

93401



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SCHOLARSHIP EXEMPLAR



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Tick this box if
there is no writing
in this booklet

Scholarship 2020 Geography

2.00 p.m. Monday 30 November 2020

Time allowed: Three hours

Total score: 24

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should answer ALL the questions in this booklet.

Pull out Resource Booklet 93401R from the centre of this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–24 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

INSTRUCTIONS

The materials in the resource booklet will enable you to become familiar with the theme and contexts of this examination: **climate change**.

Your answers to ALL three questions must incorporate a wide range of case studies from around the world, as well as information and ideas BOTH from the materials provided in the resource booklet and from your studies in geography.

Information to answer any question can be taken from any resource.

Space for planning has been provided on pages 4, 10, and 16 to help you prepare your responses. The questions on page 3 are repeated on their respective planning pages.

change
human environment infrastructure

QUESTION ONE

Critically analyse and justify the most significant cultural process that contributes to climate change.

Your answer must include:

- specific information from the resource booklet
- knowledge and insight you have gained from your studies in geography
- convincing communication
- relevant original and/or effective visuals, such as maps, graphs, and diagrams.

Use page 4 to plan your ideas, and begin your answer on page 5.

QUESTION TWO

Perspectives are bodies of thought, theories, or world views that shape people's values.

With reference to different perspectives, have positive impacts on society from the use of fossil fuels outweighed the negative impacts? Discuss.

Your answer must include:

- specific information from the resource booklet
- knowledge and insight you have gained from your studies in geography
- convincing communication
- relevant original and/or effective visuals, such as maps, graphs, and diagrams.

Use page 10 to plan your ideas, and begin your answer on page 11.

QUESTION THREE

"Twenty-five years ago people could be excused for not knowing much, or doing much, about climate change. Today we have no excuse." — Desmond Tutu

With reference to different perspectives, critically evaluate the predicted future impact of climate change on human societies across the globe. Who will be most affected?

Your answer must include:

- specific information from the resource booklet
- knowledge and insight you have gained from your studies in geography
- convincing communication.

Use page 16 to plan your ideas, and begin your answer on page 17.

QUESTION ONE

Critically analyse and justify the most significant cultural process that contributes to climate change.

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PLANNING

obj



NZ

infrachan

processes

functions

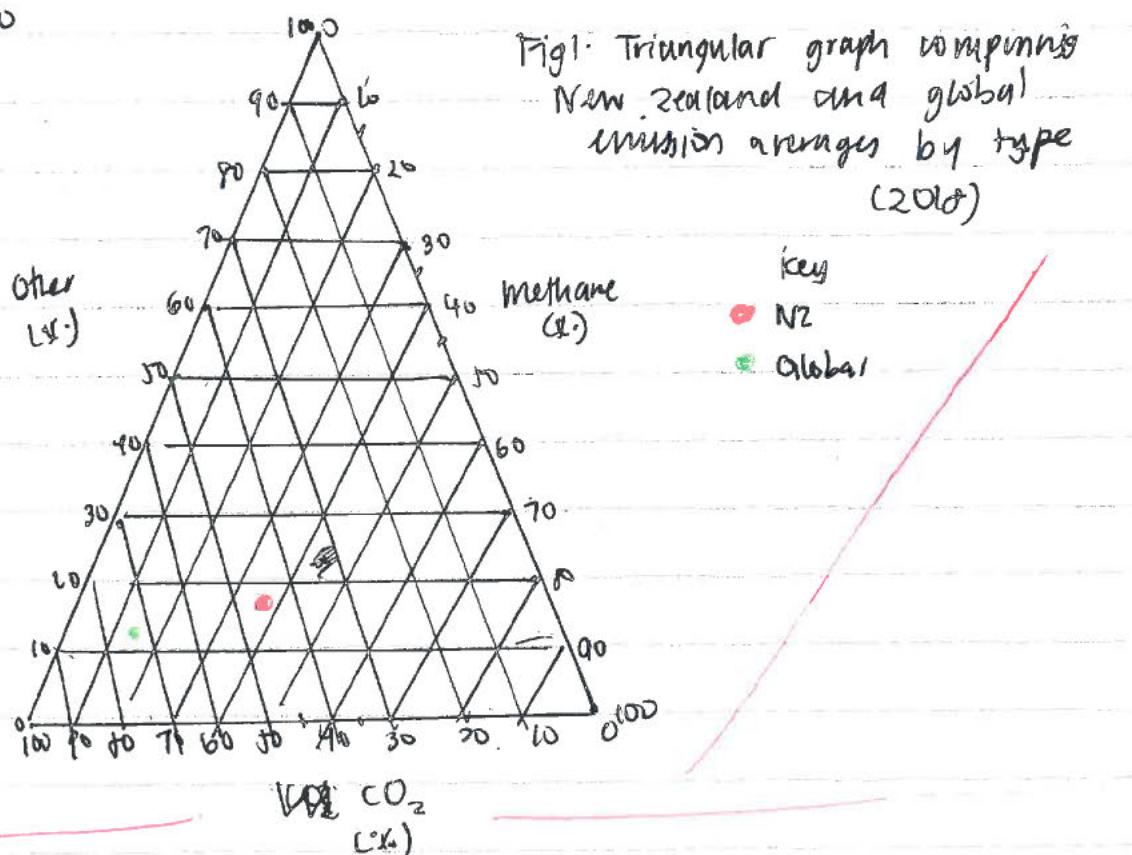
heatel

transport

Begin your answer to **Question One** here:

Anthropogenic climate change is the product of various interacting cultural processes which, while advancing development in the cultural environment, are having adverse effects on the natural environment through the release of Greenhouse gases that traps incoming Short wave radiation and leads to warming of our planet. Agricultural ^{processes} are the most significant of these processes, and interact with energy with urbanisation, ^{among} and energy consumption other notable processes.

