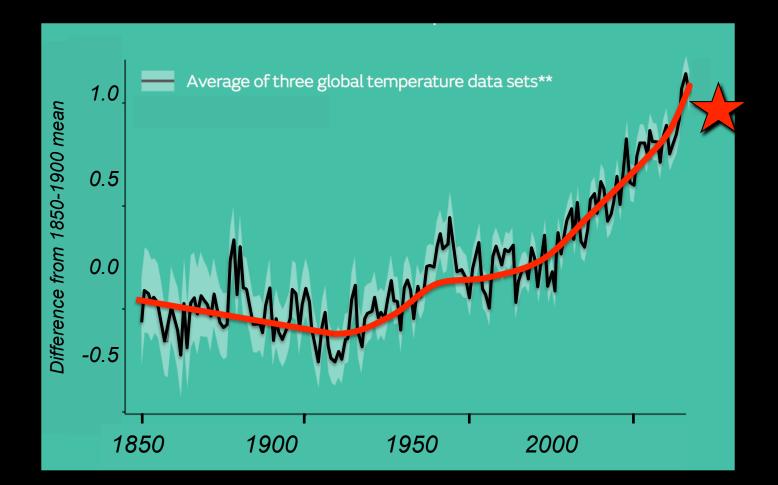
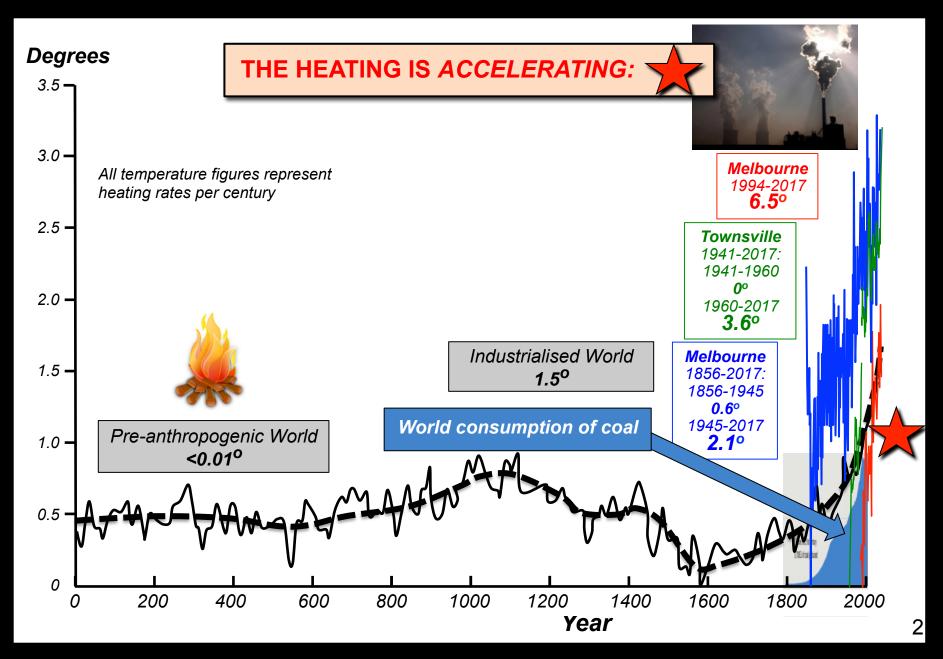
The fundamental world heating graph: Past 170 years

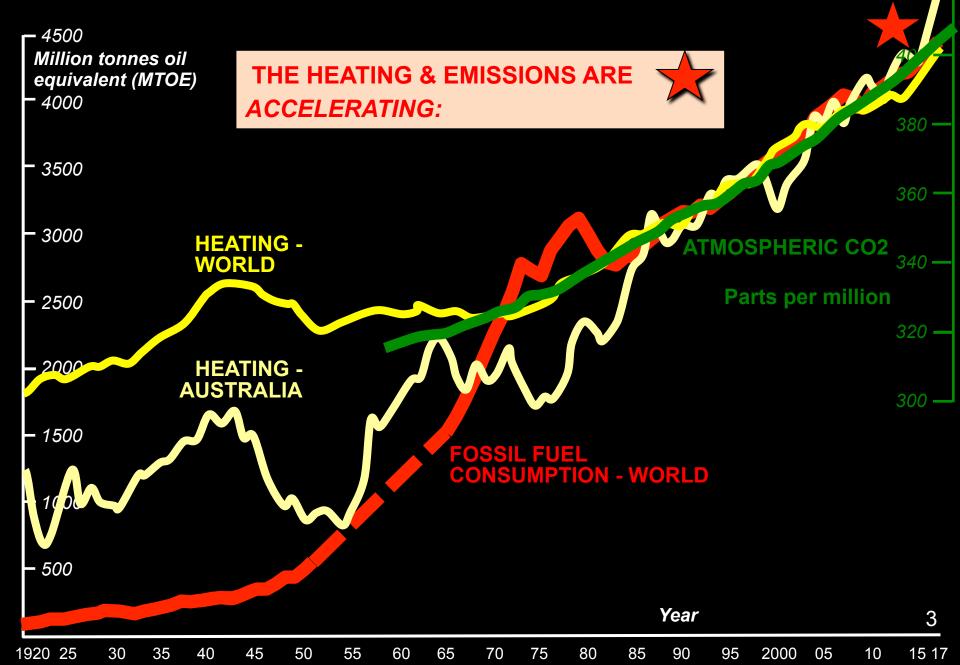




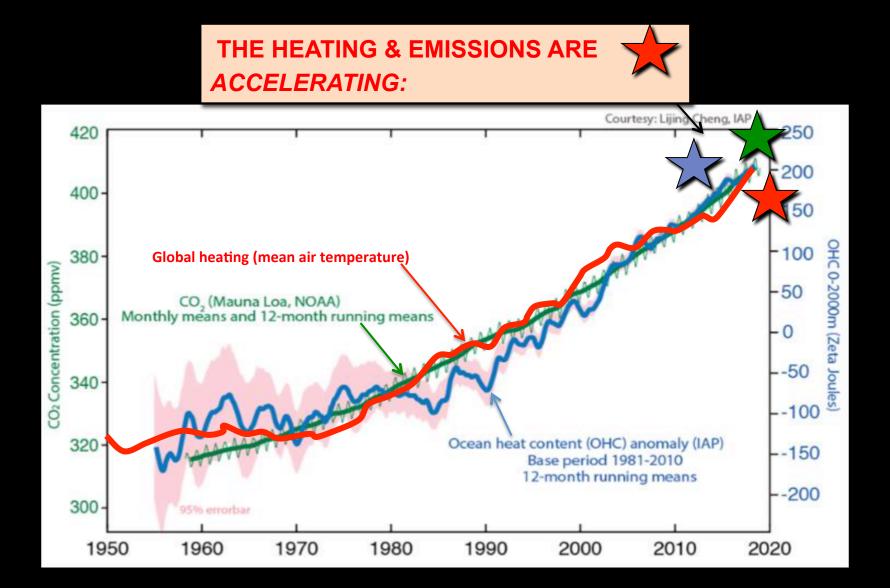
The fundamental world heating graph: Past millenium



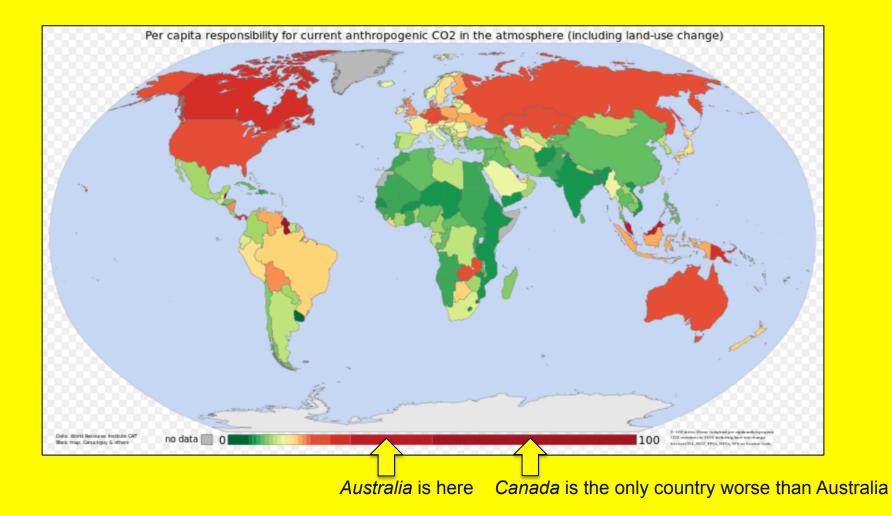
Climate heating is in direct ratio to fossil fuel consumption



Climate heating (air & ocean) is in direct ratio to CO2

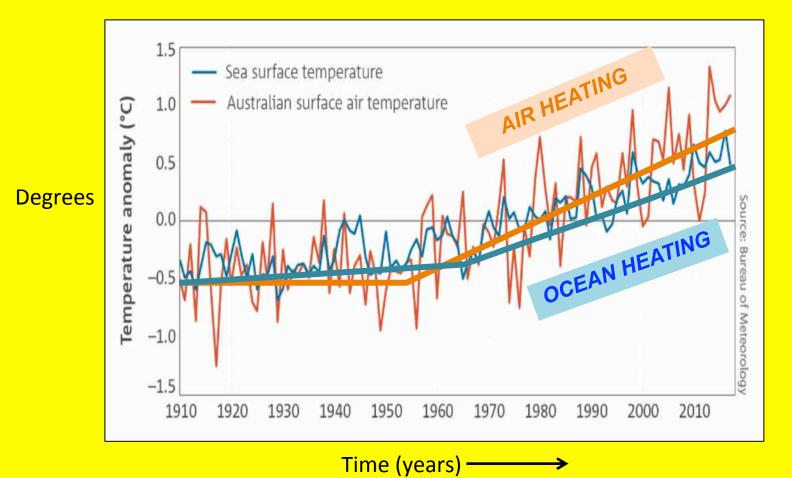


Global heating: Australia's contribution to carbon emissions



Australia & Bowen's heating curves: air & ocean (Coral Sea)

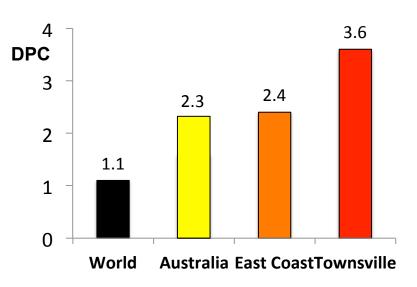
AIR & OCEAN TEMPERATURE



6

Global heating: How does Australia compare?

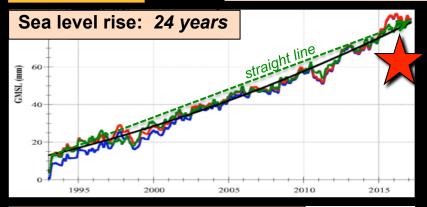




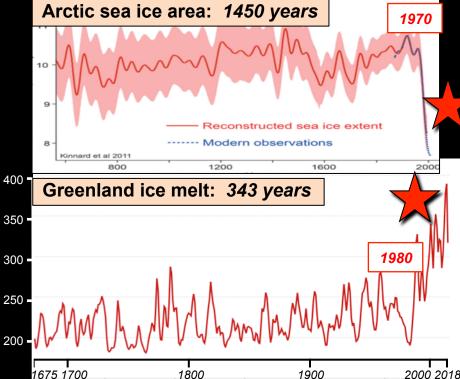
Global heating key indicators

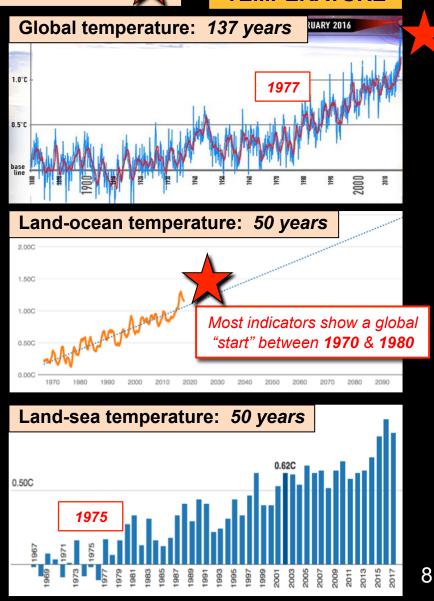
MOST ARE ACCELERATING:

