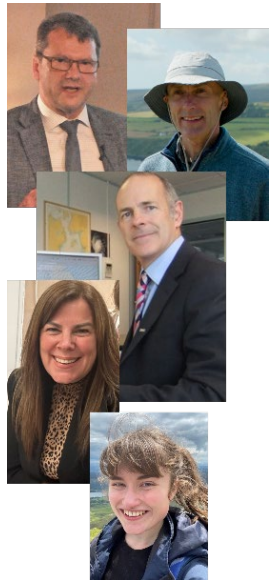
Climate change, carbon emissions and what can we do on an island?

David G Quirk, Adrian Cowin, Ralph Peake, Rebecca Keeley

Who is the Energy & Sustainability Centre Isle of Man?

Our mission is to advance the green transition by providing knowledge to communities, businesses and the public sector through independent research, verifiable data, practical training and strategic advice. On the Isle of Man, we champion local renewable energy, affordable heating solutions and a low-carbon economy for a secure, sustainable future.

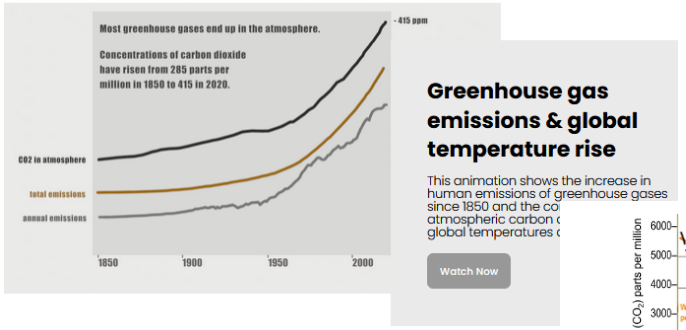
https://www.energysustainabilitycentre.im/knowledge-hub /news



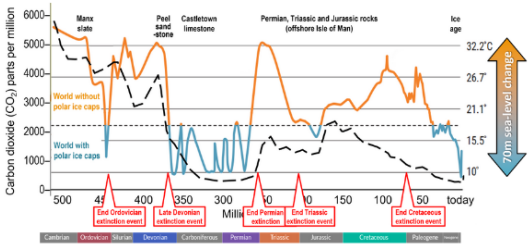
A huge thanks to all participants at the Low-Carbon Island conference on 27 Oct 2022. This was truly a landmark event in the Isle of Man's journey to net zero emissions.

Links to the presentations are available here:

Hon Jane Poole-Wilson MHK opens proceedings (Film)
Hon Jane Poole-Wilson MHK sums up the day (Film)
Terji Nielsen & Helma Trondheim (SEV) - Faroes' plan for 100% renewable electricity by 2030 (Slides) (Film)
Henrik Lund (Aalborg University) - Denmark's experience in the energy transition (Slides)
Poul Østergaard (Aalborg University) - The benefits of district heating to island communities (Slides)
Dave Quirk (ESC IoM) - Options for self-sufficiency in low-carbon power on the Isle of Man (Slides) (Film)
James Curran - Investing in ecosystems & nature-based solutions (Slides)
Simon Nicholas (KPMG) - Green business, community-supported projects & the IoM economy (Slides)
Two-slide summary Highlights from the talks (Slides)