In New Zealand, agriculture plays a pivotal role in the economy of our cultural environment, ~~and does a lot of damage to the environment~~



As a result, in the New Zealand context and environment, agricultural processes ^{are} ~~towards~~ the greatest contributors to climate change. As shown

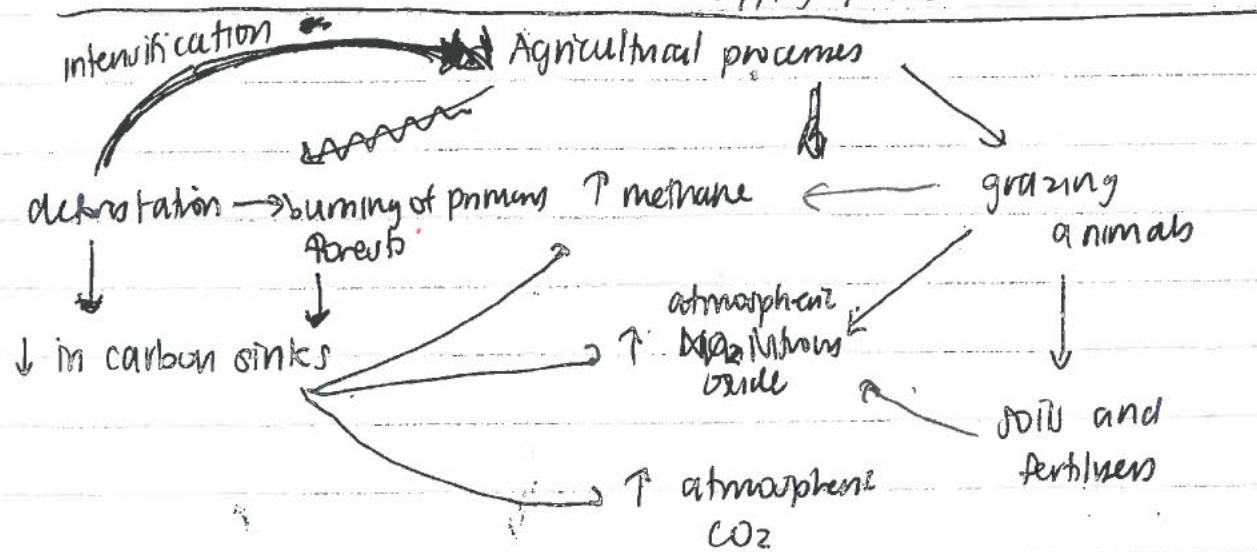
In Fig. 1, New Zealand's methane emissions significantly exceed those of global averages, with 34.5% of emissions being GHG

being from methane compared with the global average of 16%. This means that although New Zealand's CO₂ emissions are comparatively low (44.5% rather than 76%), because methane is a more potent greenhouse gas ^(84 times) on a molecule-to-molecule basis, New Zealand's ~~is transitioning~~ agricultural industry is a cultural process which is contributing significantly to climate change. ~~Methane~~ This process occurs in the biological systems of ruminant animals who release methane gas as outputs. This is particularly detrimental in the dairy farming agricultural sector ~~for~~, including that occurring in the Canterbury plains and the Waikato where intensive dairying practices are occurring, for instance in Ellesmere, North Canterbury. Meanwhile, the soil cultivation processes in agriculture, ~~particularly~~ ^{and the} use of commercial and organic fertilisers on such farms ~~will~~ further accelerates greenhouse gas emissions and global warming.

Although, as discussed ~~above~~ earlier, there is significant spatial variation around the extent to which different nations' agricultural processes contribute to climate change, New Zealand's case ~~is~~ ~~not~~ does not stand in isolation. Brazil ~~is~~ 32.6% of Brazil's GHG emissions are derived from agriculture, with 34% of its total land area being dedicated as agricultural in 2016. In Brazil, the interaction between agriculture and deforestation contributes to tipping point (Fig 2) in the climate systems, where thresholds cause further change in the system. From a governmental and political perspective, the relaxation of Brazil's Forest Code in 2012 demonstrates the interaction between government and agricultural processes and the fine balance between economic land development and environmental degradation. The result is the amplification and

Fig.2. Flow chart showing role of deforestation in climate system tipping points

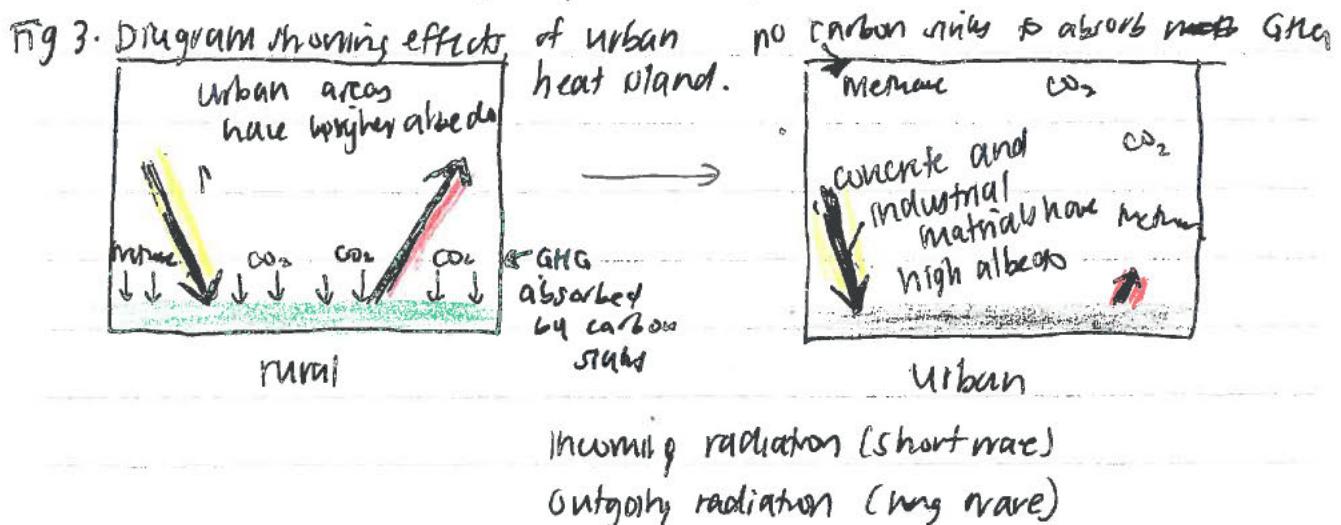
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Intensification of agriculture has the impact of agricultural process on climate change by decreasing available carbon sinks and thus exacerbation methane, CO₂ and nitrous oxide emissions. The significance of the relationship between agricultural and deforestation processes is showcased through large scale, livestock and/or small scale agriculture being a primary cause of forest loss and/or severe degradation in the Amazon, Atlantic forest, Borneo, Central Africa, Congo Basin, East Africa, Ecuador, Australia, Greater Melanesia, New Guinea and Sumatra—the world's most crucial forest and centers of biodiversity and carbon sinks. Such an interaction makes agriculture the most significant cultural process ~~throughout~~ contributing to climate change.

