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Supplementary Material for: A Blind Expert Test of Contrarian Claims about Climate Data

Data availability

The data and analysis scripts for both behavioral studies reported in this article are available at the University of Bristol's data storage facility using the following digital object identifiers (DOI):

- Main experiment (Study 2): DOI 10.5523/bris.17ejyweb6kk19odghem68one.
- Rating study: DOI 10.5523/bris.7aeind9zcl461l5hm8dju0v05.

Note that for the main experiment (Study 2), participants provided explicit consent for their data to be made publically available. The data for Study 2 are therefore Open Access. The Rating study did not obtain explicit consent for data sharing, and the data are therefore only available to credentialed scholars upon application via the DOI above.

Rating study

Method

Climate experts were presented with the same scenarios that were identified for Study 2. Experts first indicated whether the claim was accurate or misleading in light of the data. They then identified the relevant contrarian interpretative techniques from a list of 5 candidates (e.g., “cherry-picking”; see Table S1), and judged how commonly each technique was used by contrarians in general.

Participants and materials. The participants were 10 climate scientists (mean age 54, all male) who responded to an emailed invitation to participate and completed all items of an online survey. Invitations were sent to a randomly-selected list of 120 experts sampled from a larger pool, and also to 9 further experts whose public profile identified them as being particularly suitable to evaluate contrarian claims. None of the potential participants were collaborators of the authors.

All participants had 5 or more years professional experience, and all had published 10 or more peer-reviewed articles in climate science. Participants were not remunerated for this study.

The materials were as in Study 2 in the main paper.

Procedure. The study was administered via an online survey platform (Qualtrics.com). Upon entering the survey, participants indicated their informed consent and proceeded to respond to the 6 scenarios. For each scenario, after inspecting the statement and the accompanying graph, participants indicated (1) whether the data confirmed the claim, and (2) whether the claim about the data was misleading. Each item used a 6-point scale that ranged from “strongly disagree” to “strongly agree,” without a “neutral” or “don’t know” category.

Participants were then asked to identify the technique(s), if applicable, that were used to make the claim about the data misleading. Participants could choose any number from the following list of options: Cherry-picking observations, focusing on unduly short time period, misreading or misreporting of data, making false claims about the data, drawing unwarranted conclusions from the data, or “other”. The latter option was accompanied by a free-form response field if it was chosen.

Following the choice of technique(s), participants were asked to estimate the frequency of presumed usage of those techniques by climate contrarians and how representative the technique(s) were of contrarian data interpretation. The 4-point scale ranged from “not representative at all and uncommon” to “very representative and common.”

Table S1: Identification of contrarian interpretative techniques and their prevalence judged by climate experts in the rating study

Technique	Scenario ^a						Prev. ^b
	AI1 ^c	AI2	GL ^c	SLR1	SLR2	GMST	
Cherry-picking observations	9	4	8	2	6	7	3.98
Focusing on unduly short time period	10	10	1		5	8	3.88
Misreading or misreporting of data	4	2	5	10	7	7	3.61
Making false claims about the data	4	3	9	8	6	7	3.70
Drawing unwarranted conclusions	9	7	8	6	8	7	3.92
Other	1						

^a Labels for scenarios are explained in Table 1 in the body of the paper. Table entries refer to number of participants (out of 10) who identified a particular technique as being used in that scenario.

^b Judged prevalence of technique averaged across participants and scenarios. Means are on a 4-point scale ranging from “Not representative at all and uncommon” (1) to “Very representative and common” (4).

^c Scenarios AI1 and GL involved successive presentation of two graphs, each accompanied by a set of questions. Only responses following the second graph (after all data had been shown) are considered.

Results

The experts overwhelmingly identified all contrarian statements as misleading: Out of 60 total judgments, 53 “strongly agreed” that the statements were misleading, and there was only a single response below the midpoint (representing “strong disagreement” that the GL claim was misleading; this response likely represented an accidental scale reversal given that the same participant strongly agreed for all other statements that they were misleading). Conversely, experts widely disagreed that the claims were confirmed by the data, with 48 responses recording various levels of disagreement (out of 60). No inferential statistics are reported in light of this consensual interpretation of contrarian claims.

Table S1 shows the identification of interpretative techniques by the experts and their judged prevalence. It is clear that all techniques are given high prevalence ratings, with means close to the maximum score of 4 (“Very representative and common”). Out of 187 judgments overall, 82% ($N = 153$) received the maximum score of 4, and a further 15% (28) received a 3 (“fairly representative”). Only 3% (6) received a score of 2 (“infrequently used but somewhat representative”) that was below the midpoint.

The rating study confirmed that contrarian claims about key climatological data were judged to be misleading by climate experts. More important, the experts also affirmed that the interpretative strategies underlying the particular claims used in our studies were representative and prevalent among contrarians. The latter result is of particular relevance because together with Study 1 it confirms that our 6 stimulus scenarios are representative of a broader approach to climate-data interpretation by contrarians.

Additional table for Study 2

Table S2: Mean responses to all items and scenarios in Study 2

Group ^a	Scenario	Version ^b	Confirm (R) ^c	Contradict ^c	Mislead ^c	Goodpol (R) ^c	Score ^d
E	AI1	Contr	3.78	4.00	5.44	4.56	-0.94
E	AI1	Main	3.77	2.92	3.38	2.92	0.25
E	AI2	Contr	3.25	2.88	3.00	3.62	0.31
E	AI2	Main	1.79	2.43	2.93	2.50	1.09
E	GL	Contr	4.00	4.73	5.00	4.36	-1.02
E	GL	Main	3.00	2.55	3.00	2.55	0.73
E	SLR1	Contr	3.42	4.25	3.92	3.25	-0.21
E	SLR1	Main	2.30	2.80	2.90	3.20	0.70
E	SLR2	Contr	3.75	4.75	4.50	3.75	-0.69
E	SLR2	Main	1.83	2.28	2.56	2.33	1.25
E	GMST	Contr	5.15	5.38	5.38	4.77	-1.67
E	GMST	Main	2.67	3.33	3.33	2.67	0.50
E		Contr	4.05	4.45	4.63	3.90	-0.76
E		Main	2.43	2.51	2.89	2.59	0.90
S	AI1	Contr	4.53	4.47	5.67	5.87	-1.63
S	AI1	Main	2.80	2.67	3.67	3.87	0.25
S	AI2	Contr	2.41	2.71	3.94	4.47	0.12
S	AI2	Main	2.38	2.23	2.69	3.31	0.85
S	GL	Contr	5.50	4.75	5.08	5.00	-1.58
S	GL	Main	1.89	1.78	2.50	3.06	1.19
S	SLR1	Contr	5.22	4.17	4.33	4.78	-1.12
S	SLR1	Main	2.50	2.25	2.17	2.92	1.04
S	SLR2	Contr	4.43	4.21	4.79	4.79	-1.05
S	SLR2	Main	1.56	1.62	2.19	2.38	1.56
S	GMST	Contr	5.88	5.38	5.56	5.69	-2.12
S	GMST	Main	4.00	3.71	3.93	3.86	-0.38
S		Contr	4.83	4.29	4.87	5.16	-1.29
S		Main	2.29	2.15	2.65	3.04	0.97

^a Group E=economists; Group S=statisticians.

^b Version Contr=contrarian claim; Version Main=mainstream scientific interpretation.

^c Columns refer to individual items. R indicates that item is reverse-scored for analysis. Confirm="The data confirm the claim made by X"; Contradict="The data contradict the claim made by X"; Mislead="The claim made about the data by X is misleading"; Goodpol="The statement summarizes the data in a way that is appropriate for advising and supporting decisions by policy makers, industry, or other decision-making bodies". All items are scored on a 6-point scale from 1=strongly disagree to 6=strongly agree, where higher scores imply that the item is found to be more misleading.

^d Overall correctness score (composite of all other items, zero-centered) used in main analysis.

Commentary

TIDE TURNS ON SEA-LEVEL ALARMISTS

BOB CARTER

828 words

12 December 2014

The Australian

AUSTRALN

Australian

14

English

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At last, in Queensland, a government shows some coastal management responsibility

Australia is lucky to possess the high-quality, 128-year-long tide gauge record from Fort Denison (Sydney Harbour), which since 1886 indicates a long-term rate of sea-level rise of 0.65mm a year, or 6.5cm a century.

Lucky, because 60-year-long oceanographic atmospheric oscillations mean a true long-term measurement of sea-level rise can be made only when such a record is available.

Similarly low rates of local sea-level rise have been measured at other tide gauges along the east coast. National Tidal Centre records reveal variations between about 5cm and 16cm/century in rates of relative rise. The differences between individual tide gauges mostly represent slightly differing rates of subsidence of the land at each site, and differing time periods.

For example, measurements at Sydney between 2005 and 2014 show the tide gauge site is sinking at a rate of 0.49mm/yr, leaving just 0.16mm/yr of the overall relative rise as representing global sea-level change. Indeed, the rate of rise at Fort Denison, and globally, has been decreasing for the past 50 years.

Despite this high-quality and unalarming data, it is surprising that some east coast councils have implemented coastal planning regulations based on the computer projections of the [UN's Intergovernmental Panel on Climate Change](#). For instance, a recent consultancy report for the Shoalhaven and Eurobodalla shire councils, informed by IPCC computer model projections, advised those councils to plan using a rate of rise of 3.3mm/yr, four times the rate at Fort Denison.

The numbers were in part based on experimental estimates of sea-level change provided by satellite altimetry measurements. NASA's Jet Propulsion Laboratory, which launches the satellite platforms, says these estimates contain errors larger than the sea-level signal claimed and proposes spending more than \$US100 million on launching a new GRASP satellite to rectify the matter.

Mindful of these facts, on October 28, Shoalhaven Shire Council rejected advice to use the IPCC's most extreme emissions Scenario 8.5, applying the still highly precautionary Scenario 6.0, and using their nearest long tide gauge record (Fort Denison) to set future planning policy. The council specifically ruled out the future use of satellite or model-generated sea-level estimates until their accuracy is guaranteed.

In mid-2010, the Eurobodalla council, south of Shoalhaven, introduced a unique interim sea level rise policy that shackled more than a quarter of all properties in the shire to restrictive development controls. Predictably, there was an immediate shire-wide decline in property values.

Figures from RP Data property information specialists show that between 2011 and 2014, Eurobodalla property values suffered a 5.3 per cent loss in value compared with increases of 4.9 per cent and 7.3 per cent for neighbouring coastal shires that didn't have equivalent restrictive sea-level policies. In the worst cases, individual properties have lost up to 52 per cent of their market value.

In three years, individual Eurobodalla properties lost about \$40,000 in value. With 22,000 properties in the

shire, this represents a capital loss of \$880m at a rate of \$293m a year. This steady loss of rateable value means householders will face higher rate increases.

If similar policies were implemented along the entire east coast there would be annual property capital losses of billions of dollars.

So it is not surprising that NSW and Queensland governments are reconsidering their coastal management policies.

