Behavioural insights for incorporation of action orientated advice into NSWWS Warnings

2023 Introduction of *“What should I do statements?”*
Insights into the use of behavioural psychology for communication and encouraging action

WISER
Weather and Climate Information Services

UK International Development
Partnership | Progress | Prosperity

Met Office

Timeline of Key Developments to NSWWS

Continual review

1988
Threshold Warnings Introduced

2011
Impact Warnings Introduced; Wind, Rain, Snow, Ice, Fog

2014
Dual IBF Warnings Introduced

2015
Storm Naming Introduced*

2018
IBF warnings for Thunderstorms and Lightning Introduced

Lead time increased from 5- to 7- days

2021
IBF warning for extreme heat introduced

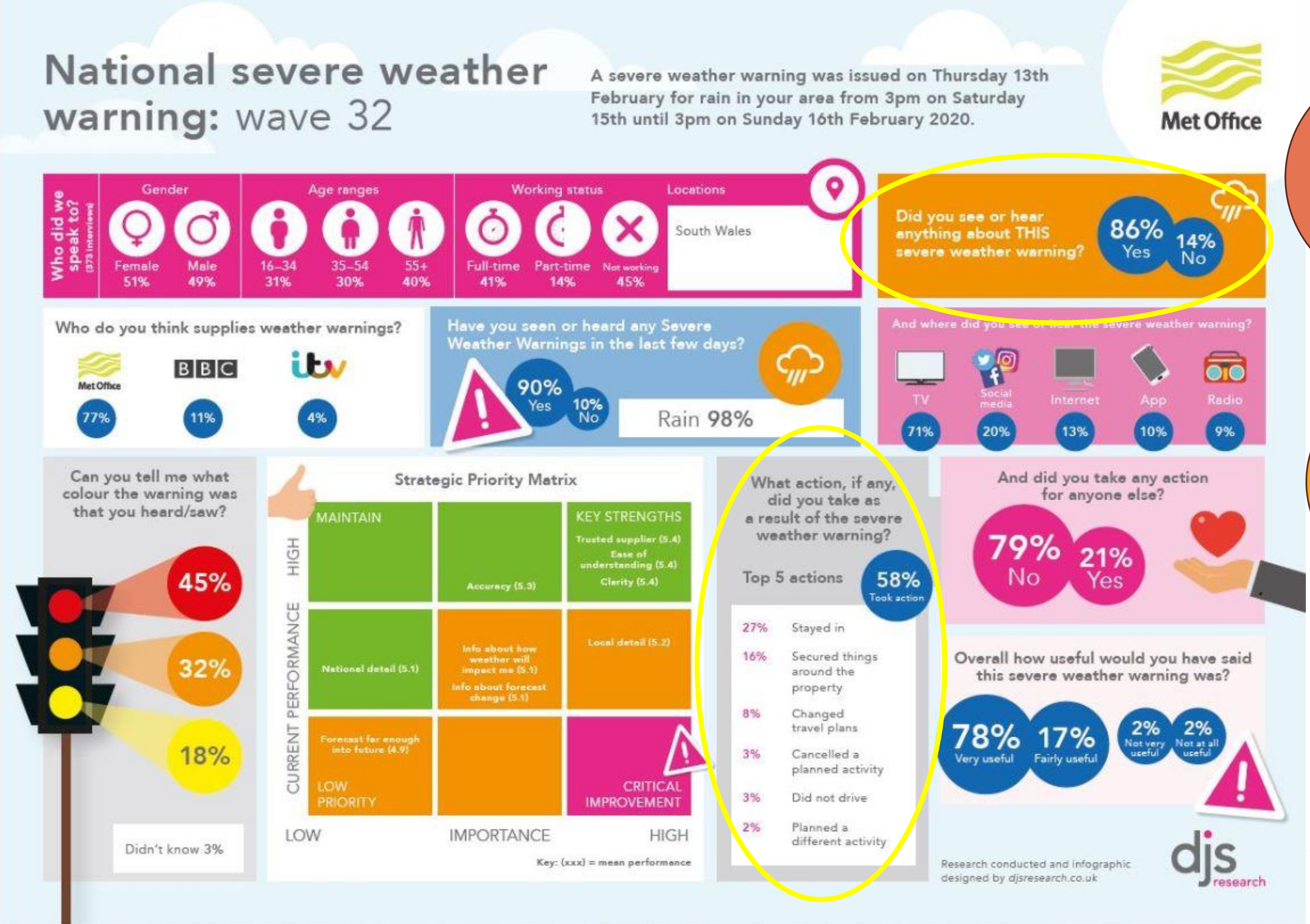
2023…

*Not directly a development of the NSWWS service but used effectively in conjunction to increase awareness amongst the public.

Advancing Impact-based Forecasts

Threshold		**Impact**
What the weather will ***be***	→	What the weather will ***do***

