Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Level 3 GCE

Time 2 hours 15 minutes

Paper reference **9GE0/03**

Geography

Advanced
PAPER 3

You must have:
Resource Booklet (enclosed)
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Any **calculations** must show **all** stages of **working out** and a **clear answer**.

Information

- The total mark for this paper is 70.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- Calculators may be used.

Advice

- You are advised to spend the first 15 minutes reading the Resource Booklet.
- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over

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Answer ALL questions. Write your answers in the spaces provided.

You must use the Resource Booklet provided and your own knowledge and understanding from across your course of study to answer the questions in this paper.

1 Explain the differences between hazards and disasters.

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(Total for Question 1 = 4 marks)

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2 (a) Table 1 below shows data for the environmental vulnerability of two different groups of states, the 47 Small Island Developing States (SIDS) and the other 187 countries.

A Chi-squared test was used to establish whether there was a statistically significant difference in the environmental vulnerability of the SIDS and the Other States.

The null hypothesis tested was: There is no significant association between the level of environmental vulnerability of a state and its status as a Small Island Developing State.

The alternative hypothesis was: There is a significant association between the level of environmental vulnerability of a state and its status as a Small Island Developing State.

The data for both O (the observed values) and E (the expected values) are shown below in Table 1.

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Level of vulnerability/ resilience	SIDS O	SIDS E	SIDS $(O–E)^2 / E$	Other States O	Other States E	Other States $(O–E)^2 / E$	TOTAL Column 3 + Column 6
Extremely vulnerable	17	6.8	15.3	17	27.2	3.8	19.1
Highly vulnerable	17	12.3	1.8	44	48.7	0.5	2.3
Vulnerable	9	16.5	3.4	73	65.5	0.8	4.2
At risk	3	8.6	3.6	40	34.4		
Resilient	1	2.8	1.2	13	11.2	0.3	1.5
TOTAL	47	47	25.3	187	187		$\chi^2 =$

Table 1

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(i) Calculate the total for $(O–E)^2 / E$ for the 'At risk' category for Other States (Column 6).

Answer to one decimal place.

You must show your working.

(2)

$(O–E)^2 / E =$ .....

(ii) Calculate the value of χ^2, using the formula below.

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

Answer to one decimal place.

You must show your working.

(2)

$\chi^2 =$ .....

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(b) The result shows that the null hypothesis should be rejected and the alternative hypothesis (shown below) accepted at the 99% confidence level.

Alternative hypothesis

There is a significant association between the level of environmental vulnerability of a state and its status as a Small Island Developing State.

Explain how this result might be used to guide further research into the environmental vulnerability of SIDS.

(4)

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(Total for Question 2 = 8 marks)

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3 Study Figure 1 and Figure 2 in Section A of the Resource Booklet.

Analyse the similarities and differences in the locations and sizes of SIDS.

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(Total for Question 3 = 8 marks)

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4 Study Figure 3, Figure 4a and Figure 4b in Section A of the Resource Booklet.

Analyse the social consequences for countries with small land areas and small populations.

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(Total for Question 4 = 8 marks)

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5 Study the resources in Section B of the Resource Booklet.

Evaluate the view that geographical isolation has been the main barrier to the sustainable development of SIDS.

(18)

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(Total for Question 5 = 18 marks)

You should have read the whole of the Resource Booklet, including Section C, before attempting this question.

6 Evaluate the view that without significant global action to address climate change, the future of SIDS is one of decline.

(24)

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(Total for Question 6 = 24 marks)

TOTAL FOR PAPER = 70 MARKS

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Geography

Advanced
PAPER 3

Resource Booklet

Do not return this Booklet with the question paper.

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SECTION A

The characteristics of Small Island Developing States (SIDS)

In 1992 the United Nations (UN) identified a group of maritime countries that faced particular challenges. Known since as 'Small Island Developing States' (SIDS), not all of these countries are recognised states, nor are they all actually islands (e.g. Belize). An estimated 65 million people live in SIDS, less than 1% of the global population.

There is no official list of members. Most UN led SIDS projects include well over 50 countries, of which 38 are full members of the UN (Figure 1), with others being territories that still belong to the old colonial powers (e.g. the British Virgin Islands). They are usually divided into three geographical groups, Caribbean (C), Pacific (P) and the countries in the Atlantic, Indian Ocean, Mediterranean and South China Sea (AIMS) (Figure 1).

