

The economic value of the **Met Office**

Updated evaluation study
of the economic value of the
Met Office's activities to the
UK over the next ten years



Contents

Key takeaways	4
The economic value of the Met Office	6
How the Met Office contributes to the UK	8
Provision of weather information	10
Impact on Industry	12
Climate science and services	14
Observations & Supercomputer	16
Non-monetised benefits	18

Executive summary

About this study:

This report summarises the 2024 independent economic evaluation of the Met Office undertaken by London Economics. The study provides an up to date assessment of the economic impacts associated with the Met Office's activities in the UK over the period 2024 to 2033. Benefits accruing outside the UK and benefits to defence are outside the scope of this study and are therefore not included in the estimates. This means that the true benefits are likely considerably higher.

Introduction to the Met Office:

The Met Office is an executive agency, sponsored by the Department for Science, Innovation and Technology. It is the UK's national meteorological service providing weather and climate science and services to the UK public, industry, government departments and other organisations to help people make better decisions to stay safe and thrive.

The Met Office is at the forefront of global meteorological and climate science, working in partnership with leading academics, other national meteorological services and international organisations such as the European Centre for Medium-Range Weather Forecasts (ECMWF). The Met Office frequently enables academic research to achieve real-world impact, by academic research, by utilising cutting-edge research in the delivery of the operational services it provides. It works globally with partner organisations to deliver impactful international development projects.

Key takeaways

The Met Office is estimated to deliver £56bn of benefit over the next decade, delivering a **return on investment of £18.80 per £1 of public money invested in the Met Office**. This research shows that the true benefits could be considerably higher.

Return on Public Investment:

The return on investment captures the £-value generated for the UK government, industry and individuals for every £1 the government invests in the Met Office.

The estimated benefits are

40%

higher compared with the previous evaluation undertaken in 2015

The estimated benefits are 40% higher compared with the previous evaluation undertaken in 2015 - £56 billion compared to £31.8 billion in 2015 (£40 billion when adjusted for inflation), an increase of £16 billion in 2024 prices). Key drivers of this increase are new, more robust estimates of the value of Met Office weather information to the public, and updated estimates of the climate adaptation and mitigation benefits attributable to the Met Office.

Analysis of the uncertainty around key assumptions provides high confidence in the robustness of the central estimates. However, there is major uncertainty upwards, especially due to varying literature estimates on climate benefits. Therefore, there is a possibility that benefits could be much larger than implied by the already large central results.

There are additional benefits of Met Office activities that were not quantified. These include soft-power benefits to the UK as a result of the Met Office's strong international standing and benefits to parties outside the UK, including developing nations, as part of the Met Office's international development work.

Approach

The key objective of this study was to bring together and update existing valuations of the Met Office's impact. Therefore, the approach focused on reviewing, evaluating, and updating valuations included in the 2015 General Review.

The study used value-chain approaches and market estimates where this was possible, for example to value benefits to industry. However, for a range of benefit streams, market estimates were not available or feasible. In these cases, avoided cost approaches were used. A non-market valuation approach (willingness-to-pay) was used to value benefits to the public.

Details on the approaches used to evaluate each benefit stream are presented in the methodological annex in the full report.



The economic value of the Met Office

The economic impact of the Met Office:

Total benefits of Met Office: **£56.0 billion over the next decade** with the potential for benefits to be much larger than this (already large central estimate)

Return of **£18.80 per £1 of public money invested in the Met Office**
40% increase compared to 2015



How the Met Office is funded:

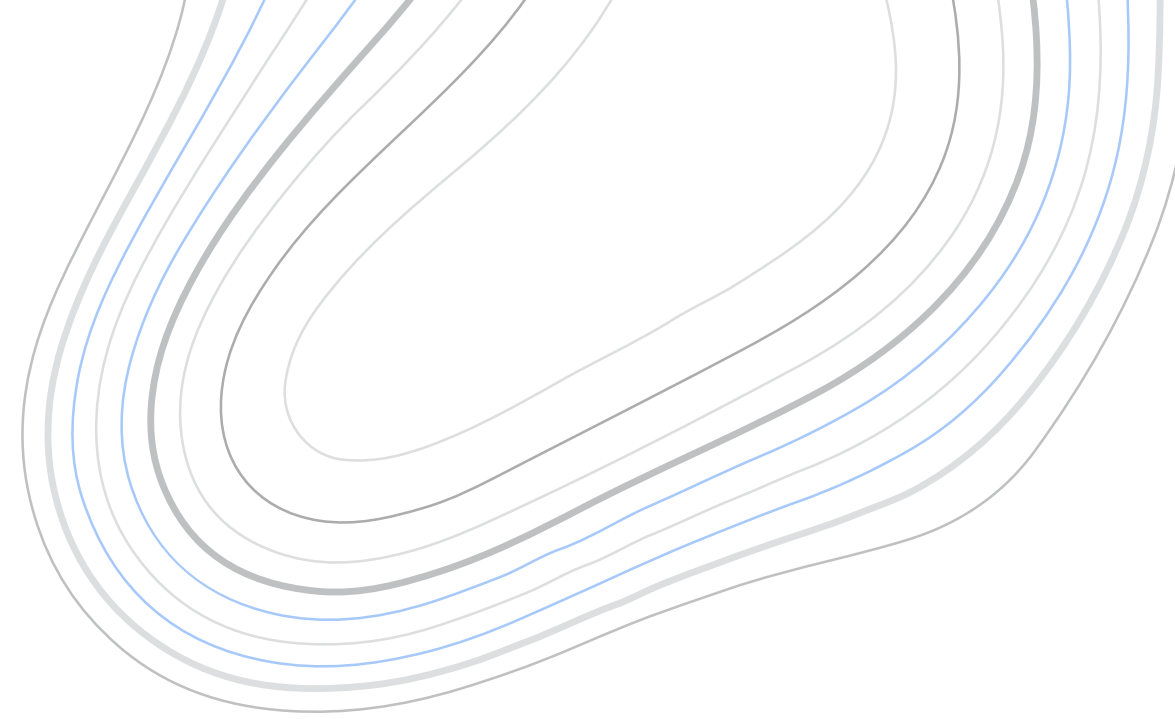
Total Met Office funding (revenue) in 2023/24: £274 million

59% of funding is managed through DSIT

The MoD, FCDO and Defra make up 16% of funding

The Civil Aviation Authority accounts for 13% of funding

The PWS (Public Weather Service) provides 45% of total Met Office funding

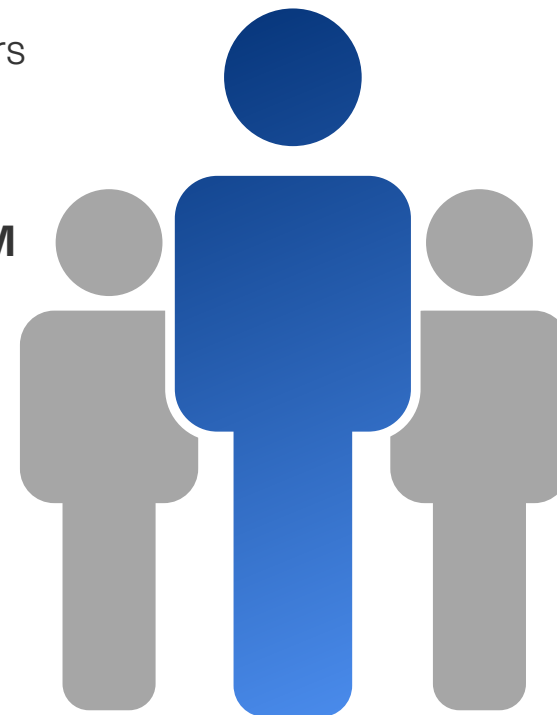


Key Met Office outputs and metrics of interest (2022):

Number of customers 2022: **1210**

Revenue from customers: **£330.8M**

Number of the UK public who trust the Met Office: **83%**



97% of emergency responders trust the Met Office to make decisions and take action



Number of products and services offered: **1100**



Gigabytes of Data publicly provided: **449,414GB**



Number of Severe Weather Warnings in 2023-24 across the UK: **544**



340 scientific publications were authored by the Met Office in 2023-24

How the Met Office contributes to the UK

Weather Services



Provision of weather information, forecasts, advice and warnings to the public, which help the public make better decisions in their daily lives.