TEMPERATURE

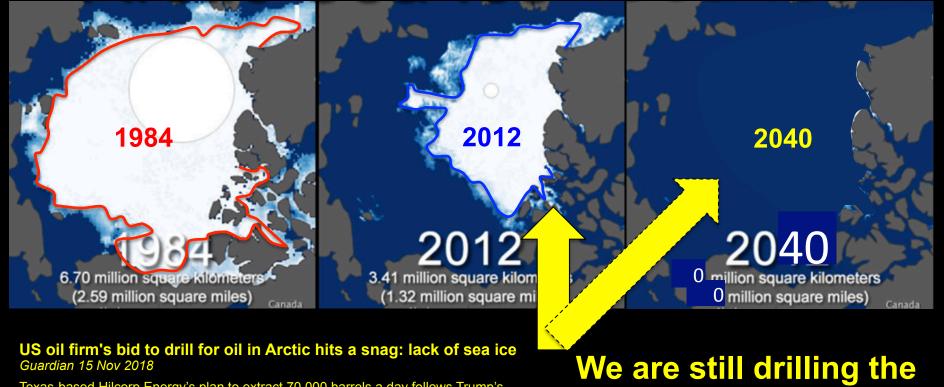


SEA LEVEL





The Arctic icecap will be destroyed in 20 years



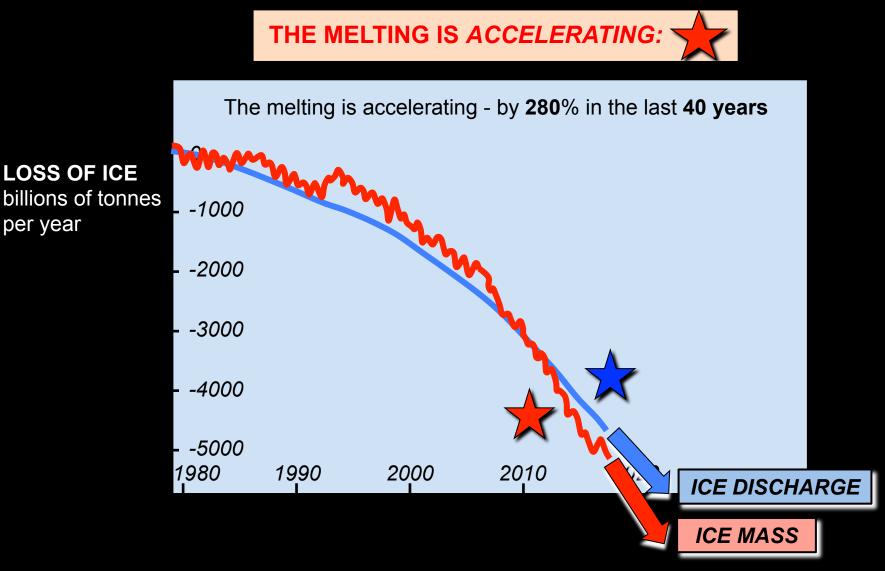
Texas-based Hilcorp Energy's plan to extract 70,000 barrels a day follows Trump's reversal of an Obama-era ban on fossil fuel activity in the region. In October 2018 President Trump approved the go-ahead of the Liberty project to extract oil from beneath the Beaufort Sea, off Alaska's north coast. The drilling would be the first of its kind in US waters in the Arctic. Hilcorp has now added another year to completion of the drilling island. Construction will start in 2020.

Climate change is causing the planet to warm, with the Arctic heating up twice as quickly as the global average. It experienced its warmest winter ever earlier this year. Bureau of Ocean Energy Management said businesses like Hilcorp that rely upon shoreline ice for drilling platforms will likely face "significant challenges as the growing season shortens", with the melting of permafrost and coastal erosion also hampering projects.

Mr Trump has opened up virtually all Federal waters, including the Arctic, for oil & and gas drilling leases, as part of a "US energy dominance" strategy.

We are still drilling the Arctic - for more oil

Antarctica is melting, and the melting is accelerating



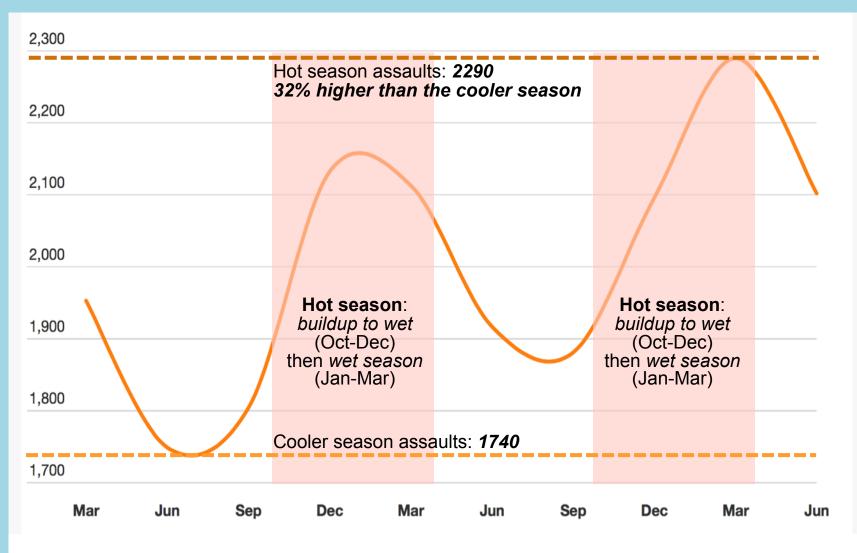
Climate rage is here: Temperature-aggression hypothesis

	erature-Aggression Hypothesis: e act more aggressively in extreme heat
Darwin (Australia)InsomniaAnxietyHostilityPhysical aggressionMurders (by quarter)Assault + sexual assaultHeat exhaustionAlcohol consumptionFracture hospitalisationProperty theft	% higher in hot season110%111%118%127%50% in "buildup", 30% in wet: only 20% in winter halfIncreasesIncreasesIncreasesIncreasesNo change
<u>Tshwane (Pretoria, Sout</u> Violent crimes Sexual crimes Property crimes <u>Chicago (USA)</u>	n <u>Africa)</u> 150% 141% 112% Heat increases crime everywhere

Hotter US cities have significantly higher violent crime. Serious assaults increase by 7% per hundred thousand for every ^oC hotter. Chicago (population 2.7 million) has **1900 more assaults on a 35° day than on a 25° day**.

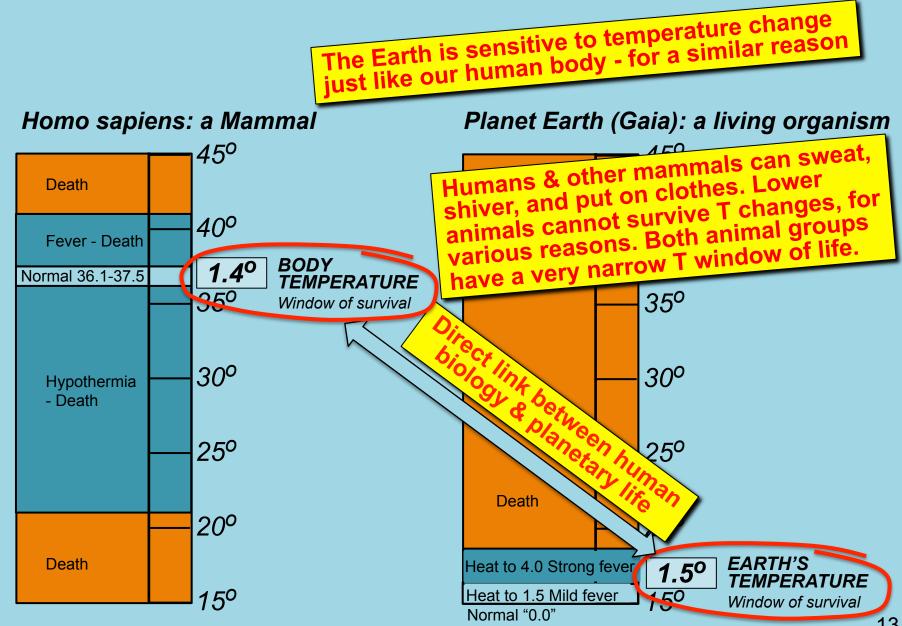
https://www.abc.net.au/news/2014-10-07/mango-madness-mental-illness-tropical-wet-season-build-up/5795852 https://phys.org/news/2018-08-temperatures-crime-evidence-south-africa.html

Climate rage is here: Darwin's mango madness



Offences against the person From Northern Territory Department of Justice, 2011-13

The damage to life from a world temperature rise over 1.5-2°



Australia adopts new, more severe climate ratings: heat & fire

NEW RATING FOR TEMPERATURE - ADOPTED IN 2013

Ultra-high temperature Australia adds new colour to temperature maps as heat soars

"Forecast temperatures are so extreme that the Bureau of Meteorology has had to add new colours to its scale. It is a sign of things to come. Global warming is turning the volume of extreme weather up, to 11. The temperature forecast for next Monday by Australia's Bureau of Meteorology is so unprecedented - over 52C - that it has had to add new colours to the top of its scale, pink and a suitably incandescent purple."

https://www.smh.com.au/environment/weather/temperatures-off-the-charts-as-australia-turnsdeep-purple-20130108-2ce33.html

NEW RATING FOR FIRE DANGER - ADOPTED IN 2017

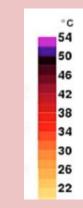
Catastrophic fire danger

"In 2017 the Australian bushfire danger rating system was modified to include a new additional 6th danger category of "catastrophic". Previously, the highest risk category was "extreme". This new category was deemed necessary by bushfire experts as the old scheme was not designed to capture the catastrophic type fires now being experienced. This new rating system reflects the established fact that there has been a long-term increase in extreme fire weather, and in the length of the fire season, across large parts of Australia.

The Bureau of Meteorology declared a "catastrophic" fire danger - the highest possible risk rating - in some central areas, while fire fighters battle to contain more than 140 blazes across the state.

Sources: News.com.au, November 29, 2018 12.01 pm"

Witness Statement, Professor Brendan Mackey PhD, 9 May 2019 Email: b.mackey@griffith.edu.au



New temperature rating system contains 2 new colour categories: 52-540 Pink 50-520 Purple



New bushfire danger rating system contains a new 6th category of "catastrophic"

Emergency vs climate emergency: the same but different

EMERGENCIES - NATURAL: THEIR KEY FEATURES								
NATURAL EMERGENCIES	Climate change	Flood	Wildfire	Earthquake	Tsunami	Eruption	Famine	Pandemics to date
Uniquely new	\checkmark	THESE		\bigtriangleup				
May be covert	\checkmark		COMPONE	NTS				
Extended time	Decades			DIF	FERENTIATE		Several years	Several years
Planet-covering	\checkmark					CLIMATE		
H. sapiens threat	\checkmark			\checkmark			CHANGE	
Uncontrollable	\checkmark	\checkmark		\checkmark	\checkmark			\checkmark
Uncertainty	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Permanent harm	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
A tick $$ denotes that the emergency may have this characteristic								
Related to climate	change							
Related to weather								
Related to geological processes								
Related to biologic	al processes							

EMERGENCIES - HUMAN: THEIR KEY FEATURES								
NATURAL EMERGENCIES	Climate change	Traffic accident	Building fire	Plane crash	Communica tions outage	Government	Civil strife	War
Uniquely new	\checkmark	THESE		\wedge				
Covert	\checkmark		COMPONEN	TS				
Extended time	Decades			DIFF	ERENTIATE	Months	Year	Several years
Planet-covering	\checkmark					CLIMATE		
H. sapiens threat	\checkmark			\checkmark			CHANGE	Nuclear
Uncontrollable	\checkmark	\checkmark	\checkmark	\checkmark			\checkmark	
Uncertainty	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Permanent harm	\checkmark						\checkmark	\checkmark
A tick $$ denotes the	at the emergenc	y may have th	nis characteristic					
Related to climate	change							
Related to human	or system error							
Related to (inter)na	ational relations							

The new arithmetic of emergency: doesn't mean fast or short

What is the urgency which defines an emergency?

Lenton et al (2019) analysing climate change developed a parameter called Urgency:

"Urgency (U) is the time it takes to react to an issue (τ) "divided by the intervention time left to avoid a bad outcome (T)" or U = τ/T ."

I clarify and restate this as follows:

Urgency = Amount of time I need to deal with it, divided by Amount of time I have to deal with it

This has quite a profound implication. The state of mind of a person facing every emergency is *not* the statement "I have to act really fast, it's an emergency". Rather, the state of mind defining every emergency is "I have lots to do to to deal with this emergency and not much time to do it". This equates to, precisely, a simple arithmetic equation: the *equation of emergency - every* emergency:

U = Tneed / Tavailable

How does this improve our perception of the timeframe of an emergency?