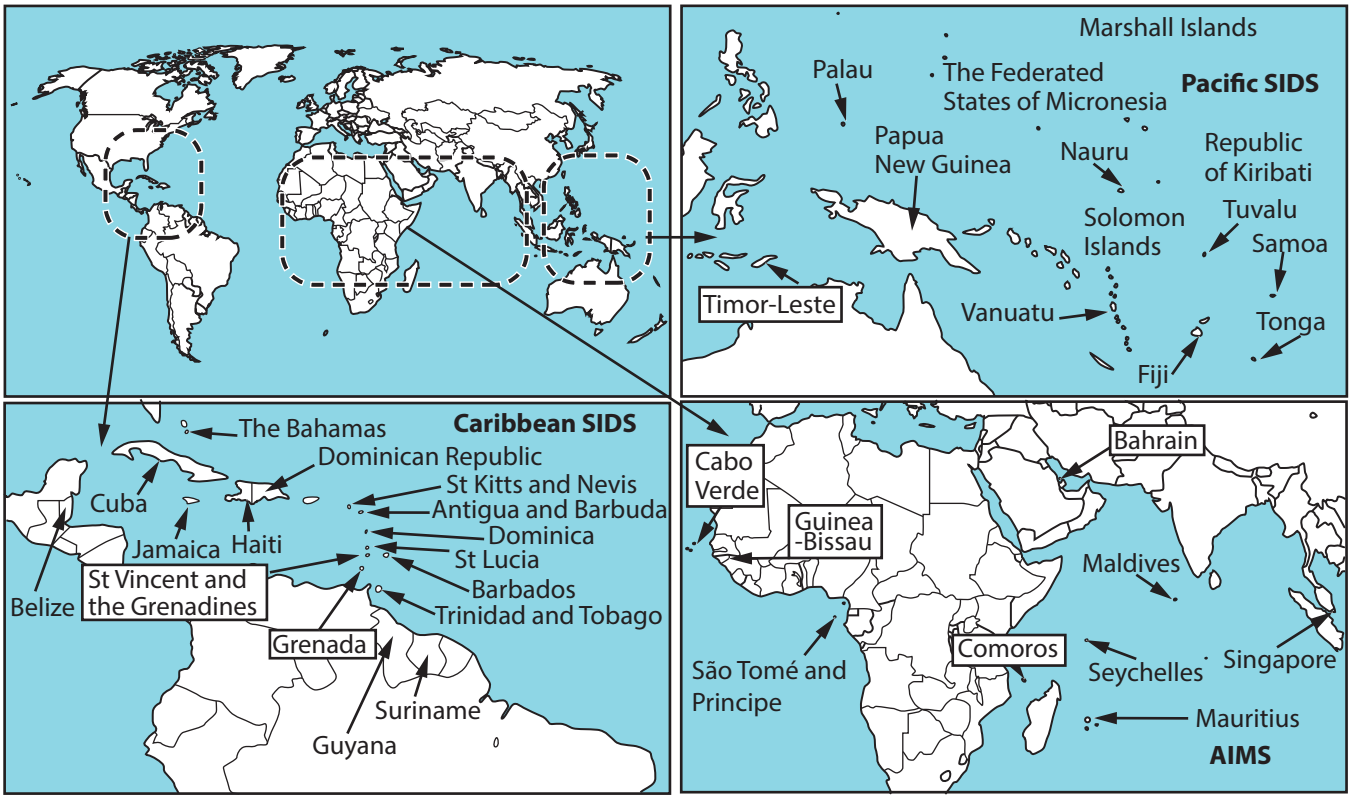


Figure 1

The 38 SIDS that are full members of the United Nations

The SIDS group varies in landscape, population, resources, and levels of development.

The challenges faced by these states are considerable and often include:

- Small populations, although some are also growing fast, placing pressure on resources
- Small land areas with limited resources as a result, especially water, energy and food
- Enormous marine resources within the 200 nautical miles covered by a country's offshore Exclusive Economic Zone (EEZ), with 30% of the world's oceans and seas controlled by SIDS, but a limited capacity to manage these zones
- Remoteness; many SIDS, especially in the Pacific, are remote and dispersed – Kiribati is made up of 33 coral atolls spread over 3.5 million km^2 – an area larger than India
- High levels of out migration including more educated people (brain drain) and a reliance on remittances (money sent home by expatriates)
- Limited and sometimes problematic connectivity to the global economy; this affects tourism and leads to a dependency on imports
- The number of natural hazards, both tectonic and hydro-meteorological threats
- Climate change, rising sea levels, ocean acidification and loss of biodiversity, e.g. loss of coral reefs

C = Caribbean P = Pacific AIMS = Atlantic, Indian Ocean, Mediterranean and South China Sea	**Land area (km^2)**	**Agricultural area (km^2)**	**Islands**	**EEZ (km^2)**	**Population (2015)**	**Population density (per km^2)**	**Remoteness rank (1–186) 1 is most remote**
Bahamas (C)	10,010	150	1,897	629,293	371,960	37	144
Haiti (C)	27,750	18,526	40	117,376	11,263,079	405	68
Jamaica (C)	10,830	4,490	47	263,283	2,768,941	256	90
Cabo Verde (AIMS)	4,030	750	36	796,840	494,401	123	80
Comoros (AIMS)	1,861	1,550	21	164,691	717,503	386	18
Maldives (AIMS)	300	70	900	916,189	338,442	1,128	46
Fiji (P)	18,270	4,276	463	1,281,122	874,472	48	7
Nauru (P)	20	4	1	308,502	10,032	502	12
Samoa (P)	2,830	350	13	131,812	188,889	67	4
Vanuatu (P)	12,190	1,870	156	827,891	247,262	20	3

Figure 2

Geographical data for 10 selected SIDS

The island of Malé in the Maldives

The highest point in the Maldives is just 5 metres above sea level. In 2009 the Maldivian President drew attention to the country's perilous future by holding a cabinet meeting under water. However, the Maldives remains heavily dependent on international tourism.

