Terms of Reference

That the following matter be referred to the Finance and Public Administration References Committee for inquiry and report by the last sitting day in 2021:

Lessons to be learned in relation to the preparation and planning for, response to and recovery efforts following the 2019-20 Australian bushfire season, with particular reference to:

(a) advice provided to the Federal Government, prior to the bushfires, about the level of bushfire risk this fire season, how and why those risks differed from historical norms, and measures that should be taken to reduce that risk in the future;

(b) the respective roles and responsibilities of different levels of government, and agencies within government, in relation to bushfire planning, mitigation, response, and recovery;

(c) the Federal Government's response to recommendations from previous bushfire Royal Commissions and inquiries;

(d) the adequacy of the Federal Government's existing measures and policies to reduce future bushfire risk, including in relation to assessing, mitigating and adapting to expected climate change impacts, land use planning and management, hazard reduction, Indigenous fire practices, support for firefighters and other disaster mitigation measures;

(e) best practice funding models and policy measures to reduce future bushfire risk, both within Australia and internationally;

(f) existing structures, measures and policies implemented by the Federal Government, charities and others to assist communities to recover from the 2019-20 bushfires, including the performance of the National Bushfire Recovery Agency;

(g) the role and process of advising Government and the federal Parliament of scientific advice;

(h) an examination of the physical and mental health impacts of bushfires on the population, and the Federal Government's response to those impacts; and

(i) any related matters.

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(d) the adequacy of the Federal Government's existing measures and policies to reduce future bushfire risk, including in relation to assessing, mitigating and adapting to expected climate change impacts, land use planning and management, hazard reduction, Indigenous fire practices, support for firefighters and other disaster mitigation measures;

(e) best practice funding models and policy measures to reduce future bushfire risk, both within Australia and internationally;

(g) the role and process of advising Government and the federal Parliament of scientific advice;

In regards to Item (d) specifically, the aspects of the Government's existing measures to reduce bushfire risk and

it's role in assessing, mitigating and adapting to climate change impacts, I must submit a detailed and complex

response.

Weather is what we have every day which is a result of climate. Climate is the interaction

of a range of global inputs including the effects of global weather systems, space weather, including

sun activity, earth's rotation, and well-researched anthropogenic effects. Knowledge of this science

and impacts and interactions is essential and is of further significance as the future unfolds for Australia

as it deals with anthropogenic effects. Knowledge and research are the key requirements to map a way

ahead into the future. A solid knowledge and research base is essential to drive further forward planning to

mitigate or minimise climate change impacts.

For the Australian government to plan to assess, mitigate and adapt to expected climate change impacts

now, and in the future, is a substantial challenge. It may require considerable planning and forward thinking, not

just in terms of reducing emissions of CO2equivalent gases in the Australian environment, but in terms of

the effects in relation to Australia's geographic location, it's specific weather parameters, and it's

economic circumstances. It is also critical to underline Australia's relationship with the international community

and how they may manage their economies and environment in the future years and even beyond 2050.

Australia is located in an interesting geographic location. As it is an island continent it developed in isolation

from the rest of the world and was inhabited by indigenous tribes who utilised its resources in ways akin

to hunter-gatherer lifestyles. Its unique geographic location has created a drier continent and is prone to

significant cycles of drought. Water is a significant resource issue. As the impacts of climate change are

beginning to evolve, but the future impacts are still an unknown to some extent, the essential issue is to be

forewarned with the knowledge and research to plan Australia's future security, not just economically, but

environmentally.

As Australia is a primary industrial and agricultural producer this presents a significant challenge.

Beyond the day-to-day political interactions, is it realistic to take Australia into the future as a

'Net-Zero emissions' economy? Rationally, we need to consider the significant security and economic

implications of minimising emissions though, also what is realistic in terms of Australia's place in the world?

We are a primary agricultural producer. We are a significant minerals and ore exporter. How will Australia

survive into 2050 and still be sustainable and exist as an industrial economy?

In planning and mitigating and adapting to future impacts in the next 10 or even 15 years,

what consideration and value can be given to the reduction of Australia's own emissions?

