Blue Flag amenities, jobs and incomes
- Severe surface water/groundwater threat where increased rain and river flow meets high tides.
- Storm Brian, Storm Ophelia
- “Where risk arises, working with the HSE, Irish Water will impose precautionary Boil Water Notices as necessary.”


http://www.epa.ie/pubs/reports/research/water/Research_Report_240.pdf CARO, 2019

# Sea Level Rise Impacts on Coastal Shrinkage




- Heat trapped by oceans leads to thermal expansion
- Global sea level rise of 2 cm each decade in the last century
- Since 1993, average sea level by just over 3 cm per decade

EPA, 2016

# Coastal Squeeze and Habitat Shrinking

- Coastal shrinking
- Shrinking shoreline habitats
- Pressure from developments seaward too

# Coastal Squeeze and Habitat Shrinking

**Kerry County Council receives Government funding of €3.3m to repair storm damage**

Sunday, December 28th, 2014 at 1:10 pm.

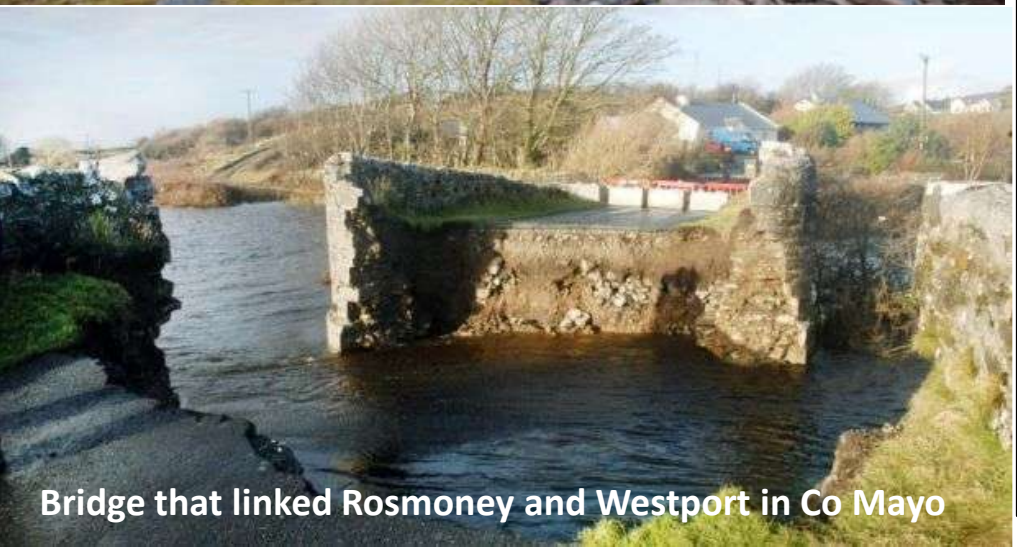
Farrell et al, 2016

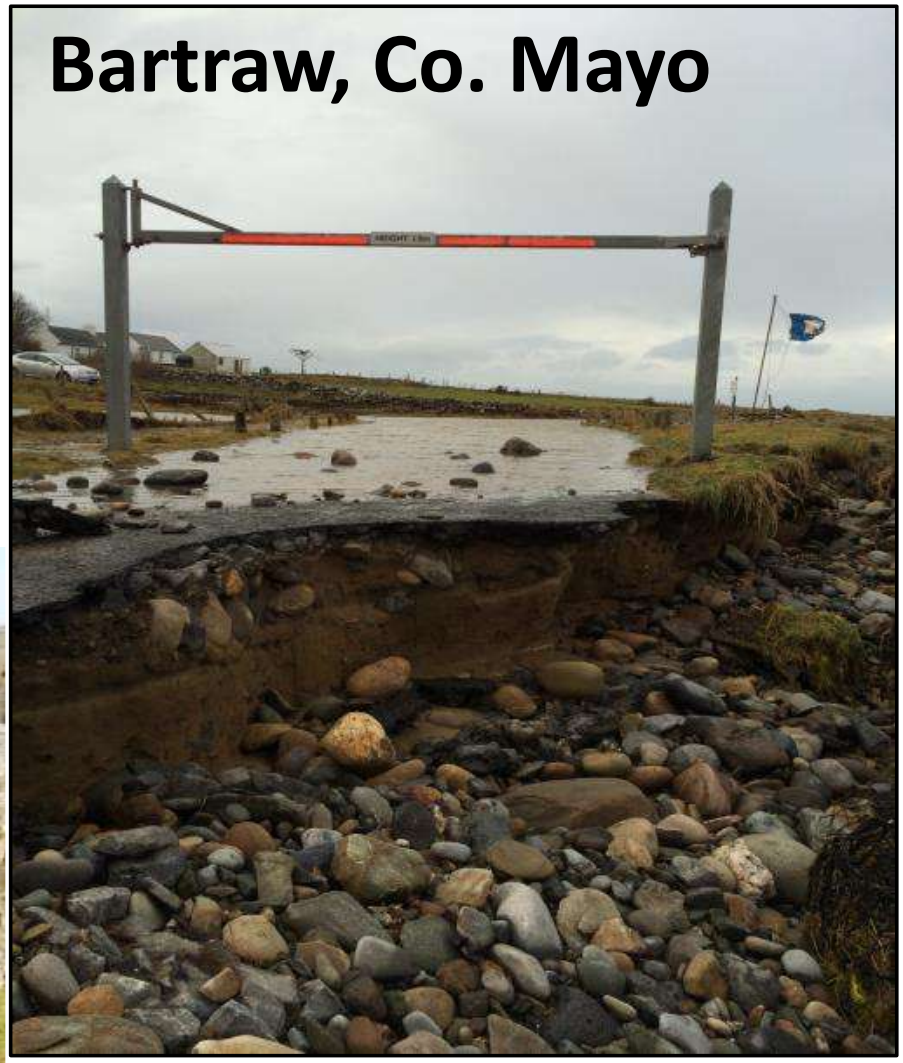
# Damage to Infrastructure Lahinch - Storm Winter 2013/2014

Flooding, sea surge, inundation (EPA, 2016).

