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«АНГЛІЙСЬКА МОВА ТА ЛІТЕРАТУРА»

Навчаємо дискусії

Є. В. Бондаренко

Environmental Issues

Проблеми навколишнього середовища

Рівень B1–C1

Видавнича група
Основа

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INTRODUCTION

There is hardly ever an issue nowadays which causes as many arguments and even conflicts. The world is definitely endangered, but who is to blame? The answer may be given on condition that we, firstly, posses some plausible facts about the environment and secondly, have linguistic ability to discuss and comment on them.

The book offered here provides you with the both. On the one hand, there is plenty of information about such global environmental problems as natural disasters, global warming, environmental pollution, waste and sewage management, alternative sources of energy. It is important that the issues at the end of the book are presented in terms of a separate nation: Great Britain, the United States and Ukraine.

Besides the scope of the information provided by the world stakeholders in the environmental monitoring and green technologies, the book will encourage honing diverse student s linguistic skills. It presents plenty of new vocabulary, authentic argumentative articles and a wide range of tasks to develop oral and written communicative skills.

It may be recommended for B1–C1 levels according to the Common European Framework of Reference for Languages.

I. ENVIRONMENTAL ISSUES IN THE WORLD

1. Divide into two groups. One of them will represent the citizens of your city, the other — the city authorities. Group 1 — make up the list of six environmental issues you consider to be unsatisfactory in your city. Group 2 — make up a list of six events, which testify to your care of the environment. Organize a round table. Present your lists to each other and discuss them.

Use the following words and expressions for your arguments: air / water / land pollution; using fossil fuels; depletion of fresh / drinkable water resources; traffic congestion; deforestation; denudation of land; extermination of trees / birds / animals species; oil / gasoline spillage; CO_2 emissions; ineffective use of energy; indiscriminate dumping wastes; unsatisfactory waste and sewage treatment; conservation movement; to install anti-pollution equipment; to limit carbon dioxide emissions; to harmonize industry and community; to impose / set standards of sewage discharges; to control production of ozone-depleting substances; to preserve woodland; to diminish the concentration of smoke in the air; to put pressure on councils to reduce car traffic; to ban car traffic in town centre; to minimize noise disturbance; urban improvement programme

2. You should be aware that the problems of your city, however specific they may be, have immediate relation to each of us. Do you know how environmentally aware you are? The instructor will give you a copy of the following test. Answer the questions of the test putting a tick in the box next to the answer you consider right. Do not think too long and be honest.

How Environmentally Aware You Are or 101 Points to a Green

1) Do you care whether the products you choose contain recycled materials?
☐ Yes. ☐ No.
2) When you buy one or two items at the supermarket do you buy a plastic bag for them?
☐ Yes. ☐ No.
3) How often do you have your waste-bin full?
☐ Daily. ☐ More seldom.

4) Do you always wrap chewing gum in the fold paper after use before throwing it away?
☐ Yes. ☐ No.

5) Does your family return the bottles for recycling (take them to a recycling bin or a special shop)?
☐ Yes. ☐ No.

6) How often do you use scrap paper for your own educational needs?
☐ Often. ☐ Not often.

7) Do you smoke?
☐ Yes. ☐ No.

8) Have you ever practiced discriminate dumping waste?
☐ Yes. ☐ No.

9) Do you use ecologically friendly vehicles or prefer walking to riding a bus if the distance is not big?
☐ Yes. ☐ No.

10) If a local park is damaged after celebrations will you volunteer to help with the clean-up project?
☐ Yes. ☐ No.

11) Are you concerned about diminishing number of trees and bushes in your city? Would you like to participate in planting trees yourself?
☐ Yes, I would. ☐ It's never crossed my mind.

12) Have you noticed in what condition are our rivers in the city?
☐ Yes, I have. ☐ It's never crossed my mind to.

13) When you clean your teeth you leave the tap running until you have finished.
☐ Yes. ☐ No, I only use one glass of water.

14) When you buy paper products, you try to purchase recycled paper.
☐ Yes. ☐ No.

15) Are you satisfied with the quality of the tap water?
☐ Yes. ☐ No.

16) If you were invited to a leisure hunting, would you like to go?
☐ Yes. ☐ No.

17) Would you participate in the movement against using natural furs in clothing?
☐ Yes. ☐ No.

18) Do you consider burning tree leaves in autumn the most optimal way of cleaning streets?
☐ Yes. ☐ No.

19) When you are at home do you care to turn off the lights where they are not needed?
☐ Yes. ☐ No.

20) Do you have any concrete suggestions as for the Kyoto Agreements?

☐ To tell the truth, I've never heard about them.

☐ Yes, I have, here they are.

1. ___
2. ___
3. ___

Now count your results

For "Yes" in questions. 1, 4–6, 8–14, 17, 19 — add 5 points, 20 (2 points for each suggestion).

For "No" in questions. 2–3, 7, 15–16, 18 — also add 5 points.

Sum up your points. If you have.

From 0 to 35 — There is little in the world about which you could care less. It's just not your cup of tea. But beware. The other drink may contain hazardous pollutants!

From 35 to 75 — You care about the nature but there are a lot of other much more important things in your life. Environmental issues worry you but let someone else do something about it.

From 75 to 101 — Congratulations! You are green! Due to the people like you the humanity has a chance. You consider yourself a part of the environment, which is actually true.

3. Below there is a Guide to Personal Actions to protect the environment offered by one of American magazines. Consider these 101 Ways to Heal the Earth and grade them according to the following principle. 1) 10 most efficient ways; 2) 10 efficient but not realistic ways; 3) 10 most unacceptable ways. Afterwards exchange your opinion with the peers and present the common list to the class.

101 Ways To Heal The Earth

A Guide to Personal Action

Slowing down climate change depends on all of us doing our part.

What can one person do to avert climate change? The answer is: a lot. This list of 101 suggestions doesn't begin to exhaust the possibilities; use it as a creative jumping off point and come up with your own ways to make an impact.

The unifying themes here are changes in lifestyle that: (1) reduce energy usage and slow down the fires of industrialism; (2) protect and restore the environment so that its climate-stabilizing mechanisms are preserved; (3) increase individual participation in governmental and economic decisions; and (4) facilitate a deep personal commitment to caring for the Earth.

The point is not to feel guilty for not doing all 101, but to use this list to empower yourself and your friends to take action. Find one thing you can do, do it, and then find another. By such incremental steps are long journeys made.

1) Insulate your home.
2) Buy energy-efficient appliances.
3) Caulk and weatherstrip doors and windows.
4) Install storm windows.
5) Close off unused areas in your home from heat and air conditioning.
6) Wear warm clothing and turn down winter heat.
7) Switch to low-wattage or fluorescent light bulbs.
8) Turn off all lights that don't need to be on.
9) Use cold water instead of hot whenever possible.
10) Opt for small-oven or stove-top cooking when preparing small meals.
11) Run dishwashers only when full.
12) Set refrigerators to 38° F, freezers to 5° F, no colder.
13) Run clothes washers full, but don't overload them.
14) Use moderate amounts of biodegradable detergent.
15) Air-dry your laundry when possible.
16) Clean the lint screen in clothes dryers.
17) Instead of ironing, hang clothes in the bathroom while showering.
18) Take quick showers instead of baths.
19) Install water-efficient showerheads and sink-faucet aerators.
20) Install an air-assisted or composting toilet.
21) Collect rainwater and graywater for gardening use.
22) Insulate your water heater. Turn it down to 121°F.
23) Plant deciduous shade trees that protect windows from summer sun but allow it in during the winter.
24) Explore getting a solar water heater for your home.
25) Learn how to recycle all your household goods, from clothing to motor oil to appliances.
26) Start separating out your newspaper, other paper, glass, aluminum, and food wastes.
27) Encourage your local recycling center or program to start accepting plastic.
28) Urge local officials to begin roadside pickup of recyclables and hazardous wastes.
29) Encourage friends, neighbors, businesses, local organizations to recycle and sponsor recycling efforts.
30) Use recycled products, especially paper.
31) Re-use envelopes, jars, paper bags, scrap paper, etc.
32) Bring your own canvas bags to the grocery store.
33) Encourage local governments to buy recycled paper.

34) Start a recycling program where you work.
35) Limit or eliminate your use of "disposable" items.
36) Urge fast-food chains to use recyclable packaging.
37) Avoid using anything made of plastic foam. It is often made from CFCs, and it never biodegrades.
38) If your car gets less than 35 mpg, sell it, buy a small fuel-efficient model, and spend whatever money you save on home energy efficiency.
39) Maintain and tune up your vehicle regularly for maximum gas mileage.
40) Join a car pool or use public transport to commute.
41) Write to automobile manufacturers to let them know that you intend to buy the most fuel-efficient car on the road.
42) Reduce your use of air conditioning.
43) Encourage auto centers to install CFC recycling equipment for auto air conditioners. Freon is released during servicing to become both a greenhouse gas and an ozone layer destroyer.
44) Remove unnecessary articles from your car. Each 100 lbs. of weight decreases fuel efficiency by 1 %.
45) Don't speed; accelerate and slow down gradually.
46) Walk or use a bicycle whenever possible.
47) Urge local governments to enact restrictions on automobile use in congested areas downtown.
48) Enjoy sports and recreational activities that use your muscles rather than gasoline and electricity.
49) Buy products that will last.
50) Rent or borrow items that you don't use often.
51) Maintain and repair the items you own.
52) Use colored fabrics to avoid the need for bleach.
53) Use natural fiber clothing, bedding and towels.
54) Don't buy aerosols, halon fire extinguishers, or other products containing CFCs.
55) Write to computer chip manufacturers and urge them to stop using CFC-113 as a solvent.
56) Invest your money in environmentally and socially conscious businesses.
57) Avoid rainforest products, and inform the supplier or manufacturer of your concerns.
58) Use postcards instead of letters for short messages.
59) Eat vegetarian foods as much as possible. Meat makes less efficient use of land, soil, water, and energy — and cows emit 300 liters of methane per day.
60) Buy locally produced foods; avoid buying foods that must be trucked in from great distances,
61) Read labels. Eat organic or less-processed foods.
62) Start a garden; plant a garden instead of a lawn.

63) Water the garden with an underground drip system.
64) Support organic farming and gardening methods; shun chemical fertilizers, herbicides, and pesticides.
65) Compost kitchen and garden waste, or give it to a friend who can.
66) Inform schools, hospitals, airlines, restaurants, and the media of your food concerns.
67) Stay informed about the state of the Earth.
68) Talk to friends, relatives, and co-workers about preventing global climate change.
69) Read and support publications that educate about long-term sustainability (like this one).
70) Start a global climate change study group.
71) Educate children about sustainable living practices.
72) Xerox this list and send it to ten friends.
73) Go on a citizen diplomacy trip and talk with those you meet about averting global climate change.
74) Get involved in local tree-planting programs.
75) Join an environmental organization. If they're not involved with climate change, get them involved.
76) Support zero population growth.
77) Support work to alleviate poverty. Poverty causes deforestation and other environmental problems.
78) Donate money to environmental organizations.
79) Support programs that aim to save rainforest areas.
80) Support solar and renewable energy development.
81) Work to protect local watershed areas.
82) Pave as little as possible. Rip up excess concrete.
83) Encourage sewage plants to compost their sludge.
84) Write your senator now in support of S. 201, the World Environment Policy Act.
85) Write your congressperson now in support of H.R. 1078, the Global Warming Prevention Act.
86) Support disarmament and the redirection of military funds to environmental restoration.
87) Write letters to the editor expressing your concern about climate change and environmental issues.
88) Support electoral candidates who run on environmental platforms.
89) Run for local office on an environmental platform.
90) Attend city council meetings and speak out for action on climate change issues.
91) Organize a citizens' initiative to put a local "climate protection program" into place.

92) Learn how to lobby. Lobby your local, state, and national elected officials for action on climate change and environmental issues.
93) Organize a demonstration at a plant that uses CFCs.
94) In place of TV and the stereo, spend time reading, writing, drawing, telling stories, making music.
95) Live within the local climate as much as possible, rather than trying to isolate yourself from it.
96) Strive to establish good communications with friends, neighbors and family including learning conflict resolution skills.
97) Spend time seeing, hearing, and rejoicing in the beauty of the Earth. Feel your love for the Earth. Make serving the Earth your first priority.
98) Learn about the simpler, less resource-intensive life-styles of aboriginal peoples.
99) Think often about the kind of Earth you would like to see for your grandchildren's grandchildren.
100) While doing small things, think big. Think about redesigning cities, restructuring the economy, re-conceiving humanity's role on the Earth.
101) Pray, visualize, hope, meditate, dream.

4. Listening to the text THE EARTH DAY. You will hear the people, who are concerned about the future of the nature and participate in Earth Day, a public event in Central Park, New York, the USA, dedicated to the environmental issues. Listen to them and fill in the gaps choosing phrases below. Make sure you know what they mean.

Mammals; ground water; rainforests; gasoline leaks; gas mileage; cleanup; air pollution; methane gas; pollutants; pharmaceuticals; millions of pounds; underground storage tanks; wildlife; tropical rainforests; alternative energy sources; air we breathe; tropical rainforest; pollution it emits; consume 450 billion gallons; wild plant, animal and insect species; for granted; The Rainforest Action; water sources; make up like 2 % of the Earth's surface; keep them tuned up; pour down in the drains; 20 % of all Earth's species; public transportation; solar powered cars; insects, fish, amphibians, reptiles; rainforest conservation.

Earth Day

Today is Earth Day. And we are here in Central Park for the big __ and celebration. We ask some of the people who turned out today what they think we ought to do to help the environment.

S1. Well... I think we'd better do something to protect the __before they are all gone. You know, __ only __but over half the world's __ live there. One out of every four __ comes from a plant in a __. We are to support organizations involved in __, like __that work in San Francisco.

S2. The most important thing to me is to save and care for all the __ in the world. Did you know that by the year 2000 __could be lost forever? Had we better not save only the __, we are to be concerned about the __ and plants. I think the governments of the world had better get together and do something.

S3. I'm really worried about the quality of the __. Cars cause a lot of the __and everybody ought to do whatever possible to stop it, you know. For example, people ought to drive together or use __. That would keep __of pollution out of the atmosphere. People ought to buy cars that get good __and __and running well. The more gas a car uses the more __. We'd all better support the development and use of cars that use __, like electric cars, __ and cars that run on __.

S4. We'd better not take the water we have __in this country. Every day we __ of water. We get this water from our rivers, lakes and streams or from __. And we have been careless about how we've treated our __. We are to take better care of the ground water and keep it safe from __, especially chemicals that people __without thinking or __from __. We'd also better start conserving water.

Answer the questions using information from the text you hear and your background knowledge.

1) What issues are touched upon in the short reports of the speakers?
2) What are the solutions for. rainforest depletion, extinguishing wildlife species, air/ water pollution?
3) Do you consider the measures enumerated efficient? Why?

II. ENVIRONMENT AND ITS COMPONENTS. ENVIRONMENT DESTRUCTION

1. Do you know what is environment? Ecology? Try and formulate definitions. How are they connected?

2. Read about the difference between physical and geographical environments. Fill in the gaps using words from the box.

geology	characteristics	town	greatly	modifications
supports	suffering	relationship	living	overexploitation
physical	influences	erosion	widely	

WHAT IS ENVIRONMENT? The conditions and (1) __ of the place in which an organism lives. The large number of different types of environment (e.g. (2) __

Environment, tropical rainforest environment) makes it impossible to give a single definition In general, the (3) __ environment describes the (4) __ of a landscape (e.g. climate, (5) __ which have not been (6) __ changed by human activity, whereas the geographical environment includes the physical environment with any human (7) __ (e.g. farming, industry, houses and towns). The (8) __ between (9) __ organisms and their environment forms part of the subject of ecology. Concern that large parts of the environment are (10) __ from misuse and (11) __ is central to conservation, and the environmental movement which (12) __ conservation has recently become popular as new threats (e.g. acid rain, soil (13) __ damage to the ozone layer) are (14) __ recognized.

3. Look at the words and expressions naming some basic issues of ecology. Find out their meaning and use them to complete the following sentences.

Greenhouse effect • biodegradable • wetlands • deforestation • dumping • toxic waste • renewable energy • emissions • biodiversity • global warming • ozone layer • desertification • smog • habitats • depletion

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1) There are still scientists who dispute the existence of. __ and say there has been no real change in temperature.
2) The draining of __ to build factories has enraged environmentalists.
3) On some days in summer the __ __ is so bad that people with breathing problems are advised to stay at home.
4) Carbon dioxide __ must be cut if we want to stop polluting the air.
5) __ of waste at sea is forbidden by international law.
6) Lack of rain means that large areas of previously fertile land in Africa are threatened with __
7) We must develop __ sources and not depend on oil.
8) The problem with most plastics is that they are not __ and cannot be reabsorbed by the earth.
9) The build up of a layer of gases trapped in the earth's atmosphere which prevents heat escaping is known as the __ .
10) Steady __ in the Himalayas has resulted in catastrophic floods in countries at sea level.
11) Scientists first became aware of the effects of certain gases on the environment when they found a hole in the __ over Antarctica.
12) As cities expand, many animals are being driven from their natural __.
13) Plant and animal species dying out means the loss of the __ of the planet.
14) Since __ continues to be hazardous for a long time it is difficult to dispose of it safely.
15) Despite attempts to persuade people to conserve water, the __ of water supplies continues.

4. Listening to the text TREES IN DANGER. Confirm or argue with the following statements. Support your opinion by the information from the text your have heard.

1) In 1980s the reason of trees dying in Europe was Dutch elm disease.
2) Deciduous trees like fir and pine as well as coniferous trees like oak, beech and birch are endangered in Europe.
3) The symptom of a tree disease is shrinking the leaves.
4) In Schwarzwald (Germany) 75 % of the trees have been killed or damaged.
5) Acid rain is formed because factories, cars and power stations emit tonnes of sulphuric and nitric acid.
6) Shifting responsibility from one nation to another makes the problem of acid rains almost impossible to solve.
7) Pollution is the main reason of killing rainforests.
8) Trees are most important for our life because they provide shelter for different wildlife species.

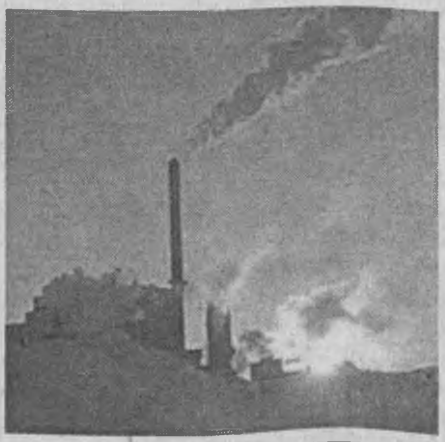
5. One of the most acute issues in ecology is conserving life-sustaining global environment. Make a short report about one of its elements (air, land and water) using the words and expressions below. Structure your report according to the following plan.

- Ecological connection of the element with the others.
- Current tendencies in condition, changes and dangers.
- Possible consequences.
- Possible ways of preventing the consequences.

6. Look through the following words and expressions concerning the issue of the environment destruction. Make sure you know their meaning and the way they are pronounced.

Air

water cycle
carbon cycling
watery vapor
release of carbon
condensation of vapour
oxygen
precipitation (rainfalls; snowfalls)
atmospheric winds,
precipitation patterns
ozone layer
solar irradiarice, ultraviolet emission / radiation

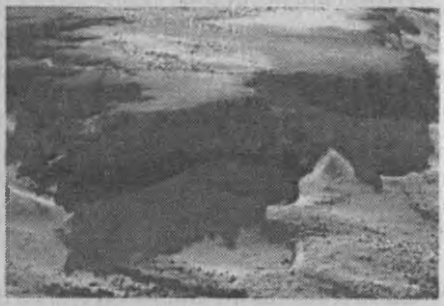


Water

air-sea exchange
global sea level
marine life
ocean biota
ocean currents
ocean sediments
(fresh) water supplies

Land

mineral resources
fossil fuels
volcano
volcanic activity. swelling, eruption, lava flows
polar ice sheets
glacier
global vegetation
vegetation pattern
land / desert vegetation
rainforests
desert
cultivated land
derelict land
open land
"green" belts
recreation areas
coastal areas
decomposition of living / organic matter



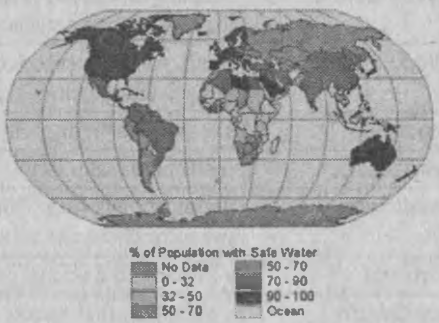
Environmental destruction

ecological catastrophe (calamity, disaster, collapse)
to face an ecological catastrophe
to slide into an ecological catastrophe
to stave off an ecological catastrophe
to repair the ecological damage
environmental degradation
the scale of devastation
the destruction of ecosystems
negative anthropogenic influences
to erode the fabric of the planet
to upset the biological balance
to abuse nature
to exert influence on... (biosphere, ocean biota)
to affect the environment
adverse (irreversible, tremendous, disastrous, uncontrolled) effect (impact on...)
to be fraught with fatal consequence
to diminish harmful influence
unrestricted industrialization, urbanization
a pressing necessity to change the character of interaction between man and nature

Wildlife	
animal kingdom (population), biodiversity (variety of plant and animal life) species habitat extinction of animals and plants to outstrip the planet's regenerative rate self-regenerating capacity of the biosphere to undergo mass destruction	

7. Look through the fact files concerning water recourses on the Earth. Share the conclusions from the information with your group using expressions above.