The emergence of China since the early 2000's has seen their emissions grow to approximately

10 GigaTonnes of CO_2e annually (20 times that of Australia!). The USA is stable at about 6 Giga Tonnes.

Australia is currently at 550 Mega Tonnes(without even counting LULUCF figures).

World CO_2e is currently at 35-40 GigaTonnes annually. China is still to reach peak capacity and stabilise

at an estimated at 12-14 Giga Tonnes (up to 2030 approx).

A compilation of 2005 and 2017 figures from Australia's Greenhouse Inventory is included.

Appendix 3 – **Sectorial Greenhouse Gas Emissions (Australia)**

Detailed sectoral breakdown of National, State and Territory greenhouse gas emissions:

2005

	AUSTRALIA
	Emissions ($Mt CO_2$-e)
Inventory total (excluding LULUCF)	**521.8**
SECTORS/KEY SUBSECTORS	
ENERGY	**399.6**
Stationary Energy	**278.7**
Energy Industries	216.5
Electricity generation	196.8
Other energy industries	19.7
Manufacturing and construction	41.6
Other sectors	20.7
Transport	**82.2**
Fugitive Emissions from Fuels	**38.7**
INDUSTRIAL PROCESSES AND PRODUCT USE	**31.9**
AGRICULTURE	**75.9**
Livestock	61.0
Other Agriculture	14.9
WASTE	**14.4**
LAND USE, LAND USE CHANGE AND FORESTRY	**88.8**
Inventory total (including LULUCF)	**610.6**

2017

	AUSTRALIA
	Emissions ($Mt CO_2$-e)
Inventory total (excluding LULUCF)	**554.1**
SECTORS/KEY SUBSECTORS	
ENERGY	**435.6**
Stationary Energy	**285.1**
Energy Industries	218.1
Electricity generation	189.8
Other energy industries	28.3
Manufacturing and construction	41.3
Other sectors	25.7
Transport	**98.7**
Fugitive Emissions from Fuels	**51.8**
INDUSTRIAL PROCESSES AND PRODUCT USE	**33.7**
AGRICULTURE	**73.0**
Livestock	55.2
Other Agriculture	17.8
WASTE	**11.8**
Land Use, Land Use Change and Forestry	**-19.4**
Inventory total (including LULUCF)	**534.7**

https://www.environment.gov.au/system/files/resources/917a98ab-85cd-45e4-ae7a-bcd1b914cfb2/files/state-territory-inventories-2017.pdf

Essentially, taking the figures on “spec” and projecting forward even 10 years, and in consideration

of CO2e “lag” effects from radiative forcing, it is difficult to know if any efforts Australia makes

within its boundaries and borders will make any serious difference to an overall change in global emissions.

Even projecting forward 10 years at Australia’s 26-28 % target to 2030 at 385 Mega

Tonnes the world total may still be as high 30-35 Giga Tonnes (at a conservative guess!).

At the end of the day, though analysis is useful what this represents is just actually data and projections.

The practical aspects of Australia’s reductions are another issue and require serious planning.

The real issues relate to what life will be like in Australia in the next 10-20 years if the world and industrial

economies move forward with limited results to transform economies and to limit emissions? How sort of lifestyle

will we have and what will the landscape and our economy be like if limited action is taken? Given the concept of

radiative forcing and the “lag” that is implied in the science, and Australia’s particular geographic location,

how vulnerable will we be in the next 10-20 years based on the climate impacts that are projected?

These essential questions cannot be answered rationally without a serious investment in research

and climate knowledge specific to Australia. This is also likely to be expensive and on-going science

which will require political will and serious motivation to impliement, as well as the preparation and co-ordination

of institutions to ensure that it is carried forward. If there is no longer climate change “denial” what

does it mean for Australia as the future for the nation unfolds?

A useful and relevant example of knowledge base is given here and includes recent science

which may link to a strategy for mitigation and adaption:

After an extended period of drought declared over 3 years and New South Wales declared

100% in drought in August 2018, a significant weather event occurred. On the 6th September 2019

the Australia Bureau of Meteorology confirmed a high altitude event over the southern ocean and Antarctica

related to the Polar Vortex. This weather event is known as a ‘Sudden Stratospheric Warming’(SSW),

Here is the link: uploaded 6th September 2019

https://www.abc.net.au/news/2019-09-06/rare-weather-event-over-antarctica-drives-hot-outlook/11481498

Shortly after this date fires commenced in south-east Queensland and the “catastrophic” fires

began down the east coast of Australia as the summer evolved.