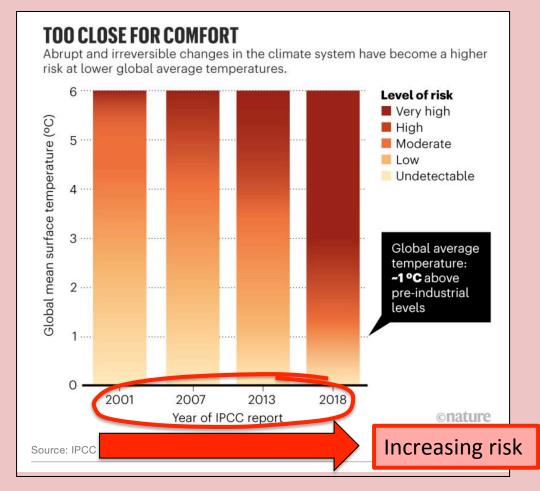
The emergency equation is important and informative in a number of areas.

The urgency equation is a ratio of variables (each is a time variable). Because the ratio divides time by time, they cancel each other out, and we are left with a dimensionless number, not a variable. Time is removed from the urgency. This means that the urgency of an emergency depends, not on a fixed amount of time, but on what we need to do in the time available, before the emergency reaches its natural climax and maximum harm. The equation is the foundation of every emergency; it is the paramount thing that defines it as an emergency, no matter how long it is lasting - one minute, one hour, one week, or one century. The equation provides the link between the experience and its arithmetic: a ratio which removes time from the emergency equation, a ratio which links every emergency, in all possible timeframes.

Urgency boils down to a dimensionless number **U** = **Tneed** / **Tavailable** = **the Urgency Index** of any emergency. Urgency consists of a ratio of times, not an absolute time. The value of the emergency equation is as follows:

- 1 it identifies the real dynamic of an emergency, and this is not speed.
- 2 It provides an index which allows us to meangingfully compare all categories of emergency, whether small or large, short or prolonged.
- 3 The index of Urgency allows us to quantify the urgency, hence to rank it against other emergencies; and it requires us to identify the qualitative elements of a solution. It delivers valuable quantitative and qualitative information which directly inform our rational response to the emergency: data acquisition, planning, prioritisation, triaging, and retro-analysis of the emergency response.

The new arithmetic shows the *urgency* of the emergency



 $https://www.theguardian.com/environment/2019/dec/01/scientists-theory-of-climates-titanic-moment-the-tip-of-a-mathematical-iceberg? utm_term=RWRpdG9yaWFsX0d1YXJkaWFuVG9kYXlBVVMtMTkxMjAy&utm_source=esp&utm_medium=Email&utm_campaign=GuardianT odayAUS&CMP=GTAU_email$

(Most) extreme weather is caused by climate change

Addition of ENERGY



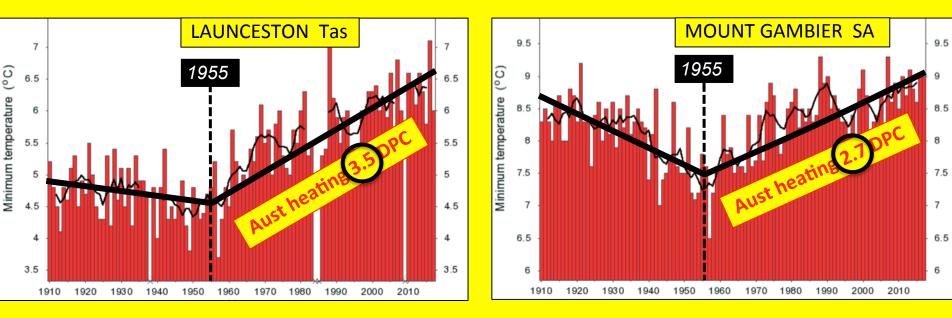
Before global heating: NO

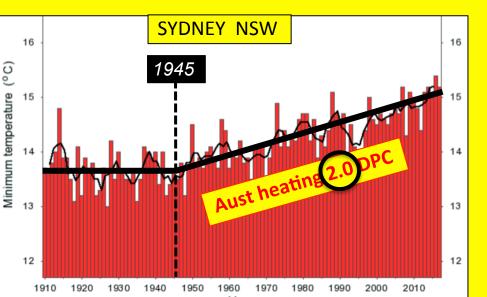
Northern Territory

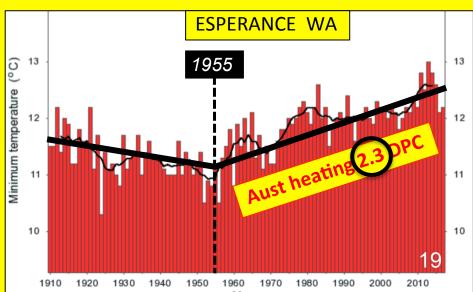
CLIMATE CHANGE - GLOBAL HEATING



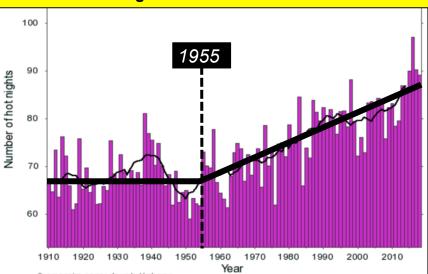
Australia's climate heating in all cities & towns: examples





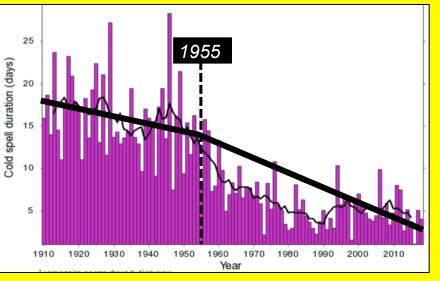


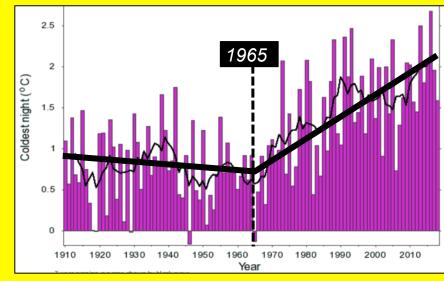
(Most) extreme weather is caused by climate change



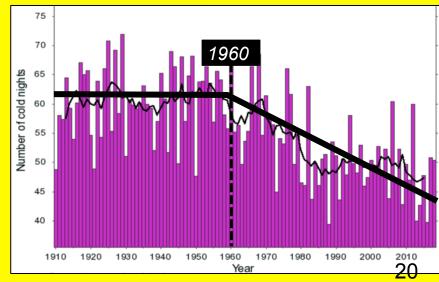
Number of hot nights INCREASING 130%





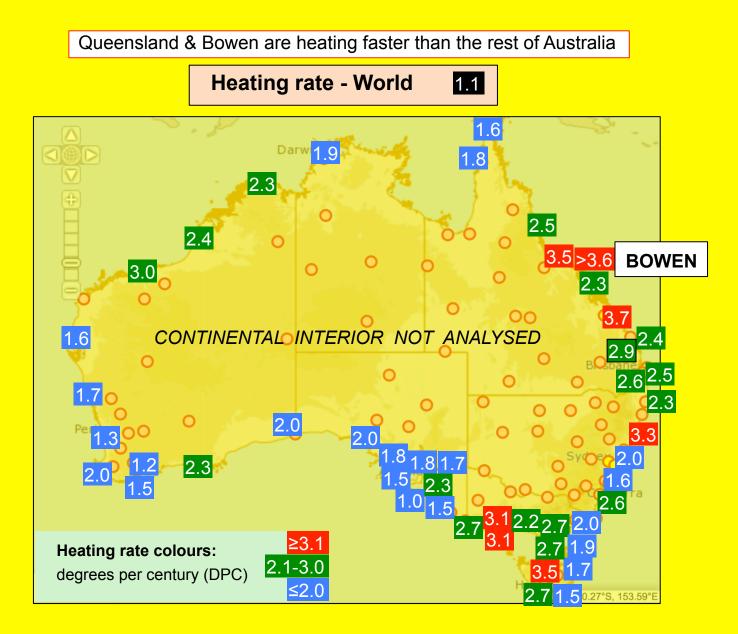


Number of cold nights DECREASING to 71%

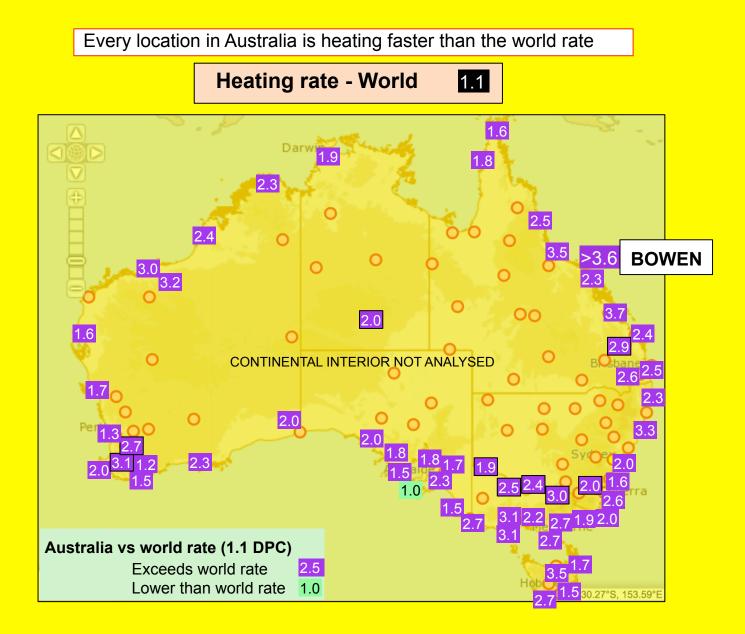


Coldest night temperature INCREASING 1.5 degrees

Australia's heating rate is 1.5x world rate: Bowen is 3x world



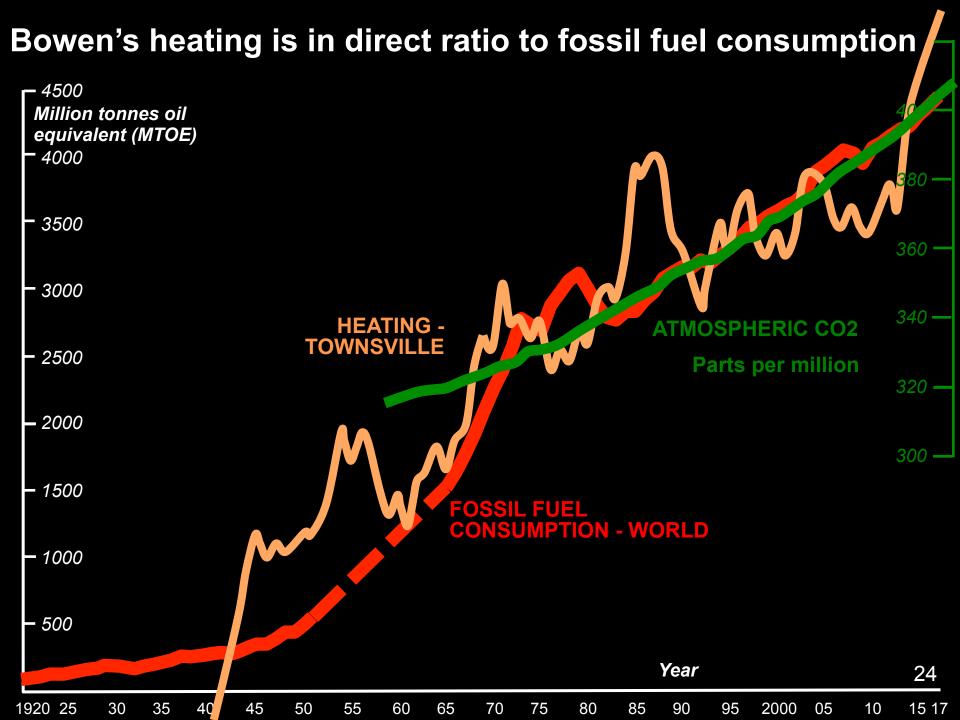
Australia's heating rate is 1.5x world rate (the whole country)