The finite nature of the world's water and air resources is shown on these scale models. On the left, all the world's water (some 1.41 billion cubic kilometres) is shown as a ball covering central Europe. On the right, the entire atmosphere (5140 trillion tonnes) at sea level pressure is a slightly larger ball.



8. Find charts or pictures concerning air, land or wildlife destruction and comment them using the words and expressions given in Ex. 6.

III. EFFECTS OF DISASTERS. PREVENTATIVE MEASURES

A. EFFECTS OF DISASTERS

1. Have you ever witnessed a natural disaster? Share your impressions.
2. Match the names of natural disasters with their descriptions.

hail	a sudden violent movement of the Earth's surface, sometimes causing great damage
thunderstorm	a wind storm that carries sand through the air in the sandy areas of deserts. The wind-driven sand forms a low cloud near the ground, not higher than 10 feet (3 meters). They last a few hours and die out at night; they damage crops, reduce visibility and thus endanger motorists on desert roads.
waterspout	bursting forth lava, hot gases, and rock fragments through the opening in the earth's surface
flood	small, roundish pieces of ice (ice pellets) or frozen vapor coming down from the clouds in a shower
landslide	a mass of earth or rocks that slides down a slope
earthquake	roads made sslippery (slick) with the ice
avalanche	floods of melt water from glaciers mixed with loose soil or rocks sweeping down the valleys along the sides of mountains
drought	a tornado that occurs over a lake or an ocean
sandstorm	a condition that results when the average rainfall drops far below the normal amount for a long period of time; in not irrigated areas the lack of rain causes farm crops to wither and die
ice-slick	a violent tropical storm or wind in which the air moves very fast in a circular direction
hurricane	a storm with thunder and lightning and, usually, heavy rain
cyclone	a severe snow storm with strong winds
blizzard	a great flow of water over what is usually dry land
volcanic eruption	a large mass of snow and ice, or of dirt and rocks, rapidly sliding or falling down the side of a mountain
mudflow	a violent wind which has a circular movement, especially found in the West Atlantic Ocean

3. Look at the pictures and using words and expressions given below comment on them.

1) DESCRIBING EFFECTS OF A DISASTER
- on-the-spot report on the tornado damage
- the scene here is one of total devastation
- destructive weather
- affected areas
- the disaster-stricken area

2) DAMAGE

- to cause / bring slight / considerable / great damage through fierce winds, torrential rain, flooding
- violent destruction
- devastating effects
- (Tahiti) was devastated by six tropical cyclones
- to destroy almost everything in its path
- severely damaged or destroyed (about buildings or crop-fields)
- property destroyed / flooded
- reduced to nothing but heaps of rubble, debris (about buildings)
- to collapse (about buildings, power lines, trees)

3) CONSEQUENCES / EFFECTS

3.1) IMMEDIATE effects

- loss of amenities (power, water, etc)

- power lines downed; electricity cables are brought down
- completely disrupted daily life
- all transportation stops and businesses close down for several days
- crops failed / destroyed, causing starvation
- crop failure, destruction of crops; crops are ruined
- livestock is destroyed

3.2) LONG-TERM consequences

- drastic effects on the economy of a region
- economic mainstays of the region un / affected
- famine
- shortages / starvation
- homelessness, poverty
- diseases
- loss of natural habitats
- destruction of environment
- climatic changes

4) INJURIES / CASUALTIES / DEATHS

- bring about deaths as well as damage to...
- threat to human / animal life
- floods taking the lives of people in the many regions of the world
- to cause loss of life
- death toll
- reports are still coming in of casualties
- current estimates place the death toll at at least 36 people
- another 200 are believed to have sustained injuries
- injuries result from falling objects and the collapse of buildings, bridges, and other structures
- injury from falling / floating debris

5) RESCUE

- to send out emergency rescue teams, rescue workers
- to salvage
- survivors, to have a lucky escape, to creep through a gap
- people had to be airlifted
- to provide temporary shelters, to be housed in temporary shelters
- to get people who were stranded to safety

4. Read about tsunami and its consequences. Pay attention to the following words and expressions, make sure you know their meaning and pronunciation.

Accumulated stress, the boundary between two of the world's tectonic plates, subduction zone, strike-slip earthquakes, a pristine marine ecosystem, the move-

ment of the seabed, to flow away from the fault, to rely on seismic data, to unleash an ocean-wide tsunami, to capsize freighters, to set off travelling with the crest, to travel trough, recede, in the waves' direct line, a giant underwater colander.

Tsunami. Anatomy of a disaster

At 00.59 GMT on 26 December 2004, a magnitude 9.3 earthquake ripped apart the seafloor off the coast of northwest Sumatra.

Over 100 years of accumulated stress was released in the second biggest earthquake in recorded history.

It unleashed a devastating tsunami that travelled thousands of kilometres across the Indian Ocean, taking the lives of more than 200,000 people in countries as far apart as Indonesia, the Maldives, Sri Lanka and Somalia.

Earthquake

Two hundred and forty kilometres (150 miles) off the coast of Sumatra, deep under the ocean floor, at the boundary between two of the world's tectonic plates, lies a 1,200km (745 miles) trench called the Andaman-Sumatran subduction zone.

At about the same speed as your fingernails grow, the lower plate, carrying India, is being forced or subducted beneath the upper plate, carrying most of South-East Asia, dragging it down, causing huge stresses to build up. These stresses were released on 26 December. Shaking from this giant mega-thrust earthquake woke people from sleep as far away as Thailand and the Maldives.

Unlike the more frequent strike-slip earthquakes of Kobe or Los Angeles, which last for a matter of seconds, subduction zone quakes last for several minutes. The shaking during the Indonesian event went on for eight minutes.

Nobody knows how many died in the actual quake itself, but scientists have since visited the nearby island of Simueleu and found something astonishing. The whole island has been tilted by the force of the earthquake, causing coral, submerged beneath the ocean for thousands of years, to be thrust out of the water on the east side; bays in the west have been drained. "We were astonished to find ourselves walking through a pristine marine ecosystem, missing only its multitude of colours, its fish, and its water", said Professor Kerry Sieh, from the California Institute of Technology, the US.

Yet, when the shaking from the earthquake subsided, no one had any idea that the tremors had set in motion something far more deadly — a tsunami.

The Tsunami

Deep under the Indian Ocean, at the epicentre of the quake, the 20 m (65 ft) upward thrust of the seafloor set in motion a series of geological events that were to devastate the lives of millions. Billions of tons of seawater, forced upward by the movement of the seabed now flowed away from the fault in a series of giant waves.

The only people in the world to have any idea what had happened were thousands of kilometres away on the island of Hawaii. But, relying on seismic data alone, the scientists at the Pacific Tsunami Warning Center had no idea the earthquake had unleashed an ocean-wide tsunami. It was a full 50 minutes after they first picked up the tremors that they issued a warning of a possible local tsunami.

Thirty minutes after the shaking had subsided, the first wave, travelling eastwards, crashed into Sumatra. On the shores directly facing the epicentre, the waves reached heights of 20 m (65 ft), stripping vegetation from mountainsides 800m (0.5 mile) inland, capsizing freighters and throwing boats into the trees.

The city of Banda Aceh, just a few kilometres further round the coast was almost completely destroyed, killing tens of thousands of people in just 15 minutes.

What the elephants knew

Leaving a devastated Sumatra behind, the series of waves continued across the Andaman Sea towards Thailand.

A herd of elephants in the mountains seemed to know it was coming. They began behaving strangely, stamping the ground and tugging at their chains, eventually breaking away to run to the hills. Elephants have special bones in their feet that enable them to sense seismic vibrations long before we can.

Animals taking to the hills was not the only sign that something was about to happen. Due to the complex way in which the seafloor ruptured, some waves set off travelling with the crest first, others traveling trough first. The trough, reaching the shores of Thailand, caused the sea to disappear off the beaches. It is one of the classic warning signs of an approaching tsunami.

Tragically, many tourists went down to the beach to look, some to rescue fish left flapping on the sand. A few minutes later, the first wave hit Thailand. A thousand tons of water crashed down on each metre of beach. At Khao Lak, the wave reached 10m (30ft) and caused billions of pounds of damage. The human cost was far greater — nearly 5,000 confirmed dead and 3,000 still missing.

At the same time, the westbound series of waves were heading for Sri Lanka. In the deeper waters of the Indian Ocean, barely noticeable at just a 30 cm (1 ft) above the surface, they were travelling at some 800 km/h (500 miles per hour).

Sri Lanka

The first wave hit Sri Lanka with no recede and no warning, The waves, up to six of them, weighing over 100 billion tons, rushed inland like a giant tide. As they hit Sri Lanka's southern tip, they began to change direction, an effect called refraction.

The part of a wave closest to the shore slowed down in the shallow water, leaving the outer part, travelling at faster speeds, to bend around the island. The southwest coast of Sri Lanka, the side that should have been safe, was suddenly in the waves' direct line. Cities such as Galle were destroyed; over 4,000 people died in this region alone. The waves carried on further north to India, where they killed 10,000 people.

The Maldives

Next in the waves' line, was one of the lowest lying countries on Earth — the Maldives. Miraculously, although 80 people died here, this country relatively unscathed.

It seems that due to their unique geography, being the tips of underwater volcanoes and without a continental shelf to push the wave height up, the tsunami just washed through. Coral reefs are also thought to have protected the country, acting like a giant underwater colander, stripping the waves of energy.

As the waves left the Maldives, they passed through a narrow gap between the island chains, focusing their energy directly at Somalia, where 300 people lost their lives.

In Kenya, the waves, when they hit were small; their energy further removed by the landmasses of the Seychelles and Diego Garcia.

They had also seen the news reports and evacuated the beaches; only one person died.

The last victim of a natural disaster that had claimed 300,000 with hundreds still unaccounted for.

Answer the following questions.

1) What is the difference between strike-slip and subduction zone quakes?
2) What were the sequences of the subduction zone quake in the island of Simueleu?
3) What triggered tsunami?
4) What was tsunami in Sumatra like?
5) What are the usual omens of tsunami? How do animals predict the disaster?
6) How big was tsunami devastation in Thailand? Could there have been fewer casualties?
7) What were the aftermaths of tsunami in Sri Lanka? Were they predictable?
8) Were the Maldives luckier than other regions? Why?

5. The aftermaths of a disaster are sometimes really severe and sometimes irremediable. Read about one of the biggest tsunami devastations, write out the phrases and words in bold and make up your own report about the aftermaths of a similar (or imaginative) disaster using them. Present your report to the class.

Indepth. Disaster in Asia

It's expected to take four years to rebuild much of the parts of south Asia that was hit by the Dec. 26, 2004 tsunami — longer in the hardest hit areas of Bandeh Aceh, Indonesia and Sri Lanka.

The disaster is believed to have killed between 176,665 and 184,378 people in Asia and Africa, more than half of them on Sumatra. Between 49,622 and 50,533 people remain unaccounted for around the Indian Ocean. The total number of dead may never be known because of the number of people swept out to sea.

As of March 9, 2005, 15 Canadians were officially listed as dead.

Meanwhile, finance ministers from the Group of Seven nations have agreed to suspend debt payments from countries hit by the waves. Canada had announced its intention to suspend debt payments on Dec. 30.

"I have never seen such utter destruction mile after mile", UN Secretary-General Kofi Annan told reporters after flying over Sumatra. "You wonder, where are the people? What has happened to them?"

The South Asia tsunami — one of the world's worst natural disasters — struck in the morning of Dec. 26, 2004. At 7.59 a.m. local time, about 150 kilometres off the coast of the Indonesian island of Sumatra, two tectonic plates heaved under the sea along a 1,000 kilometre-long fault line. The result. a magnitude 9 earthquake — the most powerful the world had seen in 40 years.

Parts of the sea floor rose by about 10 metres, displacing hundreds of cubic kilometres of seawater. That generated a tsunami — a series of huge waves that quickly fanned out across the Indian Ocean.

The waves moved so quickly, there was no time to sound the alarm. Walls of water slammed into coastal areas of Indonesia, Malaysia, Myanmar, Thailand, Bangladesh, Sri Lanka, India and — thousands of kilometres away — Somalia in East Africa.

The waves destroyed whatever lay in their path. from the built-up tourist resorts of Thailand to isolated fishing villages in Indonesia and Sri Lanka. Thousands of people were killed. The number of dead rose by the hour as the extent of the devastation became apparent.

On Dec. 29, 2004, military teams finally reached the west coast of the island's northern province — Aceh — about 150 kilometres from the quake's epicentre. They found thousands of bodies. Three-quarters of the coast had been obliterated.

By the first week of January, it was clear it would take years to rebuild across much of the stricken area. Some towns and villages were so badly damaged, they could no longer be inhabited.

6. Listening to the text Tornadoes in Florida.

Pre-listening task

Look at questions 1–7. What kind of word or information will you pick up to answer each question? Choose from the following possibilities and write the number of the corresponding question (1–7) in the correct box.

a past participle of a verb (×2) ☐

a figure ☐

an adjective describing geographical location ☐
a service or organization ☐
a day or date ☐
a noun relating to people ☐

Tornadoes in Florida

The tornadoes struck in (1) __.
Wind speeds reached nearly (2) __.
Four countries in (3) __ Florida have been affected.
At least 36 people have (4) __ and a further 200 have been (5) __.
The National (6) __ broadcast tornado warnings.
The clean-up operation will be carried out by (7) __ and emergency-management officials.

Now listen to the text and fill in the gaps with the words on the tape.

You will hear part of a radio (1) __ about a natural disaster in Florida.

Announcer. Severe storms (2) __ Florida in the early hours of Monday morning, (3) __ deadly tornadoes that (4)__ out power and damaged or destroyed scores of buildings. It (5)__ that some of the tornadoes bad wind speeds close to 200 miles per hour, which represents an intensity of f 3 on the six-point Fujitsa Tornado Intensity Scale. The areas (6) __ , all in

Central Florida, are Seminole County, Osceola County. Orange County and Volusia County. Reports are still coming in of (7) __ , but current estimates place the (8) __ at at least 36 people and another 200 are believed to have (9) __ injuries. Although the National Weather Service (10) __ tornado-watch warnings on Sunday evening, by the time these had been upgraded to full-scale tornado (11) __ many Florida residents had already gone to bed. Ironically, Monday was to have been the start of Florida (12) __ Weather Awareness Week, an event which would have included a state-wide tornado (13) __ . Instead, local residents and emergency-management officials find themselves (14) __ an enormous (15)__

operation. Now, we'll go over to our correspondent in Orlando. Florida for an on-the-spot report on the tornado damage.

7. Using the chart below, expressions in Ex. 2 and the text you have heard, create a short 150–200 word report of a real natural disaster, about which you have heard or read recently. Comment on the following issues.

- When did it occur and what caused it?
- Was the destruction the result of a single event or of an ongoing process?
- In what ways were the environment and the inhabitants affected.
  i) in the short term;
  ii) in the long term?

e.g. The severe drought in Africa last year caused extensive problems to the country's economy. The immediate effects of the drought included destruction of crops and the loss of amenities such as running water. The long-term effects of this disaster are, however, far more serious because...

Disaster	Scene / effects
flood	severely flooded to flood coasts for many miles huge waves crashing ashore the waves measure pile up to a tremendous height, causing great damage along the coast a waterproof garment thigh-deep in muddy water to float about to wade sandbags
hurricane	circulate in a counterclockwise direction sway and uproot the trees winds swirl at speeds that may exceed 300 miles to lift cattle, automobiles, and even mobile homes the wind picks up objects and hurls them through the air cars in the parking lot thrown skyward by the force of the wind trees uprooted the roof of a convenience store ripped off
drought	severe drought withered crops cracked earth to turn to dust frequent strong winds to cause unusually arid conditions or droughts to affect the inhabitants of these regions

Disaster	Scene / effects
earthquake	twisted beats of metal jagged chunks of reinforced concrete to trigger landslides that cause great damage and loss of life
volcanic eruption	large chunks of hot rock blasted high into the air evacuation of the towns in the path of lava and smoke

B. PREVENTATIVE MEASURES

8. Add in the chart natural disasters.

Preventable man-made disasters	Natural disasters
nuclear explosion	
radiation leak	
radioactive contamination	
gas explosion	
factory emission	
chemical effluent	
oil slick, oil spill	

9. Study the tables below and say how each disaster mentioned above may be prevented / relieved, what results can each measure bring. Use the suggested scheme.

Prevention and safety measures	Relief/help
satellite tracking	to rescue trapped / stranded people
monitoring	to get people to safety by rescue teams
accurate prediction	to provide first aid to the injured
issuing (tornado-watch) warnings	to send medical personnel/ medical
safety checks	teams / supplies to treat the injured
anti-seismic buildings	to send / provide tents / temporary shelters
reinforcing buildings	blankets, clothing
building flood-protection structures	to re-establish essential services (e.g. electric-
sandbags	ity, water)
storm drains	to provide emergency power/ water / food
training emergency rescue teams	supply
safety drills	to compensate the victims for damage / loss
maintaining extremely high standards at	to provide financial aid / insurance payments
nuclear power stations	to plan a reconstruction programme for the
evacuation	area
stricter laws	to reconstruct private houses, public buildings
international agreements	to arrange facilities for the media
agreements banning nuclear weapons	

Useful expressions. Short term / long term actions
The immediate response should be to... Such aid would only bring short term / temporary relief The long-term aims of the government should be... The first priority in the event of a flood... In the long run, the government would have to... Eventually, the victims would require...

- A hurricane may not be preventable, but its effects can be lessened if the area is evacuated at the first warning. The government should invest money in research into accurate prediction and into making sure that all inhabitants know the safety drills in case evacuation is necessary.
- Nuclear explosions, on the other hand, are preventable. As long as maintenance and safety checks are regular, and the workers are skilled and have high levels of training, accidental explosions should not occur. Yes, that's true, but I think it would be better if nuclear power stations were regulated by...

10. Discuss the following.

A. What needs do the victims of natural disasters have? Work with a partner and discuss whether the items below are short-term, long-terms needs, or both. Write S, L, or Both by each item.

1) blankets __
2) clothing __
3) re-establishment of essential services (e.g. gas, electricity, water) __
4) financial compensation __
5) food __
6) medical supplies __
7) medical help __
8) psychological support __
9) reconstruction of private houses __
10) reconstruction of public buildings __

B. Who do you think should be responsible for meeting each of the needs in A?

- local authorities
- international aid organisations
- national government
- insurance companies
- charities
- the victims and their families

IV. GLOBAL WARMING

1. Read the following statements and comment on them. Do you consider global warming a personal issue of every Earth's inhabitant or a matter of governmental level?

"The 2nd of February, 2007 will perhaps be remembered as the day where the question mark was removed behind the debate on where climate change has anything to do with human activity".

Achim Steiner,
Executive Director of the United Nations Environment Programme

"This is our planet. Since life began it has gone through extraordinary changes. But now it is being transformed — not by natural events, but by the actions of one species: mankind".

Sir David Attenborough

2. Below you will familiarize yourselves with the about an international agreement aimed at curbing the effects of global warming. Divide into two groups. Group A — make up a chart summing up the reasons of concerns about the global warming. Group B — make a list of challenges of this agreement. Share your information with the other group.

A) Ozone depletion. Deforestation. Global warming. Barely a decade ago, these issues interested only atmospheric and environmental scientists. Today, increasing evidence of large-scale change has made us aware of the threats to our life-sustaining global environment. From the earliest days of our planet,

the Earth has experienced changes in land patterns, atmospheric composition, and ocean dynamics. However, human beings no longer are merely spectators to the drama of Earths global change; instead, we have become active players. By increasing greenhouse gases in the atmosphere with exhaust fumes from our cars, smoke from factories and the burning of our forests; by changing the face of the natural landscape; and by producing ozone-depleting chemicals, we are for the first time in our history acting as contributing agents to worldwide environmental change. Unlike local environmental problems that affect a small area, global changes are just that — they affect the world as a whole. Within the span of a few human generations we have changed our world significantly without understanding the long-term effects on its ability to sustain life.

