

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
Cambridge Ordinary Level

**MARK SCHEME for the October/November 2014 series**

## **5014 ENVIRONMENTAL MANAGEMENT**

**5014/11**

Paper 1, maximum raw mark 120

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### Section A

- 1 (a) (i) SE Asia, Australia and the Pacific; [1]
- (ii) South and Central America; [1]
- (iii) North America; [1]
- (b) any relevant advantage, such as:  
 export earnings from sales of oil;  
 revenue used to improve infrastructure/build schools/hospitals/transport routes, etc.;  
 fuel/petrol/diesel for transport;  
 power source for industry;  
 raw material for industry/petrochemicals; [3]
- (c) (i) *hot deserts*:  
 EITHER solar;  
 because cloudless skies/abundant sunshine/maximum insolation;  
 OR wind;  
 because trade winds are strong/constant/few obstacles to wind movement;
- (ii) *equatorial climate regions*:  
 EITHER HEP;  
 because abundant rain/many rivers;  
 OR biomass/biofuels;  
 because abundance of trees/vegetation; [4]
- 2 (a) (i) any figure between 24° and 30° inclusive; [1]
- (ii) Africa larger/more than twice as large;  
 both either side of the Equator/in the tropics; [2]
- (iii) it needs hot/warm temperatures; [1]

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- (b) (i) mosquitoes lay eggs/breed in (stagnant) water; [1]
- (ii) any relevant idea, such as:
- advantages for people: new land for farming/industry/building/any sensible use;  
straight routes can be built;
- disadvantages for the environment:  
changes the ecosystem;  
loses habitats;  
death of wildlife;  
may reduce rainfall locally/less moisture for plants;
- At least one advantage needed for maximum marks.* [3]
- (iii) stops insect being able to bite/contact the person;  
stops mosquito becoming infected by biting an infected person;  
the mosquitoes (mainly) bite between dusk and dawn;  
insecticide kills the insects;  
relatively cheap method; [2]
- 3 (a) (i) plots at 335 in 1980, 355 in 1990 AND 380 in 2000 all joined by a line and to 2010; [1]
- (ii) 45; [1]
- (iii) 2090–2094; [1]
- (iv) start of the food chain for fish; [1]
- (b) (i) sulfur dioxide;  
nitrogen oxides;  
released when fossil fuels are burnt;  
coal-fired power stations/industry/vehicle exhausts;  
mix with water/rain droplets; [4]
- (ii) kills fish in rivers/lakes;  
acid soils have poor yields; [2]
- 4 (a) (i) bar for 2008 at 650 000; [1]
- (ii) much faster 2008–2012;  
600 000 in 40 years/68–08 but 450 000 in 4 years/08–12;\*  
15 000 per year 68–08 and 112 500 per year 08–12;\*\*
- Accept a tolerance on the figures of 15 000 either side.*  
*Accept a tolerance of 1000 either side.* [2]

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**(b)** any sensible suggestion, such as:

development of new industry;  
 people seek better paid jobs in city;  
 attracted by better social facilities/hospitals/schools etc.;  
 attracted by the entertainment facilities;  
 high birth rate because young migrants;  
 rural – urban migration;  
 immigrants settle in cities for work;

[3]

**(c)** any sensible suggestion, such as:

*no cars* – efficient/regular/cheap public transport;  
 legislation/penalties;

*energy* – renewable/solar/wind/used to make energy;  
 energy efficient homes;

*waste* – re-use/recycle/compost;

*water* – re-use waste water (for gardens etc.);  
 water saving appliances;  
 water meters;

[4]

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### Section B

- 5 (a) (i) letter order **E, D, C, B, A**;;
- All correct for two marks.  
Three correct for one mark.* [2]
- (ii) cyclone (**E**), drought (**D**) and flood (**B**);  
*All three and no others for one mark.* [1]
- (iii) hazard plus minimal detail;  
another hazard plus minimal detail;  
further detail;
- short-term events:*  
some only last a few minutes;  
most are over within hours or days;  
volcanoes and droughts can last longest, but often just months at most;
- long-term events:*  
possible for some to keep happening for several years, or keep repeating themselves;  
such as droughts (e.g. Sahel);  
and occasionally a volcano (e.g. on Montserrat);
- All three choices in the question are possible choices.* [3]
- (b) (i) X = destructive / convergent / converging  
Y = constructive / divergent / diverging [2]
- (ii) earthquakes occur at plate boundaries most tectonic activity being concentrated on plate boundaries / strongest / on top of plate boundary / epicentre;  
plates are moving;  
ref. ripple effect e.g. gets less moving away;  
an explanation about what is happening at destructive / conservative plate boundaries which leads to earthquake formation (e.g. friction / jolting); [3]
- (iii) 9.2 in 2004; [1]
- (iv) 2004–2007;
- includes top three years for earthquake numbers;  
10 in 2005, 7 in 2004 and 6 in 2006 / 27 of the total number of 43 in this 4-year period  
*Accept 63%.* [3]
- (v) suggests that the risk is (very) high / since at least one earthquake of magnitude 6.0 or more occurred in every year / since the average in the 10-year period was more than four strong earthquakes a year; [1]
- (vi) appropriate scale accurately marked on y-axis and y-axis labelled;
- All plots correct using bars for two marks.  
At least four correct plots for one mark.* [3]

