

**MARK SCHEME for the May/June 2009 question paper  
for the guidance of teachers**

**5014 ENVIRONMENTAL MANAGEMENT**

5014/01

Paper 1, maximum raw mark 120

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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- 1 (a) (i) plot for Australia (28%) with correct shading, bar width and length and appropriately positioned [1]
- (ii) USA, France and Japan [1]
- (iii) Northern Hemisphere / Developed world [1]
- (b) export revenues  
can be used to develop the country / industry / infrastructure etc.  
potential to develop nuclear power (with sufficient finance)  
employment  
revenues would raise living standards  
avp [3]
- (c) exhaustion of fossil fuels  
cleaner than fossil fuels / concern over air pollution from fossil fuels  
does not produce greenhouse gases / fossil fuels produce greenhouse gases  
concern about global warming  
does not produce acid rain / fossil fuels cause acid rain  
wish to diversify sources of energy / not rely on potentially volatile areas of supply of gas / oil  
rapid industrial growth in some countries  
only need to import small quantities of uranium  
advantages compared with other alternative energy sources  
avp [4]
- 2 (a) (i) larvae hatch into worms inside them [1]
- (ii) the carrier lives in water [1]
- (iii) still / shallow water / water present all year [1]
- (b) install toilets / sanitation / treat human waste before it enters the water  
do not enter the water  
wear impermeable cover on feet and legs  
control / clear snails  
drain water bodies containing snails  
introduce fish predators to eat snails  
avp [3]
- (c) weakness  
anaemia  
kidney / bladder infections  
death  
reduced resistance to other diseases  
\* reduced ability to work  
\* reduced agricultural output / food supply  
avp  
*at least one \* point for max.* [4]

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- 3 (a) (i)** 22 [1]
- (ii) summer [1]
- (iii) cool [1]
- (iv) Tundra [1]
- (v) 60–75° [1]
- (vi) too cold / short summer  
short / two / three months growing season  
soil / ground often frozen / frost / snow covered for long periods  
strong winds  
low precipitation  
avp [2]
- (b)** still using CFCs  
in (old) refrigerators, air conditioning systems  
still using halons  
in fire extinguishers  
especially in countries which lack alternatives  
gases remain in atmosphere for long periods  
elaborated upon  
avp [3]
- 4 (a) (i)** terracing / land cut into steps  
flat areas  
across slope / parallel to contours  
narrow(er) on steep(er) slopes / wide(r) on gentle(r) slopes  
bunds / low walls at the edges
- (ii)** steep slope  
(terrace) encourages / increases infiltration  
decreases run-off  
conserves soil / soil not washed down the slope (terrace or bund)  
contour ploughing so water sinks into furrows  
plough ridges prevent water from flowing downhill  
easier farming practices  
*minimum 1 mark for each part* [5]
- (b) (i)** method of storage of water described  
channels / pipes bring water from storage  
sprinkler / other suitable method on terrace (to max 2)  
care needed not to over water / not to induce run off  
wells dug to tap into underground water supplies  
avp

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- (ii) dry land farming  
widely spaced plants, no competition for small amount of water available  
mulch / straw etc. on surface, protects from evaporation  
protects from wind erosion  
grass strips between crops, reduce soil erosion explained  
GM drought resistant crops  
Plant seeds / crops after the rain  
Avp

*Allow well developed points to 2 as above. Max. 3 each part.* [5]

5 (a) (i) Line drawn linking the dots on the graph [1]

(ii) 118 years [1]

(iii) 12 years [1]

- (iv) growth expected to slow down,  
especially after 2028,  
expected to take 20 years to increase by one billion (from 14 and 15 years previously),  
growth still a lot faster than past growth up to 1959.

Basic point = 1 mark Elaboration based on graph use = 2nd mark [2]

(b) (i) No mark for the country name, but an acceptable name will be essential for full marks from the other two parts of the question.

- (ii) Reference to methods for achieving aims – general features of population policies include education and family planning advice, ready availability of contraceptives, permissible use of sterilisation and abortion, statutory limits on numbers of children with penalties, financial incentives, and promoting social change such as later marriages.

Policies can be everything from strong and enforced, as in China, to weak and voluntary, as in the many African and Middle Eastern countries.

Up to three marks for general answers not applied well, or at all, to a named country  
Up to four marks for answers which demonstrably refer to the named country

- (iii) Basic comment on success = 1 mark. Reserve one mark for this part, which can only be gained in the context of an accepted named country.

Up to three marks available for this part for reference to advantages and/or disadvantages of the population policy and comments, which are clearly relevant to the named country. [5]

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- (c) Possible reasons:  
poverty / lack of funds,  
other more pressing needs e.g. recovering from natural / human disasters,  
against social traditions / religious beliefs,  
political corruption and inefficiency,  
oil rich / wealthy so no need to worry about population growth,  
population growth considered necessary for international status / against rivals

Two reasons @1 mark

[2]

- (d) *Fertiliser*;  
improves soil fertility,  
replaces nutrients taken out of soil by previous crops,  
organic fertilisers maintain soil texture / structure  
... or similar points

disadvantage – possible choices include cost, over-use of chemical fertilisers leading to leaks into surface water courses / underground stores, unfavourable environmental consequences.