Support for UK civil contingency, specialist advice to government, and specialist weather modelling - e.g., dispersion models, space weather forecasts.

Benefits to industry:



Benefits of weather/climate information to industry (e.g., supporting planning decisions).

Specialist services (e.g., en-route provision of weather information for aircraft).

Advisory/consultancy services (e.g., working with National Grid and energy providers to support improved demand/supply management).

Climate services:



Provision of climate information and projections - e.g., UK Climate Projections (UKCP).

Additional climate related services – e.g., supporting government and industry in adapting to climate change.

Science, innovation and technology:

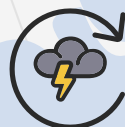


Met Office weather and climate science and research.

Enabling activities such as its ground-based observations and satellite Earth Observation data.

Wider technological and innovation related activities – e.g., tech/innovation partnerships, data provision.

Other key activities:

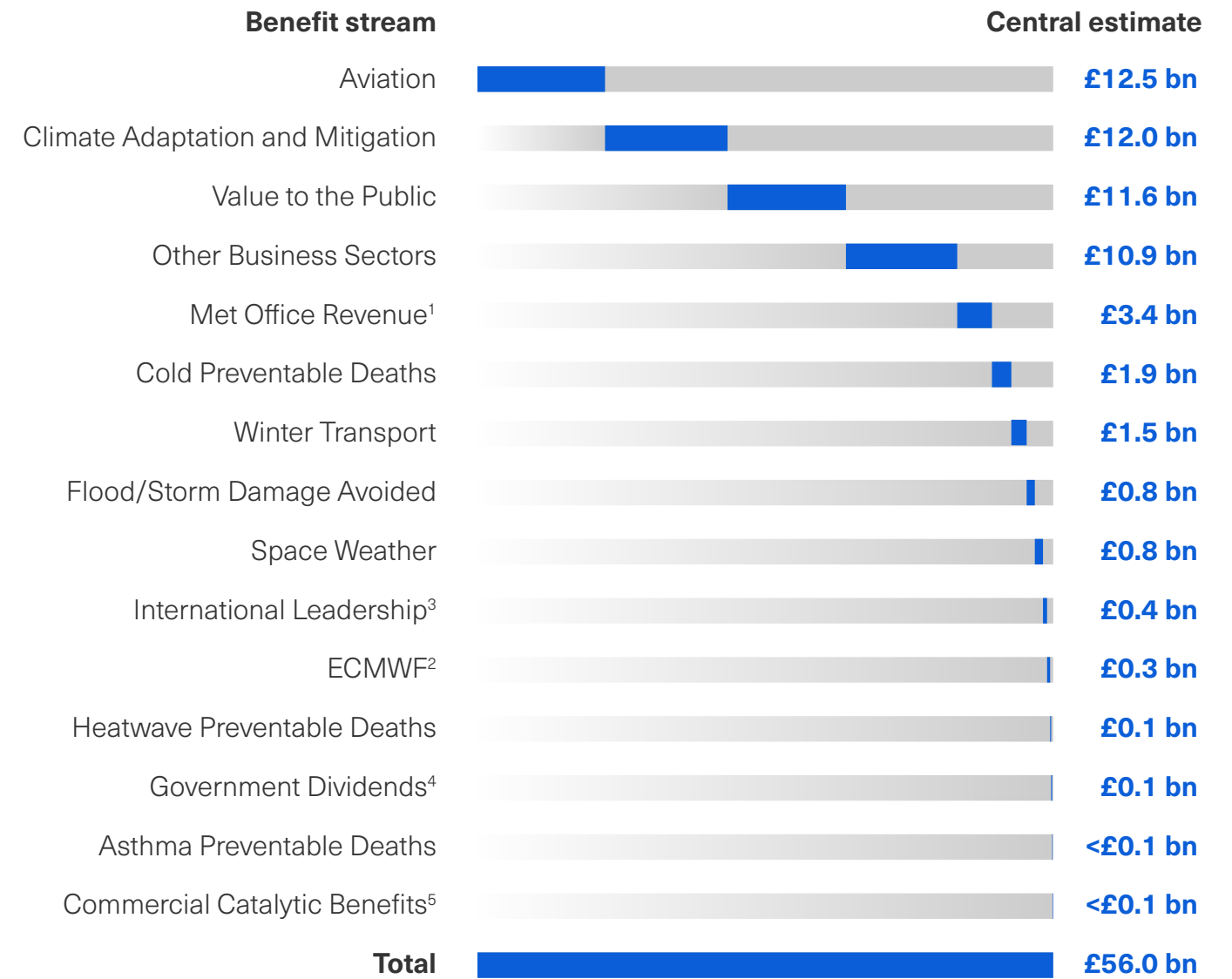


Defence-related activities (out-of-scope).

International partnerships and development activities.

Public engagement and outreach activities.

Breakdown of impact across monetised impact strands:



- 1) Met Office revenues are excluded from the returns to the public as they are not a benefit to the public.
- 2) ECMWF benefits only capture additional (direct and indirect) expenditure in the UK associated with the presence of the ECMWF headquarters in the UK.
- 3) This benefit stream captures the quantifiable benefits the Met Office accrues from other countries providing payment-in kind for sharing the Unified Model through Met Office use of their science community and their outputs.
- 4) Government dividends capture returns, to the government, on capital of the Met Office's operations over and above the HMT Minute target of 3.5%.
- 5) Captures the social return on the Met Office's public science investments. Social returns were only evaluated for a very limited number of investments to avoid double-counting with other benefit streams.

Provision of weather information

