Developing a public engagement strategy for NCAS-Climate

Richard Allan, Lesley Allison, Beena Balansarojini, Nicola Bray, Ed Hawkins, Nick Klingaman, Kathy Maskell, Robin Smith, Rowan Sutton, Dawn Turner, Sam Williams

What is Public Engagement?

- Who?
  - General community
  - Schools
  - Charities
  - Special interest groups
  - Patient groups
  - End users (businesses/practitioners)
  - Government/local authorities/policy groups
  - Health agencies
  - Cultural services
  - The media as an intermediary

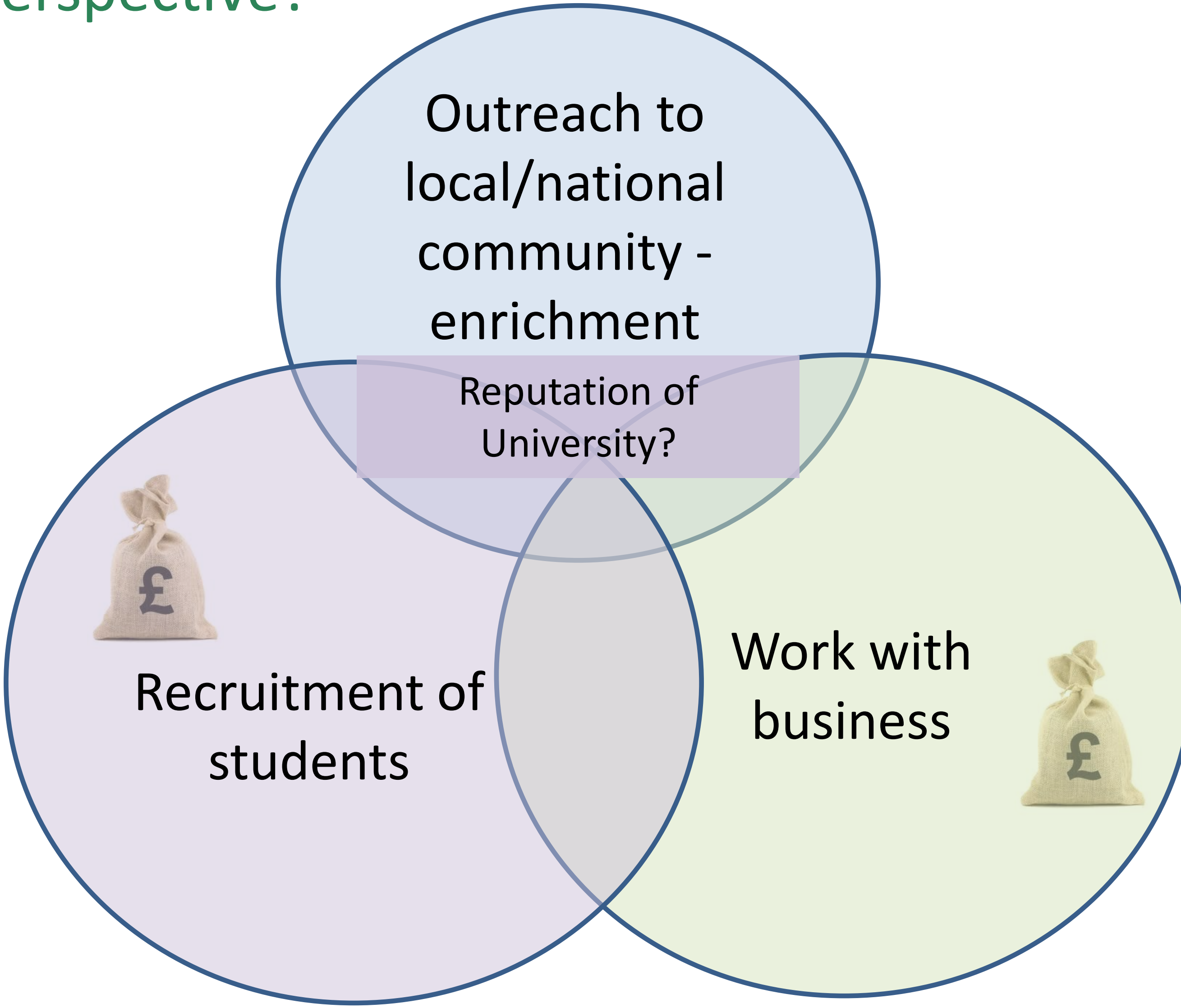
- What?

