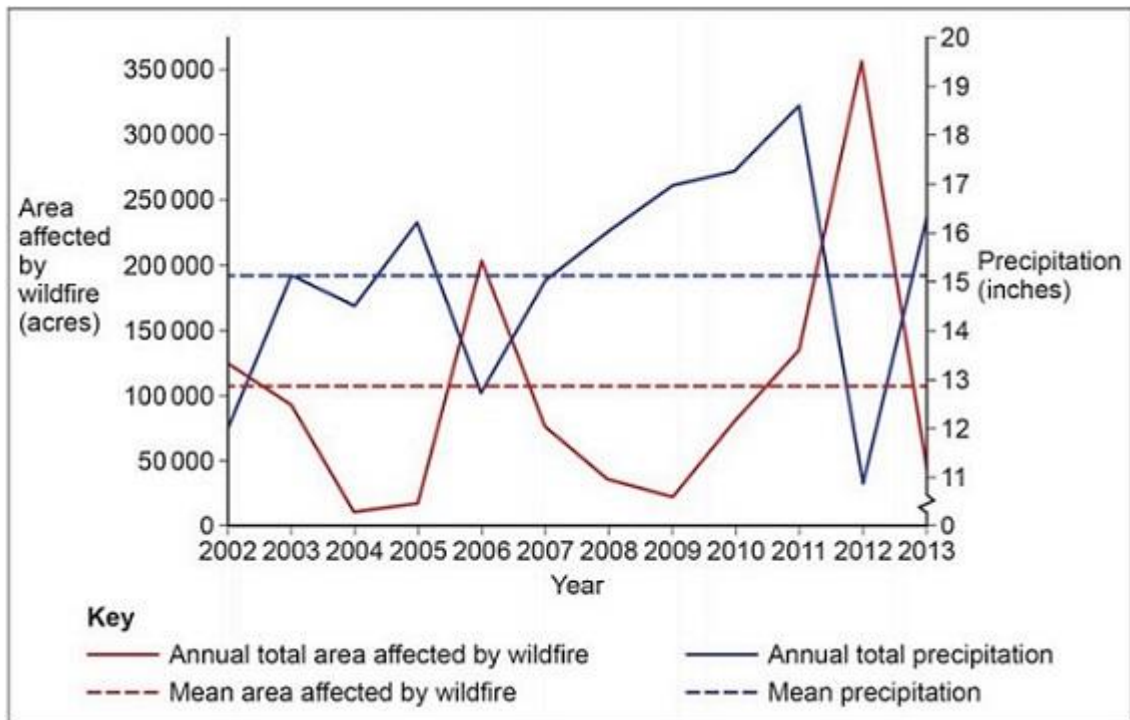## Q1.

Which of the following is a long-term response to a wildfire event?

[1 mark]

A   Deployment of firefighters to try to bring the blaze under control and prevent the further spread of flames.   ☐

B   Fires significantly reduce vegetation cover leaving exposed soils vulnerable to soil erosion.   ☐

C   New buildings are designed with driveways and patios made from incombustible materials to act as a barrier to fires.   ☐

D   Residents at risk of an approaching blaze are instructed to evacuate and temporary accommodation is made available.   ☐
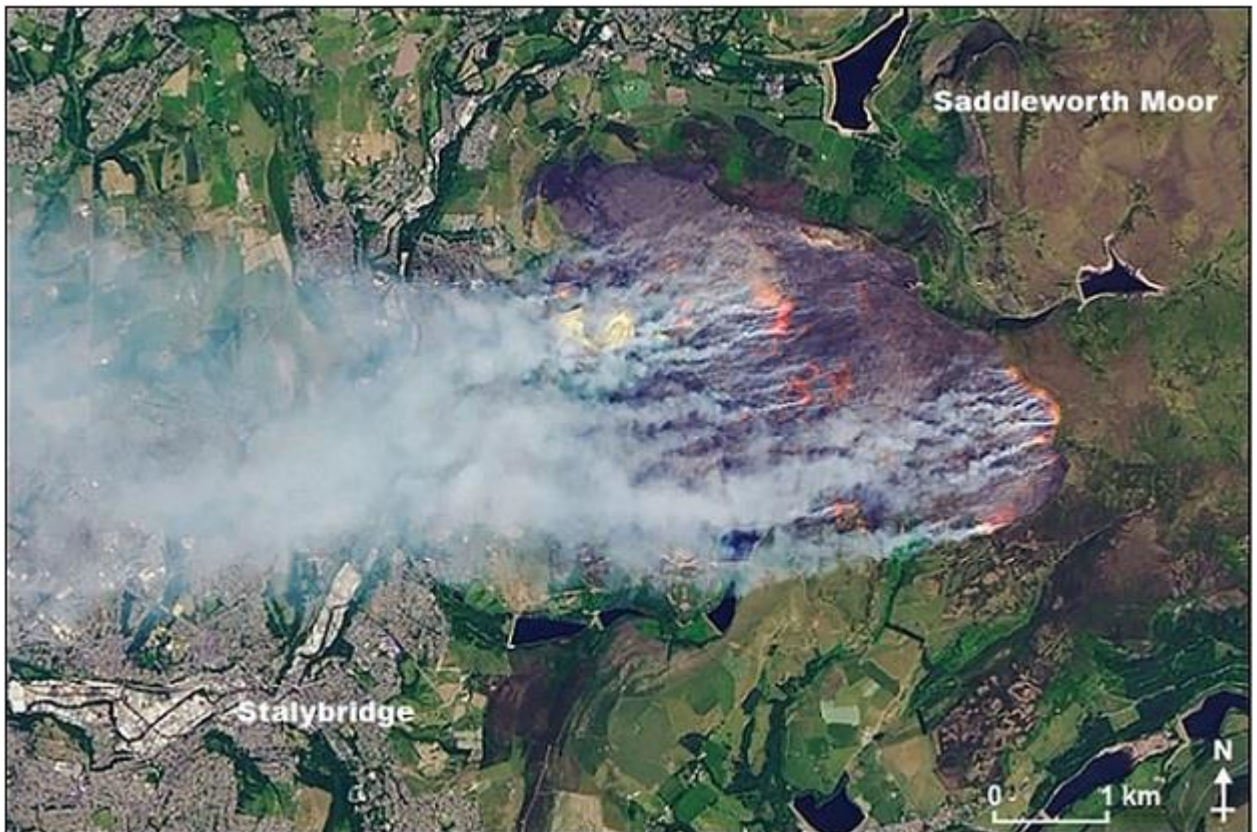
Q4.