Queensland Deputy Premier Jeff Seeney recently notified [Moreton Bay Regional Council](#) of his intention to direct it to amend its draft planning scheme “to remove any assumption about a theoretical projected sea level rise due to climate change from all and any provisions of the scheme”. Seeney said his intention was to use a statewide coastal mapping scheme “that will remove the ‘one size fits all’ approach that incorporates a mandatory 0.8m addition to historical data”.

At last, a responsible government has recognised that global average sea-level change is no more relevant to coastal management than average global temperatures are to the design of residential heating and cooling systems — local weather and local sea-level change is what matters.

Satellite measurements and computer model projections are not accurate enough for shire planning. As the NSW Chief Scientist has said, coastal policy needs to be informed by the best available factual measurements.

And as Seeney said: “All mandatory elements of the (planning) scheme must reflect only proven historical data when dealing with coastal hazards such as storm tide inundation and erosion control areas.” Similar policies need to be espoused by all state governments and councils.

Sea-level alarmism has passed high tide and is at last declining. With luck, empirical sanity will soon prevail over modelling. Bob Carter is a co-author with John Spooner of *Taxing Air*.

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TheNation

Climate rule change sees councils exposed

Michael McKenna, Rebecca Doubleday

360 words

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Australian

6

English

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QUEENSLAND councils are claiming they are now exposed to legal action from home and land owners following a precedent-setting move by the Newman government to remove a predicted 0.8m sea level rise because of climate change from a Brisbane council's draft regional plan.

Deputy Premier Jeff Seeney ordered the [Moreton Bay Council](#), near Brisbane, to remove the sea level forecasts amid outcry from some residents it would lead to development applications on low-lying land being rejected.

[Moreton Bay Council](#) was following the lead of other councils in Queensland, and throughout Australia, to adopt the predicted 0.8m rise by 2100 in their future planning and to adhere to the demands of insurers. The state government removed the predicted sea level rises from its own planning policy late last year.

The Local Government Association of Queensland yesterday said it had legal advice that councils could be liable for damages if they were forced to remove the predicted sea level rises from their planning schemes and developments go ahead in vulnerable areas. LGAQ chief executive Greg Hallam said the sea level forecasts were demanded by London-based underwriters of the council's insurers.

"We obtained advice from the leading QC in the country in respect of these matters and they made it extremely clear to us that councils had common law responsibility both at strategic planning level and development assessment levels," he said.

Mr Seeney yesterday said while predicted sea level rises should be taken into account for future developments, he wanted to protect the rights of existing landowners. "It is possible for councils across Queensland to take account of potential sea level rises in their planning schemes while not eroding the rights of residents to develop.

"The state understands and expects councils to take account of potential climate change issues in the planning of new developments," he said. "However, they must take a more understanding and sensible approach to existing suburbs to ensure homeowners maintain existing rights such as being able to construct a deck on their house, or make other improvements to their property."

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Commentary

G20 CAN cold-FRONT CLIMATE LOBBY

MICHAEL ASTEN

815 words

13 November 2014

The Australian

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Australian

12

English

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The global temperature theorists are relying on outdated observational data

THE climate lobby will be working the corridors of the G20 meeting in Brisbane this weekend, using the recent [Intergovernmental Panel on Climate Change Synthesis Report](#) and Climate Council commentary.

Curiously, neither has updated the underlying observational science relating to climate change; the figures are subsets from the IPCC Fifth Assessment Report, where data and literature review stops at 2012. Observational data and climate model predictions are presented separately, concealing the uncomfortable truth of the global temperature hiatus, which challenges the fundamental assumptions of the models. It is a challenge that gets stronger every year as increasing atmospheric CO2 content is unmatched by predicted temperature increase.

How would Joe Hockey fare if he went to the G20 with economic data that was two years out of date?

While scientists published in top journals treat the temperature hiatus as fact, activists still deny its existence. Thus the Climate Council (once a proud group of government-funded scientists in the Climate Commission, now a privately funded lobby group) claims, "Myth: The Earth has stopped warming since 1998". Use of the word warming is imprecise, being interpreted as "temperature" or "heat content" depending on the argument of the moment.

The "heat content" approach hypothesised that warming of the deep oceans was compensating for lack of global surface warming. This has been studied in a series of important papers, most recently by William Llovel and co-workers at the [California Institute of Technology](#) who used quantitative observations of global ocean mass and temperature profiles to show that the deep ocean has in fact cooled slightly in the past decade.

Failure to include this in updated assessments by the IPCC and Climate Council is inexcusable.

The hiatus in temperature can also be studied using smoothed averages. Both the Synthesis Report and the Climate Council report use old plots that show a steady rise in smoothed temperature to 2010 (the decade of the start of the hiatus).

Yet NASA's Goddard Institute of Space Studies' global temperature graphs are updated monthly, show five-year averages, are publicly available on the internet and show average temperatures peaked in 2004 and show a decline for the following eight years. Since similar declines in global temperature occurred in 1880-1910 and 1950-75, it is reasonable to ask whether the present apparent decline is historically unusual, and why our government science advisers persist in the view that steady increases in atmospheric CO2 are the major driver of such changes.

If a downward trend in global temperature is confirmed in the next decade, it will be no surprise — at least three recent peer-reviewed papers predict that — but such views are not even hinted at in the IPCC or Climate Council reviews of possible scenarios.

The dichotomy between observational data and models is similarly marked with sea-level data of the past 120 years. The rate of rise across the past century is 1.7mm a year and has increased to about 3.2mm a year across the past 20 years. The data shows that the fast 3.2mm a year rate of rise has occurred twice in historic times (around 1860-80 and 1930-50). The IPCC modelling studies of sea level rise to 2100 show up to 80cm of total rise by 2100, increasing from the present 3.2 to a predicted huge 15mm a year. These projections have immense economic and community importance, as they have been supplied to government and planning

bodies for consideration of restrictions on coastal land development.

Given we have 20 years of overlapping precise satellite altimeter-observed data and the models, we should have been given comparisons between sea-level data and model predictions, and assessment of any evidence for acceleration of the rate of rise in the first sixth of this century. Yet neither the IPCC nor the Climate Council, or the publicly funded CSIRO on its website, even admits the existence of recent data such as that by Anny Cazenave and co-workers at the Geophysical and Oceanography Laboratory, Toulouse, which shows that from 1994 to 2011 the rate of observed rise in global sea level decreased from 3.5 to 2.5mm a year.

It is of great concern that bodies meant to provide scientific advice are unable to admit that observations show the rate of sea level rise going in the opposite direction to predictions for the first 15 per cent of the model time span.

If Australian politicians get shirt-fronted at the G20 on climate change, they should insist on briefings on recent observational data and its implications for climate model predictions before committing taxpayer dollars to the \$100 billion a year [UN](#)-led Green Climate Fund. Michael Asten is a professor of geophysics at [Monash University](#), Melbourne.

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Commentary

A few facts that might be news to our self-styled experts Mungo, Waleed and Antony

646 words

29 October 2014

The Australian

AUSTRALIAN

Australian

13

English

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CUT & PASTE Sometimes it's hard to keep up with pesky details like the gender of a foreign minister

Nothing to do with Islam? Channel 10's The Project, May 6: ROVE McManus: So who is this group ([Boko Haram](#)) exactly? ... Self-styled terror expert Waleed Aly: They are a really, really hard group to define because they are so splintered and so diverse. It started as a fairly coherent group — this is a long time ago, over 10 years ago — and since then they've splintered off into all these other little groups. What we do know though is that the broader movement is a terrorist movement and they've been wanting to overthrow the Nigerian government and establish a government of their own. But beyond that, this particular group, who have done this particular thing, it's hard to identify who they are and they might just be vigilantes.

A few details about [Boko Haram](#) that terror expert Waleed Aly might want to bone up on? Charlotte Krol, Britain's The Telegraph, Monday: VICTIMS who escaped the Nigerian [Boko Haram](#) kidnappings in which hundreds of women have been violently forced to convert to Islam have spoken about their ordeal. The abuse of more than 500 women and girls since 2009 has been detailed in a [Human Rights Watch](#) report that says they are whipped, beaten or killed unless they convert to Islam ... One victim explained how Muslims and Christian women are treated differently by the terrorist group. "They told the Muslims to stand to one side and the four of us Christians to the other — they released the Muslims but kept us," she said.

The heat's in the deep oceans? Mungo MacCallum, [ABC](#) online's The Drum, October 20: SINCE 1998 there is some evidence that surface temperatures have plateaued (though not fallen) ... But the problem with the so-called global warming pause, spruiked by the sceptics beloved of The Australian, is that it doesn't make sense; the heat has to go somewhere ... possibly in the deep oceans ...

A few details about deep ocean heat that MacCallum might want to bone up on? AFP, October 6: LATEST data from satellite and direct ocean temperature measurements from 2005 to 2013 "found the ocean abyss below 1995m has not warmed measurably", NASA said in a statement ... "The combination of satellite and direct temperature data gives us a glimpse of how much sea level rise is due to deep warming. The answer is — not much."

The Guardian Australia yesterday: HOW to be an investigative journalist with Antony Loewenstein. You'll come out of this one-day Masterclasses with a detailed understanding of investigative journalism, from start to finish.

A little grammar for Antony to investigate. Tim Blair, The Daily Telegraph blogs, yesterday: YOU'LL come out of this one-day Masterclasses with a detailed understanding of investigative journalism, from start to finish. But you still won't know the difference between singular and plural.

Investigative journalist Antony Loewenstein, New Matilda, 2005: YET more evidence of Israel speaking the language of "peace" but acting entirely differently came from a senior ally of Sharon, Justice Minister Tzipi Livni.

He told a legal conference in early December that, despite years of Israeli denials, Sharon himself imagines the 425-mile separation barrier as the future border between Israel and a potential Palestinian State.

"One does not have to be a genius to see that the fence will have implications for the future border," he said.

A few things about Tzipi Livni's gender Loewenstein might want to investigate? Encyclopedia Britannica website: TZIPI Livni (is an) Israeli politician who served as minister of foreign affairs (2006 to 2009). She was also the leader of the Kadima party (2008 to 2012).

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TheNation

NASA rules out deep ocean for hidden heat

GRAHAM LLOYD ENVIRONMENT EDITOR

395 words

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The Australian

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3

English

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THE “missing heat” that would explain the more than decade-long pause in global average surface temperatures could not be found in the deep ocean, a NASA study has found.

The report in journal *Nature Climate Change* said the absence of warming below 1995 metres left “unresolved the mystery of why global warming appears to have slowed in recent years”.

NASA’s analysis had shown deep ocean warming had contributed “virtually nothing” to sea level rise for the past 20 years.

Study co-author Josh Willis said the findings did not throw suspicion on climate change itself because “the sea level is still rising”.

And other research by the [US Department of Energy](#), also published in *Nature Climate Change*, said earlier warming in the upper Southern Ocean had been underestimated by up to 58 per cent.