Green Energy Island videos released

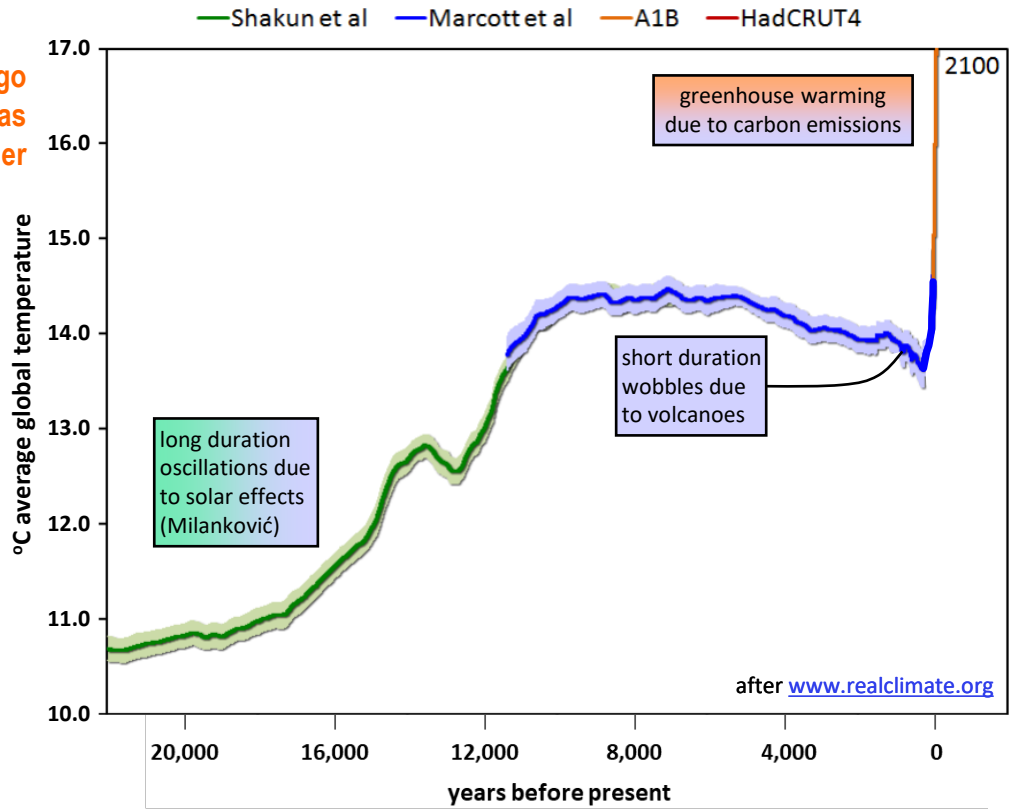


500 million years of climate change on the Isle of Man

Find out about follow-up courses & workshops here - www.greenfutureisland.im

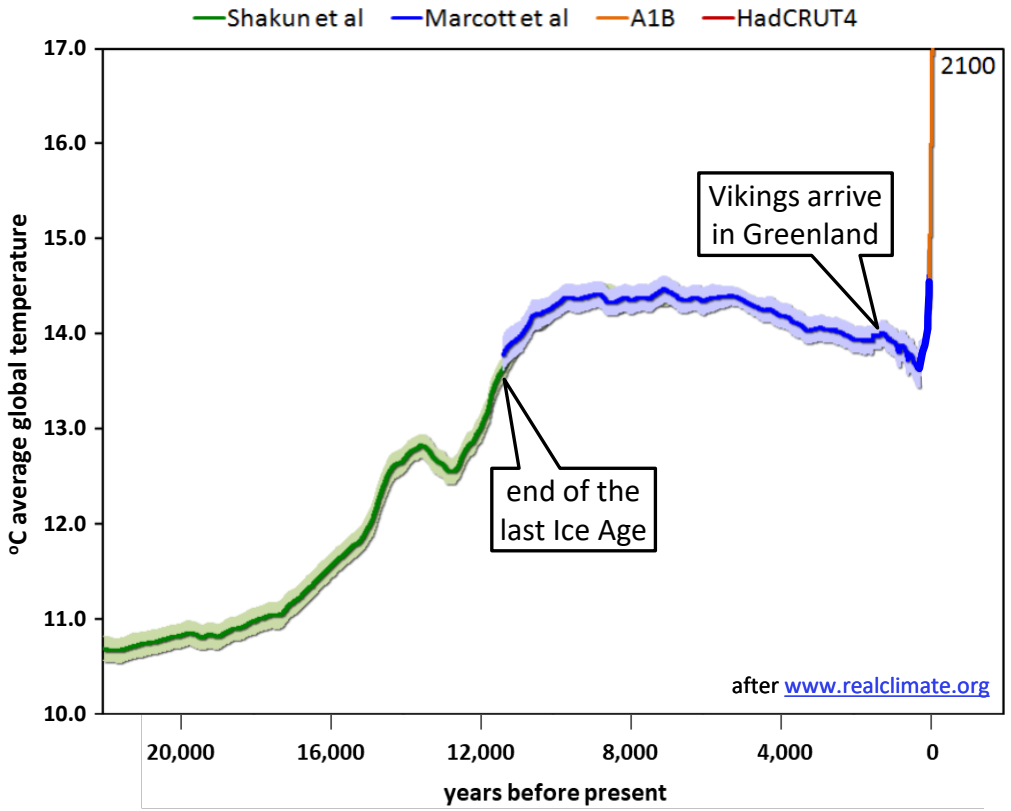
Historical change in global temperature + future projections

125,000 yrs ago sea-level was 6-9 m higher



Quirk, D.G., 2021 (www.energysustainabilitycentre.im/knowledge-hub)

Historical change in global temperature + future projections



Quirk, D.G., 2021 (www.energysustainabilitycentre.im/knowledge-hub)

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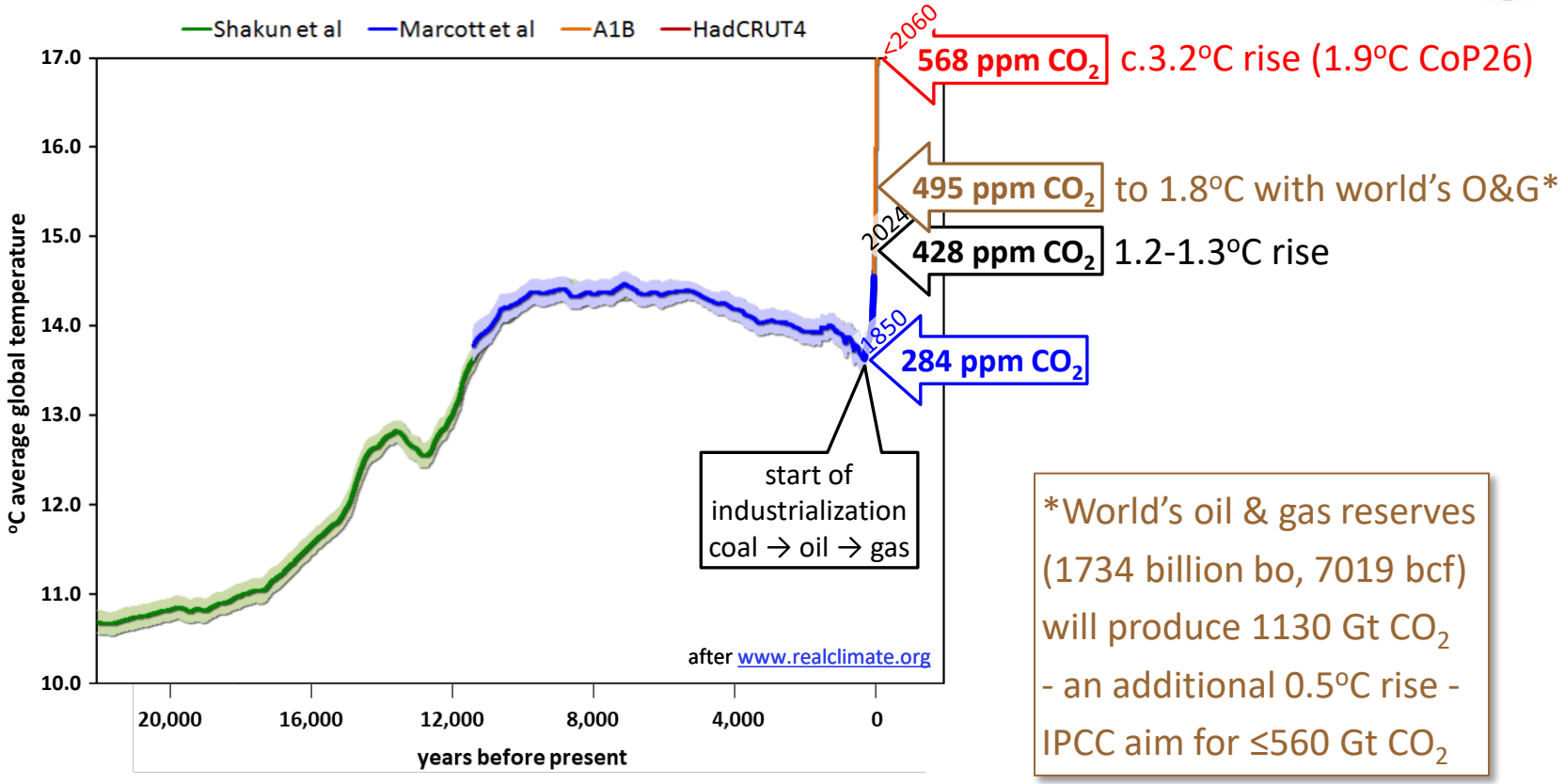


*World's oil & gas reserves (1734 billion bo, 7019 bcf) will produce 1130 Gt CO_2 - an additional 0.5°C rise - IPCC aim for ≤560 Gt CO_2

Quirk, D.G., 2021 (www.energysustainabilitycentre.im/knowledge-hub)