Urbanisation is another crucial cultural process contributing to climate change, through ⁱⁿ ~~on~~ the less significant scale as agriculture. Much of the significance of urbanisation lies in the changing landscape and urban expansion. For instance, in ~~New~~ Delhi, urban sprawl has resulted in a 30% increase in concrete ⁱⁿ the city over the past four years. The result is an urban heat island effect ^(Fig 3) due to the low albedo of concrete and

high absorption of incoming short wave radiation. This shows how the pattern of land use is driven by the process of urbanisation, contributes to global warming through an urban heat island, amplified by the loss of carbon sinks.

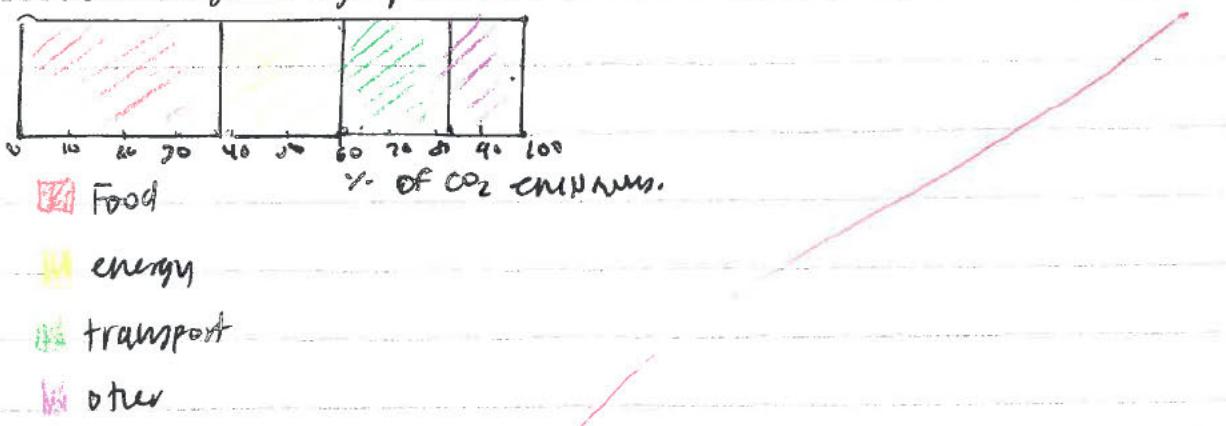


However, such loss of carbon sinks as shown in Fig 3 equates to 5% of total emissions from vegetation biomass conversion. This reveals that, though important, urbanisation has less of an impact on climate change than agriculture, when 25% of the world's net greenhouse gas emissions do not originate (5%) from land conversion for urbanisation. On a macroscale, the greater significance of agriculture can be explained by the fact that, by providing food en masse to meet urban demands (rather than those of subsistence rural farmers), agricultural processes interact with urbanisation processes ~~and~~ as they do with deforestation, and these complex interactions and the urban world's dependency on agriculture makes it a significant cause of climate change. //

The processes occurring in the energy sector also have a

Urbanisation is linked closely with the process of urban sprawl and the role of transportation. Marchetti's constant states that ~~that~~ each person will spend on average one hour of commuting time. By through the urbanisation processes of expanding and building roads, urban sprawl occurs, as does transport emissions. This was evident in the ~~Geog 3401~~ yester

Fig 4 Percentage bar graph of NZ CO₂ emissions by source



Freeway in Seoul, South Korea, when the freeway caused more traffic (and thus CO₂) but removal of the freeway cause traffic to "just disappear" according to human geographers. However, as transport contributes just 1500 kg of CO₂ in NZ per capita rather than food (agriculture) 2000 kg, transport and, by extension urbanisation is less of a prevalent cause of climate change. (Fig 4)

Likewise, energy consumption (Fig 4) contributes 16 000 kg. On a global scale, energy also shows significant spatial variation in its contribution to GHGs, with Europe decreasing its CO₂ emissions by 1.1% 2017-18, and India increasing by 4.8%, again revealing the importance of governments in shaping ~~their~~ the significance of different contributions of climate change. Overall, agriculture, due to its interactions with urbanisation and cultural processes and its numerical contributions to GHGs, especially methane, make it the most significant cause of Geography 93401, 2020 climate change.

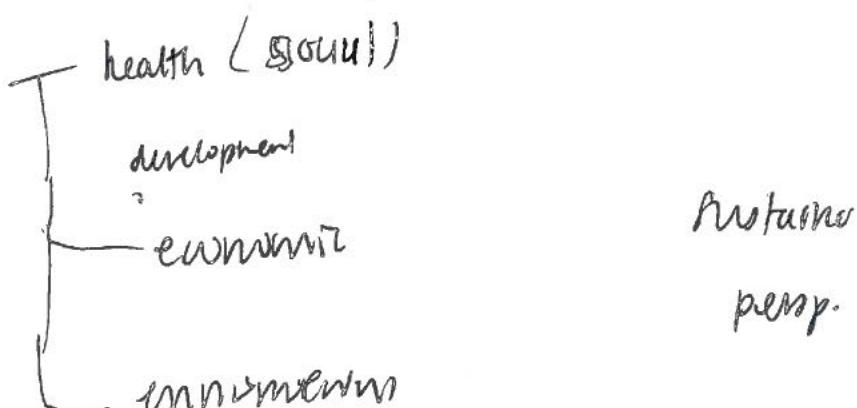
QUESTION TWO

Perspectives are bodies of thought, theories, or world views that shape people's values.

