KNOX GRAMMAR SCHOOL

STATE

DA VINCI DECATHLON 2021

CELEBRATING THE ACADEMIC GIFTS OF STUDENTS IN YEARS 5 & 6

da Vinci Decathlon® EXCITE ENRICH CHALLENGE An initiative of Knox Grammar School

IDEATION

TEAM NUMBER _____

Total	Rank
/60	

THE CHALLENGE

ONLY ONE CHANCE

BACKGROUND

The world today is facing a number of **incredibly pressing environmental challenges**, many which have been emphasised and heightened by the recent devastating **bushfires** and **floods** towards the end of 2019 and beginning of 2020.

These natural disasters show that **Australia's environment and society** are particularly at risk due to **climate change** and other environmental phenomena. For example, as a result of the recent bushfires:

- Over one billion animals are estimated to have perished.
- Over eighteen million hectares of land were burnt.
- Over 300 million tonnes of CO_2 were emitted.
- Over 5,900 buildings were destroyed.

Unfortunately, this is just **one example** out of a number of severe issues facing the country. Others include:

- The ongoing damage to the Great Barrier Reef.
- Continued deforestation and loss of animal life, habitats and biodiversity.
- Rising sea levels and ocean acidification.
- Overfishing resulting in the depletion of marine life.
- Plastic pollution in the ocean and on land.
- Mass fish kills in our river systems.

Ultimately, while **industry and individuals** can assist in addressing these challenges, the **power and resources** of the **Government** are essential to effectively solving the issues. This, though, is something that our current Government is perhaps reluctant to accept, and Australia has accordingly been hampered by a **long period of political inaction** when it comes to climate change and other critical environmental problems.

THE DESIGN CHALLENGE

Imagine that you are Prime Minister of Australia, but only for **one day**. You have the **chance** to **pass one law** during your very short time in office, and you decide to take this opportunity to enact what you believe to be the **most important measure for the protection of the environment.** What do you do?

You should note that most, but not all, of the problems outlined above can be linked back to a **failure to reduce carbon emissions,** and the resulting depletion of the ozone layer and global warming effect that this produces. **However**, this problem itself is due to **multiple differing factors,** making it difficult to solve through **just one solution.**

This should not discourage you from **considering** options that *do* address carbon emissions directly, but you should be **aware** that **more specific solutions** may perhaps be more practical and effective, **depending on which environmental issue you believe is most pressing.**

You may assume, for the purposes of this exercise that you will have **no barriers** to passing the law that you wish to enact through Federal Parliament, and that each of the **States and Territories** will also be supportive of your solution.

Importantly, your solution, while it must be passed by law, **can go beyond words on a page**. Although it could simply be a rule or regulation, it could also be a law that facilitates **something more than this –** for example, a program, a project, the creation of a new organisation, investment in new technology, and much more – **you have full creative licence** in this respect.

Indeed, those teams who present the most **innovative, but also plausible** and **effective** ideas, will score highest. Further marking guidelines are provided on the following page, as well as in your answer booklets.

Stimulus material is also provided within this paper, following the marking criteria. You are encouraged to **refer** to this material in your answers as much as possible.

You are required to follow the **four-step process of ideation.** This is outlined on the following page and is also set out in your answer booklet.

EMPATHISE (Ethical Decision-Making Framework) (15 marks)

> This involves evaluating what 'ought to be done', through considering rights, obligations, fairness, the benefits and detriments for societies and other virtues. Reaching a final decision involves a degree of conviction and belief in what is 'the right thing to do'.

DEFINE (Design Brief) (10 marks)

> Here, you must identify the problem, outline the ethical issues, evaluate the challenges and research findings, and identify possible solutions.

IDEATE (Reflection) (25 marks)

You must then reflect on their solutions and whether they will be viable. A preferable solution should be identified, and any unanswered questions should be addressed. Issues of implementation are also crucial to reflect upon.

CREATE (Prototype) (10 marks)

Finally, a design for how your ideas and solution will be disseminated must be produced. This could be a story-board, mind-map, diagram, model, narrative or any other appropriate medium. Critically, an audience must be able to understand the process of dissemination by examining this prototype.