"the involvement of specialists listening to, developing their understanding of, and interacting with, non-specialists" (HEFCE, 2006).

  - Two-way dialogue/debate
  - Inform end users of research
  - Influence direction of research
  - Enrichment
  - Evaluable

From IOP talk by Averil Macdonald

University perspective?



Public Engagement and the Research Excellence Framework

- Importance for University funding
- Demonstrate research impact
  - Publications (4 outputs)
  - Case studies (planned, impact, two-way exchanges, evaluable, reach & significance)

- **Research impact** includes stimulating interest, awareness and debate of scientific issues, promoting the value of science, informing government policy and influencing business practice.

Evidence for impact depends upon the reach (numbers and diversity) and the significance (what difference did it make).

- **Engagement** may include dialogue or debate with sections of the public, research-informed events aimed at cultural enrichment and discourse with end users of research who may also inform the direction of research.

Why the need for a strategy?

- Decline in the public trust in climate science?
- Time is precious
- Maximize benefit or impact of research
- Enhance the quality of research and abilities of scientist

There is a place for ad hoc outreach but the above points and more indicate a need for a more planned, coherent strategy…

Strategy: Guiding Questions

- What are we trying to achieve?
- Who are we trying to reach?

Objectives

- Enhance research quality and communication
- Maximize the impact of research activities
- Contribute to increasing public understanding and trust in climate science

Approach

- Identify 2-3 major activities
- Individual-led
  - Career, skills, fulfilment
- Top down approaches
  - Good practice, incentives, strategy

Activities

- Existing departmental activities…

NCAS-Climate@Reading activities:

  - Public Engagement group meetings (monthly)
  - PE activities as a valid promotion criteria
  - NCAS website and preliminary public content
  - Web-based video clips?
  - Research Highlights
  - Web-based Resources
  - Documenting and evaluating activities

NCAS science highlights

Audience:

1. Interested members of the public
2. Funding agencies

Level: Sixth former (17-18 years), some scientific knowledge

Aim: Let the public know…

1. what we're doing
2. why it's useful

Interesting paper coming out? → Write a highlight!

Feedback

http://climate.ncas.ac.uk/public-engagement

Template

National Centre for Atmospheric Science
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NCAS Science Highlight (DRAFT)

University of Reading

Title

Authors (names can be hyperlinks to authors' personal websites)

Author affiliations

Highlight by … (if not written by the lead author of the paper)

Author photo

Name of person in photo

What are the new findings?

If the background to the research topic is not widely understood by the public, please first include some text on the background to give the results some context.

Write a short summary of the research findings.

Figure

Consider using a relevant schematic, which may be simpler and more helpful than a figure from the paper.

The figure should be clearly labelled, and extra annotations may be helpful.

Above: The figure caption should explicitly include the main message of the figure.

Why are these findings important?

Write about why the results of this particular study are important.

Ideas: What do they add to our understanding? How can the results be used? Who will benefit from these findings? (Examples of beneficiaries - policy makers, government departments, insurance industry, research community, water industry, energy suppliers, weather forecasting, model development, general public, teachers, farmers, …)

How did we discover this?

Write about the methods used in the research.

Find out more:

- Read more
- See [Author]'s webpage
- Email author@reading.ac.uk
- Take a look at the journal article

[Paper reference goes here]

Return to NCAS Climate public engagement website

Tell us what you think
- How clearly was this article written?
- How interesting or useful was it?
- Do you have any other comments?

Please let us know: feedback@ncas-climate.reading.ac.uk

This research was funded by [include funding source here]

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NCAS Science Highlight **Download as a PDF** **Listen to podcast**

Potential for Atlantic Current collapse supported by climate model and observations

Author photo

Ed Hawkins*, Robin Smith*, Lesley Allison*, Jonathan Gregory*#, Tim Woollings*, Holger Pohlmann# and Beverly de Cuevas†

*NCAS-Climate, University of Reading; #Met Office; † National Oceanography Centre

For more information, see Ed's webpage or take a look at the journal article

What's the new result?