With reference to different perspectives, have positive impacts on society from the use of fossil fuels outweighed the negative impacts? Discuss.

Your answer must include:

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PLANNING

Begin your answer to Question Two here:

"The most fundamental attribute of modern society is simply this: Our is a high-energy civilisation based largely on combustion of fossil fuels" — Vaclav Smil.

Our global societal reliance on fossil fuels, alluded to by Smil can be viewed from many perspectives, including socially, economically and environmentally". Though our society is reliant on these materials, the argument that the positive impact on society from the use of fossil fuels outweighs the negative impact is flawed. ~~The overarching~~ concept of sustainability reveals that despite the positive impact posed, these effects are short-term in nature and are unsustainable in keeping with present ecological trends.

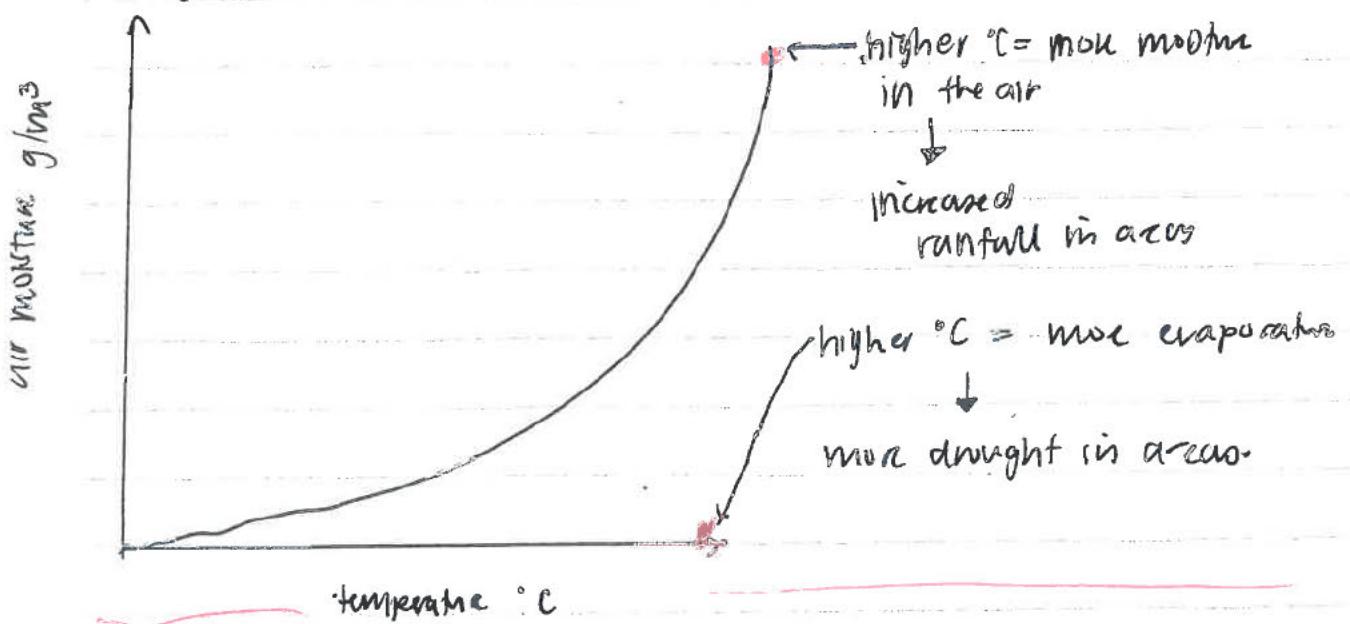
From an ~~economic~~ perspective, fossil fuels have been ~~ever~~ ^{economically} ~~available~~ ^{as pf}, with being $\frac{1}{3}$ of the price of wind power and other forms of renewable energy. Fossil fuels such as oil and gas are ~~inherently~~ ~~economically~~ ~~to~~ ^{as pf} to regions such as Taranaki where it contributes \$1.57 B to Taranaki's GDP and provides employment for 7070 people. However, this has also caused regions and nations to rely too heavily on fossil fuels for their economic growth, with Russia receiving ~~severe~~ ^{severe} warnings from the World Bank ~~about~~ due to their centralized economic reliance on oil. Every \$1 decline in oil prices result in a \$2B loss in revenue for Russia. ~~These~~ Colombia and Venezuela also fear ~~and~~ experience similar negative impact from an economic perspective, with the collapse of oil prices in 2014 causing 37.8% decline in the Colombian peso ~~and~~ and an economic crisis and mass migration ^{cultural} processes in Venezuela. This illustrates how

short term ^{positive} economic prosperity from fossil fuels is outweighed by long-term economic risk and reliance, as will be further mentioned through long-term economic effects on health expenditure //

From a social perspective, it is argued that the economic affordability of fossil fuels and their positive contribution to technological advancement, including through the Industrial revolution and powering of plants by multinational corporations which produce mobile computing devices, has caused the living standards for people in ^{the} global society to increase. Meanwhile from the sub-perspective of health within the social viewpoint, Keatinge and Donaldson have argued that health outcomes will improve from global warming because of "heat-related deaths are generally much fewer than cold-related deaths. However, this argument is dispelled by the fact that heat-related illnesses are increasing exhibiting negative temporal changes for society due to climate change. In India, it is expected that heat extreme heat will decrease working hours by six-eight% by 2030, which has parallel flow-on effects for lower economic productivity. Meanwhile in the USA, ~~heat~~ extreme heat was the cause of 55% of natural hazard deaths in Australia from 1910-2010, and over the temporal scale, the situation is only worsen //

Fig 1 illustrates that changes due to global warming are causing further change to meteorological extremes. There is an exponential relationship between temperature and air moisture, and the result of increased temperatures, as shown in Fig 1 is both more