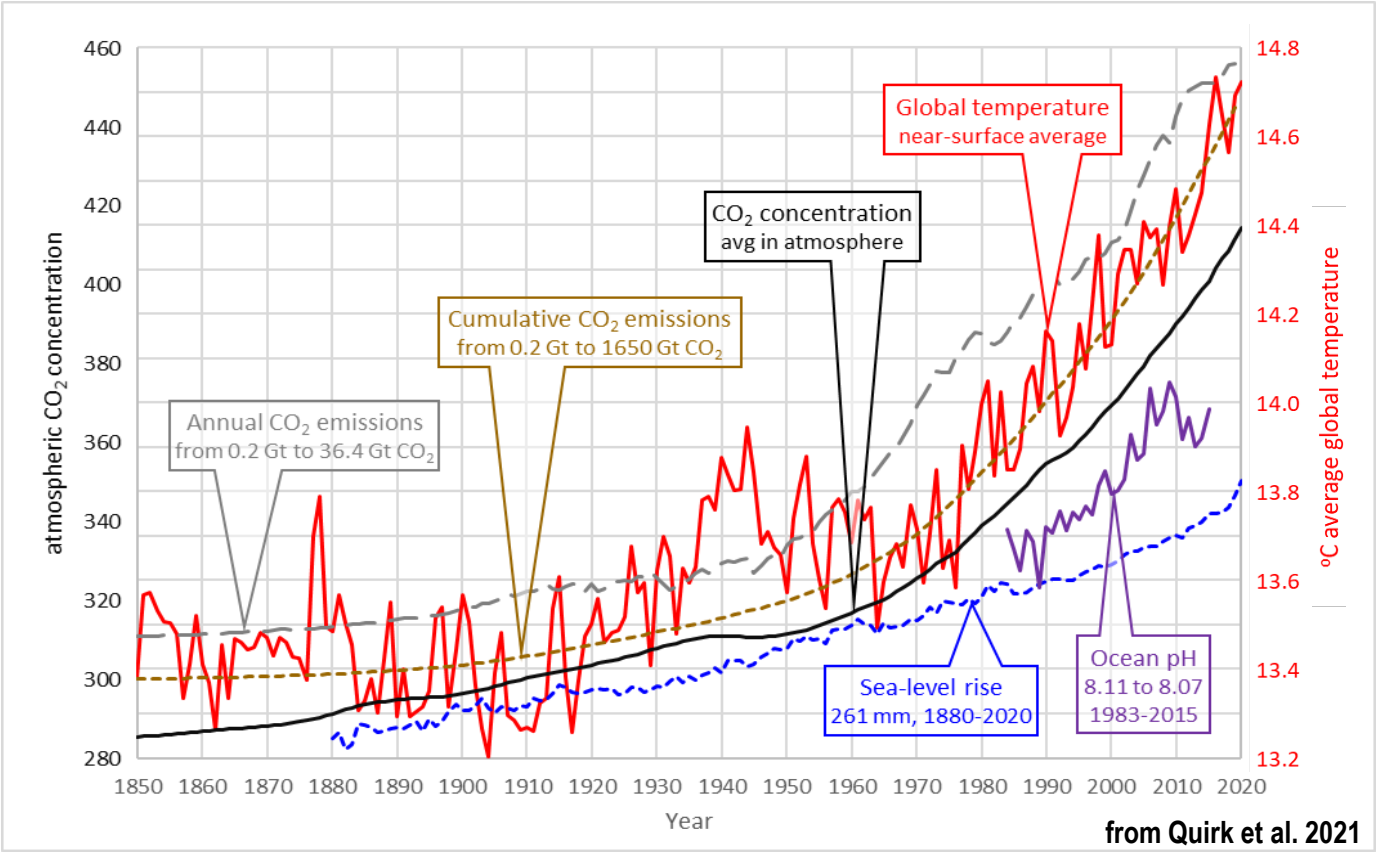
Human-related greenhouse gas emissions & their effects, 1850-2020

Avg N European emissions:
17 t CO_2/yr (direct + imports)
c.80% from oil & gas
Avg Chinese 9 t CO_2/yr

1 t CO_2 = 10,000 bin bags
≡ burning 1.4 large trees

Each of us is responsible for putting the equivalent CO_2 into the atmosphere as burning 24 trees each year to fuel our lifestyle…
i.e. 170,000 bin bags CO_2/yr

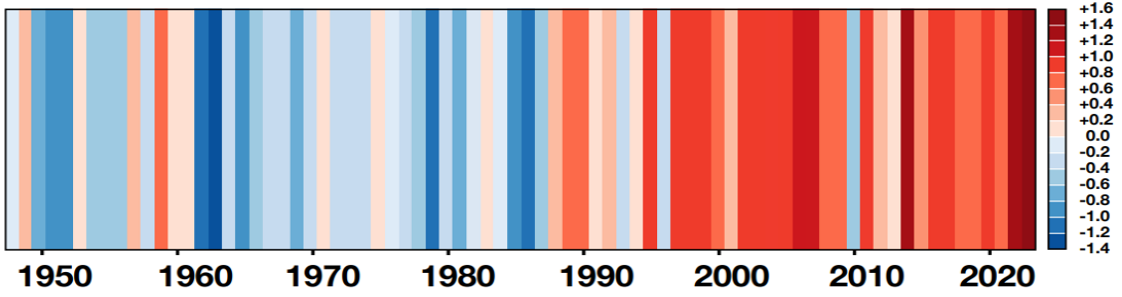
Renewable electricity can get us down to c.3 t CO_2/yr



from Quirk et al. 2021

Data sources (Apr 2021): Our World in Data after Global Carbon Project; NASA Goddard Institute for Space Studies + www. sealevel.info; Hadley Centre & UEA Climate Research Unit; US Environmental Protection Agency

Climate change on the Isle of Man



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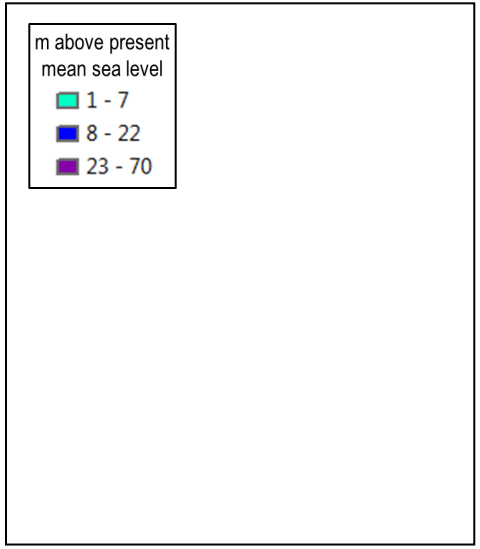
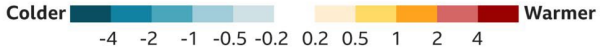
Manx spring was 'warmest and sunniest' on record

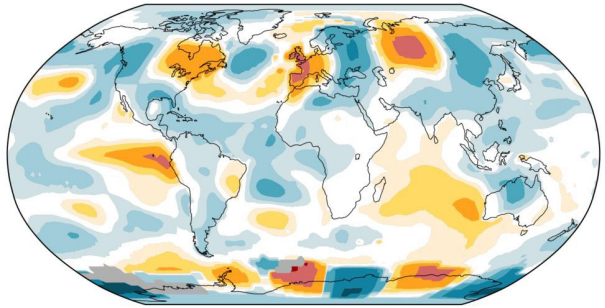


How global temperatures have changed

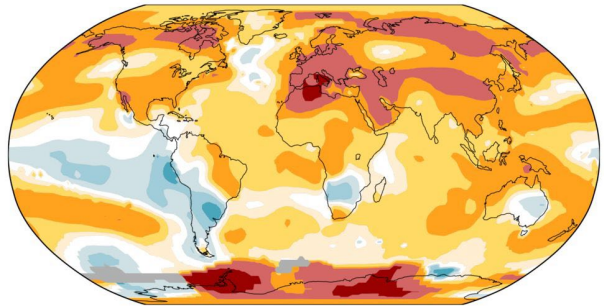
Temperatures (°C) compared with 1951-80 global averages