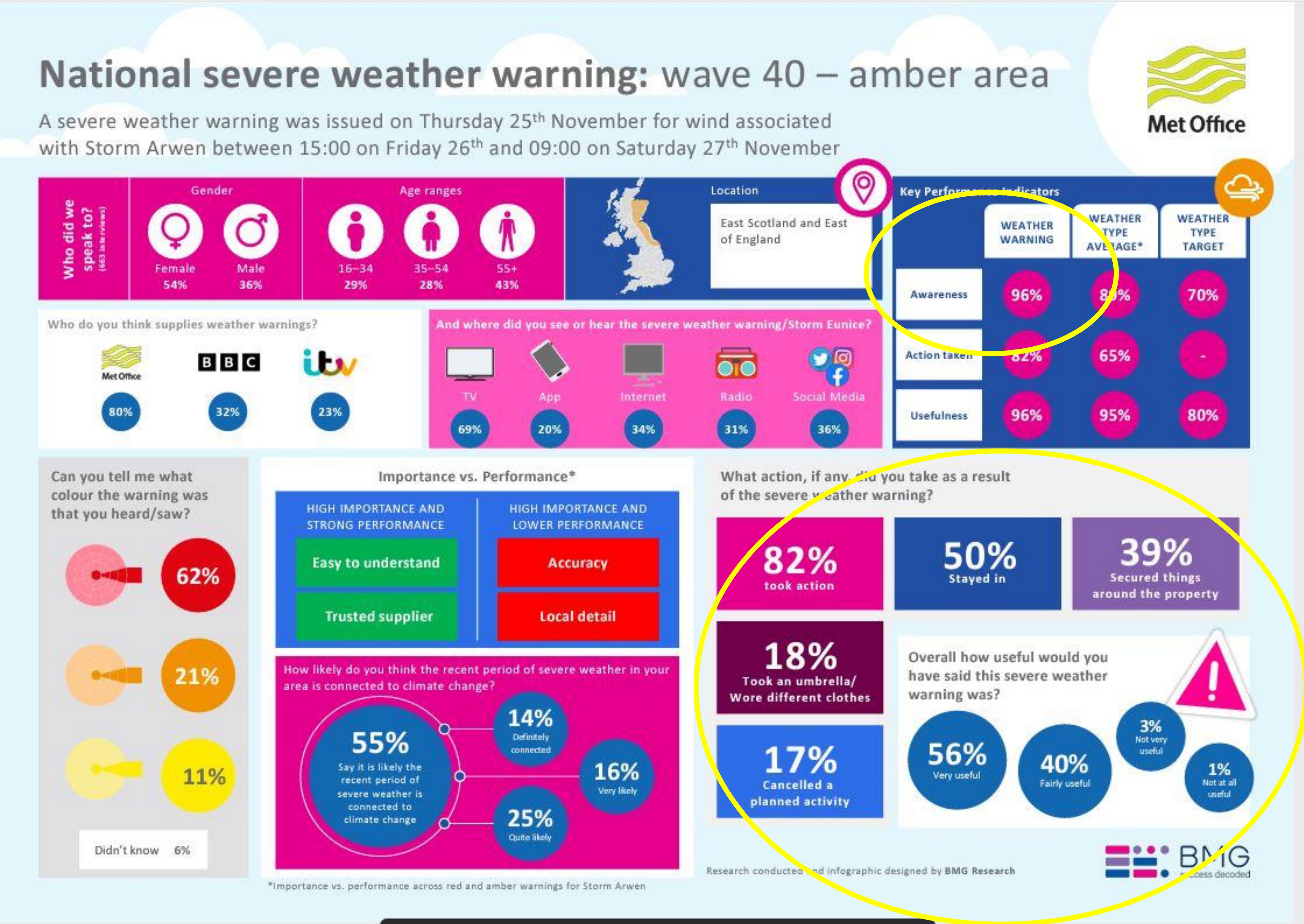
Are these warnings effective?



