



UNIVERSITY OF OXFORD

Geography Admissions Test (GAT)

Specimen Paper B answers

Part A - Critical thinking: Answer all questions in this section

Sub-section (i):

Read the following article from *The Conversation* and answer the following questions:

An entire Pacific country will upload itself to the metaverse. It's a desperate plan – with a hidden message

The Pacific nation of Tuvalu is planning to create a version of itself in the metaverse, as a response to the existential threat of rising sea levels. Tuvalu's minister for justice, communication and foreign affairs, Simon Kofe, made the announcement via a chilling digital address to leaders at COP27.

He said the plan, which accounts for the “worst case scenario”, involves creating a digital twin of Tuvalu in the metaverse in order to replicate its beautiful islands and preserve its rich culture:

“The tragedy of this outcome cannot be overstated [...] Tuvalu could be the first country in the world to exist solely in cyberspace – but if global warming continues unchecked, it won't be the last.”

The idea is that the metaverse might allow Tuvalu to “fully function as a sovereign state” as its people are forced to live somewhere else.

There are two stories here. One is of a small island nation in the Pacific facing an existential threat and looking to preserve its nationhood through technology.

The other is that by far the preferred future for Tuvalu would be to avoid the worst effects of climate change and preserve itself as a terrestrial nation. In which case, this may be its way of getting the world's attention.

What is a metaverse nation?

The metaverse represents a burgeoning future in which augmented and virtual reality become part of everyday living. There are many visions of what the metaverse might look like, with the most well-known coming from Meta (previously Facebook) CEO Mark Zuckerberg.

What most of these visions have in common is the idea that the metaverse is about interoperable and immersive 3D worlds. A persistent avatar moves from one virtual world to another, as easily as moving from one room to another in the physical world.

The aim is to obscure the human ability to distinguish between the real and the virtual, for better or for worse.

Kofe implies three aspects of Tuvalu's nationhood could be recreated in the metaverse:

1. territory – the recreation of the natural beauty of Tuvalu, which could be interacted with in different ways
2. culture – the ability for Tuvaluan people to interact with one another in ways that preserve their shared language, norms and customs, wherever they may be
3. sovereignty – if there were to be a loss of terrestrial land over which the government of Tuvalu has sovereignty (a tragedy beyond imagining, but which they have begun to imagine) then could they have sovereignty over virtual land instead?

Could it be done?

In the case that Tuvalu's proposal is, in fact, a literal one and not just symbolic of the dangers of climate change, what might it look like?

Technologically, it's already easy enough to create beautiful, immersive and richly rendered recreations of Tuvalu's territory. Moreover, thousands of different online communities and 3D worlds (such as Second Life) demonstrate it's possible to have entirely virtual interactive spaces that can maintain their own culture.

The idea of combining these technological capabilities with features of governance for a "digital twin" of Tuvalu is feasible.

There have been prior experiments of governments taking location-based functions and creating virtual analogues of them. For example, Estonia's e-residency is an online-only form of residency non-Estonians can obtain to access services such as company registration. Another example is countries setting up virtual embassies on the online platform Second Life.

Yet there are significant technological and social challenges in bringing together and digitising the elements that define an entire nation.

Tuvalu has only about 12,000 citizens, but having even this many people interact in real time in an immersive virtual world is a technical challenge. There are issues of bandwidth, computing power, and the fact that many users have an aversion to headsets or suffer with nausea.

Nobody has yet demonstrated that nation-states can be successfully translated to the virtual world. Even if they could be, others argue the digital world makes nation-states redundant.

Tuvalu's proposal to create its digital twin in the metaverse is a message in a bottle – a desperate response to a tragic situation. Yet there is a coded message here too, for others who might consider retreat to the virtual as a response to loss from climate change.

The metaverse is no refuge

The metaverse is built on the physical infrastructure of servers, data centres, network routers, devices and head-mounted displays. All of this tech has a hidden carbon footprint and requires physical maintenance and energy. Research published in Nature predicts the internet will consume about 20% of the world's electricity by 2025.

The idea of the *metaverse nation* as a response to climate change is exactly the kind of thinking that got us here. The language that gets adopted around new technologies – such as “cloud computing”, “virtual reality” and “metaverse” – comes across as both clean and green.

Such terms are laden with “technological solutionism” and “greenwashing”. They hide the fact that technological responses to climate change often exacerbate the problem due to how energy and resource intensive they are.

So where does that leave Tuvalu?

Kofe is well aware the metaverse is not an answer to Tuvalu's problems. He explicitly states we need to focus on reducing the impacts of climate change through initiatives such as a fossil-fuel non-proliferation treaty.

His video about Tuvalu moving to the metaverse is hugely successful as a provocation. It got worldwide press – just like his moving plea during COP26 while standing knee-deep in rising water.

Yet Kofe suggests:

“Without a global conscience and a global commitment to our shared wellbeing we may find the rest of the world joining us online as their lands disappear.”