B. To unite the efforts in preventing climate change the Kyoto accord was signed by states, which aims to curb the air pollution blamed for global warming.

- The Kyoto Protocol is a component of the Framework Convention on Climate Change (FCCC) established at the Earth Summit in Rio de Janeiro in 1992.
- Under the Convention all nations agree to take action to reduce emissions of greenhouse gases.
- Five years later in 1997, the principles of the Kyoto Protocol, the first to be established under the FCCC was agreed by the countries who were Parties to the Convention.
- Some 141 countries, accounting for 55 % of greenhouse gas emissions, have ratified the treaty, which pledges to cut these emissions by 5.2 % by 2012.
- But the world's top polluter — the US — has not signed up to the treaty. The US says the changes would be too costly to introduce and that the agreement is flawed.
- Large developing countries including India, China and Brazil are not required to meet specific targets for now.
- The head of the UN Environment Programme, Klaus Toepfer, says Kyoto was only a first step and much hard work needed to be done to fight global warming.

2. Imagine the Earth as a hotter place. Think of the likely benefits and troubles that global warming might cause. Consider the vegetation, animal life, ecological balance, rivers, and woods, human activity. Also, consider the ideas below. Suggest whether the advantages would outweigh disadvantages.

Warmer winters will produce less ice and snow to torment drivers, facilitating commuting and making snow shovelling less of a chore.

Farmers could grow crops nearly all the year round.

Heavy rains could result in dangerous mudslides in mountainous regions.

Global warming would cause some ice at the North and South Poles to melt. Oceans would then rise at least a foot or two. Vast areas of dry land would end up underwater. Countries with very little high ground, like Bangladesh, would mostly disappear.

Transportation would benefit generally from a warmer climate since road transport would suffer less from slippery or impassable highways.

You would harvest homegrown once-exotic tropical fruit.

Insects that carry tropical diseases like malaria would start to appear in places they've never been before.

Climate changes will affect the established economy structure and labour resources, leading to massive unemployment.

You might be able to swim outside in October even if you lived up North.

There would be fewer colds and cold-related epidemics.

Expenditures for heating and cooling would be cut by about $12.2 billion annually.

Hurricanes and typhoons would become more powerful. Steppes would become replaced by deserts.

3. Read a report on global warming. Study the issue and the language of the paper. As you read through the text, make sure you don't mispronounce the unfamiliar words.

Over the past, decades the issue of global warming has slowly moved to the forefront of humanity's concerns about the future. Initially treated as, fantasy, global warming is now a primary issue as a result of two indisputable facts.

- Rising Surface Temperatures. The surface temperature of Earth has increased 0.45–0.6 degrees Celsius.
- Rising Sea Levels. The average sea level has risen globally by 10–25 cm over the past century.

There have been at least six major extinctions on our planet in the last 600 million years, and these extinctions have eliminated 99 % of all species. The reasons for these extinctions vary, but what they all have in common are dramatic changes in weather patterns and sea levels.

What the Scientists Are Saying

After considerable study, scientists have realised that our Earth is a closed and very ecologically fragile system, which relies on everything working in concert.

Although our planet has cooled and warmed through recurring cycles for eons, the scientific community now sees the impact of our industrial age and this consensus is worldwide.

- 2,500 scientists of the United Nations sponsored by Intergovernmental Panel on Climate Change (IPCC) warn us that, "...the balance of evidence suggests that there is a discernible human influence on global climate".

- Doctors from Harvard University and the Johns Hopkins Medical Schools have linked recent US outbreaks of dengue fever, malaria and other diseases to climate change.
- NASA's Goddard Institute for Space Studies has analysed data from thousands of meteorological stations around the world and have conclusively stated that "there has been a long-term global warming trend underway since the early 1960s".

The Primary Sources of Global Warming

The levels of carbon dioxide (CO_2), in our atmosphere have increased approximately 30 % in the last century and methane concentrations have more than doubled.

If CO_2 is not directly responsible for Global Warming, there can be little doubt that its increased presence is a clear sign of danger to come.

The three main engines of Global Warming are:

- Increased Solar Activity. The amount of sunlight received from the Sun, which has noticeably increased due to the Solar Maximum.
- Diminished Atmosphere. The reflectivity of our upper atmosphere has diminished due to the depletion of certain gases.
- Retained Heat. The amount of heat retained by the varying gases in our atmosphere.

The primary greenhouse gases that are generated in part by man are.

- Carbon Dioxide (CO_2). The primary man-made source comes from the burning of fossil fuels.
- Methane (CH_4). This gas traps over 21 times more heat than CO_2.
- Nitrous Oxide (N_2O). This gas traps 270 times more heat than CO_2.

The heat-trapping properties of these gases are undisputed and the amount of heat retained by Earth is also dependent on the amount of greenhouse gases being trapped inside the atmosphere.

However, an even greater danger seems to loom upon the horizon beyond the pale of greenhouse gases. According to our government, more oxygen is being consumed right now than the planet's ecosystem can generate. While this shortfall in oxygen production has yet to reach a state that is harmful to humans, it does signify a serious threat.

Assuming that Global Warming is a worsening natural condition that is being aggravated by humans, this oxygen shortfall is a loud alarm bell. Simply put, we're methodically ripping the lungs out of our planet.

Disaster Modelling Results

The most respected scientific institutions in the world have consistently produced computer-based scenarios that predict.

- Major shifts in temperature and precipitation.

- Varying ranges of infectious disease and increasing cases of infection.
- Rising sea levels.
- Melting glaciers and disappearing snow cover.
- Habitat shifts for plants and animals.

These same scientists will quickly add caveats to their computer-generated models because they willingly admit that they need more data to make their models more precise.

But, do we really need a computer to tell us about it..

Heat Related Death, Suffering and Starvation

- The ten warmest years of the 20th century occurred within the last fifteen years, and the first four months of the year 2000 are the hottest on record for the last 106 years.
- Extreme weather events have become more common. As result of extreme droughts and rainfall throughout the U.S., the Department of Agriculture crop forecast for 2000 is "dismal".
- The increase in childhood asthma has been linked to air pollution.
- Experts fear mosquito-born diseases like West Nile Fever will cause outbreaks in summer on the East Coast, as mosquito's population tends to increase in warmer climates.
- Populations of ticks and fleas infected with Lyme disease and antibiotic-resistant strains of TB and Bubonic Plague have flourished in recent warm weather. Infections are on the rise as rodents spread these diseases.

Polar Melt Down

Since 1958, the Arctic icecap has thinned by approximately 50 %, as the atmospheric ozone level dropped 45 %.

Antarctic atmospheric ozone levels have degraded by 70 % and entire mountain ranges in the Antarctic have lost their snow cover. Consequently, huge icebergs are breaking free of the Antarctic far ahead of even the most conservative estimates.

Concurrent with the polar melt down, there has been an average global sea level increase of 10–25 cm, which is important for areas with low ground.

So What If We Do Nothing?

If Global Warming continues at its present pace, we can most likely expect the following noticeable effects within our lifetimes.

- A continued rise of global atmospheric temperatures, leading to accelerated melting of the polar ice caps, which in turn will cause average global sea levels to rise, flooding coastal areas and devastating island and coastal nations.
- A continued rise of global sea temperatures, leading to mass deaths of oceanic animals and the accelerated extinction of endangered oceanic species.

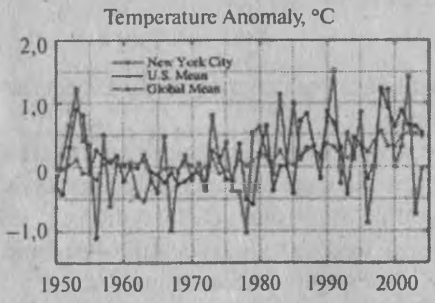
- Our polar ozone levels will continue to erode, downward from the poles toward the equator, leading to a rise of skin cancers among humans and devastating crops and farmlands.
- Devastating wars between hungry nations desperate for scarce resources, and these countries are likely to use weapons of mass destruction.

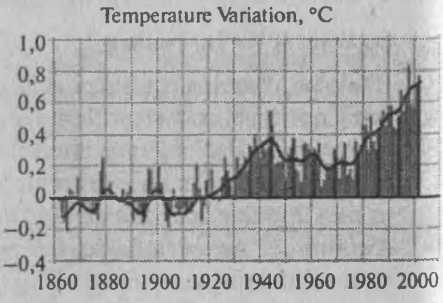
As global warming proceeds, plants and animals are migrating beyond their traditional home grounds. As this progresses, we will see certain species of plants and animals become threatened by the presence of other, newly-migrated species, as each vies for both resources (sunlight, water, etc), as well as to establish its position on the food chain of which we are also a member.

Answer the questions on the text and beyond.

1) How much attention is being given to global warming nowadays?
2) Why are the dramatic changes in weather patterns and sea levels alarming indicators?
3) How do you understand the conclusion "that our Earth is a closed and very ecologically fragile system"?
4) What were the findings of the Intergovernmental Panel on Climate Change (IPCC)?
5) How long has global warming been underway?
6) What are the primary engines of global warming?
7) How do you explain the "greenhouse effect"?
8) How can we be affected by excessive global consumption of oxygen?
9) How is destruction of forests related to the discussed problem?
10) What are the current developments that contribute to climate change?
11) Have the poles remained unharmed by the climate change?
12) What are the disaster scenarios for humans if nothing is done to mitigate the climate change?
13) What is likely to happen to flora and fauna in the worst-case scenario?

4. Look at the following temperature charts published by NASA and Hadley Centre (USA). Do you believe that the alarm is grounded?





5. Listening to the text INSIDE THE GREENHOUSE. Listen to the text and outline the points of the scientist's answer according to the sample. Does the interview support or decline your suppositions made in Ex. 4?

Is the Earth really getting warmer?

- there's no doubt at all
- scientists tell us that it is true
- four years out of the last ten have been hottest since records began
- the greenhouse effect continues
- the next hundred years the Earth will have heated up by 4 degrees

But why does it matter if the Earth gets warmer?

- —
- —
- —
- —

And would there be any other effects?

- —
- —
- —
- —

Present the outlines to the group.

6. Match the beginnings and ending of the phrases to make them meaningful. Make sure you know what they mean.

to speed up (slow down)	agriculture and life
to head off (to combat, to reverse)	and cleaners
to address	patterns
to alter the climate	of the greenhouse effect
man-made	a cooling effect
to disrupt	of ozone
disruption	global climate change
to aggravate the impact	substances
to exert	the ozone layer
a built-up	global warming effect
precipitation	earth's protective ozone layer
rainfall	of ozone layer
industrial solvents	global warming
depletion of	records
destruction	gas emissions

ozone depleting	of greenhouse gases
retention and regeneration	taxes
to reduce	the lowest costs
to cut greenhouse	global warming
International	of weather patterns
carbon	by trapping heat in the atmosphere
to reach emission targets at	emission trading

7. Read the following article. Why do the scientists believe that nuclear threat and climate changes may be juxtaposed? Don't they overshadow the issue of global warming?

Hawking warns. We must recognise the catastrophic dangers of climate change

Climate change stands alongside the use of nuclear weapons as one of the greatest threats posed to the future of the world, the Cambridge cosmologist Stephen Hawking has said.

Professor Hawking said that we stand on the precipice of a second nuclear age and a period of exceptional climate change, both of which could destroy the planet as we know it.

He was speaking at the Royal Society in London yesterday at a conference organised by the Bulletin of Atomic Scientists which has decided to move the minute hand of its "Doomsday Clock" forward to five minutes to midnight to reflect the increased dangers faced by the world. Scientists devised the clock in 1947 as a way of expressing to the public the risk of nuclear conflagration following the use of the atomic weapons that destroyed Hiroshima and Nagasaki at the end of the Second World War.

"As we stand at the brink of a second nuclear age and a period of unprecedented climate change, scientists have a special responsibility, once again, to inform the public and to advise leaders about the perils that humanity faces", Professor Hawking said. "As scientists, we understand the dangers of nuclear weapons and their devastating effects, and we are learning how human activities and technologies are affecting climate systems in ways that may forever change life on Earth".

Lord Rees of Ludlow, president of the Royal Society, said humankind's collective impacts on the biosphere, climate and oceans were unprecedented. These environmentally-driven threats "threats without enemies" should loom as large in the political perspective as did the East-West political divide during the Cold War era.

Technology in the 21st century could offer immense opportunities to everyone but it would also present new threats that were more diverse and more intractable than those posed by nuclear weapons, Lord Rees said.

The board of directors of the Bulletin of the Atomic Scientists said the threat of nuclear apocalypse was now almost matched by the environmental threats posed by climate change.

"We stand at the brink of a second nuclear age. Not since the first atomic bombs were dropped on Hiroshima and Nagasaki has the world faced such perilous choices", the board said in a statement issued yesterday.

We have concluded the dangers posed by climate change are nearly as dire as posed by nuclear weapons. The effects may be less dramatic in the short term than the destruction that could be wrought by nuclear explosions, but over the next three to four decades climate change could cause drastic harm".

8. Role-play

Let's imagine that this is a panel on climate change. Divide into two groups: a) Skeptics and b) Optimists. Using the information from the text above and the chart below, organize the discussion of the global warming issue trying to define whether it is as dramatic as it as presented by mass media.

Global Warming. Myth vs. Fact

M Y T H. Although thermometers located at Earth's surface indicate that the planet's average temperature is higher today than it has been for at least 130 years, satellite measurements of the temperature of the atmosphere thousands of feet above the surface indicate a slight cooling since 1979. The surface temperature data is unreliable due to the heat-trapping effect of urban areas. Therefore, there is no compelling evidence that warming has occurred.

F A C T. Since thermometers and satellites measure temperatures at two different places in the atmosphere, it is not surprising that the trends sometimes differ. At higher altitudes, temperatures fluctuate more than at the surface due to natural climate influences like sunlight-reflecting particles from volcanoes. This variability or noise in the satellite record obscures the warming trend due to the build-up of the greenhouse gases which is apparent in the global surface temperature data. Furthermore, the depletion of the ozone layer, which has occurred mostly since 1979, has had a cooling effect on the atmosphere which is more marked at higher altitudes than at the surface. Earth's surface has warmed over both the northern and southern hemispheres, and the warming is apparent in data taken both on land and at sea. Therefore, the urban "heat island" effect could not be causing much of the observed warming.

M Y T H. Changes in temperature and changes in greenhouse gas emissions over the past century did not occur simultaneously. Therefore, measured warming cannot be due to the greenhouse gases.

F A C T. Many factors have influenced climate in addition to the buildup of greenhouse gases, so there is no reason to expect the two trends to match exactly.

However, computer models indicate that warming due to the greenhouse gas build-up will dominate the other factors over the coming decades. These factors include small changes in the output of the sun, a haze of particles arising from volcanic eruptions and from fossil fuel burning which reflects sunlight, and natural variations of climate.

In addition, the slow heating of the oceans leads to a lag between emissions and their effect on temperature. Therefore, a simple overlay of greenhouse gas emissions and temperature data is deceptive. When global temperatures are simulated with a computer model which accounts for most of the additional influences, the result is consistent with the observed warming, and the buildup of greenhouse gases is a dominant factor.

M Y T H. Computer models are unreliable as a guide to future climate change because they do not reproduce past changes. In particular, they fail to account for the one-half degree warming over the past century.

F A C T. When changes in the haze of particles as well as greenhouse gases are taken into account, the models simulate a global temperature trend over the past century which is consistent with the observed warming. In addition, there is increasing agreement between the geographical pattern of climate change predicted by the models and the measured pattern of temperature change. Models reproduce other key features of global climate, including the magnitude of the temperature variation from winter to summer and aspects of ancient climates inferred from ice cores, pollen and fossil data.

M Y T H. Carbon dioxide is removed from the atmosphere fairly quickly, so if global warming turns out to be a problem, society can wait until after consequences occur to reduce greenhouse gas emissions.

F A C T. Carbon dioxide, which is emitted largely by combustion of fossil fuels, is the most important human-made greenhouse gas. If emissions of carbon dioxide were halted today, it would take more than a century for the atmospheric level of carbon dioxide to approach its pre-industrial level. Furthermore, about 15 % of all the carbon dioxide which has been emitted already would remain airborne for thousands of years, causing warming indefinitely. In addition, the slow warming of the ocean creates a lag between emissions and their full effect on temperature. In others words, the consequences of past emissions are not yet entirely apparent.

M Y T H. Rapid warming occurred at early times without catastrophic consequences, so society and ecosystems can adapt readily to any foreseeable warming.

F A C T. Rapid warming occurred in some places at the end of the last glacial period, but since then, global climate has been stable for ten thousand years. During this time agriculture and civilization arose, leading to fixed settlements, infrastructure, and large populations in areas which are highly vulnerable to climate shifts, such as low-lying coastal zones.

Furthermore, the existence of rapid climate changes in the distant past provides only limited insight into the fate of natural ecosystems. Previously, rapid climate changes may not have occurred everywhere at once, as they are expected to in the future. Furthermore, there were no human-made barriers to inhibit adaptation by ecosystems. In contrast, human settlements, highways, and farmland will block migration of species adjusting to the warming climate of the coming century.

M Y T H. Warming has been occurring largely at night, which is less of a problem than daytime warming.

F A C T. Warming over the past century has occurred both during the day and at night, but night-time warming has been the greater of the two. The buildup of the haze of particles from combustion discussed above has probably contributed to this asymmetric warming. But as warming continues, the tendency toward night-time warming is expected to diminish, in part because the slow heating of the oceans causes a uniform atmospheric warming over time. In any event, night-time warming would be experienced by society and ecosystems differently than daytime warming, but may be no less problematic. For example, the northward spread of certain infectious diseases is currently limited by cold night-time temperatures.

M Y T H. The IPCC has reduced its projected global warming by 1/3. If we wait a little longer, the threat of human-induced climate change may disappear altogether.

F A C T. Computer models of climate have been adjusted to account for the cooling effect of particle haze, which has resulted in lower projections of global average warming by year 2100. The reflection of sunlight by particles partially masks, but does not eliminate, the buildup of the greenhouse effect. When developing countries like China move to reduce the emissions of sulfur dioxide which generate these particles (as the U.S., Europe and Japan already have in order to reduce health effects and acid rain), the hidden warming inevitably will be revealed.

M Y T H. Human activities only contribute 4 % of CO_2 emissions; the rest comes from natural sources like decaying vegetation and forest fires started by lightning. The human contribution is too small to have a significant effect on climate, particularly since the oceans absorb most of the extra CO_2 emissions.

F A C T. Before human beings began to affect the level of CO_2 in the atmosphere, the natural emissions of CO_2 were nearly exactly balanced by natural process which remove CO_2. As a result, the amount of CO_2 in the atmosphere had changed very little for 10,000 years. The additional source of CO_2 from human activity like burning coal and oil for energy, has thrown the system out of balance. Although the oceans and forests absorb about half the CO_2 emitted by industry, the rest builds up in the atmosphere. As a result, CO_2 levels are now 30 % above what they were in pre-industrial times. Similar changes of CO_2 occurred naturally tens

of thousands of years ago and they were generally accompanied by large shifts in global average temperature.

M Y T H. The build-up of CO_2 will lead to a "greening" of the earth because plants can utilize the extra CO_2 to speed their growth.

F A C T. Under the controlled conditions which occur in a greenhouse with ample water and fertilizer, plants grow more rapidly in an atmosphere enriched by CO_2. The extent that this effect carries over into natural systems like forests is unknown. Some plants, potentially including weeds, may benefit while others may not. The consequence for forests and other ecosystems is uncertain, but it is unlikely to counteract the adverse impacts of a rapid climate change.

M Y T H. If Earth has warmed since pre-industrial times, it is because the intensity of the sun has increased.

F A C T. The intensity of the sun continuously changes, but there were no direct measurements of the size of these shifts before 1979. Indirect evidence suggests that the Sun's variations in the past may have been large enough over the course of centuries to affect Earth's climate significantly. However, a recent estimate indicates that the

9. Present your consolidated and balanced standpoint on global warming in a written argumentative essay "Global Warming. Myth or Reality?"

V. TYPES OF ENVIRONMENTAL POLLUTION. NEW TECHNOLOGIES AND SOLUTIONS

1. Divide into the groups and discuss the following. Have you seen the signs of air / land / water pollution in your city / village? Which of them do you think is the most / least dangerous for the human being? animals? flora?

Use the following words and expressions.

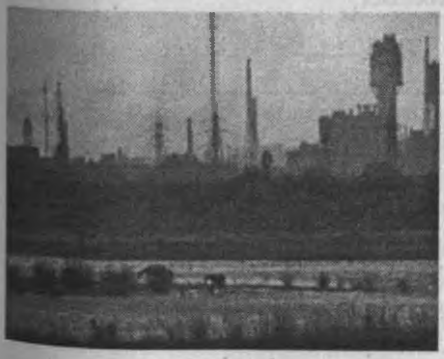
HARMFUL INFLUENCE OF THE HUMAN. industrial impact, to upset the biological balance, to abuse nature

POLLUTANTS / CONTAMITANTS. to contaminate, to pollute, a range of pollutants, release / effluence / discharge of...