# Damage to Infrastructure


Damage at the Claddagh


Bridge that linked Rosmoney and Westport in Co Mayo




Farrell et al, 2016

# Damage to Main Bridge in Leenane

- Bridge over Lahill River
- Carried up to 4,000 cars each day
- Collapsed 18th July 2007
- Torrential rain brought landslides
- Significant repair

- Better foresight & response
- Large round about trip
- Need transport response
- Community and Public
- Buses and journey sharing

.

Mayo News and Irish Times

# Drought Impacts

- Animal Welfare
  - Impacts fodder supply and price
  - Impacts water supply to animals
- Human Welfare
  - Impacts human food supply
  - Impacts human water supply
  - Water conservation and rations

- Gorse fires
  - Peatland is 38% of Mayo
  - Habitats wiped out
  - Soil erosion
  - Animal welfare

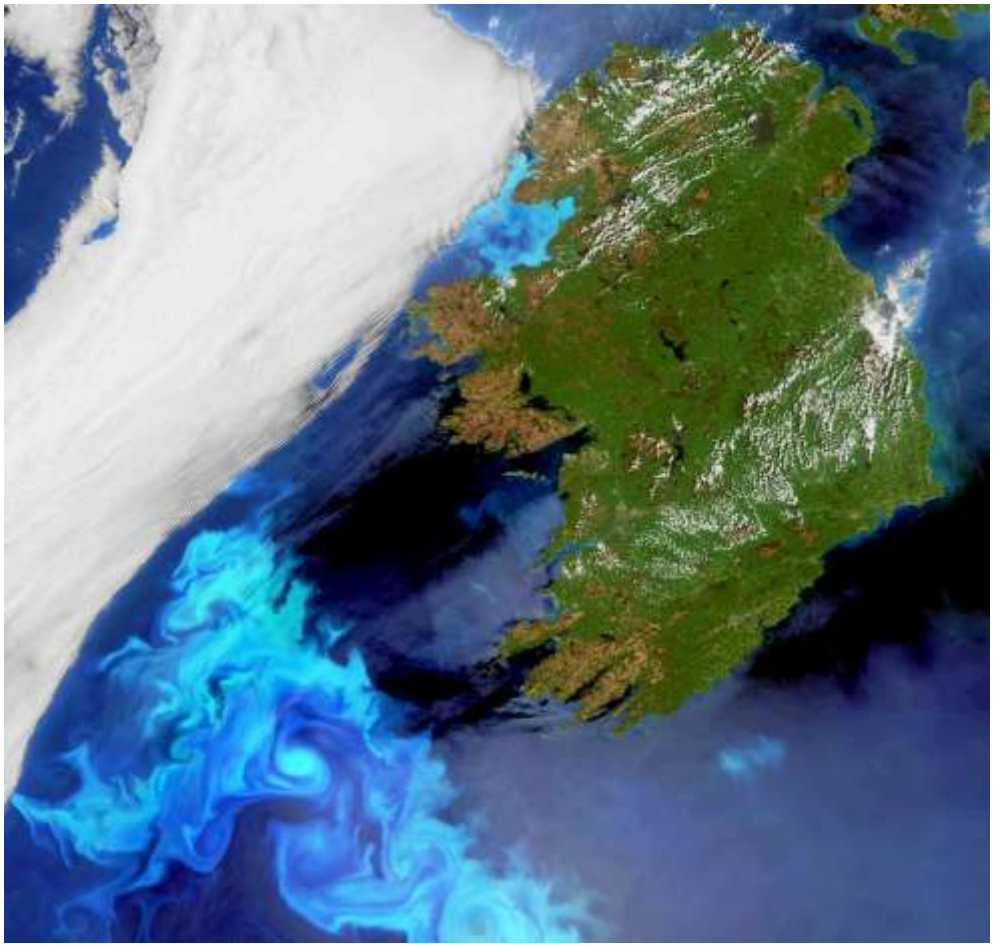
(CCAS, Cavan County Council)

# Impacts on Algal Blooms – Oxygen Depleted Dead Zones

- Intense rain and runoff increases sediment and nutrient loads in waterways. **Nutrient enrichment** helps **reduce dissolved oxygen** & leads to **algal blooms** & increased concentration of bacteria & pollutants. Nitrogen is a chief culprit.
- Fish death and displacement
- The blue economy
- Impacts seawater and freshwater
- Value of the ocean
    - Major food source
    - 30,000 jobs
    - €1.8 billion in 2016
    - Oceans produce half of the oxygen in the atmosphere
    - And absorb 30% of all CO2 emissions
    - Ocean ecosystem services are very important

NUIG, 2015, Valuing Irelands Blue Ecosystem Services

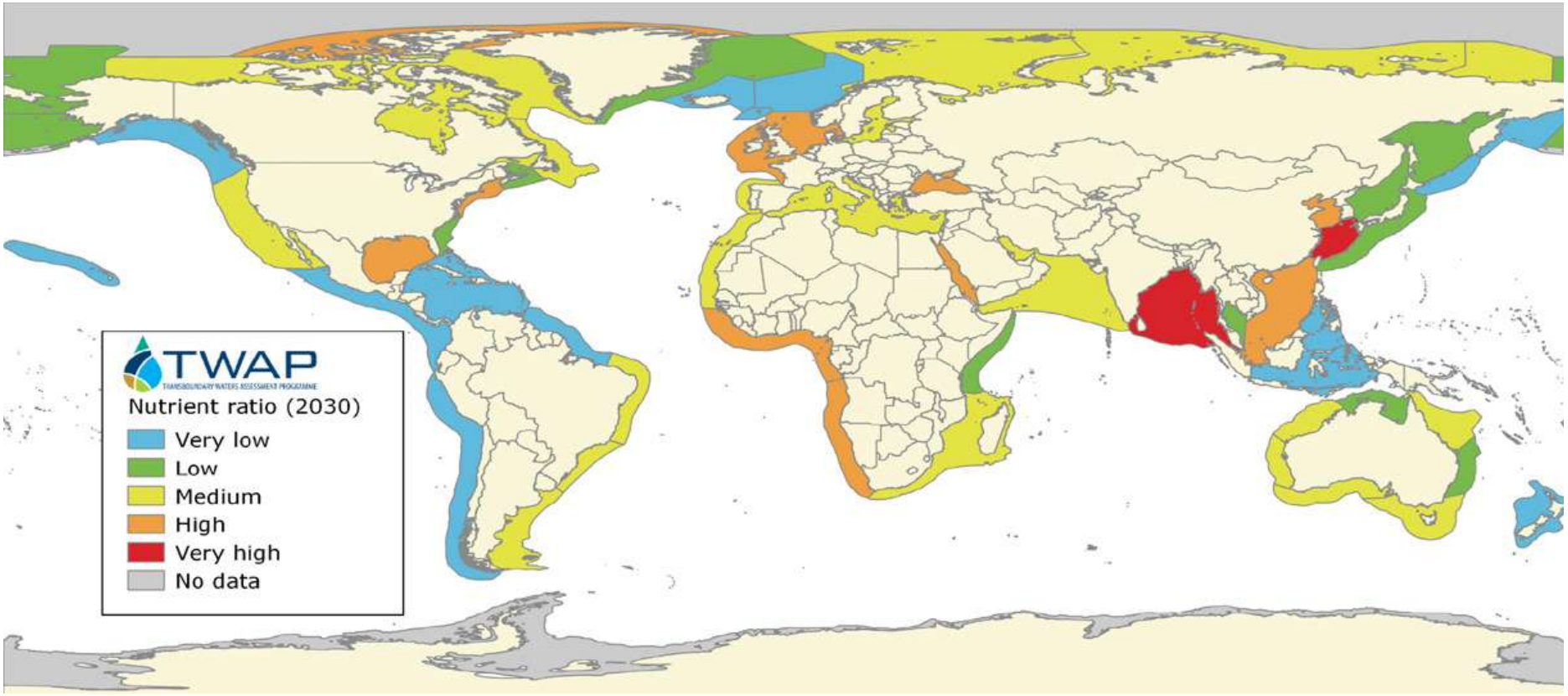
# Impacts on Algal Blooms – Oxygen Depleted Dead Zones