It is dangerous to believe, even implicitly, that moving to the metaverse is a viable response to climate change. The metaverse can certainly assist in keeping heritage and culture alive as a virtual museum and digital community. But it seems unlikely to work as an ersatz nation-state.

And, either way, it certainly won't work without all of the land, infrastructure and energy that keeps the internet functioning.

It would be far better for us to direct international attention towards Tuvalu's other initiatives described in the same report:

“The project’s first initiative promotes diplomacy based on Tuvaluan values of olaga fakafenua (communal living systems), kaitasi (shared responsibility) and fale-pili (being a good neighbour), in the hope that these values will motivate other nations to understand their shared responsibility to address climate change and sea level rise to achieve global wellbeing.”

The message in a bottle being sent out by Tuvalu is not really about the possibilities of metaverse nations at all. The message is clear: to support communal living systems, to take shared responsibility and to be a good neighbour.

The first of these can't translate into the virtual world. The second requires us to consume less, and the third requires us to care.

1. Which one of the following statements best summarises the author's understanding of Tuvalu's response to climate change?
 - A. Tuvalu believes in the power of new technologies to provide solutions to climate change.
 - B. Tuvalu is looking at way of preserving aspects of the nation through technology, but would much prefer to remain as a territorial nation.
 - C. In the face of catastrophic sea level rise, Tuvalu has accepted that it will disappear from the world.
 - D. Tuvalu has sought to exert influence on other countries through diplomacy, but has struggled to do so due to its small population and economy.
 - E. Tuvalu believes that the metaverse is its only possibility for survival in the face of sea level rise.

The answer is **B**.

The author explains that while Tuvalu is looking at digital options, it would prefer more conventional responses to climate change. **A** and **E** are both a misreading of Tuvalu's response to climate change; evidence of this is in the second-to-last paragraph of the passage where the author says "...is not really about the possibilities of metaverse nations at all". The author does not come to the conclusions expressed in **C** or **D**; **C** is in fact contradictory to Tuvalu's response.

2. Which one of the following statements best reflects the author's main criticism of the idea of a digital twin of a nation-state?
 - A. Virtual environments are inherently poor representations of complex real-world environments and communities.

- B. The technology involved in replicating a whole nation-state in the metaverse is very expensive and unaffordable for a country like Tuvalu.
- C. A nation-state that only exists in the digital world is not guaranteed to retain its legal status in the international community.
- D. Solutions to climate change which rely on technology are often described in ways which obscure their counter-productive use of energy and resources.**
- E. Tuvalu is not using the proposal to create a 'digital twin' as a genuine solution to the threat of climate change but as a symbolic message to the international community.

The correct answer is **D**.

A is an argument that is implicit in the points the author is making, but their main criticism of the digital twin idea as a response to climate change is best reflected by **D**. **B** and **C** might be true but are not mentioned by the author. **E** is a point that the author makes, but it is not their main criticism of the idea; this is more of an explanation of why Tuvalu is proposing a 'digital twin'.

3. Which one of the following statements best summarises the article's main conclusion?

- A. The idea of making a 'digital twin' of a country facing an existential threat from climate change is a complete waste of time and resources.
- B. As a country with a very small population, Tuvalu is facing the worst of climate change's impacts while being least at fault for causing it, and so other countries have a moral responsibility to help it.
- C. While climate change represents a severe threat for low-lying island nations like Tuvalu, some element of those nations will always survive.
- D. Tuvalu is using the proposal for a 'digital twin' of the country more as a way of drawing attention to the country's situation than a genuine response to climate change.**
- E. The idea of a 'digital twin' of a nation-state is misleading as it relies on real-world infrastructure.

The correct answer is **D**.

D best summarises the author's conclusion. The author is arguing that the 'digital twin' is not Tuvalu's genuine response to climate change and their proposal is primarily about raising awareness to their situation. **A** is not a conclusion reached by the author as they do not criticise the 'digital twin' idea in such strong terms. **B** and **C** both might be implied but neither are the main conclusion of the article. **E** is a point made by the author as part of their overall argument but does not summarise the main conclusion as strongly as **D**.

4. Which one of the following assumptions does the author's argument depend on most strongly?

- A. Creating a digital twin of the country in the metaverse is not Tuvalu's primary or preferred option for adapting to the impacts of climate change.
- B. Tuvalu and other Pacific island nations do not have the resources to be able to respond to climate change by means of large-scale engineering projects.
- C. Engaging in international climate diplomacy with other nations has been an ineffective strategy for Tuvalu.
- D. Sea level rise is occurring twice as fast in the Pacific, where Tuvalu is located, compared to other areas of the world.
- E. Technological solutions to climate change are often suggested by countries with high carbon emissions so that they can continue using fossil fuels.

The correct answer is **A**.