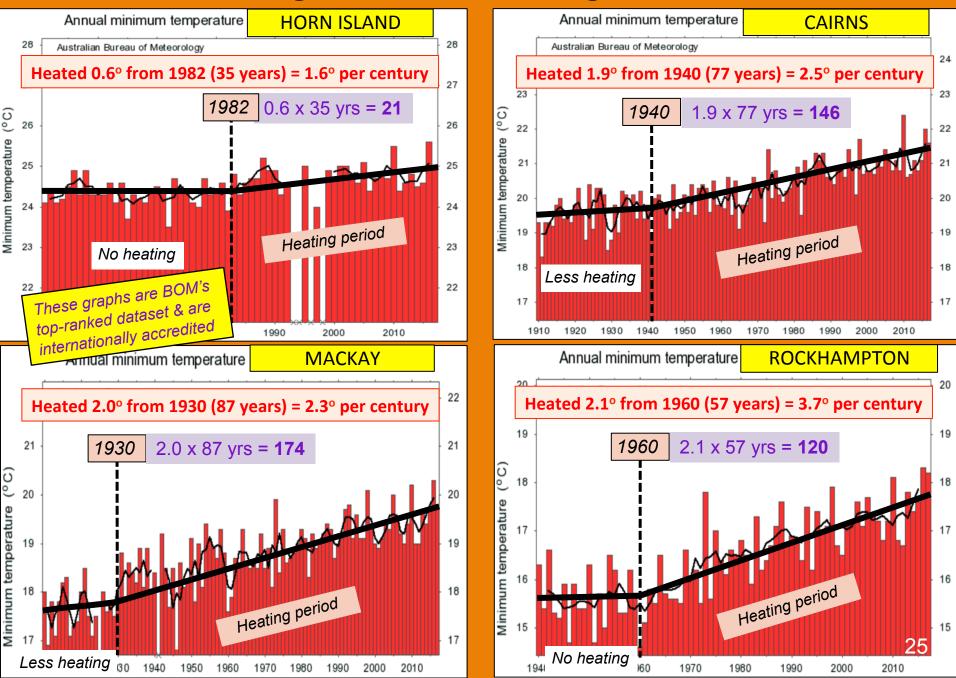


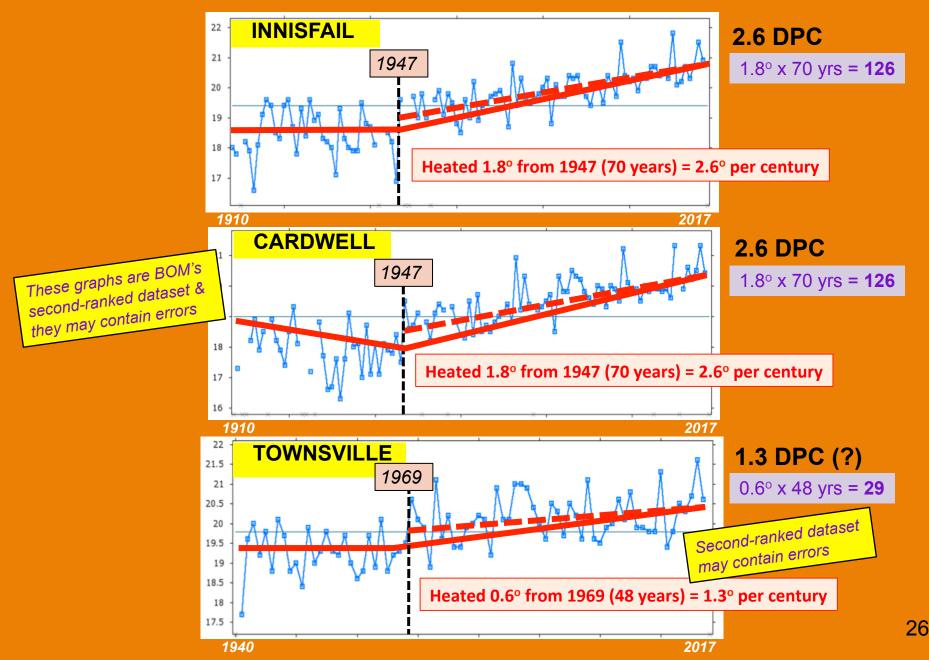
Bowen Basin companies emit more carbon than our economy

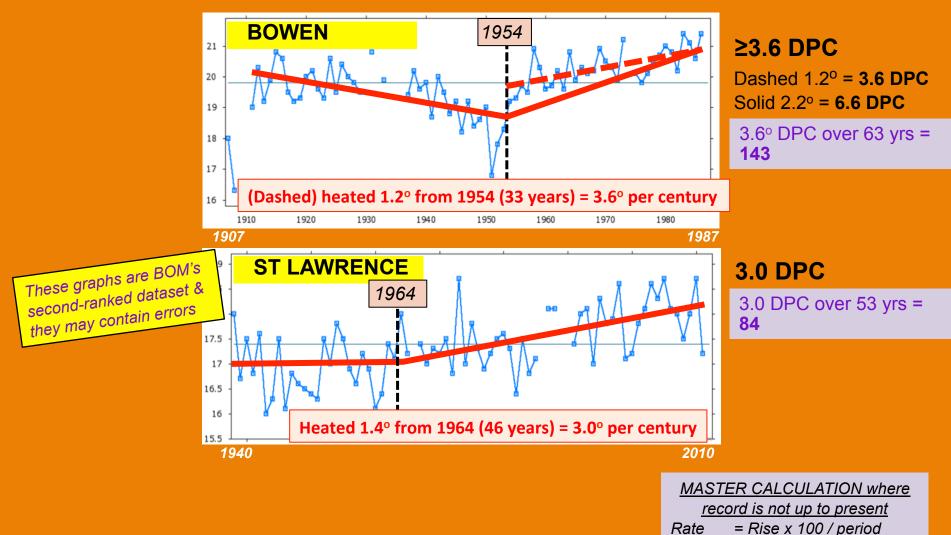


https://www.theguardian.com/australia-news/2019/nov/01/six-biggest-coalminers-in-australia-produce-more-emissions-than-entire-economy 23









27

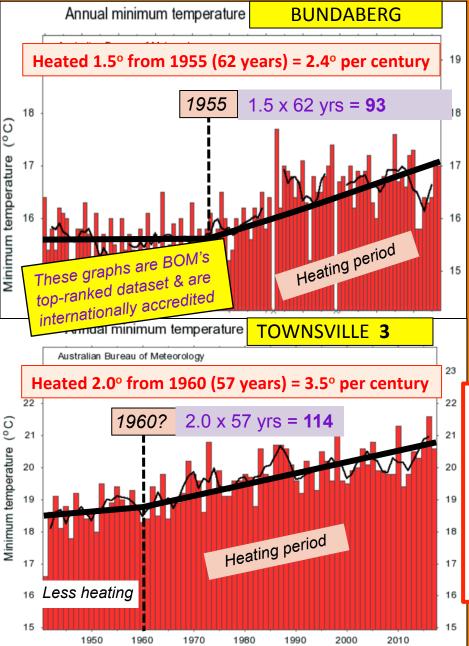
Rise

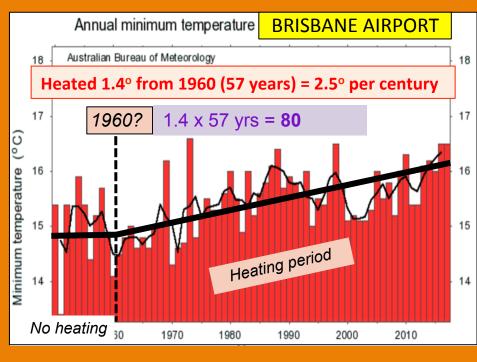
∆Heat

= Rate x period / 100

= Rate x period² / 100

= Rise x period





2	Startdate (ye	ear)	Heating rate (DPC)	<u>∆Heat (degree-years)</u>		
	Horn Island	1982	Horn Island	1.6	Horn Island	21	
1	Cairns	1940	Cairns	2.5	Cairns	146	
	Innisfail	1947	Innisfail	2.6	Innisfail	126	
þ	Cardwell	1947	Cardwell	2.6	Cardwell	126	
	Townsville	1969	Townsville	3.5	Townsville	114	
9	Bowen	1954	Bowen	>3.6	Bowen	143	
3	Mackay	1930	Mackay	2.3	Mackay	174	
5	St Lawrence	1964	St Lawrence	3.0	St Lawrence	84	
,	Rockhamptor	n 1960	Rockhampton	3.7	Rockhampton	120	
1	Bundaberg	1955	Bundaberg	2.4	Bundaberg	93	
5	Brisbane	?1960	Brisbane	2.5	Brisbane	80	