2. Now look at the pictures, what do they have in common? Describe in brief what you see in them using the following phrases.

in gridlock • bumper-to-bumper traffic • (to) grind to a halt • palls of smoke • (to) obscure • blazing • raging • an eyesore • (to) mar • an otherwise idyllic landscape • frustrating / disturbing / saddening / disgusting • a stifling atmosphere • (to) choke • thoughtlessness / carelessness • deliberate disregard for the long-term consequences of...

The photos deal with different aspects of...



3. Consider the vocabulary below. Make sure you understand the meaning and know the pronunciation of the following. Choose among the preventive measures enumerated under the chart specific for each cause of air pollution.

AIR/ATMOSPHERE POLLUTION		
CAUSE	**DANGERS**	**PREVENTATIVE MEASURES**
Combustion of sulphur-containing fossil fuels (coal)		
smoke	deposits soot on buildings and trees, causing them damage. Permeates the air, making it difficult for living creatures to breathe	
sulfur dioxide (SO_2)	contributes to acid rain	
Traffic emissions (petrol and diesel-engined motor vehicles)		
carbon monoxide (CO)	poisonous gas	
carbon dioxide (CO_2)	greenhouse gas that contributes to global warming	
oxides of nitrogen (Nox)	poisonous gas	
volatile organic compounds (VOCs)	have increasing impact on urban air quality	
particulates (PM10)	have increasing impact on urban air quality. Diminishes life expectancy	
Photochemical reactions resulting from the action of sunlight		
action on NO_2 and VOCs from vehicles → ozone, a secondary long-range pollutant	impacts in rural areas often far from the original emission site	
Industrial processes		
emission of CFCs	greenhouse gases	
solid waste disposal		
accumulation of waste	strong odour and humidity, right conditions for pests (houseflies) and bacteria growth	
Forest fires / burning wood / leaves, firewood		
release of particulates into atmosphere	causing smog and haze results in poor vision and strong smells, causing acute fits of asthma and other respiratory maladies	

installing particulates/gas trappers on factory chimneys, using alternative power cars, "green" cars on hydrogen, recycling waste, digging fallen leaves in autumn, phasing out CFCs, curbing MPC (maximum permitted concentrations) for dangerous chemicals, using alternative (solar, wind, water) power sources, building sustainable communities which practice energy preserving technologies, using biological filters

4. Read about one of the consequences of air pollution, acid rains. Divide in three groups and discuss. A) the main reasons of their formation, B) the main dangers they may present and C) the ways of their preventing. Exchange your information with the other groups.

What is Acid Rain?

Modern industry produces a lot of dangerous gases. Two of the most dangerous are sulphur dioxide and nitrogen oxide. To stop pollution near factories and power stations, these gases enter the atmosphere from high chimneys. Then they mix with water in the air. After that the wind carries them for hundreds or even thousands of kilometers. Finally, the mixture of water and chemicals falls back to earth as acid rain.

The Size of the Problem

Here are some facts and figures on acid rain pollution in Europe.
Seven million hectares of European forest are dead or dying because of acid rain.

Country	% of Forest Dead or Dying
West Germany	54 %
Switzerland	50 %
Netherlands	50 %
Poland	27 %
Austria	25 %
Belgium	4.5 %
Denmark	2.9 %

- 80 % of the lakes in south Norway have acid pollution. 50 % of that pollution comes from Britain.
- Sweden receives 6 times more sulphur dioxide from other countries than it produces itself.
- 60 % of Britain's sulphur dioxide comes from power stations which use coal.
- Britain produces 3.6 million tonnes of sulphur dioxide every year. 75 % of it falls in other countries as acid rain.
- The soil in parts of Scandinavia is now 10 times more acid than 50 years ago.
- In Britain there are dangerously high levels of acid in 120 Welsh rivers and 57 Scottish lakes. When scientists tried to put new fish into one lake, all the fish died in less than two days.

- Acid rain doesn't just kill trees and lakes. It's also attacking many of Europe's most famous buildings — Notre Dame in Paris and St. Paul's in London, for example. Also, doctors now think that acid rain can harm people, too. Figures show more lung and kidney illness in countries with high levels of acid pollution.

Is it Possible to Stop Acid Rain?

The short answer is "yes", but not quickly or easily. That's because money is at the centre of the acid rain problem. It's not cheap to make power stations or factories cleaner. In other words, less acid rain means more expensive electricity. Even so, that's a price, which some countries are ready to pay. In 1983 a group of European nations, The 30 % Club, agreed to produce 30 % less acid rain pollution by 1993. (Britain didn't join the club. Instead it agreed to spend £770 million on the fight against acid rain.) The cost of their plan was $1.4 billion — an extra 4 % on the average electricity bill.

It's a start, but many scientists believe it's not enough. In parts of Norway, for example, the acid level needs to be 80 % lower, not 30 %, to save the environment.

Many young people are worried about the acid rain problem, too. In fact, several British and Norwegian schools are now twinned and send each other information about acid rain. Also, there's a project called "Acid Drops" in Britain. This helps science classes to study the problem. In 1986 (European Year of the Environment) there was even an international "Acid Drops" project. Students all over Europe produced information and sent it to scientists, politicians and environmental groups like "Friends of the Earth".

5. Now look at the picture, which you may comment having considered the vocabulary below. Make sure you understand the meaning and know the pronunciation of the following. Choose among the preventive measures recommended for individuals enumerated under the chart specific for some causes of water pollution. What other preventive measures would you recommend for the industrial causes?

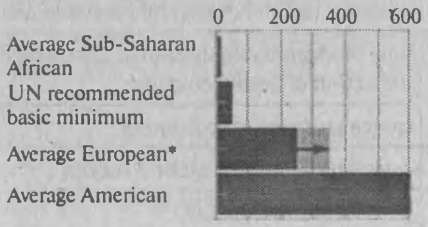
WATER POLLUTION		
CAUSES	**DANGERS**	**PREVENTATIVE MEASURES**
Domestic sewage		
congested communities	in developing countries may cause various infectious diseases	
absence of drinking water and sewage segregation		
Industrial waste		
asbestos	a serious health hazard and carcinogenic	
lead	non-biodegradable substance, can inhibit the action of bodily enzymes	
mercury	can cause mercury poisoning	
nitrates	causes problems for marine habitat	
sulphur	harmful for marine life	
oils	forms a thick layer on the water surface preventing the process of photosynthesis in marine plants, kills fish and birds	
Nuclear waste		
radioactive traces	land and water nuclear contamination	
Underground storage leakages		
underground storage tanks corrosion	leakages into the surrounding soil and groundwater	

- Conserve water by turning off the tap when running water is not necessary. This helps prevent water shortages and reduces the amount of contaminated water that needs treatment.
- Be careful about what you throw down your sink or toilet. Don't throw paints, oils or other forms of litter down the drain.
- Use environmentally friendly household products, such as washing powder, household cleaning agents and toiletries.
- Make sure that you take great care not to overuse pesticides and fertilisers. This will prevent runoffs of the material into nearby water sources.
- By having more plants in your garden you are preventing fertiliser, pesticides and contaminated water from running off into nearby water sources.
- Don't throw litter into rivers, lakes or oceans. Help clean up any litter you see on beaches or in rivers and lakes, make sure it is safe to collect the litter and put it in a nearby dustbin.

6. Consider the facts concerning water consuming and polluting on the Earth. What ways of solving the problem do you see? Start from the individual solutions and then sum them up at the global level.

We all need clean, fresh water. Without it, we die in three days. But in many parts of the Third World, clean water is rare. Instead, people have to drink dirty water. Then they become ill. Then they can't work. Then they can't afford to buy food. Like soil erosion, the water problem often ends in death. Here are the facts.

1) Over 2 billion people don't have clean water.
2) 80 % of the world's diseases come from dirty water.
3) Nearly 30,000 people die every day from these diseases.
4) 50 % of the people in hospitals are there because of "dirty water" diseases.



Water use around the world (all figures approx, in litres per person per day)

7. Water pollution also presents a great risk for coral reefs. Listen to the text REEFS AT RISK.

A. Part 1. Listen and complete the following statements.

Reefs affected worldwide. 1__ per cent.
Regions at greater risk. 2__
3__

Causes of the problem.
Construction of 4__ and 5__
6__ discharge
7__

Pollution from 8__ and 9__.
Catching fish by means of 10__ and 11__.

B. Part 2. Listen and decide which statements are true or false.

1) Fish are inevitably threatened with extinction as a result of tourists visiting coral reefs.
2) Many countries with coral reefs earn most of their income from tourism.
3) Irresponsible tourists might be tempted to damage coral reefs.
4) Tour operators are unable to influence hotels' environmental policies.

* Consumption differs between European coutries, ranging from 250–350 litres/day.

5) Cleaning up the environment in areas with coral reefs is not cost-effective in the long term.

8. The third type of pollution affects land/soil. Look at the picture and describe how the land may be polluted. Use the following words and phrases.

An open dump • discarded household goods • (to) blot • to pollute land • to pollute/contaminate land • to litter the land

9. Deforestation is one of the most acute effects of land pollution. Compare the two pictures below and comment on the difference discussing separate continents. Where is the deforestation most obvious?

World Forests 8000 BCE World Forests 2000 CE

10. Read the text below and fill in the gaps with the phrases given below.

Erosion; solvents and cleaners; land pollution; dispersing them over the surface; dumping waste materials; use of agrochemicals; denudation of soil; mercury, lead; minerals and medicines; deforestation; drainage waters; by-products of massive industrialization; derelict; storing radioactive wastes; overexploit; industrial wastes.

Land Pollution

The issue of __stands out among the most topical nowadays since the factors causing it range from __on land to abusing land by agriculture.

The former lies in the sphere of industrialization and search of new sources of energy. This brings, for example, nuclear technologies to the necessity of __in the land, which in the end may result in __or under it by __. The other __are chemical and other __, which include __and various types of __.

Agriculture nowadays affects land so that __is not a rare case. The immediate consequence of this is __. In Africa, for example, the Sahara desert is growing bigger every year. That's what happens when farmers __or misuse the land. As a result of the denudation of soil, the wind blows it away or erodes it. Extensive __as well as herbi- and pesticides makes the land __.

The other aspect of land pollution is __. 40 % of the world's rainforests have disappeared in the last 80 years. Today in South America 50 hectares disappear every minute. This is happening because people need wood and paper, __and more room for farms and houses.

11. What do you think are the ways to cope with the high-tech pollution crisis? Read the following article and confirm or present arguments against the statements below using the text and your background knowledge.

The Era of High-Tech Pollution

Implausible as it sounds, the recycling of high tech garbage is becoming a big concern. In the last few decades we have been like children in a toyshop, rushing to get our hands on the latest electronic gadgets. Manufacturers have obligingly brought out new toys faster than we can buy them. And of course the more we buy, the more we end up throwing away.

The speed of turnover is frustratingly high. But while frustration is transient, the toys on the scrap heap are not. Computers have an average lifespan of five years, and the speed of development, combined with plummeting prices, is reducing this further. If a computer has a fault, it is more economical to throw-it away and buy another one than to mend it.

This trend is not confined to computers either. Germany, Europe's richest nation, discards 1.5 million tons of electrical appliances every year. Only about 100,000 units are recycled. The vast majority is incinerated, and this, Germans are learning, causes serious problems. One of the country's major recycling firms has been charged with dumping toxic waste containing the substance PCB, once widely used in TV-sets and computers as insulation. Since 1985 its production has been illegal, and disposal is governed by strict rules. But the rules are not being followed.

Klaus Brodersen of Erlangen University is trying to produce a definite classification of what chemicals should and should not be allowed in the production of high tech equipment. But it is an uphill struggle. It costs up to £7.000 to analyze a single component.

Even such seemingly simple things as computer casings are bafflingly recycle-proof. Siemens Nixdorf, which runs a very expensive recycling program, says there are more than 100 different plastics in its computer casings and no one knows precisely what went into each model. The only certainty is that all the casings contain bromine, a kind of toxic anti-flame component.

So what is to be done about electronic waste? Eco-visionaries propose a future in which appliances not bought but leased, remain the manufacturer's responsibility to the bitter end. This would be a tricky practice, though. Who would take back the equipment — the dealer, manufacturer or importer? What if the firm has gone out of business? Who is going to monitor the manufacturers and ensure that the goods aren't just shipped to countries with laxer regulations?

The Swiss have addressed the problem by making a charge at the time of purchase to cover all disposal costs. In Germany, where such a system is on the books but has yet to come into force, there is chaos. Some firms collect without charge, others make you pay, some accept all goods, others just their own — and many refuse to have anything to do with it. Municipal authorities are just as disorganized.

The answer to all these problems lies in intelligent design, with an emphasis not only on economy but also on ease of disposal. Increasing the life expectancy of products would also alleviate the problems.

1) The speed of the turnover of electronic equipment presents a problem for environment.
2) It is more economical to throw a computer than to mend it if it is defective.
3) Only 10 per cent of electric appliances in Germany are recycled.
4) PCB, a chemical matter, which was used for insulation, is now illegal.
5) Working out a list of recommended components for high-tech production is a senseless task.
6) Bromine is a component, which always composes computer casings.
7) The practice of leasing high-tech equipment may solve the problem of technological pollution.
8) There is a European accord about the ways the high-tech equipment should be disposed.
9) Designing computers of degradable materials may become the solution.
10) Life expectancy of computers is impossible to increase.

12. Find in the Internet or periodicals an article dedicated to the solutions of the problem of pollution by using new "green" technologies. Organize your presentation according to the following plan.

- The type of pollution the new technology helps to eliminate.
- The area of science within which this technology lies.
- The essence of the new technology (in brief).
- Opinion of the experts as for the perspective of the technology.
- Your opinion of the perspective of this technology in the country.

After all the presentation have been made, organize a panel discussion of the issue to work out the basic ways of overcoming the global pollution crisis.

VI. WASTE MANAGEMENT. MODERN TECHNOLOGIES

1. Divide into groups and discuss the following: a) don't you think that modern marketing technologies aggravate the problem of growing the amount of refuse in the cities? b) do you consider the situation with waste recycling in your city satisfactory? c) what simple solutions to the problem would you offer?

Use the following words and expressions.

GARBAGE/WASTE: packing materials; recycled bags, packages and plastic bottles; trash containers, over-wasting city sites; carelessly deposited garbage; contaminated community, littering roads, highways and railways.

SOLID-WASTE MANAGEMENT: refuse disposal systems; salvageable materials.

What is common in the following two pictures? Answer using the words and expressions above.

2. Now consider the vocabulary, which may help you to be more specific talking about the issue of over-wasting the environment and its management. Make sure you understand the meaning and know the pronunciation of the following.

WASTE
carelessly deposited garbage
a prime source of disease

a breeding ground and food source for flies, rats, and other carriers of disease	
refuse generated per person	
SOLID WASTE (refuse, garbage)	**SEWAGE (wastewater)**
to feed on raw garbage	infection of water supplies
to contract diseases	to handle storm runoff
trichinosis	ineffective segregation of sewage and drinking water
to pass a disease along to humans	disastrous epidemics of cholera and typhoid fever
toxic chemicals and radioactive materials	the addition to sewage of manufacturing waste
disposed of improperly	
contaminated communities	
careless handling or decomposition of toxic chemicals	
littering roads and highways	
indiscriminate dumping wastes	
dumping garbage at sea from scows	
degradable/non-degradable plastics	

WASTE MANAGEMENT TECHNOLOGIES	
Waste disposal collection/processing/recycling/deposition of the waste materials	
materials salvage	
SOLID-WASTE MANAGEMENT	**SEWAGE TREATMENT**
refuse disposal system	sewage system
heat treatment of garbage	disposing of organic refuse in water
to prevent the transmission of diseases	food grinder attached to the sewage system
manual picking up trash bags from individual households	collection pipes and mains
mechanical emptying large community trash containers into trucks	treatment works
trucks equipped with compactors to maximize their capacities	to drain wastewater
a disposal site	domestic and industrial sewers
a sanitary landfill	storm sewers
an open dump	pass through treatment plants

refuse dumped into trenches	to accept the enormously enlarged inflow from rainstorms
levelled and compacted with a bulldozer	to provide adequate velocity for the dry-weather flow of the waste water
to transport refuse to areas with sparse populations	removal of organic matter
incineration	to pass through large mesh screens
combustible refuse	screening and grit removal
combustion stages	sedimentation (suspended solids/sludge settling)
cleansing exhaust gases	the Imhoff tank
recycling salvageable materials. metal, glass and newsprint	solids decomposed by bacteria
deposits on beverage containers (refundable with the return of the containers)	to promote the coagulation of the finer suspended solids
to reduce roadside litter	microorganisms and bacterial slime
products made of recycled paper	use of trickling and sand filters
	activated-sludge process
	aeration by jets of compressed air
	organic matter oxidized by the microorganisms
	decomposed to produce methane gas

3. Now that you have familiarized yourselves with the vocabulary of the topic, read the following text about the main consequences of over-wasting the environment and modern technologies of the waste-management, solid waste disposal and sewage systems.

Waste disposal is the collection, processing, and recycling or deposition of the waste materials of human society. The term "waste" covers both solid wastes (refuse, or garbage) and sewage (wastewater).

What is Solid Waste Disposal Systems?

Solid Waste Disposal Systems are the technique for the collection and disposal of the solid wastes of a community. The development and operation of these systems is often called solid-waste management.

Has it always been the same in human history?

Although all societies have had some systematic form of refuse disposal, it was not until relatively recent times that the modern concept of solid-waste management became recognized as an essential health and welfare service.

Carelessly deposited garbage was for centuries a prime source of disease, whether through the infection of water supplies or as a breeding ground and food source for flies, rats, and other carriers of disease. Because pigs were often permitted to feed on raw garbage, they contracted such diseases as trichinosis, which was then passed along to humans. In the early 20th century Britain began heat treatment of garbage to prevent the transmission of such diseases.

How Did Industrialization Aggravate the Issue?

The industrialization of modern societies resulted in a vast increase in the amount of refuse generated per person. Industry has created new types of waste, especially toxic chemicals and radioactive materials that are highly dangerous to public health and safety if they are disposed of improperly. There have already been several instances of entire communities being contaminated and evacuated because of careless handling or decomposition of toxic chemicals.

How We Ourselves Contribute into the Problem?

Individuals share in the carelessness by littering roads and highways with trash and indiscriminately dumping such items as wrecked cars and old refrigerators. Estimates for the United States have put the bulk amount of these materials at 20,000,000 cubic yards (15,300,000 cubic metres) per year.

How is the Refuse Processed Now?

Refuse is generally collected either by manually picking up trash bags from individual households or by mechanically emptying large community trash containers into trucks equipped with compactors to maximize their capacities. The refuse is then taken to a disposal site, of which the favoured design site is a sanitary landfill. Refuse of a landfill — as opposed to garbage in an open dump which is left exposed — is dumped into trenches, levelled and compacted with a bulldozer, and then covered with a layer of soil. When the landfill has reached its full capacity after a period of years, it may be used as a recreational area. Many cities have begun to run short of landfill space, however, and have begun to transport refuse to areas with sparse populations.

Is Incineration a long-term alternative?

Incineration has proved to be a satisfactory means of refuse disposal in areas where there is little or no landfill capacity. Combustible refuse is brought to a plant that is, in effect, an enormous furnace. There it is burned thoroughly by putting it through two combustion stages, and to protect air quality, the exhaust gases are cleansed. The expense of such a system can sometimes be reduced by putting the heat energy to use; plants of this type are in operation in Munich, Frankfurt, Paris, and Montreal.

Is the Issue of Waste in Water Solvable?

Disposal of refuse in water often creates pollution that can be a hazard for living things; for this reason the long-practiced method of dumping garbage at sea from scows has been greatly restricted. A relatively effective and safe method of disposing of organic refuse in water is the use of a food grinder attached to the sewage system of a household or food-handling establishment. Although these devices add only a small quantity of water to the community sewage system, they do increase the amount of solid material that must be handled at the treatment plant.

Salvageable Materials

How to recycle? The practice of recycling such salvageable materials as metal, glass, and newsprint began in earnest during World War II and has been revived to some extent since the early 1970s. Several states have passed laws requiring deposits on beverage containers (refundable with the return of the containers), which has resulted in reduced roadside litter. A variety of salvage companies have been established; products made of recycled paper, for example, have become common.

Using the information given in the text above, confirm or discard the following statements.