86% aware

58% acted

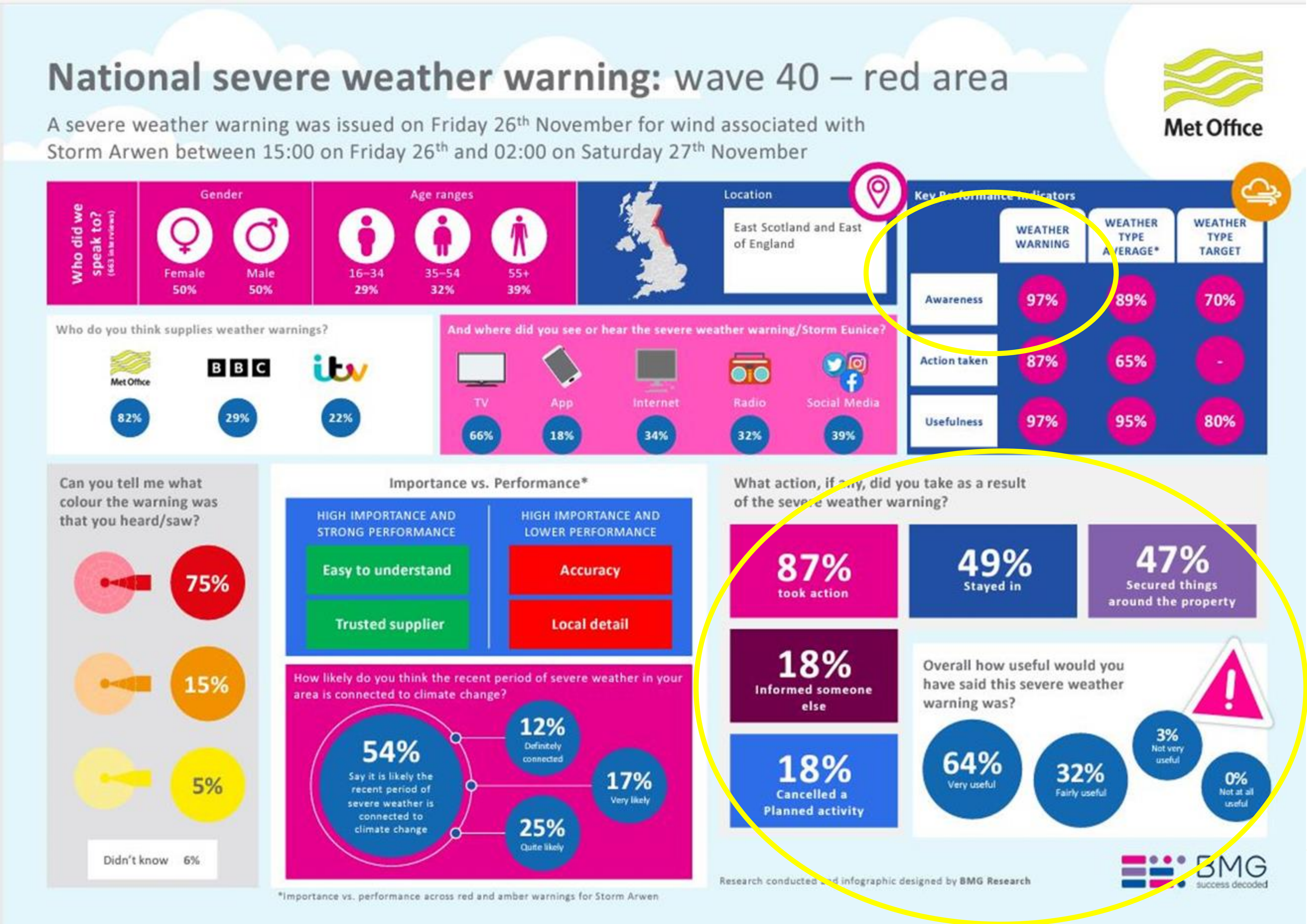
Storm Dennis



96% aware

82% acted

Storm Arwen (Amber)



97% aware

87% acted

Storm Arwen (Red)

What are impact-based forecasts & warnings?

WARNING TYPE	EXAMPLE
Phenomenon-based warning	Rainfall accumulations of 150mm expected within 18 hours in [local Govt. region] tomorrow.
Impact-based warning	Rainfall accumulation of 50mm expected within 18 hours in [city] tomorrow, which may result in road closures due to flooding.
Impact warning	Expect traffic to be delayed tomorrow at rush hour in [city] due to road closures from flooding, caused by heavy rainfall.
Call-to-Action warning	Reconsider your commute home tomorrow evening in [city], as it is likely that traffic will be delayed due to flooding of roads, caused by heavy rainfall.

Action-led Forecasting

Threshold

What the weather will ***be***

Impact

What the weather will ***do***

Action

What needs to ***be done*** to mitigate the impacts of the weather

Timeline of Key Developments to NSWWS

Continual review

1988
Threshold Warnings Introduced

2011
Impact Warnings Introduced; Wind, Rain, Snow, Ice, Fog

2014
Dual IBF Warnings Introduced

2015
Storm Naming Introduced*

2018
IBF warnings for Thunderstorms and Lightning Introduced

Lead time increased from 5- to 7- days

2021
IBF warning for extreme heat introduced

2023
Introduction of *"What should I do?" statements*

*Not directly a development of the NSWWS service but used effectively in conjunction to increase awareness amongst the public.

Action-Led Warnings

Weather hazard (considering nature, extent, duration, multi-hazards, location)

+

Impact assessment (considering vulnerabilities, exposure, location, time of day/year etc.,)

+

Behavioural science frameworks (How do we encourage people to take action?)

+

Appropriate advice (co-developed with partners to ensure it is effective and timely)

$\underbrace{\hspace{10em}}$

Action-led Warnings

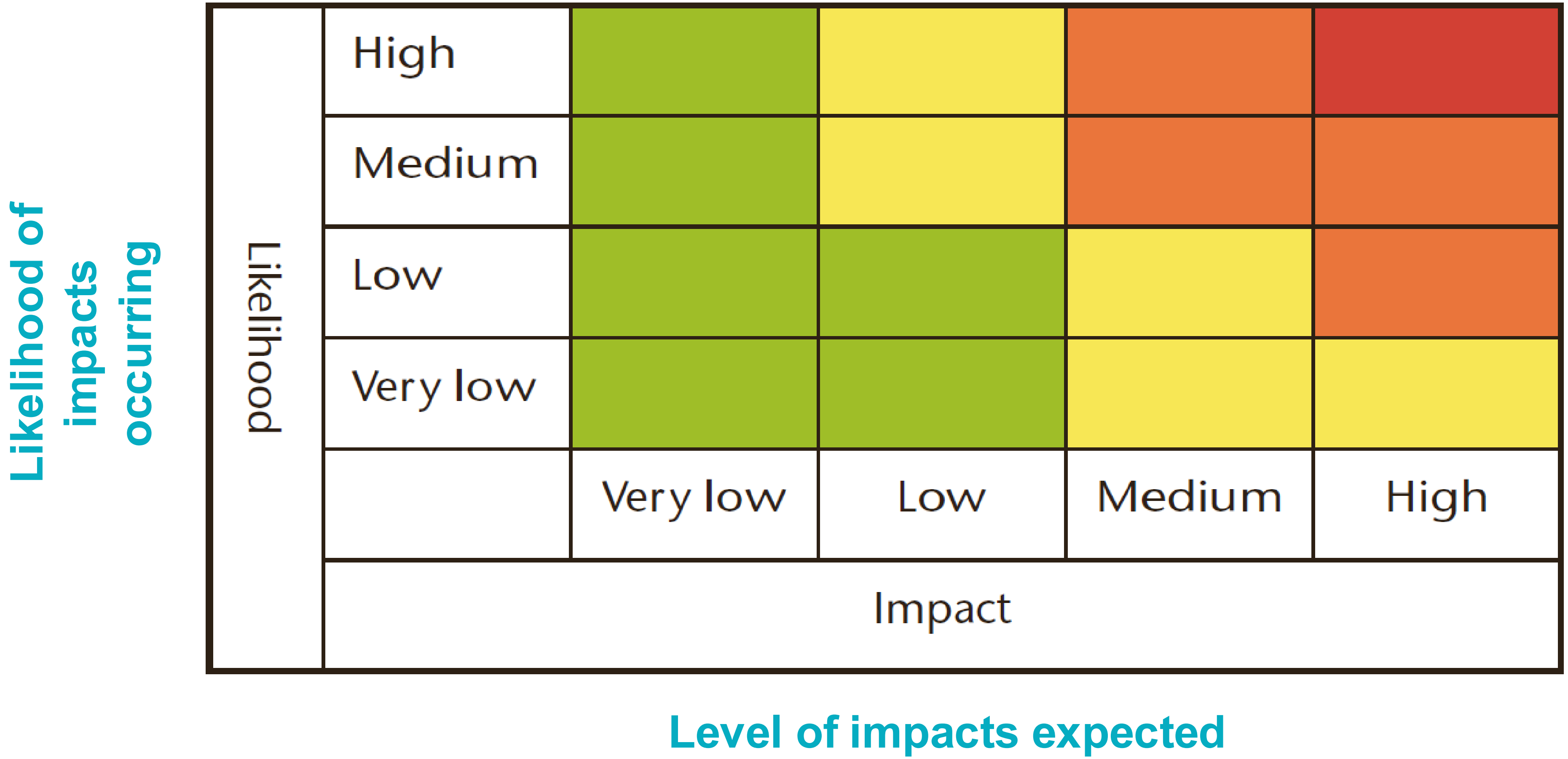
WISER
Weather and Climate Information Services