- Toxic phytoplankton
- Bottom of the marine food chain
- Harmful to fish and humans

Wiki Commons, EPA Report 223

# Impacts on Algal Blooms – Oxygen Depleted Dead Zones

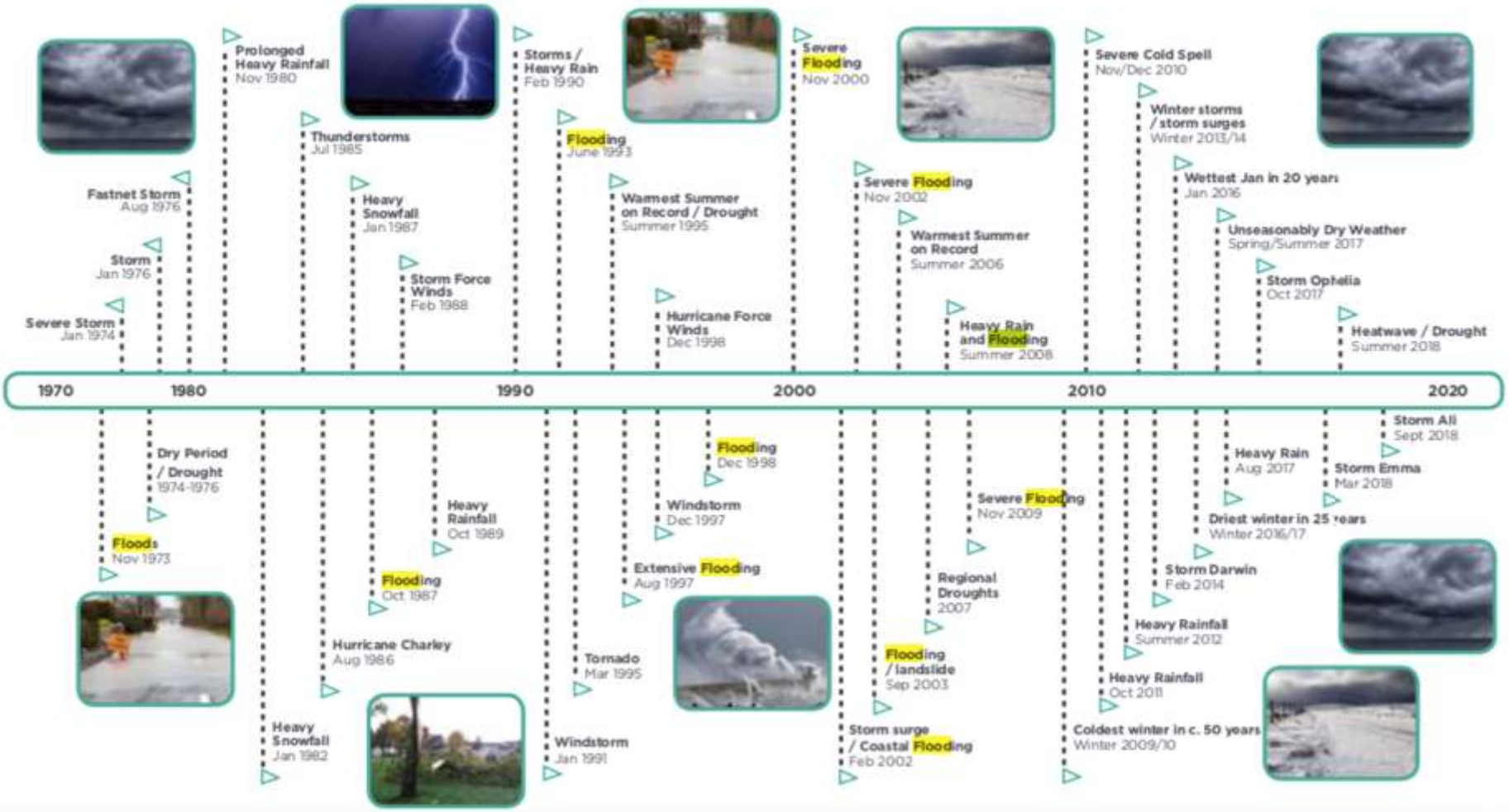



- Algal bloom prominent in high nutrient and warm waters

*Source: TWAP 2019*
*Tier III; Custodian agency: United Nations Environment Programme (UNEP)*