A Jamaican resort and golf course

The Caribbean SIDS are a favourite destination for American tourists visiting by cruise ship and by plane on all-inclusive holidays. The environmental impact is negative, especially for marine environments, above all coral reefs and mangrove forests.

A volcanic island in Vanuatu

Most Pacific SIDS are made up of highly dispersed islands and atolls. Many of these are uninhabited and most are too remote to attract tourists. In common with many other SIDS, their experience of colonialism was almost wholly negative.

Haiti after the 2010 earthquake

Haiti is the poorest country in the Americas with a complex and often unhappy relationship with the USA. Twelve years after the 2010 earthquake and despite over US$13bn in aid it has still not recovered. It is regarded as a 'fragile' state by some analysts, by others as a victim of neo-colonialism.

Figure 3

The varied landscapes of SIDS

Average emigration rates of SIDS are far above those of other developing countries and high-income countries. This is true for low-skilled workers (15.6%, i.e. about 13 percentage points above the average level of other developing countries) and for college graduates (50.8%, i.e. about 37 percentage points above the average level of other developing countries).

SIDS with the largest brain drain rates of college graduates are Guyana (89.2%), Jamaica (84.7%), Grenada (84.3%), Saint Vincent and the Grenadines (81.9%), Haiti (79.0%), Tonga (75.6%) and Samoa (73.4%). Other SIDS have no higher education facilities whatsoever.