The Met Office provides a range of accurate, timely and easy-to-digest weather information to the public. This includes forecasts, seasonal advice, pollen, UV, or air quality, and severe weather warnings. This information helps the public make better decisions in their daily lives such as:

Decisions related to health and safety and to protect property:

- Decisions about when to take medication for a health condition that is affected by the weather
- Changing plans because a member of the public or someone they care for has a health condition that is affected by the weather
- Buying flood protection products, or sandbagging the property

Decisions related to community, and getting/providing information about the weather:

- Signing up for severe weather alerts, finding out if a home is at risk from severe weather
- Checking that friends, family or neighbours are safe, helping or supporting someone else

Actions in relation to work and travel:

- Changing travel plans, or plans for long distance travel (including by train/plane)
- Staying at home, avoiding working outside

Other activities, daily tasks, and plans that might be affected by the weather:

- Changing plans for undertaking an activity in a risky setting (e.g., mountains and coastal areas)
- Cancelling a planned activity, or planning a different activity to be inside

The Met Office plays an important role providing support for UK civil contingency, and provides advice and modelling to governments (e.g., to support the government's energy security priorities). It also provides advanced warning for heavy rain, strong winds, snow/ice and high temperatures through its National Severe Weather Warning Service as well as specialist forecasts (e.g., air quality and pollen, which help those suffering from respiratory illnesses such as Asthma, and space weather forecasts).

Monetised impacts related to the provision of weather information:

Provision of weather information to the Public

£11.6bn

Cold Preventable Deaths

£1.9bn

Flood/Storm Damage Avoided

£0.8bn

Space Weather Impacts on the Electricity Grid Avoided

£0.6bn

Heatwave Preventable Deaths

£110m

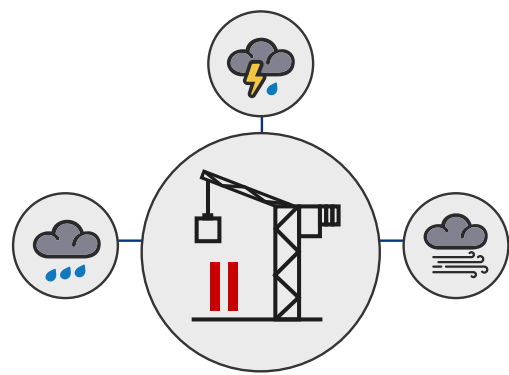
Asthma Preventable Deaths

£25m

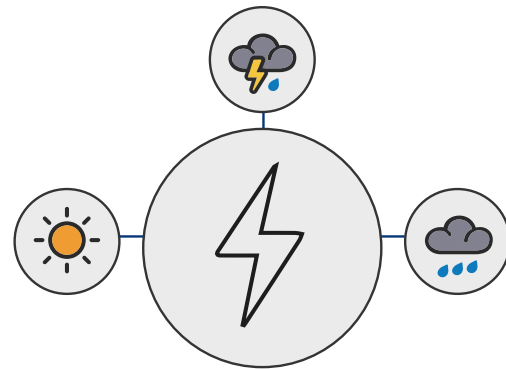
Impact on Industry

Benefits of provision of weather information to industry:

High quality weather information plays a key role in many decisions made by industry. It allows businesses to proactively plan for upcoming weather events and enables the creation of effective contingency plans. The Met Office also provides weather/climate advisory services to industry. These empower businesses to navigate daily weather patterns, mitigate the impact of extreme events, and strategically prepare for future climate conditions.



The construction industry decides whether to continue or halt construction based on potential rain, storms, or winds.



The energy sector uses weather information to make safety-critical planning decisions for new energy reactors.

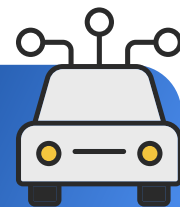
Estimated benefits:

£10.9bn¹

(capturing winter transport only)

1) Excluding sectors captured directly (aviation, winter transport) and sectors potentially double counting with other streams (in particular the finance, insurance and real-estate sector).
2) See The Winter Resilience Review Panel, 2010.

Can Autonomous Vehicles take the "rains"?



Read case study in full report



Aviation:

The Met Office provides vital services to the aviation industry. It is one of only two World Area Forecast Centres (WAFC), providing global en-route weather information. The Met Office also hosts and runs the London Volcanic Ash Advisory Centre (VAAC), a facility responsible for issuing advisories pertaining to volcanic eruptions originating in Iceland and the north-eastern sector of the North Atlantic.

Estimated benefits:

£12.5bn

As a World Area Forecast Centre the Met Office contributes to flight safety and enables the optimisation of flight routes and fuel consumption.

Transport:

The Met Office provides significant value to the road transport industry through provision of weather information and advisory services to transport providers. A substantial share of weather-related costs in the transport sector occur in the winter.²

- Weather information helps transport providers in their decision-making thereby minimising delays and avoiding costs.
- It also enables drivers to adapt their behaviour (e.g., driving more slowly or not at all, taking alternative transport means), thereby helping to avoid road accidents.
- Met Office advice helps to safeguard critical infrastructure from extreme winter weather conditions.



Climate science and services

The Met Office is a Public Sector Research Establishment (PSRE). It undertakes world-class climate science, improving our understanding of climate change. This is essential to mitigate the risk of climate change and to better adapt to the impacts of climate change through improved adaptation measures.

The Met Office Hadley Centre for Climate Science and Services is one of the foremost climate change research centres in the world. Met Office Hadley Centre scientists have:



Worked across
144
countries



Produced over
3,192
peer-reviewed articles
since 1990



Worked with
2,025
institutions



Produced science
that appeared across
200
different journals



Produced publications
of MOHC cited
310,477
times since 1990

In addition to science itself, the Met Office helps decision-makers better understand climate change and how to better manage climate risks. For example, it advises the Department for Environment, Food and Rural Affairs (Defra) during the development of the Climate Change Risk Assessment (CCRA) and the National Adaptation Plan (NAP). It also works with:

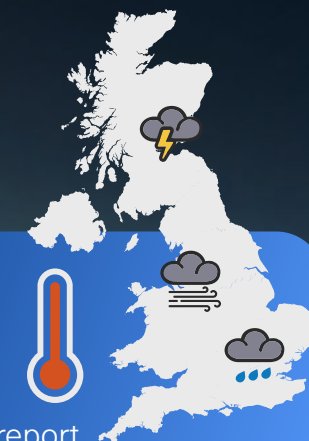
- UK civil contingency responders
- government departments
- academic partners
- industry
- international organisations such as the Intergovernmental Panel on Climate Change (IPCC)

This advice has a significant bearing on a number of high value economic policies around mitigation of and adaptation to climate change. Therefore, the associated estimated benefits the Met Office can bring are both large and uncertain.