June 1976



June 2022

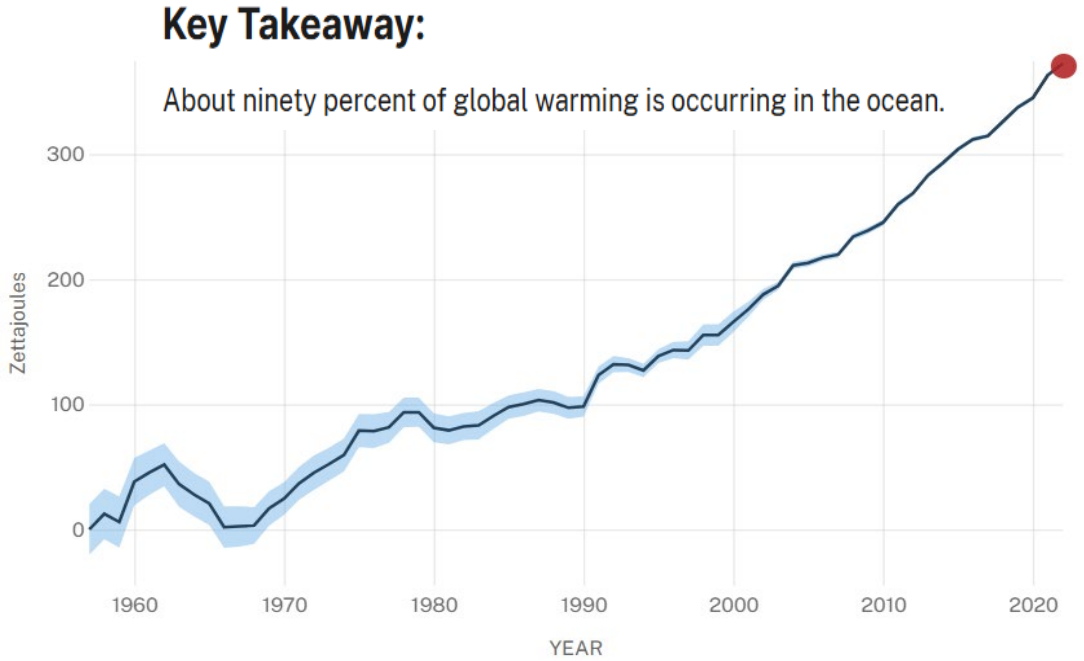


Source: NASA

BBC

OCEAN HEAT CONTENT CHANGES SINCE 1955 (NOAA)

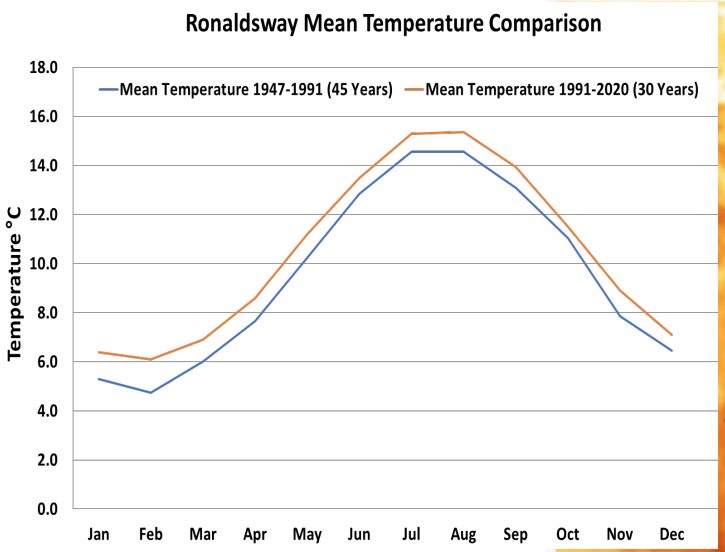
Data source: Observations from various ocean measurement devices, including conductivity-temperature-depth instruments (CTDs), Argo profiling floats, and eXpendable BathyThermographs (XBTs). Credit: NOAA/NCEI World Ocean Database

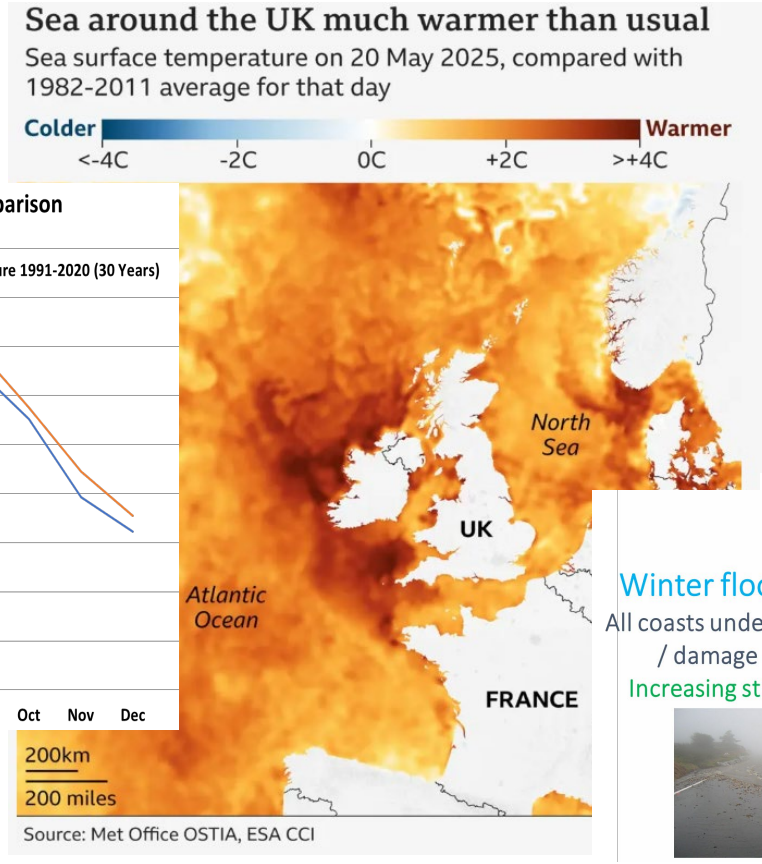


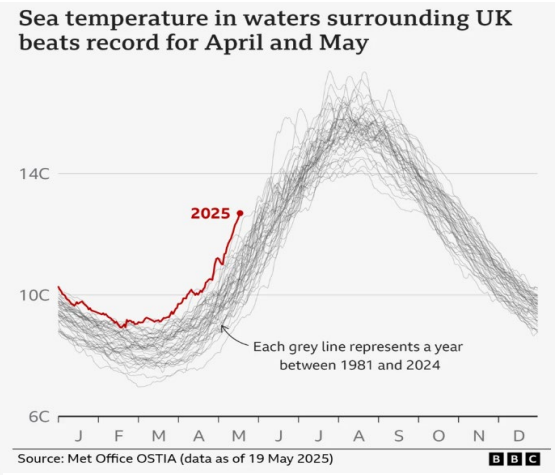
As the ocean warms, its volume increases. Thermal expansion as well as meltwater from Greenland, Antarctica and glaciers around the world are causing sealevels to rise.