# Flood Legacy in Mayo

## HISTORIC CLIMATE EVENTS IN MAYO



# Projected Climate Change Impacts for Ireland

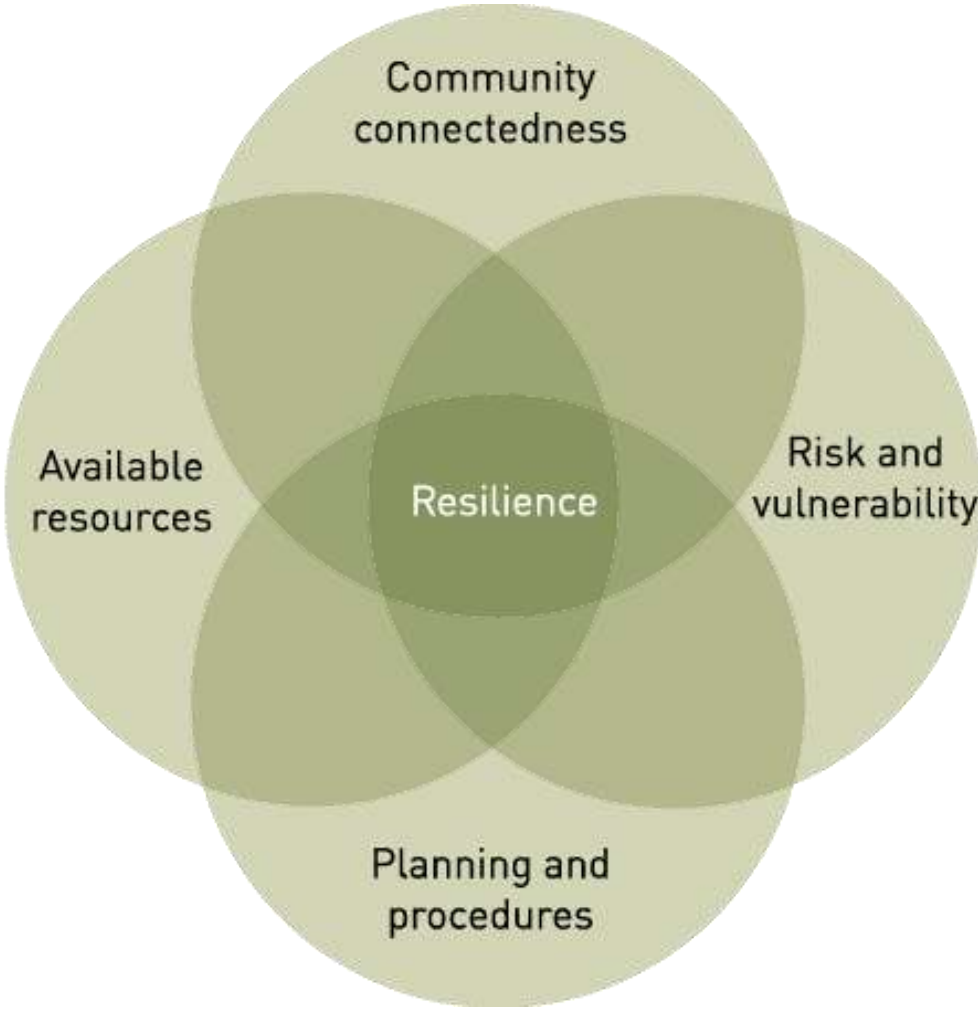
Increased winter rain, water flows and storms to damage infrastructure more, threaten defense integrity & challenge slurry storage & spreading in wetter areas.

Coastal cultural heritage, archaeological sites may be lost.
The decreased summer flow and droughts reduce soil quality and global food supply.

CARO, 2019

# Responding to Impacts and Building Resilience in Adaptation

- Risk and response identification
- Flexible governance seeking stakeholder input
- Resources available to a community, planning, design, competence, adaptation tools like armouring, flood barriers…
- Co-creation
- Funding managed
- Resilience and resilient relationship are key in adaption and its responses and actions
- Staff and also response personnel are key



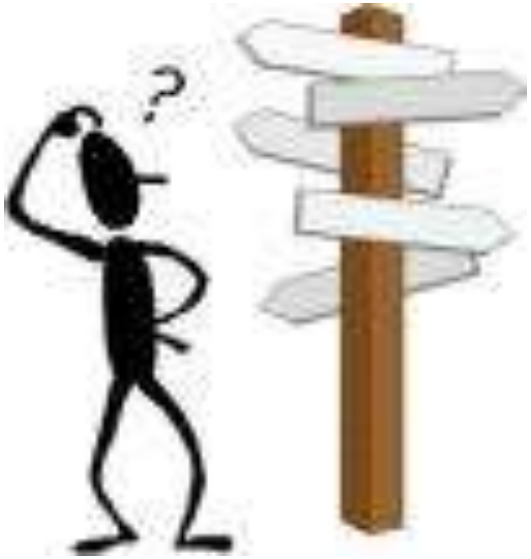

**(Norris *et al.* 2008)**

Arbon, 2014. Developing a model and tool to measure community disaster resilience https://ajem.infoservices.com.au/items/AJEM-29-04-04#sthash.DitYa9i5.dpuf