The Atlantic Meridional Overturning Circulation (AMOC, also known as the thermohaline circulation) is a vast ocean current in the Atlantic that moves warm water northwards near the surface and cooler water southwards at depths of 2-5km (see Figure 1). We have shown that in a complex climate model, the AMOC can have two stable states: "on" and "off", and that a simple indicator might exist that could tell us whether the real AMOC is presently in this "bistable" regime.

Figure 1: Simple illustration of the AMOC circulation. Warm surface waters move northwards in the Atlantic (red), and release heat to the atmosphere, before sinking at high latitudes and returning southwards at depth (blue).

Why is this important?

The AMOC transports heat northwards; it is partly responsible for the mild climate of Western Europe. If it were to shut down, the climate impacts would be felt throughout the world, but most strongly in the regions surrounding the Atlantic. There has been concern that with climate change (through warming temperatures, increased precipitation and melting ice), the surface water in the North Atlantic might become too buoyant to sink, therefore causing the AMOC to weaken or even shut down completely.

Theory suggests that the AMOC can have two stable states under the same background conditions.

Previous studies that used simple climate models (with a very basic atmosphere component) seem to support this. However, previous experiments using more complex climate models (with a more realistic atmosphere), seemed to suggest that if the AMOC is forced to collapse, it gradually recovers over decades to centuries. It was thought that the more realistic atmosphere prevented the AMOC from having a stable "off" state.

Our experiments, using a comprehensive climate model (with a realistic atmosphere), suggest that the AMOC can have stable "on" and "off" states for the same forcing. This means that if the AMOC were to shut down, then it might not recover under the same background conditions.

Our results also suggest that the presence of an "off" state might be detectable using an indicator which can be measured in the real ocean. The indicator is related to whether the AMOC imports or exports salt into the Atlantic basin. Observations of this quantity appear to suggest that the real AMOC might indeed be in a bistable regime at present.

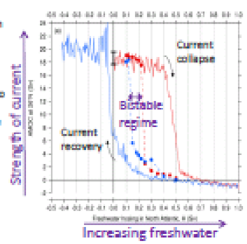

Figure 2: AMOC strength with varying freshwater input. The experiment starts at the "I" symbol, and the AMOC strength follows the red curve as the freshwater increases. When the freshwater input reaches 1 Sv, the freshwater is then reduced, and the AMOC strength follows the blue curve. The coloured circles show the AMOC strength in "equilibrium" experiments, which have constant freshwater input for several thousand years.

How did we discover this?

Using FAMOUS (a lower-resolution version of the widely-used climate model HadCM3), we performed experiments in which freshwater (water with no dissolved salt) was added to the surface of the North Atlantic (to represent melting ice or increased rainfall). This reduces the density of the surface water, making it less able to sink.

We increased the freshwater input very slowly (it took 2000 years to go from zero to 1 Sv (1 Sv is 1 million cubic metres of water per second). When around 0.4-0.5 Sv of freshwater was added, the AMOC collapsed (see Figure 2, red curve). When we reduced the freshwater input again (blue curve), the AMOC did not recover at the same freshwater input value at which it collapsed, indicating hysteresis behaviour (like the thermostat in your central heating system). The freshwater input value had to be reduced to negative values (i.e., salt input) for the AMOC to resume again.

We performed additional experiments to check that the "on" and "off" states are truly stable. These experiments started off from various points in the original experiment, but kept the freshwater input constant for several thousand years. They show that the true bistable regime spans a narrower range of freshwater input values than the slowly-changing experiments, but that it still does exist.

How does this research contribute to the NCAS big questions?

How does the climate system work?
... (lots to say here) ...

What changes in climate can we expect over the coming decades?
... (possibly some things to say here?)...

This research was funded by the Natural Environment Research Council under the RAPID-WATCH programme.

Tell us what you think — Not at all → Very
How clearly was this article written?
How interesting or useful was it?
Any other comments?

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NCAS Science Highlight (DRAFT)

University of Reading

Could the Atlantic Ocean circulation switch off?