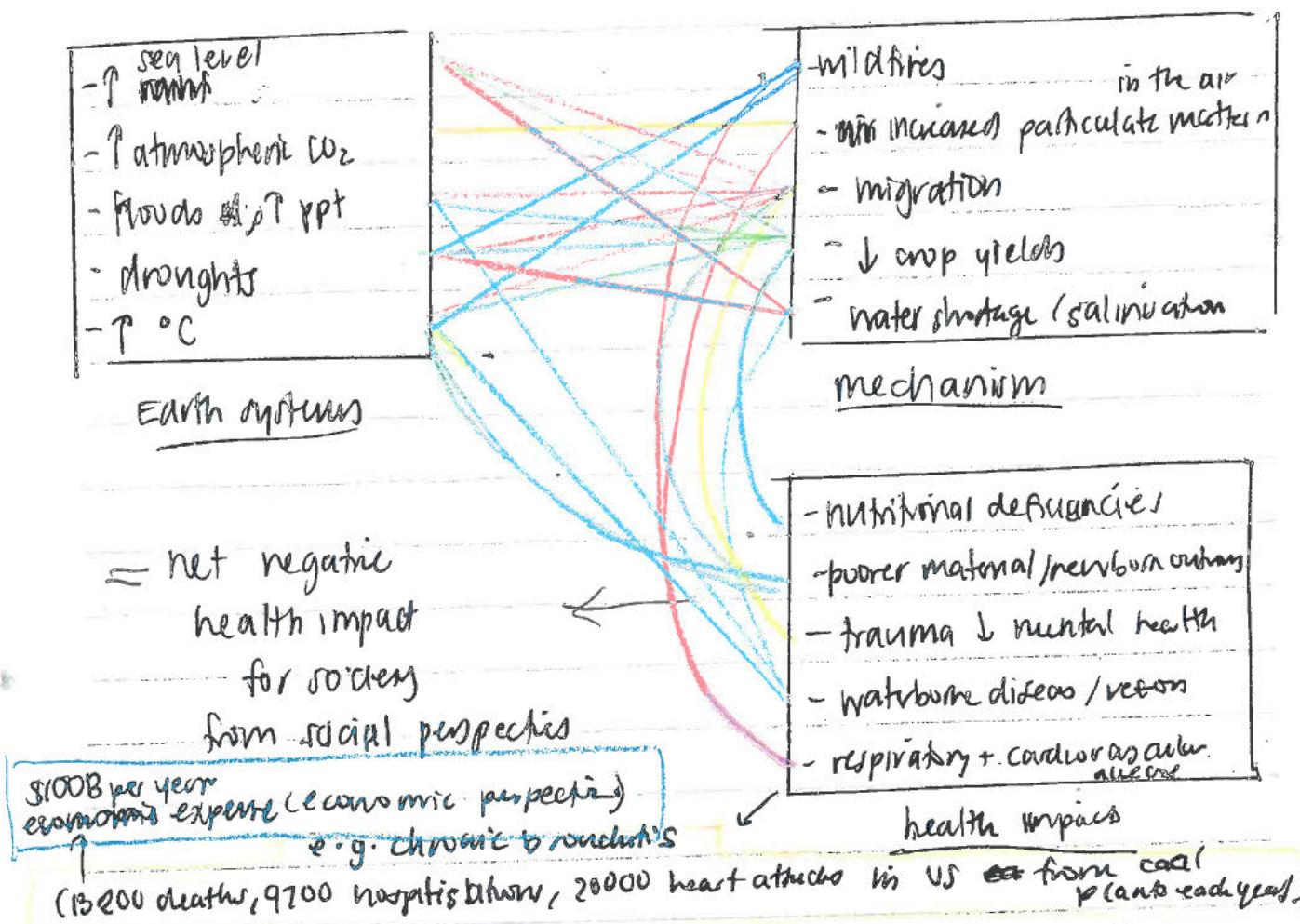
Fig 1 "exponential graph showing relationship between temperature and air moisture"



~~teen plus~~
rainfall (precipitation pattern changes) and more droughts.
According to Professor James Renwick of Victoria University of Wellington, a ~~less~~ ⁱⁿ 2°C warming from pre-industrial times will cause the West Coast to have 10x as many rainfall events and the East Coast to have 2x as many droughts, showing illustrating both spatial variation in changes, based on underlying location and geography, such as orographic rainfall barrier of the Southern Alps, but also dangers of heat related and wet weather events.

Additionally from a social perspective, the negative effect of fossil fuels outweigh the positives due to increased risk of health related diseases, as illustrated in Fig 2, showing the earth systems, mechanisms and health impacts of climate change and the interactions between man factor.

Fig 2:



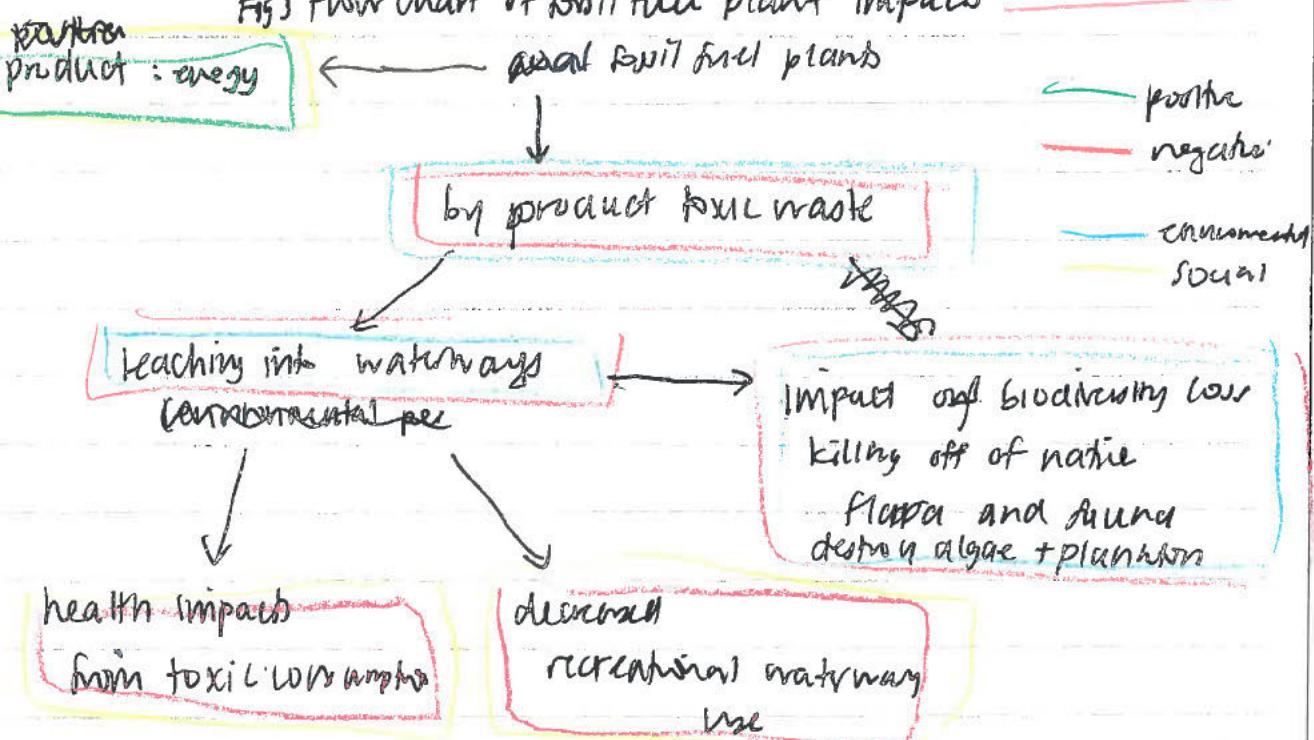
Warmer temperatures due to climate change cause faster extrinsic incubation of parasites, increasing social health impacts of malaria and dengue fever. Thus although "climate change has exerted only a minimal influence" on such conditions ^{at present}, as the climate warms further, these effects will only then ~~be seen~~ be realized, from the social perspective. Increased precipitation and changes to pluvial ~~pluvial~~ processes will also cause more an increase in waterborne diseases and enteric pathogens such as E. coli and hepatitis A, as shown in Fig 2.