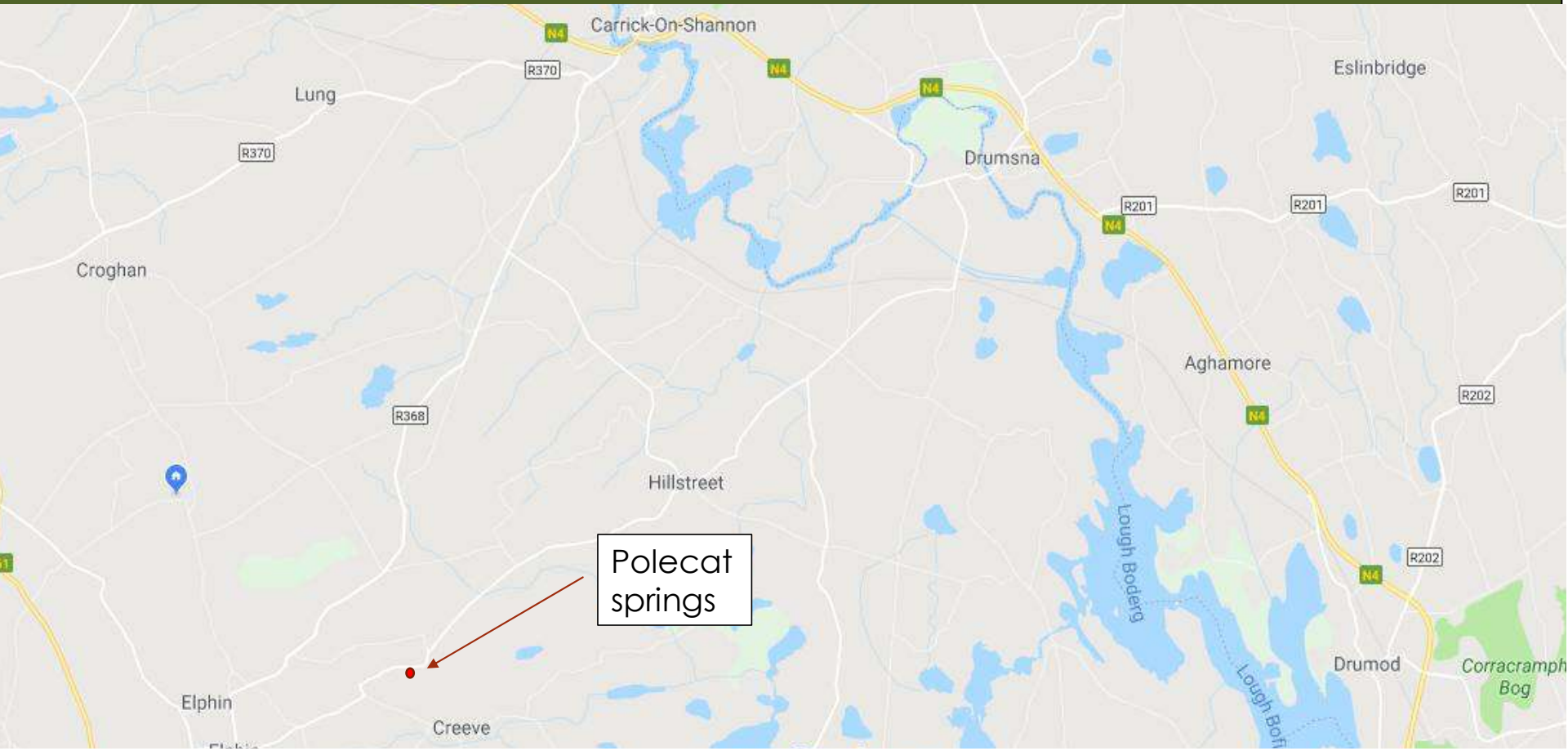
# Emergency Response Management: People & Staff

1. Strong need to respond to climate change as its accelerating
2. Increasing risk of Gorse and wild fire
3. Increasing pressure on resources, water and personnel
4. Occupational health and safety and response planning for safety
5. Increased flooding, poisoning, infection and risk of illness.
6. Planning safe environments for indoor and outdoor staff
7. Awareness on health and safety impacts of climate change
8. Plan climate change risk into health and safety plans

# What Water Projects could your Community do?



# Case Study Polecat Manage their Water Supply and Treatment




- Near Elphin and Lissavilla
- Community owned and run water supply scheme
- 400 house connections
- 200 farm connections

https://www.energyco-ops.ie/wp-content/uploads/2019/05/Polecat-SEC.pdf

# Case Study Polecat Manage their Water Supply and Treatment

SEC since 2016
Suppy and treat their own water

Community control the quantity and quality of water they receive
Historical consumption 900m3 per day (fill a 40’ container 13 times)
Current consumption 450m3 per day
Pumping over 8km wit a lift of 85 metres
Annual electricity bill €7000
https://www.energyco-ops.ie/wp-content/uploads/2019/05/Polecat-SEC.pdf

# Case Study Polecat Manage their Water Supply and Treatment


Granted planning permission for Solar PV

51kW installation income or money saved €7,000

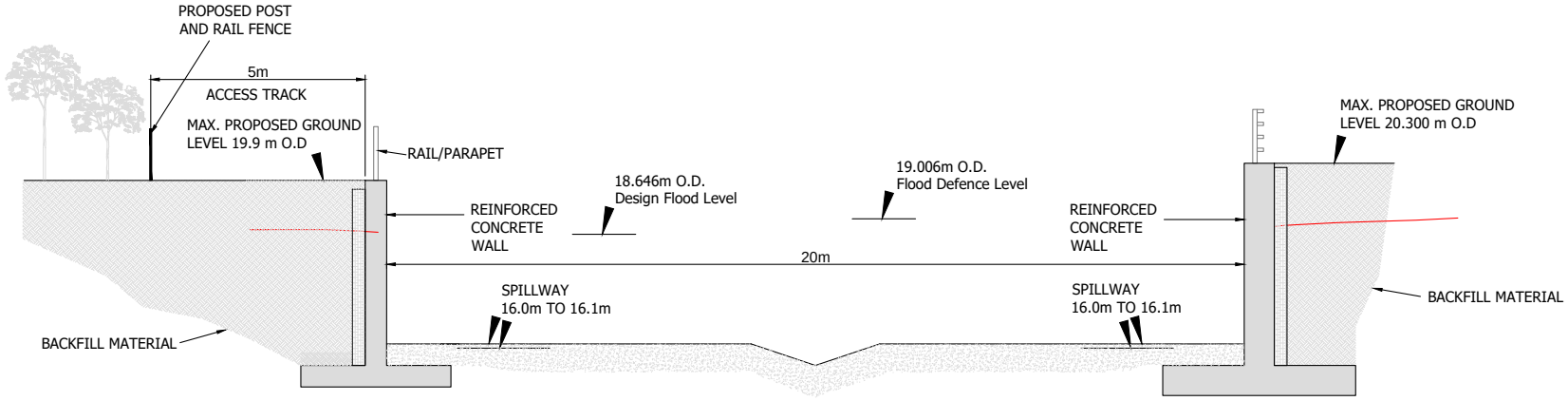
Capacity for 150kW

Total cost - €80,000

https://www.energyco-ops.ie/wp-content/uploads/2019/05/Polecat-SEC.pdf

# Flood Adaptation Case Study in Crossmolina

- Plan to divert flow away from Crossmolina
- Collaboration with OPW
- Crossmolina Flood Action Group
- Design stage
- 2 new bridges and road diversion
- **Local wardens** monitor river depth
- Flood barrier response
- Local Adaptive response to flooding