The graph below shows data on annual precipitation and annual area affected by wildfire in Wyoming, USA, between 2002 and 2013.

Key

—— Annual total area affected by wildfire   —— Annual total precipitation

‑ ‑ ‑ Mean area affected by wildfire   ‑ ‑ ‑ Mean precipitation

Analyse the data presented in the graph.

[6 marks]

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Q5.

Evaluate the effectiveness of the hazard management cycle in assisting with the planning for wildfire events.

[9 marks]

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Q6.

The photograph below shows a wildfire on Saddleworth Moor, Greater Manchester, UK on 27 June 2018.

Note: Saddleworth Moor is an upland area north east of Manchester. The soils are composed of peat. In June 2018, there was a heatwave which was accompanied by virtually no rain and a dry wind for several weeks. Around 150 soldiers and firefighters were called in to tackle the blaze. The blaze lasted for weeks and may have been started deliberately.

Using the photograph above and your own knowledge, assess the potential issues associated with managing an event such as this.

[9 marks]

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Q7.

Assess the usefulness of prediction in the management of wildfire.

[9 marks]

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Q8.

Assess the impacts of a recent wildfire event upon people's lived experience of the place.

[9 marks]

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Q9.

How far do you agree that storms and wildfires are increasing in frequency and intensity, presenting an increasing threat to people?

[20 marks]

Q10.

With reference to a multi-hazardous environment that you have studied, assess the view that the underlying cause(s) leading to the hazards is human activity rather than physical factors.
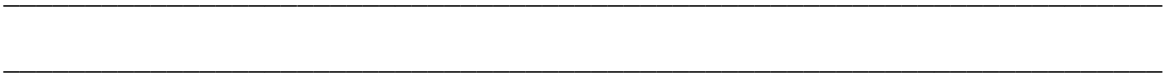
[20 marks]

Q11.

How far do you agree that global governance is crucial in meeting the challenge of reducing incidence of wildfires?

[9 marks]

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Q12.

Outline conditions that may lead to intense wildfires.

[3 marks]

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Mark schemes

Q1.
C

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AO1 = 1
[Total 1 mark]

</div>

Q4.
AO3 − Uses the graph to analyse the main trends and relationships shown within the data. Also shows awareness of anomalies and evidence of data manipulation.

Mark scheme

Level 2 (4−6 marks)
AO3 − Clear analysis of the quantitative evidence provided, which makes appropriate use of data in support. Clear connection(s) between different aspects of the data and evidence.

Level 1 (1−3 marks)
AO3 − Basic analysis of the quantitative evidence provided, which makes limited use of data and evidence in support. Basic connection(s) between different aspects of the data and evidence.

Notes for answers

- Wildfire is an annual issue for this area of the USA. There are no years without fire.
- In broad terms there is a clear correlation i.e. when rainfall is high, the amount of wildfire (in acres) is low and vice versa.
- Some may support response with data, e.g. in 2012 there were 11 inches of precipitation but around 360,000 acres of coverage by forest fire. In 2009 there were 17 inches of precipitation and only around 80,000 acres of wildfire.
- It is not possible to state a trend in terms of increasing or decreasing rates of wildfire. The pattern is extremely erratic.
- Some may calculate the range which is approximately 360,000 − 12,000 = 348,000. There are 8 years below average and only 4 years above average.
- Rainfall is also erratic, though the range is much lower 18.5 − 11 = 7.5 inches.
- Some will naturally conclude from the data that when rainfall is high it must be naturally putting out any fire which starts.

<div align="right">

AO3 = 6
[Total 6 marks]

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Q5.
AO1 − Knowledge and understanding of the hazard management cycle. Knowledge and understanding of the response to wildfire.