MARKING GUIDELINES

1. Empathise (15 marks)

QUESTIONS	LIMITED	SOUND	OUTSTANDING	TOTAL
1: Factors contributing to the issue	0-1	2-3	4	
2: Consequences if not addressed	0-1	2-3	4	
3: Identify different perspectives	0-1	2	3	
4: Identifies barriers to addressing the issue and why they are barriers	0-1	2-3	4	
			TOTAL	/15

2. Define (10 marks)

ASPECT	LIMITED	SOUND	EFFECTIVE	OUTSTANDING	TOTAL
Vision Statement: What do you want to achieve?	0-1	2-3	4	5	
Importance of Vision Statement	0-1	2-3	4	5	
				TOTAL	/10

3. Ideate (25 marks)

ASPECT	LIMITED	SOUND	OUTSTANDING	TOTAL
Possible Solution #1	0-1	2-3	4	
Possible Solution #2	0-1	2-3	4	
Possible Solution #3	0-1	2-3	4	
Choice of solution	0	1	2	
Justification of solution	0-1	2-3	4	
Implementation: when, where, who?	0-1	2	3	
Dissemination: how to succeed with the solution	0-1	2-3	4	
			TOTAL	/25

4. Create (10 marks)

ASPECT	LIMITED	SOUND	EFFECTIVE	OUTSTANDING	TOTAL
Originality and creativity	0-1	2-3	4-5	6	
Clarity and communication of ideas	0-1	2	3	4	
				TOTAL	/10

TOTAL: /60

ADDITIONAL STIMULUS

Murray-Darling: thousands of fish have died in NSW in past two weeks **(Readfearn, G, *The Guardian,* 2 February 2020)**

Thousands of native fish have died in a series of ongoing mass death events at more than 20 different locations across the Murray-Darling Basin and in coastal areas of New South Wales in the past two weeks.

Government officials are warning of still more fish deaths to come, with heatwave conditions and then potential storms this weekend bringing further risk.

Sporadic heavy rain in some parts, combined with drought conditions and ash and exposed soil running into waterways from bushfire prone areas, were blamed.

Since 16 January, the NSW government has received reports of fish kills at 13 locations in the Murray-Darling catchment.

An update to the NSW Department of Primary Industries “fish kills” website shows the Macquarie River, Gwydir River, Buckinbah Creek and the Turon River have all seen reports of localised events that have killed hundreds to thousands of fish.

In the Turon River, thousands of fish including Murray cod, golden perch and carp had died. Rain had caused “short and sharp” flows into the river, along with run-off, and had reduced oxygen levels.

Two sites in the Macquarie River had been affected. A 32km stretch of the river near Dubbo had been seen the deaths of thousands of fish, including Murray cod, golden perch, freshwater catfish, carp and shrimp. That event was ongoing, the department said.

Murray cod, golden perch, silver perch, bony bream, common carp and shrimp had also been reported dead around Raby, south of Sydney, when river flow had hit a previously dry river bed, mobilising “thick plumes of silt and picking up significant volumes of organic debris.”

Two sites in the Murray River had also seen reports of deaths.

Earlier this month, hundreds of thousands of fish died in the Macleay River near Kempsey, in a mass fish kill event that ecologists said could have impacts for decades.

A NSW Department of Primary Industries spokesperson told Guardian Australia the state was likely to see further fish kills “across coastal and inland catchments during the summer of 2020.”

The spokesperson said: “Extended hot days with a cool change have been forecast for the coming days across much of NSW, which unfortunately poses a significant risk to our native fish populations in certain areas.

“Additionally, runoff from bushfire and drought affected areas can impact water quality and place stress on river health and on native fish.”

Drought, run-off from bushfire-hit areas were putting increased stress on fish populations, the spokesperson said.

The fisheries department had been working with local communities to relocate more than 3,000 fish and 43 aeration units had been installed.

On Thursday, the Murray–Darling Basin Authority issued an update saying rain in the past fortnight had been a catalyst for the deaths.

The MDBA executive director of river operations, Andrew Reynolds, said it was “a cruel twist but an unavoidable risk that much-needed rain would contribute to fish deaths in areas affected by ash and sediment being washed into waterways.”

He said: “We have seen fish deaths in recent weeks in several locations under stress due to fires and the ongoing drought – in the Macquarie River, the Namoi, Gwydir, Border rivers, Barwon–Darling, Lachlan, Upper Murray and Murrumbidgee rivers, and the Lower Darling continues to be an area of concern.”