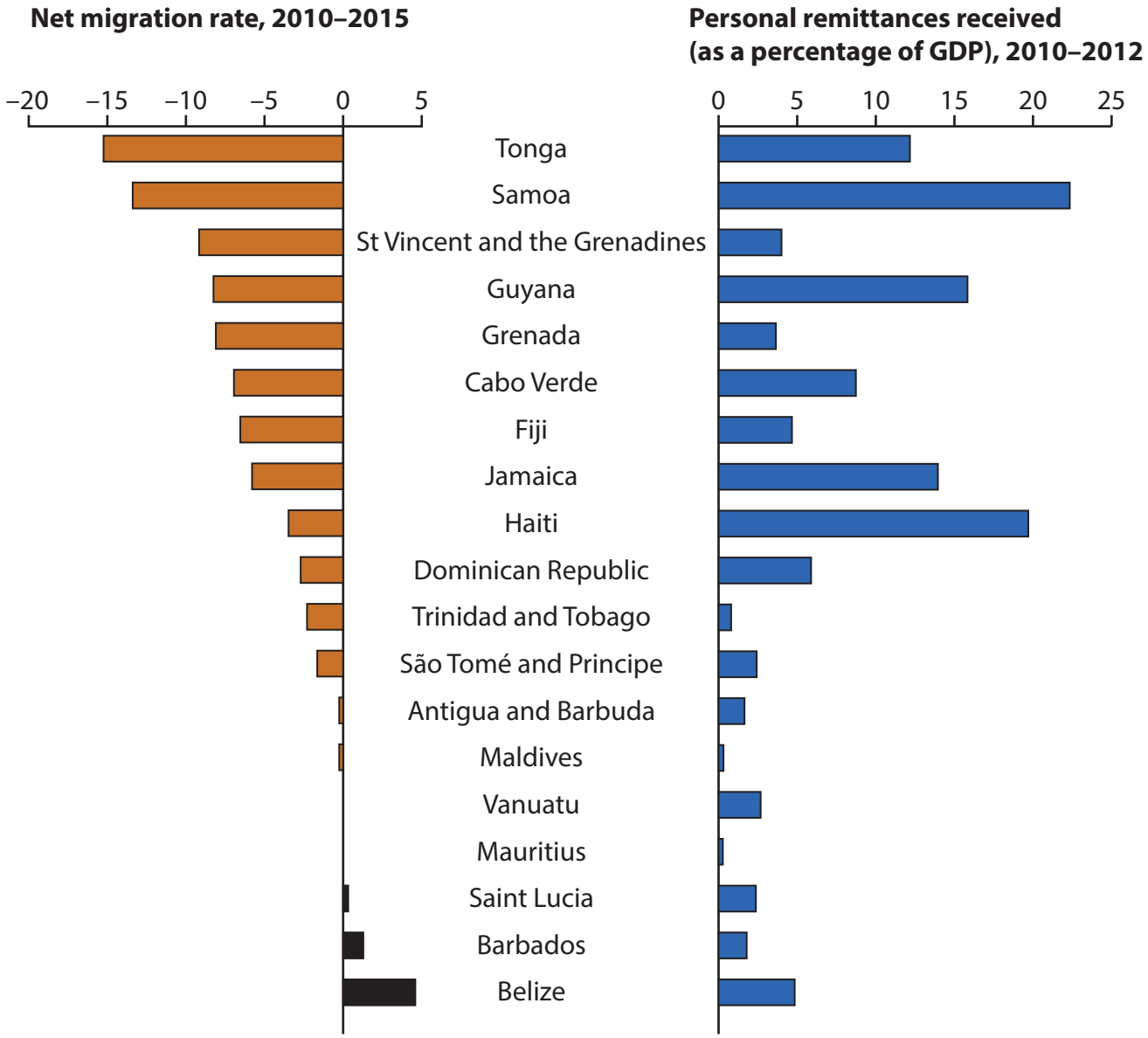


Figure 4a

Migration rates and remittances for selected SIDS

Small Island Developing State	Region	Human Development Index rank highest to lowest
Barbados	C	58
Mauritius	AIMS	66
Trinidad and Tobago	C	67
Grenada	C	74
Antigua and Barbuda	C	78
Saint Lucia	C	86
Dominican Republic	C	88
Fiji	P	93
Maldives	AIMS	95
Saint Vincent and the Grenadines	C	97
Jamaica	C	101
Tonga	P	104
Samoa	P	111
Guyana	C	122
Cabo Verde	AIMS	126
São Tomé and Principe	AIMS	135
Vanuatu	P	140
Timor-Leste	P	141
Papua New Guinea	P	155
Haiti	C	170

Figure 4b

Human Development Index for 20 selected SIDS, 2020

SECTION B

The vulnerabilities of SIDS

The small size of most SIDS (17 of them are smaller than 1,000 km^2) is an obstacle to economic development because there is limited scope to develop economies of scale, which in turn prevents the development of a manufacturing sector.

Most SIDS have narrowly based economies that depend on just a few products and resources due to their small domestic markets, distance from international markets, high production costs and limited competitiveness.

This leads to an almost total dependence on imported products (including fossil fuels but also food), partially paid for by exporting any available raw materials and allowing the development of tourism, often foreign owned and controlled.

SIDS are, on average, more severely indebted than other developing countries. In 2014, the SIDS' debt to GDP ratios stood at, on average, 57% as compared to 44% in all other middle- and low-income countries.

Their vulnerability also makes them unattractive for foreign investors, so some SIDS governments have offered financial services with low tax rates. In 2015 the European Union identified 30 countries as tax havens; more than half were SIDS.

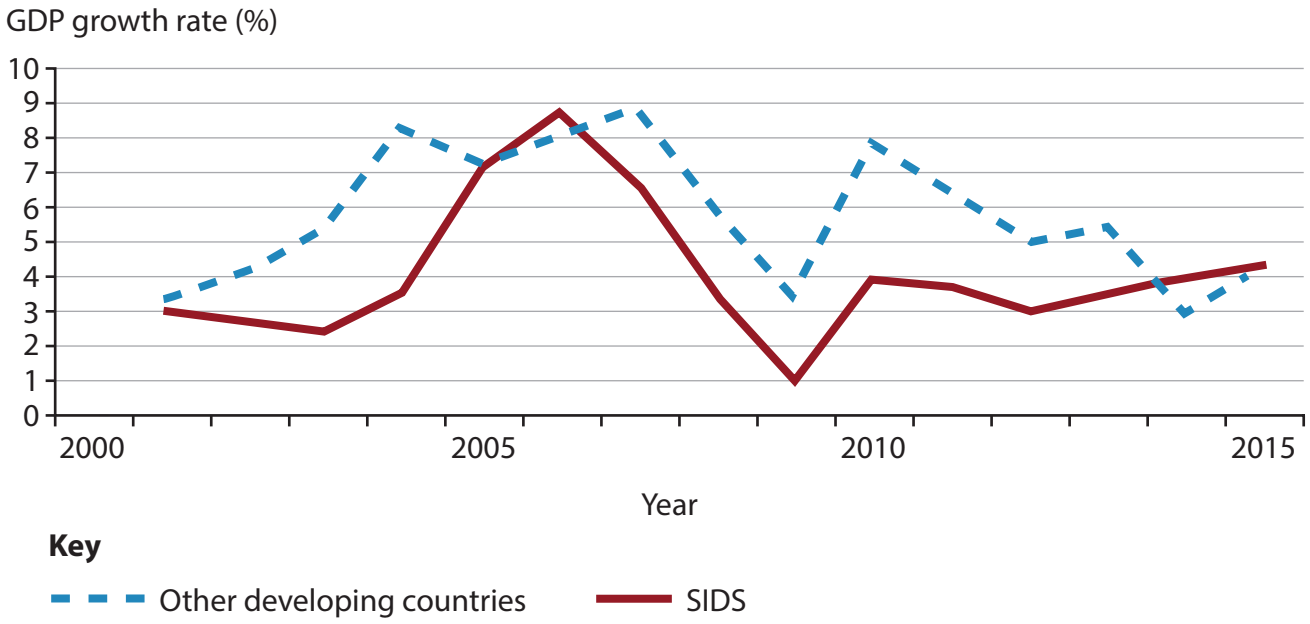


Figure 5

Economic growth rates for SIDS and other developing countries, 2000–2015

Ninety per cent of SIDS are in the tropics (Figure 6). Many are affected by extreme weather events, especially tropical cyclones (typhoons and hurricanes). Climate variability, droughts and flooding are also features of their climate. The El Niño Southern Oscillation events also produce dramatic changes in rainfall, rising sea levels and other weather-related phenomena.