AO2 − Application of knowledge and understanding in evaluating the extent to which this theoretical model can assist in planning for the management of wildfire events.

Level 3 (7−9 marks)
AO1 − Demonstrates detailed knowledge and understanding of concepts, processes, interactions and change. These underpin the response throughout.
AO2 − Applies knowledge and understanding appropriately with detail. Connections and

relationships between different aspects of study are fully developed with complete relevance. Analysis and evaluation is detailed and well supported with appropriate evidence.

Level 2 (4−6 marks)
AO1 − Demonstrates clear knowledge and understanding of concepts, processes, interactions and change. These are mostly relevant though there may be some minor inaccuracy.
AO2 − Applies clear knowledge and understanding appropriately. Connections and relationships between different aspects of study are evident with some relevance. Analysis and evaluation evident and supported with clear and appropriate evidence.

Level 1 (1−3 marks)
AO1 − Demonstrates basic knowledge and understanding of concepts, processes, interactions and change. This offers limited relevance with inaccuracy.
AO2 − Applies limited knowledge and understanding. Connections and relationships between different aspects of study are basic with limited relevance. Analysis and evaluation basic and supported with limited appropriate evidence.

Notes for answers

AO1
• Nature of wildfires. Conditions favouring intense wild fires: vegetation type, fuel characteristics, climate and recent weather and fire behaviour.
• Causes of fires: natural and human agency.
• Impacts: primary / secondary, environmental, social, economic, political.
• Short and long-term responses; risk management designed to reduce the impacts of the hazard through preparedness, mitigation, prevention and adaptation.
• Characteristic human responses − fatalism, prediction, adjustment / management, risk sharing − and their relationship to hazard incidence, intensity, magnitude, distribution and level of development. The Hazard Management Cycle.
• Impact and human responses as evidenced by a recent wild fire event.

AO2
• Responses will bring a variety of variations upon the Hazard Management Cycle. Some will refer to the Disaster Management Cycle. This is acceptable and should be credited.
• The cycle provides a framework within which management of wildfire comfortably sits. The model operates within key elements − Preparation / Response / Recovery / Mitigation.
• Many will argue that preparation requires an understanding of the cause of wildfire as well as an understanding of the typical locations where wildfire tends to occur.
• The causes are well documented. Natural causes relate to lightning strikes, volcanic eruptions and even sparks from a rockfall. There is also some evidence that wildfire can be started by spontaneous combustion. Human causes can be categorised as either intentional or accidental. Carelessness with camp fire and cigarettes are the main accidental causes. Some will point out that intentional fire starting is very difficult to plan for because of its random nature. However, without a fuel source, there can be no wildfire.
• Expect to see reference to hazard mapping as part of preparation for wildfire. This is used to map areas most at risk using a variety of data on vegetation type and coverage, precipitation rates, weather forecasting and historical records.
• The model also proves useful around managing the response. For wildfire, the use of water is a major factor in the response. The aim is to put out the fire as soon as possible. There are a variety of techniques and some overlap with preparation in this regard. For example, ensuring a substantial supply of water is readily available in affected areas is key. Also for response, planners will have established protocols

around the use of fire lines which are measures taken to remove vegetation and isolate the fire.
- In terms of recovery, a major factor relates to the risk of soil erosion. Exposed soil can be easily eroded by the action of wind and heavy rainfall. Expect to see reference to measures designed to protect the soil such as straw coverage or using partially burned vegetation to cover the soil. There is also the added risk of mudflow where the burning occurred on a hillside. Stabilising such slopes is another part of recovery.
- Mitigation is the final strand of the cycle. In terms of wildfire this is about reducing the risk to property and the environment. There is overlap here with preparation and response. Mitigation may involve using fire retardant / resistant building materials for example.
- In terms of evaluation, some may suggest that this model is a little basic. Whilst it does provide a framework, it lacks the sophistication of the Park Model. Some may suggest that this model is much more centred around the human impacts and therefore useful in shaping the response. It includes a temporal dimension and charts the recovery back to normal quality of life and levels of economic activity in the area following a disaster.

AO1 = 4, AO2 = 5
[Total 9 marks]

Q6.

AO1 – Knowledge and understanding of cause, impact and management of wildfire.

AO2 – Application of knowledge and understanding to assess the scale of challenge associated with managing an event such as this in such a relatively inaccessible location.

Mark scheme

Level 3 (7–9 marks)
AO1 – Demonstrates detailed knowledge and understanding of concepts, processes, interactions and change. These underpin the response throughout.
AO2 – Applies knowledge and understanding appropriately with detail. Connections and relationships between different aspects of study are fully developed with complete relevance. Evaluation is detailed and well supported with appropriate evidence.

Level 2 (4–6 marks)
AO1 – Demonstrates clear knowledge and understanding of concepts, processes, interactions and change. These are mostly relevant though there may be some minor inaccuracy.
AO2 – Applies clear knowledge and understanding appropriately. Connections and relationships between different aspects of study are evident with some relevance. Evaluation is evident and supported with clear and appropriate evidence.