Basin governments were “working hard” to relocate fish, install aerators and deliver strategic releases of water for the environment, he said.

He added: “The rain has so far had little impact on overall basin storage levels, which are at 27% capacity overall. Though some catchments will see levels recover slightly over coming weeks, the total volume of water in basin storages continued to decline over the past fortnight.

“We really need a long period of above-average rainfall to break current drought conditions.”

There were 13 sites covered by blue-green algae alerts in NSW and three more at locations in Victoria, the authority said.

Is Climate Change to Blame for Australia’s Bushfires? (*BBC,* 11 November 2019)

Australia is enduring a bushfire crisis that has left three people dead, razed more than 150 homes, and prompted warnings of "catastrophic" danger.

Bushfires are a regular feature in the Australian calendar, but the blazes in New South Wales and Queensland have not previously occurred on such a scale and so early in the fire season, officials say.

This has led many Australians to ask how closely the fires can be linked to climate change.

The science around climate change is complex - it's not the cause of bushfires but scientists have long warned that a hotter, drier climate would contribute to Australia's fires becoming more frequent and more intense.

But the nation's political leaders are facing a backlash for batting away questions on the subject.

What have Australia's leaders said (or not said)?

On Sunday, Prime Minister Scott Morrison refused to answer a question about climate change, saying: "My only thoughts today are with those who have lost their lives and their families."

When asked the same question, New South Wales Premier Gladys Berejiklian told reporters: "Honestly, not today."

Some Australians agreed, but others were furious the question was being ignored.

Mr Morrison later tweeted to offer "thoughts and prayers" to those affected, but critics compared that to rhetoric used by US lawmakers who have opposed gun reforms after mass shootings.

Deputy Prime Minister Michael McCormack stoked the most anger, when on Monday he dismissed climate change as the concerns of "raving inner-city lefties" who were ignoring the needs of rural Australians.

"We've had fires in Australia since time began," he said.

What is Australia's climate change commitment?

The nation's target under the Paris Agreement - the global deal to tackle rising global temperatures - is a 26-28% reduction in emissions by 2030. Some have criticised that as inadequate for a G20 country.

Last year, the UN reported that Australia - the world's largest coal exporter - was not on track to meet its commitment.

Mr Morrison told the UN last year that Australia was doing its bit to address climate change, and "balancing our global responsibilities with sensible and practical policies to secure our environmental and our economic future".

So are these bushfires due to climate change?

"We find it very difficult in general to attribute climate change impacts to a specific event, particularly while the event is running," said Dr Richard Thornton, chief executive of the Bushfires & Natural Hazards Co-operative Research Centre.

"But what we do know is that the average temperature in Australia now is running about 1C above the long-term average." He added fire seasons were starting earlier and "the cumulative fire danger" in many areas was growing.

Prof Glenda Wardle, an ecologist from the University of Sydney, agreed: "It's not every weather event that is the direct result of climate change. But when you see trends... it becomes undeniably linked to global climate change."

She said there was a "collective shift" in the timing and intensity of weather events.

Australian National University climate scientist Dr Imran Ahmed called it a direct link: "Because what climate change does is exacerbate the conditions in which the bushfires happen."

Will Australia's bushfires get worse?

"We will start to see the extreme end of the fire behaviour scale occur more frequently because of the increase of temperatures", said Dr Thornton.

"Everything we normally see as variability between a good fire season and a bad season is sitting on top of that extra 1C - and that means that the severe events will occur more frequently."

Do scientists believe Australia is doing enough?

But Prof Wardle said the government was "passing the buck" on climate change and not doing enough to help stem the rise in global temperatures.

"It hasn't just been fires, there's been flood, there's the drought," she said. "Every time [the government] has had the chance to take on the big issue of climate change and do something, they choose not to and blame other things like land management."

Dr Ahmed said the leaders' responses this week were a "very unfortunate" reaction to peer-reviewed warnings by leading scientists.

"With that sort of evidence on the ground, it's hard to see that you still have the politics around doubting climate change," he said.

Was Australia warned about the risk?

The Bureau of Meteorology's State of the Climate 2018 report said climate change had led to an increase in extreme heat events and increased the severity of other natural disasters, such as drought.

In April, 23 former fire chiefs and emergency leaders issued a letter, warning the government about "increasingly catastrophic extreme weather events". It requested a meeting which was declined by the government.