The author's argument that a metaverse nation is not a truly viable response to climate change, but is being used as a way to draw attention to Tuvalu's situation, rests on the author's assumption that Tuvalu is not using the idea of a 'digital twin' as its primary or preferred option for adapting to climate change. The author is assuming that Tuvalu would prefer to remain as a physical nation-state through climate mitigation and the preservation of Tuvalu's territory.

B might be a reasonable assumption but does not underpin the author's argument as strongly as **A**, because if **B** was the case, Tuvalu might choose to propose a digital twin regardless as a way to attract attention to their cause. The answer is not **C** as author is not assuming that diplomacy has been ineffective, otherwise Tuvalu would not be seeking international attention as argued by the author. **D** and **E** are not assumptions which underpin the author's argument.

5. Which one of the following statements is not consistent with the author's argument?

- A. Complex social activities and shared cultural experiences are always going to be difficult to replicate in digital environments.
- B. Sea level rise poses an existential threat to low-lying island countries, and so neighbouring countries have a moral duty to help respond.
- C. Technological solutions to climate change are inherently problematic and contradictory, and so the primary aim should be encouraging nation-states and companies to stop using fossil fuels.
- D. Tuvalu sees international climate diplomacy and politics as a key means to mitigating climate change and receiving assistance to adapt to its impacts.
- E. The existential threat posed to Tuvalu by climate change means that a digital twin is appropriate to consider is a last resort, especially seen as the government has given up on engaging with larger countries in climate diplomacy.

The correct answer is **E**.

The author's argument is that Tuvalu is proposing a 'digital twin' as a means of drawing attention to its perilous situation. It can be inferred that the aim of drawing attention from the

international community is engagement with larger countries in the hope of convincing them to reduce their greenhouse gas emissions and mitigate climate change. This is contradictory to statement **E**, which is saying that Tuvalu is using a digital twin as a last resort and has given up on engaging with larger countries.

All of the other statements would be consistent with the author's argument.

Sub-section (ii):

Read the following passage and answer the following questions:

If you have any interest in geography or politics, or learned about them in school, then chances are you will have heard about the term 'globalisation'. This word started to be popularised by economists in the 1980s, and through the 1990s and 2000s was part of a new *zeitgeist* of free-markets, openness, and global connectivity. However, scholars have long contested the idea of globalisation – its extent, when it began, and its exact definition. However, in the 2020s, with a long-term trend of the reassertion of the nation-state sharply exemplified by the Covid-19 pandemic, globalisation is now clearly not only a contested term, but a useless concept.

The term 'globalisation' became popularised to describe the integration primarily of economies, but also societies and cultures, across national borders. After the fall of the Berlin Wall in 1989, some historians declared the final victory of free-market capitalism and liberal democracy, with this 'end of history' ushering in a new era of increasing global trade which would bring with it a mingling of politics and culture. The last vestiges of socialism and communism were fizzling out, the Cold War was over, and an unfettered flow of goods, services, money, people, and ideas would be free to flow around the world. Soon after, the rise of the internet and other developments in communications and transport technologies contributed to this post-Cold War sense of unprecedented connectivity bringing distant parts of the world ever closer together in what economic geographer David Harvey called 'time-space compression'.

However, if we take globalisation to mean global flows of trade, the idea that globalisation is as new as the 1990s can be questioned. The Roman Empire had cross-continental trade almost two thousand years ago, and the ancient trade routes of the Silk Road carried goods between China and the West from before the first millennium and into the late Middle Ages. In modern history, it is hard to argue that globalisation 'began' in the 1980s or 1990s after hundreds of years of colonial history, during which European empires had established global networks of territorial control, economic circuits, and the movement of people. If the time limit of this supposedly new process cannot easily be delineated, then the concept fails to be useful in any meaningful sense.

Additionally, the sense of a homogenising world that globalisation often implies is misleading. While supply chains and commodity circuits are now truly global, this does not mean that economies are becoming equal. Coffee is one example of a global commodity; however, its trade relies on production in the Global South and transport to the Global North for consumption. While this trade is global, it is not a two-way relationship that is making Colombia and Ethiopia more similar to the UK or USA. Furthermore, discussions of trade between countries can give the impression that those nation-states are economically and culturally homogenous blocs, which is clearly not the case.

Indeed, in some cases, globalisation can be seen to have made those intra-national differences even more stark. For example, China's increasing international trade has been key to the story of globalisation, but this economic activity has been concentrated in the Eastern coastal regions such as Shanghai and Beijing. While those cities may be becoming truly global places of interconnectivity,

the gap between there and the poor rural regions of central and western China has arguably become even bigger than before the 1990s. In places like the US, UK, and Europe, populist politicians have stoked perceptions of a 'liberal elite' in cities who benefit from globalisation while working people in more peripheral areas are left behind. As such, notions of a 'globalised world' are over-simplistic and erase inequalities both between and within nation-states.