Climate change & night temperatures in the Bowen area

Night temperatures 14-16 February 2020 Bowen area, Queensland

Townsville 10030am 33.8 100000 100000 30.1 temp Range: 7.2° 100530am 28.5 5.0° 100530am 28.4 100770am 28.6 daily 100330am 29.5 5.0° 100530am 28.4 6.5° 100530am 28.4 100230am 28.4 100230am 28.4 100230am 28.4 100230am 28.4 100230am 28.5 100130am 28.4 100												
Townsville 16 1000 000m 16 1000 000m 20.0 Alva Beach 1000 000m 20.0 10000 000m 1000 000m 20.0					16/	09:00am	32.0		15/	09:00am	31.0	
Townsville 1003.0am 3.3 100 1007.0am 30.0 Range: 7.2° Alva Beach 1007.0am 28.4 1007.0am 28.4 1003.0am 29.3 1004.0am 29.5 5.0° 1005.0am 28.4 1005.0am 28.4 1007.0am 28.6 diality 29.2° 1004.0am 28.5 5.0° 1006.0am 28.4 6.5° 1003.0am 29.7 1003.0am 28.4 1003.0am 28.5 SUCh 1002.0am<					16/	08:30am	31.6		15/	08:30am	30.0	At any loca
Iownsville Range: 100:00am 28.6 Bowen 1007:00am 28.6 daily 100:00am 28.6 100:00am 27.0 100:00am 28.7 100:00am 28.7 100:00am 28.1 10					16/	08:00am	31.0		15/	08:00am	30.1	
Range: 1000:30am 29.6 7.20 1000:30am 29.2 Minimum: 1000:30am 29.2 1000:30am 29.2 5.00 1000:30am 29.4 6.50 1000:30am 29.4 1000:30am 29.4 1000:30am 29.7 1000:30am 29.4 1000:30am 27.6 1000:30am 29.7 1000:30am 29.4 1000:30am 27.8 1000:30am 27.8 1000:30am 30.3 1000:30am 29.7 1000:30am 27.8 show 1000:30am 30.3 1000:30am 28.6 1000:30am 28.7 1000:30am 30.3 1000:30am 28.7 1500:30am 28.7 1000:30am 30.3 1000:30am 28.7 1500:30am 28.7 1001:30am 30.3 1001:30am 28.7 1500:30am 28.8 1001:30am 30.3 1011:30am 28.7 1500:30am 28.8 1501:30am 28.8 1501:30am 28.8 1501:30am 28.8 1501:30am 28.8 1501:30am <	Townowil				16/	07:30am	30.6	Pouro	15/	07:30am	29.0	temperatu
Range: 1000:30am 29.6 7.20 1000:30am 29.2 Minimum: 1000:30am 29.2 1000:30am 29.2 5.00 1000:30am 29.4 6.50 1000:30am 29.4 1000:30am 29.4 1000:30am 29.7 1000:30am 29.4 1000:30am 27.6 1000:30am 29.7 1000:30am 29.4 1000:30am 27.8 1000:30am 27.8 1000:30am 30.3 1000:30am 29.7 1000:30am 27.8 show 1000:30am 30.3 1000:30am 28.6 1000:30am 28.7 1000:30am 30.3 1000:30am 28.7 1500:30am 28.7 1000:30am 30.3 1000:30am 28.7 1500:30am 28.7 1001:30am 30.3 1001:30am 28.7 1500:30am 28.8 1001:30am 30.3 1011:30am 28.7 1500:30am 28.8 1501:30am 28.8 1501:30am 28.8 1501:30am 28.8 1501:30am 28.8 1501:30am <	TOWNSVI	6/07:00am		Alva Dea	CN 16/	07:00am	28.4	Dowe	15/	07:00am	28.6	daily temp
Range: 7.2° 1003.00m 28.3 10003.00m 28.4 10013.00m 28.4 10013.00m 28.3 diag 1003.00m 29.5 5.0° 1003.00m 29.4 6.5° 1003.00m 28.4 1003.00m 28.5 1003.00m 28.6 1003.00m 28.1 1003.00m 28.6 1002.00m 28.1 1003.00m 28.4 elsev 1501.00m 28.5 Such 1501.00m <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>27.6</td><td></td><td>15/</td><td>06:30am</td><td>27.2</td><td></td></t<>							27.6		15/	06:30am	27.2	
Nearlyse. Nearlyse. 1903-30am 29.1 1903-30am 29.1 1905-30am 28.3 diagr 7.2° 1904-30am 9.2 5.0° 1903-30am 29.4 6.5° 1903-30am 9.7 1903-30am 29.4 6.5° 1904-30am 27.1 1904-30am 27.1 1904-30am 27.1 1904-30am 27.1 1904-30am 27.1 1904-30am 27.1 1904-30am 27.3 1412-30am 28.3 1903-30am 27.3 1412-30am 28.3 1903-30am 27.3 1413-30am 27.3 1413-30am 27.9 1500-30am 28.4 1502-30am 27.9 1500-30am 28.2 1500-30am 28.3 1500-30am 28.3 1500-30am 28.	Dongoi				16/	06:00am	28.6		15/	06:00am	26.4	temperatu
7.20 1004.30am 29.5 5.00 1006.50am 29.4 6.50 1006.30am 28.6 90.30am 29.7 1003.30am 29.4 1003.30am 29.4 1003.30am 27.3 1506.30am 27.4 datass 29.20 1002.30am 30.0 27.60 26.30 1506.30am 29.4 1506.30am 27.3 datass 1602.30am 30.2 1602.30am 29.8 1506.30am 28.8 26.30 1602.20am 30.3 1602.30am 29.8 1501.30am 28.8 <t< td=""><td>Range.</td><td></td><td></td><td></td><td></td><td></td><td>29.1</td><td></td><td>15/</td><td>05:30am</td><td>26.3</td><td>diagnostic</td></t<>	Range.						29.1		15/	05:30am	26.3	diagnostic
Minimum: 1004.30am 29.7 1003.30am 29.7 1003.30am 29.8 29.2° 1002.20am 1002.20am 30.2 1002.20am 30.2 1002.20am 30.4 1012.20am 30.0 1012.20am 30.0 1012.20am 30.3 1012.20am <	7 20	16/04:30am	29.5	5 00	16/	05:00am	29.4	6 50	15/	05:00am	26.6	ulagnostic
Minimum: 1603.30am 28.6 29.20 1604.00am 29.4 1603.30am 28.6 1603.30am 28.6 1603.30am 28.6 1603.30am 29.6 1602.30am 29.7 1602.30am 29.7 1602.30am 29.7 1602.30am 29.7 1602.30am 29.7 1602.30am 29.7 1607.30am 29.8 1607.30am 29.8 1671.30am 30.3 1671.20am 30.3 1671.20am 30.3 1671.30am 30.7 1671.30am 30.7 1671.30am 30.3 1671.30am 30.7 1671.30am 30.3 1671.30am 30.7 1670.30am 32.7 1670.30am 32.7 1670.30am 32.7 1670.30am 32.7 1670.30am 32.7 1670.30am 30.7 16	1.2	16/04:00am	29.2	0.0				0.0	15/	04:30am	27.0	The survey in the
29.20 100330am 28.4 27.60 100330am 29.4 26.30 100230am 30.2 100230am 29.4 26.30 100230am 27.8 shows 100230am 30.2 100230am 29.7 100230am 27.8 shows 100230am 30.4 100130am 29.7 100230am 29.7 100230am 22.9 gast 100130am 30.4 100130am 29.8 100130am 29.8 101120am 29.8 101120am 29.8 101120am 29.8 1011130am 29.5 such 101220am 30.3 101120am 29.8 101130am 29.8 1011130am 29.5 such 101120am 30.3 1511000m 30.0 150100m 30.0 14/1030pm 29.8 100130am 29.8 100130am 29.5 such 101120am 30.3 1510030pm 30.2 100130pm 30.2 100130pm 30.3 100130pm 30.2 100130pm 30.	Minimum	16/03:30am	29.7						15/	04:00am	27.1	The minim
29.20 1602.88m 30.0 27.9 show 1602.28m 30.2 1602.30m 22.7 1503.30m 27.9 show 1602.28m 30.2 1602.20m 26.3 1503.20m 27.8 show 1602.20m 30.4 1507.30m 29.7 1507.30m 22.2 elsev 1607.20m 29.9 1607.20m 29.8 1507.10m 28.9 1507.10m 28.9 1507.10m 28.9 1507.10m 28.9 1507.20m 29.1 This anecc 1607.20m 30.0 16/12.30m 29.7 14/11.30pm 29.1 anecc 15/11.30pm 29.5 SUCh This anecc 15/11.30pm 29.5 SUCh This anecc 14/11.30pm 29.5 SUCh Town 14/08.30pm 20.0 SUCh This 16/03.30pm 30.0 14/08.30pm 20.0 SUCh This 16/03.30pm 30.0 14/07.30pm 29.5 SUCh This 16/03.30pm 30.3 14/	<u>Iviii iii iuii i</u>	10/03.07 am							15/	03:30am		datasets for
1602:30am 30.2 1502:30am 27.8 51100 1602:20am 30.3 1602:00am 29.7 1502:30am 22.8 1501:30am 29.2 elsev 1601:30am 30.0 1601:30am 29.8 1501:30am 29.2 elsev 1601:30am 30.0 1601:30am 29.8 1501:30am 28.2 elsev 1601:22aam 30.0 1511:30pm 29.8 1571:230am 28.1 This 1601:20am 30.0 1511:30pm 29.8 1571:230am 28.1 This 1601:20am 30.3 1571:30pm 29.7 14/10:30pm 29.0 such 1601:30pm 30.3 1571:30pm 29.7 14/10:30pm 29.5 such 1601:30pm 30.3 1571:30pm 30.0 14/10:30pm 29.5 such 1601:30pm 30.3 1570:30pm 30.0 14/09:30pm 29.5 which 1607:30pm 31.6 1509:30pm 30.3 14/09:30pm 29.5<	29.20			27 6º	16/			26.30				
1602.328m 3.3 1602:00am 29.7 1500:00am 27.9 past 1600:00am 29.8 1500:00am 28.8 1500:00am 28.4 elsev 1601:00am 29.9 16112:00am 29.8 15112:00am 29.1 This 1611:203am 30.0 15111:00pm 29.8 14/11:30pm 29.1 This 1611:203am 30.3 15110:00pm 29.7 14/10:30pm 29.5 such 1611:203am 30.3 15110:00pm 29.7 14/10:30pm 29.5 such 1611:203am 30.3 1510:00pm 30.0 14/10:30pm 29.5 such 1611:30pm 31.3 1500:00pm 30.0 14/00:30pm 29.5 which 1510:00pm 31.6 1500:30pm 30.2 14/00:30pm 29.5 which 1500:30pm 31.6 1500:30pm 30.2 14/00:30pm 29.3 hot at 1500:30pm 31.6 1500:30pm 30.2 14/00:30pm <	<u></u>			<u></u>				<u>20.0</u>				show climation
1602.00am 30.4 160/130am 22.8 150/130am 22.4 elsev 160/130am 29.9 16/12:30am 29.8 15/12:30am 28.9 15/12:30am 28.9 16/12:30am 30.0 16/12:00am 29.8 15/12:30am 28.9 15/12:30am 28.9 16/12:20am 30.0 15/11:30pm 29.8 14/11:30pm 29.0 anecc 16/12:20am 30.3 15/10:00pm 30.0 14/10:30pm 29.5 such 16/11:30pm 30.3 15/10:00pm 30.0 14/10:30pm 29.5 such 16/11:30pm 30.3 15/10:00pm 30.0 14/00:30pm 29.5 such 15/10:30pm 31.5 15/00:30pm 30.0 14/00:30pm 29.8 Town 15/10:30pm 31.5 15/00:30pm 30.2 14/00:30pm 29.3 hot a 15/00:30pm 31.6 15/00:30pm 30.2 14/00:30pm 31.4 14/00:30pm 31.4 15/00:30pm 32												past few d
1601:30am 29.8 1601:00am 29.8 1601:00am 29.8 1601:00am 29.8 1601:00am 29.8 1601:230am 29.8 1601:230am 29.8 1601:230am 29.8 1601:230am 29.8 1601:230am 29.8 1601:20am 29.8 1601:20am 29.8 1601:20am 29.1 1anec 1601:20am 30.3 1501:030pm 29.7 1401:00pm 29.0 Such 1611:30pm 30.3 1501:030pm 30.0 1409:30pm 29.5 Such 1611:30pm 31.0 1509:30pm 30.0 1409:30pm 29.3 high 1610:30pm 31.6 1509:30pm 30.2 1407:30pm 29.3 high 1509:30pm 32.2 1506:30pm 30.2 1407:30pm 29.3 high 1509:30pm 32.2 1506:30pm 30.2 1407:30pm 29.3 high 1509:30pm 32.2 1506:30pm 30.8 1407:30pm 29.7 hot a 1509:30pm												
1601:00am 28.9 16/12:30am 28.8 15/12:30am 28.9 14/12:47am 30.0 16/12:00am 29.8 15/12:00am 29.1 This 16/12:00am 30.0 15/11:00pm 29.7 14/11:00pm 29.5 SUCh 16/12:00am 30.3 15/10:00pm 29.7 14/10:00pm 29.5 SUCh 16/12:00am 30.3 15/10:00pm 30.0 14/10:00pm 29.5 SUCh 16/17:00pm 31.0 15/09:00pm 30.0 14/09:30pm 29.5 Which 15/09:00pm 31.6 15/09:00pm 30.0 14/09:00pm 29.5 Which 15/09:00pm 31.6 15/09:00pm 30.2 14/09:30pm 29.5 Which 15/09:00pm 32.0 15/09:00pm 30.2 14/09:30pm 29.3 night 15/09:00pm 32.2 15/07:00pm 30.3 14/07:00pm 29.3 night 15/09:00pm 32.6 15/07:00pm 30.3 14/07:00pm 32.												elsewhere
Internal (b) Internal (b)<												
16/12:30am 30.0 15/11:30pm 29.8 16/12:20am 30.3 15/11:00pm 29.7 16/12:00am 30.3 15/10:30pm 29.7 16/12:00am 30.3 15/10:30pm 29.7 16/12:00am 30.3 15/10:30pm 30.0 16/11:00pm 31.0 15/00:30pm 30.0 16/10:00pm 31.6 15/00:30pm 30.0 15/00:30pm 31.5 15/00:30pm 30.2 15/00:30pm 32.2 15/00:30pm 30.3 15/00:30pm 32.2 15/00:30pm 30.8 16/00:30pm 35.5 15/00:30pm 31.6 15/00:30pm 31.6 14/00:30pm 31.6 16/00:30pm 35.5 15/00:30pm 31.6 16/00:30pm												This forma
16/12:23am 30.1 16/12:03am 30.3 16/11:00pm 30.0 16/12:03am 31.3 15/01:030pm 31.0 15/01:030pm 31.5 15/01:030pm 30.0 16/10:00pm 31.5 15/01:00pm 30.1 15/01:00pm 30.2 15/01:00pm 30.3 15/01:00pm 30.3 15/01:00pm 30.2 15/01:00pm 30.2 15/01:00pm 30.3 15/01:00pm 31.5 15/01:00pm 31.6 15/01:00pm 31.6 15/01:00pm 32.1 <		16/12:30am	30.0									
16/12:03am 30.3 16/12:03am 30.3 15/10:30pm 30.7 15/10:30pm 30.0 15/10:30pm 30.0 16/10:00pm 31.0 15/10:30pm 31.3 15/10:30pm 31.3 15/10:00pm 31.6 15/10:00pm 31.6 15/00:30pm 30.2 15/00:30pm 30.3 15/00:30pm 30.3 15/00:30pm 30.3 15/00:30pm 30.3 15/00:30pm 30.3 15/00:30pm 31.5 15/00:30pm 31.6 15/00:30pm 31.6 15/00:30pm 31.6 15/00:30pm 31.6 15/00:30pm 31.6 15/00:30pm 31.6 15/00:30pm 32.1 15/00:30pm 32.1		16/12:29am	30.1			•						anecdotal
16/11:30pm 30.7 15/10:00pm 30.0 14/10:00pm 29.6 Town 15/11:00pm 31.0 15/09:00pm 30.0 14/09:30pm 29.8 Which 15/11:00pm 31.6 15/09:00pm 30.0 14/09:30pm 29.8 Which 15/09:00pm 31.6 15/09:00pm 30.2 14/09:30pm 29.3 hot a 15/09:00pm 32.0 15/07:30pm 30.2 14/07:30pm 29.3 hot a 15/09:00pm 32.2 15/07:30pm 30.3 14/07:30pm 29.3 hot a 15/07:30pm 32.2 15/07:30pm 30.3 14/07:30pm 29.3 hot a 15/07:30pm 32.2 15/06:30pm 30.3 14/07:30pm 29.7 night 15/07:30pm 32.5 15/06:30pm 31.6 14/06:30pm 31.6 14/06:30pm 31.6 15/06:30pm 35.5 15/06:00pm 31.6 14/04:30pm 32.0 In my 15/06:30pm 35.5 15/06:30pm <td< td=""><td></td><td>16/12:03am</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>such as th</td></td<>		16/12:03am										such as th