Level 1 (1–3 marks)
AO1 – Demonstrates basic knowledge and understanding of concepts, processes, interactions and change. This offers limited relevance with inaccuracy.
AO2 – Applies limited knowledge and understanding. Connections and relationships between different aspects of study are basic with limited relevance. Evaluation is basic and supported with limited appropriate evidence.

Notes for answers

AO1
- Nature of wildfires. Conditions favouring intense wild fires: vegetation type, fuel characteristics, climate and recent weather and fire behaviour.

- Causes of fires: natural and human agency. Impacts: primary / secondary, environmental, social, economic, political.
- Short and long-term responses; risk management designed to reduce the impacts of the hazard through preparedness, mitigation, prevention and adaptation.
- Impact and human responses as evidenced by a recent wild fire event.

AO2
- The first issue is scale. The area affected is clearly extensive with multiple sources of fire. This requires substantial support from expert firefighters.
- Accessibility is another issue. These are upland areas. Getting large and cumbersome equipment up to such relatively remote locations is likely to be extremely challenging.
- The weather appears to be presenting another major issue. The lack of rainfall, prolonged heat and very dry conditions means that new fires are likely to start.
- Some may recognise that peat is a flammable material. The fact that the underlying soil is composed of peat means that the fire can spread underground making it almost impossible to manage without extensive rainfall.
- Evacuation is another issue. In this case the smoke is blowing towards the north of Stalybridge. This will present a major health and safety issue for the local managers. Evacuation may be required particularly for the elderly or infirm.
- Communication is another significant challenge for the local managers. Emergency planners will need a communication strategy for local people which remains up-to-date and responsive to the changing dynamic.
- Transport issues are likely to emerge particularly where the smoke causes poor visibility or where the fire is close to roads. Any planning is likely to require road closures and re-routing of vehicles.
- The apparent deliberate starting of the fire is a major concern. Managing the fire itself is a problem but other arsonists may copy the original offender exacerbating the issue for the local emergency services.

Credit any other valid assessment.

AO1 = 4
AO2 = 5
[Total 9 marks]

Q7.

AO1 – Knowledge and understanding of the cause of wildfire. Knowledge and understanding of strategies to manage wildfire.

AO2 – Application of knowledge and understanding to assess potential for predicting wildfire as a type of management.

Mark scheme

Level 3 (7–9 marks)
AO1 – Demonstrates detailed knowledge and understanding of concepts, processes, interactions and change. These underpin the response throughout.

AO2 – Applies knowledge and understanding appropriately with detail. Connections and relationships between different aspects of study are fully developed with complete relevance. Evaluation is detailed and well supported with appropriate evidence.

Level 2 (4–6 marks)
AO1 – Demonstrates clear knowledge and understanding of concepts, processes, interactions and change. These are mostly relevant though there may be some minor inaccuracy.

AO2 – Applies clear knowledge and understanding appropriately. Connections and relationships between different aspects of study are evident with some relevance. Evaluation is evident and supported with clear and appropriate evidence.

Level 1 (1–3 marks)
AO1 – Demonstrates basic knowledge and understanding of concepts, processes, interactions and change. This offers limited relevance with inaccuracy.

AO2 – Applies limited knowledge and understanding. Connections and relationships between different aspects of study are basic with limited relevance. Evaluation is basic and supported with limited appropriate evidence.

Notes for answers
AO1
•   Characteristic human responses to wildfires – fatalism, prediction, adjustment/adaptation, mitigation, management, risk sharing – and their relationship to hazard incidence, intensity, magnitude, distribution and level of development.
•   Nature of wildfires. Conditions favouring intense wildfires: vegetation type, fuel characteristics, climate and recent weather and fire behaviour. Causes of fires: natural and human agency. Short and long-term responses; risk management designed to reduce the impacts of the hazard through preparedness, mitigation, prevention and adaptation. Impact and human responses as evidenced by a recent wildfire event

AO2
•   Any attempt to proactively plan for wildfire will inevitably involve a degree of prediction around areas most vulnerable / susceptible to an outbreak.
•   Prediction is not only used to predict the likelihood of fire, it is also used to predict the direction of travel and likely extent of severity. There are a number of tools which managers use to help predict the characteristics of wildfire. This helps in the response and helps in understanding where and how best to deploy resources. Crucially it helps to ascertain evacuation strategies in advance of an outbreak of fire. In the United States for example, wild fire managers use:
•   Fire Danger Maps - A fire danger rating map is developed using current and historical weather and fuel data. These data are transferred to models to give present condition information and predicts what may happen. Maps are developed to give a visual presentation of the potential danger of fire in each region.
•   Dead Fuel Moisture - Fire potential is heavily dependent on dead fuel moisture ie litter which has not experienced rain in recent days.
•   Live Fuel Moisture/Greenness Maps - Live fuels also play a major part in the potential of fire. Vegetative "Greenness" determines fire spread. The greener the vegetation, the lower the fire potential.
•   Drought Map - There are several maps that depict drought as determined by measuring soil moisture.
•   Atmospheric Stability Maps - The stability term is derived from the temperature difference at two atmosphere levels. The moisture term is derived from the dew point depression at a single atmosphere level. This Haines Index has been shown to be correlated with large fire growth on initiating and existing fires where surface winds do not dominate fire behaviour.
•   Some may consider the important response to fire is in the emergency planning once fire has broken out. Evacuation and the use of emergency services may feature in such responses. This is a legitimate approach and challenges the thrust of the question.