The NASA research said the temperature increase in the upper oceans was not enough to explain the “pause”.

“In the 21st century, greenhouse gases have continued to accumulate in the atmosphere, just as they did in the 20th century, but global average surface air temperatures have stopped rising in tandem with the gases,” NASA said.

“The temperature of the top half of the world’s oceans — above the 1995m mark — is still climbing, but not fast enough to account for the stalled air temperatures.” Many processes on land, air and sea have been invoked to explain what is happening to the “missing” heat.

This NASA study was the first to test the idea using satellite observations, as well as direct temperature measurements of the upper ocean.

Scientists have been taking the temperature of the top half of the ocean directly since 2005, using a network of 3000 floating temperature probes called the Argo array.

“The deep parts of the ocean are harder to measure,” said NASA Jet Propulsion Laboratory’s William Llovel, lead author of the study.

“The combination of satellite and direct temperature data gives us a glimpse of how much sea level rise is due to deep warming. The answer is — not much”, he said. Study co-author Dr Willis said the findings did not throw suspicion on climate change and his colleague, Felix Landerer, said warming in the top half of the ocean continued, a clear sign that our planet is heating up.

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TheNation

Scientists scotch 'tenuous' 2C climate goal

GRAHAM LLOYD, ENVIRONMENT EDITOR

438 words

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The Australian

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5

English

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THE 16-year pause in global average surface temperature rise made the scientific case to limit climate change to 2C "tenuous", a widely promoted article in Nature says.

As a result, a new set of indicators or "vital signs" was needed to gauge the stresses that humans were placing on the climate system, joint authors David Victor and Charles Kennel from University of California said.

The suggested new measures include the level of CO2 in the atmosphere, ocean heat content and high latitude temperatures.

The Nature article confronts head-on the dilemma of the pause in global surface temperatures that climate scientists have long argued did not exist. Strong debate remains as to whether or not the pause is an "existential" issue for climate change as a major concern.

A recent peer-reviewed paper said the earth's climate was less sensitive to rising levels of CO2 than had previously been claimed.

At the least, the lack of surface warming has highlighted gaps in scientific understanding of natural variability. US climate scientist Judith Curry said: "I do regard the emerging realisation of the importance of natural variability to be an existential threat to the mainstream theory of climate variations on decadal to century timescales." The Victor and Kennel article said the fact the planet's average temperature had barely risen in the past 16 years made the scientific basis for the 2C goal set by the [Intergovernmental Panel on Climate Change](#) tenuous.

"But other measures show that radiative forcing — the amount by which accumulating greenhouse gases in the atmosphere are perturbing the planet's energy balance — is accelerating," they said.

"How could human stresses on the climate be rising faster even as global surface temperatures stay flat?" they asked. "The answer almost certainly lies in the oceans.

"The oceans are taking up 93 per cent of the extra energy being added to the climate system, which is stoking sea-level rise and other climate impacts." Limiting global warming to 2C has been the aim of nearly every policy to reduce carbon emissions.

Professor Victor and Professor Kennel said "politically and scientifically the 2 goal is wrongheaded. Politically, it has allowed some governments to pretend that they are taking serious action to mitigate global warming when in reality they have achieved almost nothing," they said. "Scientifically, there are better ways to measure the stress humans are placing on the climate system than the growth of average global surface temperature, which has stalled since 1998 and is poorly coupled to entities that governments and companies can control directly."

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Feature

A DEGREE OF UNCERTAINTY

STEVEN E. KOONIN

2054 words

23 September 2014

The Australian

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Australian

11

English

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Climate science is not sufficiently settled to confidently predict what the future holds

THE idea that “climate science is settled” runs through today’s popular and policy discussions. Unfortunately, that claim is misguided. It has not only distorted our public and policy debates on issues related to energy, greenhouse gas emissions and the environment, it also has inhibited the scientific and policy discussions that we need to have about our climate future.

My training as a computational physicist — together with a 40-year career of scientific research, advising and management in academe, government and the private sector — has afforded me an extended, up-close perspective on climate science. Detailed technical discussions during the past year with leading climate scientists have given me an even better sense of what we know and don’t know about climate. I have come to appreciate the daunting scientific challenge of answering the questions that policymakers and the public are asking.

The crucial scientific question for policy isn’t whether the climate is changing. That is a settled matter: the climate has always changed and always will. Geological and historical records show the occurrence of major climate shifts, sometimes across only a few decades. We know, for instance, that during the 20th century the Earth’s global average surface temperature rose 0.8C.

Nor is the crucial question whether humans are influencing the climate. That is no hoax; there is little doubt in the scientific community that continually growing amounts of greenhouse gases in the atmosphere, due largely to carbon dioxide emissions from the conventional use of fossil fuels, are influencing the climate. There is also little doubt that the carbon dioxide will persist in the atmosphere for several centuries. The impact today of human activity appears to be comparable to the intrinsic, natural variability of the climate system itself.

Rather, the crucial, unsettled scientific question for policy is: how will the climate change during the next century under both natural and human influences?

Answers to that question at the global and regional levels, as well as to equally complex questions of how ecosystems and human activities will be affected, should inform our choices about energy and infrastructure.

But — here’s the catch — those questions are the hardest ones to answer. They challenge, in a fundamental way, what science can tell us about future climates.

Even though human influences could have serious consequences for the climate, they are physically small in relation to the climate system as a whole. For example, human additions to carbon dioxide in the atmosphere by the middle of the 21st century are expected to directly shift the atmosphere’s natural greenhouse effect by only 1 per cent to 2 per cent. Since the climate system is highly variable on its own, that smallness sets a very high bar for confidently projecting the consequences of human influences.

A second challenge to knowing future climate is today’s poor understanding of the oceans. The oceans, which change across decades and centuries, hold most of the climate’s heat and strongly influence the atmosphere. Unfortunately, precise, comprehensive observations of the oceans are available only for the past few decades; the reliable record is still far too short to adequately understand how the oceans will change and how that will affect climate.

A third fundamental challenge arises from feedbacks that can dramatically amplify or mute the climate’s

response to human and natural influences. One important feedback, which is thought to approximately double the direct heating effect of carbon dioxide, involves water vapour, clouds and temperature.

But feedbacks are uncertain. They depend on the details of processes such as evaporation and the flow of radiation through clouds. They cannot be determined confidently from the basic laws of physics and chemistry, so they must be verified by precise, detailed observations that are, in many cases, not yet available.

Beyond these observational challenges are those posed by the complex computer models used to project future climate. These massive programs attempt to describe the dynamics and interactions of the various components of the Earth system — the atmosphere, the oceans, the land, the ice and the biosphere of living things. While some parts of the models rely on well-tested physical laws, other parts involve technically informed estimation. Computer modelling of complex systems is as much an art as a science.

For instance, global climate models describe the Earth on a grid that is currently limited by computer capabilities to a resolution of no finer than 100km. But processes such as cloud formation, turbulence and rain all happen on much smaller scales. These critical processes then appear in the model only through adjustable assumptions that specify, for example, how the average cloud cover depends on a grid box's average temperature and humidity. In a given model, dozens of such assumptions must be adjusted ("tuned", in the jargon of modellers) to reproduce current observations and imperfectly known historical records.

We often hear that there is a "scientific consensus" about climate change. But as far as the computer models go, there isn't a useful consensus at the level of detail relevant to assessing human influences. Since 1990, the [UN Intergovernmental Panel on Climate Change](#) has periodically surveyed the state of climate science. Each successive report from that endeavour, with contributions from thousands of scientists around the world, has come to be seen as the definitive assessment of climate science at the time.

For the latest IPCC report (September last year), its Working Group I, which focuses on physical science, uses an ensemble of about 55 models. Although most of these models are tuned to reproduce the gross features of the Earth's climate, the marked differences in their details and projections reflect all of the limitations I have described. For example:

- The models differ in their descriptions of the past century's global average surface temperature by more than three times the entire warming recorded during that time. Such mismatches are also present in many other basic climate factors, including rainfall, which is fundamental to the atmosphere's energy balance. As a result, the models give widely varying descriptions of the climate's inner workings. Since they disagree so markedly, no more than one of them can be right.

- Although the Earth's average surface temperature rose sharply by 0.5C during the last quarter of the 20th century, it has increased much more slowly for the past 16 years, even as the human contribution to atmospheric carbon dioxide has risen by 25 per cent.

This surprising fact demonstrates directly that natural influences and variability are powerful enough to counteract the present warming influence exerted by human activity. Yet the models famously fail to capture this slowing in the temperature rise. Several dozen explanations for this failure have been offered, with ocean variability most likely playing a major role. But the whole episode continues to highlight the limits of our modelling.

- The models roughly describe the shrinking extent of Arctic sea ice observed across the past two decades, but they fail to describe the comparable growth of Antarctic sea ice, which is now at a record high.

- The models predict that the lower atmosphere in the tropics will absorb much of the heat of the warming atmosphere. But that "hot spot" has not been confidently observed, casting doubt on our understanding of the crucial feedback of water vapour on temperature.

- Even though human influence on climate was much smaller in the past, the models do not account for the fact the rate of global sea-level rise 70 years ago was as large as what we observe today — about 30cm a century.

- A crucial measure of our knowledge of feedbacks is climate sensitivity — that is, the warming induced by a hypothetical doubling of carbon dioxide concentration. Today's best estimate of the sensitivity is no different, and no more certain, than it was 30 years ago. And this is despite a heroic research effort costing billions of dollars.

These and many other open questions are in fact described in the IPCC research reports, although a detailed and knowledgeable reading is sometimes required to discern them. They are not “minor” issues to be “cleaned up” by further research. Rather, they are deficiencies that erode confidence in the computer projections. Work to resolve these shortcomings in climate models should be among the top priorities for climate research.

Yet a public official reading only the IPCC’s Summary for Policymakers would gain little sense of the extent or implications of these deficiencies. These are fundamental challenges to our understanding of human impacts on the climate, and they should not be dismissed with the mantra that “climate science is settled”.

While the past two decades have seen progress in climate science, the field is not yet mature enough to usefully answer the difficult and important questions being asked of it. This decidedly unsettled state highlights what should be obvious: understanding climate, at the level of detail relevant to human influences, is a very, very difficult problem.

We can and should take steps to make climate projections more useful across time. An international commitment to a sustained global climate observation system would generate an ever-lengthening record of more precise observations. And increasingly powerful computers can allow a better understanding of the uncertainties in our models, finer model grids and more sophisticated descriptions of the processes that occur within them.

The science is urgent, since we could be caught flat-footed if our understanding does not improve more rapidly than the climate itself changes.

A transparent rigour also would be a welcome development, especially given the momentous political and policy decisions at stake. That could be supported by regular, independent, “red team” reviews to stress-test and challenge the projections by focusing on their deficiencies and uncertainties; that would certainly be the best practice of the scientific method.

But because the natural climate changes across decades, it will take many years to get the data needed to confidently isolate and quantify the effects of human influences.