Finally, in recent years the inevitability of a globalised, frictionless world has been thrown into serious question. Brexit demonstrated that there can be political motivations to actively reject economic integration, and the Presidency of Donald Trump in the USA involved walls both physical (along the border with Mexico) and metaphorical (trade barriers with China). The migrant crisis in Europe in the mid-2010s led to suspensions of the Schengen zone of free movement by some European Union countries as borders were re-asserted. And while the rapid global spread of the Covid-19 virus in early 2020 demonstrated the connected nature of the world to some extent, ultimately the response to the pandemic was defined by nation-states, as it was national governments that closed borders and initiated lockdowns.

Overall, then, we are not in such a 'globalised' world. There are clearly influential economic links stretching across the world; however, long-distance trade and exchange is nothing new, and has been part of human history for thousands of years. If the concept of globalisation describes everything from the early Roman Empire to 2023, it holds no real use and only serves to over-simplify the complexity of economic geography.

1. Which one of the following statements best reflects the author's main argument?
 - A. Globalisation is a flawed concept but is still useful for describing some aspects of human geography.
 - B. Globalisation is a new term for a very old process.
 - C. When discussing the concept of globalisation, we should bear in mind the exceptions and complicating factors that might contradict the idea of a globalised world.
 - D. Globalisation is not a useful concept because it is too vague, doesn't refer to anything new, and obscures the complex relationships between geographical scales.
 - E. The Covid-19 pandemic proves that we do not truly live in a globalised world.

The correct answer is **D**.

The main argument of the article is that globalisation is not a useful concept for the reasons given in statement **D**. The structure of the article roughly follows the three main points made in statement **D**. **A** is the next-best summary, however the final line of the article shows that the author's argument goes further than describing globalisation as a flawed concept by stating that it "holds no real use".

B does not summarise the author's argument well as the key point of the article is how useful the term 'globalisation' is. **C** is a reasonable summary but does not go far enough in reflecting the author's criticism, which is not that we should bear complicating factors in mind but that the term globalisation has no use at all. **E** is not a good summary; Covid-19 is mentioned briefly in discussion of a broader point but does not form the basis of the overall argument.

2. Which one of the following statements best summarises the main evidence the author uses to support their argument?
- A. The unclear time boundaries of globalisation, its uneven impacts, and the continued existence of trade barriers such as tariffs.
 - B. The decrease in the use of the term by economic geographers, the amount of time since the term was first used, and its vague definition.
 - C. The unclear time boundaries of globalisation, its uneven impacts which obscure inequalities within countries, and the resurgence of the nation-state in the last decade.**
 - D. The uneven impacts of globalisation which obscure inequalities between countries, the decrease in trade after the global financial crisis in 2008, and the global spread of the Covid-19 pandemic.
 - E. The historic long-distance trade links which show globalisation isn't new, the global trade in commodities such as coffee, and the spread of information by the internet.

The correct answer is **C**.

The main evidence the author gives is reflected by the structure of the article, with the paragraphs following the three key points outlined in **C**.

A reflects the first two points of evidence, however the author does not use the continued existence of trade barriers as a substantive point in their argument. **B** does not reflect evidence used by the author. **D** references uneven impacts of globalisation, however the author does not reference a decrease in trade after 2008, and the mention of Covid-19 is not part of the main evidence the author uses to substantiate their argument. **E** reflects some specific examples used by the author to evidence their argument (historic trade and coffee), however the inclusion of the spread of information by the internet make this statement a less strong summary compared to **C**, as the internet is discussed in the context of why the term 'globalisation' exists.

3. Which one of the following statements would best support the author's argument?

- A. The traditional economic view of globalisation as an inevitable force since the 1990s, causing increased economic growth and efficiency and improving people's lives, has been severely undermined by political and economic crises since 2008.**
- B. The concept of globalisation often ignores the environmental impacts of global transport and trade.
- C. Although there were temporary suspensions of the Schengen Zone of free movement in the European Union, it has since been reinstated.
- D. Globalisation is often presented as a positive process, however you can argue that there are plenty of 'losers' from globalisation as well as 'winners'.
- E. Globalisation is not a useful term because it is contested by academics.

The correct answer is **A**.

Statement **A** best supports the author's argument as the political and economic crises since 2008, some of which the article mentions, undermine the usefulness of a concept of a frictionless, globalised world.

B might be true but does not have relevance to the author's main argument. **C** actually undermines the author's argument, as it states that although the Schengen Zone was suspended, this reversal of a form of globalisation was only temporary. **D** is not relevant to the author's argument, which is about the usefulness of the term 'globalisation' rather than whether the process is considered to be positive or negative. **E** might support the author's argument but is not as strong a statement as **A** because the simple fact that academics contest a term does not make it useless.