# Communities Impacting Water Quality – 2 Case Studies

**CANN (Case Study)** www.thecannproject.org

- Cross-border environmental conservation project
- Improving the condition of protected habitats
- Supporting wildlife
- IT Sligo are a partner
- They are blocking drains to help with water retention & water quality

**Community Wetlands (Case Study)** https://www.communitywetlandsforum.ie

- Umbrella organisation
- 21 community organisations
- community of interest (bog and wetlands)
- rewetting
- Moate and Tullamore
- Twitter: @forum_wetlands
- https://www.facebook.com/communitywetlandsforum/

# CANN Impacting Water Quality – Case Study

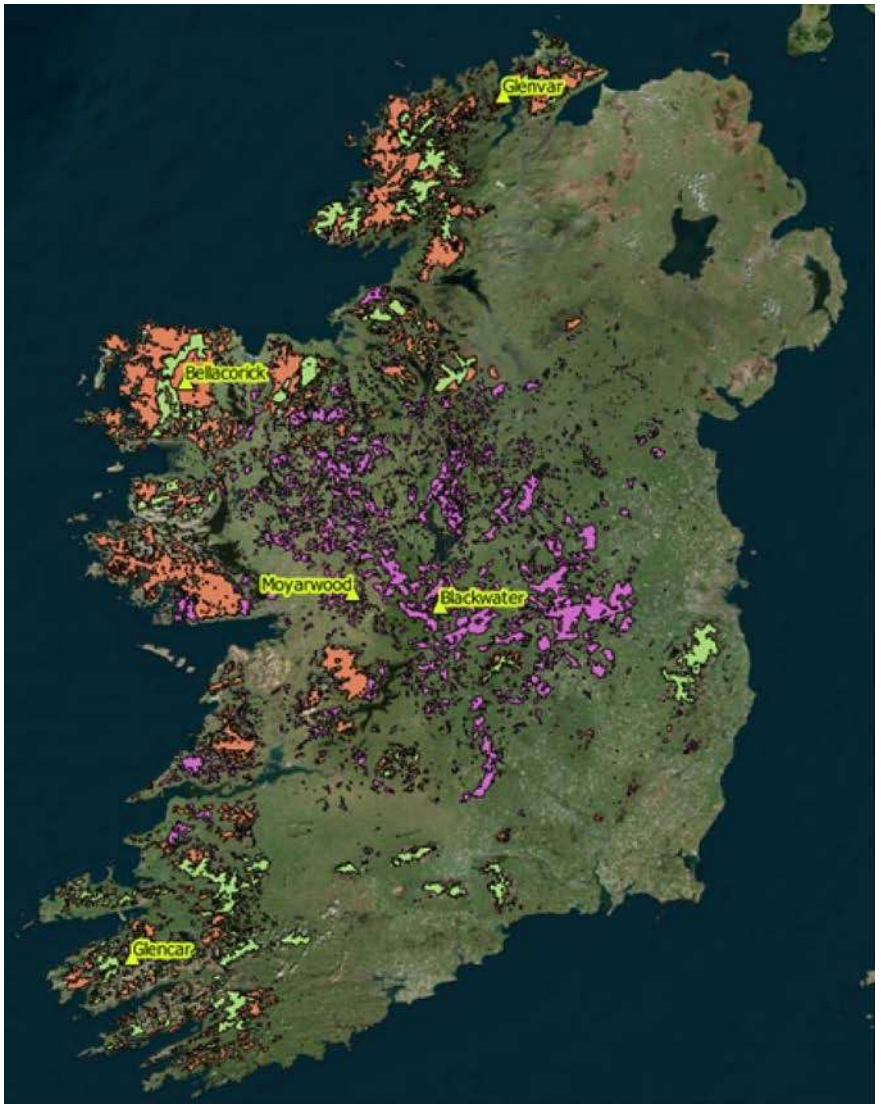
**CANN**

- Lough Arrow is a large spring fed limestone lake
- Counties Sligo and Roscommon
- Nutrient levels largely unchanged over the past 40 years
- Lough Arrow supports a diverse range of species
- Aquatic plants, Great crested glebe, Merganser and Tufted duck, Brown trout, Eels and Otter
- Designing a Conservation Action Plan
- Conservation actions
- Monitoring of water quality
- Biodiversity surveys
- Assessment of environmental pressures
- Invasive species management
- Introduction of biosecurity boxes

Nuttals Waterweed - invasive

# Rewetted Bogs

- Vulnerability Assessment of Peatlands: Exploration of Impacts and Adaptation Options in Relation to Climate Change and Extreme Events (VAPOR).
- This EPA research looks at related rewetted bogs in Ireland, monitoring them.
- Extensive work in Bellacorick, Co. Mayo has been monitored since 2002.




http://www.epa.ie/pubs/reports/research/climate/Research_Report_250.pdf

# Case Study Solution – Plant a Tree

Native forests provide an amenity resource:

- filter and clean water
- help prevent flooding by slowing the flow of water off land
- sequester and store carbon dioxide reducing climate change
- provide jobs (timber, foraging, walk tours) and tourism provide immense biodiversity value
- Irish Wildlife Trust - Community of Interest

Monoculture plantations:

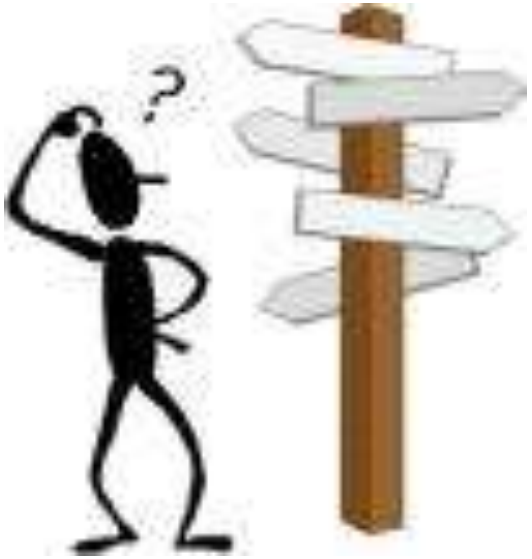
- pollute water courses
- provide no amenity or habitat value
- and contribute to flooding during harvesting

https://iwt.ie/what-we-do/campaigns/living-landscapes/forestry-and-woodland-in-ireland/