Another flaw of Willis, Keatinge and Donaldson's argument is the concept of the heat index. According to Harvard EdX Climate Change and Health, even ^{low} higher temperatures with

higher humidity can cause poor health outcomes, so temperature should not be the sole consideration in health effects from the social perspective.

Lastly, the environmental impacts of fossil fuels lie heavily towards the negative impact on society. After all, in the plants themselves, waste from fossil fuels contain toxic chemicals such as arsenic, cadmium and mercury with 50% of pre-processed coal material being converted into extremely toxic substances. Not only is this negative from an environmental perspective, health impacts should they end up in waterways, humans may also be ~~also~~ affected from a social perspective.

Fig 3 Flow chart of fossil fuel plant impacts



affecting recreational use and its providing second order effects due to human consumption. Therefore, the environmentally, socially and economically unsustainable practice of using fossil fuels ^{makes} makes its negative effect is subtle to be positive effect for society.

QUESTION THREE

"Twenty-five years ago people could be excused for not knowing much, or doing much, about climate change. Today we have no excuse." — Desmond Tutu

With reference to different perspectives, critically evaluate the predicted future impact of climate change on human societies across the globe. Who will be most affected?

Your answer must include:

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PLANNING

Inequality

Apartheid



migration

action

minerals



Begin your answer to Question Three here:

Desmond Tutu's sentiment around the ubiquitous knowledge around climate change in contemporary society and demands to take action on the issue ~~reflects~~ illustrates that human action is necessary and crucial for the mitigation of climate change's disastrous effects.

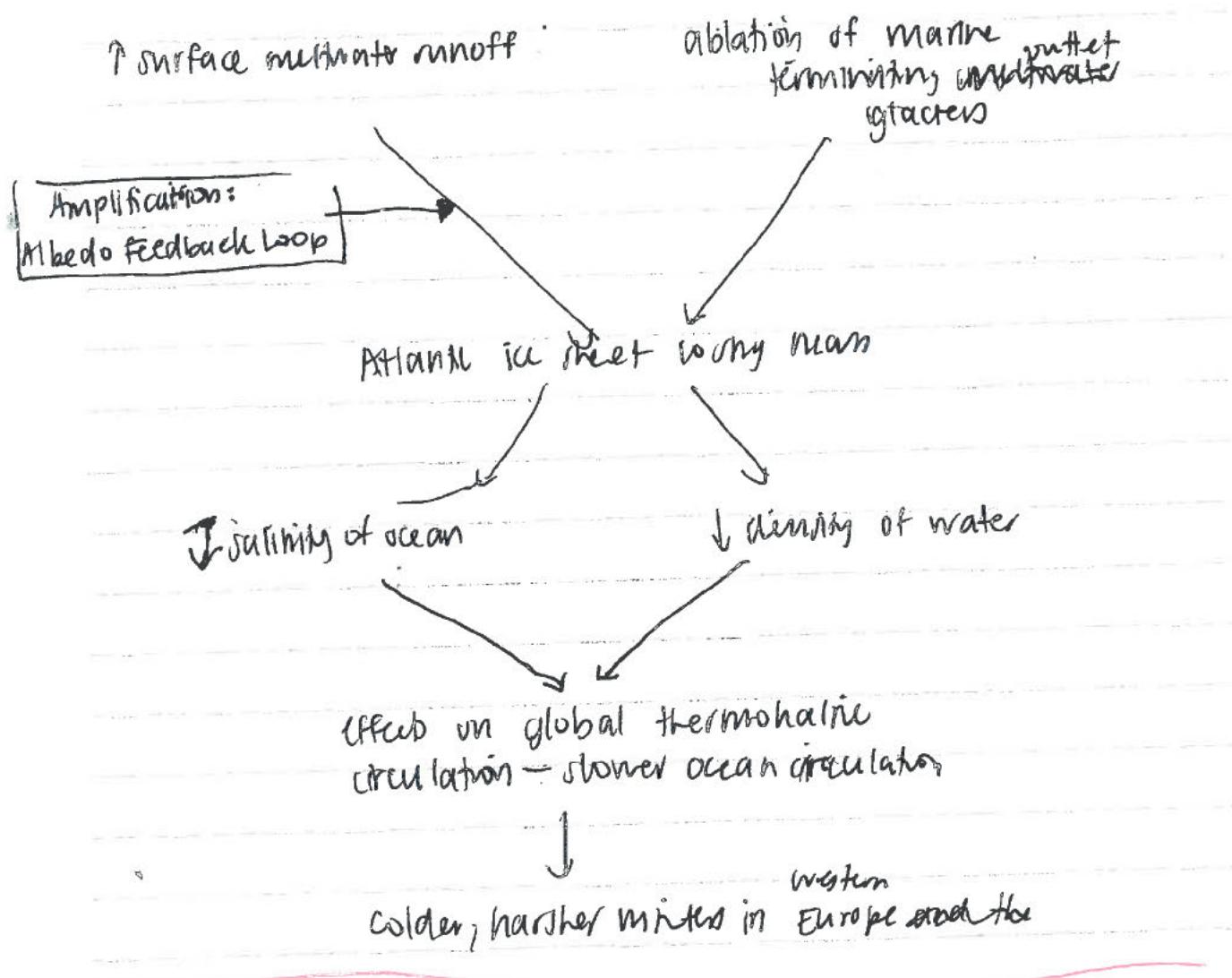
To this end, the predicted future impact of climate change on human societies, globally, is dependent on ~~the~~ the steps our communities take to mitigate, or refuse to mitigate these impacts. These actions can be summarised by the Representative Concentration Pathways (RCPs) where RCP2.6 is a state of mitigation, 4.5 and 6.0 are stabilisation efforts and 8.5 is "business as usual".