Great Barrier Reef could face 'most extensive coral bleaching ever', scientists say **(Readfearn, G, *The Guardian,* 22 February 2020)**

The Great Barrier Reef could be about to experience its most widespread outbreak of mass coral bleaching ever seen, according to an analysis from the US government’s National Oceanic and Atmospheric Administration.

But the analysis, seen by Guardian Australia, says while bleaching could hit the entire length of the world heritage-listed reef, the impacts may not be as intense as previous major outbreaks.

Pockets of bleaching are being seen in areas including Lizard Island, north of Cooktown, and more than 1,100 kilometres south-east at Heron Island, off Gladstone.

On Thursday, the Great Barrier Reef Marine Park Authority, conservationists and scientists warned that heat stress was building along most of the 2,300-kilometre reef along Queensland’s north coast.

Temperatures would need to drop from current levels over the next two weeks if the reef was to avoid a third mass bleaching event in five years.

Dr William Skirving, of Noaa’s Coral Reef Watch, prepared a briefing on the “status of heat stress on the GBR” on 19 February.

The agency’s observations and model forecasts suggested that “2020 is likely to be the most extensive coral bleaching event that we have seen so far” on the reef.

He told Guardian Australia: “We are pretty confident that it’s likely there will be bleaching right up and down the reef and you will find very few reefs that don’t have some bleaching.”

While bleaching would be extensive, the intensity of the heat may not reach previous major bleaching events, Skirving said.

In 2016 and 2017, back-to-back bleaching killed about half the reef’s corals.

He said: “I’m expecting a bit of mortality but I don’t think this will get to the levels where we have seen large-scale mortality.”

Corals bleach if they sit in unusually warm waters for long periods. The algae that provides food and the coral’s colour separate from the animal, leaving behind a visible white skeleton.

Severe bleaching can kill some corals, and weaken others. Extreme heat can also kill corals almost immediately.

Skirving’s analysis identified a key period from 26 February to 4 March when widespread bleaching was likely to hit.

During this time, tides would be weak, meaning there was less mixing of the waters that help dissipate heat through the water column. At the same time, the unusually high ocean temperatures would remain.

He said: “We will see temperatures rocket through that period. But if it does get really bad is yet to be seen – it depends on rain and wind – and neither of those can be precisely predicted.”

A 20 February update on heat stress conditions from the Great Barrier Reef Marine Park Authority.

His analysis said only a significant weather event “such as a cyclone” during that eight-day period would save the reef from widespread bleaching.

The world’s oceans have taken up about 93% of the extra energy caused by rising levels of greenhouse gases in the atmosphere, according to the UN’s climate science panel.

According to the panel, it had high confidence that tropical coral reefs “are projected to reach a very high risk of impact at 1.2°C [of global warming], with most available evidence suggesting that coral-dominated ecosystems will be non-existent at this temperature or higher.”

Prof Ove Hoegh-Guldberg, a marine biologist at the University of Queensland, whose early work helped to explain the link between coral bleaching and climate change, said in the past two weeks, “the risk factors for major bleaching events, like elevated water temperatures” had “increased dramatically”.

Skirving said it appeared large-scale bleaching events were happening more frequently on the reef, and listed 1983, 1987, 1998, 2002, 2016, 2017 and “now likely 2020”.

While reefs could “bounce back” from bleaching events, there was concern individual reefs would not have enough time to recover between each outbreak.

Dr Lyle Vail, director of the Australian Museum’s Lizard Island Research Station, said on Friday there was already bleaching on some corals there.

“Alarm bells are ringing, we’re in troubled waters,” he said.

Lizard Island was badly hit by bleaching in 2016. Vail added: “The coral recovery was coming along nicely so it’s hard to see it bleaching again, fingers crossed for some cloud cover and rain to cool things down.”

Several scientists working at Heron Island and the nearby One Tree Island have also been sharing images of corals beginning to bleach.

Dr Tracy Ainsworth, a coral biologist at UNSW, has been with a team of scientists at a research station on Heron Island since 15 January.

“We have been recording bleaching in the lagoon and reef flat and some exposed areas of the reef, and that’s concerning. A lot of the reef is fine though in the wave-exposed areas.”