Climate change on the Isle of Man

https://iomfloodhub.im/







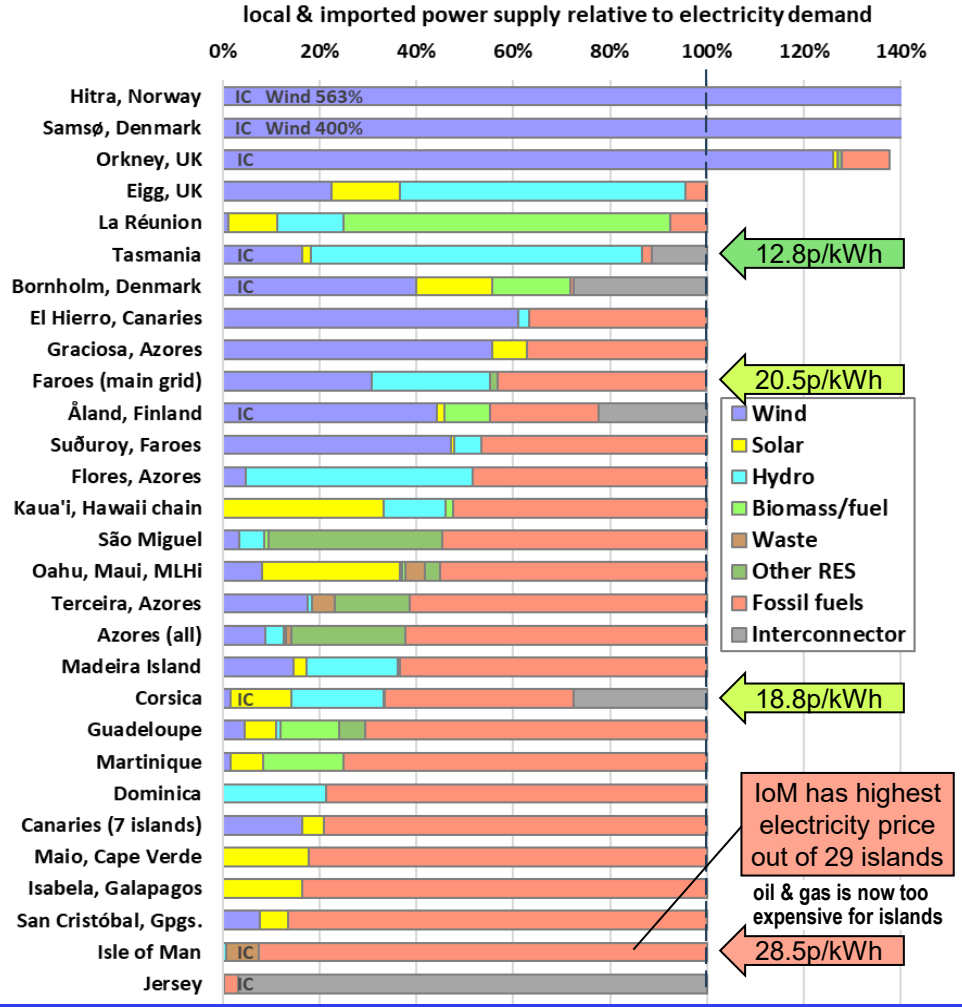
Impacts

Winter flooding. Summer heat-waves / droughts.

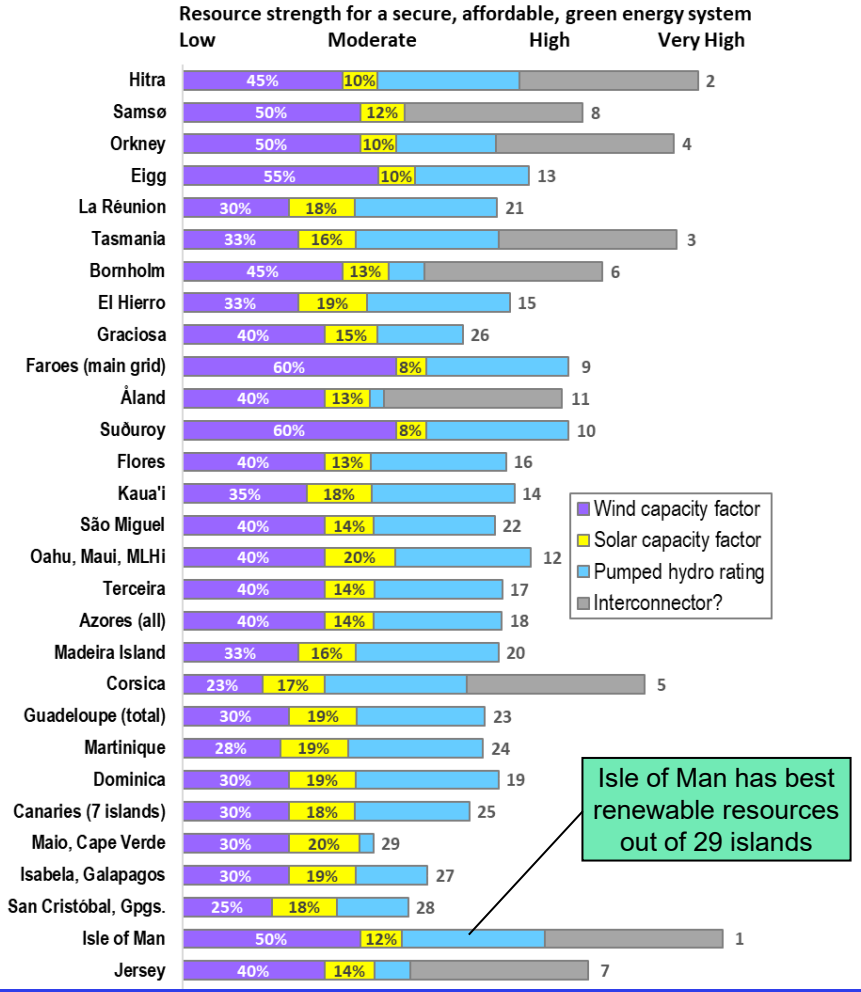
All coasts under threat from rising sea levels, Storm Surge incursions / damage & more / increasing erosion. Economic & social.

Increasing stress on wildlife & ecosystems as well as agriculture.