15/11:00pm 31.0 15/09:30pm 30.0 14/09:30pm 29.8 10W1 15/10:00pm 31.3 15/09:00pm 30.1 14/09:00pm 29.5 Which 15/09:00pm 31.6 15/08:00pm 30.2 14/08:30pm 29.3 hot a 15/09:00pm 32.0 15/07:30pm 30.2 14/08:00pm 29.3 night 15/09:00pm 32.1 15/07:30pm 30.2 14/07:30pm 29.3 night 15/09:00pm 32.2 15/07:30pm 30.2 14/07:00pm 29.7 The r 15/09:00pm 32.5 15/06:00pm 31.6 14/06:00pm 31.0 Town 15/09:00pm 32.5 15/06:00pm 31.6 14/06:00pm 31.0 Town 15/09:00pm 32.5 15/06:00pm 31.6 14/06:00pm 31.0 Town 15/09:00pm 35.4 15/06:00pm 31.6 14/04:00pm 32.0 In my 15/09:00pm 36.4 15/00:00pm 32.1 14/04:00pm 32.0 In my 15/09:00pm 36.5 15/00:00pm			30.3							•		
15/10:30pm 31.3 15/00:00pm 30.1 15/00:00pm 31.6 15/00:00pm 30.2 15/00:30pm 31.6 15/00:30pm 30.2 15/00:30pm 32.0 15/00:30pm 30.3 15/00:30pm 32.1 15/00:30pm 30.2 15/00:30pm 32.2 15/00:30pm 30.3 15/00:30pm 32.2 15/00:30pm 30.3 15/00:30pm 32.2 15/00:30pm 30.3 15/00:30pm 32.2 15/00:30pm 30.8 15/00:30pm 32.2 15/00:30pm 31.5 15/00:30pm 32.5 15/00:30pm 31.6 15/00:30pm 35.5 15/00:30pm 31.6 15/00:30pm 35.5 15/04:30pm 31.6 15/04:30pm 35.5 15/04:30pm 32.1 15/03:30pm 36.4 15/02:30pm 32.1 15/03:30pm 36.4 15/02:30pm 32.1 15/02:30pm 32.1 14/02:30pm 32.8						•						Townsville
15/00:00pm 31.6 15/08:30pm 30.2 14/08:30pm 29.3 hot a 15/09:00pm 32.0 15/08:00pm 30.3 14/08:00pm 29.1 night 15/09:00pm 32.1 15/07:30pm 30.2 14/07:00pm 29.3 night 15/08:00pm 32.1 15/07:00pm 30.2 14/07:00pm 29.3 night 15/07:00pm 32.2 15/06:00pm 30.3 14/07:00pm 29.7 night 15/07:00pm 32.5 15/06:00pm 31.1 14/06:00pm 31.0 Town 15/06:00pm 34.4 15/05:00pm 31.5 14/06:00pm 31.4 almo 15/05:00pm 35.5 15/04:00pm 31.6 14/04:00pm 32.0 In my 15/04:30pm 36.4 15/04:30pm 32.1 14/04:00pm 32.0 In my 15/04:30pm 36.4 15/02:30pm 32.1 14/04:00pm 32.0 In my 15/04:30pm 36.6 15/02:30pm 32.1 14/04:30pm 32.0 In my 15/02:30pm 36.1 15/02:30pm <td></td> <td>which has</td>												which has
15/09:30pm 31.5 15/08:00pm 30.2 14/08:00pm 29.3 night 15/09:00pm 32.0 15/08:00pm 30.2 14/07:30pm 29.3 night 15/09:00pm 32.2 15/07:30pm 30.2 14/07:30pm 29.3 night 15/09:00pm 32.2 15/07:00pm 30.3 14/07:00pm 29.7 The r 15/07:00pm 32.2 15/06:30pm 31.1 14/06:00pm 30.3 The r 15/07:00pm 32.2 15/06:30pm 31.6 14/06:00pm 31.6 Town 15/06:00pm 35.5 15/06:00pm 31.6 14/06:00pm 31.6 14/04:00pm 32.0 In my 15/06:00pm 35.2 15/04:00pm 32.1 14/02:00pm 32.0 In my citize 15/04:00pm 36.0 15/02:00pm 31.6 14/02:00pm 32.8 article citize 15/02:00pm 37.1 15/02:00pm 31.6 14/02:00pm 32.8 article years 15/01:00pm 35.7 15/01:00pm 32.1 14/01:00pm 32.						•						which has
15/09:00pm 32.0 15/07:30pm 30.2 14/07:30pm 29.3 night 15/07:30pm 32.2 15/07:30pm 30.3 14/07:30pm 29.3 night 15/07:30pm 32.2 15/07:30pm 30.3 14/07:30pm 29.3 night 15/07:30pm 32.2 15/06:30pm 30.3 14/06:30pm 30.3 The r 15/07:30pm 32.2 15/06:00pm 31.1 14/06:30pm 30.3 The r 15/06:30pm 33.7 15/06:30pm 31.6 14/06:30pm 31.6 14/06:30pm 31.6 15/05:30pm 36.4 15/05:00pm 31.6 14/04:30pm 32.0 In my 15/06:30pm 36.4 15/04:00pm 32.1 14/04:30pm 32.0 In my 15/04:30pm 36.0 15/04:00pm 32.1 14/04:30pm 32.0 In my 15/03:30pm 36.0 15/02:30pm 32.1 14/02:30pm 32.8 article 15/01:30pm 36.0 15/01:30pm 32.1 14/01:30pm 32.4 years 15/01:30pm 36.0										•		hot and hu
15/08:00pm 32.2 15/07:00pm 30.3 14/07:00pm 29.7 The r 15/07:30pm 32.2 15/06:30pm 30.8 14/06:30pm 30.3 The r 15/07:00pm 32.2 15/06:30pm 30.8 14/06:00pm 31.0 Town 15/06:00pm 34.4 15/05:30pm 31.6 14/06:00pm 31.4 almo 15/06:00pm 36.4 15/04:00pm 31.6 14/04:30pm 32.0 In my 15/06:30pm 36.5 15/04:00pm 31.6 14/03:00pm 32.0 In my 15/06:30pm 36.6 15/04:00pm 32.1 14/03:00pm 32.0 In my 15/04:30pm 36.6 15/02:30pm 31.8 14/03:00pm 32.0 In my 15/03:30pm 36.4 15/02:30pm 32.1 14/03:00pm 32.8 article 15/02:30pm 36.0 15/02:30pm 32.1 14/02:30pm 32.4 years 15/01:30pm 36.3 15/01:30pm 31.9 14/01:00pm 32.5 temp 15/01:30pm 36.7 15/01:30pm </td <td></td> <td>15/09:00pm</td> <td>32.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		15/09:00pm	32.0									
15/06:00pm 32.2 15/07:00pm 32.2 15/07:00pm 32.5 15/07:00pm 32.5 15/06:00pm 33.7 15/06:00pm 33.7 15/06:00pm 34.4 15/06:00pm 34.4 15/05:00pm 35.4 15/06:00pm 35.5 15/06:00pm 35.5 15/06:00pm 35.5 15/06:00pm 35.6 15/06:00pm 35.5 15/06:00pm 35.6 15/06:00pm 35.5 15/04:00pm 32.0 15/03:30pm 36.4 15/02:30pm 31.8 15/02:30pm 32.4 15/02:30pm 32.1 15/02:30pm 36.0 15/02:30pm 31.6 15/02:30pm 32.1 15/01:30pm 32.1		15/08:30pm				•						night - see
1507.30pm 32.2 1507.30pm 32.2 1507.30pm 32.2 1507.30pm 33.7 1507.30pm 33.7 1506.30pm 31.1 1506.30pm 31.1 1506.30pm 31.1 1506.30pm 31.4 1506.30pm 31.6 1506.30pm 35.4 1506.30pm 35.5 1506.30pm 35.5 1506.30pm 31.6 1506.30pm 32.1 1507.30pm 32.1 1508.30pm 32.1 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>•</td> <td></td> <td>The minim</td>										•		The minim
15/06:30pm 33.7 15/05:30pm 31.5 14/05:30pm 31.4 15/06:00pm 34.4 15/05:00pm 31.6 14/05:00pm 31.6 15/06:00pm 35.5 15/04:30pm 31.6 14/04:00pm 32.0 14/04:00pm 32.0 14/04:00pm 32.0 14/04:00pm 32.0 16/04:00pm 30.3 Citize 15/04:00pm 36.0 15/03:00pm 32.4 14/03:00pm 31.1 Citize 15/02:30pm 36.0 15/02:30pm 32.1 14/02:00pm 32.8 article 15/02:00pm 37.1 15/01:30pm 31.6 14/01:30pm 32.4 years 15/01:30pm 36.0 15/01:30pm 31.6 14/01:30pm 32.6 14/01:30pm 32.6 14/01:30pm 32.6 14/01:30pm 32.6 14/01:30pm 32.6 14/01:30pm 32.6 16/01:30pm 32.6 14/01:30pm 32.6 16/11:30am 32.6 14/12:30pm						•						
15/06:00pm 34.4 15/05:00pm 31.6 14/05:00pm 31.6 14/05:00pm 31.6 14/04:30pm 32.0 15/05:00pm 35.5 15/04:30pm 31.6 14/04:30pm 32.0 11 mmy 15/04:00pm 35.5 15/04:30pm 31.8 14/04:30pm 32.0 11 mmy 15/04:00pm 35.5 15/04:00pm 32.1 14/04:00pm 32.0 11 mmy 15/04:00pm 35.6 15/03:30pm 31.8 14/03:30pm 30.3 citize 15/03:30pm 36.4 15/02:30pm 32.1 14/02:30pm 32.8 article 15/02:30pm 36.0 15/02:00pm 31.6 14/01:00pm 32.8 years 15/02:00pm 37.1 15/01:00pm 31.6 14/01:00pm 32.4 years 15/01:00pm 35.7 15/01:00pm 32.1 14/01:00pm 32.6 14/01:00pm 32.6 15/12:30pm 34.1 15/12:00pm 32.6 14/11:00pm 32.2 in liv 15/12:00pm 34.0 15/11:00am 31.3 14/11:00am 31.7						•						Townsville
15/05:30pm 35.4 15/05:00pm 35.5 15/04:30pm 31.6 15/04:30pm 32.0 15/04:30pm 32.1 15/04:00pm 32.1 15/04:00pm 32.1 15/04:30pm 32.0 15/04:00pm 32.1 15/04:00pm 32.1 15/04:00pm 32.4 15/03:30pm 31.8 15/03:30pm 35.5 15/02:30pm 35.5 15/02:30pm 32.1 15/02:30pm 32.1 15/02:30pm 31.6 15/02:30pm 32.1 15/02:30pm 32.1 15/02:30pm 32.1 15/01:00pm 32.1 15/01:00pm 32.1 15/01:00pm 32.1 15/12:30pm 32.1 15/12:30pm 32.1 15/12:30pm 32.1 15/12:30pm 32.6 15/12:30pm 32.6 15/12:30pm 32.6 15/11:30am 31.6 15/11:30am 31.6										•		almost the
15/05:00pm 35.5 15/06:00pm 35.5 15/04:30pm 35.2 15/04:30pm 35.2 15/04:30pm 32.1 15/04:30pm 32.4 15/03:30pm 31.8 15/03:30pm 32.4 15/02:30pm 32.1 15/02:30pm 32.1 15/02:30pm 32.1 15/02:30pm 32.1 15/02:30pm 32.1 15/02:30pm 32.1 15/01:30pm 31.6 15/01:30pm 32.1 15/01:30pm 32.1 15/01:30pm 32.1 15/12:30pm 32.1 15/12:30pm 32.1 15/12:30pm 32.6 15/11:30am 31.6 15/11:30am 31.6 15/11:30am 31.6 15/11:30am 31.6						•						annost the
15/04:30pm 35.2 15/04:00pm 32.1 14/04:00pm 32.0 111111 15/04:00pm 36.0 15/03:30pm 31.8 14/03:30pm 30.3 Citize 15/03:30pm 36.4 15/03:00pm 32.4 14/03:00pm 31.1 Citize 15/02:30pm 36.0 15/02:00pm 32.1 14/02:00pm 32.8 article 15/02:00pm 37.1 15/01:30pm 31.9 14/01:00pm 32.4 years 15/01:30pm 36.3 15/01:00pm 32.1 14/01:00pm 32.5 temp 15/01:00pm 35.7 15/01:00pm 32.1 14/01:00pm 32.6 temp 15/12:30pm 34.1 15/12:00pm 32.6 14/11:30am 32.6 temp 15/11:30am 31.6 15/11:00am 31.3 14/11:00am 32.7 temp 15/11:30am 31.6 15/11:00am 31.3 14/11:00am 31.7 Weath												
15/04:00pm 36.0 15/03:30pm 31.8 14/03:30pm 30.3 Citize 15/03:30pm 36.4 15/03:00pm 32.4 14/03:00pm 31.1 Citize 15/03:00pm 35.5 15/02:30pm 32.4 14/02:30pm 32.8 article 15/02:00pm 37.1 15/02:00pm 31.6 14/02:00pm 32.8 years 15/02:00pm 37.1 15/01:30pm 31.9 14/01:30pm 32.4 years 15/02:00pm 37.1 15/01:30pm 32.1 14/01:30pm 32.5 temp 15/01:00pm 35.7 15/01:00pm 32.1 14/12:30pm 32.6 temp 15/12:00pm 34.1 15/12:00pm 32.6 14/11:30am 32.2 temp 15/11:30am 31.6 15/11:30am 31.6 14/11:30am 32.2 temp 15/11:30am 31.6 15/11:30am 31.6 14/11:30am 32.2 temp 15/11:30am 31.6 15/11:30am 31.3 14/11:30am 31.7 Weath										•		In my and
15/03:30pm 36.4 15/02:30pm 32.1 14/02:30pm 32.8 14/02:00pm 32.8 15/02:30pm 36.0 15/02:00pm 31.6 14/01:30pm 32.8 Years 15/02:30pm 36.3 15/01:30pm 31.9 14/01:30pm 32.6 14/01:00pm 32.6 110/01:00pm 32.2 110/01:00pm 32.6 110/01:00pm 32.2 110/01:00pm 32.6 110/01:00pm 32.2 110/01:00pm 32.2 110/01:00pm 32.2 110/01:00pm 32.6 110/01:00pm 32.2 110/01:00pm 32.2 110/01:00pm 32.7 110/01:00pm 32.7 110/01:00pm 32.6 110/01:00pm 32.2 110/01:00pm 32.7 110/01:00pm 32.7 110/01:00pm 32.7		15/04:00pm	36.0									citizens' ex
15/02:30pm 36.0 15/02:00pm 31.6 14/02:00pm 32.8 years 15/02:00pm 37.1 15/01:30pm 31.9 14/01:30pm 32.4 years 15/01:00pm 35.7 15/01:00pm 32.1 14/01:30pm 32.5 temp 15/12:30pm 34.1 15/12:30pm 32.6 14/12:30pm 32.6 temp 15/12:00pm 34.0 15/11:30am 31.6 14/12:30pm 32.2 temp 15/11:30am 35.6 15/11:30am 31.6 14/11:30am 32.7 temp 15/11:30am 35.6 15/11:30am 31.6 14/11:30am 32.7 temp		15/03:30pm	36.4									
15/02:00pm 37.1 15/01:30pm 31.9 14/01:30pm 32.4 Years 15/01:30pm 36.3 15/01:00pm 32.1 14/01:00pm 32.5 temp 15/01:30pm 34.1 15/01:30pm 32.1 14/01:30pm 32.6 temp 15/12:30pm 34.0 15/12:00pm 32.6 14/12:00pm 32.2 temp 15/11:30am 35.6 15/11:30am 31.6 14/11:30am 32.2 temp 15/11:30am 31.6 15/11:00am 31.3 14/11:00am 31.7 Weath		15/03:00pm				•						articles ov
15/01:30pm 36.3 15/01:00pm 32.1 15/01:00pm 35.7 15/12:30pm 32.1 15/12:30pm 32.1 15/12:00pm 34.1 15/11:30am 31.6 15/11:00am 31.3										•		years, Tov
15/01:00pm 35.7 15/12:30pm 32.1 15/12:30pm 34.1 15/12:00pm 34.0 15/11:30am 31.6 15/11:00am 31.3						•				•		
15/12:30pm 34.1 15/12:00pm 32.6 14/12:00pm 32.2 in liv 15/12:00pm 34.0 15/11:30am 31.6 14/11:30am 32.2 16/11:30am 14/11:30am 32.7 Weath												temperati
15/12:00pm 34.0 15/11:30am 31.6 14/11:30am 32.2 15/11:00am 34.3 15/11:00am 31.3 14/11:00am 31.7 Weath												in living n
15/11:30am 35.6 15/11:30am 31.8 14/11:30am 32.2 15/11:00am 24.3 15/11:00am 31.3 14/11:00am 31.7 Weath										-		in living n
15/11:00am 31.3 14/11:00am 31.7 VPCU												14 (a set la seconda da set
15/10:30am 35.8 15/10:30am 31.4 14/10:30am 31.4												Weather date
		15/10:30am	35.8									http://www.l
15/10:00am 36.0 15/10:00am 32.0 14/10:00am 31.8 1DQ60		15/10:00am	36.0									IDQ60801/ID
15/09:30am 34.3 15/09:30am 31.5 14/09:30am 31.3												
15/09:00am 33.5 15/09:00am 31.5 14/09:00am 30.5		15/09:00am	33.5		15/	09:00am	31.5		14/	09:00am	30.5	