Policymakers and the public may wish for the comfort of certainty in their climate science. But I fear that rigidly promulgating the idea that climate science is settled (or is a hoax) demeans and chills the scientific enterprise, retarding its progress in these important matters. Uncertainty is a prime mover and motivator of science and must be faced head-on. It should not be confined to hushed sidebar conversations at academic conferences.

Society’s choices in the years ahead necessarily will be based on uncertain knowledge of future climates. That uncertainty need not be an excuse for inaction. There is well-justified prudence in accelerating the development of low-emissions technologies and in cost-effective energy-efficiency measures.

But climate strategies beyond such “no regrets” efforts carry costs, risks and questions of effectiveness, so non-scientific factors inevitably enter the decision. These include our tolerance for risk and the priorities that we assign to economic development, poverty reduction, environmental quality, and intergenerational and geographical equity.

Individuals and countries can legitimately disagree about these matters, so the discussion should not be about believing or denying the science. Despite the statements of numerous scientific societies, the scientific community cannot claim any special expertise in addressing issues related to humanity’s deepest goals and values. The political and diplomatic spheres are best suited to debating and resolving such questions, and misrepresenting the current state of climate science does nothing to advance that effort.

Any serious discussion of the changing climate must begin by acknowledging not only the scientific certainties but also the uncertainties, especially in projecting the future. Recognising those limits, rather than ignoring them, will lead to a more sober and ultimately more productive discussion of climate change and climate policies. To do otherwise is a great disservice to climate science. Steven E. Koonin was undersecretary for science in the [US Energy Department](#) during President Barack Obama’s first term and is director of the Centre for Urban Science and Progress at New York University. His previous positions include professor of theoretical physics and provost at the [California Institute of Technology](#), as well as chief scientist of [BP](#), where his work focused on renewable and low-carbon energy technologies.

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TheNation

\$226bn at risk of rising tides

SID MAHER

345 words

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The Australian

AUSTLN

Australian

5

English

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MORE than \$226 billion of properties, roads and rail lines on the Australian coast could be at risk from rising sea levels and associated storm surges if climate change produces a sea level rise of about 1m.

A report by the Climate Council, to be released today, warns that sea levels are expected to rise between 0.4m and 1m over the next century and that coastal flooding risks roughly treble with every 0.1m rise.

Storm surges would become more frequent in Sydney despite the city already dealing with flooding events that became three times more common during the 20th century as a result of sea level rises.

The report builds on previously published research on the impacts of climate change by the Climate Commission, which was set up by the Gillard government and abolished by the Abbott government. In the wake of its scrapping, Climate Commission head Tim Flannery set up the independently funded Climate Council.

Fremantle had also experienced the same rise in flooding events. But the report found that Victoria and Queensland had the most coastline at risk.

The report warns that under a high-end sea level rise scenario, \$14bn-\$20bn worth of residential buildings would be at risk in NSW (44,000 to 68,000 residences); \$5bn-\$9bn of commercial buildings; \$7bn of roads and up to \$1.3bn of rail and tramways.

In Queensland, under the same scenario, \$15bn-\$20bn worth of residential buildings would be at risk representing 44,000 to 68,000 residential buildings; \$10bn to \$15bn worth of commercial buildings up to \$12.9bn in roads and \$2.3bn of rail and tram track. In Victoria, \$8bn-\$11bn worth of residential buildings would be at risk representing 31,000 to 48,000 residential buildings, \$8bn-\$12bn of commercial buildings; \$7bn of roads and \$500 million of rail and tram tracks. The report also warns that higher sea levels pose risks for the Great Barrier Reef, Torres Strait communities and Kakadu National Park in the Northern Territory.

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TheNation

Puzzle of deep ocean cooling

GRAHAM LLOYD, ENVIRONMENT EDITOR

587 words

25 July 2014

The Australian

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Australian

4

English

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EXCLUSIVE THE deep oceans have been cooling for the past two decades and it is not possible to say whether changes in ocean heat adequately explain the “pause” in global warming, two of the world’s leading ocean scientists have said.

Warmer oceans have been a key explanation for the “missing” heat. Global average surface temperatures have not increased dramatically for more than a decade despite steadily rising carbon dioxide levels in the atmosphere.

A paper by Carl Wunsch from [Harvard University](#) and Patrick Heimbach from [MIT](#), accepted for publication with the Journal of Physical Oceanography, says more work is needed.

“Direct determination of changes in ocean heat content over the past 20 years are not in conflict with estimates of the radiative forcing, but the uncertainties remain too large to rationalise, e.g. the apparent ‘pause’ in warming,” Professor Wunsch and Dr Heimbach say.

They conclude that much less heat is being added to the oceans than has been claimed in previous studies.

Professor Wunsch and Dr Heimbach say trends showed a warming in the upper ocean and a net cooling below 2000 metres. Below 3600m, the cooling is about 0.01 celsius over 19 years.

“As with many climate-related records, the unanswerable question here is whether these changes are truly secular, and/or a response to anthropogenic forcing, or whether they are fragments of a general red noise behaviour,” the paper says.

Some climate scientists claim the deep oceans are not significant because of the long timeframes over which temperature changes occur.

Professor Wunsch and Dr Heimbach say shifts in deep ocean properties “may indeed be so slight that their neglect in discussions of heat uptake and sea level change is justified”.

“The history of exploration suggests, however, that blank places on the map have either been assumed to be without any interesting features and dropped from further discussion, or at the other extreme filled with ‘dragons’ invoked to explain strange reports,” they say.

The paper says that, given the combination of the high stakes for society in the accurate estimation of global heating rates and sea level rise, and the fundamental science questions of understanding of oceanic variability, direct confirmation or refutation of the existing hypothesis was essential.

Andy Hogg from ANU said while there was uncertainty about temperatures in the deep ocean, shallower regions were well understood, and the findings of the Wunsch paper were “consistent” with warming oceans. He said cooling of the deep ocean was not necessarily significant. “Most parts of the abyssal ocean take a very long time (centuries to millennia) to come into equilibrium with surface forcing,” he said. “So if cooling has occurred over large parts of the abyssal ocean, it is unrelated to global warming of the atmosphere over the last century.” He said there were key parts of the abyss, which had a closer connection with the surface. “The paper indicates that these regions have indeed been consistent with the expected heat uptake of the ocean in a warmer world,” Dr Hogg said. A recent paper by Matthew England, executive director of the climate change research centre at the University of NSW, said the global surface temperature “hiatus” could be explained by increased winds in the Pacific Ocean. The paper claims the strong trade winds, which pushed heat deeper into

the ocean, explained why climate models had not matched physical observations on global temperatures, a key area of dispute between climate scientists and sceptics.

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Commentary

Letters to the Editor

745 words

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English

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There is evidence that Hamas stashes rockets around schools in Gaza ACCORDING to Ali Kazak, "Israel's claim that the Palestinian resistance stores weapons in houses, mosques, hospitals and schools is a lie to justify targeting and collectively punishing the civilian population" ("Israel is not above law", 23/4). A lie?

Last week, the [UN](#) Relief and Works Agency published a statement that it had found 20 rockets stashed in a school in Gaza operating under its auspices and condemning the group or groups responsible. On Tuesday, UNRWA found more rockets that had been secreted in another of its schools in Gaza.

UNRWA said it "strongly and unequivocally condemns the group or groups responsible for this flagrant violation of the inviolability of its premises under international law." Israel is using its weapons to protect its civilians from [Hamas](#) rockets and from terrorist attacks through its network of tunnels. [Hamas](#) is using its civilians and civilian buildings, to protect its weapons. Even the Palestinian representative to the [UN Human Rights Council](#), Ibrahim Khraishi, has admitted that "each and every" Palestinian missile launched against Israeli civilians constitutes "a crime against humanity" and that, by contrast, Israel's response actions in Gaza have "followed the legal procedures". We know who is lying.

Peter Wertheim, Executive Council of Australian Jewry, Sydney, NSW

Lambie in context JACQUI Lambie told a crude joke about her taste in men. She did this on FM radio, a medium that prefers crude humour. She made fun of stereotypical preferences. She inverted the conventional form of objectification — usually it is men objectifying women. She was humorously turning the tables.

She told a joke and the radio hosts, the young man who called in, and the radio audience were in on the joke. I don't believe the young man or indeed any men were oppressed or degraded by this joke.

I acknowledge the serious issue people are raising. A person's attractiveness and worth should not be reduced to their physical attributes and financial status. It is overwhelmingly women and girls who are evaluated by their physical attributes, but men and boys face body image struggles as well, and in all cases this is wrong.

We ought to change our attitudes to recognise the reality of nature — that human beings come in many shapes and sizes. We should stop torturing ourselves if we do not fit a narrow, culturally created ideal.

But surely there is space in a good society for people to lighten up and tell some jokes. Context is key.

Nicholas Haines, Kenmore, Qld

THERE have been times when I have been embarrassed by the comments of some Tasmanian senators, but never so appalled or affronted as by the coarse and uncouth conversation of Jacqui Lambie on talkback radio, then replayed on national television.

With a significant salary and many fringe benefits, does she not understand that she has a responsibility to represent her state with dignity and intelligence — neither characteristic has she displayed to date.

If the voting for [the Senate](#) enables such inept and unsuitable candidates to be elected, it is high time the system was modified.

Nancye Read, Kings Meadows, Tas

Temperature reality AS conservative governments around the world begin to realise that pandering to global

warming denial is electoral suicide, it is perhaps no surprise that the NSW government has announced that it intends to be Australia's answer to California by encouraging more wind farms and solar panels, as June was the 352nd consecutive month when global temperatures were above the 20th century average.

Instead of accepting reality, the cult that global warming denial has become is reduced to arguments denying sea level rise, more extreme weather events and misrepresenting the [Intergovernmental Panel on Climate Change](#) (Letters, 23/7).

Chris Roylance, Paddington, Qld

Popular medicines CASSANDRA Wilkinson's article ("Hard to swallow this bitter pill", 19/7) about complementary medicines expressed a point of view which is inconsistent with the evidence. There is a growing evidence to support the use of CMs, which are taken by two-thirds of Australians.

CMs play an important role in maintaining good health and preventing and treating illness. Australians have embraced CMs as a way of treating short-term ailments, preventing and managing chronic conditions and staying healthy. CMs have a history of traditional use or scientific evidence to demonstrate their efficacy. Clinical studies have provided evidence to support their use. Steven Scarff, Australian Self-Medication Industry, Sydney, NSW

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Commentary

Letters to the Editor

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13

English

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Unions' budget solution smacks of economic naivety YOUR article "Make business pay for budget: [ACTU](#)" (22/7) highlights the problem Australia faces in industrial relations. Shifting the planned GP co-payment to business, demands for additional superannuation, and the demand for a working parents' allowance smacks of economic naivety.

It also indicates an unwillingness on the part of some union leaders to think broadly. Unions have a responsibility to safeguard workers' rights but, given their influence, they should also accept responsibility for the economic wellbeing of the country. Until they accept that wider responsibility and work with the party that happens to be in government, Australia will not make real progress in returning to a fiscal position that is sustainable.