Islands' energy mix, ranked for progress in transition to renewables



Potential for energy self sufficiency (Isle of Man ranks no. 1)



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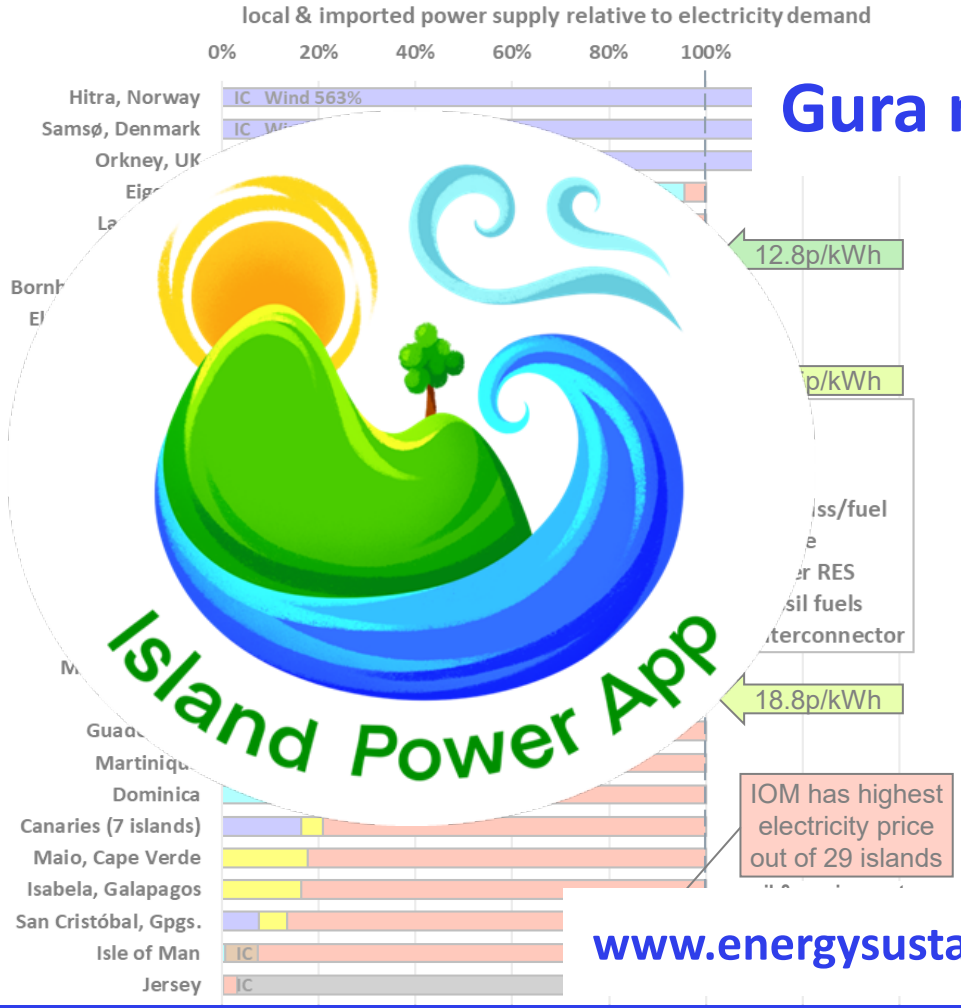

Potential for energy self sufficiency (Isle of Man ranks no. 1)

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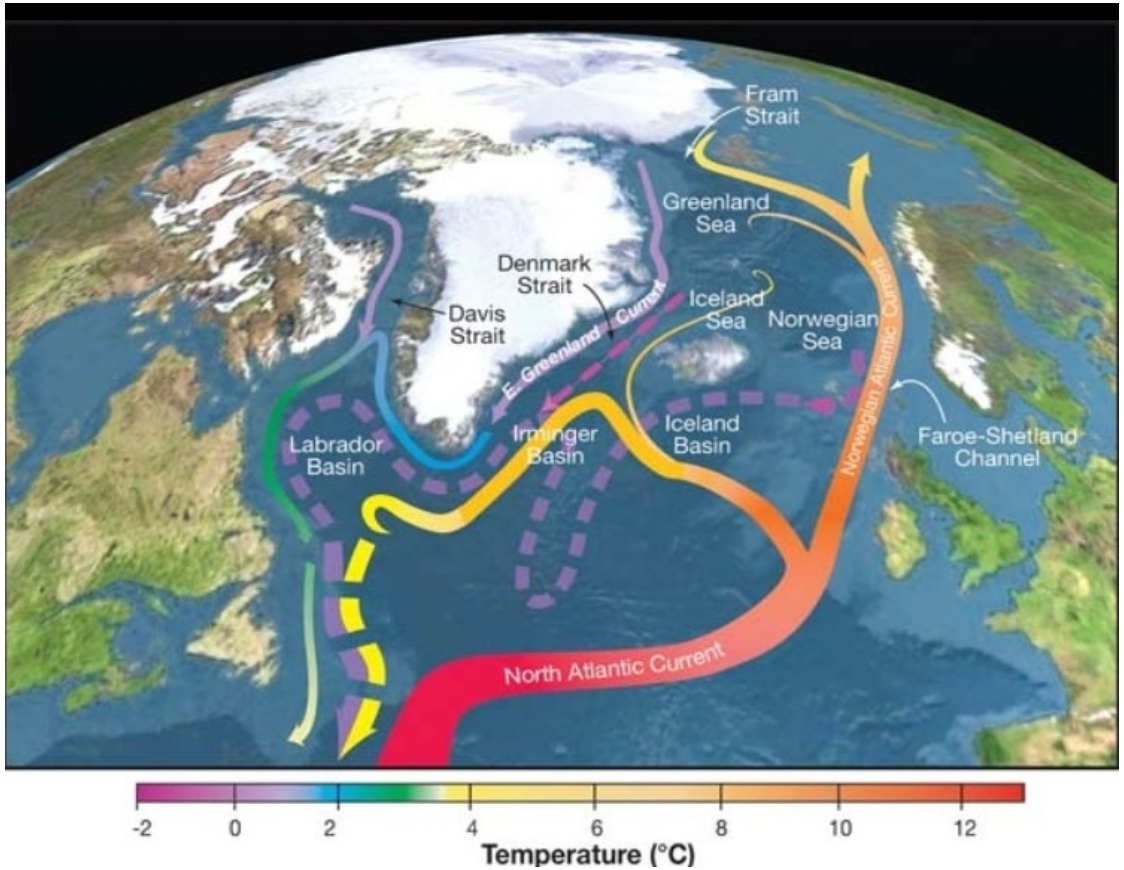
Island Power App