Assessment may conclude that prediction is a vital tool in fighting wildfire, though it is not a complete science as there are so many variables at work.

AO1 = 4, AO2 = 5

Q8.

AO1 − Knowledge and understanding of the impacts of a recent wildfire event. Knowledge and understanding of people's lived experience of the place. Knowledge and understanding of the effects of the impacts of a recent wildfire event on people's lived experience of the place.

AO2 − Application of knowledge and understanding to evaluate the impacts of a recent wildfire event and the effect of these on the lived experience of the people in the place under investigation.

Level 3 (7−9 marks)
AO1 − Demonstrates detailed knowledge and understanding of concepts, processes, interactions and change. These underpin the response throughout.
AO2 − Applies knowledge and understanding appropriately with detail. Connections and relationships between different aspects of study are fully developed with complete relevance. Analysis and evaluation is detailed and well supported with appropriate evidence.

Level 2 (4−6 marks)
AO1 − Demonstrates clear knowledge and understanding of concepts, processes, interactions and change. These are mostly relevant though there may be some minor inaccuracy.
AO2 − Applies clear knowledge and understanding appropriately. Connections and relationships between different aspects of study are evident with some relevance. Analysis and evaluation is evident and supported with clear and appropriate evidence.

Level 1 (1−3 marks)
AO1 − Demonstrates basic knowledge and understanding of concepts, processes, interactions and change. This offers limited relevance with inaccuracy.
AO2 − Applies limited knowledge and understanding. Connections and relationships between different aspects of study are basic with limited relevance. Analysis and evaluation is basic and supported with limited appropriate evidence.

Notes for answers

AO1
- Nature of wildfires. Impacts: primary / secondary, environmental, social, economic, political.
- Impacts as evidenced by a recent wildfire event.
- The ways in which students' own lives and those of others are affected by continuity and change in the nature of place.
- People's lived experience of the place where they live in the past and the present.

AO2
Responses are expected to show an understanding of the impact of a recent wildfire event. There should be a clear recognition of the learning from the Changing Places unit in assessing the impact of events such as wildfires and how they affect the peoples' lived experience of the place. Reciting learned case study material does not constitute AO2. It is the integration of the place study ideas and concepts which allow access to AO2.
Assessment will depend on the recent wildfire event named in the response.
- Assessment − For example, wild fires such as that in Fort McMurray, Alberta, Canada in May-June 2016, may feature in responses. There should be clear application of knowledge which shows how the impacts left their mark on the people and place. Although no deaths or serious injuries were linked directly to the fire,

other economic, environmental and social impacts were considerable. This caused significant distress and emotional damage to people. Whole communities were forced to evacuate along roads clogged with traffic surrounded by fires on either side. Over 80,000 people were forced to leave. Many have still to return. The physical destruction and absence of people has transformed the character of the place. With the almost complete destruction of some communities and their own personal experiences of the wildfire the peoples' sense of that place will have been greatly affected.

- Assessment − Some neighbourhoods escaped almost unscathed, whilst in others all buildings were completely destroyed. Even following reconstruction this will significantly alter the character, and therefore sense of place.
- Assessment − Many sources also reflect on the considerable mental health impacts for both victims and relief workers, with many suggesting this needs to be considered as part of the response to future possible events.
- Assessment − some responses may consider the perception of Fort McMurray and how this was represented in the media.
- Overall Assessment will reflect on the degree to which different aspects of peoples' lived experience of place was affected by the wildfire. It is the level and clarity of assessment in the response that will allow it through to Level 2.

AO1 = 4, AO2 = 5
[Total 9 marks]

Q9.

AO1 – Knowledge and understanding of the cause of storms and wildfire.

AO2 – Application of knowledge and understanding to assess the changing threat of wildfire and storms on people and place.

Notes for answers
AO1
- The nature of tropical storms and their underlying causes. Forms of storm hazard: high winds, storm surges, coastal flooding, river flooding and landslides.
- Spatial distribution, magnitude, frequency, regularity, predictability of hazard events.
- Impacts: primary/secondary, environmental, social, economic, political. Short- and long-term responses: risk management designed to reduce the impacts of the hazard through preparedness, mitigation, prevention and adaptation.
- Impacts and human responses as evidenced by two recent tropical storms in contrasting areas of the world.
- Nature of wildfires. Conditions favouring intense wild fires: vegetation type, fuel characteristics, climate and recent weather and fire behaviour.
- Causes of fires: natural and human agency.
- Impacts: primary/secondary, environmental, social, economic, political. Short- and long-term responses; risk management designed to reduce the impacts of the hazard through preparedness, mitigation, prevention and adaptation.
- Impact and human responses as evidenced by a recent wild fire event.
- Characteristic human responses – fatalism, prediction, adjustment/adaptation, mitigation, management, risk sharing – and their relationship to hazard incidence.