The ABC statement, and also the BOM, stated that this event “is not caused by global warming!”

Though ,in my opinion, SSW was lilkely the “match” that lit the fire given as Australia was tinder-dry in a lot of

places. I can recall a flight to Canberra from the Gold Coast in September 2019 and the visual interpretation

showed the land brown and almost grey in appearance.

Related to the science of SSW’s is this link. It provides extra information.

https://eos.org/features/how-sudden-stratospheric-warming-affects-the-whole-atmosphere

An SSW is a “planetary” event and can represent a significant global weather shift. This article

was released in 20 March 2018 and is well referenced science. According to this

article the effect of an SSW can last years. Also, it is relevant to note that it suggests that

the SSW commences in the Troposphere which is the weather zone closest to the ground.

The Troposphere varies in height though becomes thinner at the poles. The SSW commences in the lower

atmosphere and is carried higher into the stratosphere by 'Rossby' waves.

A link is shown here:

https://www.sciencedirect.com/topics/earth-and-planetary-sciences/planetary-wave

The research suggests that vertical scale of Rossby waves are increased in the higher latitudes.

This is certainly complex science when the physics components are added. Based on this background

knowledge, it is a theory that perhaps an extended drought with "flat" or dormant weather systems that created

hardly any rain through 2018 and 2019 turned the land mass and oceans around Australia into a "pond" of heat.

If the Rossby wave science is examined it may suggest that it was the impact of heat from deeper oceans and

the extended heat that may have "kicked" off the SSW. Though you cannot say precisely or exactly that the SSW

was a result of climate change it cannot be completely denied either. High altitude measurements are not readily

available locally except for Cape Grim. Measurements of high altitude Precipitable Water Vapour (PWV) and

CO2 and other CO2e measurements seem not to be conducted all around Australia or out into the Pacific Ocean

or the Indian Oceans surrounding the continent. CO2e gases are not consistent all over the planet at the same

time. Seasons and winds mix all these species of gases. Indeed, the SSW link from above suggests

that there is significant mixing. Was there altitude readings of the gases above Australia prior to the fires of

2019/20? Were there measurements of the gases during the fires? Is there currently high altitude readings

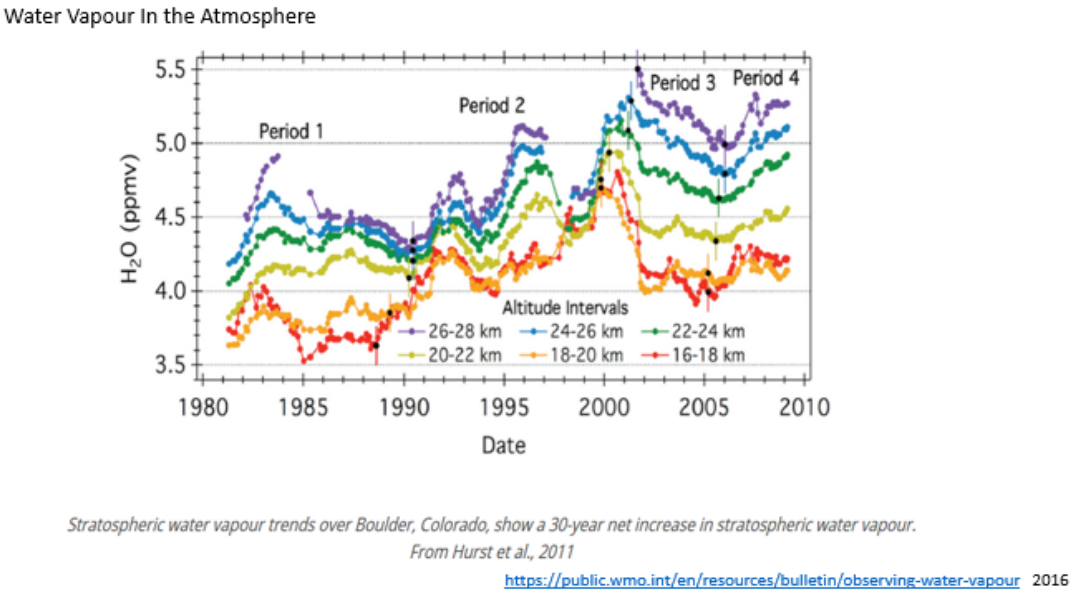
in the Troposphere and the Stratosphere after the SSW? Research and measurement like these may

indicate a shift in the CO2e at higher altitudes. An unexplored scenario is whether a serious amount of CO2e

was “burned up” in the fires,or shifted in all the mixing and rotational shift of Earth as we moved into summer.