www.energysustainabilitycentre.im

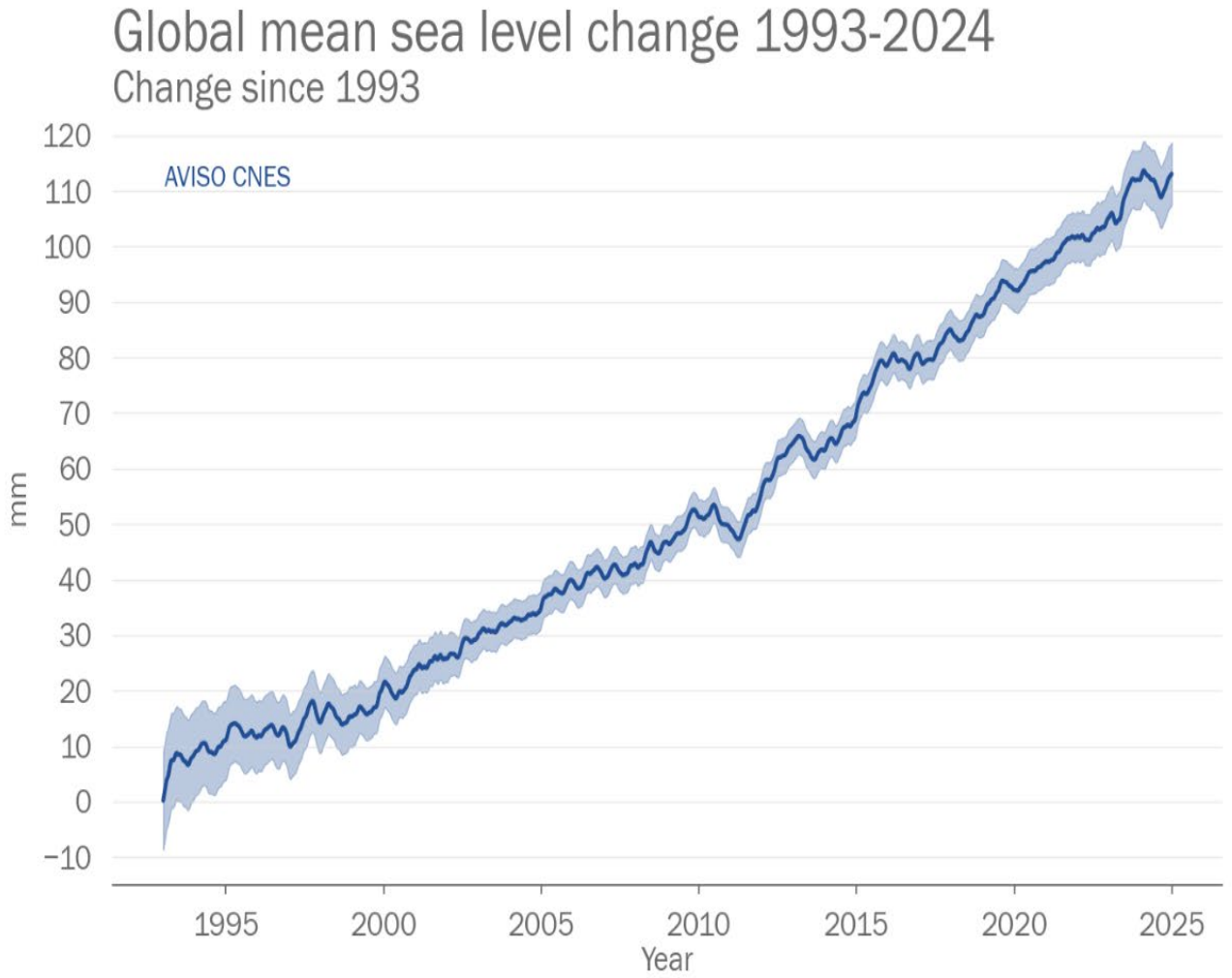
Reserve slides

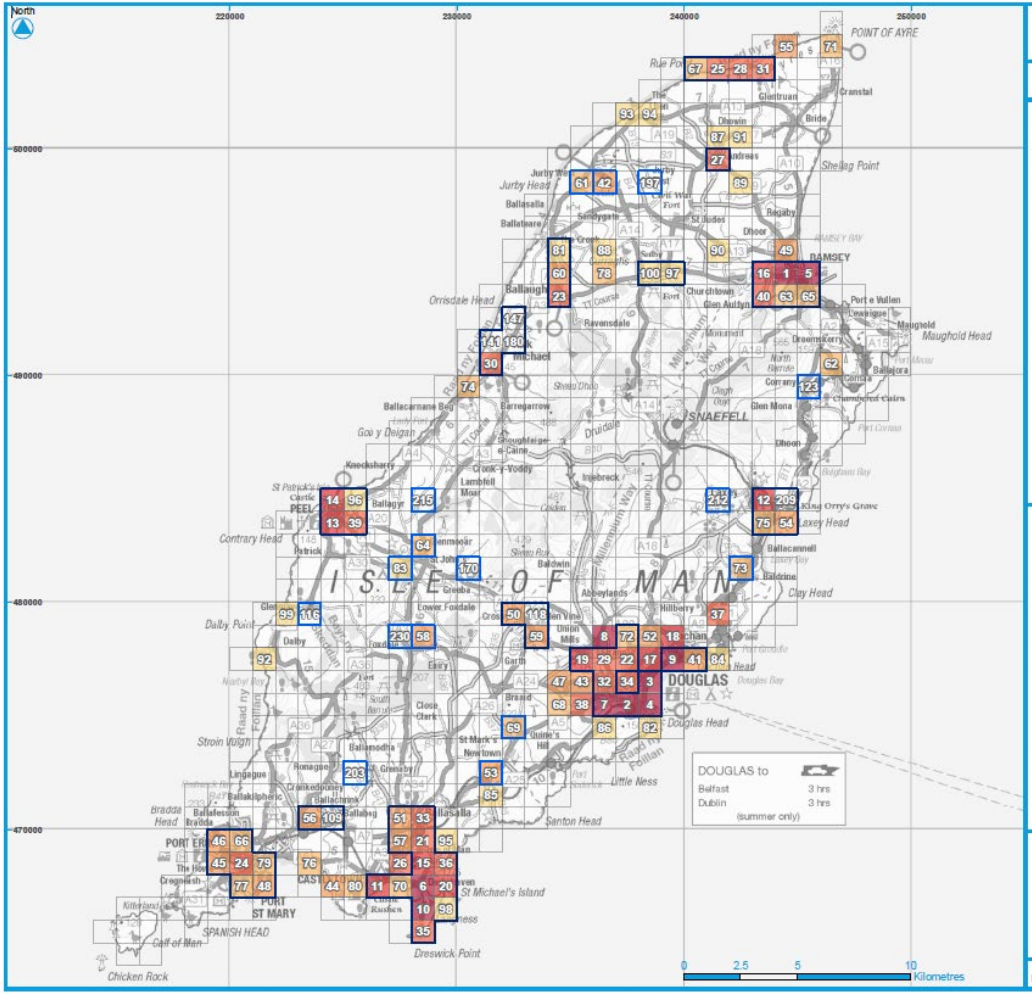
Northern part of Atlantic Meridional Overturning Circulation



In 2024, global mean sea level reached a record high.