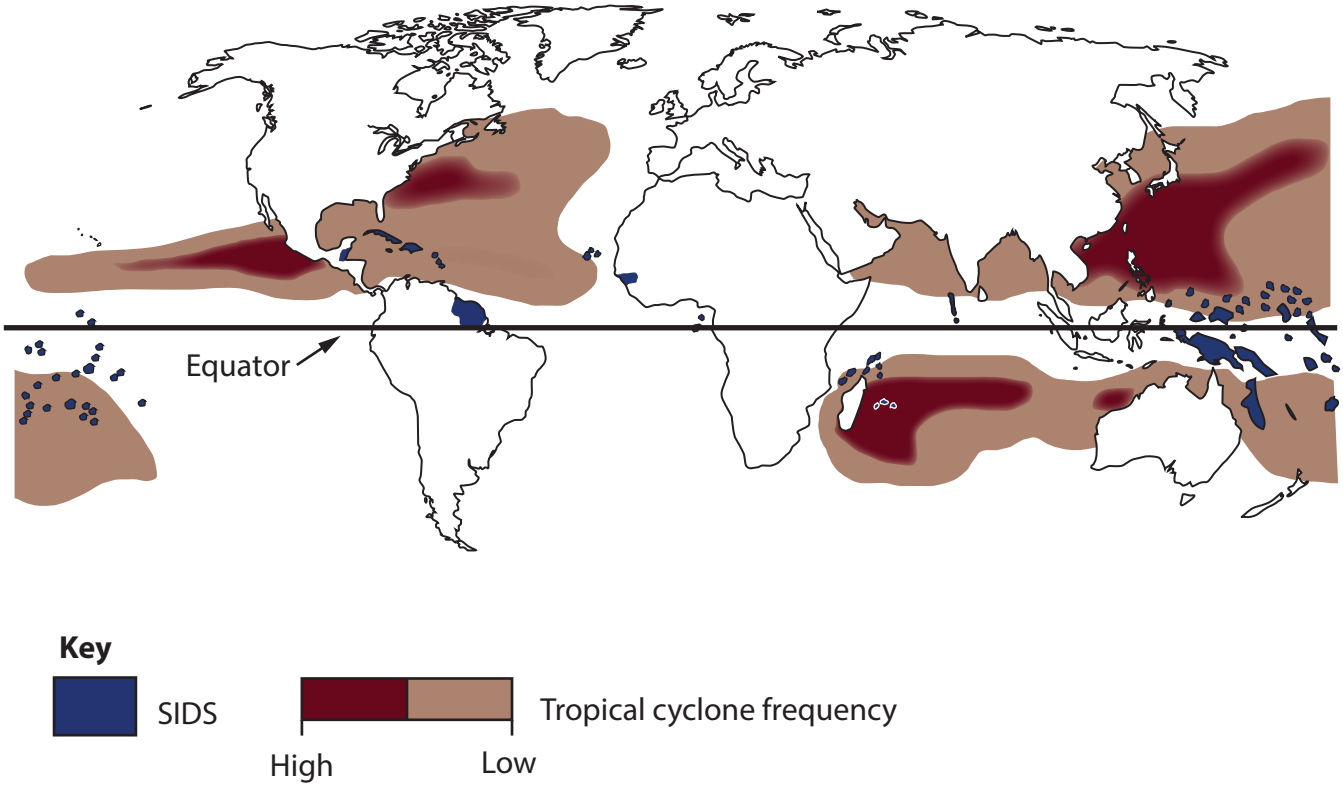


Figure 6

The frequency of tropical cyclones, 1990–2015

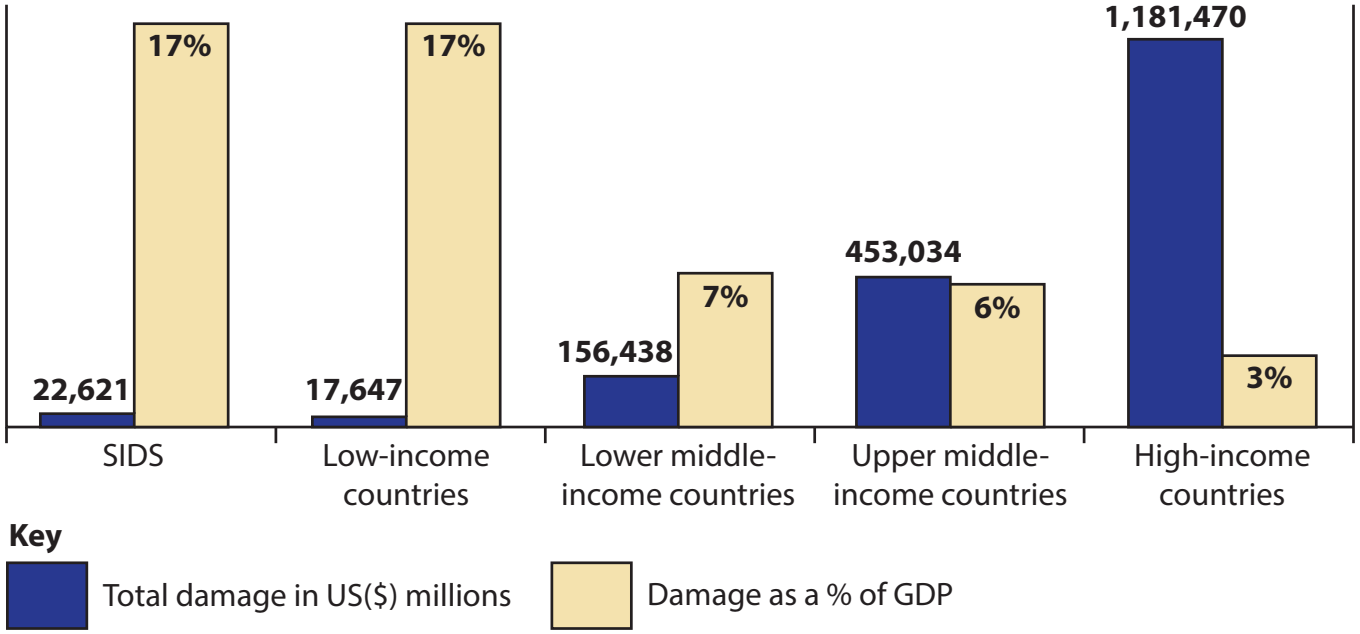


Figure 7

The costs of tectonic and hydro-meteorological hazards for selected groups of countries, 2000–2020

SIDS were especially exposed to the 2020/21 collapse in international travel (Figure 8). Low-income countries experienced, on average, a 1% fall in their GDPs but SIDS suffered a 4.7% fall.

Country	Tourism as % of GDP, 2019	Change (%) in GDP, 2019–2021	Government debt as % of GDP, 2019
Maldives (AIMS)	66	–17	48
Seychelles (AIMS)	66	–16	198
St Kitts and Nevis (C)	63	–16	20
Grenada (C)	56	–14	59
Vanuatu (P)	48	–12	46
Cabo Verde (AIMS)	46	–12	89
St Vincent and the Grenadines (C)	46	–12	38