UK International Development
Partnership | Progress | Prosperity

Met Office

Process of moving towards action orientated advice in warnings

Impact Matrix



Forecast Based Early Action (FBEA)

The goal of FBEA is to anticipate disasters, prevent, or at least significantly lessen, their impact, if possible, reducing human suffering and loss.

A **pre-agreed set of early actions** that will be implemented at the time of a **triggering forecast**.

The roles and responsibilities of everyone involved in implementing actions should be clearly defined.

Full commitment towards implementation of mitigations amongst involved stakeholders.

Triggering Action Plans

Medium / Significant Impacts  	 • Flood Warnings Issued • Medium / Significant Impacts reported • Level-3 Heat-Health Watch or Cold Weather Alerts	• Injuries with danger to life • Disruption to day-to-day routines and activities. • Short-term strain on emergency responder organisations. • Transport routes and travel services affected. Longer journey times expected. Some vehicles and passengers stranded. • Disruption to some utilities, infrastructure, and services. • Damage to buildings, property, and structures. • Some rural communities temporarily inaccessible due to deep snow or snow drifts or affected by flooding. • Small-scale evacuation of properties may be required.	• **Trigger** a TAG Teleconference for Medium Impact Snow and Ice Warnings. * • **Trigger** a TAG Teleconference where likelihood for any warning is Medium/High/Level 3 Heat Health or Cold Weather Alert • **Consider** the TAG Teleconference where likelihood is Low/Very Low • **Consider** the requirement for an TCG/SCG and MAIC • Warn and inform the public appropriately • **Consider** Ramping up and rostering resources • **Consider** voluntary sector support

> *"It is no longer enough to provide a good weather forecast or warning – people are now demanding information about what to do to ensure their safety and protect their property"*
>
> (World Meteorological Organisation, 2015)

Introduction

At a glance

Despite significant advances in science and in the ability to now reliably forecast weather, adverse weather events continue to cause significant damage to people, wildlife, property, and infrastructure [1]. There is a clear mismatch between the ability to forecast weather events and people's ability, willingness, and drive to protect themselves. Addressing this challenge is paramount. Additionally, climate change means that severe weather experiences are likely to become increasingly frequent [1]. The general public are already provided with information about what the weather will be and what the weather will do. However, they are currently not provided with (easily accessible) information regarding what they can or should do to keep themselves and others safe.

In 2020 Met Office completed a large-scale review of its warnings system. One of the key recommendations from the review was to: (1) include advice within the warnings, so that the public understand what to do, and (2) to ensure advice statements drive action. **We, Magpie, were asked to develop succinct advice statements that will drive the greatest level of behaviour change.**

What we did:

We used the following systematic approach in order to develop a behavioural science-informed and evidence-based approach for communicating weather warning advice:

- We conducted a comp … of the interdisciplinary … existing internal Met Office research
  Literature Research
- We conducted … key partners to … behaviours they …
  1-to-1 Partner Interviews
- We developed advice statements based on what the Met Office alrea… the partner inte… the behavioural science evidence and theory (impact)
  Developed Statements
- We evaluated th… statements on … action using a r…
  Evaluated Statements
- We conducted a Randomised Controlled Trial (RCT) with… impact of … intentions…
  RCT with members of public
- We conducted focus groups to dig deeper into the nuances o…
  Focus groups
- Finally, we… collated evidence and used this to develop an advice statements framework

Key Findings

1. Both the desk research and our audience research show that **providing the public with advice is (1) wanted, and (2) effective** for engaging people in protective behaviours.

2. Using evidence-based and behavioural **science-informed messaging techniques is essential in order to most effectively drive engagement** in protective behaviours. In this report we provide a concrete framework that can be used and applied in the specific context of weather warnings.

3. In order to most effectively drive engagement with weather warnings and protective behaviours, it is worthwhile providing the general public with **easy and accessible information on the likelihood and impact level of the weather warning** (e.g. “there is a **small chance** of **very strong winds** for this local area”).

4. Providing **advice statements seems to lead to the greatest level of behavioural change for the Amber and Red warnings**, however its effects are less consistent for Yellow weather warnings. Therefore, it is crucial that, for Yellow warnings, advice focuses on small and easy steps.