The long-term rate of sea-level rise has more than doubled since the start of the satellite record, increasing from **2.1 mm/year between 1993-2002 to 4.7 mm/year between 2015-2024.**





The National Strategy on Sea Defences, Flooding and Coastal Erosion

Overview Map

Summary and instructions:

- This map provides an overview of the predicted flood and coastal erosion risk hotspots across the Isle of Man. Predicted risk has been calculated from fluvial, surface water and coastal still water predicted flood risk as well as coastal erosion predicted risk.
- The Isle of Man has been divided into 1km grid squares which are ranked with respect to the predicted impact to property, infrastructure, environment and critical assets from the sources of risk outlined above. The 1km grid squares predicted to be impacted the most are displayed and their ranks labelled (1 representing the highest risk).
- Click on either a Management Area (dark blue box) or Outlier Hotspot (light blue box) to open more detailed mapping.
- Users are recommended to read the accompanying guidance for further information.

Legend

- Management Area (Click on map to zoom to)
- Outlier Hotspot (Click on map to zoom to)

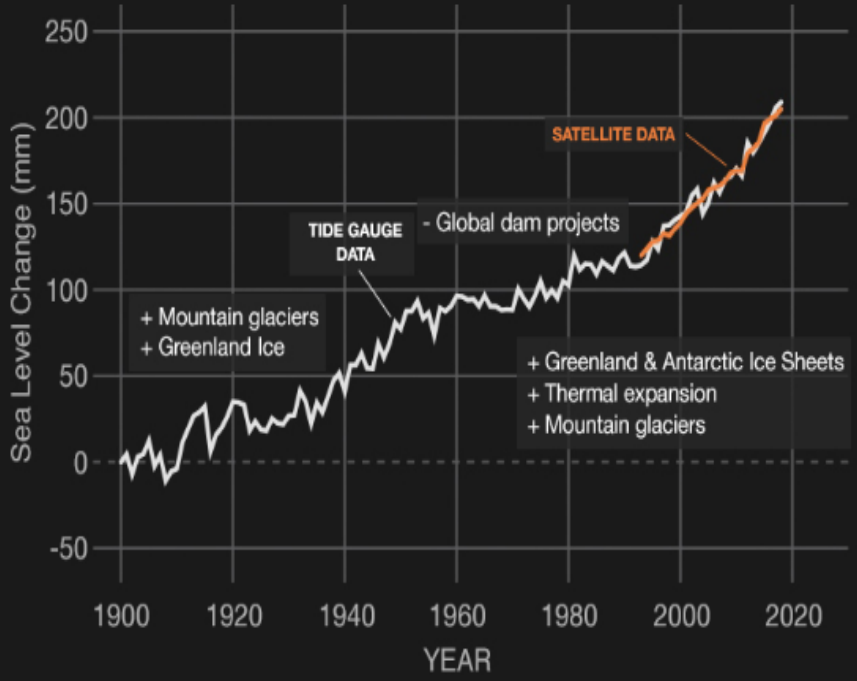
Top 100 1km Grid Squares Overall Receptor Rank

- 1 - 10 (Highest Risk)
- 11 - 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 100

Sea Level

SOURCE DATA: 1900-2018

Data source: Frederikse et al. (2020)
Credit: NASA's Goddard Space Flight Center/PO.DAAC

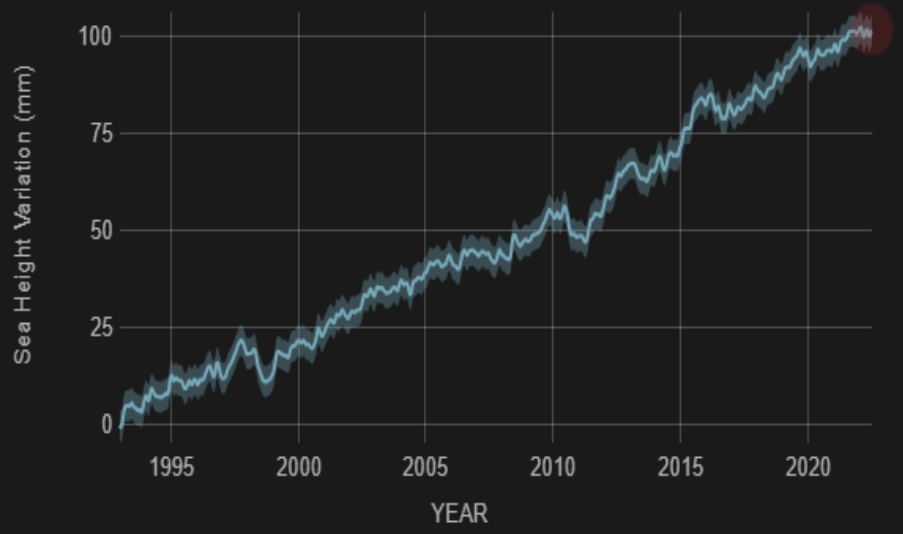


SATELLITE DATA: 1993-PRESENT

Data source: Satellite sea level observations.
Credit: NASA's Goddard Space Flight Center

RISE SINCE 1993

↑ 101.4
millimeters



Click+drag to zoom RESET

Get Data: HTTP | Snapshot: PNG

DENMARK'S NATIONAL R&D CENTRE FOR OFFSHORE TECHNOLOGIES

DTU Offshore – Danish Offshore Technology Centre – Denmark's national R&D centre for offshore technologies with a central position in the energy transition, developing commercial, research-based energy & sub-surface solutions for marine & coastal environments.

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- Energy transition solutions for islands
- Sub-surface energy storage, including H_2
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- Environmental impact of offshore energy operations
- Responsible abandonment of wells & depleted oil & gas fields
- Maintenance of offshore structures, incl. corrosion management

Since the Centre opened in 2014, we have delivered more than 100 solutions for companies worth DKK 2.3 billion & involving around 700 researchers, incl. 200 PhD students. We are currently working on 90 industrial projects.

Technical University of Denmark* - global expertise in the green transition

- DTU Offshore (Danish Offshore Technology Centre)
  - expertise in island energy systems, energy storage, green hydrogen, CO_2 storage, offshore licencing, economics, risk & uncertainty, district heating, geothermal energy, waste water, public engagement
- DTU Wind – including the Global Wind Atlas and Centre for Clean Energy
- DTU Elektro – including Solar PV Systems and Solar DTU
- DTU Energy (Department of Energy Conversion and Storage)
- DTU Sustain – including Centre for Absolute Sustainability
- DTU Aqua - National Institute of Aquatic Resources
- VILLUM Center for Sustainable Fuels and Chemicals
- Climate Challenge Laboratory
- https://issuu.com/dtudk/docs/dtu_facts_and_figures_2025

Public engagement in energy transition

- Card game & digital app
- Animations
- Talks & films
- Workshops & training courses
- Conferences (e.g. www.greenfutureisland.im)
- Business support (e.g. www.iomchamber.org.im/[redacted]/business-sustainability-group/)
- Online info & resources (e.g. www.energysustainabilitycentre.im/knowledge-hub)
- Objective & independent advice on renewable energy & sustainability

For further information, please contact Dave Quirk – dquirk@dtu.dk

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