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- (vii) *magnitude on Richter scale/earthquake strength:*  
referring to those of exceptional strength such as the 9.2 and 8.6, and/or by referring to the logarithmic nature of Richter scale;

*nature of the earthquake:*  
such as depth of the focus/length of ground shaking/frequency/strength of after-shocks;  
low lying coastal locations are also at risk from tsunamis;

*density of population:*  
highest in urban areas, many coastal areas;  
least in mountainous areas/none in the islands of Indonesia that are not inhabited;  
high density of high rise buildings increases risks to people living or visiting there;

*time of day earthquake occurred:*  
people more alert to what is happening during the day and more likely to be able to reach open spaces;

*human factors related to:*  
earthquake proofing of buildings;  
preparations in advance (with examples such as education/food supplies/shelters/medical facilities);  
differences between rich and poor neighbourhoods in terms of house structure also in terms of inferior locations of slums on hillsides where landslides are more likely to be triggered; [5]

- (c) (i) ocean location where sea-water heats up most/is warm (around the Equator);  
26/27 °C are needed for cyclone formation;

further details about how this triggers off rising air currents/leading to condensation of water vapour/formation of towering cumulonimbus clouds/formation of deep area of low pressure; [3]

- (ii) (end of summer season) when sea-water temperatures are at their highest/sea-water takes longer to heat up than land surfaces which means later than the time when the Sun is overhead; [1]

- (iii) Philippines is much closer to the source area/cyclones reach the Philippines first;

*further supporting use of the map such as:*  
location of the islands in relation to Japan and Hong Kong/or to tracks of cyclones which become more varied away from the source so that only some carry on towards Hong Kong or Japan whereas fewer miss the Philippines; [2]

- (d) (i) *evidence for heavy rainfall:*  
(severe) flooding (everywhere);  
flash floods;  
(most of the dead were) from drowning;  
houses swept into rivers and out to sea; [2]

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(ii) island nature of the country so very vulnerable to effects of cyclones/ cyclones happen (every year/ often/ regular) since one of the closest land areas to the source/ comment about the way the tracks of the cyclones bend northwards; [1]

(iii) *physical factors:*  
 wind strength was too weak;  
 to trigger mobile phone text messages;  
 great wind strength usually expected from typhoons hitting the Philippines;  
 but on this occasion it was flooding which did the damage;  
 massive amounts of rainwater must have fallen to make the rivers flood so badly showing the force of nature;  
 and perhaps its non-predictability (all natural hazard events are different);  
 Cagayan de Oro geographical factors of steep-sided mountains:  
 proximity to the sea;  
 deforested slopes\*;

*human factors:*

poverty meant slum houses /poor quality houses have been built;  
 lack of planning leads to building on sand banks in the middle of the river;  
 lack of money spent by government with examples such as to build shelters;  
 lack of flood defences;  
 despite previous warnings about a location between steep mountain sides and the sea;  
 lack of sending advance warnings;  
 not looking at advance weather information as would be the case in a more developed country;  
 lack of shelters;  
 deforested slopes\*;  
 \* *Credit once only.*

*or a mixture of the two:*

can never prevent large losses of life from natural hazards;  
 on the other hand, most developed countries are much better prepared than was the Philippines, especially considering that typhoons are regular events and there is a known time of the year when they will occur; [7]

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6 (a) (i) accurate plots for the three percentages;  
sectors correctly labelled; [2]

(ii) *lakes and rivers*

it is fresh / sweet water / does not need desalination;  
easily accessible surface supplies;  
widely available / widespread distribution;  
reliable source / large amounts of water can be readily available;

small amount comparatively;

most at risk from pollution / problems of dirty water supply;

surface waters used as places of disposal for human wastes / ref. water-borne diseases;

in some places natural contamination as well / other hazards (dangerous animals);

may destroy habitats supported by existence of lakes and rivers;

*Max. two marks.*

*glaciers*

it is fresh water / does not need desalination;

clean water supply;

more water released in summer when often it is most needed;

very extensive supply (biggest reservoir of fresh water on Earth) / supplies some of the world's major surface rivers (e.g. Ganges);

located in some of the most inaccessible places away from people;

winter freezing can cut off supplies to people;

store decreasing as mountain glaciers are melting;

*Max. two marks.*

[4]