AO2
- Response should acknowledge that wildfire is a natural phenomenon which is often exacerbated by human activity. It is the direct and indirect human activities, which may have contributed to create favourable conditions for the spread of wildfire. The question is whether these activities are contributing to an increase in the phenomena.
- Some may reference data to support argument e.g. research suggests that large wildfires in the United States burn more than twice the area they did in 1970, and

the average wildfire season is 78 days longer. Responses which argue in favour of the question may suggest that either human activity has contributed to this or that changes in local / global climate may have exacerbated the issues.

- Research shows that climatic factors, especially earlier snowmelt due to warming in the spring and summer, have led to hot, dry conditions that boost this increase in fire activity in some areas. For much of the US West for example, projections show that an average annual 1 degree Celsius temperature increase would increase the median burned area per year as much as 600 percent in some types of forests.
- Land use and firefighting tactics can play a role in lowering or raising risks and this human activity may feature in some responses.
- Wildfire risk depends on a number of factors, including temperature, soil moisture, and the presence of trees, shrubs, and other potential fuel. All these factors have strong direct or indirect ties to wildfire.
- Once a fire starts (data suggests that more than 80 percent of US wildfires are caused by people) temperatures and dry conditions can help them spread and make them harder to put out. Warmer, drier conditions also contribute to the spread of the mountain pine beetle and other insects that can weaken or kill trees, building up the fuels in a forest.
- Others may consider changes in agriculture practice as causal factors. The recent wildfires in Amazonia have a direct causal link to slash burn techniques combined with a drier summer period.
- With hurricanes, there is similar evidence in support of the question. Sea temperature is generally accepted as being a major contributor to the increasing intensity and arguably frequency of events.
- Although scientists are uncertain whether climatic factors will lead to an increase in the number of hurricanes, candidates can reasonably argue that warmer ocean temperatures and higher sea levels are expected to intensify their impacts.
- Recent analyses suggests that the strongest hurricanes occurring in the North Atlantic have increased in intensity over the past two to three decades. For the United States for example, models project up to a 90% increase in the frequency of Category 4 and 5 hurricanes.
- Hurricanes are subject to two main climate influences: warmer sea surface temperatures could intensify tropical storm wind speeds, potentially delivering more damage if they make landfall. Scientists expect up to an 11% increase in average maximum wind speed, with more occurrences of the most intense storms. Warmer seas also mean more precipitation. Rainfall rates during these storms are projected to increase by about 20 percent and, as Hurricane Harvey showed in 2017, this can sometimes be the more destructive impact.
- Some may consider local factors such as coastal geology as well as spring high tides, which when combined with low pressure systems, can exacerbate impacts. There is some evidence that heightened sea levels intensified the impact of Hurricane Sandy, which caused an estimated $65 billion in damages in New York, New Jersey, and Connecticut in 2012. Much of this damage was related to coastal flooding.
- The notion of increased hurricane frequency is debatable.
- Globally, about 70 to 110 tropical storms form each year, with about 40 to 60 reaching hurricane strength. But records show large year-to-year changes in the number and intensity of these storms.
- Frequency and intensity vary from basin to basin. In the North Atlantic Basin, the long-term (1966–2009) average number of tropical storms is about 11 annually, with about six becoming hurricanes. More recently (2000–2013), the average is about 16 tropical storms per year, including about eight hurricanes.

Credit any other valid assessment.

Level 4 (16–20 marks)
- Detailed evaluative conclusion that is rational and firmly based on knowledge and

understanding which is applied to the context of the question. Interpretations are comprehensive, sound and coherent (AO2).
- Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout (AO2).
- Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).
- Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout (AO1).
- Full and accurate knowledge and understanding of key concepts, processes and interactions and change throughout (AO1).
- Detailed awareness of scale and temporal change which is well integrated where appropriate (AO1).

Level 3 (11–15 marks)
- Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question (AO2).
- Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding (AO2).
- Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).
- Generally clear and relevant knowledge and understanding of place(s) and environments (AO1).
- Generally clear and accurate knowledge and understanding of key concepts and processes (AO1).
- Generally clear awareness of scale and temporal change which is integrated where appropriate (AO1).

Level 2 (6–10 marks)
- Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question (AO2).
- Some partially relevant analysis and evaluation in the application of knowledge and understanding (AO2).
- Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).
- Some relevant knowledge and understanding of place(s) and environments which is partially relevant (AO1).
- Some knowledge and understanding of key concepts, processes and interactions and change (AO1).
- Some awareness of scale and temporal change which is sometimes integrated where appropriate. There may be a few inaccuracies (AO1).

Level 1 (1–5 marks)
- Very limited and/or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question (AO2).
- Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence (AO2).
- Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).
- Very limited relevant knowledge and understanding of place(s) and environments (AO1).
- Isolated knowledge and understanding of key concepts and processes (AO1).
- Very limited awareness of scale and temporal change which is rarely integrated where appropriate. There may be a number of inaccuracies (AO1).

Level 0 (0 marks)
- Nothing worthy of credit.

Q10.

AO1 − Knowledge and understanding of a named multi hazardous environment. Aware of the factors which have contributed to generate the hazards.