Ed Hawkins[1], Robin Smith[1], Lesley Allison[1], Jonathan Gregory[1,2], Tim Woollings[1], Holger Pohlmann[2] and Beverly de Cuevas[3]

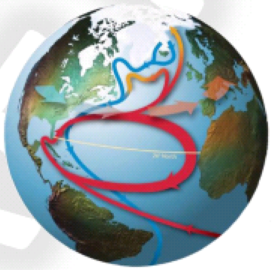
[1]NCAS-Climate/University of Reading; [2]Met Office; [3]National Oceanography Centre

Highlight by Lesley Allison

Ed Hawkins

What are the new findings?

The ocean circulation in the Atlantic moves warm water northwards near the surface and cooler water southwards beneath (see Figure), with a warming effect on surrounding regions (e.g., Western Europe). The circulation relies on the surface water in the North Atlantic being cold and salty (and hence dense) enough to sink. We have shown that an input of freshwater in the North Atlantic could cause the ocean circulation to collapse and remain permanently switched off, even if the fresh water input stops. Our results also suggest that the direction in which the circulation transports salt in the South Atlantic might tell us whether a future collapse would be permanent or temporary. Observations of this from the real ocean suggest that it might be permanent.



Above: Simple illustration of the Atlantic Ocean circulation. Warm surface waters move northwards (red), and release heat to the atmosphere, before sinking in the far north and returning southwards at depth (blue). Winds pick up heat from the surface waters and carry it to Europe.

Why are these findings important?

There is concern that climate change might cause the Atlantic circulation to weaken or even switch off, as melting ice, increased rainfall and warming make the water in the North Atlantic less dense. If the circulation collapsed, one of the main effects would be a cooling in regions surrounding the North Atlantic. Complex climate models are often too expensive to perform the experiments needed to properly check whether the circulation could remain switched off permanently, and until now, it was thought that in these models the circulation might always gradually recover. However, ours is the first complex climate model to show that a collapse could be permanent, suggesting that the real ocean might show this behaviour too. The results will help scientists and policymakers to better understand the possible effects of climate change.

Find out more:

- Download in-depth highlight (PDF)
- See Ed Hawkins' webpage
- Email e.hawkins@reading.ac.uk
- Take a look at the journal article

Hawkins *et al* (2011), *Geophys. Res. Lett.*, 38, L10605, doi:10.1029/2011GL047208

How did we discover this?

We performed lots of climate simulations, in which different amounts of freshwater were added to the surface of the North Atlantic. The climate model we used was complex enough to include important processes, yet inexpensive enough to run the long simulations (many thousands of years) required to determine whether the "off" state was temporary or permanent.

Return to NCAS Climate public engagement website

This research was funded by the Natural Environment Research Council under the RAPID-WATCH programme.

Tell us what you think
- How clearly was this article written?
- How interesting or useful was it?
- Do you have any other comments?

Please let us know:
feedback@ncas-climate.reading.ac.uk

www.ncas.ac.uk

Feedback

NCAS Science Highlights: We welcome your feedback

In NCAS Climate, we are currently improving our website to make it more engaging and interesting for members of the public. The website will include some "science highlights", to showcase some of our recent research findings. We have written some draft examples of these science highlights, and we would be grateful to hear any comments that you might have about their content or design. Thank you for your time!

Feel free to answer for the 4 examples in general, or for any of them in particular.

1. How clearly were the articles written? Were they easy to understand?

Work experience students (comments on early versions):

- I thought the articles were written very clearly, and were very easy to understand. They gave a simple yet detailed overview on the different topics of research and explained well what they found, why it is important and how they found it.
- Yes, easy to understand, clearly written. Diagrams and graphs helped. The layout (having a clear, good title and sub-headings) was easy to follow and the language used is relatable for the public as it is not too scientific.
- I thought the articles were very clear and descriptive, it had a lot of information, and I understood it all.
- The articles were clear to read and understand. The font of the text was a good choice. It was laid out on the page very well and the layout all together was clear.
- Written clearly, but difficult to understand for people unfamiliar with technical terms used in the articles.
- Very clear, precise. Shows data well through good use of graphs (graphs help). Not too much jargon, understandable.
- The articles were fairly easy to read. People would probably find it easier if some of the meteorology terms were described in more detail.