*Pesticides*;

destroys insects etc. which eat / damage crops,  
kills weeds which would compete for nutrients / water with the crops  
... or similar

disadvantage – chemical pesticides also kill other useful insects, destroy habitats for birds and wildlife, has knock-on effects in natural food chains

*Irrigation water*;

water allows plant growth when rainfall is too little or too unreliable,  
allows use of otherwise favourable conditions for crops (such as fertile soils, sunshine),  
increases size of crops / fruit and the amount produced  
... or similar

disadvantage – overuse leading to salinisation, costs (of all types) of building infrastructure for supply (especially large dams), competing use for a scarce natural resource

*Machinery*;

sowing/spraying etc. done more evenly / in a more controlled way, more can be done more quickly while weather conditions are favourable, large scale / more efficient operations possible,  
larger areas brought into cultivation by new technology  
... or similar

disadvantage – heavy machinery compresses soil / damages soil structure, encourages loss of wildlife habitats through clearance of vegetation for easy use of machinery, high costs to small farmers in developing countries

In general, it will be two marks for explanation and one for disadvantage, because only one disadvantage is required; however, good / full elaboration about the one disadvantage can receive two marks when the explanation is not worth two marks. Keep one mark for each part.

2 @3 marks = 6 marks

[3][3]

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- (e) (i) Revolution = change / big difference  
Green = referring to plants / output from farming  
(as opposed to earlier Industrial Revolution)
- Decent understanding shown for the mark [1]
- (ii) new seeds  
more plants per hectare because they can be planted closer together,  
yield 3.5 tonnes per hectare more / more than three times greater,  
shorter growing season allows more chance of growing a second crop
- Two reasons such as these, clearly stated [2]
- (iii) Old seeds are tall plants, more prone to falling over in poor weather,  
suggested weather conditions named such as strong winds or heavy rain
- Growing season for new seeds is one month shorter,  
less time for adverse weather to affect them / harvested one month earlier before  
weather changes
- Reason clearly stated = 1 mark  
Elaborated upon including references to weather = 1 mark [2]
- (iv) More intensive farming so more inputs are needed / more capital is needed,  
for buying fertilisers and pesticides in order to obtain promised high yields,  
other costs may be for irrigation water and machinery,  
seeds are bought instead of using own seeds from previous year
- Once farmers achieve higher output they have the income to keep on investing,  
small farmers are more likely to get into debt if not successful,  
larger farmers buy more land for increased output and profits
- Points made along these lines, with something from both parts for full marks [3]
- (f) (i) More rapid rate of growth before 1999 than after,  
elaborated upon by evidence / use of data e.g. size of increase in three years up to 1999  
took five years to achieve after 1999,  
some speeding up of annual increases from 2003 without ever matching the big increase  
from 1997 to 1998
- General point made for one mark  
Further detail for the second mark. [2]
- (ii) Correct plot of pie graph percentages = 2 marks  
One obvious error or just minor errors = 1 mark
- Countries for sectors clearly identified = 1 mark [3]
- (iii) Bar graph showed annual increases in plantings but without a big change / take-off,  
pie graph shows that they were only planted in 21 countries in 2005,  
more than half was in the USA which is the home of the GM companies,  
four countries account for over 90% of plantings (or similar use of the %s)
- Three points made along these lines. [3]

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- (g) (i) Lack of GM crops in Europe is due to public resistance to them (logical or otherwise). There may also be an environmental element; although this is not explicitly tied to Europe in the comments, but it is reasonable to infer that it will apply more in developed countries in Europe.

Lack of GM crops in Africa is stated as being for economic reasons - not worth selling in poor countries where prices have to be low for use.

Different reasons clearly stated = 2 marks

One sided, or differences stated more weakly = 1 mark [2]

- (ii) Expect?

No – no evidence from the 10 years to 2005 that a big increase will happen, reasons for not using them such as people's views and poverty do not change quickly

Yes – have great advantages for increased food output, even from areas where conditions are difficult at present, world will need more food for its growing population, crops are being used more for bio-fuels as well, so that resistance to use might diminish or be overcome

- (iii) Should there be? This is personal candidate opinion.

If no, it is most likely to reflect environmental concerns.

If yes, the needs to increase output for feeding people and economic development for developing countries are likely reasons.

Mark as one as the two answers overlap (even though they are kept separate).