(iii) *possible labels:*

rainwater to fill the aquifer;

arrows or labels to show water seeping underground through the aquifer;

aquifer labelled as permeable or porous rock either in key or on diagram;

impermeable (impervious) rock labelled in key or on diagram;

(limestone / sandstone / chalk / shale) in correct place in key or on diagram;

(granite / marble / basalt / slate) in correct place in key or on diagram;

additional labelling about impermeable acting as a water trap for the permeable;

labelling for folding of rocks / downfold / syncline;

[3]



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- (iv) contamination by terrestrial activities;  
ref. pollution control measures;
- running out of water in the aquifer, use > replenishment;  
ref. water conservation measures;
- collapse of ground;  
constructing buildings/dykes to take account/recharge of aquifer;
- saltwater intrusion in coastal sites;  
water conservation;
- overexploitation leads to less water elsewhere/other countries/ref. to conflict;  
political discourse/agreement;
- ref. engineering problems/cost of drilling/hard to extract;  
aid for money/expertise from outside;

*At least two marks needed from each of problems and from solutions.* [6]

- (b) (i) *high water stress:*  
Asia, because it has about 59–60% of total world population for 35–38% of world's water resources.  
Europe with 12–14% of population for 7–9% of water.

*low water stress:*  
South America, because it has only 5–6% of the world population for 25–27% of the world's water resources.  
Oceania, because it has only 1–2% of population for 5–6%.  
N and C America it has only 5–7% of population for 15%.

Asia/Europe and South America/Oceania/N and C America;  
use of supporting values for each;;

[3]

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(ii) *physical reasons:*

Africa hotter climates on average;  
more evaporation/less precipitation effectiveness;

continent has varied distribution of rainfall;  
large areas/many countries with a hot desert climate (e.g. Sahara desert);

e.g. Sahel noted for droughts;  
and unreliable precipitation from year to year;  
O.R.A. for Europe.

*human reasons:*

lower levels of economic development in Africa;  
developing countries less able to afford to manage their water resources by dam  
building/river control/water transfer/extraction from underground sources/desalination;

the biggest use of water in Africa is for agriculture;  
irrigation not needed as much in the cooler climates of Europe because economies are  
less agriculture dependent;  
O.R.A. for Europe.

*One mark for identifying a reason. Second mark for elaboration/development/  
exemplification.* [4]

(c) (i) sea-water is (forced) through (thousands) of fine membranes (to take out the salt). [1]

(ii) *suggestions include:*

a lot of energy is needed;  
so cost of fuel used since fuel costs in the oil producing countries of the Middle East will  
be lower;  
lower percentage of salt in sea-water in some locations;  
such as near river mouths, so that less energy is used for its separation;  
costs involved in importing technology/skilled personnel;  
developing countries may need to import technology/skilled personnel;  
economy of scale argument;

*One suggestion with some elaboration or two suggestions for two marks.* [2]

(iii) (very) expensive;

more expensive than obtaining fresh water from rivers and aquifers;  
cheapest desalination is 1 \$US compared with only 20 cents for rivers;  
desalination can cost as much as 5 \$US making it 25 times more expensive;  
comment stressing the massive size of the difference meaning that desalination will only  
be used where surface and groundwater supplies are inadequate; [2]

(iv) 38% circled or otherwise clearly identified; [1]

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- (v) they can afford it;  
lots of (valuable) oil;  
rich in energy sources;  
oil/gas;
- few/no alternative supplies/not water rich;  
as desert countries;
- population centres are close to the coast;  
sea-water is available;
- increasing demand for water;  
as rapid population growth/increased standard of living/urbanisation/tourism; [3]

- (vi) *increase unlikely:*  
can be justified by reference to massive costs;
- in an era of rising world energy costs/future energy crisis;  
likely to be increased only in countries where the water need is great and nothing cheaper is available;
- increase likely:*  
in response to increased world need for water;
- due to rising world populations;  
rising standards of living;  
leading to increased consumption of water per head;  
as (energy prices fall/alternative energy becomes available) will be more likely;  
more food output to feed world's people will need more irrigation water;  
desalination might be the only local/national alternative, despite its costs; [2]

- (d) (i) most likely answer is to refer to water-efficient methods of irrigation, such as:
- trickle drip irrigation;  
root zone/clay pot irrigation;  
the method described emphasising how the water is targeted at plant roots;  
calculate water need of crop and just use that/not water excessively;  
to reduce wastes by seepage and evaporation;  
changing crops to ones which need less water for successful growth/increased use of drought resistant varieties/saline tolerant plants;  
water re use/reclamation/recycling; [3]
- (ii) salination;  
leaching (of minerals)/infertile;  
eutrophication;  
reduced river flow downstream from usage area;  
loss of wetland habitat;  
loss of biodiversity;  
waterlogged;
- Credit one development mark for any of these.* [4]

[Total: 120]