Regardless of which route we take however, some nations will be more ~~effected~~ vulnerable than others.

Among these are developing and low-lying states, African nations in particular. Though Africa contributes <4% of global GHG emissions, the cost of climate change adaptation from an economic ~~cost~~ will cost them \$10.6 B per year — and that is just stabilisation costs rather than mitigation. ~~Meanwhile in areas like the Himalayan mountain Areas with high ice coverage are also~~ will also be the most vulnerable. The Himalayas, even in the best case scenario where all countries meet the targets outlined in the Paris Climate Agreement, will see ~~1/3~~ of its ~~area~~ ice cover melted by 2050, ~~or~~ or $2/3$ if keeping to current trends. Northern Nepalese human societies/communities are already realising the effects and being forced to build to higher altitude settlements. Millions of South Asians

who depend on the ranges' ^{for water} ~~for food~~ ^{and glacial} into adjacent areas though fluvial processes, are also at risk. Changes to the composition of mountainous areas, such as ~~decreasing~~ ^{increasing} the decreasing mass of the Atlantic ice Sheet will also impact human societies, as shown in Fig 1:

Fig 1: Impact of melting Atlantic ice sheet



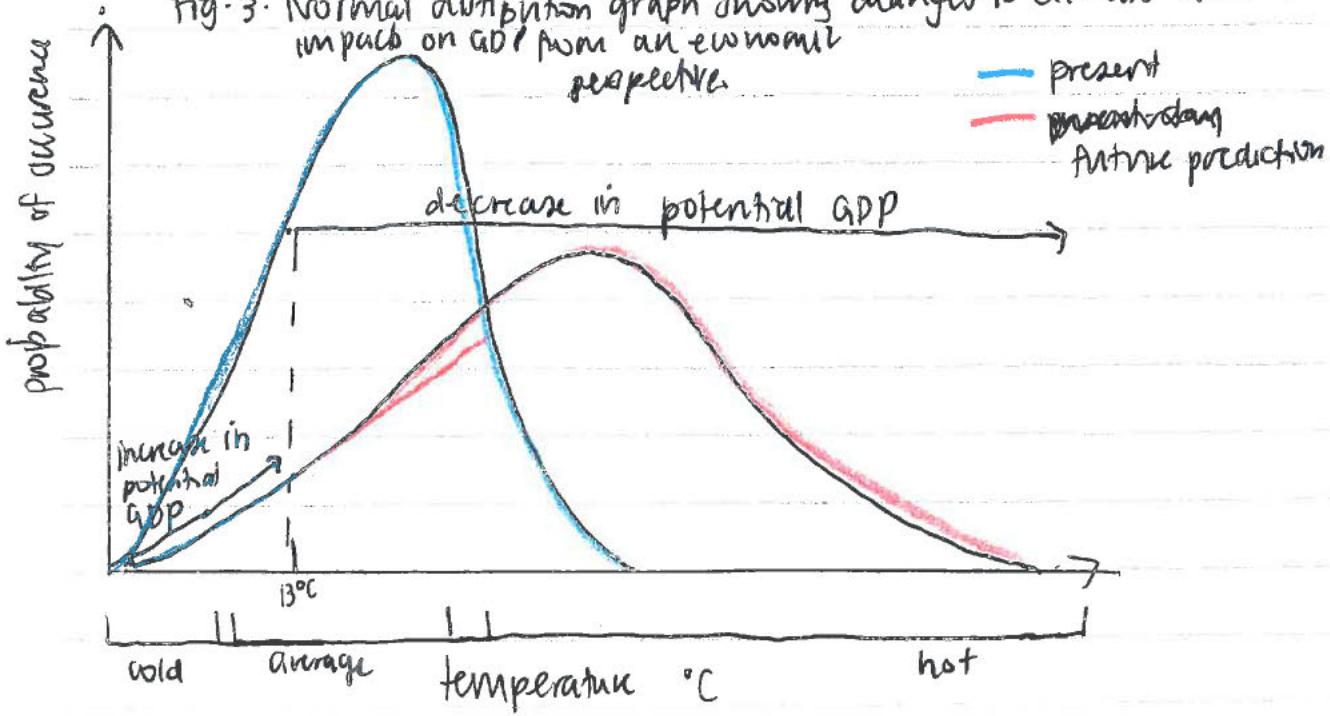
As humanity experiences harsher ~~extremes~~^{weather} this will only be exacerbated by factors such as positive, self-amplifying feedback loops and cascading tipping points. The Albedo feedback loop in Fig 1 represents how when ice ^{turns} high albedo melts, the exposure of rock on glacier ~~will~~ accelerates melting.

as rocks / other geological surfaces have higher albedo / reflects more short-wave radiation. Similarly, a cascading tipping point may occur where permafrost thawing causes release of methane which causes increased atmosphere greenhouse gases and more warming; amplifying effects on human society.