Michael Schilling, Millswood, SA

SURELY the [ACTU](#) cannot be so foolish as to push claims on employers for the GP co-payment, fuel excise, working parents' allowance and increased super contributions. Have unions learned nothing from the many manufacturing businesses that have closed with resultant jobs losses while watching service industries outsource their work overseas?

Labor and the unions talk of fairness, but what is fair about Australians losing their jobs? Increasing labour costs to employers will lead to the further loss of jobs, increased cost of goods and services to consumers and lead to increasing imports and decreasing exports as business becomes less competitive.

Mort Schwartzbord, Caulfield, Vic

Shorten on climate THE reasons Bill Shorten gives for greenhouse gas reduction policies have no merit ("Shorten long on compassion", 22/7). He says that "climate change is real" — yes, climate has always changed, historical and paleo records show that recent changes are not unusual.

"Sea levels are rising" — sea level rise is about 3mm a year worldwide or about 300mm a century, no big deal. This is a little more than the average of the past several thousand years. The [Intergovernmental Panel on Climate Change](#) says the reasons for this, and whether the increased rate reflects an increase in the underlying long-term trend, are not clear.

"There are more extreme weather events than ever before" — the IPCC admits that this is not the case and that the links between warming and extreme weather are not clear.

Shorten says that "the Australian people are up for real and genuine action on climate change". Only those who have heard the scare stories and not looked at the evidence.

Michael Cunningham, West End, Qld

Aye for Scotland JACQUELIN Magnay's article was well-balanced, entertaining and generally favourable to Scotland regaining independence ("Scots tae think again", 22/7). Although I haven't lived there since 1976, I was born and reared in Scotland. I have visited often. Although it is hard to get a real handle on what folks in Scotland are thinking when you are no longer living in the country, I think most commentators focus on economic factors — peripheral issues.

Scots will vote primarily on emotional and historical grounds. They will vote with their hearts rather than their heads. I will be surprised if the yes vote doesn't get up.

Some will see such a result as being fraught with problems and dangers for Scotland, but I cannot think of a single country that has won its independence later seeking to renounce independence. When asked if you wanted Scotland to be independent, it would be a sorry sort of Scot who would say no.

Bill Anderson, Surrey Hills, Vic

Pseudo-medicines NOT surprisingly, the excellent article by Cassandra Wilkinson ("Hard to swallow this bitter pill", 19/7) triggered a reaction by Alan Bensoussan, representing the view of the National Institute of Complementary Medicine (Letters, 22/7).

Complementary medicines are most often assumed to be effective, simply because many people use them. In the eyes of their proponents, complementary medicines are simply waiting to be accepted by orthodox medicine. The opposite is true.

Scientific medicine tries many potential treatments. Some come from folk medicine. Seldom do they come from complementary medicines. If any treatment works, that is based on scientific evidence, it simply becomes medicine.

To claim that there are different medicines called complementary is to continue a subtle disingenuous campaign to preserve pseudo-science in health matters. The NICM should perhaps review its principles and join Friends of Science in Medicine campaigns to keep pseudo-medicines out of public health. Marcello Costa, Friends of Science in Medicine, [Flinders University](#), SA

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Commentary

Letters to the Editor

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The Australian

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Australian

17

English

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Cut from the top at the ABC, but some shows are sacred AS a consequence of the budget, the ABC is to suffer some slight financial cuts. Managing director Mark Scott said this must result in cuts in services and jobs. Might I suggest the cuts and job losses start at the top?

Scott and divisional heads, including the head of news, could be required to reapply for their jobs against all comers. The chairman and members of the board might be asked to justify their positions to a trio of management experts. Then some of the Left's pets might be sold off at auction to commercial media outlets, starting with Q&A, Insiders and Lateline. A television and radio network or two might also be closed down or sold off.

Radio National could be asked to part company with Fran Kelly, Jonathan Green, Waleed Aly and a few others. But hands off any television repeats of anything with Stephen Fry in it, or of series such as Father Brown, Midsomer Murders, Eggheads and New Tricks — the latter even to the fourth or fifth repeat.

Gregory Haines, Croydon, NSW

Glacial calculations THE glaciologist who claims a potential 61cm of sea level rise due to total melting of the Thwaites glacier ("Melting of Antarctic glaciers unstoppable", 14/5) demonstrates the ineptitude of supposed experts.

Such a global sea level rise would equate to an increase in ocean volume of 196 million cu/km. Given that the Thwaites glacier has an area of 168,000 sq/km, a volume of melt water such as that quoted means that the glacier is around 1100km thick. Some glacier!

John Nethery, Chillagoe, Qld

Terrorists claim link STEPHEN Morgan needs to be reminded that Islamic terrorist groups such as Boko Haram and al-Qa'ida themselves claim the link with Islam (Letters, 14/5). They themselves claim that they act in the name of Allah.

He also needs to be reminded that Islamic terrorism is worldwide and bent on destroying Western culture in order to establish Islam and sharia law, whereas the IRA movement was driven primarily by a localised nationalist independence philosophy which also happened to use violence as a tool to try to achieve its objective.

The difference is Islamic terrorism is based on an interpretation of the Koran; IRA terrorism had nothing to do with any interpretation of the Bible.

Deric Davidson, Bunbury, WA

Thin MH370 evidence BEFORE millions more dollars are dumped in the Indian Ocean, the thin evidence on which the search for MH370 is based should be seriously reviewed ("Confusion over flight recorders", 14/5) Not only is there now doubt about the black box signals, the Inmarsat analysis which directed the search to the seas west of Perth has been challenged by three US scientists. The group has come up with the conclusion that the search may be in the wrong ocean. They have re-evaluated the signals sent from MH370 and believe that Inmarsat's calculations of a southern track for the plane are wrong.

Their calculations are complex, based on frequency shifts in the signals, but the findings take into account for the first time that the Inmarsat satellite is not stationary but in an ellipse. Their results, if correct, show the

search in the Indian Ocean is based on faith in authority. The team has been trying for two months to get authorities to look at its data, without success. Geoffrey Luck, Killara, NSW

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Local

IPCC plays down sensitivity of change

GRAHAM LLOYD

425 words

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The Australian

AUSTLN

2 - All-round First

8

English

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THE Intergovernmental Panel on Climate Change has downplayed evidence that the global climate is considerably less sensitive to greenhouse gases than climate models are estimating, a new paper says.

Published by Britain's Global Warming Policy Foundation think tank, the new paper says clues to weaker climate sensitivity have all been referred to in the IPCC's recently published Fifth Assessment Report.

"However, this important conclusion was not drawn in the full IPCC report, it is only mentioned as a possibility, and is ignored in the IPCC's Summary for Policymakers," the report says.

The report was written by independent British climate scientist Nic Lewis and Dutch science writer Marcel Crok. Both were expert reviewers of the IPCC report, and Lewis was an author of two papers cited in it.

In a foreword to their report published by the foundation, respected US climate scientist Judith Curry says the sensitivity of the climate to increasing concentrations of carbon dioxide is at the heart of the scientific debate on anthropogenic climate change, and also the public debate on the appropriate policy response to increasing carbon dioxide in the atmosphere.

"Climate sensitivity and estimates of its uncertainty are key inputs into the economic models that drive cost-benefit analyses and estimates of the social cost of carbon," Dr Curry said.

The Lewis and Crok report says that for more than 30 years climate scientists have presented a range for climate sensitivity that remains largely unchanged at 1.5C to 4.5C.

But the new report suggests the inclusion of recent evidence, reflected in the IPCC's assessment, justifies a lower temperature range of 1.25C-3C, with a best estimate of 1.75C, for a doubling of CO2.

By contrast, the climate models used for projections in the assessment indicate a range of 2C-4.5C, with an average of 3.2C.

The report says new estimates point to climate sensitivity most likely being under 2C for long-term warming over 70 years.

"The observational evidence strongly suggest that climate models display too much sensitivity to carbon dioxide concentrations and in almost all cases exaggerate the likely path of global warming," Mr Lewis said.

A lower climate sensitivity to a doubling of CO2 in the atmosphere would result in considerably less global warming and sea level rise than most climate model projections suggest.

"We estimate that on the IPCC's second highest emissions scenario warming would still be around the international target of 2C in 2081-2100," he said.

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World

Severe storms linked to global warming

BEN WEBSTER, LONDON

THE TIMES

633 words

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The Australian

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1 - All-round Country

10

English

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THE intense storms that have been lashing Britain this northern winter are likely to be linked to man-made global warming, according to the [Met Office's](#) chief scientist.

Julia Slingo said yesterday while there was not yet "definitive proof", "all the evidence" suggested that climate change was a contributory factor. She warned that the country should prepare itself for more such events in future.

Her comments, supported by new analysis published by the [Met Office](#), are the strongest link yet made by the weather forecasting service between the recent storms and climate change.

The [Met Office](#) intervention in the debate supports British Prime Minister David Cameron's comment last month that he "very much suspects" that an increase in extreme weather was partly caused by man-made greenhouse gas emissions.

The Conservative Prime Minister was criticised by climate sceptics for making the link. In its analysis, the [Met Office](#) said: "There is an increasing body of evidence that shows that extreme daily rainfall rates are becoming more intense.

"It is worth emphasising that there is no evidence to counter the basic premise that a warmer world will lead to more intense daily and hourly heavy rain events."

The [Met Office](#) added that in Britain extreme rainfall events had increased in frequency from one in 125 days in the 1970s to one in 85 days.

However, it added: "In terms of the storms and floods of winter 2013-14, it is not possible yet to give a definitive answer on whether climate change has been a contributor or not."

It said there was also evidence that the jet stream was "making greater excursions, north and south" and "becoming more locked in one position", bringing storms to Britain and exceptionally cold weather in Canada and the US. Dame Julia said: "If we look at the broader base of evidence, then we see things that support the premise that climate change has been making a contribution.

"One of the most unusual aspects of the winter's weather has been the southerly track of the storms. We expect them to go well north of Scotland. They have been slamming into the southern part of Britain.

"We also know that the subtropical, tropical Atlantic is now quite a lot warmer than it was 50 years ago. The air that enters this storm system comes from that part of the Atlantic where it is obviously going to be warmer and carrying more moisture. This is just basic physics."

The [Met Office](#) said rising sea levels would increase the risk of flooding. It added that the level had risen along the English Channel by 12cm in the past 100 years and "with the warming we are already committed to over the next few decades, a further 11-16cm of sea level rise is likely by 2030".

Dame Julia said: "That might not sound a lot, but when you are looking at storm surges, when you are looking at moving water from the Somerset Levels out to sea, it does matter.

"In a nutshell, while there is no definitive answer for the current weather patterns that we have seen, all the

evidence suggests that climate change has a role to play in it."

Dame Julia said detecting when and how such storms developed would become increasingly important. "We need to very urgently deliver much more robust detection of changes in storminess and daily and hourly rates," she said. "We have the data. We just need to get on and perform the analysis."