At any location, its *nightly* comperatures - the *minimum daily temperature* - are the comperature most formally diagnostic of climate change.

The minimum temperature datasets for these 3 locations show climate heating for the past few decades (see graphs elsewhere).

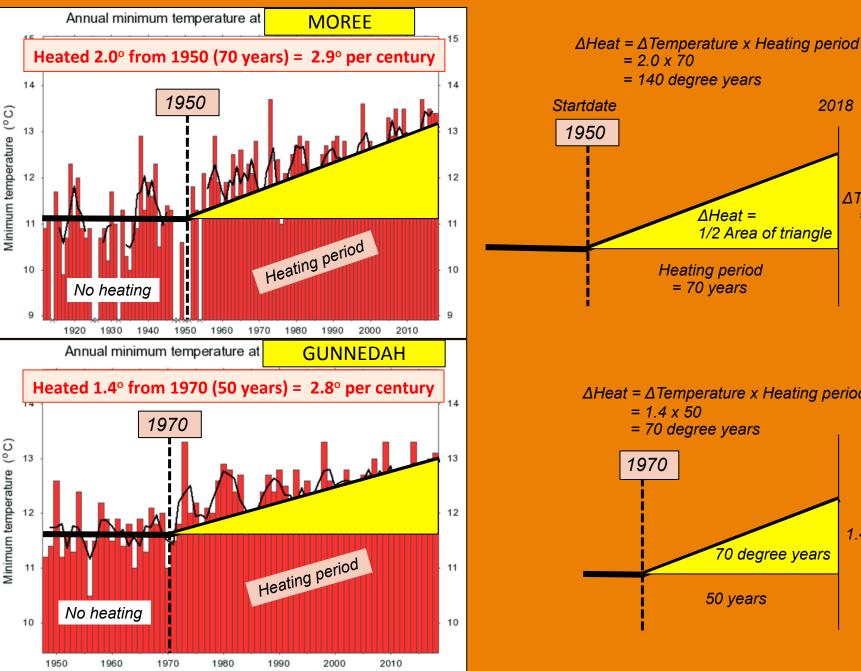
This formal source is reified in anecdotal daily experiences, such as the past week in Townsville in mid-February 2020 which has delivered unusually hot and humid nights, mostly all night - see 24 hour tables on left. The minima are very high; Townsville is above 30° for almost the full 24 hour cycle.

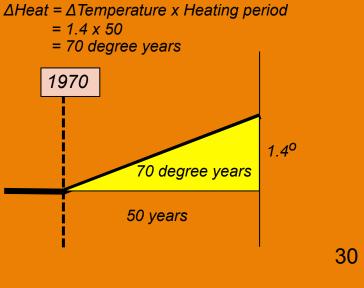
In my and fellow Townsville citizens' experience, plus media articles over the past several years, Townsville's nightly temperatures are higher than in living memory.

Weather data, BOM, 2020 http://www.bom.gov.au/products/ IDQ60801/IDQ60801.94294.shtml

29

ΔHeat: its factors, definition and calculation





2018

 $\Delta Heat =$

1/2 Area of triangle

∆Temperature $= 2.0^{\circ}$

HEATING RATE



HEATING PERIOD



Heating rate (DPC)				
Horn Island	1.6			
Cairns	2.5			
Innisfail	2.6			
Cardwell	2.6			
Townsville	3.5			
Bowen	>3.6			
Mackay	2.3			
St Lawrence	3.0			
Rockhampton	3.7			
Bundaberg	2.4			
Brisbane	2.5			

Startdate (y	r)
Horn Island	1982
Cairns	1940
Innisfail	1947
Cardwell	1947
Townsville	1969
Bowen	1954
Mackay	1930
St Lawrence	1964
Rockhampto	
Bundaberg	1955
Brisbane	?1960

Heating period	<u>d (yrs</u>)
Horn Island	35
Cairns	77
Innisfail	70
Cardwell	70
Townsville	48
Bowen	63
Mackay	87
St Lawrence	53
Rockhampton	57
Bundaberg	62
Brisbane	?57

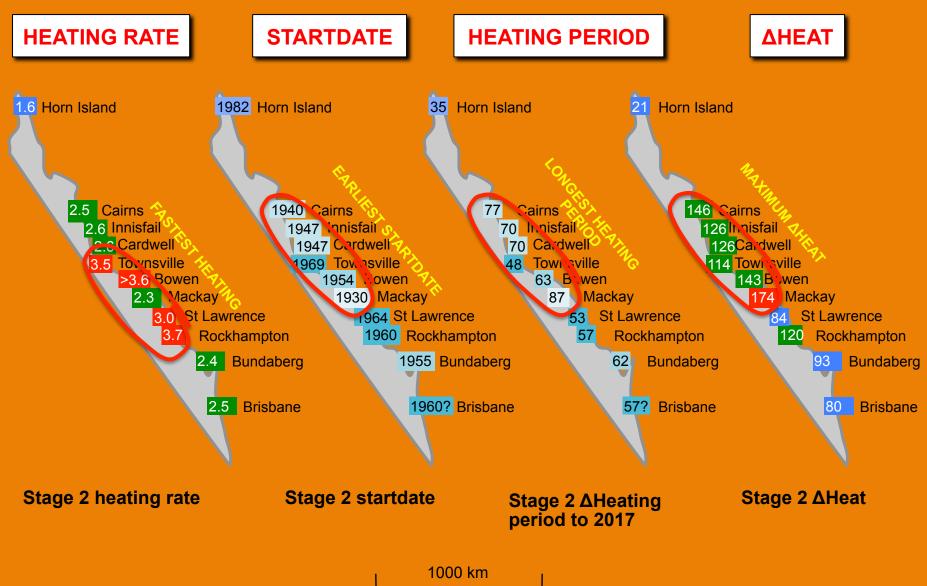
<u>∆Heat (degree</u>	- <u>yrs</u>)
Horn Island	21
Cairns	146
Innisfail	126
Cardwell	126
Townsville	114
Bowen	143
Mackay	174
St Lawrence	84
Rockhampton	120
Bundaberg	93
Brisbane	80

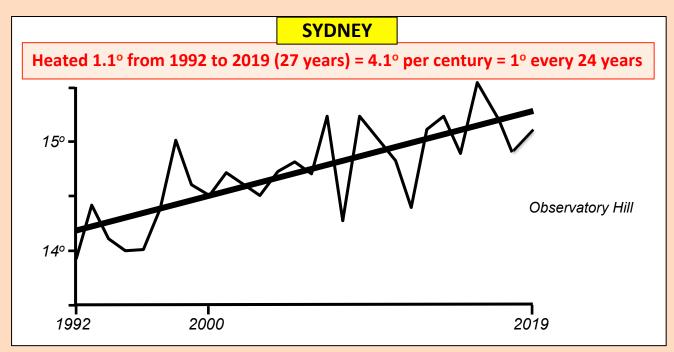
Stage 2 heating rate

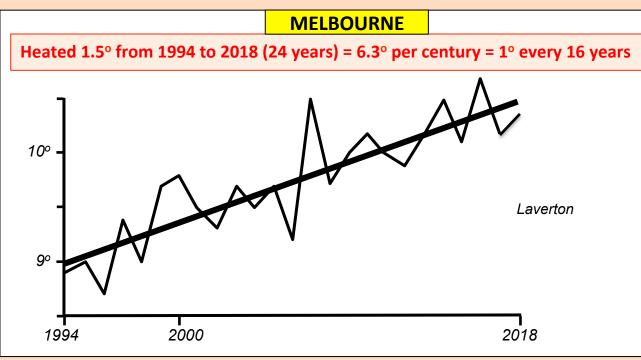
Stage 2 startdate

Stage 2 ΔHeating period to 2017

Stage 2 ∆Heat







Accelerated heating in Sydney & Melbourne

From BOM ACORN-SAT dataset.