Behavioural Psychology

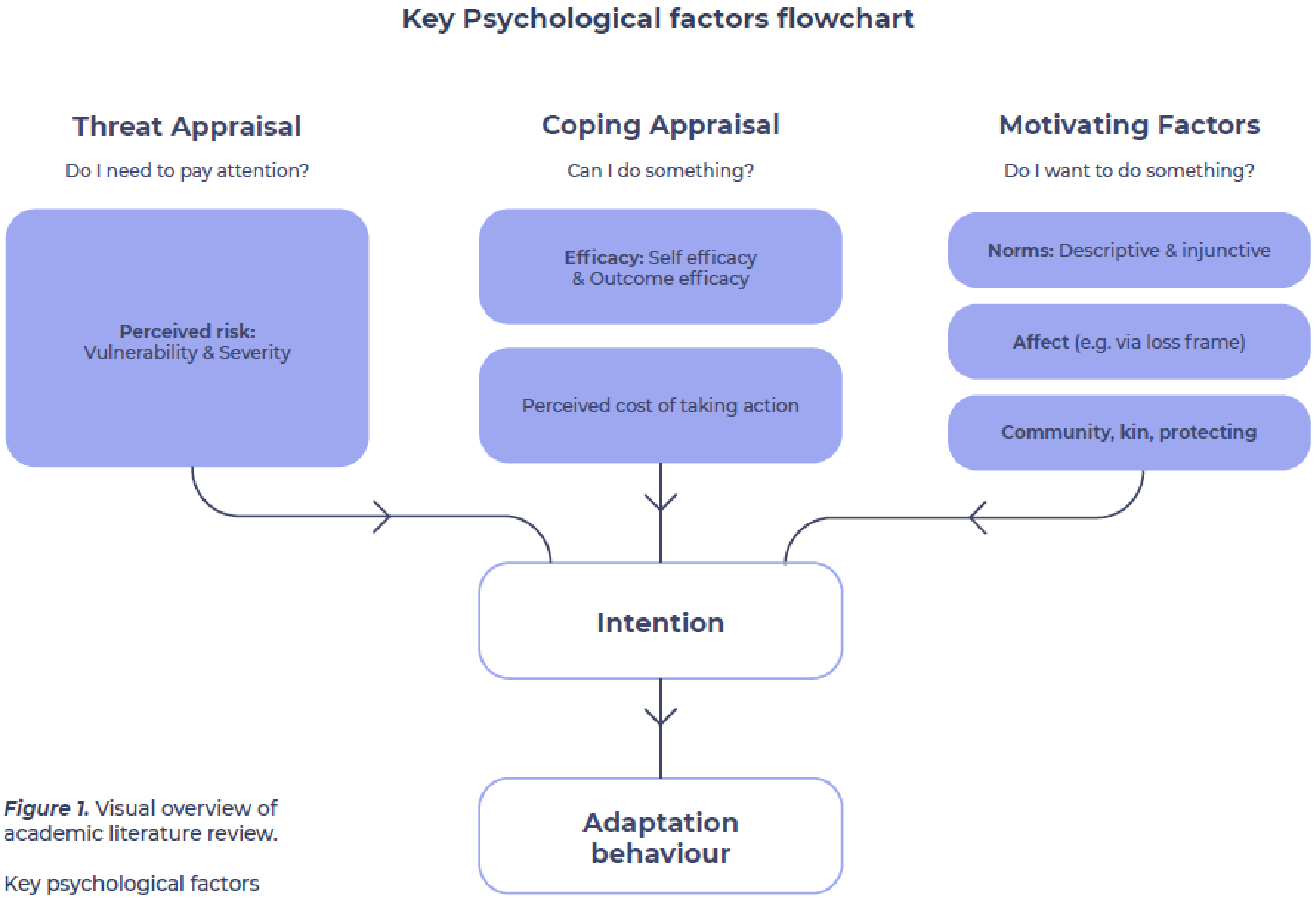


Figure 1. Visual overview of academic literature review.

Key psychological factors predicting people's willingness to engage in weather protection behaviours. Adapted from the Protection Motivation Theory [24]

WISER Weather and Climate Information Services

UK International Development Partnership | Progress | Prosperity

Met Office

Capability	**Psychological capability** (understanding)	Public lack a good understanding of SWWs.	Public confused about the difference between yellow and amber.	Public are unsure what to do when there is a SWW.	
	Physical capability	Some people do not have the physical ability to undertake protective behaviours.			
Opportunity	**Physical opportunity** (presentation and dissemination of info.)	Public would like more visuals. Some find the map difficult to use.	Met office app perceived as being too sophisticated and complex for general public.	Key devices used by public are mobiles, tablets, and TV but varies by age.	
	Social opportunity (looking to others)	Public (esp. younger) assume they will hear about a warning on the grapevine if it is serious enough.			
Motivation	**Automatic**	Affect: Many people have not experienced negative effects from SWWs and thus have no negative associations.	Habit: Public tend to check general weather forecast but are not in the habit of checking SWWs.		
	Reflective	Self-relevance: Many do not think SWWs will affect them.	Self-relevance: Public want info. specific to their local area.	Self-efficacy: Many are unsure how to (and whether they are able to) undertake protective action.	Gauging risk: Public want and need information on severity. Public do not perceive yellow or amber as serious.
		Cost: Many feel that yellow and amber are "not worth cancelling plans for". There is a fear of wasting time/resources.	Risk: Public is motivated by any perceived risk to life or health to self, family members, pets, neighbours, friends.	Inconvenience: Public is motivated by any perceived impacts of SWWs on disruption of daily routine (e.g. commute)	Damage: Public is motivated by any possible damage to their property or land.