The case studies for effect on human society illustrate spatial variation in climate change effects and how climate change will affect areas of the world differently. For instance, from an economic perspective, all countries will experience economic decline by 2100 under RCP8.5, and a 4°C global average temperature rise. Under a Paris agreement scenario however the economic losses in North America will be limited to 2% (from 10.5 - 13% - RCP8.5). Yet more worrying are the developing nations such as Bangladesh and India which are predicted to be the most vulnerable nations to climate change.

This will affect

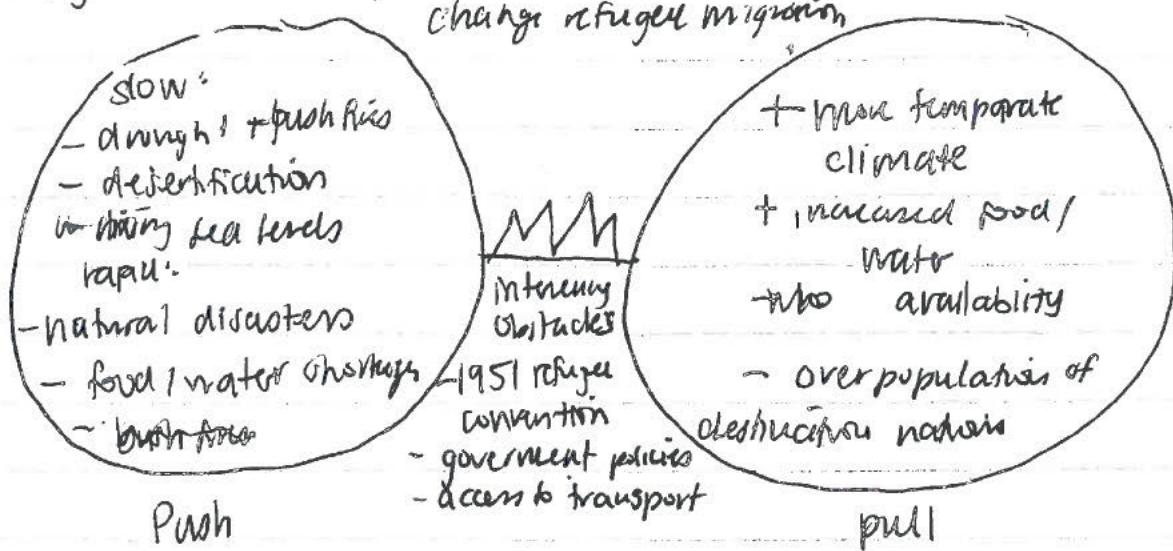
Fig. 3. Normal distribution graph showing changes to climate and its impact on GDP from an economic perspective



As shown in Fig 2, the optimal temperature for economic productivity is 13°C . Therefore, prior to 2050, some nations will see an increase in potential GDP, while others will see a decrease. Fig 182 shows that climate change ~~will~~ increases both the mean and range of temperatures which causes more extreme meteorological extremes, while increasing risk of floods and droughts. In Bangladesh, high population density and weak infrastructure in the cultural environment, combined with flat topography in the natural environment means it is especially vulnerable to floods and droughts in its lowlands to the North ~~as well as coastal~~ as well as coastal inundation and storms by the Bay of Bengal. ~~as well as~~ Areas such as the Philippines, Cambodia and Vietnam in South East Asia are also developing nations at extreme risk due to their low-lying coastal geography and risk of coastal inundation as sea levels rise. Meanwhile, more developed nations, who contribute to the bulk of climate change (as discussed ^{earlier} with the contrasting scenario in Africa) such as Australia and New Zealand are low risk nations. This is what the UN describes as a possible "climate apartheid".

The inequalities caused by climate change will affect all nations through migration and climate change refugees. Fig 3, *Migration and Climate Change*, explores how the factors causing climate change migration from the slow push factor of droughts and bushfires to the more rapid ^{cause of} flood / water shortages. The fact that the ^{UN's} 1951 Refugee convention is yet to be amended to accept climate change refugees as a classification of legitimate

Fig 3 : Adapted Gers model to fit context of climate change refugee migration



refugee is a possible intervening obstacle as residents of pacific island states such as Tuvalu and Kiribati are already applying to be accepted as climate change refugees in places like New Zealand. Meanwhile, conditions such as bush fires may drive drives migration with nations like Australia NZ expected to have a 7% increase in high risk extreme fire risk by 2040 and Australia's 15-70% increase by 2050. Nevertheless, migration is an adaptive rather than a mitigatory response to climate change and is unavoidable as the habitable land space environment surface decreases over time.

To conclude, from present through political environmental, social and economic perspectives, climate change is likely to impact all corners of human society, but it is developing poor nations, as well as our coastal and glacial communities which are most vulnerable.

Scholarship Exemplar 2020

Subject	Geography		Standard	93401	Total score	15
Q	Grade score	Annotation				
1	5	The most significant cultural process is acknowledged in the introduction, setting up the argument. Original diagrams enhance the response. The answer goes into detailed analysis of the most significant cultural process (agriculture), with supporting evidence from the resource booklet and beyond. Importantly, the candidate also analyses urbanisation and energy consumption for comparison. This answer could have been strengthened by acknowledging links between the processes. There is sufficient debate within the answer to reach scholarship level.				
2	5	Perspectives are used effectively to give this answer structure. Again, original diagrams are sophisticated and enhance the answer. The candidate's use of evidence from the resource booklet across their argument is sufficient to reach scholarship, yet not consistent enough for higher score. For instance, environmental impacts lack supporting evidence. The candidate clearly understands and effectively answers the question to meet scholarship level.				
3	5	The candidate does not critically evaluate their response through perspectives in this answer as effectively as in Question Two. Yet, perspectives are implied and summarised in the conclusion. Again, the candidate only 'just' uses enough resource booklet evidence; they mostly support their answer with knowledge beyond the resources. Original diagrams again strengthen the answer. The candidate answers the question with sound literacy skills.				
Overall		Overall, this is a scholarship script. The candidate demonstrates the ability to be critical, shows insight and uses convincing communication. The script could have been strengthened by using more evidence from within the resource booklet. The sophisticated use of diagrams strengthened the script sufficiently enough to be awarded scholarship.				