The [Met Office](#) said its supercomputer was capable of producing "scientifically robust assessments" of the links between increased storminess and climate change, but "with current resources" they would not be available for at least another year.

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Local

Flannery goes against the tide on threat of rising seas

EAN HIGGINS

415 words

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The Australian

AUSTLN

1 - All-round Country

4

English

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CLIMATE change guru Tim Flannery has stood by his call to act on UN predictions of rising sea levels, defying a NSW government verdict this week that they are too fickle for use in practical coastal planning.

Professor Flannery, the former climate commissioner under the Labor government and a promoter of extreme visions of dire weather events, drought and flooding under global warming, now heads the privately funded Climate Council.

The Weekend Australian put questions to him after the NSW government instructed local councils to concentrate on "clear and present" actual and measurable current coastal hazards rather than theoretical "doomsday" predictions.

"Long-term sea-level rise is a serious concern for communities located on the NSW coast," the Climate Council said in response. "It is prudent policy to prepare for the risks of a changing climate."

NSW Planning Minister Brad Hazzard this week released a new planning circular for local councils, instructing them to distinguish clearly between current and future risks on property planning documents known as Section 149 certificates. It cautions councils about relying on long-term predictions such as those promoted by Professor Flannery and the UN Intergovernmental Panel on Climate Change.

"The further into the future we seek to predict an outcome, the more uncertainty that is associated with the prediction," the circular says.

"Counter-balancing the need to disclose information as soon as possible is the need to avoid adverse property market and other impacts by the disclosure of information prematurely, or by disclosing information that lacks the necessary rigour and certainty."

But the Climate Council defended the IPCC predictions. "Globally, sea level has already risen 0.2m, which has led to an increased incidence of high sea-level events," it said. "Sea level is projected to rise between 0.2 and 0.8m by 2100. However, higher levels cannot be ruled out.

"According to Australian government research, at 1.1m of sea-level rise, between 40,800 and 62,400 residential buildings may be at risk from inundation."

The NSW government, in announcing its policy, noted a wide variation in observations and predictions.

A report by engineers Worley Parsons to the Great Lakes Council on the NSW mid north coast quoted a 2004 CSIRO study that said the average sea-level rise in Australia from 1920 to 2000 was about 1.2mm a year. That suggests a rise of only about 10cm or so over 80 years.

News Ltd.

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Local

New coast erosion policy to cost councils and ratepayers

EAN HIGGINS

494 words

31 January 2014

The Australian

AUSTLN

1 - All-round Country

5

English

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A NEW coastal policy in NSW could prove a goldmine for consultants, with local councils required to do far more engineering and environmental planning on a beach-by-beach basis rather than relying on blanket UN predictions of global sea level rises.

Planning Minister Brad Hazzard yesterday released a draft planning circular to coastal councils instructing them to make a distinction between ``doomsday" predictions of the future and observable and measurable hazards.

The move followed concern in the state government that some councils were imposing severe planning restrictions based on dire UN Intergovernmental Panel on Climate Change predictions of sea level rises of up to a metre by the turn of the century.

Some councils ignored the situation of individual beaches, which in some cases have been found in engineering studies to be resilient to erosion and experiencing a minute, not accelerating, rate of sea level rise.

In the release, Mr Hazzard's department said NSW Chief Scientist and Engineer Mary O'Kane had reviewed the adequacy of the science behind long-term predictions of the IPCC and other bodies. ``The report noted sea levels have risen over the past 100 years but projections vary widely for future sea level rise, particularly for the latter part of the 21st century," the release says.

Councils will be required to distinguish such theoretical future hazards from actual dangers, and analyse the scientific data of beaches and other waterfronts before placing warnings of flooding or erosion dangers on the compulsory planning documents for individual properties, known as Section 149 (2) certificates.

An expert in environmental planning law at the [University of Tasmania](#), Jan McDonald, warned the new policy could impose burdens on local councils.

The new rules would mean councils would have to develop a full coastal planning policy and back it up with ``robust evidence" before placing restrictions on the section 149 (2) certificates.

``It's a resource-intensive activity," Professor McDonald said. Although councils could put any local hazard studies they commission on their websites and not develop specific controls, most would be reluctant to do so because of the risks of litigation if they did not warn of future coastal hazards, and a desire to plan for future generations.

``The government policy shows a preference to leave this difficult decision to local councils who don't have consistent resources," Professor McDonald said. ``It's a very expensive process."

The government has anticipated the problem, and announced additional departmental resources that councils can draw on, including a ``Coastal Processes and Responses Node" and a Coastal Expert Panel.

But the material released yesterday effectively admits councils will have to hire their own experts to develop plans adapted to specific local conditions, saying that apart from government and academia, some of the expertise councils would rely on would come from ``the private sector".

Some of this extra cost is likely to be passed on to ratepayers.

News Ltd.

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Local

Climate doomsday planning powers to be eroded - EXCLUSIVE -

EAN HIGGINS

667 words

30 January 2014

The Australian

AUSTLN

1 - All-round Country

1

English

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COUNCILS in NSW will be instructed to distinguish between "clear and present dangers" of coastal erosion and flooding and "doomsday" UN scenarios of global sea-level rises under a landmark policy on coastal planning and climate change to be unveiled today.

NSW Planning Minister Brad Hazzard will release a draft circular aimed at stopping some coastal councils from imposing draconian planning restrictions based exclusively on UN International Panel on Climate Change predictions of what could happen a century ahead.

Such restrictions include warnings of coastal-erosion hazards on home owners' planning certificates based on long-term sea-level predictions; and "time limited consents" where property owners are permitted to build on land but warned they will have to pull down all structures in coming decades if climate change predictions come true. Such restrictions have left many beachside property owners anguished after their house values fell sharply.

Mr Hazzard told The Australian some residents and prospective buyers had been "scared witless" by council policies and decisions that relied solely on IPCC scenarios, rather than also examining beach-by-beach data, which showed that in some cases coastal erosion was reversing.

Carolyn Lucas has not proceeded with her original intention of selling her home at Lake Cathie on the NSW mid-north coast since the [Port Macquarie-Hastings](#) council put a coastal hazard warning on the Section 149 planning certificate on her property and those of more than 60 other owners on beachside Chepana Street.

Ms Lucas said that when she bought her house in 2007, the Valuer-General put the land value at \$465,000; since the notification

Continued on Page 6

Continued from Page 1

on her certificate in 2008, this had fallen to \$280,000.

The council's director of development and environmental services, Matt Rogers, conceded that without the IPCC predictions of a global sea-level rise of 40cm by 2050 and 90cm by 2100, council officers would not have recommended keeping the notations of coastal erosion danger on the Chepana Street properties.

Ms Lucas welcomed the changes to be announced by Mr Hazzard today.

"To be saying that a property is at risk of erosion in 2100, it's ridiculous," Ms Lucas said yesterday.

Although the beach had suffered from erosion after major storms, it had always come back, she said. Studies had shown the local "coffee-rock" -- sand saturated and made hard by decayed organic material -- formed a natural protective barrier.

"It's a good thing for individual areas to be assessed," she said.

Mr Hazzard said the plight faced by beachfront owners at Lake Cathie was what the new policy was designed to address.

"I think the sea-level rise issues are real, but they also have to be looked at in the context of local areas," the

minister said.

As revealed by The Australian last year, another NSW council, Great Lakes, has imposed time-limited consents and coastal hazard warnings on properties at Blueys and Boomerang beaches based on the IPCC predictions, even though a study it commissioned by engineering consultants Worsley Parsons said the topography of the beaches made them resilient to erosion and they were actually pushing back the sea.

“What’s going to happen in a particular area depends very much on local topography and morphology,” Mr Hazzard said.

In a policy statement titled “Councils urged to think local as well as global when dealing with coastal hazards”, Mr Hazzard will say the government has “moved to ensure that coastal property buyers are given clear and accurate advice by local councils on the impacts of coastal hazards such as erosion and flooding”.

The draft circular will recommend councils “distinguish between current and future hazards on Section 149 certificates.”

“The problem that property owners face is that some councils have been casting potential longer-term issues as a clear-and-present danger,” Mr Hazzard said.

“We just needed to get councils to jump away from that doomsday scenario.”

News Ltd.

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Features

Mass appeal on horizon for ex-PM's haven

LISA ALLEN

375 words

25 January 2014

The Australian

AUSTLN

5 - A Plus NSW

11

English

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Beach site will be marketed worldwide

IT may have been revered by former prime minister John Howard as a holiday destination for more than 20 years, but Hawks Nest in NSW has never taken off as a popular vacation spot for the masses.

That could soon change after the international attention the area should draw from a marketing campaign of an exclusive beachfront site -- having been held by one family for more than three decades.

The 1.37ha 2 The Boulevard, Hawks Nest site -- replete with a 260m beach frontage -- is being marketed worldwide with planning approval to

build a six-bedroom contemporary home, full-sized tennis court, swimming pool, and most

importantly a security post designed inside the main entry gate.

The wealthy Hunter Valley family-based company, Sunlea Investments, has owned the site since 1979.

It is difficult to put a price on the site-- about 2 1/2 hours drive north of Sydney -- but smaller lots in the same street without beachfront have fetched as much as \$2.5 million according to public records.

Prominent Newcastle architects Seymour Lawler designed the house with the upper floor to capture ocean and coastal panoramas across to the popular snorkelling area of Barnes Rock through to Port Stephens' twin headlands.

The design includes an elevated 25m lap pool with ocean viewing platforms and guest bedrooms with their own private pavilions. A self-contained caretaker's residence is proposed on the ground level and accessed independently off the driveway.

Along with the tennis court, the design also features a retreat with bi-fold doors for lunch or spa treatments. A security post has been designed inside the main entry gate.

Even though it's a beachfront site, the vendors assure privacy.

A dune has been constructed which is about 2m higher than the area for the approved home -- providing privacy from people who swim near Barnes Rock. The vendors have also ensured any suggestion of sea level rise is negated by a 5.5m sand wall as part of the design.

Tenders for the site close through Knight Frank Newcastle agent Matt Kearney and Tea Gardens Real Estate agent Rick Wraight on March 4.

News Ltd.

Document AUSTLN0020140124ea1p0000y

Features

Fighting on the beaches

EAN HIGGINS

1401 words

11 January 2014

The Australian

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1 - All-round Country

20

English

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Property owners remain at the whim of councils' guesswork on coastal erosion

WHEN Greg and Lesley Newton spotted the last vacant lot in a long row of houses at idyllic Jimmys Beach on the NSW mid-north coast, they fell in love with it. Being sensible people, they did their due diligence.

Their plan was to secure a block of land on which to build an absolute beachfront holiday house and, being conscious of predictions of sea-level rise due to climate change, they checked out the council planning guidelines and the title. It was all good: no adverse coastal erosion risk notation on the Section 149 planning certificate, no warnings from the [Great Lakes Council](#).