Key psychological factors table

The **7 key behavioural areas** (or nudging techniques) to use for driving behaviour change are detailed here:

		Evidence-based and informed by:	
Behavioural frameworks:	**Description**	**Relevant academic paper**	**User information / reports**
Promote response efficacy	Messaging highlights that behaviour will have an impact	Van Valkengoed & Steg (2019)	B2B
Promote self-efficacy	Messaging highlights that behaviour is easy, achievable	Van Valkengoed & Steg (2019)	B2B
Clear and concrete	Messaging is clear and concrete	Taylor et al. (2019)	B2B, DJS, Met Office digital team
Self-relevant	Messaging highlights that highlights relevance to the people reading the warning	Bubeck et al. (2013)	B2B, DJS
Kin, protecting others	Messaging highlight impacts on family and friends	Van de Vyver et al. (2018)	
Loss frame	Messaging highlights possible losses of not taking action	Van Valkengoed & Steg (2019)	B2B
Gain frame	Messaging highlights possible gains of taking action	Van der Linden (2015)	

Met Office

Co-development of advice

"Yellow - there are too many warnings and we don't expect people to really do anything. Amber and Red we need people to get ready and prepare themselves in advance - when the weather comes it is too late. Amber is when to take action."

"Yellow is really a check - so it's more of a be aware. Keep an eye on it and be a bit more alert. Be informed. Drive with care. Check your speed. Adhere to speed limits. Be careful. Plan ahead"

- Transport
- Danger to life
- Health
- Utilities
- Personal safety
- Protection of property

Of those partners and specialist agencies interviewed, they agreed that the **Met Office Weather warnings are intrinsic to the services they provide**. The Met Office is viewed as a key source of information, with forecasts relied upon as the most accurate. On receipt of a MET Office Severe Weather Warning all parties will set an action plan focused on the warning type and the area of most need. Partners felt that the relationship was inclusive and two way.

They felt that **offering advice** at the point of a warning **would work well to help the public** understand how the weather impacts on them.

It was seen as an **opportunity to join up all parties** that are active in an extreme weather warning event and enable echoing of each other's advice communications. Communicating messaging that covers both weather information and the impact of weather.

Think

- Understand the risks of different weather types to safety
- Take time to know what the weather really means and trust the warnings
- Understand the impact the weather can have on property and which adverse weather can lead to displacement and difficult situations
- Consider others in adverse weather, e.g neighbours and the elderly
- Understand what essential travel means
- Understand how a car responds in different conditions and drive appropriately
- Know how to manage a situation

Plan

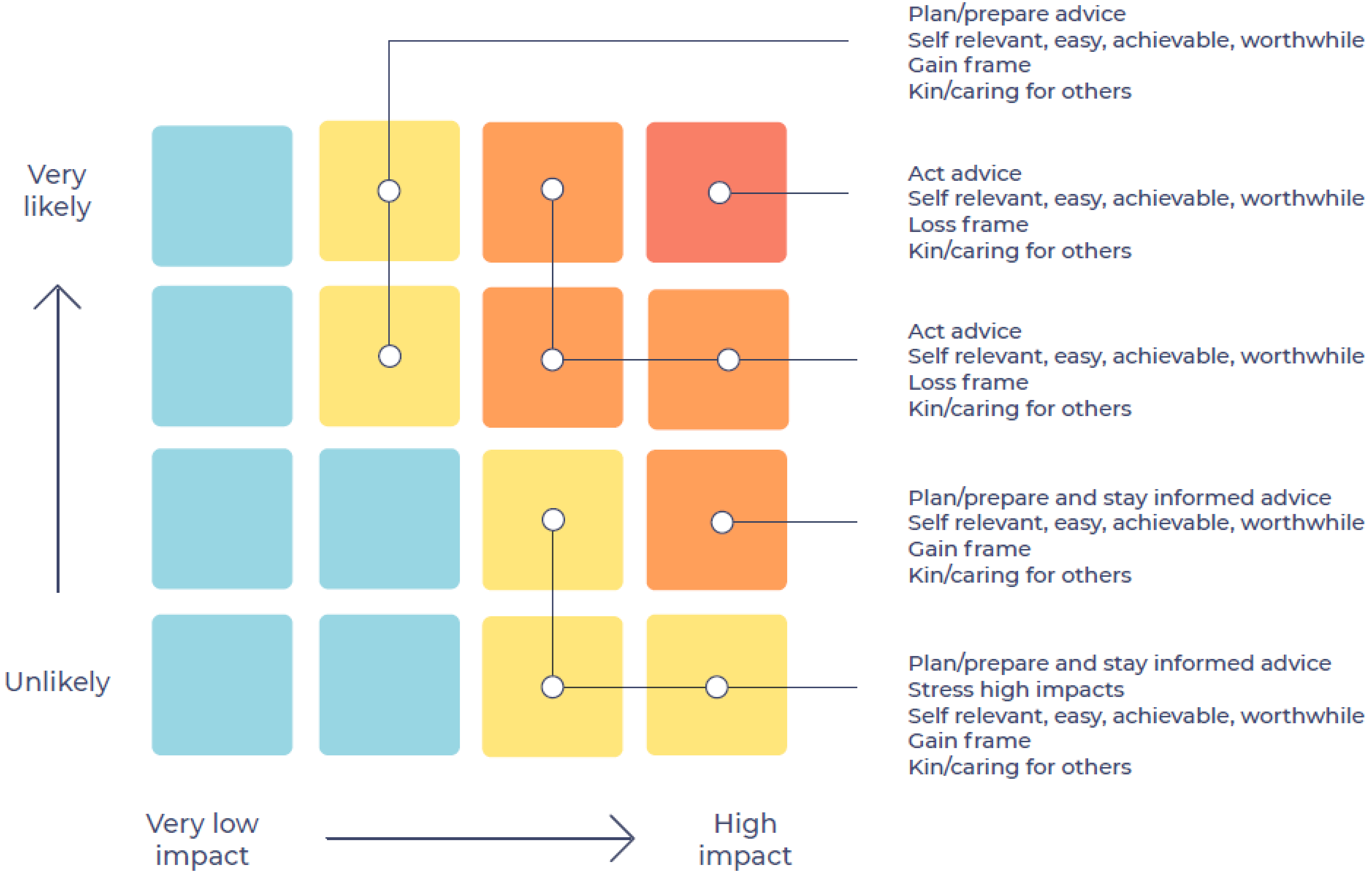
- Check the weather and take notice of all weather warnings
- Check and plan five days in advance if possible
- Alter activity or location based on weather forecast. Replan where possible and be prepared to turn back
- Choose coast guarded beaches when there is wind or very hot weather
- Stick to main roads and check routes in bad weather
- Check the weather and tides
- Consider if they are elligible to be on a vulnerable persons list - based on health, young children and disability