1) Solid-waste management is the technique for collection and discrimination wastes.
2) The term "waste" covers refuse and garbage.
3) Manual packing up trash bags was a prime source of disease.
4) Solid wastes are a breeding ground and food source for flies, rats and other carriers of disease.
5) Rats were the main contractors of trichinosis.
6) The growth of industries in modern society resulted in the big amount of garbage.
7) Toxic chemicals and radioactive materials disposed improperly can contaminate communities evacuated in the places where they are dumped.
8) Indiscriminate dumping wastes causes littering roads and highways.
9) Compactors in the trash collecting trucks are used to avoid contaminating communities with the waste.
10) There is no principal difference between an ordinary dump and a landfill.
11) The landfill is a completely derelict land when it has reached its full capacity.
12) Incineration is possible only for combustible waste.
13) The expense of an incineration plant can be reduced by using its exhaust gases.
14) A food grinder in the household is a way to avoid polluting water by solid refuse.

15) The drawback of the food grinders is adding solid waste for processing it in the plant.
16) Salvageable materials are recycled due to the practice of fining the population for littering the roadsides.

4. Now you will find out about the history and modern technologies of cleansing water. Read the text and answer the questions below.

Sewage systems are the collection pipes and mains, treatment works, and discharge lines for the wastewater of a community.

Early civilizations often built drainage systems in urban areas to handle storm runoff. The Romans constructed elaborate systems that also drained wastewater from the public baths. During the European Middle Ages these systems fell into disrepair. As the populations of cities grew, disastrous epidemics of cholera and typhoid fever broke out, the result of ineffective segregation of sewage and drinking water. As the correlation between sewage and disease became apparent in the mid-19th century, steps were taken to treat wastewater. The concentration of population and the addition to sewage of manufacturing waste that occurred during the Industrial Revolution increased the need for effective sewage treatment.

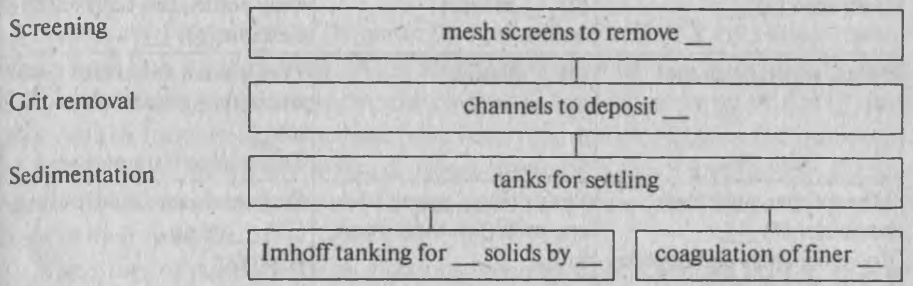
Modern sewage systems fall under two categories: domestic and industrial sewers, and storm sewers. Sometimes a combined system provides only one network of pipes, sewer mains, and outfall sewers for all types of sewage. To avoid pollution, all wastewater should pass through treatment plants, but it is uneconomical to build plants large enough to accept the enormously enlarged inflow from rainstorms and to treat sewage at the same time. In addition, a combined system must be made so large that it may not be able to provide adequate velocity for the dry-weather flow of the wastewater alone. The preferred system provides separate sewers for human waste, which is then generally treated before discharge.

1) Do you think it is so important for the community to provide appropriate treatment of wastewater?
2) Can combined systems create difficulties or even disasters? Share your opinions.

5. Read the next part of the text, look at the scheme below and complete the missing stages and elements of the process of sewage treatment. Using the scheme give an outline of sewage treatment.

Sewage treatment entails the removal of organic matter and is usually accomplished in two stages. In the first, or primary, stage sewage is first passed through

large mesh screens to remove such large objects as wood, rags, and wire. It is then run through channels at a controlled velocity so that sand and ash grit is deposited on the bottom. After screening and grit removal, the sewage is passed into large tanks about 10 feet (3 metres) deep where many of the suspended solids (sludge) settle in a process called sedimentation. Two additional methods can supplement primary treatment. The Imhoff tank, developed by the German engineer Karl Imhoff, is a second compartment under the settling tank where solids are further decomposed by bacteria. Chemicals can also be added to the sewage to promote the coagulation of the finer suspended solids, so that they become heavy enough to settle in sedimentation.



Primary treatment of sewage

6. Now read the description of the secondary stage of sewage treatment. Answer the questions.

The secondary treatment of sewage produces an effluent clean enough for discharge. The work of further purification is performed by microorganisms and bacterial slime, most commonly through the use of trickling and sand filters or the activated-sludge process. The organic matter remaining in sewage after solids have been removed is mainly in a dissolved state. The trickling filter is a bed of stones covered by a thin film of purifying slime through which sewage, sprayed from above, is allowed to trickle. It then runs onto a bed of sand that filters the water clean. The activated-sludge process utilizes sludge that has been allowed to breed microorganisms. The sludge is mixed with treated sewage and then aerated by jets of compressed air over a period of several hours; during this time the organic matter is oxidized by the microorganisms. Afterward the sewage is returned to settling tanks and then aerated a second time.

Sludge from both primary and secondary treatments is collected from the various tanks and hauled out to sea and dumped or buried in sanitary landfills. It may also be used, in liquid or dried-out form, as fertilizer. By placing it in digestion tanks heated to an optimal 95° F (35° C) it can be further decomposed to produce methane gas, which can be used to run the machinery of the treatment plant.

1) What are the main types of secondary treatment of wastewater?
2) How is trickling performed?
3) What is the role of aeration in the sewage treatment?
4) How can sludge be used afterwards?

7. Now listen to the text THE QUICK RECYLCING GUIDE. Complete the table.

The Quick Recycling Guide

Please consult this chart before recycling.

Unbroken (1) __	(2) __, mirrors	Only bottle glass is recyclable. Ceramics (3) __ .
Plastic which bears the (4) __	(5) __ plastic.	Even a small amount of the wrong type of plastic can (6) __ . Throw away if unmarked.
Mixed paper, junk mail, computer (7) __ . dry newspapers and newspaper (8) __ , cereal boxes.	Wet or (9) __ paper, stickers, milk (fast food wraps, foil).	Pack newspaper tightly using (11) __ twine. Keep dry.
(12) __ such as lawn chairs and window frames. Empty (13) __ , caps, lids and foil.	Magnetic (14) __ parts. Spray cans may have held paint or (15) __ material.	Aluminum is not attracted to magnets.

- There is no need to remove (16) __ from cans and bottles.
- Keep motor oil and (17) __ out of the environment. Call your council if you need to dispose of used car (18) __ .

8. Look at the text about the challenges of recycling plastics. Read it and make up a synopsis in two groups. A) enumerating problems and B) ways of their solution. Exchange your information organizing a discussion.

Ecological Nightmare

Plastic is a fraud. It cheats the laws of nature. It is born, but does not ever really die. Plastic is designed to be impervious to natural decay, which is why it's so useful for wrapping sweaty sandwiches in. Because it doesn't erode, this makes it an ecological nightmare. Twelve billion plastic bags are handed out to shoppers in Britain every year.

Most plastic ends up in a landfill site, it will never biodegrade, but thanks to the biological conditions which exist in landfills, neither will organic waste such as onion skins and nail clippings or hamburgers, which can remain intact

for decades, 27 m tonnes of it accumulating year by year. If someone in the future excavates these sites, they almost certainly will be living on a planet empty of blue whales, elephants and tigers. What they will have, however, are billions and billions of bags with the word Asda or Miss Selfridge stamped on the side.

Government targets may mean that plastic bags in the future will be recycled, but this will be tricky. One problem is that a variety of plastics exist which cannot be recycled together. Contamination or mixing of plastics may render the material unusable, and even when successful, plastics can only be recycled a few times. Of the 15 million plastic bottles used in the UK every day, less than 3 % get recycled.

The seabed is becoming increasingly "plasticized". Half a kilometre down, plastic bags float on the bottom of the Mediterranean in densities per hectare; and 550 plastic bottles per kilometre were recovered in a recent survey of Bristol Channel coast. In Indonesia, plastic bags have been reported clogging up the pumps at water refineries. Turtles in the Bay of Biscay commonly die of ingestion of plastic bags. Seabirds too, have plastic so fragments in their stomachs, and plastic molecules in their muscles.

The irony of plastic waste as a serious environmental problem is that, unlike fossil fuel consumption or rainforest destruction, it is easily solvable. Plastic is an immensely useful material. We use it, however, as though it has no downside at all. We must reduce our use of plastic. As shoppers we should use non-disposable bags to carry shopping, or simply refuse a bag when we buy something. We have a national obsession with wrapping everything in plastic; it is unnecessary and, environmentally, deadly.

9. The problem of waste treatment does not encompass the issues described above. Organize a panel discussion of the problem having distributed the following topics:

1) Toxic wastes. potential and real dangers
2) Degradable and non-degradable plastics as the main source of refuse in a modern city. How to solve the problem?
3) Radioactive pollution. Where to store the wastes?
4) Discriminate waste dumping. Is it really necessary?
5) Discriminate waste dumping. European success story
6) Incineration. Cleansing or polluting?
7) Recycling paper
8) Recycling industrial wastes
9) Recycling domestic wastes and composting
10) Recycling glass
11) Recycling fuelling elements (batteries, accumulators, etc.)

VII. ALTERNATIVE SOURCES OF ENERGY. GREEN TECHNOLOGIES. PROS AND CONS

1. Divide into groups and discuss the following: a) have you ever noticed any signs of searching for alternative sources of energy in your neighbourhood? b) do you consider it necessary to look for alternative sources of energy in your city? c) what solutions would you offer?

   Use the following words and expressions.

   ALTERNATIVE SOURCES OF ENERGY: renewable energy, wind power, solar energy, geothermal energy, water power.

2. Now consider the vocabulary, which may help you to be more specific talking about the issue of finding alternative sources of power. Make sure you understand the meaning and know the pronunciation of the following.

ALTERNATIVE SOURCES OF ENERGY: renewable energy, wind power, solar energy, geothermal energy, water power, hydro-electric power, tidal power, wave power	
Wind power	
'Wind farms'	rotate at 10–30 revolutions per minute
blades	face into the wind
generator	spin a shaft inside the turbine
noise generated from wind turbines	cause some slight electromagnetic interference
Solar power	
photo cells converting sunlight into electricity	paint water pipes black
photovoltaic cells (PV's) used as roof tiles	put water pipes in a "greenhouse" type insulator
easy to install	replace the need for other materials
Geothermal energy	
over 6, 500 km below the crust	circulate fluid through the warm ground
The upper 3 m of the Earth's surface	emit only excess steam and very few trace gases

district heating	outweigh the cost of installing and running the system
geothermal heat pumps	become competitive with traditional power plants
a turbine driven by steam, which then drives a generator	circulate water through the hot dry rock
advanced drilling techniques	identify deep geothermal aquifers
impact of drilling wells	
molten and semi-molten magma of the Earth's core	
Water power	
Hydro-electric power	
reservoir with a dam	hold back a mass of water
up and running station	suddenly release mass of water
	find sites for stations
Tidal power	
	use the gravitational pull of the moon
	create tidal rises and falls
Wave power	
	capture mass of kinetic energy created by waves

3. Read about one of the alternative sources of energy, wind power. Consider its principle of functioning, advantages and disadvantages as well as costs and perspectives.

Wind power

Wind farms

- The most common way of getting energy from the wind is through setting up "Wind farms". When they were first introduced they were very expensive, however, over the years, initial costs have fallen, and therefore the cost of getting electricity from the wind has dropped considerably.

How they work

- Wind turbines generally have 3 blades and they rotate at 10–30 revolutions per minute. The blades face into the wind, the wind forces them to go round, which then spins a shaft inside the turbine, which is connected to a generator which produces the electricity.

The advantages

- Wind power enables electricity to be produced in an environmentally friendly way — the turbines do not produce chemical or radioactive emissions. The

ground on which the turbines are positioned can still be used for agricultural purposes — such as sheep grazing. If the turbines need to be taken down, there is no damage to the environment and no residues are left behind.

The disadvantages

- There are concerns from some people who are worried about wind farms being positioned in their area. The main worries are that they ruin the landscape — because they generally have to be positioned on hills to get the maximum benefits of the wind.
- Wind farms also take up much more space to produce the same amount of energy as other methods such coal-fire powered stations.
- Wind farms can be costly to maintain and electricity produced by this method is more expensive than that produced by other means. There are arguments that the money would be better put into energy conservation.
- The noise generated from wind turbines has been criticised by some people who live very close to the wind farms.
- The turbines can cause some slight electromagnetic interference, which can cause interference with television signals and some communications equipment, although this is thought now to be negligible.

The future

- The initial costs of setting these kinds of farms up is the main obstacle at the moment, but as the need to use more environmentally friendly methods of electricity production increases, this could be an avenue to explore.

4. Now organize a panel discussion. Divide into groups and according to the sample above and the following hints, "defend" your chosen alternative source of energy. The other groups should mind its disadvantages, costs and future (if any information is available).

Solar Power

How it works

- The photovoltaic effect (photo cells convert sunlight directly into electricity). Photovoltaic cells (PV's) used as roof tiles.
- Designing buildings to collect the heat. large glass windows, heating water pipes (painting them black and putting them in a "greenhouse" type insulator).

Advantages

- no extra land space is needed
- can also be situated in urban areas, where there is plenty of available space
- easy to install
- replace the need for other materials, such as tiles
- generate more electricity than is needed at certain times in the day, so can be sold back to local electricity companies

Disadvantages

- depend on changeable weather
- costly installation

The costs

- Expensive, though reduced by 90 % since 1970.

The future

- Within 10 years photo voltaic cells are likely to be competitive with conventional power sources.

- More large-scale projects are to be centrally funded with an energy-efficiency programs devised alongside it.

Geothermal Energy

How it works

- Geothermal that is "Earth's heat". The centre of the Earth is hot (current estimates are 5,500° C at the core just over 6, 500 km below the crust (about as hot as the surface of the sun). The upper 3 m of the Earth's surface nearly constantly stay at a 10–16° C throughout the year.

Ways of tapping geothermal energy

- Direct use (1) directly for heating buildings (2) district heating — the system of supplying communities with hot water or heating.
- Geothermal heat pumps — using a series of pipes to circulate fluid through the warm ground. In the winter when the ground is warmer than the buildings above, the liquid absorbs heat from the ground, which is then concentrated and transferred to the buildings. In the summer, when the ground is cooler, the pump transfers heat from the buildings back into the ground.
- Electricity production using a turbine driven by steam, which then drives a generator.

The advantages

- No fossil fuel burning is required.
- Emit only excess steam and very few trace gases (1000–2000 times less carbon dioxide than fossil fuel power plants).
- Take up very little land compared to traditional fossil-fuel plants.
- Advanced drilling techniques minimise the impact of drilling wells.
- Electricity produced more "available" as fossil-fuelled power plants produce electricity 65–75 % of the time compared to 90 % from geothermal power plants.
- Geothermal heat pumps can be used nearly anywhere.

The costs

- The savings on electricity can outweigh the cost of installing and running the system.
- In agriculture (such as to heat greenhouses) heating costs can be cut by up to 80 %.
- Very slowly becoming competitive with that from traditional power plants.

The future

- to drill deeper and circulate water through the hot dry rock found 3–5 miles under the surface
- to identify deep geothermal aquifers
- to venture even deeper and try to utilise the hottest source of all — the molten and semi-molten magma of the Earth's core.

Water Power

Hydro-electric power

How it works

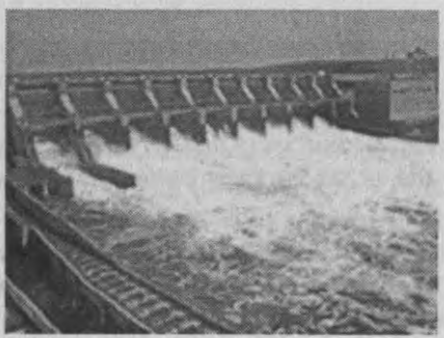
- a reservoir is built with a dam in it, a mass of water is held back by the damp and then suddenly released all at once, sending the water through a turbine at great force.

Advantages

- pollution free and safe when up and running.

Disadvantages

- creating it there can he tremendous disruption and upset to the environment, animals and nearby residents
- finding sites large enough for this is quite hard.



Tidal power

How it works

- By using the gravitational pull of the moon, which creates tidal rises and falls, to produce energy.

Advantages

- using natural forces (no additional fuel sources are needed)
- in the long-term it could enable cheaper electricity
- once up and running, quite safe to the environment
- a large-scale tidal power scheme on the River Ranee near St Maio in France helps produce a considerable amount of electricity; others in Canada and China have also been very productive and economical.

Disadvantages

- tidal power generators can be quite expensive to set-up — the costs involved in building such a scheme would be quite high initially
- the disruption to the area
- the risk of pollution to the river.

Wave power

How it works

- by capturing mass of kinetic energy created by waves
- building dams or pipes for the water to go up.

Advantages

- with waves which are around 400 m long 700 kilowatts of electricity per metre could be captured
- if a suitable site could be found, cheaper and environmentally friendly energy could be created.

Disadvantages

- disruptive to other industry, such as fishing.

Costs

- building dams or pipes can be quite expensive
- cheaper energy.

5. Read about alternative sources of energy used in the United States paying attention to the phrases given below. Make sure you know their meaning.

Appropriate power plant siting issues; bottlenecks in transmission and distribution; economically viable; a build-up of unacceptably high levels of carbon dioxide; implementing clean energy solutions; incentives and sustained programs; a more compelling and conducive environment for an integrated, large-scale approach to renewable energy innovation and market expansion; "quick fix" solutions; advanced energy conversion devices such as fuel cells; conversion technologies; to install and bring on-line; photovoltaic (solar) panels and solar hot water heaters; to shave peak-power demands; wind and cogeneration system deployment; photovoltaic arrays, windmills, biomass, or small hydropower;

tailored to meet specific energy loads and service conditions; to have less of an impact on the environment; contribute significantly to ambient air pollution and acid rain; low incremental costs; the direct damage to the terrestrial and river systems from mining and pollutant emissions, as well as the impacts on crop yields and urban areas.

Renewable Energy. A Viable Choice

Renewable energy systems — notably solar, wind, and biomass — are poised to play a major role in the energy economy and in improving the environmental quality of the United States. California's energy crisis focused attention on and raised fundamental questions about regional and national energy strategies. Prior to the crisis in California, there had been too little attention given to appropriate power plant siting issues and to bottlenecks in transmission and distribution. A strong national energy policy is now needed. Renewable technologies have become both economically viable and environmentally preferable alternatives to fossil fuels. Last year the United States spent more than $600 billion on energy, with U.S. oil imports climbing to $120 billion, or nearly $440 of imported oil for every American. In the long term, even a natural gas-based strategy will not be adequate to prevent a build-up of unacceptably high levels of carbon dioxide (CO_2) in the atmosphere. Both the Intergovernmental Panel on Climate Change's (IPCC) recent Third Assessment Report and the National Academy of Sciences' recent analysis of climate change science concluded that climate change is real and must be addressed immediately and that U.S. policy needs to be directed toward implementing clean energy solutions.

Renewable energy technologies have made important and dramatic technical, economic, and operational advances during the past decade. A national energy policy and climate change strategy should be formulated around these advances. Despite dramatic technical and economic advances in clean energy systems, the United States has seen far too little research and development (R&D) and too few incentives and sustained programs to build markets for renewable energy technologies and energy efficiency programs. Not since the late 1970s has there been a more compelling and conducive environment for an integrated, large-scale approach to renewable energy innovation and market expansion. Clean, low-carbon energy choices now make both economic and environmental sense, and they provide the domestic basis for our energy supply that will provide security, not dependence on unpredictable overseas fossil fuels.

Energy issues in the United States have created "quick fix" solutions that, while politically expedient, will ultimately do the country more harm than good. It is critical to examine all energy options, and never before have so many technological solutions been available to address energy needs. In the near term, some

expansion of the nation's fossil fuel (particularly natural gas) supply is warranted to keep pace with rising demand, but that expansion should be balanced with measures to develop cleaner energy solutions for the future. The best short-term options for the United States are energy efficiency, conservation, and expanded markets for renewable energy.

For many years, renewables were seen as energy options that — while environmentally and socially attractive — occupied niche markets at best, due to barriers of cost and available infrastructure. In the last decade, however, the case for renewable energy has become economically compelling as well. There has been a true revolution in technological innovation, cost improvements, and our understanding and analysis of appropriate applications of renewable energy resources and technologies — notably solar, wind, small-scale hydro, and biomass-based energy, as well as advanced energy conversion devices such as fuel cells.

There are now a number of energy sources, conversion technologies, and applications that make renewable energy options either equal or better in price and services provided than the prevailing fossil fuel technologies. For example, in a growing number of settings in industrialized nations, wind energy is now the least expensive option among all energy technologies — with the added benefit of being modular and quick to install and bring on-line. In fact, some farmers, notably in the U.S. Midwest, have found that they can generate more income per hectare from the electricity generated by a wind turbine than from their crop or ranching proceeds. Also, photovoltaic (solar) panels and solar hot water heaters placed on buildings across the United States can help reduce energy costs, dramatically shave peak-power demands, produce a healthier living environment, and increase the overall energy supply.