They bought the block in October 2012, and a few months later filed a development application to build the house. What happened next, says Greg Newton, left him gobsmacked. "We were first told when we lodged the DA that we were not able to build on that site," Newton tells Inquirer.

By raising a stink, Newton convinced council officers to consider the application, which came back with an approval, but also an extraordinary condition. The consent would be "time limited" to 20 years, and the Newtons or successive owners would have to demolish the house in 2033, assuming dire UN sea-level rise predictions came true.

More than a year ago, the NSW Coalition government scrapped the previous Labor government's requirement that coastal councils adopt as gospel the UN Intergovernmental Panel on Climate Change predictions of sea-level rise, being 40cm by 2050 and 90cm by 2100.

But that left councils to decide themselves what projections to use, and most have stuck with the IPCC forecasts, including Great Lakes.

The Newtons decided to fight. They first used their right to argue their case at a full council meeting, seeking to have the condition removed. In a split decision, [Great Lakes Council](#) deputy mayor Len Roberts and some other councillors voted to remove the time-limited consent, but they were narrowly outvoted by mayor Jan McWilliams and other councillors.

The Newtons fought on. They took the matter to the Land and Environment Court, and last month Senior Commissioner Tim Moore ruled in their favour on the "build it up but knock it down in 20 years" provision, ordering that the condition be struck from the development approval consent.

The council had held out the prospect that in 2033 the owners at the time could hire a consultant to do a review of the coastal hazard, and apply for a possible extension of consent. But it was simply unfair, Moore wrote in his decision, for the Newtons, having bought the property in good faith, to be menaced by the "damoclean sword" held over them by the council.

It was a victory for the Newtons, but also for a growing number of lobby groups representing coastal landholders. The members of these lobby groups are determined to not have their livelihoods endangered by falling property values or severe building restrictions resulting from what they see as fickle council planning decisions based on varying sea-level rise models.

Owners of 17 beachside houses at Lake Cathie, south of Port Macquarie in NSW, were faced with a recommendation to council from the [Snowy Mountains Engineering Corp](#) that their houses be subjected to "planned retreat", meaning they would be evicted and their properties resumed by the council and torn down.

SMEC and the [Port Macquarie-Hastings council](#) picked the wrong people to tangle with.

A retired couple, engineer and former company managing director Paul Flemming and his wife, Priscilla, a barrister with QC after her name who had specialised in administrative law, organised the locals and took on SMEC and the council. They pointed out errors in council documents, hired their own engineering consultants, who produced a conflicting report, and shouted to the heavens to the media. The council rejected the SMEC recommendation for planned retreat, and opted for a retaining sea wall, called a revetment.

In yet another tussle, a group of coastal landholders at Boomerang and Blueys beaches, also on the NSW mid-north coast, are fighting time-limited consents and adverse notations on their Section 149 certificates imposed by [Great Lakes Council](#).

That followed an engineering report the council commissioned from engineering consultants Worley Parsons.

That report said the beaches were topographically robust, and actually getting bigger, with more sand flowing in naturally, pushing back the sea.

It mentioned CSIRO and Department of Defence analyses of the actual sea-level rise over the past century and also recent decades, the latter at Newcastle, only 100km away as the crow flies. But the council chose to ignore those elements of the report, and instead relied on IPCC predictions of the sea rising at a rate 10 times what it has been at Newcastle.

While some might think the sorts of seemingly ludicrous decisions by [Great Lakes Council](#) must be based on green idealism gone mad, the truth is that it has more to do with the increasingly litigious nature of society.

Roberts says that in the case of the Newtons' development application at Jimmys Beach, the other councillors who voted to retain the time-limited consent were panicked that "if something went wrong, we could be liable".

Reading through the documents of various councils, the dominant concern of officers and advisers is to limit the chances of the council being sued for not warning prospective purchasers of beachside properties of the dangers of coastal erosion from climate-based sea-level rise.

Equally, they don't want to be sued for allowing property owners to build houses that could be undermined by erosion on the same basis.

An example of the degree of caution can be found in legal advice commissioned by the insurer of [Wyong Shire Council](#), which was debating what benchmark it would set for future sea-level rise.

"In the absence of compelling data supporting a benchmark significantly less than those set out in the (former Labor IPCC-based predictions), council will likely limit statutory defences otherwise available to it in any liability claim concerning the issue of the appropriateness of the benchmark concerned," the lawyers said.

In a rare move, [Wyong Shire Council](#) rejected the advice, and chose not to include additional climate change-based sea-level rise predictions in its flood planning strategy.

Rather, it adopted the older flood-management benchmark of a flood level expected in a one-in-a-century storm, plus a freeboard of 50cm, which the council decided could be held to include unspecified allowance for sea-level rise if it came to court.

The mayor, Doug Eaton, tells Inquirer that councillors around the country are "terrorised" by the insurers, lawyers and local and state government bureaucrats to accept the IPCC predictions to reduce legal risk, and told they could bear personal liability if the council were sued.

But Eaton says that, as a lawyer himself, he has carefully analysed the issues and decided the council would still have the defence that it had acted in good faith because the Labor-era requirement to rely on the IPCC guidelines had been scrapped. "We threw out the sea-level rise crap," Eaton says.

Had it not done so and incorporated the IPCC predictions, Eaton says, the council would have had to put coastal erosion warning notifications on the title certificates of a large number of houses in the shire, which would have undermined their property value and saleability.

The situation has left coastal property owners at the whim of whether or not their particular council retains the

UN climate change orthodoxy, either because the councillors believe in it or because they fear being sued.

Such luck of the draw, which can mean the difference between being able to build or not, and having the value of a landowner's property halved or not, is worrying the state government.

“The NSW government has been concerned at inconsistent treatment of people's properties by councils on Section 149 certificates,” a spokeswoman for Planning and Infrastructure Minister Brad Hazzard says.

Hazzard's department will soon put out a planning circular to coastal councils which, a spokesman says, “will help provide more clarity on the nature, type and likelihood of coastal hazards and this will benefit all stakeholders in the process: councils, property owners and buyers, conveyancers and solicitors.”

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Local

Council ignores IPCC sea level rise warning

EAN HIGGINS

431 words

11 January 2014

The Australian

AUSTLN

1 - All-round Country

8

English

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A COASTAL local council has defied what its mayor calls a campaign of terror by lawyers, insurers and local and state government officials and rejected their advice to abide by dire UN predictions of sea level rise.

Wyong Shire Council on the NSW central coast is understood to be the first in the state to abandon the predictions of the UN International Panel on Climate Change in its planning policy.

“We threw out the sea level rise crap,” Mayor Doug Eaton told The Weekend Australian.

The move comes as the NSW government is preparing to issue a major new coastal planning strategy, which it hopes will encourage local councils to look at what is actually happening in the science of individual beaches rather than blindly adopting the global IPCC predictions.

The Coalition scrapped the previous Labor government's policy that required councils to adopt the IPCC forecast of a 40cm rise in global sea levels by 2050 and a 90cm rise by the turn of the century. Despite this, councils have retained those predictions when planning coastal strategy.

Late last year, Wyong Shire councillors were advised by council planning officers, state government environmental officials, insurers and lawyers to retain the IPCC predictions as the basis for their flood management strategy.

Lawyers for the council's insurer said the council would face a liability risk if it moved away from the IPCC predictions.

The councillors rejected the advice because, Mr Eaton said, it would have resulted in a flood level benchmark so high that a large number of properties in the shire would have been designated at risk of flooding and such a notation put on their planning certificates.

“The lawyers, insurers and the bureaucrats use the threat of law suits to terrorise councillors, saying they could be found personally liable,” Mr Eaton said.

“But I'm a lawyer as well.”

Mr Eaton said he came to the conclusion that since the state government had renounced Labor's policy legally requiring councils to use the IPCC predictions, it would be possible to legally rely on a 2005 state policy document, the Floodplain Development Manual.

That provided for a flood benchmark calculated at the level of a once-in-a-century flooding event, plus a freeboard margin of 50cm, which was adopted by the council.

The council's decision defied the staff recommendation, which said provision for sea level rise should not be incorporated into the freeboard when determining flood planning levels, and recommended another 40cm be added to the flood level benchmark.

News Ltd.

Document AUSTLN0020140110ea1b0001x

Search Summary

Text	sea level rise
Date	In the last year

Source	The Australian
Author	All Authors
Company	All Companies
Subject	All Subjects
Industry	All Industries
Region	All Regions
Language	English
Results Found	20
Timestamp	12 January 2015 5:29 PM

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Information Screen

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Perception of Economic Data

Purpose of Study

You are invited to participate in a survey conducted by Timothy Ballard as part of a research project in the School of Experimental Psychology at the University of Bristol. The study examines how people interpret data pertaining to economics, demographics, climate, geography, and sociology. The study should take approximately 30 minutes to complete.

Description of Study and Risks

If you decide to participate, you will be asked read a series of statements about fictitious trends that may relate to economics, demographics, climate, geography, or sociology, and to inspect graphs showing those trends. You will then be asked to report the extent to which you agree or disagree with the statements based on the information shown in the graphs. There are no risks associated with taking part in this study and you are free to withdraw the study at that point.

What will happen to my data?

Your involvement in the study will remain confidential. This information will only be available to research staff and national bodies which monitor whether research studies are conducted properly.

Your study data will be anonymised. This means that it will be given an identification number and any identifying information about you will be removed. Therefore, it will not be possible to identify you by name from any aspect of documentation or reporting for this research study.

Upon completion of the experiment we will ask you to give consent to include your data in further analyses. At the end of the study your data will become “open data”. This means that it will be stored in an online database so that it is publicly available.

What is open data?

Open data means that data are made available, free of charge, to anyone interested in the research, or who wishes to conduct their own analysis of the data. We will therefore have no control over how these data are used. However, all data will be anonymised before it is made available and therefore there will be no way to identify you from the research data.

Why open data?

Sharing research data and findings is considered best scientific practice and is a requirement of many funding bodies and scientific journals. As a large proportion of research is publicly funded, the outcomes of the research should be made publicly available. Sharing data helps to maximise the impact of investment through wider use, and encourages new avenues of research.

Your consent

Your decision whether or not to participate will not prejudice your future relations with The University of Bristol. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without prejudice. Your participation in this study does not prejudice any right to compensation, which you may have under statute or common law.

Inquiries

If you have any questions about this research you may address them to the chief investigator, Timothy Ballard, at timothy.ballard@bristol.ac.uk or on [+44 117 95 46615](tel:+441179546615).

This study has received a favourable ethical opinion from the Faculty of Science Human Research Ethics committee at the University of Bristol, ethics approval code: 2905148228. If you have any concerns related to your participation in this study please direct them to the Faculty of Science Human Research Ethics Committee, via Liam McKervey, Research Ethics Coordinator (Tel: 0117 331 7462 e-mail: Liam.McKervey@bristol.ac.uk).