4. Which one of the following statements is the strongest criticism of the author's argument?
- A. Environmental issues such as the climate and biodiversity crises have no regard for national borders, and so attempting to tackle them without any concept of globalisation would be an ineffective strategy.
 - B. Trade agreements and regional blocs such as the North American Free Trade Agreement (NAFTA) and the EU show that global economic integration is continuing.
 - C. Although responses to the Covid-19 pandemic were led by nation-states, the global distribution of vaccines is evidence that globalisation does indeed exist.
 - D. Trade across the Roman Empire and along the Silk Road was very slow, and so can't be considered to be examples of globalisation.
 - E. While globalisation is difficult to define, and might not necessarily be 'new', it is important to recognise and conceptualise the pace of change and increase in volume of international trade since the 1990s due to information and communication technologies.**

The correct answer is **E**.

This statement directly addresses the author's main argument and provides the counter-point that the pace of change since 1990 means we need the term 'globalisation' to recognise and discuss these changes.

A focuses on the use of the concept of globalisation in tackling cross-border environmental issues, which is not the author's main argument. **B** makes the point that economic globalisation is continuing, which is not incompatible with the author's argument. **C** does provide evidence to argue against the article's point about pandemic responses; however, the author's argument is not whether globalisation exists, but is about whether the concept is conceptually useful. **D** does provide a counter-point to the argument; however the author mentions historical trade links as evidence of historical globalisation because of the distance, not speed.

5. Which one of the following assumptions does the article's conclusion depend upon most strongly?
- a. Globalisation is an inevitable and wholly positive process.
 - b. Definitions of globalisation usually focus too much on economics and not enough on culture, society, or politics.
 - c. Globalisation needs to have clear boundaries in time and space to be useful as a concept.
 - d. Globalisation does not actually exist.
 - e. Geographers need terms like 'globalisation' to explain complex phenomena, even when they are potentially inaccurate or misleading.

The correct answer is **C**.

The author's main criticism stems from what they perceive as the vagueness of the term 'globalisation'. This assumes that the concept needs to have clear boundaries to be useful; other authors may argue that the concept can still be useful even with these blurred boundaries.

The article does not make a judgement on whether globalisation is inevitable or wholly positive and so the answer is not **A**. The author does not criticise the term as being too focused on economics and so the answer is not **B**. **D** is contradictory to the author's argument, as they are clearly assuming that globalisation, as commonly defined, does exist. **E** is also contradictory to the author's argument, and is actually more of a criticism of their conclusion.

[END OF PART A]

Part B - Problem solving: Answer all questions in this section

Sub-section (i):

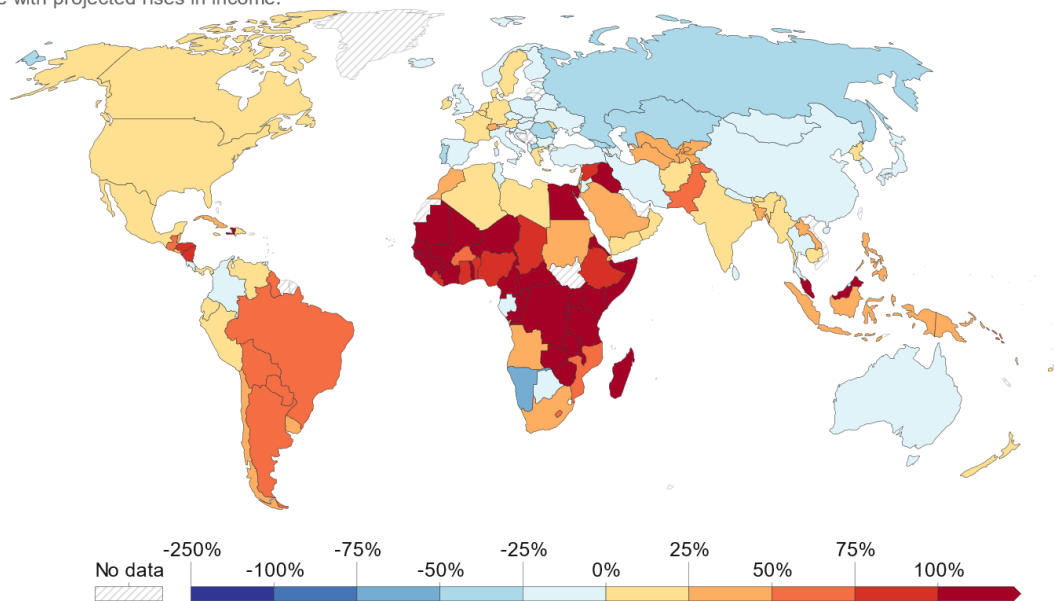
Study the two maps below. **Map 1** shows projected change in cropland area by 2050 and **Map 2** shows projected habitat loss for all species by 2050, both under a business-as-usual scenario.

Map 1:

Projected change in cropland area: Business-as-usual

Our World
in Data

Projected change in cropland area by 2050 under a business-as-usual scenario. This assumes population growth from UN medium projections; crop yield increases in line with historical rates of improvement; and dietary changes in line with projected rises in income.