# Case Study – Ballina – Water Conservation

- Community Water Conservation Campaign
- Participation - School and stakeholders
- Householders asked to take normal showers on a particular evening at 6pm
- Householders supplied with a 4 minute shower-timer
- A week later households then asked to turn showers (on for 4 minutes) at 6pm
- Volumes of water supply to Ballina monitored
- Community awareness on benefits of a 4 min shower
- https://lowenergysupermarket.com/water-heating/water-services/1385/shower-timer-4-minute,-blue-sand-les

# How much water do you use?

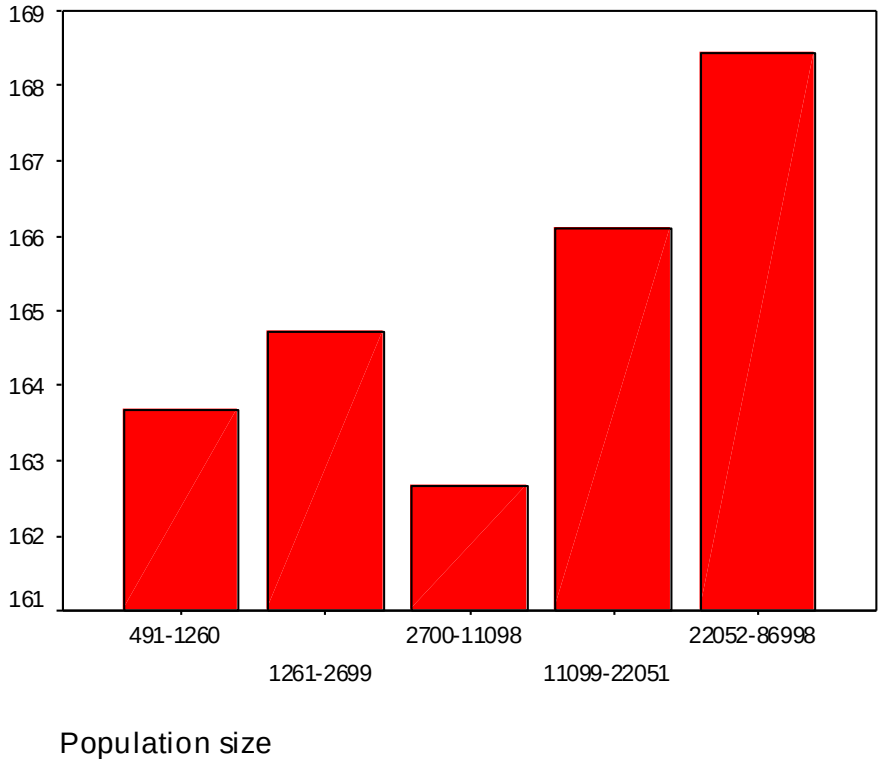


# Water Use and Footprint

Water used in bathing, toilet flushing and laundry ……

Reductions in water consumption:

- takes the pressure off wastewater treatment and sanitation plants
- preserves groundwater and surface water quality and resources




Water use increases with population size and this maybe due to a greater number of appliances in these households.

Average water use from 79 Irish settlements - 164 Litres per capita day

(Foley, 2006).

# Let us work out your Water Use and its Footprint?

In the audit sheet provided you will see the rows below, each section is divided into options for example – for toilet flushing you will have either a full flush toilet, a dual flush toilet or a low volume toilet. Average frequencies of use are given but please decide on yours and calculate for each section. The data follows the National Water Study and Foley (2006).

| Activity | Frequency of Use per capita per day | Volume of water (litres) | Occupancy | Total litres per capita per day |
|---|---|---|---|---|
| **Toilet Flushing** | | | | |
| Full Flush | 4.2 | 9 | 1 | ? |
| Dual Flush Long | 2 | 9 | 1 | ? |
| Dual Flush Short | 2 | 6 | 1 | ? |
| Low Volume | 4 | 7 | 1 | ? |
| | | | | |
| **Personal Washing** | | | | |
| Hand basin | 5 | 2.9 | 1 | ? |
| Bath | 0.06 | 80 | 1 | ? |
| Bidet | 0.14 | 2 | 1 | ? |
| Standard shower | 0.42 | 37.2 | 1 | ? |
| Power shower | 0.42 | 63 | 1 | ? |
| Teeth cleaning | 2 | 1.5 | 1 | ? |
| Hair washing | 0.1 | 15 | 1 | ? |

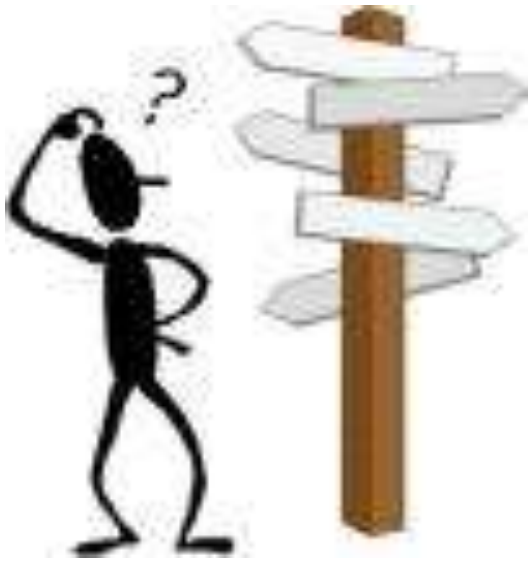
# Let us work out your Water Use and its Footprint?

In the audit sheet provided, clothes washing, house cleaning and dishwashing need to factor in the others in your dwelling, see the fourth column. Additional water use through running taps was included at 15 litres per day for extra activities such as shaving and drawing drinking water. Additionally, the original *National Water Study* (2000) assumed that all washing and clothes cleaning are done together. But Foley (2006) assumed that one in five households wash separately, adding 2 litres per day (17 L at * estimate adjustment).

| Activity | Frequency of Use per capita per day | Volume of water (litres) | Occupancy | Total litres per capita per day |
|---|---|---|---|---|
| **Clothes Washing** | | | | |
| Automatic | 0.69 | 87.4 | ? | ? |
| Low volume | 0.69 | 63.1 | ? | ? |
| Non automatic | 0.29 | 90 | ? | ? |
| Manual | 0.14 | 20 | ? | ? |
| Washer/drier | 0.8 | 30 | ? | ? |
| **House Cleaning** | 1 | 3.6 | ? | ? |
| **Dish Washing** | | | | |
| Automatic | 0.86 | 40 | ? | ? |
| Manual | 2 | 10 | 1 | ? |
| Waste Disposal Units | 1.1 | 35 | ? | ? |
| Cooking Water | 2.3 | 5 | ? | ? |
| Drinking Water | 7 | 0.5 | 1 | ? |
| Misc. In House | | | | 10 |
| Out of House | | | | |
| Out House Total | | | | 6.7 |
| Estimate Adjustment* | | | | 17 |
| TOTAL | | | | ? |

# Water Use and Footprint

In the audit sheet provided your final estimate for your water use in Litres per day is converted to its footprint using a conversion factor.