AO2 − Application of knowledge and understanding to identify and assess the causes of hazards in multi hazardous environments.

Notes for answers

The direction of the response largely depends upon the chosen case study of the multi hazardous environment as well as the hazards contained within that location.

AO1

• Case study of a multi-hazardous environment beyond the UK to illustrate and analyse the nature of the hazards and the social, economic and environmental risks presented, and how human qualities and responses such as resilience, adaptation, mitigation and management contribute to its continuing human occupation.

• Nature, forms and potential impacts of natural hazards (geophysical, atmospheric and hydrological). Hazard perception and its economic and cultural determinants. Characteristic human responses − fatalism, prediction, adjustment / adaptation, mitigation, management, risk sharing − and their relationship to hazard incidence, intensity, magnitude, distribution and level of development. The Park model of human response to hazards. The Hazard Management Cycle.

AO2

• Los Angeles, USA is considered to be a multi hazard environment though other case studies may feature. Expect to reference to places such as Haiti, The Philippines and Japan.

• In Los Angeles, it would be difficult to argue to that all hazards are generated by human activity. As an advanced economy, the city has the economic advantage of being able to manage many of its hazards, though not all are easily manageable or predictable. Lying close to the San Andreas Fault (with a number of other minor faults in the area such as the Northridge / Santa Barbara Fault), the area is prone to significant seismic activity. It is not possible to argue that this root cause is human activity in this regard. However, managing the impact of the hazard is a significant preoccupation and human endeavour in the area. Some may argue that hazard is made more or less dangerous by the extent of management of the hazard. This is a legitimate approach. There are other hazards though, which are certainly the product of human activity.

• Wildfire periodically affects the Los Angeles basin. Whilst the main cause is the flammability of vegetation as a result of drought and the dry vegetation, human factors certainly exacerbate the issue. Human activity is known to start wildfire and building in areas prone to wildfire inevitably adds to the problem. Expect to see reference to recent events in support e.g. June '17 four major brush fires struck LA, affecting over 6000 acres of land. It was sparked by a car crash in the San Jacinto mountains. However, it was also fuelled by high temperatures, low humidity and wind gusts of up to 35 mph. This shows that in this case, it was a combination of human and physical factors which created this hazard.

Whatever the approach, there should be more than one hazard considered and a clear overarching response to the question.

Level 4 (16−20 marks)

- Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question. Interpretations are comprehensive, sound and coherent (AO2).
- Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout (AO2).
- Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).
- Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout (AO1).
- Full and accurate knowledge and understanding of key concepts, processes and interactions and change throughout (AO1).

Level 3 (11−15 marks)
- Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question. Interpretations are generally clear and support the response in most aspects (AO2).
- Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding (AO2).
- Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).
- Generally clear and relevant knowledge and understanding of place(s) and environments (AO1).
- Generally clear and accurate knowledge and understanding of key concepts, processes and interactions and change (AO1).

Level 2 (6−10 marks)
- Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question (AO2). Interpretations are partial but do support the response in places.
- Some partially relevant analysis and evaluation in the application of knowledge and understanding (AO2).
- Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).
- Some relevant knowledge and understanding of place(s) and environments which is partially relevant (AO1).
- Some knowledge and understanding of key concepts, processes and interactions and change. There may be a few inaccuracies (AO1).

Level 1 (1−5 marks)
- Very limited and / or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question (AO2). Interpretation is basic.
- Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence (AO2).
- Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2).
- Very limited relevant knowledge and understanding of place(s) and environments (AO1).
- Isolated knowledge and understanding of key concepts, processes and interactions and change. There may be a number of inaccuracies (AO1).

Level 0 (0 marks)
- Nothing worthy of credit.

AO1 = 10, AO2 = 10
[Total 20 marks]

Q11.

AO1 – Knowledge and understanding of the cause of wildfire. Knowledge and understanding strategies to manage wildfire. Knowledge and understanding of the role of global governance in taking global action.

AO2 – Application of knowledge and understanding assess potential for global governance structures to reduce incidence of wildfire.

Mark scheme

Level 3 (7–9 marks)
AO1 – Demonstrates detailed knowledge and understanding of concepts, processes, interactions and change. These underpin the response throughout.

AO2 – Applies knowledge and understanding appropriately with detail. Connections and relationships between different aspects of study are fully developed with complete relevance. Evaluation is detailed and well supported with appropriate evidence.

Level 2 (4–6 marks)
AO1 – Demonstrates clear knowledge and understanding of concepts, processes, interactions and change. These are mostly relevant though there may be some minor inaccuracy.

AO2 – Applies clear knowledge and understanding appropriately. Connections and relationships between different aspects of study are evident with some relevance. Evaluation is evident and supported with clear and appropriate evidence.

Level 1 (1–3 marks)
AO1 – Demonstrates basic knowledge and understanding of concepts, processes, interactions and change. This offers limited relevance with inaccuracy.

AO2 – Applies limited knowledge and understanding. Connections and relationships between different aspects of study are basic with limited relevance. Evaluation is basic and supported with limited appropriate evidence.