Antigua and Barbuda (C)	45	–11	34
St Lucia (C)	43	–11	35
Palau (P)	43	–11	31
Bahamas (C)	40	–10	194
Fiji (P)	40	–10	17

Figure 8

The impact of a decline in tourism on the 12 most affected SIDS

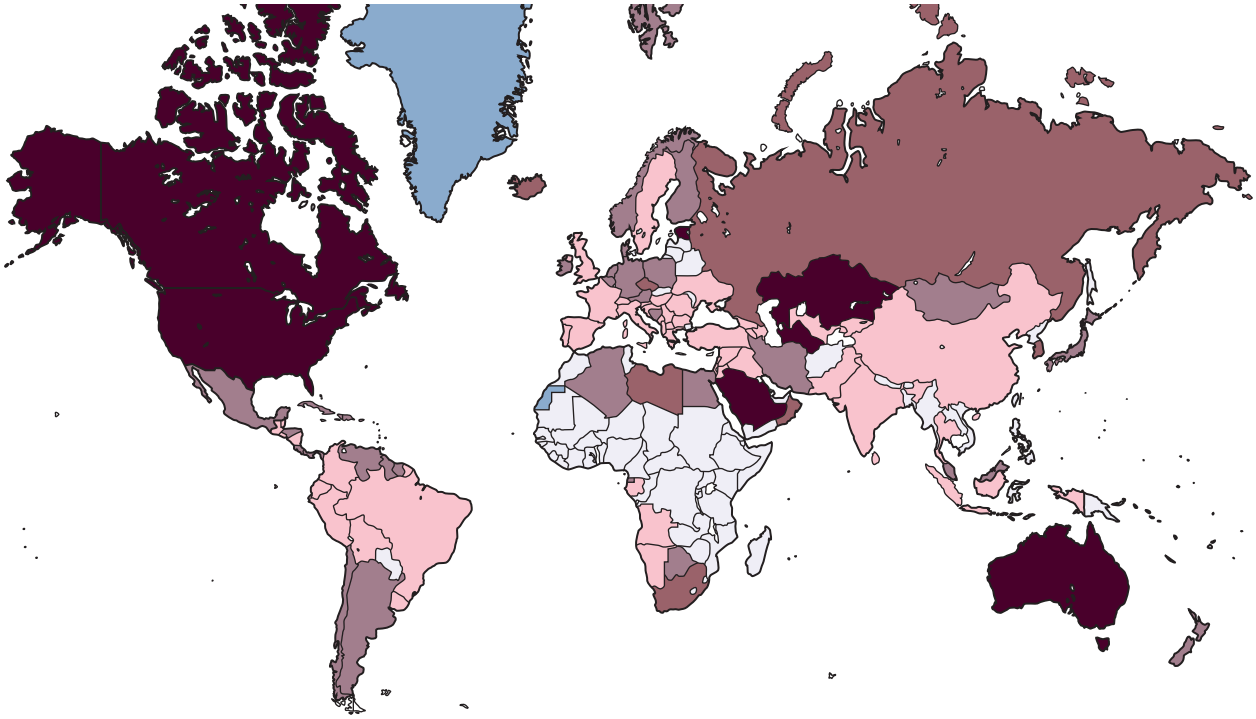
SECTION C

The challenges to come

Almost all SIDS depend heavily on fossil fuels for power production, the desalination of water, but also transport which includes tourists, the main source of foreign exchange, and the exploitation of marine resources.

Some SIDS, for example Bahrain and Trinidad and Tobago, produce and export fossil fuels but most consume very little because of their level of development and their weak infrastructure. The vast majority have carbon emissions levels <5t per annum per capita.