The United States has lagged in its commitment to maintain leadership in key technological and industrial areas, many of which are related to the energy sector. The United States has fallen behind Japan and Germany in the production of photovoltaic systems, behind Denmark in wind and cogeneration system deployment, and behind Japan, Germany, and Canada in the development of fuel-cell systems. Developing these industries within the United States is vital to the country's international competitiveness, commercial strength, and ability to provide for its own energy needs.

Theoretically, renewable energy sources can meet many times the world's energy demand. More important, renewable energy technologies can now be considered major components of local and regional energy systems. Solar, biomass, and wind energy resources, combined with new efficiency measures available for deployment in California today, could supply half of the state's total energy needs. As an alternative to centralized power plants, renewable energy systems are ideally suited to provide a decentralized power supply that could help to lower capital infrastructure costs. Renewable systems based on photovoltaic arrays, windmills,

biomass, or small hydropower can serve as mass-produced "energy appliances" that can be manufactured at low cost and tailored to meet specific energy loads and service conditions. These systems have less of an impact on the environment, and the impact they do have is more widely dispersed than that of centralized power plants, which in some cases contribute significantly to ambient air pollution and acid rain.

There has been significant progress in cost reductions made by renewable technologies. In general, renewable energy systems are characterized by low or no fuel costs, although operation and maintenance costs can be considerable.

Systems such as photovoltaics contain far fewer mechanically active parts than comparable fossil fuel combustion systems and are therefore likely to be less costly to maintain in the long term. Costs of solar and wind power systems have dropped substantially in the past 30 years and continue to decline. For decades, the prices of oil and natural gas have been, as one research group noted, "predictably unpredictable". Recent analyses have shown that generating capacity from wind and solar energy can be added at low incremental costs relative to additions of fossil fuel-based generation. Geothermal and wind can be competitive with modern combined-cycle power plants — and geothermal, wind, and biomass all have lower total costs than advanced coal-fired plants, once approximate environmental costs are included. Environmental costs are based, conservatively, on the direct damage to the terrestrial and river systems from mining and pollutant emissions, as well as the impacts on crop yields and urban areas. The costs would be considerably higher if the damage caused by global warming were to be estimated and included.

The push to develop renewable and other clean energy technologies is no longer being driven solely by environmental concerns; these technologies are becoming economically competitive. The traditional energy sector has lacked appeal to investors in recent years because of heavy regulation, low growth, and a tendency to be cyclical. The United States' lack of support for innovative new companies sends a signal that U.S. energy markets are biased against new entrants. The clean energy industry could, however, become a world-leading industry akin to that of the U.S. semi-conductors and computer systems.

Using the information of the text, state whether the statements below are true or false, correct the false ones.

- Before the crisis in California the issues of correct location of power plants and dealing with pick-power demands were not appropriately attended.
- Imported oil for every American costs about $120 billion.
- Clean energy solutions are crucial for the U.S. since natural gas-based national policy does not contribute into curbing the built-up of GHGs (green house gases).

- Clean energy solutions do not provide the country's independence on unpredictable fossil fuel market.
- "Quick fix" energy supply solutions are more politically than environmentally expedient.
- Renewable energy technologies have become profitable.
- Alternative energy sources are solar, wind, small-scale hydro, and biomass-based energy, as well as tide-wave energy.
- Photovoltaic systems are the cheapest to install and bring on-line.
- Hot water heaters can cut the needs of energy during rush hours, improve living environment, and increase the overall supply of energy.
- The United States is the leader in the production of photovoltaic and fuel-cell systems.
- Renewable systems based on photovoltaic arrays, windmills, biomass, or small hydropower are less economically and energetically efficient but more environmentally friendly than traditional power sources.
- Environmental costs are estimated by the damage done to soil, water, wildlife and agriculture.
- Alternative power industry may compete with semi-conductors and computer systems in the U.S.

6. As you see, every alternative to the traditional source of power and energy has its pros and contras. Read about the contradictions of another environmental project. Answer the questions using the information from the text as well as your background knowledge.

The Big Green Fuel Lie

George Bush says that ethanol will save the world. But there is evidence that biofuels may bring new problems for the planet

By Daniel Howden in Sao Paolo

The issue

The ethanol boom is coming. The twin threats of climate change and energy security are creating an unprecedented thirst for alternative energy with ethanol leading the way.

That process is set to reach a landmark on Thursday when the US President, George Bush, arrives in Brazil to kick-start the creation of an international market for ethanol that could one day rival oil as a global commodity. But a growing number of economists, scientists and environmentalists are calling for a "time out" and warning that the headlong rush into massive ethanol production is creating more problems than it is solving.

Pros of ethanol

To its advocates, ethanol, which can be made from corn, barley, wheat, sugar cane or beet is a green panacea — a clean-burning, renewable energy source that will see us switch from dwindling oil wells to boundless fields of crops to satisfy our energy needs.

Background and history of the issue

In its first major acknowledgment of the dangers of climate change, the White House this year committed itself to substituting 20 per cent of the petroleum it uses for ethanol by 2017. In Brazil, that switch is more advanced than anywhere in the world and it has already substituted 40 per cent of its gasoline usage.

Ethanol is nothing new in Brazil. It has been used as fuel since 1925. But the real boom came after the oil crisis of 1973 spurred the military dictatorship to lessen the country's reliance on foreign imports of fossil fuels. The generals poured public subsidies and incentives into the sugar industry to produce ethanol.

Today, the congested streets of Sao Paolo are packed with flex-fuel cars that run off a growing menu of bio and fossil fuel mixtures, and all filling stations offer "alcohol" and "gas" at the pump, with the latter at roughly twice the price by volume.

Cons of ethanol

But there is a darker side to this green revolution, which argues for a cautious assessment of how big a role ethanol can play in fllling the developed world's fuel tank. The prospect of a sudden surge in demand for ethanol is causing serious concerns even in Brazil.

The ethanol industry has been linked with air and water pollution on an epic scale, along with deforestation in both the Amazon and Atlantic rainforests, as well as the wholesale destruction of Brazil's unique savannah land.

Fabio Feldman, a leading Brazilian environmentalist believes that Brazil's trailblazing switch has had serious side effects.

"Some of the cane plantations are the size of European states, these vast monocultures have replaced important ecosystems", he said. "If you see the size of the plantations in the state of Sao Paolo they are oceans of sugar cane. In order to harvest you must burn the plantations which creates a serious air pollution problem in the city".

Despite its leading role in biofuels, Brazil remains the fourth largest producer of carbon emissions in the world due to deforestation. Ethanol enthusiasts reject any linkage between deforestation and ethanol and argue that cane production accounts for little more than 10 per cent of Brazil's farmland.

The conditions for a true nightmare scenario are being created not in Brazil, despite its environment concerns, but in the US's own domestic ethanol industry.

The warning voices say, "The competition for grain between the world's 800 million motorists who want to maintain their mobility and its two billion poorest people who are simply trying to stay alive is emerging as an epic issue".

Biofuel costs

When Rudolph Diesel unveiled his new engine at the 1900 World's Fair, he made a point of demonstrating that it could be run on peanut oil. "Such oils may become, in the course of time, as important as petroleum and the coal tar products of the present time", he said. And so it has come to pass that US President George Bush has decreed that America must wean itself off oil with the help of biofuels made from corn, sugar cane and other suitable crops.

At its simplest, the argument for biofuels is this. By growing crops to produce organic compounds that can be burnt in an engine, you are not adding to the overall levels of carbon dioxide in the atmosphere. The amount of CO_2 that the fuel produces when burnt should balance the amount absorbed during the growth of the plants.

However, many biofuel crops, such as corn, are grown with the help of fossil fuels in the form of fertilisers, pesticides and the petrol for farm equipment.

One estimate is that corn needs 30 per cent more energy than the finished fuel it produces.

Another problem is the land required to produce it. One estimate is that the grain needed to fill the petrol tank of a 4X4 with ethanol is sufficient to feed a person for a year.

1) What economic and political reasons make world countries look for alternative sources of energy, especially fuel?
2) What event triggered the weighing pros and cons of ethanol?
3) What is the background history of ethanol production?
4) What are the main arguments against ethanol industry in the environmental area?
5) What arguments for biofuels do the enthusiasts forward?
6) What economic reasons may prevent ethanol production industry from development?

VIII. ENVIRONMENTAL ISSUES IN GREAT BRITAIN

1. How much do you know about the environmental issues in Great Britain? Answer the questions of the quiz and will find it out.

Do you believe that:

1) an average British uses about 125 litres of water every week?
☐ Yes. ☐ No.
2) 70 % of Britain's sulphur dioxide, causing acid rains in Europe, comes from power stations, which use coal?
☐ Yes. ☐ No.
3) there now exists primary legislation to ensure that 10 % of the renewable energy in the country will come from wind power by 2010?
☐ Yes. ☐ No.
4) solar power has a great potential in the country?
☐ Yes. ☐ No.
5) the UK is unlikely to meet its own target of reducing CO_2 emissions by 20 % by 2010?
☐ Yes. ☐ No.
6) England is the fourth most people-congested country in the world?
☐ Yes. ☐ No.
7) the UK government plans to use its green belts for building new residential houses there?
☐ Yes. ☐ No.

The answers to some questions may be found in the previous units whereas you will be able to answer to the majority of questions using the materlal of this one.

2. Read the following article and answer the questions below.

Government "lagging on climate"

The UK government is a "climate laggard" when it comes to policies on tackling global warming, MPs say.

A report for the all-party environment group of MPs says current efforts are failing to curb emissions from businesses, transport and homes.

The MPs' report was compiled by the Institute for European Environmental Policy.

The group's chairman, Liberal Democrat MP Norman Baker, said, "This comprehensive independent report provides a clear snapshot to show how the government is measuring up to the challenges of climate change.

Sadly, the answer is not very well. The analysis shows that while the government has been innovative in some areas, it has time and again fallen down on delivery".

The report's conclusions include.

- the link between energy and climate policy is too weak
- renewables sector should be given greater priority
- efforts to limit emissions from transport need to be more ambitious
- annual reports should be used to highlight "priority climate issues"
- all government departments need to set clear climate targets

It added that the UK was unlikely to meet its own target of reducing CO_2 emissions by 20 % by 2010.

Unveiling the updated climate change program, Mrs. Beckett said that the government was not giving up on achieving the goal, but said new and existing policies were likely deliver a reduction of 15–18 %. However, she said that the UK was on course to reduce greenhouse gas emissions by 12 % from 1990 levels by the end of the decade, as required by the Kyoto Protocol.

The UK is currently on track to meet its Kyoto commitment to reduce emissions of six different greenhouse gases by an average of 12.5 % compared with 1990 levels over the years 2008 to 2012. The fall in emissions through the 1990s and early part of the 2000s was achieved at a time of strong growth in the UK economy

Carbon dioxide emissions have risen recently, largely due to increased burning of coal in power stations. This was prompted by a rise in the price of gas (gas is "cleaner" than coal)

1) What is the main reason of criticism towards British government on behalf of MPs?
2) What priorities if British environmental policy cause the biggest concern?
3) What Kyoto commitments may Britain fail to fulfill by 2010?
4) What emissions is Britain yet on course to reduce?
5) What is Britain's biggest achievement in curbing greenhouse emission through the 1990s and early part of the 2000s?
6) What is the situation with emission of CO_2 in Britain now?

3. One of the priority environmental issues in the UK nowadays is developing urban areas. Look though the excerpt from the report of the British Environment Agency, choose one of the aspects. A) transport; B) water

and C) noise, greenspace and loss of wildlife, organize a panel discussion of the issue as if you were the members of this commission.

Question. Which environmental issues are most pressing in urban areas, and how are they being addressed? What is the overall environmental profile of urban areas? Are new environmental issues emerging that have been neglected or are little understood?

We here make some observations on issues connected with transport (pollution, congestion, stress), water (supply and use), noise (generation and pollution).

Transport

We take as a given the situation of urban traffic congestion that causes economic losses and has a negative effect on life quality. There is a need to reduce such traffic.

We think the UK has much to learn from other countries in Europe. The growth of car travel and long-distance commuting by car should be compared with trends from other EU countries and cities, particularly those with comparable levels of GDP as the UK, such as the Netherlands and Denmark. We make the observation that there are many cities around Europe (e.g. Den Haag, Munchen) where car ownership levels exceed those in the UK but where car use is lower because of excellent public transport systems. The important work by Mees (2000), comparing Toronto and Melbourne, both relatively dispersed low-density cities, demonstrates conclusively that the crucial factor in public transport use is not investment or land use, but simply delivery of an effective coordinated service on an 18-hour, 7-day-week basis. There are lessons to be learnt, particularly about the need for long term planning, investment levels and citizen participation from these "best practice" cities.

New estates have been built around small towns with poor public transportation services, making their residents car-dependent. The government has been reluctant to finance major urban transport schemes.

It is very difficult to persuade motorists to use public transport (at least in the short term). Therefore technology solutions need to be encouraged e.g. biofuels in diesel engines (carbon cycle contributors, agricultural surplus mop up).

How can we change behaviour? Road pricing is clearly vital, but the need is also to make it easier for people to change travel modes to walking, cycling and public transport by making these modes safer, pleasanter and more efficient. Car clubs provide people with easy access to a car when essential, but break the link to car ownership. We would observe that where such facilities are in place then people make environmentally friendly decisions (e.g. most business trips between Leeds and London and Manchester and London use the excellent high-speed, electric rail links between these cities).

Water

In South-East England, climate change and household growth is pushing available services to their very limits. A particular problem is the increase of household demand for water. Attention focuses on water company losses and failures to meet targets for reducing leakage. However, much of the leakage problem lies between the company mains and the household pipes. Householders are responsible for leaks on their properties and often delay taking action to address these problems, which leads to a high wastage of water. Thames Water, for example, believe that the amount of water they lose due to leakage is higher than the average because householders in their area are particularly reluctant to pay the costs incurred with leakages. Responsibility for leaks on householders' properties needs to be shared with water companies, enabling earlier action.

Very high users are a problem. These show up on water company monitoring studies as extreme events. If there is insufficient resource for investigating the extreme, the cause is ascribed to instrument failure or the like. Investigation often reveals some real extreme behaviour (e.g. the householder who runs a fish farm on their property). In such situations, water companies need the power to install meters compulsorily.

All new dwellings must have water meters and the issue is whether this should be extended to all dwellings. This could be done as a condition of selling a house, so that once legislation has been introduced, purchasers (or vendors) know that house sale must mean metering is fitted. There would need to be means to ensure high-demand/low ability to pay users are not disadvantaged (e.g. large but poor families). Stepped tariffs (lifelines) are used in the USA so that the first set of units of demand is free, but then marginal costs increase with demand. We must ensure that poor people are not disadvantaged and public health is not jeopardised.

Garden culture will probably have to change through introduction of more drought resilient plants (but avoiding the hazard of introducing more invasive species that out-compete native UK wildlife), less broadcast watering, more delivery

to plants individually (watering cans) and more use of rain capture (roof fed water butts etc.). Incentives and help need to be developed for companies and households to move to a new water use culture.

If domestic users are rapidly switched to meters then careful thought about the right arrangements needed to provide financing of "extreme event" works (storm drainage, droughts) and other social goods, because the revenue streams to water companies will decline if prices limit consumption. New technologies will need to be developed for dealing with concentrated sewerage.

Noise

This is becoming a big issue. There is a steep rise in complaints from traffic and domestic noise, as well as commercial outlets such as pubs and clubs. Densification of urban areas means that people are in greater proximity and noise becomes more of a problem. This can have very deleterious effects on quality of life and even on sleep and mental health. There is a need to specify standards of noise insulation, both inside buildings and in relation to the outside world. It is possible to achieve high standards, as modern hotels show. The aim should be to emulate these in domestic construction.

Loss of green space and wildlife

Land erosion and littering in coastal and suburban areas

Urban areas do have significant areas of greenspace in the UK, but these are being eroded through development (including loss of school playing fields). Public green spaces do not receive much investment for maintenance and many areas are in poor condition. Poverty of green spaces is another factor contributing to low environmental quality of a local area, which encourages suburbanization and greater travel. Similarly, urban areas are highly impoverished in terms of wildlife, due to habitat loss to development and pollution, though suburban biodiversity may be in better shape. This suburban biodiversity and its possible loss is a factor that is often overlooked in discussions on densification.

4. What measures can be taken if it comes to the polluted land? Read an article about "recycling" land resources in Great Britain and discuss the issues offered below.

Does the word "greenfield" remind you of anything? Do you think that it is accidentally spelt as one word?

The Regenerators

We all want to save the green belt but the demand for new housing has never been greater. Part of the solution could be to regenerate land previously thought uninhabitable due to industrial pollution.

If England was equally divided between all its inhabitants we would each have a plot of land slightly smaller than the floor-area of Westminster Abbey. In major cities such as London people-congestion is even greater, with every person allocated a little less than the floor space in the House of Commons Chamber. England is the fourth most densely populated country in the world, putting space at a premium. In order to avoid concreting over our "green and pleasant" land the UK Government is promoting "brownfield" development. The idea is to recycle land by trying to construct at least 60 % of new dwellings on previously developed land (known as brownfield), rather than building on fresh, undeveloped, "greenfield" land.

Since July 2003 a multi-disciplinary project has been funded, aiming to investigate the problems of developing on brownfield land. A range of scientists, including hydro-geologists, chemists, engineers and social scientists focused on a portfolio of brownfield sites in two regions. Manchester in the northwest and the Thames Gateway, near London.

Black lagoons

Potentially there are 64,000 hectares (roughly equivalent to half the size of Greater Manchester) of brownfield land available for development in England. However, not all of it is very tempting. Acid tar lagoons present one of the biggest challenges. These black, oily lakes are a relic from the petrochemical and coal processing industries. There are around 150 registered acid tar lagoons in the UK. Sulphuric acid was used to remove impurities during refining and the resulting waste was typically dumped in any locally available holes in the ground. Microbiologists have been able to show that some organisms thrive in this extreme environment.

So what is the best way to manage these extreme environments? One school of thought is that some lagoons should remain undisturbed. "If lagoons are left alone they may not have a large environmental impact, whereas disturbing them typically results in the emissions of significant volumes of sulphur dioxide fumes, which can cause major challenges for remediation", the experts explain.

But even if a clean up is possible, encouraging developers to take on this kind of land is not always easy. One big issue for most developers is deciding what to do with the contaminated soil waste. Dig and dump is still the most frequently used method of dealing with land contamination, but the new EU Landfill Directive has significantly reduced the number of landfill sites which can take contaminated material. Instead developers may have to turn to more sustainable methods of cleaning up land such as bio-remediation, where bacteria gobble up the waste.

Another dilemma is deciding what to build. It is tempting for developers to go for immediate profit and build high-density apartments but this kind of development often lacks infrastructure, jobs and facilities (such as schools, hospitals and

shops) and can create a transient, unsustainable community. A more long-term development will use sustainable construction techniques to create a mixed set of houses and facilities that appeals to a range of age and income groups.

Thinking ahead

For a truly sustainable development it is also important to look a few decades into the future. Currently when a building is demolished it is reduced to rubble and very little is reused. Most components are encased in concrete which reduces the potential for systematic deconstruction. For example steel framed buildings tend to be directly connected to their concrete floor, making it impossible to remove the frame and re-use it at a later date. Researchers are developing reversible fixing methods, meaning that the components could be reused.

A further long-term consideration for developers is global warming. Many areas, like the Thames Gateway, are being created on flood plains. Within the next 20 to 30 years these sites will experience flooding unless there is additional protection. Flooding could mobilise pollutants and contaminate rivers and water groundwater.

Without a doubt there are more hurdles associated with developing on brownfield rather than greenfield land, but careful planning, new cleanup techniques and modern building technologies mean that they are all surmountable. Using Brownfield is the ultimate in recycling and sustainability, and ensures that the countryside is still there for us all to enjoy.

1) What is the difference between a brownfield and a greenfield?
2) Why is recycling brownfields so topical in the UK?
3) What is the main treatment problem with recycling brownfields? What are acid tar lagoons?
4) Is it easy to treat acid tar lagoons? Why?
5) What construction dilemma should experts solve in re-using acid lagoons?
6) As you could see from the text, one of the basic issues in the environment protection is building sustainable communities. Using the text formulate what is sustainability. If necessary use an encyclopaedia.
7) What challenges does the project face?
   Do you believe that the idea of recycling brownfields is promising in the UK?

5. Find the information in the Internet or British periodicals the facts about the following aspects of British environmental issues, choose one and present it to the group.