Act

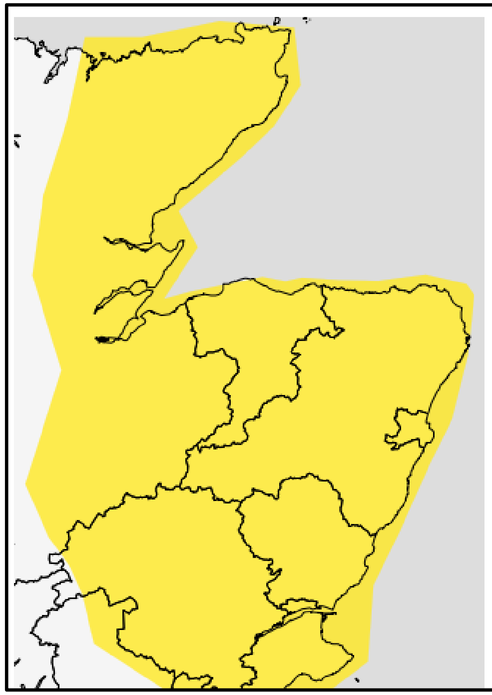
- Have a grab bag ready (and know what to have in it)
- Ensure you have a way to call for help if needed e.g. mobile phone, radio or whistle
- Check your vehicle, petrol and tyres
- Have appropriate screen wash for weather conditions
- Take water and appropriate clothing
- Make a call for help if required

Met Office

Weather warning advice: behavioural framework



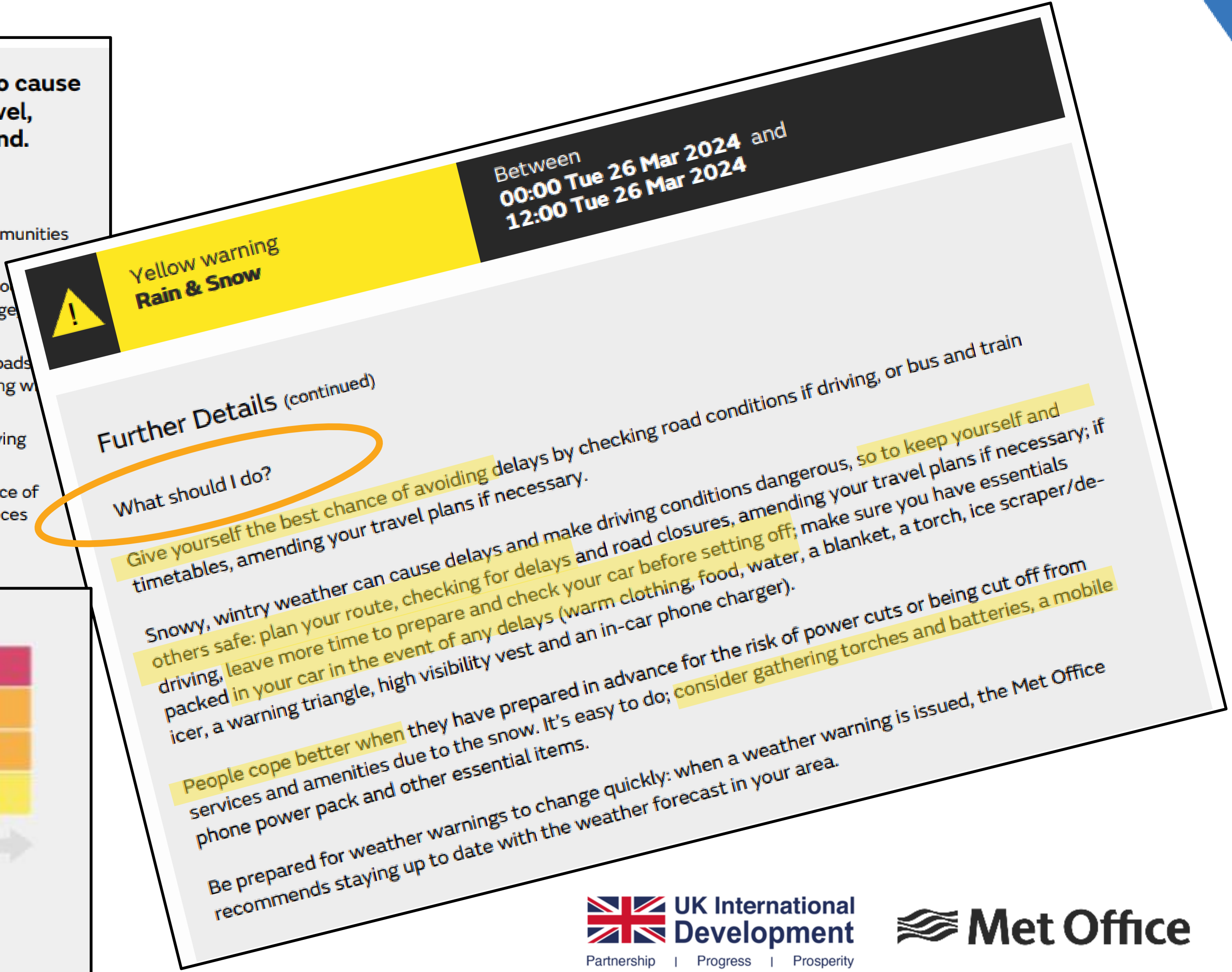
Encouraging action…



Rain and snow has the potential to cause disruption in places, mainly to travel, with snow focused over high ground.