Although SIDS are among the least responsible of all nations for climate change (Figure 9), they are likely to suffer strongly from its negative effects, and in some cases could even become uninhabitable.



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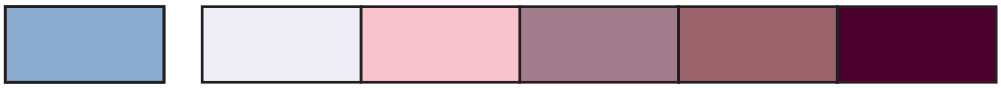
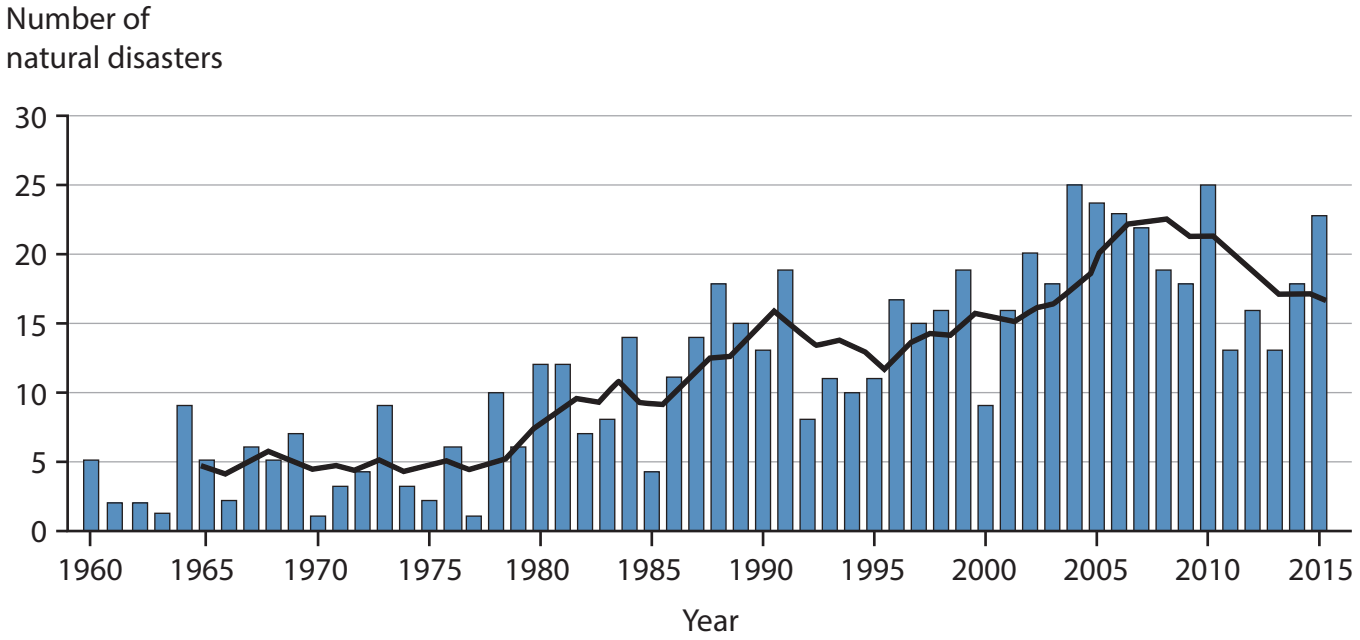


No data | 0 to 5 | 5.1 to 10 | 10.1 to 15 | 15.1 to 20 | 20.1 to >50

Figure 9

Carbon emissions (tonnes per capita) by country, 2017

Rising carbon emissions are widely blamed for an increase in natural disasters, especially over the past 50 years as the enhanced greenhouse effect has accelerated (Figure 10). The cost of these disasters is counted in billions of US$, each year. For this reason, SIDS were among the first to call for putting climate change on the agenda of the UN Security Council.



Key

Number of natural disasters in SIDS

Five-year moving average

Figure 10

The number of natural disasters impacting SIDS, 1960–2015

Sea level rise is by no means the only future challenge for the SIDS. However, for some, it is the most pressing. Some experts argue that we are already past the point of no return with positive feedback loops and tipping points reached, making accelerating global warming unavoidable.

Since the 1970s the UN has organised a series of global conferences to address the challenges of climate change (Figure 11). In 1992 SIDS campaigned successfully in the UN for a recognition of their special needs in confronting climate change.

The UN has funded the US$60 million Pacific Adaptation to Climate Change (PACC) project involving 13 Pacific SIDS. The aim is to enhance the capacity of the participating countries to adapt to climate change in key development sectors such as coastal zone management, food security and water.

The UN is also funding the US$35 million five-year Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP) project. It aims to reduce the growth rate of greenhouse gas emissions through the promotion of renewable energy. In Fiji, for example, 200 solar home systems have been installed in various remote locations and four schools have been equipped with biogas digesters.