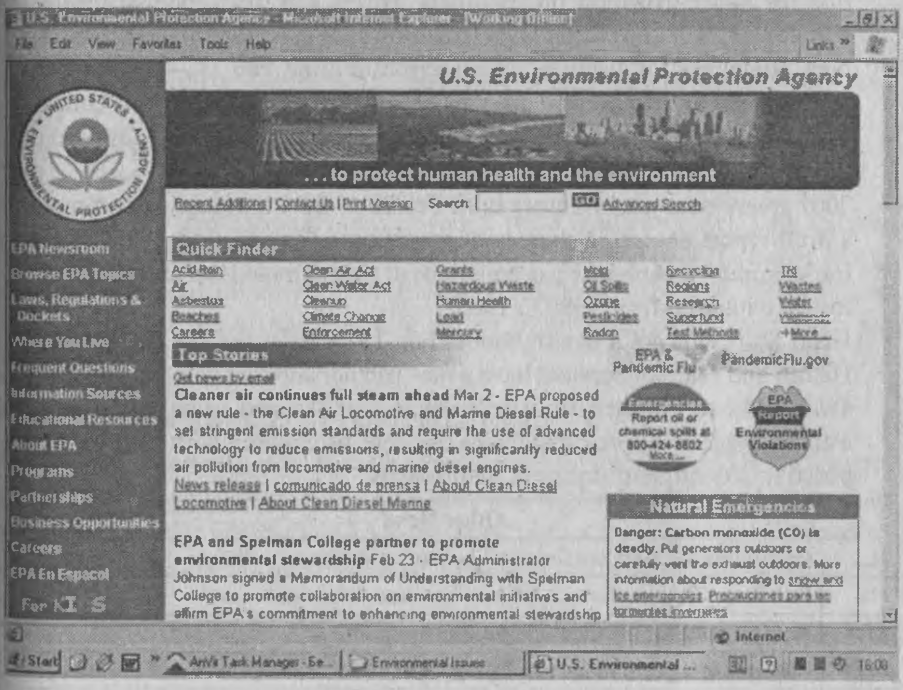
1) Environmental threats to the sea and coastal areas
2) Gulf Stream. Does it have a future?
3) GHG problem
4) British rural areas and land. environmental challenges and solutions

5) Threats to the British wildlife
6) Environmental Programs in Great Britain
7) Water resources
8) Forests in the country
9) Using alternative power sources
10) Fighting acid rain effects
11) Green technologies in British construction and industry
12) British health protection issues in terms of environment
13) Traffic in Great Britain
14) Developing environmentally sustainable communities in the British Isles
15) Natural resources and their preservation.

IX. ENVIRONMENTAL ISSUES IN THE USA

1. Look at the site of American Environmental Protection Agency (EPA). Discuss the following.

- the basic environmental concerns of the Agency
- services provided by the EPA
- possibility of personal participation of the citizens in the environmental issues
- news services and raising environmental awareness



2. Look at the environmental news on the EPA site. Divide into two groups, each taking three subheadings of stories. Read your subheadings and share your information with the other group. Using also OTHER NEWS,

can you try and draw an overall picture of 1) environmental situation on the USA and 2) measures taken to amend it in the USA. Do you think Americans are informed enough about the situation with the environment in their own place?

- Cleaner air continues full steam ahead Mar 2 — EPA proposed a new rule — the Clean Air Locomotive and Marine Diesel Rule — to set stringent emission standards and require the use of advanced technology to reduce emissions, resulting in significantly reduced air pollution from locomotive and marine diesel engines.
- EPA and Spelman College partner to promote environmental stewardship Feb 23 — EPA Administrator Johnson signed a Memorandum of Understanding with Spelman College to promote collaboration on environmental initiatives and affirm EPA's commitment to enhancing environmental stewardship and sustainability through partnerships.
- Water efficiency brings lawn order Feb 22 — WaterSense now offers certification for home irrigation professionals. Hiring a certified person means the homeowner will know their lawn irrigation system will use water efficiently.
- New guidelines for disposing of prescription drugs Feb 21 — The guidelines are designed to help prevent drug abuse and also reduce pollution. Unless the label instructs differently, unused prescription drugs should be disposed of in the trash.
- 2007 greenhouse gas inventory draft Feb 20 — EPA is accepting comment on a draft report analyzing sources of greenhouse gas emissions. The inventory tracks annual greenhouse gas emissions at the national level and presents historical emissions from 1990 to 2005.
- Head Start kids get a healthy boost Feb 13 — EPA and the Department of Health and Human Services have a new partnership that will educate families about risks to children from secondhand smoke and other environmental asthma triggers. Approximately 20 per cent of children with asthma are exposed to secondhand smoke in their homes.

Other News	
IL	Goldschmidt Chemical fined, will clean up sludge
IN	Port Stop Citgo settlement for underground tank violations
MD	New director for the Chesapeake Bay program
ME	Hannaford supermarkets win Energy Star label
NJ	Kids and communities receive $40K in EPA grants
NJ	Demolition begins at Cornell-Dubilier Site in South Plainfield
NY	Plan to clean up Fulton Avenue site
PA	Grant to improve East Waterford sewers

Other News	
PR	March meetings on Vega Baja and Florida landfills
VA	New life for old building materials in Henrico County
VA	Lynchburg upgrades sewers to reduce overflows
VI	Island Laundries in Charlotte Amalie fined, will revamp operations
WV	Cleanup completed at Custom Plating

3. Look at the action steps offered by the EPA to curb greenhouse gasses effect. Can you extend upon the recommendations? Make up the rules for your country and your place.

You release greenhouse gases as a result of using energy to drive, using electricity to light and heat your home, and through other activities that support our quality of life like growing food, rasing livestock and throwing away garbage. Greenhouse gas emissions can be reduced through simple measures by changing light bulbs and properly inflating your tires. Here we provide the following 9 easy steps you can take to not only reduce your greenhouse gas emissions, but also reduce air pollution, increase the national energy independence and save money.

1. Change 5 lights

Replace the conventional bulbs in your 5 most frequently used light fixtures with bulbs that have the ENERGY STAR label and you will help the environment while saving money on energy bills. If every household in the U.S. took this one simple action we would prevent more than 1 trillion pounds of greenhouse gas emissions.

2. Look for ENERGY STAR labeled products

When buying new products, such as appliances for your home, get the features and performance you want AND help reduce greenhouse gas emissions and air pollution. Look for ENERGY STAR-qualified products in more than 50 product categories, including lighting, home electronics, heating and cooling equipment and appliances.

3. Heat and cool smartly

Simple steps like cleaning air filters regularly and having your heating and cooling equipment tuned annually by a licensed contractor can save energy and increase comfort at home, and at the same time reduce greenhouse gas emissions. When it's time to replace your old equipment, choose a high efficiency model, and make sure it is properly sized and installed.

4. Seal up your home with better insulation and duct-work

Close up any visible cracks and gaps in your house, install adequate check that ducts are sealed and choose ENERGY STAR qualified windows when replacing old windows. Not sure where the cracks and gaps are? A home energy auditor can also help to identify areas with poor insulation and evaluate the energy efficiency of your home. By taking these steps, you can eliminate drafts, keep your home more comfortable year round, save energy that would otherwise be wasted, and reduce greenhouse gas emissions.

5. Use green power

Green power is environmentally friendly electricity that is generated from renewable energy sources such as wind and the sun. There are two ways to use green power. you can buy green power or you can modify your house to generate your own green power. Buying green power is easy, it offers a number of environmental and economic benefits over conventional electricity, including lower greenhouse gas emissions, and it helps increase clean energy supply. If you are interested, there are a number of steps you can take to create a greener home, including installing solar panels and researching incentives for renewable energy in your state.

6. Reduce, Reuse, and Recycle

If there is a recycling program in your community, recycle your newspapers, beverage containers, paper and other goods. Use products in containers that can be recycled and items that can be repaired or reused. In addition, support recycling markets by buying products made from recycled materials. Reducing, reusing, and recycling in your home helps conserve energy and reduces pollution and greenhouse gases from resource extraction, manufacturing, and disposal.

7. Be green in your yard

Use a push mower, which, unlike a gas or electric mower, consumes no fossil fuels and emits no greenhouse gases. If you do use a power mower, make sure it is a mulching mower to reduce grass clippings. Composting your food and yard waste reduces the amount of garbage that you send to landfills and reduces greenhouse gas emissions.

8. Use water efficiently

Everyone can save water through simple actions. Municipal water systems require a lot of energy to purify and distribute water to households, and saving water, especially hot water, can lower greenhouse gas emissions. Do not let the water run while shaving or brushing teeth. Do not use your toilet as a waste basket for toiletry items — water is wasted with each flush. And did you know a leaky toilet can waste 200 gallons of water per day? Repair all toilet and faucet leaks right away.

9. Spread the Word

Tell family and friends that energy efficiency is good for their homes and good for the environment because it lowers greenhouse gas emissions and air pollution. Tell 5 people and together we can help our homes help us all.

4. You will hear a report FIRES IN THE PARK about the disasters in Yellowstone National Park in the USA.

For questions 1–5, choose the most appropriate answer A, B, C, or D.

1) Why did the firelighters stop fighting lightning fires?
   a) They couldn't be controlled.
   b) They happened outside the park.
   c) They weren't doing much damage.
   d) They were too dangerous.
2) What happened concerning the park in 1988?
   a) Some research into fires there was concluded.
   b) The "natural fire management policy" began there.
   c) There was an enormous fire there.
   d) Fires were caused by visitors to the park.
3) What did research conclude about fires in the park?
   a) None of the trees in one area survived the 1704 fire.
   b) The number of fires has been increasing all the time.
   c) The fire in the 1870s did little damage.
   d) The first big fire happened in 1704.
4) What does research indicate about trees in the park?
   a) In one part the lodge pole pine has permanently disappeared.
   b) Aspen survive fires better than other trees.
   c) The lodge pole pine can adapt to the threat of fire.
   d) Aspen grow back after fires more quickly
5) What is the report's conclusion?
   a) The effect of forest fires has changed.
   b) Fires can be beneficial to nature.
   c) Trees grow bigger after fires.
   d) Fires have no long-term effect on nature.

Listen to the text again and fill the gaps.

P r e s e n t e r. The firelighters of __in the USA were a strange breed of firefighters. They responded instantly to any fire but only fought fires __. If it was a __, the chances were that they would just fly out and watch it burn. The policy was arrived at in the 1970s when they found that lightning fires __in a fairly small area of land. The bulk of the park remained __, enjoyed by thousands of visitors. The policy made sense until 1988, when the American public was enraged when

a __engulfed Yellowstone. The "__" was suspended and the fires were fought. But by then nearly __had burned away. Today the results of the fires are still __. So was the policy of __wrong? Ironically, the year when the policy ended also __of a study of the history of fires in the park. This showed that huge fires had __large parts of the park regularly __years. Bill Romme is one of the researchers.

Bill. By __of the trees, we found that there was a __across the park where the forests all began to grow in the same year — __— and that indicates to us that there was a __than that destroyed all those trees __.

Presenter. That fire burnt down __of the park. Another fire was traced to the __,when some trees __but still __. Ash __from lakes testified to __, dating back over a __. The policy of allowing lightning fires to burn __a general philosophy of letting nature __its own problems. Tracing so many __suggested that they weren't a problem but were actually an __of shaping the __of the park. The fires a few years ago gave an opportunity to __that theory. Bill Romme is now carefully analysing which __are __in different areas of the park.

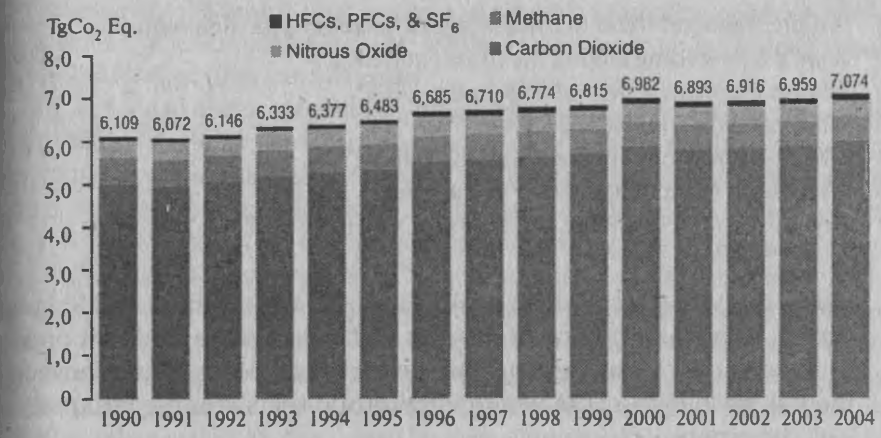
Bill. On one site, we found that the lodge pole pine, the __tree in the park, is having a __time fighting back. You'll only find one or two of them around there, while in other parts of the park it's thick with __. We've traced that to a difference in the __on the trees before the fire. In other parts they were __and able to __fire, while on that particular site they were __and __. Why's that? Well, the other difference is that the sites where they are growing back well burned in the fire in the __, while the last fire on that particular site was a __earlier. It's almost as if more recent __ prepared some trees for the __. Every site under study that burned in the fires a few years ago is growing back in a __. We've found some aspen tree seedlings, which are a bit of a surprise because there weren't any __ in that area before the last fires. We still don't know exactly how they got there but they wouldn't have got there if it hadn't been for the large size of those fires.

Presenter. And that seems to be the important thing. Fire creates __. In one place the __ grow straight back, in another something different grows. The nature of Yellowstone has always been diverse and it now appears that fire is a __ of that diversity. All that destruction is actually preserving nature. The natural fire policy seems to __.

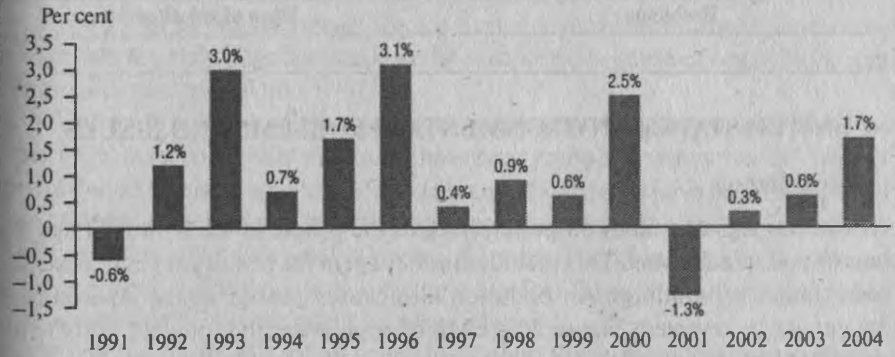
5. Look at the information on greenhouse gas emissions in the USA (current trends). Comment on them answering the following questions.

1990–2004 Trends

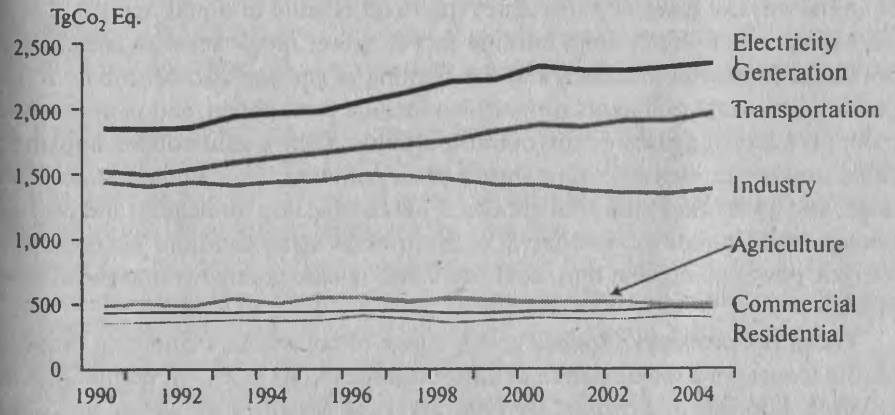
- Total GHG emissions rose 16 per cent since 1990 (increasing 1,3 per cent since 2000)
- Dominant gas emitted was CO_2, mostly from fossil fuel combustion
- Methane emissions decreased by 10 per cent
- Nitrous oxide emissins decreased by 2 per cent
- HFC, PFC, and SF_6 emissions have grown by 58 per cent



U.S. GHG Emissions by Gas



Annual Per cent Change in U.S. GHG Emissions



Emissions Allocated to Economic Sector

1) Is there a general trend for increasing or decreasing gas emissions?
2) What gas in leading among the most emitted?
3) What is the main source of CO_2 in the USA?
4) What gas emissions were decreased?
5) What gas emissions are presented in Graph 2?
6) What is the main CO_2 polluter in the USA?
7) Do households contribute greatly into CO_2 emissions?

6. Divide onto three groups: 1) an Air Group, 2) Water Group and 3) Land Group. Read your portion of the text and make up the chart according to the sample below. Organize a round table dedicated to the environmental issue in the USA where each group will share the information with the others.

AIR POLLUTION	
Problems	**Ways of solution**

UNITED STATES. ENVIRONMENTAL PROBLEMS AND ISSUES

Air Pollution

The damage caused by air pollution costs the people of the United States billions of dollars each year. This includes money spent for health care and increased maintenance of buildings. Air pollution also causes damage to the environment that cannot be reversed. The rapid growth of population and industry, and the increased use of automobiles and airplanes have made air pollution a serious problem. People produce most of the wastes that cause air pollution. Such wastes can be in the form of gases or particulates (particles of solid or liquid matter). These substances result chiefly from burning fuel to power motor vehicles and to heat buildings. Industrial processes and the burning of garbage also contribute to air pollution. Natural pollutants (impurities) include dust, pollen, soil particles, and naturally occurring gases. Forms of transportation, such as automobiles, airplanes, ships, and trains, are the leading source of air pollution in the United States, Canada, and most other industrial nations, Fuel combustion for heating and cooling homes, office buildings, and factories contributes significantly to air pollution. Electric power plants that burn coal or oil also release pollutants into the atmosphere.

Industrial processes produce a wide range of pollutants. Plants that produce plastic foams are a major source of chlorofluorocarbons (CFC's), compounds of chlorine, fluorine, and carbon. By 1996, most industrialized countries, including the United States, had ended production of CFC's.

Burning of solid wastes often creates a very visible form of air pollution-thick, black smoke. The burning of garbage, leaves, and other refuse is banned in most parts of the United States and Canada.

In the United States, air pollution problems became particularly serious in the early 1900's. During the Industrial Revolution, coal powers, most factories, most city homes also relied on coal as a heating fuel. By the 1930's, smoke and soot from steel mills, power plants, railroads and heating plants filled the air over many Eastern and Midwestern cities. In some industrial cities, such as Pittsburgh, Pa. and St. Louis, Mo., pollution frequently became so thick that drivers needed streetlights and headlights to see during the day. In the United States, all levels of government — federal, state, and local — have passed laws designed to control pollution. Congress passed the Air Quality Act in 1967. Under this Act, the federal government sets goals called air quality standards for achieving cleaner air. When states fail to enforce the regulations, the federal government can act against the polluters by imposing fines. However, the lack of funding to enforce these regulations has allowed some polluters to continue releasing harmful pollutants for years.

Since 1970, California has set the strictest standards for motor-vehicle emissions. However, they have been repeatedly postponed because of opposition from automobile industry groups.

Pollution from automobiles has been reduced by changes in motor vehicles. Since 1975, most American-made cars have been equipped with pollution-control devices called catalytic converters. Devices called scrubbers have been installed in many electric power plants, factories, and incinerators, to remove sulphur oxides and some other pollutants before they reach the air. Pollution can also be reduced by increasing energy efficiency and burning less fuel. In addition, recycling reuses some wastes that otherwise might have been burned.

Efforts to control air pollution in the United States have had some success. But many urban areas fail to meet federal air quality standards. Since 1970, emissions of sulfur oxides, hydrocarbons, and carbon monoxide have decreased by 25 to 40 per cent. But emissions of nitrogen oxides have increased slightly. Emissions of lead have fallen about 96 per cent, mostly because lead has been phased out of gasoline.

Progress in controlling pollution has gained speed. Nearly all the railroads, industries, and homes of the United States have switched from coal to cleaner burning fuels, such as oil and natural gas. In many other places, pollution controls effectively limit the air pollution created by coal burning.

In 1990, the United States Congress amended the Clean Air Act of 1970 to reduce acid rain in the United States and Canada. The amendments tightened standards for emissions, required fuels that burn more cleanly, and called for power plants to cut their sulphur dioxide emissions.

Many local governments have enacted laws to help clean up the environment. For example, in 1989, California adopted a 20-year plan to reduce air pollution in

the Los Angeles area, which had the worst air quality in the United States. The plan includes measures to restrict the use of gasoline-powered vehicles and to encourage the use of mass transportation.