Here is a link to a WMO artic le referencing research over Boulder Colorado USA.

https://public.wmo.inten/resources/bulletin/observing-water-vapour



Stratospheric water vapour trends over Boulder, Colorado, show a 30-year net increase in stratospheric water vapour.
From Hurst et al., 2011
https://public.wmo.int/en/resources/bulletin/observing-water-vapour 2016

I suspect we will never know how significant the SSW event was in terms of shifting high altitude CO2e.

Only a substantial knowledge base backed with solid research will be able to predict how CO2e gases

will impact Australia. A worldwide data base on all PWV and CO2e may be useful so as to supply

data on localised CO2e emissions and emissions sitting higher in the atmosphere. The process of mitigation

and adaption based on anthropogenic climate change can only be better served by serious research which

serves Australia’s unique location in the world. This may require a serious on-going budget to assess

the impacts now and into the future.

Water is the most critical element in mitigating and abating climate change in Australia.

In a simple scenario, if evaporation and precipitation functions in the normal weather cycle

and there is sufficient water on Australia’s surface then rain will likely occur as a normal evaporative

process. Even if there are high amounts of CO2e in the atmosphere if there is sufficient water for evaporation

then rain will wash Carbon Dioxide and other types of Greenhouse gases from the sky.

“Sufficient” is the critical word in that sentence. What is “sufficient” is something that may require calculation!

Rather than having excess CO2e in the atmosphere better, on a practical level, to have it wash

to Earth and into the oceans. Precipitable Water Vapour (PWV), simply described as evaporated water, has a

strong interaction with CO2 and “binds” or functions on a similar wavelength to increase radiative forcing.

The less PWV in the sky the better. The more water in the system on a ground level then the more potential

for rain. The more water on Australia’s surface via rivers and lakes the more natural evaporation will occur.

The function of rain is slightly more complex and involves electrostatic processes in the upper levels of the

Troposphere and still involves complex interactions to create Cloud Condensation Nuclei (CCN) which are the

early stages of rain.

In a scenario where the Darling River and its associated tributaries are flowing reasonably well and function as

rivers then water will evaporate from them all day. In a scenario, where wind and weather systems come from

the west and pick up water as evaporation on a regular basis then in normal weather function it is usual to build

cloud layers during the day and have storms and develop rain systems based on the amount that ends up in the

upper layers of the troposphere. The lack of water in the interior of Australia caused by the drought and lack of

water in the whole system led to a situation where vegetation was dying off and in survival mode and even

photosynthesis was probably limited. It’s a “tinderbox” scenario. Water as a critical resource in Australia cannot

be underestimated. To mitigate climate change and to prepare for the next 10-20 years, whatever actions are

done to reduce emissions, we will need to ensure our rivers and dams are sufficiently healthy and functioning.

If State governments cannot manage or even monitor their rivers effectively then the Commonwealth may be

best to run the whole show. States rights are one issue though a climate “emergency” is, apparently, an

“emergency”. Ensuring that there is an effective strategy in place for water and possibly more infrastructure

in place for water to work in the function of weather may be a critical issue. It’s not practical to break out

the garden hose out in the Tanami Desert. However, the management of water as a critical resource

may require some innovation and when State governments drain lakes like the Menindee Lakes in NSW

then that pool of water is no longer a function of an evaporative process. Though schemes like the

proposed Bradfield scheme do seem like “pie-in-the sky” concepts, the basic idea of getting more water into the

“system” has considerable merit. More science may be required to develop this further.

A large evaporative lake like Lake Torrens or even Lake Eyre may be a suitable evaporation pond.