Some Australian locations have sufficiently dense data to show accelerated heating in the past 25 years (this precludes many stations, because proof of accelerated change requires denser data than linear change).

These graphs show minimum daily temperatures for Sydney and Melbourne over the past quarter century, with a calculated linear regression line.

Their heating rates are respectively 4.1 and 6.3 degrees per century (DPC).

These are respectively 205% and 290% greater than each city's heating rate since heating began (respectively 2.0 and 2.2 DPC, each starting ca 1945).

Their accelerations in the past quarter century, 205% and 290%, show a mean 250% acceleration.

http://www.bom.gov.au/climate/change/ index.shtml#tabs=Tracker&tracker=sitenetworks

North Queensland's Wet Tropics are in accelerating decline

The Wet Tropics World Heritage Area Management Authority 29 April 2019

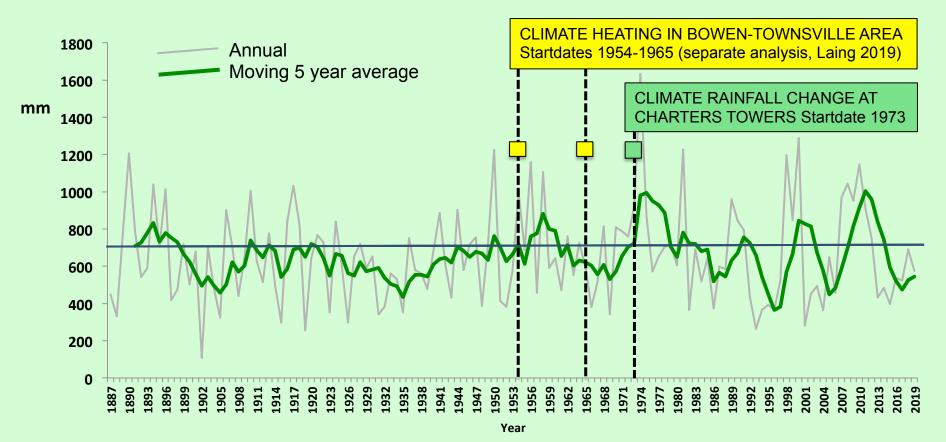
- The Wet Tropics World Heritage Area has been damaged by climate change extreme heat equivalent to coral bleaching of the Great Barrier Reef
- The tropical rainforest is in "accelerating decline"
- Last summer 2018-19 was the *hottest on record*
- Mount Bartle Frere recorded an *unprecedented 39°C* on 6 days that summer
- Some unique species are at *imminent risk of* extinction
- Mountain species like the lemuroid ringtail possum are unable to survive even one day above 29C
- This is occurring *now, not in the future*, and requires an *immediate response*



https://www.theguardian.com/environment/2019/apr/30/climate-change-damage-to-queenslands-world-heritage-rainforest-as-bad-asgreat-barrier-reef utm_term=RWRpdG9yaWFsX0d1YXJkaWFuVG9kYXlBVVMtMTkwNDMw&utm_source=esp&utm_medium=Email&utm_campaign=GuardianT odayAUS&CMP=GTAU_email Eungella rainforest near Bowen, incinerated for the first time in thousands of years, November 2018

Climate change and its impact on rainfall in the Bowen area

Rainfall 1887-2019 Charters Towers, Queensland



Greater rainfall amplitude, longer and deeper droughts, and more extreme wet periods, have pushed the long term annual average rainfall up in the past 50 years. in the 1980s the CSIRO modelling (based on long term rainfall and coral core data) predicted this pattern, within an overall long term drying trend for that region. The prediction has been realised. Similar rainfall patterns exist in Eastern Indonesia and coastal Vietnam.

ECOGRAZE project, J. Corfield & others, CSIRO, 2001, updated with rainfall data to 2019

Global heating impacts Townsville: Letter to St Pats' students

(Editor's headline)

Cynics of sea level rise engulfed by ignorance

KEL Ackland's "thoughts and opinions" (Letters, November 10) include "I would like to assure Michael and many others that the climate in tropical Townsville has not changed in any way shape or form. It has always been that way. I was born in Townsville in 1942 and lived in this city all of my life". And he cites "the melodies from the Greens songbook ... mistakes and exaggerations".

Kel represents a sizeable proportion of Townsville in disbelieving climate change.

Unfortunately for them, for Townsville, and for the world, the climate sceptics are profoundly wrong.

Graphs show the Bureau of Meteorology data for Townsville (airport) and other North Queensland towns which most of us know.

All show a heating climate, every one with the same diagnostic pattern: a flat line until heating commences in the middle of the 20th century, and with the same rate of heating: averaging 2.7 degrees per 100 years.

This evidence is incontrovertible. Townsville is heating up via man-made global warming, and our rate is 2.5 times the overall global rate of 1.1 degrees per 100 years. Townsville is in for a beating, and nothing will change unless we do something about it, starting right now

We had better start telling our grandkids to buckle up and get used to big cyclones like Yasi, more heatwaves in summer, heatwaves in winter, hot nights, and a rising sea along Pallarenda and the Strand (the Coral Sea has already risen around 7cm).

life in Townsville you have experienced its full period of heating to date.

Kel, in primary school did you hear about King Canute, who sat by his own Strand in Denmark and told the tide to stop coming in?

Facts are facts, and no amount of sticking your head in the sand will stop the sea already rising along our Strand.

Are climate sceptics going to be part of the problem or part of the solution?

Will you take responsibility for acknowledging the global warming data, and getting your grandkids ready for a different and difficult future?

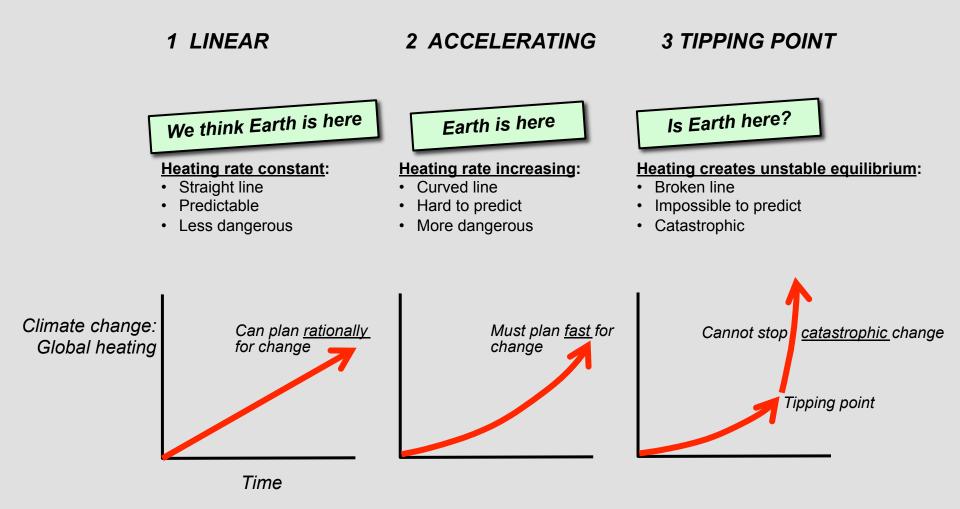
> DR BILL LAING, Mining & Renewable Energy Analyst.

This tells the students of St Pats about the rising sealevel 50 metres from their school, and the cyclone storm surges which hit their school every few years

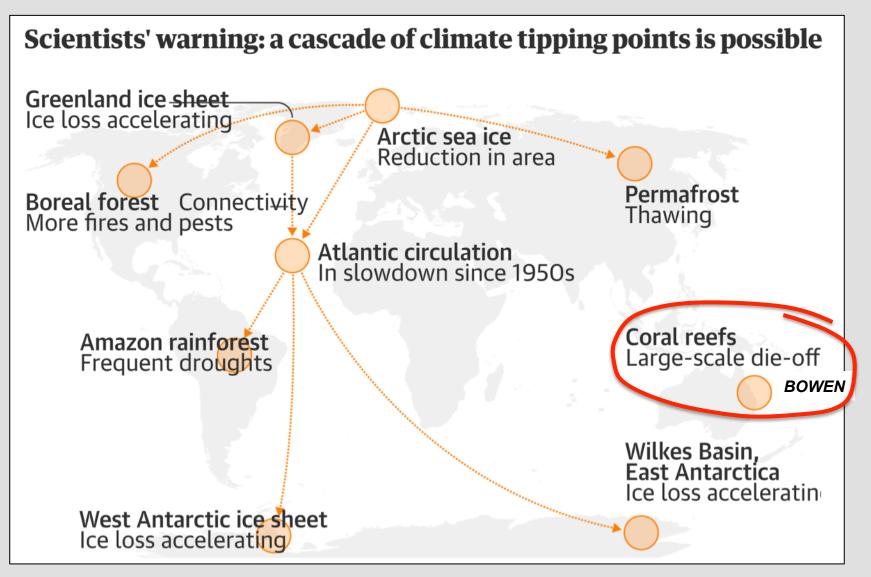
The Coral Sea has already risen 7 cm



Global heating scenarios: Linear - accelerating - tipping



Climate change: acceleration and tipping points



The Guardian, Lenton et al, Nature, November 2019

ANNEXURE OF TABLES AND FIGURES

- Figure 1 The fundamental world heating graph: Past 170 years
- Figure 2 The fundamental world heating graph: Past millenium
- Figure 3 Climate heating is in direct ratio to fossil fuel consumption
- Figure 4 Climate heating (air & ocean) is in direct ratio to CO2
- Figure 5 Global heating: Australia's contribution to carbon emissions
- Figure 6 Australia & Bowen's heating curves: air & ocean (Coral Sea)
- Figure 7 Global heating: How does Australia compare?
- Figure 8 Global heating key indicators
- Figure 9 The Arctic icecap will be destroyed in 20 years
- Figure 10 Antarctica is melting, and the melting is accelerating
- Figure 11 Climate rage is here: Temperature-aggression hypothesis
- Figure 12 Climate rage is here: Darwin's mango madness
- Figure 13 The damage to life of a world temperature rise over 1.5-2°
- Figure 14 Australia adopts new, more severe climate ratings: heat & fire
- Figure 15 Emergency vs climate emergency: the same but different
- Figure 16 The new arithmetic of emergency: doesn't mean fast or short
- Figure 17 The new arithmetic shows the *urgency* of the emergency
- Figure 18 (Most) extreme weather is caused by climate change
- Figure 19 Australia's climate heating in all cities & towns: examples
- Figure 20 (Most) extreme weather is caused by climate change
- Figure 21 Australia's heating rate is 1.5x world rate: Bowen is 3x world
- Figure 22 Australia's heating rate is 1.5x world rate (the whole country)
- Figure 23 Bowen Basin companies emit more carbon than our economy
- Figure 24 Bowen's heating is in direct ratio to fossil fuel consumption

LAING EXPLORATION Pty Ltd

1

Figure 25	Climate heating: The slow-roasting of the Bowen area
Figure 26	Climate heating: The slow-roasting of the Bowen area
Figure 27	Climate heating: The slow-roasting of the Bowen area
Figure 28	Climate heating: The slow-roasting of the Bowen area
Figure 29	Climate change & night temperatures in the Bowen area
Figure 30	Δ Heat: its factors, definition and calculation
Figure 31	Climate heating: The slow-roasting of the Bowen area
Figure 32	Climate heating: The slow-roasting of the Bowen area
Figure 33	Accelerated heating in Sydney and Melbourne
Figure 34	North Queensland's Wet Tropics are in accelerating decline
Figure 35	Eungella rainforest near Bowen, incinerated for the first time in
	thousands of years, November 2018
Figure 36	Climate change and its impact on rainfall in the Bowen area
Figure 37	Global heating impacts Townsville: Letter to St Pats' students
Figure 38	Global heating scenarios: Linear - accelerating - tipping
Figure 39	Climate change: acceleration and tipping points

,

Figure 25