Consent Form

I (the participant) have been given information explaining about the survey. I understand that I will be asked read a series of statements about trends that may relate to economics, demographics, climate, geography, or sociology, to inspect graphs showing those trends, and to report my level of agreement with statements based on the information shown in the graphs. I have been given enough information about the study to make a decision about participation. I agree to participate in this activity, realising that I may withdraw at any time without reason and without prejudice.

I agree that the data collected from me as part of the study will be anonymised, and that after the study will be made “open data”. I understand that this means the anonymised data will be publicly available and may be used for purposes not related to this study, and it will not be possible to identify me from these data.

I have been advised as to what data is being collected, the purpose for collecting the data, and what will be done with the data upon completion of the research. I agree that research data gathered for the study may be published provided my name or other identifying information is not used.

Please indicate whether or not you are willing to participate in the study. Clicking the YES button below indicates that you have decided to participate.

Yes

☐

No

☐

Scenario A11

Consider the following public statement by the CEO of the supreme widget corporation (SWC), made a few months ago:

“Our auditors' records show conclusively that in April 2009, our profits had indeed returned to and surpassed 1989 levels.”

Consider the following public statement by the CEO of the supreme widget corporation (SWC), made a few months ago:

“The underlying trend in our profits has been consistently negative between 1989 and 2009.”

When the data are plotted across a 30-year span from 1979 to 2009 (in real dollars, i.e. adjusted for CPI), the following pattern is revealed:

When the data are plotted by month of the two years in question, 1989 and 2009 (again in real dollars), the following pattern is revealed:

In light of the statement by SWC above and the data plotted in the figure, indicate your agreement with each of the following options:

The data confirm the claim made by SWC.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The data contradict the claim made by SWC.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree

☐ Strongly agree

The claim made about the data by SWC is misleading.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The statement summarizes the data in a way that is appropriate for advising and supporting decisions by policy makers, industry, or other decision-making bodies.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

For the *upper graph*, what is the most likely data value for 2010 (just off the above graph to the right)?

- ☐ 11.75
- ☐ 11.5
- ☐ 11.25
- ☐ 11
- ☐ 10.75
- ☐ 10.5
- ☐ 10.25

Do you have any other comments about SWC's interpretation of the data? (this question is optional)

Please select "5+2" from the list below

- ☐ 7-3

☐ 5+2☐ 9+1

Scenario GL

A blogger who comments on population migration issues, Mr. Z, wrote an article in 2010 with a title that claimed:

“Our country's rural population is growing, not shrinking.”

The article proceeded to identify rural villages in different parts of the country that are growing, claiming that:

"almost all of the rural regions of the country are now *gaining* population."

A blogger who comments on population migration issues, Mr. Z, wrote an article in 2010 with a title that claimed:

“Our rural population is shrinking overall, not growing.”

The article proceeded to identify rural villages in different parts of the country that are growing, claiming that:

"almost all of the rural regions of the country are *losing* population."

When the population balance (i.e., whether the villages grow or shrink) of individual villages for consecutive years (shown here for 2009 and 2010) is plotted, the following pattern results (negative numbers refer to shrinking villages, positive numbers to growing villages).

Individual Village Population Change Between 2009 and 2010

In light of the statement by Mr. Z above and the data plotted in the figure, indicate your agreement with each of the following options:

The data confirm the claim made by Mr. Z.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The data contradict the claim made by Mr. Z.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The claim made about the data by Mr. Z is misleading.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The statement summarizes the data in a way that is appropriate for advising and supporting decisions by policy makers, industry, or other decision-making bodies.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

Please write the word "survey" in the space below

Do you have any other comments about Mr. Z's interpretation of the data? (this question is optional)

Scenario SLR1

A blogger who comments on economic issues, Mr. W, reported that

“...so far from there being a greater overall increase in daily global currency trade volume, the official figures show that, if anything, there was a slightly smaller increase in daily global currency trade volume in the second half of the 20th century than in the first half.”

A blogger who comments on economic issues, Mr. W, reported that

“Daily global currency trade volume has risen throughout the previous century. If anything, there was a larger increase in daily global currency trade volume in the second half of the 20th century than in the first half.”

When daily global currency trade volume (in real dollars, i.e. adjusted for CPI) over the course of the 20th century is plotted, the following pattern results:

In light of the statement by Mr. W. above and the data plotted in the figure, indicate your agreement with each of the following options:

The data confirm the claim made by Mr. W.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The data contradict the claim made by Mr. W.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The claim made about the data by Mr. W. is misleading.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The statement summarizes the data in a way that is appropriate for advising and supporting decisions by policy makers, industry, or other decision-making bodies.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

What is the most likely data value for 2001 (just off the graph on the right)?

- ☐ 6
- ☐ 5.5
- ☐ 5
- ☐ 4.5
- ☐ 4
- ☐ 3.5
- ☐ 3

Do you have any other comments about the Mr. W's interpretation of the data? (this question is optional)

Senario AI2

In 2013, a newspaper headline read:

“And now it’s trade surplus rise! Return of the trade surplus as it grows by 29% in a year.”

The article proceeded to report that:

"this year has left 53.3 billion dollars less in trade surplus than at the same time last year - an increase of 29%. The rebound from 2012's record low comes six years after [a large broadcasting corporation] reported that the trade surplus would disappear by 2013."

The word "disappear" was replaced by "be eliminated" for the economists sample.

In 2013, a newspaper reported that:

"There has been a consistent underlying downward trend in the trade surplus for 30 years accompanied by moderate inter-annual variability."

When the trade surplus (in real dollars, i.e. adjusted for CPI) between 1979 and 2013 is plotted, the following pattern results:

In light of the statement by the newspaper above and the data plotted in the figure, indicate your agreement with each of the following options:

The data confirm the claim made by the newspaper.

- ☒ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The data contradict the claim made by the newspaper.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The claim made about the data by the newspaper is misleading.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The statement summarizes the data in a way that is appropriate for advising and supporting decisions by policy makers, industry, or other decision-making bodies.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

What is the most likely data value for 2014 (just off the graph on the right)?

- ☐ 300
- ☐ 275

- ☐ 250
- ☐ 225
- ☐ 200
- ☐ 175
- ☐ 150

Do you have any other comments about the newspaper's interpretation of the data? (this question is optional)

Scenario GMST

Referring to the year 2009, a news analyst stated:

"We have the lowest agricultural output of any year on record. Output is extremely low in the southeastern United States. China and Russia are suffering from low output. The rest of the country has slowed. The lowest agricultural output of any year on record."

Referring to the year 2009, a news analyst stated:

"Agricultural output has been increasing considerably and almost continually at least since the beginning of the 20th century."

When world agricultural output between 1880 and 2010 is plotted, the following pattern results:

In light of the statement above and the data plotted in the figure, indicate your agreement with each of the following options:

The data confirm the claim made by the news analyst.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The data contradict the claim made by the news analyst.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The claim made about the data by the news analyst is misleading.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The statement summarizes the data in a way that is appropriate for advising and supporting decisions by policy makers, industry, or other decision-making bodies.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

What is the most likely data value for 2010 (just off the graph on the right)?

- ☐ 130
- ☐ 120
- ☐ 110
- ☐ 100
- ☐ 90
- ☐ 80
- ☐ 70

Do you have any other comments about the news analyst's interpretation of the data? (this question is optional)

Scenario SLR2

In early 2012, a blogger who comments on the global economy stated:

"2011 was an interesting year for world lithium production. The total world lithium production in 2011 was not only lower than 2010, it was

also lower than 2009. All of the different indices agree with that, but perhaps even more interesting is that European measurements show that world lithium production in 2011 was even lower than it was back in 2005. Those particular measurements show that there has been almost no net change in world lithium production over the past 8 years."

In early 2012, a blogger who comments on the global economy stated:

"World lithium production has been increasing continually for the last 20 years, accompanied by short-term fluctuations about the underlying trend."

When monthly world lithium production between 1993 and 2012 is plotted, the following pattern results:

In light of the statement above and the data plotted in the figure, indicate your agreement with each of the following options:

The data confirm the claim made by the blogger.

- ☐ Strongly disagree
- ☐ Moderately disagree

- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The data contradict the claim made by the blogger

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The claim made about the data by the blogger is misleading.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The statement summarizes the data in a way that is appropriate for advising and supporting decisions by policy makers, industry, or other decision-making bodies.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

What is the most likely data value for 2012 (just off the graph on the right)?

- ☐ 325
- ☐ 300
- ☐ 275
- ☐ 250

- ☐ 225
- ☐ 200
- ☐ 175

Do you have any other comments about the blogger's interpretation of the data? (this question is optional)

Follow-up Questions

What is your age?

Which best describes your gender?

- ☐ Male
- ☐ Female
- ☐ Other/unwilling to say

How much professional experience in statistics or an allied discipline (e.g. mathematics) do you have? (this question is optional)

- ☐ None
- ☐ 1-2
- ☐ 3-5
- ☐ 6-10
- ☐ more than 10

How many peer-reviewed papers have you published in statistics or an allied discipline (e.g. mathematics)? (this question is optional)

- ☐ None
- ☐ 1-2
- ☐ 3-5
- ☐ 6-10
- ☐ more than 10

Debriefing

Debriefing

The aim of this survey was to examine how economists evaluate statements made about data pertaining to climate change phenomena when it is expressed in economic terms. Public debate surrounding climate change involves two competing views of the data, by mainstream science and 'skeptics', and the purpose of this study was to examine how data relating to climate change are interpreted by individuals trained in reading trends, but who are blind to the nature of the data.

The fictitious economic trends displayed in the graphs presented in this survey actually displayed climate data. Some of the statements that you read about the data were statements made by climate 'skeptics' and some were made by climate scientists. Specially, the statements that you evaluated about the profits of the supreme widget corporation and unemployment actually represented statements made about changes in sea ice. The statements that you evaluated about daily global currency trade volume and lithium production actually represented changes in sea level. The statement you evaluated about rural population change actually represented a statement about changes in glacier volume. The statement about world agricultural output represented a statement about global surface temperature. Finally, the statement about soybean prices represented a statement about ocean heat content.

By providing evaluations of the statements prior to learning the true nature of the data, you have helped us understand claims about the trends relating to climate phenomena that are independent of any prior bias. Now that you know the true nature of the study, we ask that you once again indicate whether you are willing to have your anonymous data used as part of this research.

Please click YES to allow your data to be used in this research or NO if you do not want your data to be used in this research.

YES, I am willing to have my data used in this research.

☐

NO, I am not willing to have my data used in this research.

☐

Manipulation Check

While taking this survey, how strongly did you feel that the trends shown in the graphs were in fact real data?

- ☐ Extremely
- ☐ Very
- ☐ Moderately
- ☐ Slightly
- ☐ Not at all

While taking this survey, how strongly did you feel that the trends shown in the graphs were fictitious?

- ☐ Extremely
- ☐ Very
- ☐ Moderately

- ☐ Slightly
- ☐ Not at all

Do you have any other comments about how you perceived the trends shown in the graphs while taking the survey (this question is optional)?