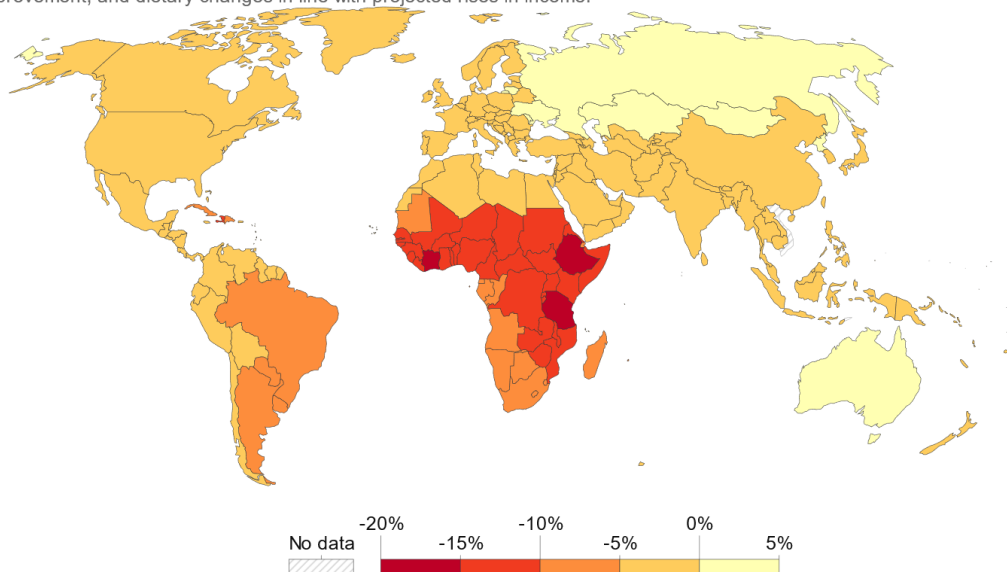


Source: Williams, D. R., Clark, M., Buchanan, G. M., Ficitola, G. F., Rondinini, C., & Tilman, D. (2021). Proactive conservation to prevent habitat losses to agricultural expansion. *Nature Sustainability*, 4(4), 314-322.
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Map 2:

Projected habitat loss for all species in 2050: Business-as-usual

Projected habitat loss for mammal, bird and amphibian species by 2050 under a business-as-usual scenario. This assumes population growth from UN medium projections; crop yield increases in line with historical rates of improvement; and dietary changes in line with projected rises in income.



Source: Williams, D. R., Clark, M., Buchanan, G. M., Ficetola, G. F., Rondinini, C., & Tilman, D. (2021). Proactive conservation to prevent habitat losses to agricultural expansion. *Nature Sustainability*, 4(4), 314-322.
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1. Based on the information provided in Map 1, which one of the following statements is true?
 - A. The average projected change in cropland area for the continent of Africa is approximately 50%.
 - B. Greenland is not projected to have any change in cropland area by 2050.
 - C. Only one country in South America will not see an increase in cropland area by 2050.
 - D. The USA, Mexico, and Canada will see increases in cropland area whereas for Russia, China and Australia cropland area will decrease or stay the same.**
 - E. Brazil is projected to have a 75% increase in cropland area by 2050.

The correct answer is **D**.

D is the only statement which is true based on the information in Map 1. It is impossible to work our **A** without the exact values of change in cropland area for African countries. For **B**, there is no data for Greenland, as reflected by the key. For **C**, this statement might not be true as there are some countries in South America for which there is no data. For **E**, this statement might not be true as the colour coding indicates that Brazil could have anywhere between a 50% and 75% increase in cropland area.

2. Based on the information provided in both maps, which one of the following statements is not true?
- A. The highest rates of habitat loss are projected to occur in Africa.
 - B. Some countries, such as Russia and Australia, are actually projected to see an increase in habitat by 2050 even under a business-as-usual scenario.
 - C. Western, central, and eastern Africa is projected to have the highest rates of both cropland expansion and habitat loss by 2050 under a business-as-usual scenario.
 - D. Western Europe is not projected to have any change in habitat loss by 2050 under a business-as-usual scenario.**
 - E. For many countries in Africa, cropland area is projected to more than double.

The correct answer is **D**.

D is not true as Map 2, which reflects a business-as-usual scenario, displays all Western European countries having between -5% and 0% change in habitat loss by 2050. All other statements are supported by the information provided by the maps.

3. Which one of the following statements, if true, would help to explain a trend observable in the maps?
- A. Sub-Saharan Africa's increases in agricultural production have come from using more land rather than increases in yields.**
 - B. The habitat loss in Europe has been driven by wildfires.
 - C. The USA will require less cropland than Mexico by 2050 due to advances in agricultural technology.
 - D. China and India will both require more cropland due to their rapidly increasing populations, leading to habitat loss in both countries by 2050.
 - E. The UK will need more cropland than France by 2050 because of a larger population.