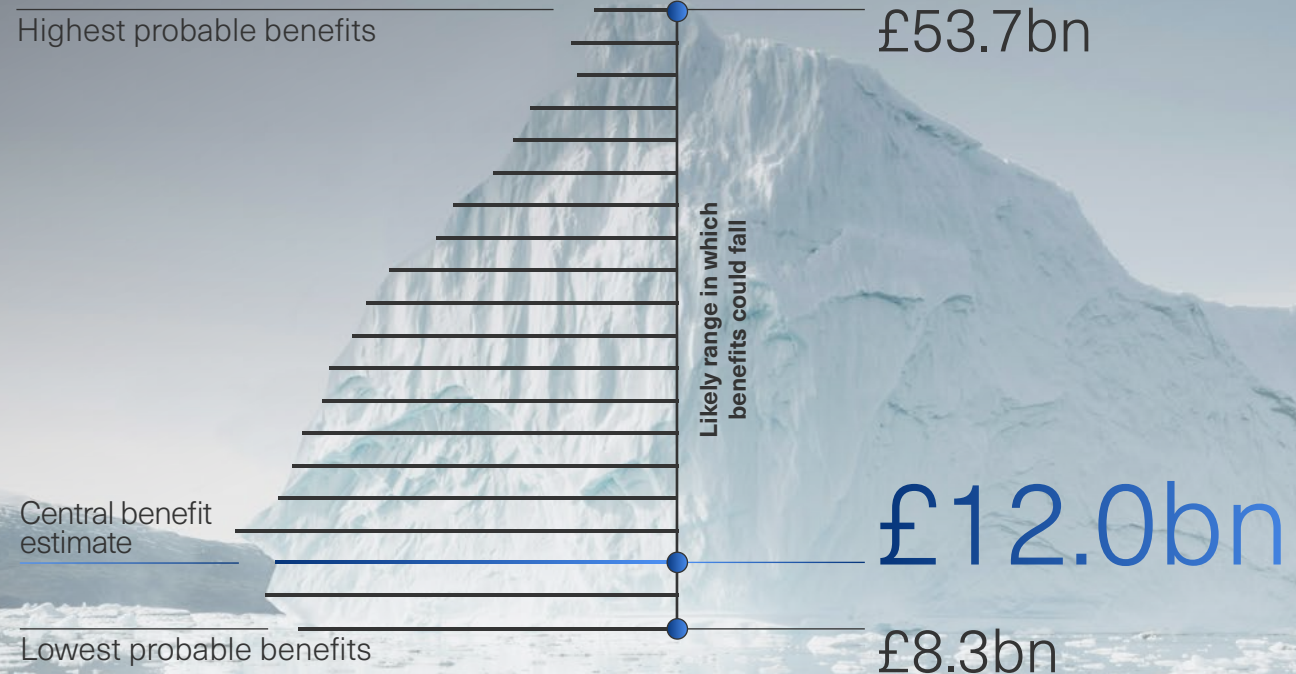
Estimated benefits:
£12bn

UK Climate Projections (UKCP)

Read case study in full report



Estimated climate adaptation and mitigation benefits resulting from Met Office climate research over the next decade



Observations & Supercomputer

All Met Office products and services rely on a national underpinning capability comprising of data supply, post-processing and analysis, prediction and projection, and observation.

A key component of the national capability is the Met Office's supercomputer. Supercomputing is a key enabler for sophisticated meteorological models. To ensure the Met Office's infrastructure makes the most of recent advances in computational capability, continued investment is needed. Therefore, the Met Office, funded by the Department for Science, Innovation and Technology, is investing £1.2 billion in upgrading its supercomputing capability. This investment will further enable more accurate, more granular and more diverse modelling, enabling new areas of scientific research.

"We are changing the Supercomputing industry by being the first organisation globally to move to a fully managed "Supercomputing as a service" model from our partner Microsoft."

MetOffice

The Met Office, funded by the Department for Science, Innovation and Technology, is investing

£1.2bn

in upgrading its supercomputing capability

Our new supercomputing capability will have well over 1.5 million compute cores. The average laptop has eight. When our new cloud based storage goes live it will have around 460 petabytes of data.