A lake filled with salt water pumped from Port Augusta creating water storage west of NSW may create

possible extra rainfall. If one or both of these areas were engineered to hold permanent or semi-permanent

water then these lakes may be big enough to impact weather. A project like that would need serious

computer modelling and prior analysis of weather. Using flood ponds for run-off in regional areas so water is

stored longer is also of rational consideration. Flood waters held in purpose-built ponds may extend water flow to

local rivers and tributaries. This would also require an investment in infrastructure.

Draining Australia of water resources for agricultural purposes is also a complex issue in itself. Pipelines are now

being built to service towns where they have limited water. If climate change is going to increase even with

Australia’s own efforts and we are going to be a drier continent what contingencies and efforts can we make to

“shore” up our water security? Australia is at the mercy of the larger global systems like El Nino and the Indian

Dipole. Can we engineer more water into our river systems and then have enough to serve our agricultural

community needs and requirements? Certainly, infrastructure has a substantial cost and in a tight fiscal

environment there is the issue of funding and priorities. And no matter which party is "steering" the ship different

ideologies are secondary to the science of water as a critical resource. Better management of water may reduce

the severity and impacts of droughts now and in the future. On this basis, water as a resource may need to be

re-assessed as the pure essential "gold" that requires a consideration beyond its previous commercial value.

On a local level, it is also worth considering how daily emissions impact on our local environment

Australia has been lucky that there were not significant issues with acid rain as in Europe and the US.

What does the research suggest in regards to CO2 and NOx effects on coastal weather in Australia?

Do urban areas "burn off" more water vapour and clouds at peak times and weekdays and limit local rainfall

around urban areas? This may be indicative and worth analysis if attempts at local mitigation efforts are a

attempted. Air quality in cities is certainly a consideration due to the concentration of industry and

vehicles. The government even signed on with the states on the 'National Clean Air Agreement Plan'.

As per attached link below:

http://www.environment.gov.au/system/files/resources/382042b2-d9e0-4b1c-aeaa-a4bcb93f71ff/files/national-clean-air-agreement-work-plan.pdf

Grey water tanks and programs funding them may be a way to further reduce the waste of water. Consideration

could be given to better treatment of all waste and sewerage. Even advice from the government on how many

times a day the toilet ought to be flushed can be considered as drought mitigation. Overall, if the Commonwealth

had substantial water policies then this may be strategically useful to better manage our water resources into the

future. As a drier continent it may evolve as a serious security issue now and in the future, and with the drought

still an influence in many places, adapting in a country with less water resources may require further

infrastructure investment. Better to have more water managed at a high level than less with more economic

impacts. Working with all the states to ensure water is flowing effectively through the river systems is really a

an issue of national security to safeguard the economy at the most basic level.

The role and process of advising the government of scientific advice (reference “g”) is also critical.

Most universities have a climate ‘institute’ or ‘college’. If the government accepts climate change and its impacts

are real the role they play in advising the government is a consideration. Beyond the political agendas and party

motivations how may they contribute? Certainly, it seems the general perception is that it seems like “early days”

as far as the government’s attempts at building and developing policies to minimise actual emissions. And also

the government must overcome the perception that it is not making sincere efforts to oversee the process and

model realistic and rational policies given the day-to-day economic priorities of government fiscal policy. An

“open” interaction on the scientific level would seem rational, and further, may assist to model that advice from

different sources into rational and practical government policy. Treating that advice with an open

mind and look forward to modelling the different sectors of economy to reduce emissions takes serious strategic

planning. Certainly, as an example, coal in the energy sector will likely produce 100 Million tonnes (estimate)

emissions annually continuing until 2032 at least .Loy Yang will run until even 2048. Is it possible to reduce

emissions of those existing power stations with new technology without shutting them down? There may be

practical measures that may be cost effective and new technologies that may be available or can be brought

in to assist with this.

Realistically, it may be only necessary to practically plan, at present, to a 35% emissions reduction target at

2050 (Around 200 MTonnes). Implementing new or existing technology and making a commitment to invest in

new technology may accelerate the process further. Serious interactions and conversations with the scientific

community may assist, and with a further commitment to building links and serious pathways, this may assist

further to develop realistic planning.