What to expect

- There is a slight chance that some rural communities could become cut off
- There is a small chance that power cuts will o other services, such as mobile phone coverage affected
- There is a small chance of travel delays on roads some stranded vehicles and passengers, along w delayed or cancelled rail and air travel
- Spray and flooding could lead to difficult driving conditions and some road closures
- Where flooding occurs, there is a slight chance of delays or cancellations to train and bus services



Yellow warning
Rain & Snow

Between
00:00 Tue 26 Mar 2024 and
12:00 Tue 26 Mar 2024

Further Details (continued)

What should I do?

Give yourself the best chance of avoiding delays by checking road conditions if driving, or bus and train timetables, amending your travel plans if necessary.

Snowy, wintry weather can cause delays and make driving conditions dangerous, so to keep yourself and others safe: plan your route, checking for delays and road closures, amending your travel plans if necessary; if driving, leave more time to prepare and check your car before setting off; make sure you have essentials packed in your car in the event of any delays (warm clothing, food, water, a blanket, a torch, ice scraper/de-icer, a warning triangle, high visibility vest and an in-car phone charger).

People cope better when they have prepared in advance for the risk of power cuts or being cut off from services and amenities due to the snow. It's easy to do; consider gathering torches and batteries, a mobile phone power pack and other essential items.

Be prepared for weather warnings to change quickly: when a weather warning is issued, the Met Office recommends staying up to date with the weather forecast in your area.

WISER
Weather and Climate Information Services

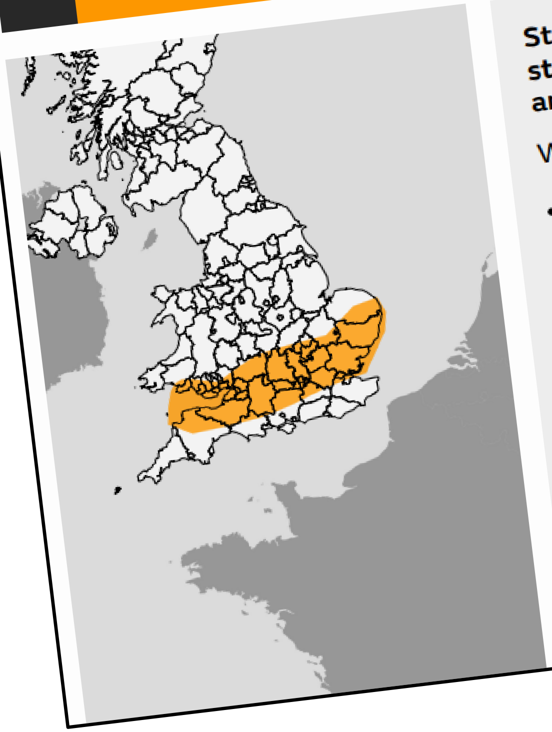
UK International Development
Partnership | Progress | Prosperity

Met Office

Encouraging action…

Amber warning
Wind

Between
10:00 Tue 2 Jan 2024 and
20:00 Tue 2 Jan 2024



Storm Henk will bring a spell of very strong winds, causing disruption to travel and utilities.

What to expect

- Longer journey times and cancellations likely, as road, rail, air and ferry services may be affected
- Some roads and bridges likely to close
- Probably some damage to buildings, such as tiles blown from roofs
- Flying debris is likely and could lead to Injuries or danger to life
- There is a good chance that power cuts may occur, with the potential to affect other services, such as mobile phone coverage
- Injuries and danger to life is likely from large waves and beach material being thrown onto coastal road sea fronts and properties

If you must drive, you can do this more safely by taking the following actions; drive slowly to minimise the impact of wind gusts, be aware of high sided vehicles/caravans on more exposed roads and be cautious when overtaking, and give cyclists, motorcyclists, lorries and buses more room than usual.

Being outside in high winds makes you more vulnerable to injury. Stay indoors as much as possible. If you do go out, try not to walk, or shelter, close to buildings and trees. In advance of high winds, check for loose items outside your home and secure them. Items include; bins, garden furniture, trampolines, tents, sheds and fences.

If you are on the coast, stay safe during stormy weather by being aware of large waves. Even from the shore large breaking waves can sweep you off your feet and out to sea. Take care if walking near cliffs; know your route and keep dogs on a lead. In an emergency, call 999 and ask for the Coastguard.

People cope better with power cuts when they have prepared for them in advance. It's easy to do; consider gathering torches and batteries, a mobile phone power pack and other essential items.

her forecast for your area and follow advice from emergency services and local

Medium likelihood of medium impacts

WISER
Weather and Climate Information Services

UK International Development
Partnership | Progress | Prosperity

Met Office

Summary

Encouraging learning from UK experience

CAUTION: This may not work on a like for like basis / approaches from the UK experience may not drive the same action in other countries;

- Insight into the considerations and testing which took place to incorporate action orientated advice into UK NSWWS (IBF) statements are presented for discussions on appropriate strategies for communication in South Asia.
- Are there similar studies and/or understanding of the most appropriate way to encourage action?
- Can we test approaches / which approaches can we test, using behavioural psychology principles, as part of demonstration activities in South Asia?

Any questions?