The correct answer is **A**.

If statement **A** is true, it would help to explain why the region of Sub-Saharan Africa is projected to have some of the highest rates of cropland area expansion. The other statements do not reflect trends observable in the maps.

4. Which one of the following statements would be a reasonable summary of the data?
- A. Cropland expansion and habitat loss appear to be weakly correlated as not all countries projected to see large increases in cropland area are projected to have large increases in habitat loss.
 - B. All countries are projected to have some habitat loss by 2050.
 - C. Broadly speaking, most areas which are projected to have the largest increases in cropland area are the areas which are projected to have the highest levels of habitat loss, and both are particularly high for much of Africa.
 - D. All of North America has the same projected rate of change in cropland area, and so the populations of each country must be increasing at a similar rate.
 - E. It is difficult to compare biodiversity and land use between countries.

The correct answer is **C**.

C is a reasonable broad summary of the data, picking out the main pattern of areas with the largest projected increases in cropland area being projected to have the highest levels of habitat loss, and the noticeable high level for both in a lot of Africa.

A is incorrect as although not all countries with a large projected increase in cropland area are projected to have large increases in habitat loss, the two factors do appear to be linked.

B is not true as some countries are projected to have between 0% and 5% habitat increase.

5. Which one of the following statements would be a reasonable conclusion to draw from the data?
- A. The correlation between percentage change in cropland area and habitat loss is statistically significant.
 - B. The similar distribution of areas projected to have high levels of cropland expansion and habitat loss must mean that cropland expansion is the most important factor in driving biodiversity loss.
 - C. Data collection on biodiversity and land use in Sub-Saharan Africa is extremely difficult due to remoteness and a lack of research funding.
 - D. Because some countries in the Middle East are projected to have some of the highest increases in cropland area but not habitat loss, there is not a strong link between cropland expansion and habitat loss.
 - E. While the UK and some of Europe is not projected to see an increase in cropland area, they are still projected to have between 0-5% habitat loss, meaning that habitat loss might be being driven by factors other than cropland expansion in those countries.

The correct answer is **E**.

This is because **E** identifies a notable exception to the broad trend in the data and suggests that this may be explained by information which is not available in the two maps.

It is not possible to reach the conclusions in **A** or **C** using only the information available in the maps. **B** makes too strong a conclusion; a link between the two factors does not necessarily mean cropland expansion is the most important factor in driving biodiversity loss. **D** identifies a notable exception to the broad trend but it would be inaccurate to say that this alone means there is not a strong link between cropland expansion and habitat loss.

Sub-section (ii):

Study the table of data below.

The table shows data collected during research into the effect of urban vegetation on mitigating heat in the city centre of Barcelona. Data was collected on six different streets, at three times of day. Temperature was measured 2 metres above the ground, in the shade. Each street was assigned a vegetation index value from 0 to 1 depending on its vegetation coverage. Temperature was recorded in degrees Celsius.

Note: this data was generated for the purposes of this test and does not reflect real observations.

Street	Vegetation Index (0-1)	Temperature, °C (12:00)	Temperature, °C (14:00)	Temperature, °C (16:00)	Mean afternoon temperature, °C
Street 1	0.75	28.5	29.2	29.8	29.2
Street 2	0.45	30.2	31.1	31.6	31.0
Street 3	0.6	27.8	28.4	29.0	28.4
Street 4	0.8	26.5	27.2	27.9	27.2
Street 5	0.5	29.0	29.7	30.3	29.7
Street 6	0.65	28.1	28.9	29.6	28.9

1. Which street recorded the highest temperature at 14:00?

- A. Street 1
- B. Street 2**
- C. Street 3
- D. Street 4
- E. Street 5

The correct answer is **B**.

2. Which street had the largest range in temperature across the afternoon?

- A. Street 2
- B. Street 4
- C. Street 1
- D. Street 6**
- E. Street 3

The correct answer is **D**, as Street 6 has the largest difference between temperatures across the afternoon.

3. Which one of the following variables is not likely to be a factor affecting temperature variations in this research study?

- A. Altitude above sea level**
- B. Shade from buildings
- C. Reflected heat from glass and metal surfaces
- D. Heat retention of building materials
- E. Volume of vehicle traffic

The correct answer is **A**. As the streets are all in the same city, it is very unlikely that there would be enough difference in altitude above sea level to meaningfully affect temperature. All other variables could be different on each street and affect temperature.

4. Based on a rough judgement of the data, which one of the following statements is most likely to be true?

- A. Vegetation cover is strongly positively correlated with mean afternoon temperature.
- B. Vegetation cover is weakly positively correlated with mean afternoon temperature.
- C. Vegetation cover is negatively correlated with mean afternoon temperature.**
- D. There is no correlation between vegetation cover and mean afternoon temperature.
- E. Vegetation cover is correlated with mean afternoon temperature but only at 12:00.