The Met Office also maintains a substantial infrastructure to gather weather and climate data. These observational datasets are a crucial input to the Met Office's models and forecasts. Observations are collected via traditional meteorological sites, satellite earth observation (EO) systems, weather balloon systems, and the UK radar network. The Met Office also collects data on air conditions, soil, relative humidity, wind speed, atmospheric pressure, sea surface temperature, sea ice, as well as a range of other data.

The Met Office gathers vital environmental data from over 63 Hi-tec instruments flying on

56 satellites

which are operated by 20 satellite agencies around the globe

Primary Met Office Observation Networks with approximately 1000 sites and platforms in total, with many more operated by partners:

Observations Capability	Met Office Operated	Partner Operated
 <p>Land Surface</p>	~300 Met Office surface observing stations	~1,800 voluntary observing sites
	~200 voluntary climate observing sites	
	~254 Met Office rain gauges	~1,000 Environment Agency, NRW, SEPA rain gauges
	2 Principal Radiation Stations	
 <p>Marine Networks</p>	260 Voluntary Observing Ships	~110 instrumented rigs/platforms (oil & gas)
	15 fixed platforms (ocean moored buoys, light vessels)	1 sub-surface North Sea Glider
	15 drifting buoys	Global network of ~1,400 drifting buoys (EUMETNET)
		Argo float sub-surface profiles
 <p>Weather Radar & Remote Sensing</p>	15 operational radar (+1 in delivery)	1 operational radar (Jersey)
	9 volcanic ash lidars	90 Global Navigation System water vapour sites and data processing system (Ordnance Survey & Uni of Luxembourg)
	9 long range lightning detection sites	
 <p>Upper Air</p>	2 manually operated radiosonde sites	100's AMDAR equipped commercial aircraft (EUMETNET)
	4 automatic radiosonde launchers	~16 ASAP Shipborne radiosondes (EUMETNET)
	UK Mode-S commercial aircraft network	Global Mode-S network
		UK and overseas partner operated radiosonde stations
 <p>Satellite</p>	Exeter satellite reception system	All satellite programmes (EUMETSAT & Others)

The numbers in this table are approximately correct at the time of publishing. The network and its composition evolves constantly.

Non-monetised benefits

Activities highlighted in this report are only a snapshot of the activities that can be evaluated. In addition, the Met Office delivers a wide range of other services which are likely to lead to substantial benefits which could not be monetised in the study. This includes:

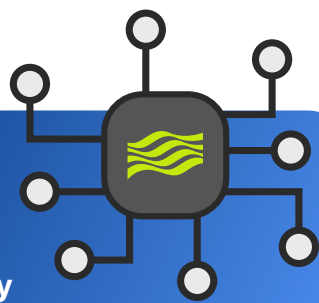
- The Met Office partners with universities and international organisations to exchange knowledge, share access to resources and improve weather/climate modelling. For example, the Met Office has ongoing partnerships with the World Meteorological Organization (WMO) and the European National Meteorological Services (EUMETNET).
- Other activities include services to the UK military to aid them in defence activities, ensuring operational effectiveness and better decision-making abilities; education and outreach activities such as STEM events and Science Camps; The Natural Hazards Partnership (NHP) which helps to mitigate risks from natural hazards.
- International development activities include partnerships supporting the development of weather and climate science in countries such as China, Brazil, South Africa, India, the Philippines, Indonesia, Malaysia and Vietnam. It also includes capability development programmes aimed at helping meteorological services in developing countries build or improve their disaster detection and mitigation services.

The Met Office also has important technology partnerships to improve access to Met Office data and to facilitate the development of products and services.



Powering Up by Partnering up - The Met Office and its Technology Partnerships.

Read case study in full report





Authors:

Daniel Herr
Associate Director

Tiffany Head
Senior Economic Consultant

Clio von Petersdorff
Senior Economic Consultant

Andrew Pritchard
Economic Consultant

Moritz Profanter
Economic Analyst

Charlotte Duke
Partner

Moritz Godel
Partner

Wouter Landzaat
Senior Economic Consultant

Taras Wolczuk
Intern

Phoebe Worsley
Intern

Responsibility for the contents of this report
remains with London Economics.