Comments on later versions:

- In general I found the articles very clear. In Richard's article, it would have been good to have an explanation of the El Nino Southern Oscillation to illustrate this point more clearly. Also I didn't understand the acronyms on the graph, so wasn't sure what this was saying. Otherwise I'd say the pitch was about right for the target audience (if I could understand it I'm sure most people would).
- Very clear and easy to understand

2. How interesting did you find them?

Work experience students (comments on early versions):

- I thought they were all quite interesting, especially the parts on what they found and why it is important, and although I wasn't as interested by how they found it, it was still good to know.
- Very interesting, particularly the "when will climate change affect different areas?" article. They were interesting because they were short and concise. Also they are all relevant, up-to-date topics.
- It's pretty interesting, especially the AMOC. I thought that was really good. I'd love to read more on it.

e slightly brief, but much more information may begin to bore some
mount of information. Very interesting facts and information I didn't
fair amount from these pages.
ticles describe the climate changes that our planet is undergoing as

oint, so informative. Graphs and pictures help explain and liven up the

to know how the things we do affect us.

ions:

g, particularly those related to global warming. It would have been
arison of historic warming using the same models on Ed's article
will affect different regions. Not having used such models and
nding of them, this would have reassured me about the reliability of the
fascinating – it was very engaging and easy to follow.
le of 1-10 I'd give it 8

ed in reading a longer (2-page) more-detailed version of

ts (comments on early versions):

ding a bit more about the effects of what they found out, particularly
n and the accumulating energy below the ocean's surface – how this
y.
e change affect different regions?"
ueensland's variable rainfall". I thought it had enough information as it

ey give all the relevant information required if someone is interested.
interesting. But much more longer pages may not appeal since it's
view of it.
in the first article which talks about potential for Atlantic current
ate simulations and observations.
ike "what can we do?". If longer, still make succinct.
ting to know how the weather is affecting our world.

ions:

ed through to the longer articles – the highlights are very eye catching
ams and their brevity lends to this, making them good for attracting
work very well as 'tasters' and were interesting enough to want to
plexity of content on the longer articles is still something to think about
people with too much of a switch.

- Yes, but keep it simple..... (Please don't include long winded complicated mathematical equations)

ments that would help to improve the articles?

mments on early versions):

very good.
aphs, e.g., exactly what they are showing.
d picture for the climate change article. Other than that, it's all
C one) it has "see figure 1" but the picture isn't labelled as

n country, and see how climate change would affect us in the

ite some parts in a simpler to read style with less terminology

tive.
ab the audience's feelings and also use less technical terms.

the web page of each of the authors?

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Things to include over time:

- Build up a glossary
- Video/audio content
- Link to “tutorials” (e.g., ENSO, radiation budget etc)
- Group the highlights into topics

http://climate.ncas.ac.uk/ncas-climate-highlights

Communication

(from presentation by Emily Shuckburgh; further links on Blackboard)

1. Avoid patronising; but **don't be overly technica**l in scientific statement. Consider carefully whether particular words or expressions may not be understood by a general audience.
2. Try to improve the **presentation of uncertainty**. Choose risk terms with care because otherwise statements can be misunderstood or misinterpreted and be careful to avoid framing bias. Avoid the use of "could" and "may" if possible because the public is very sensitive to them and interpret them as lack of knowledge or guessing.
3. Recognise that the participants liked information regarding **indicators of change** (such as the bees).
4. Provide more **high-quality graphics** including simple graphs.
5. Recognise that **passion and emotion** help the public to generate a sense of trust.
6. Provide solid statements, e.g. **carefully explained mechanisms**, where possible.
7. **Contextualise numbers and risks** in everyday terms (but not with spurious comparisons)
8. Emphasise **implications of uncertainty**; people want to know what they can do with the information.
9. Treat **communications as dialogue** (so learn and improve) and evaluate the impact.
10. Recognise that the public really want a **celebrity scientist** they can build trust in to deliver the messages and find statements from multiple scientists they have not heard of confusing.
11. Consider putting more effort into encouraging/facilitating the inclusion of climate science in **documentary-making** since this often provides the base points for people to then hook their interest in news stories on. A good book would also be welcomed.
12. State clearly **who funded research** (a question frequently asked).