The correct answer is **C**. A rough judgement of the data indicates that as vegetation cover increases, average afternoon temperature decreases, which is a negative correlation.

5. Which of one of the following actions would be the least useful improvement for this investigation?
- A. Multiple observations could be taken at each time and an average taken.
 - B. Wind speed could be recorded as this might be a factor affecting heat and might be affected by vegetation cover.
 - C. Relative humidity could be collected as this might be a factor affecting heat and might be affected by vegetation cover.
 - D. Measurements could be taken at multiple sites per street to increase the size of the data set, meaning results are more likely to be statistically significant.
 - E. The data collection could be repeated for three times in the evening, and the average afternoon temperature compared to the average evening temperature, to give more information on heat on each street throughout the day.

The correct answer is **E**. Collecting data for evening temperature to give more information on heat on each street throughout the day would not contribute to any additional understanding of the key research question, which is how urban vegetation mitigates heat on the city streets. It might show that vegetation has different effects at different times of day, but the key aim is to understand the effect of vegetation on mitigating heat, and streets will be warmest during the day. All other statements reflect actions which could either give additional information or make the data more reliable.

[END OF PART B]

Part C – Timed essay: read the passage and answer the essay question

Study the passage of text, which is a series of extracts from an address by Halford Mackinder to the Royal Geographical Society in 1887 titled 'On the Scope and Methods of Geography'.

What does this passage tell us about Mackinder's views on the subject of Geography?

Your answer should be based primarily on the material in the passage; no additional credit will be given for reference to material outside the passage.

What is geography? This seems a strange question to address to a Geographical Society, yet there are at least two reasons why it should be answered, and answered now. In the first place geographers have been active of late in pressing the claims of their science to a more honoured position in the curriculum of our schools and Universities. The world, and especially the teaching world, replies with the question, "What is geography?" There is a touch of irony in the tone. The educational battle now being fought will turn on the answer which can be given to this question, Can geography be rendered a discipline instead of a mere body of information? This is but a rider on the larger question of the scope and methods of our science.

The other reason for now pressing this matter on your notice comes from within. For half a century several societies, and most of all our own, have been active in promoting the exploration of the world. The natural result is that we are now near the end of the roll of great discoveries. The Polar regions are the only large blanks remaining on our maps. A Stanley can never again reveal a Congo to the delighted world. For a time good work will be done in New Guinea, in Africa, in Central Asia, and along the boundaries of the frozen regions. For a time a Greely will now and again receive the old ringing welcome, and will prove that it is not heroes that are wanting. But as tales of adventure grow fewer and fewer, as their place is more and more taken by the details of Ordnance Surveys, even Fellows of Geographical Societies will despondently ask, "What is geography? "

[...]

The first inquiry to which we must turn our attention is this: Is geography one, or is it several subjects? More precisely, are physical and political geography two stages of one investigation, or are they separate subjects to be studied by different methods, the one an appendix of geology, the other of history? Great prominence has recently been given to this question by the President of the Geographical Section of the British Association. In his address at Birmingham he took up a very definite position. He said, -

"It is difficult to reconcile the amalgamation of what may be considered 'scientific' geography with history. One is as thoroughly apart from the other as geology is from astronomy." It is with great reluctance and diffidence that I venture to oppose so justly esteemed an authority as Sir Frederic Goldsmid. I do so only because it is my firm conviction that the position taken up at Birmingham is fatal to the best prospects of geography.

[...]

I believe that on lines such as I have sketched a geography may be worked out which shall satisfy at once the practical requirements of the statesman and the merchant, the theoretical requirements of the historian and the scientist, and the intellectual requirements of the teacher. Its inherent breadth and manysidedness should be claimed as its chief merit. At the same time we have to recognise that these are the very qualities which will render it "suspect" to an age of specialists. It would be a standing protest against the disintegration of culture with which we are threatened. In the days of our

fathers the ancient classics were the common element in the culture of all men, a ground on which the specialists could meet.

The world is changing, and it would seem that the classics are also becoming a speciality. Whether we regret the turn which things have taken or whether we rejoice at it, it is equally our duty to find a substitute. To me it seems that geography combines some of the requisite qualities. To the practical man, whether he aim at distinction in the State or at the amassing of wealth, it is a store of invaluable information; to the student it is a stimulating basis from which to set out along a hundred special lines; to the teacher it would be an implement for the calling out of the powers of the intellect, unless indeed to that old-world class of schoolmaster who measure the disciplinary value of a subject by the repugnance with which it inspires the pupil. All this we say on the assumption of the unity of the subject. The alternative is to divide the scientific from the practical. The result of its adoption will be the ruin of both. The practical will be rejected by the teacher, and will be found indigestible in after life. The scientific will be neglected by most men, because it lacks the element of utility in every-day life. The man of the world and the student, the scientist and the historian, will lose their common platform. The world will be the poorer.

[END OF TEST]