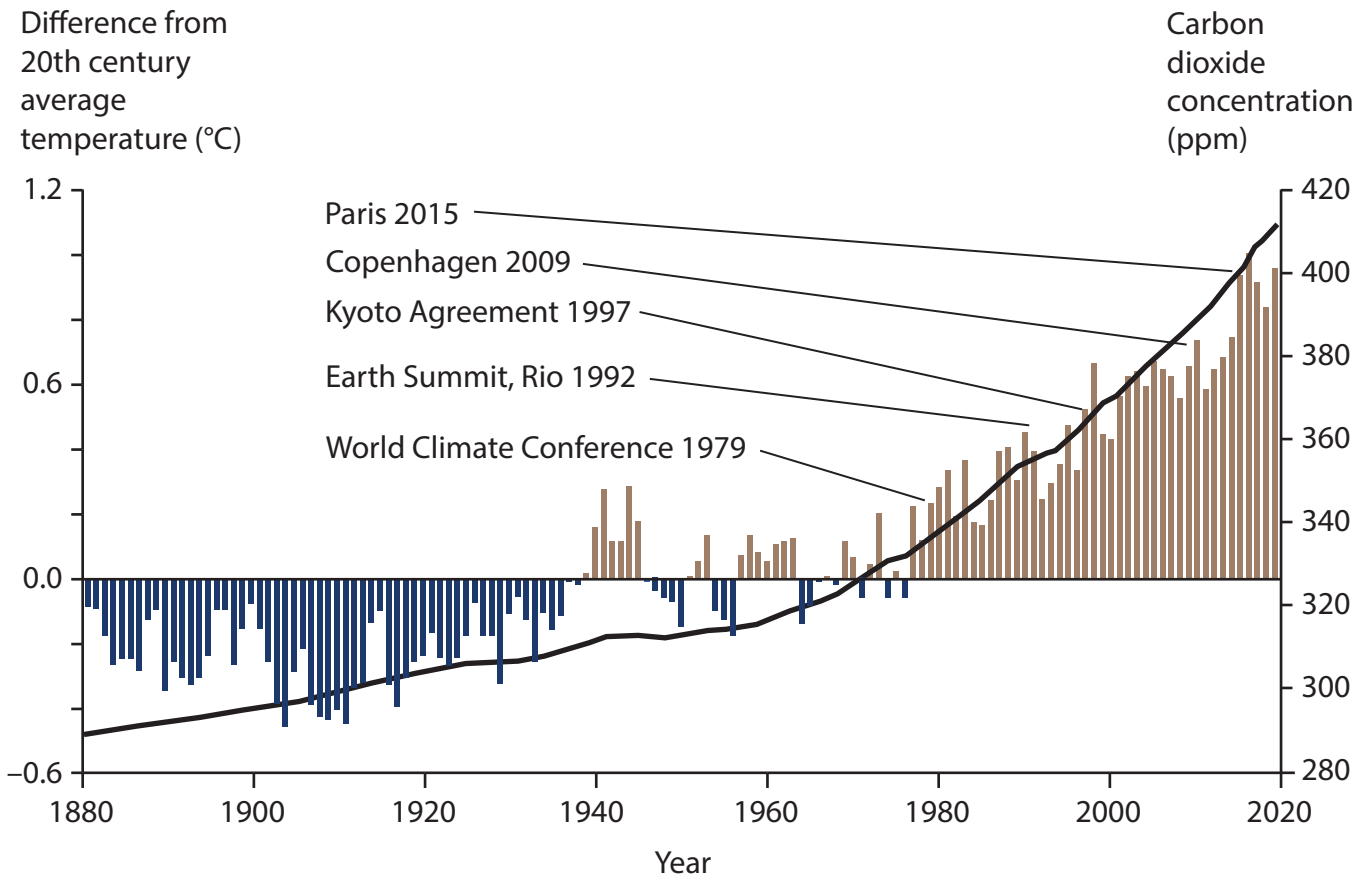


Figure 11

Changing global temperatures and CO_2 concentrations with selected global environmental conferences

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Acknowledgements
Pearson Education Ltd gratefully acknowledges all following sources used in preparation of this paper:
Figure 1 https://www.researchgate.net/figure/Map-of-small-island-developing-states-SIDS-geographical-distribution-of-SIDS_fig1_332076404
Figure 3 (Source: ©Shahee Ilyas/Alamy Stock Photo & © AlissaEverett/Alamy Stock Photo & © incamerastock/Alamy Stock Photo & ©Tommy E Trenchard/Alamy Stock Photo)
Figure 4 Sourced from https://sustainabledevelopment.un.org/content/documents/5104333SID_%20 2014_%20wallchart.pdf
Figure 5 https://www.oecd-ilibrary.org/sites/9789264287648-6-en/index.html?itemId=/content/component/9789264287648-6-en
Figure 6 & Figure 11 https://www.oecd-ilibrary.org/docserver/9789264266919-en.pdf?expires=1603970744&id=id&accname=guest&checksum=E7F38A7FD2795D6A187524BF03A36D59
Figure 7 https://oecdobserver.org/news/fullstory.php/aid/6082/Small_islands,_big_threats.html
Figure 8 Sourced from https://www.un.org/development/desa/dpad/publication/un-desa-policy-brief-64-the-covid-19-pandemic-puts-small-island-developing-economies-in-dire-straits/
Figure 9 https://unctad.org/news/impact-covid-19-tourism-small-island-developing-states