***World’s Top Climate Negotiator Condemns Australian Response to Climate Change* (*ABC,* 24 February 2020)**

The leader of the Paris Climate Agreement talks says she is "deeply pained" by the attitude of the Australian Government to climate change in the wake of this summer's unprecedented bushfires.

Costa Rican diplomat Christiana Figueres became the United Nations' top climate negotiator in 2010 and was at the helm for the historic Paris Climate Agreement in 2015.

Her task was to bring the leaders of 195 countries together to negotiate a binding agreement to stop the world warming beyond 2 degrees Celsius - no easy task after the disastrous failure of the 2009 Copenhagen climate summit.

In an interview with *Hack*'s Avani Dias about her new book, she hit out at the Australian Government's response to the bushfire disaster.

"I am deeply pained by the attitude of the current Australian Government, that still after the worst disaster that has ever hit the planet, the bushfires in Australia, that this government is still denying climate change and denying the fact that there is a lot that Australia can and should be doing," Figueres said.

A common argument against Australia doing more to reduce emissions and transition away from fossil fuels is that as a country, Australia is only responsible for around 1.3 per cent of global carbon emissions.

Figueres also criticised that defence, saying Australia is at the frontline of climate change.

"I see it the following way: we now know because of the consequences of the bushfires, that Australia is actually one of the most vulnerable countries to unmitigated climate change," she told *Hack*.

"We also know Australia cannot single-handedly solve the problem."

Labor has recommitted to its 2019 election policy of zero net emissions by 2050, saying Australia should pull its weight.

"Seventy-three countries, including the UK, Canada, France and Germany, many with conservative governments, have already adopted it as their goal. Australia should too," Opposition Leader Anthony Albanese said on Friday.

Mr Albanese said the Morrison Government had been "complacent" about the risk of climate change, even as bushfires tore through the country.

Emissions Reduction Minister Angus Taylor told RN Breakfast on Monday that the Australian Government would not follow Labor's net zero emissions, as the plan was "uncosted and unfunded".

Mr Taylor was reticent to give an emissions target beyond 2030 ahead of the global climate meetings in Glasgow in November.

"We said by November we'll have a long-term strategy with technology as a centrepiece... That work is going on."

Minister Taylor's office responded to *Hack's* request for comment by citing a quote from Scott Morrison's National Statement to the United Nations General Assembly: "Australia is doing our bit on climate change and we reject any suggestion to the contrary."

Christiana Figueres called on the Morrison Government to lead by example when it comes to cutting carbon emissions and averting runaway global warming.

"Australia needs all other countries to help in solving what is a global problem, not a national problem. If Australia doesn't put a firm foot forward, it stands in no position to actually ask all other countries to also put their best foot forward."

Australia depends on the best efforts being put forward by all countries, but for that, Australia has to do the same."

However, Figueres acknowledged every country is falling short of what she regards as necessary to stop the world warming beyond 2 degrees.

"No one is doing enough. Frankly, we should all be moving much faster than we are."

When it comes to meeting our Paris commitments, the Federal Government has kept open the option of using a "loophole" to reach the 2030 target of reducing emissions by 26-28 per cent on 2005 levels.

It's often referred to as carryover credits - put simply, Australia's record on the previous Kyoto Treaty targets would be used as credit that's deducted from our Paris goal.

Christiana Figueres said that undermined the purpose of the Paris Agreement.

"I think it's very dangerous to act as though this were a game of cards. This is not a game, we cannot play with emissions or emissions reductions of the past," she said.

"It's not about looking back and beginning to get credit where credit is not due, this is about looking into the future."

However, she acknowledged the challenges facing Australia's coal industry as the world transitions away from fossil fuels.

"It is definitely a complicated issue. I'm not going to underestimate how you transition those jobs out of coal into the present and the future."

We cannot shy away from a challenge by simply admiring the problem."

Since leaving as the chief UN climate diplomat, Figueres founded the Global Optimism group, and has co-authored a new book, The Future We Choose, which focuses on what can be achieved if climate change is addressed in the coming decade.

She said there are many reasons to be optimistic about what's in store.

"Yes, we are facing the most important challenge that humanity has ever faced, but we have everything that it takes to address climate change! We have the technologies, we have the finance, we know what the policies are, we absolutely have all the tools in our hands."

"Right now we're holding the pen of history in our hands, it's up to us to write what the history or humanity and of this planet will be."