# Water Saving Measures for the Home

## *The Kitchen*

- **Washing machines** – always wash a **full load.** The low temperature (**30 degrees**) economy wash is just as effective due to **modern washing powders and uses less water.**
- **Dishwashers** – Use a full load and the **low temperature programme** as **this uses less water overall.**
- Turn **off** taps fully and **fix** dripping taps

- **Kettles** – On average we boil twice the volume of water we need and often empty the kettle before refilling. Just heat the water you really need – this could **save over €100 per year and lots of water**.
- **Eco-kettles** cost €30 - 45 at www.ethicalsuperstore.com and make a great present. Some can also dispense clean, cool filtered water so no need to buy bottled water either!

# Water Saving

## *The Bathroom*

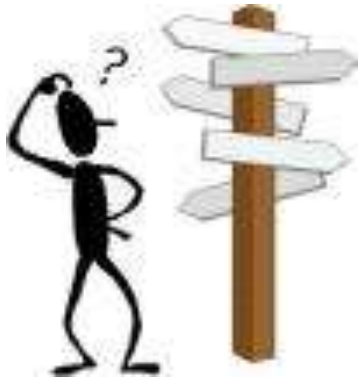
- In just one day, a dripping hot water tap can waste enough water
- to fill a bath and lots of energy too. **Make sure the taps are off!**
- An **ordinary shower uses 2/5's the water** and heat needed for a bath.
- Showers use **5L/minute**. Power Showers use **15L/min.** You could easily **save lots of water, €100 & carbon dioxide emissions** on water heating every year by taking **shorter showers**, **and not baths**, and using slightly lower temperatures.

- With water saving shower head you can easily reduce your warm water need by one third. A saving showerhead can use just 5 to 7 litres water/min
- Saves up to €25 per year
- Costs vary €10-25
- Should pay for itself within a year

# Breakout Session – What can we do?

# Breakout Session – What can we do?

What can individuals and communities do to reduce the climate change impacts on water quality and quantity (Adaptation and Mitigation), feedback to the group (20 minutes).

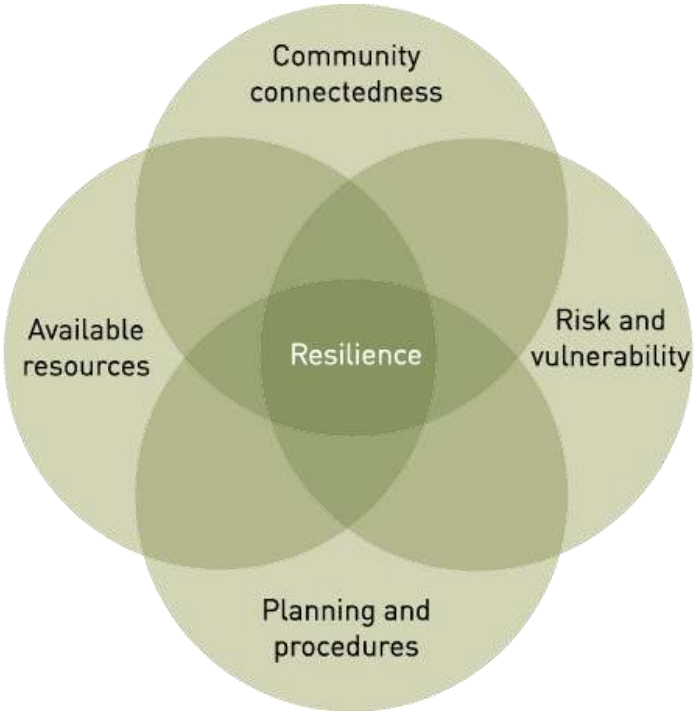


Your ideas?

# Breakout Session – What can we do?

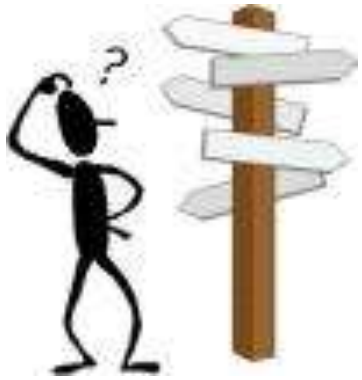
Resilience is strengthened when you work with your Local Authority and generate and submit to plans, local, regional and national:

1. Surface Water Management Plan
2. Integrated Coastal Zone Management
3. Beach Management Plan
4. Emergency Response Plans
5. River Basin Management Plan
6. Community Futures Plans
7. Biodiversity Management Plan
8. Peatland Management Plan
9. Conservation Action Plan (CANN)
10. Risk Management Plan
11. Invasive Species Management Plan
12. County Development Plans
13. Local Economic and Community Plan




Arbon, 2014. Developing a model and tool to measure community disaster resilience https://ajem.infoservices.com.au/items/AJEM-29-04-04#sthash.DitYa9i5.dpuf

# Whats your Water Quality like?



Publically available information on your current water quality:

- EPA Water Audits for Mayo are published at this link
- Each report carries recommendations for improvement of water quality in each area, do you know anything about your water quality?
- https://www.epa.ie/pubs/advice/drinkingwater/audits/mayococo
- Ireland's Catchment Flood Risk Assessment and Management (CFRAM) Programme is also worth a look

Energy Co-operatives Ireland
Building community energy networks
energyco-ops.ie

Download Presentaion From:
energyco-ops.ie/resources/mayo-climate-action-awareness-workshops/

Email: vincentcarragher@gmail.com
ofeeney@mayococo.ie
Email: rethinkgalway@gmail.com
Email: vincent.carragher@tcd.ie