READING PASSAGE 2

You should spend about 20 minutes on Questions 14-26 which are based on Reading Passage 2 below.

SAVING THE SOIL

More than a third of the Earth's top layer is at risk. Is there hope for our planet's most precious resource?

A

More than a third of the world's soil is endangered, according to a recent UN report. If we don't slow the decline, all farmable soil could be gone in 60 years. Since soil grows 95% of our food and sustains human life in other more surprising ways, that is a huge problem.

B

Peter Groffman, from the Cary Institute of Ecosystem Studies in New York, points out that soil scientists have been warning about the degradation of the world's soil for decades. At the same time, our understanding of its importance to humans has grown. A single gram of healthy soil might contain 100 million bacteria, as well as other microorganisms such as viruses and fungi, living amid decomposing plants and various minerals.

That means soils do not just grow our food, but are the source of nearly all our existing antibiotics, and could be our best hope in the fight against antibiotic-resistant bacteria. Soil is also an ally against climate change: as microorganisms within soil digest dead animals and plants, they lock in their carbon content, holding three times the amount of carbon as does the entire atmosphere. Soils also store water, preventing flood damage: in the UK, damage to buildings, roads, and bridges from floods caused by soil degradation costs £233 million every year.

C

If the soil loses its ability to perform these functions, the human race could be in big trouble. The danger is not that the soil will disappear completely, but that the microorganisms that give it its special properties will be lost. And once this has happened, it may take the soil thousands of years to recover.

Agriculture is by far the biggest problem. In the wild, when plants grow they remove nutrients from the soil, but then when the plants die and decay these nutrients are returned directly to the soil. Humans tend not to return unused parts of harvested crops directly to the soil to enrich it, meaning that the soil gradually becomes less fertile. In the past, we

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developed strategies to get around the problem, such as regularly varying the types of crops grown, or leaving fields uncultivated for a season.

D

But these practices became inconvenient as populations grew and agriculture had to be run on more commercial lines. A solution came in the early 20th century with the Haber-Bosch process for manufacturing ammonium nitrate. Farmers have been putting this synthetic fertilizer on their fields ever since.

But over the past few decades, it has become clear this wasn't such a bright idea. Chemical fertilizers can release polluting nitrous oxide into the atmosphere and excess is often washed away with the rain, releasing nitrogen into rivers. More recently, we have found that indiscriminate use of fertilizers hurts the soil itself, turning it acidic and salty, and degrading the soil they are supposed to nourish.

E

One of the people looking for a solution to his problem is Pius Floris, who started out running a tree-care business in the Netherlands, and now advises some of the world's topsoil scientists. He came to realize that the best way to ensure his trees flourished was to take care of the soil, and has developed a cocktail of beneficial bacteria, fungi, and humus* to do this. Researchers at the University of Valladolid in Spain recently used this cocktail on soils destroyed by years of fertilizer overuse. When they applied Floris's mix to the desert-like test plots, a good crop of plants emerged that were not just healthy at the surface, but had roots strong enough to pierce dirt as hard as a rock. The few plants that grew in the control plots, fed with traditional fertilizers, we're small and weak

F

However, measures like this are not enough to solve the global soil degradation problem. To assess our options on a global scale we first need an accurate picture of what types of soil are out there, and the problems they face. That's not easy. For one thing, there is no agreed international system for classifying soil. In an attempt to unify the different approaches, the UN has created the Global Soil Map project. Researchers from nine countries are working together to create a map linked to a database that can be fed measurements from field surveys, drone surveys, satellite imagery, lad analyses, and so on to provide real-time data on the state of the soil. Within the next four years, they aim to have mapped soils worldwide to a depth of 100 meters, with the results freely accessible to all.

G

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But this is only a first step. We need ways of presenting the problem that brings it home to governments and the wider public, says Pamela Chasek at the International Institute for Sustainable Development, in Winnipeg, Canada. 'Most scientists don't speak the language that policy-makers can understand, and vice versa.' Chasek and her colleagues have proposed a goal of 'zero net land degradation'. Like the idea of carbon neutrality, it is an easily understood target that can help shape expectations and encourage action.

For soils on the brink, that may be too late. Several researchers are agitating for the immediate creation of protected zones for endangered soils. One difficulty here is defining what these areas should conserve: areas where the greatest soil diversity is present? Or areas of unspoiled soils that could act as a future benchmark of quality?

Whatever we do, if we want our soils to survive, we need to take action now.

Questions 14-17

Complete the summary below.

Write **ONE WORD ONLY** from the passage for each answer.

Write your answers in boxes 14-17 on your answer sheet.

Why soil degradation could be a disaster for humans

Healthy soil contains a large variety of bacteria and other microorganisms, as well as plant remains and **14** …….. It provides us with food and also with antibiotics, and its function in storing **15** ……. has a significant effect on the climate. In addition, it prevents damage to property and infrastructure because it holds **16**……

If these microorganisms are lost, the soil may lose its special properties. The main factor contributing to soil degradation is the **17**…….. carried out by humans.

Questions 18-21

Complete each sentence with the correct ending, **A-F**, below.

Write the correct letter, **A-F**, in boxes 18-21 on your answer sheet.

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18 Nutrients contained in the unused parts of harvested crops

19 Synthetic fertilizers produced with Haber-Bosch process

20 Addition of a mixture developed by Pius Floris to the soil

21 The idea of zero net soil degradation

A	may improve the number and quality of plants growing there.
B	may contain data from up to nine countries.
C	may not be put back into the soil.
D	may help governments to be more aware of soil-related issues.
E	may cause damage to different aspects of the environment.
F	may be better for use at a global level.

Questions 22-26

Reading Passage 2 has seven paragraphs, **A-G**.

Which section contains the following information?

Write the correct letter, A-G, in boxes 22-26 on your answer sheet.

NB You may use any letter more than once.

22 a reference to one person's motivation for a soil-improvement project

23 an explanation of how soil stayed healthy before the development of farming

24 examples of different ways of collecting information on soil degradation

25 a suggestion for a way of keeping some types of soil safe in the near future

26 a reason why it is difficult to provide an overview of soil degradation

Write your answers in **CAPITAL** letters.

14.	15.	16.	17.	18.
19.	20.	21.	22.	23.
24.	25.	26.		

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