Notes for answers
AO1
•	Nature of wildfires. Conditions favouring intense wildfires: vegetation type, fuel characteristics, climate and recent weather and fire behaviour. Causes of fires: natural and human agency. Short and long-term responses; risk management designed to reduce the impacts of the hazard through preparedness, mitigation, prevention and adaptation. Impact and human responses as evidenced by a recent wildfire event.
•	The emergence and developing role of norms, laws and institutions in regulating and reproducing global systems.
•	Interactions between the local, regional, national, international and global scales.

AO2
•	Wildfire is an increasingly severe problem affecting large areas of the planet. Areas not normally associated with wildfire are also becoming affected. The Siberian wildfires of 2019 are a case in point.
•	Some may also point to places which are prone to wildfire, which appear to be experiencing even more extreme events. The Australian wildfires of 2019–20 are likely to feature in this regard.
•	Responses are likely to suggest that climate change is an increasing threat to natural vegetation in such areas and therefore global systems can play their part in reducing the risk and impact of such events. Expect to see responses focus on

global agreements to reduce greenhouse gas emissions.
- Equally though there should be some acknowledgement that reducing the impact of wildfire requires local action and national policy. For instance, in the case of the Siberian wildfire, there was an active policy in 2019 that only areas likely to affect local populations should be tackled by firefighters. This meant that millions of acres of wildfire were effectively left to burn themselves out.
- In the case of the Australian wildfires, logging practices are considered to have contributed significantly to the widespread nature of the fires. This type of deforestation leaves behind huge amount of dead vegetation which becomes tinder in the dry conditions.
- Some responses may consider the local actions of planners and managers to predict wildfire and take actions on the ground to reduce incidence.
- Global governance is therefore crucial in tackling the spread and incidence of wildfire but so too is local action and national policy on fire prevention and mitigation strategies.

Credit any valid assessment.

AO1 = 4, AO2 = 5
[Total 9 marks]

Q12.

<u>Point marked</u>
Allow 1 mark for each valid point with additional marks for developed points.

<u>Notes for answers</u>
- Sufficient amounts of dry vegetation, with low moisture levels (1) for example following a drought or at the end of a dry season (1d).
- Semi-arid climates (1), with enough precipitation for vegetation to grow followed by extended dry periods (1d). Dry winds (1) to control the direction and speed of propagation of the fire (1d).
- Low levels of atmospheric humidity (1).
- Intense fires can heat the soil to temperatures over 1000ºC which can further aid the spread and longevity of the fire (1).

The notes for answers are not exhaustive. Credit any valid points.

AO1 = 3
[Total 3 marks]

Examiner reports

Q1.

This proved to be a straightforward question for students, with almost all correctly shading lozenge C.

Q4.

The mean mark for this question was 3.12 with only 39% accessing Level 2. Many failed to spot the inverse relationship evidenced in most years i.e. that when precipitation levels are above the mean, areas affected by wildfire are generally relatively low and vice versa. Data was often lifted to support trends but not used in a more sophisticated way to analyse the relationships. Some responses simply dealt with the lines separately and failed to see the relationship. Others drifted into the cause of forest fire or the reasons why rain reduces incidence. This constitutes AO2 as it is application of knowledge. No credit was available for this approach.

Q6.

It was surprising to see so many fail to identify the potential management issues of scale, potential pollution, minimising habitat loss, minimising risk to life, addressing evacuation issues, managing potential respiratory issues and so on. Some students tried to bring in their own case study which was credited at AO1, but could have been used more effectively to identify the management issues in this resource. There were many issues which could be reasonably derived from the resource and too many over complicated their responses. Application of knowledge in this case did not require a lengthy recital of a learned case study. The application required knowledge of the management issues in a wildfire to be applied to this resource.

Q7.

Students generally found this to be an accessible question. Many had prepared well and wrote confidently about what prediction actually means in the context of wildfire. They also contrasted this with other approaches around planning, preparation and mitigation. Case studies also complimented the responses with content related to Australia (Black Friday) and Canada (Fort McMurray).

Q8.

This question required students to make a link across specification units. It is clear that many students were well prepared for this. It is important to remind centres that every series there will be one question which crosses specification units at both AS and A Level. In this case, the link was to Changing Places. The concept (from that unit) of people's lived experience of place, was integrated into this hazards question. It is an Ofqual requirement that such questions are set every series so that students can demonstrate understanding and learning from across the breadth of study.

There was a pleasing range and variety in case studies used. Most candidates went beyond a simple list of impacts of their chosen fire and did at least begin to assess how these affected the lives of the people affected. This was shown by 69% of responses reaching Level 2 or higher. However, only 18% reached Level 3, so there was scope for further, or more detailed, links to be made. Those that did not focus on how the fires impacted on people's lives remained in Level 1.

Q10.

Some students self-penalised here by referring to more than one multi hazard environment. This did not allow such responses to get to the required depth in such a relatively short amount of writing time. In considering the question, the best responses understood that human activity is always the underlying the cause. The fact is that an event only becomes a hazard when it affects people in places. It is the human occupation of the place which creates the hazard. However equally others argued that the underlying cause is often physical, for example referencing tectonic processes in the development of seismic hazards. Either approach was credited. Some students ran out of time and lost marks simply through poor time management.