Statement of views with limited or generalised explanation = 1 or 2 marks

Clear statement of views, with meaningful explanatory support = 3 or 4 marks [4]

- 6 (a) From map, such as undersea or offshore in province of Ica / Pisco, or from the introduction, 150 km south east of Lima [1]

- (b) (i) From introduction, up to 150 km away in Lima  
From map, allow any distance between 150 and 190 km [1]

- (ii) 70% – 80% damage to buildings in places close to epicentre such as Pisco and Imperial, also all the other signs of severe earthquake shocks like people trapped and infrastructure failure are present, whereas 150 km away in Lima there is mention of buildings shaking, but without any reference to them falling down

Points made along these lines which indicate decline in severity away from the epicentre. [3]

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(c) (i) Plots accurate = 1 mark  
 Attempted use of the same shading types = 1 mark [2]

(ii) use of percentages from graph to show examples of increased damage with earthquake strength e.g. mud 5% to 50% to 100%, same for the other two types of buildings materials although percentages increases are less dramatic, they only reach 33% and 20% for a scale 9 earthquake compared with 100%, comment about the great importance of building materials / inability of mud bricks to survive a strong earthquake shock.

Three points made along these lines, with one mark reserved for each of earthquake strength and building materials. [3]

(iii) 80% of the adobe brick houses in Imperial had fallen, which is between the percentages given for Richter scale 7 and 9 where the strength of the Peru earthquake lies, Pisco is located closer to the epicentre where damage at 70% appears to be less, but churches and hotels in Pisco, less likely to be made of mud bricks, fell down due to proximity to the epicentre, earthquakes of 7 and above cause significant damage as the collapse of the church in Ica shows, overall summary that damage reasonably close to what can be expected from an earthquake of that strength

Three points made along these lines. [3]

(d) (i) Earthquake zones are found in long belts / relatively narrow zones, Follow the lines of the plate boundaries, one runs north south up the west of North and South America, another goes east-west across Asia and into Europe / Mediterranean, a third follows the western side of the Pacific Ocean linking island chains along coasts / islands / borders between continents and seas, Most of Africa / Australia outside major earthquake zones.

Accept both comments about the world pattern and more detail about alignment / course followed by the earthquake zones, including named references to places

4 points @ 1 mark [4]

(ii) Earthquake zones follow the plate boundaries (especially destructive / converging margins), earth movements are much less frequent and strong away from plate boundaries, where earthquakes depend more on the presence of faults

Clear answer showing understanding = 2 marks  
 Some idea about the importance of plate boundaries = 1 mark [2]



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- (iii) Maximum 3 marks for general answers about plate movement, causing friction which leads to shaking of the ground and earthquakes. Likewise for answers which name a country (e.g. Peru) without including supporting detail specific to that country.

For more than three marks, specific information about the country needs to be included, most easily done by identifying the type of plate boundary, typically destructive, but conservative if USA / California is chosen and by naming the plates. Likely country choices are Pakistan (convergence of Indian and Eurasian plates) or Peru (convergence of Nazca and South American plates).

4 @ 1 mark [4]

- (e) (i) Reasons include the cost of doing this, people and companies used to living, working and doing business there, they have made big investments there, all the transport infrastructure focuses on Tehran, anyway, people living in earthquake zones take the view that it will never happen to them, logistics of moving so many people, another approach is that damage from any future earthquake can be limited by good building techniques and emergency planning.

Point like these, made in a convincing way for the question for three marks. [3]

- (ii) Constructing buildings that are designed to be earthquake-proof; details of how this is done

Planning for an emergency by having trained emergency teams; equipment ready for use / trained rescuers and sniffer dogs

Educating people about what to do and what not to do in an earthquake

Land use zoning - keeping industrial zones with oil refineries etc. separate from housing zones

One mark for each of three clearly different strategies = 3 marks

Final mark available for rewarding quality of statements, or any elaboration = 1 mark [4]

- (f) (i) World population growth is greater in developing than developed countries due to high birth rates / rates of natural increase, a lower percentage of the population are urban than in developed countries, rural to urban migration is widespread and will continue for many more years, cities in developing countries are full of young people of child-bearing ages, problems such as housing are not under control.

Three points made along these lines. [3]

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- (ii) Many of the world's big cities are coastal to benefit from port access, flat land, wet climate etc.,  
cities on the coast are equally at risk from stormy weather / tsunamis,  
and from rising sea levels associated with climatic change,  
some evidence that severe storms and coastal flooding are increasing,  
although more defences / precautions are likely in developed world cities, economic costs of a disaster are much larger

Three points made along these lines. [3]

- (iii) Likely to stop increasing?  
Precautions and preparations exist for all natural disasters – flood defences, warning systems, trained emergency teams, well constructed buildings,  
in theory, there is no reason why the death toll should increase, which is the main message from the UN,  
in practice, authorities in big cities in developing countries are struggling to cope with existing problems,  
constant growth means no breathing space to plan ahead to stop worse future problems,  
adverse effects of natural disasters increase as the proportion of self-help housing increases and moves onto less suitable building sites,  
overall conclusion may not be the optimistic one hoped for by the UN.

View supported by one or two points / ideas, but limited overall = 1 or 2 marks  
Better understanding shown by making a range of points = 3 or 4 marks [4]