Major Water Problems

Even though North America has a lot of water (only the Great Lakes, contain 18 % of the Earth's fresh water), some areas in this region often ran short of water. The drier areas of the Western United States often have a lack of water; areas of the Canadian prairie are also very dry. Because there is so much water, it is quite cheap, this causes people to use water more often. Because people are using water more often, the large resource is being threatened, leading to public concerns.

About 1/5 of all Americans receive water from an area that does not meet the requirements of water quality. Pollutants commonly found in water are: bacteria, copper, lead and other toxic chemical substances.

There are three chief sources of water pollution. These sources are (1) industrial wastes, (2) sewage, and (3) agricultural chemicals and wastes.

Industrial wastes. United States industries discharge pollutants that include many toxic chemicals. Industries discharge much chemical waste directly into natural bodies of water. In addition, the burning of coal, oil, and other fuels by power plants, factories, and motor vehicles releases sulfur and nitrogen oxides into the air. These pollutants cause acid rain, which enters streams and lakes. High levels of mercury have been found in fish far from industrial areas.

Some industries pollute water in yet another way. They use large quantities of water to cool certain equipment. Heat from the equipment makes the water hot. The industries then discharge the hot water into rivers and lakes, heating those bodies of water. Such heating that harms plants or animals is known as thermal pollution.

Sewage. Most of the sewage in the United States goes through treatment plants that remove solids and such dissolved substances as the nutrients, nitrogen and phosphorus. About 25 per cent of the households of the United States use septic tank systems, which pass the sewage through tanks and filter it through leaching fields into the land. Some sewage in the United States still goes untreated directly into waterways or the ocean. However, government regulations control the amount and the quality of the discharge.

Agricultural chemicals and wastes. Water from rain or melted snow flows from farmland into streams, carrying chemical fertilizers and pesticides that farmers have used on the land. Animal wastes also can cause water pollution, particularly from feed lots with many animals. Cattle, hogs, sheep, and poultry raised on feed lots do not distribute their wastes over widespread pastureland. Instead, much of their wastes runs off into nearby streams. Water used for irrigation also may be polluted by salt, agricultural pesticides, and toxic chemicals on the soil surface before it flows back into the ground.

Effects

Human illness. Water polluted with human and animal wastes can spread typhoid fever, cholera, dysentery, and other diseases. About 80 per cent of the U.S. community water supplies are disinfected with chlorine to kill disease-causing germs. However, disinfections does not remove harmful chemical compounds, such as polychlorinated biphenyls (PCB's) and chloroform, or harmful metals, such as arsenic, lead, and mercury. The careless release of such toxic wastes, primarily into waste dumps, threatens ground water supplies. PCB's, chloroform, and pesticides have been found in some municipal drinking water. Scientists are concerned that drinking even small quantities of these substances over many years may have harmful effects.

Reduced recreational use. Pollution prevents people from enjoying some bodies of water for recreation. For example, odors and floating debris make boating and swimming unpleasant, and the risk of disease makes polluted water unsafe. Oil spilled from ships or offshore wells may float to shore. It can kill water birds, shellfish, and other wildlife. Water pollution also affects commercial and sport fishing. Fish can be killed by oil or by a lack of oxygen in the water, or they may die because of a reduction in the quantity and quality of their food supply. Industrial wastes, particularly PCB's, also harm fish.

Disruption of natural processes. Various natural processes that occur in water turn wastes into useful or harmless substances. These processes use oxygen that is dissolved in the water. Water pollution upsets these processes, mainly by robbing the water of oxygen.

In 1974, the U.S. Congress passed the Safe Drinking Water Act to protect the nation's public water supply against pollution. This act authorized the Environment Protection Agency (EPA) to establish uniform quality standards for more than 200,000 public systems throughout the United States. The standards were designed to reduce the amount of harmful bacteria, chemicals, and metals in drinking water. The EPA and the state governments began to enforce the standards in 1977. The Safe Drinking Water Act was amended in 1986 and 1996 to further improve the quality of drinking water. Among the many changes were provisions to improve methods to detect and kill certain disease-causing microorganisms.

Important progress has been made in other areas of pollution management. Industrial waste, sewage, fertilizers, and other contaminants have polluted the Great Lakes since the mid–1800's. By the early 1970's, Lake Erie, Lake Ontario, and shallow regions of Lake Huron and Lake Michigan were so polluted that the waters had turned green and smelled foul, and huge fish kills were common. In 1972, Canada and the United States signed the Great Lakes Water Quality Agreement. Since then, local governments around the lakes have improved sewage treatment plants, controlled the runoff of chemical fertilizers from farms, and worked to reduce the use of phosphate detergents. They have also forced industries to

reduce the pollutants they dump into the lakes. Today, the Great Lakes are much cleaner.

Major Land Problems. Waste Disposal

In the USA, the population of people who are agriculturalists has decreased in the progression of history. To this day half the land in the United States is still used for agriculture.

North America has many land problems. They range from poor land usage and poor farming practices, erosion, soil contamination to other forms of land degeneration.

The brand new farming practices have greatly attacked the land. Chemicals such as DDE has not just ruined the land, but the human bodies as well, which has caused a big amount of people getting sick. Chemical reduction programs are encouraging farmers and other land users to decrease their use of chemicals that might harm the land.

Land disposal involves hauling garbage to an area owned by a community or a private firm. Such areas range from unsanitary open dumps to properly operated sanitary landfills.

Open dumps are a poor method of waste disposal because they cause environmental problems. In the United States, it is illegal to create a new open dump. Existing dumps are required to convert to sanitary landfills or to close.

Few people want to live or work near a garbage disposal site. As it grows increasingly difficult to find locations for new landfills and incinerators, and as people have become more aware of environmental concerns, recycling and waste reduction have gained importance. In the mid-1990's, Americans buried about 57 per cent of their municipal solid waste in landfills, recycled about 27 per cent of it, and burned 16 per cent in incinerators.

Major Forest Problems

A third of USA is covered in forests. The area has had big forest resources for a very long time. It has served it good in many different kinds of ways. There are some concerns about the consumption of the forest resources in the area. The government and the companies in the forest group, are working together to make sure that the amount of deforestation remains level.

The practice of forestry helps maintain an adequate supply of timber for the manufacture of lumber, plywood, paper, and other wood products. It also includes the management of such valuable forest resources as water, wildlife, grazing areas, and recreation areas.

In general, forests provide the greatest benefits when they are managed with the goal of providing several benefits at once. This concept, called multiple use forest management, is applied in the national forests of the United States and in

most state forests. These forests furnish about a third of the timber harvested annually in the United States. They also provide water for communities; food and shelter for wildlife; grazing land for livestock; and recreation areas for campers, hikers, and picnickers.

Human activities have had tremendous impact on modern forests. Since agriculture began about 11,000 years ago, large forest areas have been cleared for farms and cities. The damage if the continents last rainforests is a very big problem. The USA has some rainforest in the Pacific Northwest part. The policyholders and the public have taken very special interest in saving the rain and old growth forests. As a result to this the rainforests are not likely to get destroyed than the other forests.

7. Find the information in the Internet or American periodicals the facts about the following aspects of the environmental issues in the US, choose one and present it to the group.

1) The USA and Kyoto Protocol
2) Natural disasters in the USA (tornadoes, floods, storms)
3) GHG issue
4) American water resources. environmental challenges and solutions
5) Threats to the American wildlife. National Parks in the USA
6) Environmental Programs in the USA
7) Forestation issue in the country
8) Using alternative power sources
9) Green technologies in American construction and industry
10) Health protection issues in terms of environment
11) Traffic congestion problem
12) American big cities. environmental issues
13) Developing environmentally sustainable communities in the USA
14) Natural resources and their preservation (oil of Texas, etc.)
15) American public and state environmental organisations

X. ENVIRONMENTAL ISSUES IN UKRAINE

1. Divide into the following groups. 1) air; 2) land and forests; 3) water. Each group should make a list of at least 5 reasons for concern about the environment in Ukraine making special accent on their scope of competence (air, land or water). Share with the other groups. As a whole group work out the reasons of such situation in Ukraine.

Birdview of Pripiat Region

2. One of the reasons of disconcerting situation with our ecological system is the Soviet legacy. Read the following text and answer the questions below.

A Poisoned Legacy

Industrial development at any cost was the dominant dogma during the communist decades. Civil society did not exist as we know it today and industry belonged to the state. So major industrial lobbies within the state bureaucracy made decisions with little attention to the consequences for public health and the environment. The economy was highly militarized, and the enterprises of the military-industrial complex very often extremely dangerous environmentally operated without any control from the nature protection authorities. The performance of every enterprise was mainly assessed by the quantity of goods it produced. Clean air, water, and a pristine environment were considered free goods, without value. So polluting them was acceptable.

Secrecy in practically all aspects of life was another characteristic feature of communism. Information on environmental pollution was classified, and could not be discussed openly — which explains why it was so bad for decades without major public concern. Only when it exceeded all tolerable limits, in the 1980s, did the first independent green movements start in Poland, Hungary, Czechoslovakia, Bulgaria, and the former Soviet Union.

Nevertheless, monitoring the environment was organized reasonably well — for example through the State Committee on Hydrometeorology and Control of the Environment in the former USSR. All major cities and water bodies were under permanent observation, as were major sources of pollution (excluding military installations), and findings were published in a series of annual classified reports, with only limited circulation (100 to 200 copies).

Diluting pollutants was often regarded as the major environmental management mechanism. So-called "maximum permissible concentrations" (MFCs) were established for a very long list of pollutants, hundreds of them for water quality alone. Very often they were stricter than in the Western countries. But in reality only a few dozen compounds were regularly monitored. Technology did not permit wide-scale monitoring of many environmentally dangerous chemicals, especially VOCs, PAHs, dioxins and other compounds which have significant effects even at very low concentrations. There was some tracking of some of their emissions, calculated through knowledge of the production processes, but not of their concentrations in the environment.

Needless to say, concentrations of pollutants could very rarely be kept at "maximum permissible" levels, especially as there was very little enforcement of regulations. It was easier (and cheaper) for enterprises to dilute them by building higher chimneys or dumping wastes in large rivers, lakes and seas, than to construct and operate expensive purification equipment. Industrial wastes, including toxic and even radioactive ones, very often accumulated (sometimes for decades) in primitive dumping sites near the factories themselves.

1) What were the main reasons of the state's indifference to the environment?
2) Why was the information about the situation with the environment classified? When did it start to become known to the public?
3) Was environmental monitoring in the Soviet Union a retarded area?
4) What was the major environmental management mechanism? Why?
5) Find in the dictionary what is MFC, VOC and PAH. Make sure you know their equivalent in the native tongue.
6) What was the industrial practice of waste management? Was it friendly for the environment?

3. Look the fact files concerning socio-ecological situation in Ukraine. What ways out would you offer for each area using the experience of

Great Britain and the USA you found out about in Units 8 and 9? Make up a chart according to the following sample.

AIR POLLUTION	
Areas of concern	Ways of solution

Introduction

The nuclear meltdown at Chornobyl in 1986 and the resultant damage to the environment in Ukraine have been well documented, but the degradation of Ukraine's environment goes well beyond Chornobyl. Soviet industrialization of Ukraine, especially in the Donetsk basin, has left a legacy of air pollution, and industrial runoff into the Dnieper River has contributed to the pollution and decay of the Black Sea.

In addition, many of Ukraine's thermal power plants are old, with antiquated equipment, obsolete technology, and lacking modern pollution control equipment. In response, Ukraine adopted in May 1996 the "National Power Energy Program Until the Year 2010", designed to rehabilitate working thermal power stations to allow them to continue operation for the next 25 years. The program's mandate specified technological improvements, use of renewable energy sources and modernization of the power plants, as well as making them more environmentally friendly.

The program also specified that combined cycle-gas turbine equipment — as well as most of the auxiliary equipment — would be improved to reach acceptable safety levels. Good quality coal was to be used to reduce environmental damage. However, many of these reconstruction and modification projects have been seriously delayed because of the shortage of state budget financing for the Ministry of Environmental Protection and Nuclear Safety, unfavorable legislation, and the lack of private investment.

SOURCES OF POLLUTION

Air pollution

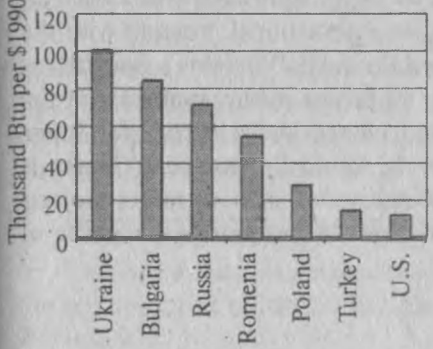
Million tons of air pollutants are emitted. Air pollution is worse in major industrial centres — Donetsk Oblast, with 26.7 % of the nation's industrial output, Dnipropetrovsk and Luhansk Oblast.

As is the case elsewhere in the former Soviet bloc, the transition to democracy in Ukraine has had offsetting effects on air pollution in Ukraine. Also, the contraction of Ukraine's economy has helped decrease air pollution from the industrial sector. Numerous unprofitable factories were closed in the early transition to capitalism, and Ukraine's continuing economic woes have caused a slowdown in industrial production, resulting in less air pollution from that industrial sector.

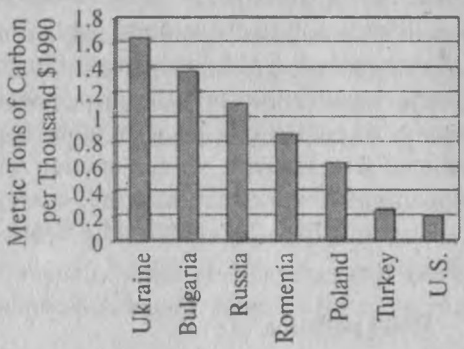
On the other hand, a boom in car ownership after independence has added to air pollution problems in Ukrainian cities. With many more cars on the road, traffic problems have increased. In addition, a large percentage of these cars lack catalytic converters to reduce carbon monoxide exhaust, which resulted in an increase in harmful emissions from the transportation sector. Oxygen levels in downtown areas are, on average 42 % lower than in suburban areas.

Although the contraction of the economy has meant that these emissions have tapered off in the years since independence, Ukraine's economic woes have also affected the government's ability to enforce environmental regulation effectively.

Energy and Carbon Intensity



1999 Energy Intensity



Carbon Intensity 1999

In terms of energy consumption per dollar of GDP, Ukraine ranks as one of the most energy-intensive countries in the world because of its inefficient, Soviet-era industries. Ukraine's energy intensity in 1999 at 101.3 thousand Btu/$1990 was more than 8 times that of the United States (12.6 thousand Btu/$1990) and more than 15 times that of Japan (6.5 thousand Btu/$1990). Even more telling is the fact that Ukraine's energy intensity is considerably higher than any of its fellow transition neighbors. In 1999, Poland's energy intensity was 28.6 thousand Btu/$1990, Turkey's 14.9 thousand Btu/$1990, Romania's 55.1 Btu/$1990, and Russia's 72.1 thousand Btu/$1990.

Not surprisingly, therefore, Ukraine's carbon intensity also is extremely high. With Ukraine's reliance on coal — as well as the industry's low productivity and inefficiency—the country's carbon intensity in 1999 was 1.64 metric tons of carbon per thousand $1990. Byway of comparison, the United States' carbon intensity was at 0.2 metric tons of carbon/thousand $ 1990. Other neighboring countries also were well below Ukraine, with Romania at 0.9 metric tons,

Poland at 0.6, and Turkey at 0.3 metric tons per thousand $1990 all coming in at less than one-half of Ukraine's carbon intensity.

On the per capita level, Ukraine is more comparable to other countries in transition. Ukraine's per capita energy consumption in 1999 was 127.0 million Btu—substantially lower than the U.S. value of 288.9 million Btu, but above Poland (99.3 million Btu), Romania (73.1 million Btu), and Turkey (45.9 million Btu). Similarly, per capita carbon emissions in Ukraine were 2.1 metric tons of carbon per person in 1999, this figure is again lower than both the United States (4.4 metric tons) while higher than Romania (1.1) and Turkey (0.8).

The Ukrainian government has taken several concrete actions to promote lower energy consumption and better energy efficiency. The National Energy Conservation Information Network was set up to disseminate energy conservation information to the general public, and an international program with the Alliance to Save Energy is helping strengthen the role of Ukraine's nongovernmental organizations and the private.sector in raising public awareness of the benefits of energy efficiency. In addition, the United States Agency for International Development, in conjunction with the Worid Environment Center, is supporting 18 waste minimization/energy conservation demonstration projects at 10 enterprises located in the Donetsk and Dnipropetrovsk regions of Ukraine.

Water pollution

Effluents are spilled into natural water reserves — the sea, rivers, lakes and ponds, streams polluting them with metals, which affects nutrition and increases the risk of diseases. The volume of sewage affluent has increased while industrial pollutants have declined.

Drinking water

The purity and accessibility of drinking water is fundamental to human health. Problems often result from water shortages and its quality. The best provided are the regions of the Caφathian Mountains, Polissia, and central Ukraine, where underground water sources are predominantly used. However, there are serious water problems in the regions along the Dnipro basin. Yet, part of the solution is reducing the substantial leakages from water distribution system.

Economics is clearly at the bottom of the problem of water purity. A lack of funds prevents water authorities from making the necessary infrastructure improvements. The existing water supply infrastructure is in urgent need of additional capital investment for purification and filtering plants. The current state of purification equipment has made it necessary to increase chlorination and introduce aluminium sulphate as fiocculants.

Solid Waste

Garbage is another important source of pollution. Every year, households discard 1.18 cubic metres of domestic wastes per urban resident. Nearly all this waste — 95.7 % — is dumped at one of the 656 open-air sites; only a small part is processed at one of the four garbage disposal plants operating in Ukraine. Four out of five of the open-air dumps have no facilities to protect the underground water or the air and are huge toxic areas, As a result, it has been necessary to prohibit the use of large land areas for 50 years and agricultural lands around dumps suffer low productivity due to pollution of the soil and the destruction of natural micro-organisms. The rural environment

Villages are home to 16.6 million people in Ukraine. Rural environments suffer less from air pollution than do urban areas. However, the out of all rural housing, only 7.7 % have water mains, 8 % natural gas, 3.7 % main sewage, and 8.4 % water heating. Only one-fifth of the rural population is provided with treated drinking water. 1, 140 villages have to use water brought from elsewhere. More than 1,500 villages have no asphalt / cemented pavements. The absence of modern communications and basic infrastructure deprive people of timely medical, fire, and emergency assistance.

PROTECTING ENVIRONMENT OBJECTIVES

The World Bank has made environmentally sustainable development one of the top objectives of its Country Assistance Strategy for Ukraine for the period 2004–2007.

In the past, the World Bank has helped Ukraine build its institutional capacity to design a environmental policy changes through two grants from the Institutional Development Fund grants specifically targeted local management in the Donetsk Oblast, Ukraine's worst polluted region.

Safe Drinking Water

Ukraine made progress towards achieving Millennium Development Goals by adopting a national program on safe drinking water in March 2005.

It took steps to control air pollution and replace obsolete and inefficient equipment in its factories. Like other ex-Soviet Republics, Ukraine remains one of the least energy-efficient countries in the world.

As the spread of the radioactive cloud following the Chornobyl meltdown of 1986 made clear, the quality of the Ukrainian environment has not only local and global repercussions. Air pollution, climate change and biodiversity are considered global and deserve concerted international action. For this reason, Ukraine, like many other countries, receives from grants made by the Global Environmental Facility (GEF), a fund set up by international protect the planet's shared resources.

Renewable Energy

The use of renewable energy in Ukraine was one of the principal goals of the 1996 National Power Energy Program. In 1999, however, renewable energy sources represented only 8.6 % of electricity generation, a figure that includes hydropower, solar, wind, tide, geothermal, solid biomass and animal products, biomass gas and liquids, and industrial and municipal wastes. This figure appears low, but it can partially be explained by the fact that the development of renewable resources in Eastern Europe and the former Soviet Union remains limited primarily to expansion or refurbishment of existing hydroelectric units. Indeed, the National Power Energy Program called for completion of new hydropower utilities — such as the Dnistrovska hydro pumping storage station — to reduce dependence on imported energy sources.

Yet, renewable energy sources are beginning to find a market in Ukraine. In the Carpathian region of the country, the Environmentally Sound Business Development project is focusing on small business development in wood processing industry to increase the efficiency of the production process by reducing timber use, waste products, and energy consumption. In addition, as part of an alternative energy source program, the Ukrainian State Geology Committee and the Ministry of Coal — along with the United States Agency for International Development, Ukrainian coal companies, and the U.S. coal bed methane industry — are working to identify opportunities to develop coal bed methane as a commercially viable alternative energy source in Ukraine.

In addition, the Ukrainian parliament passed a bill in July 2001 that aims to develop alternative energy sources such as solar, and geothermal. Additionally, through the Wind Power Development Project, Ukraine seeks to establish wind power as a significant source of electricity generation by 2020.

Outlook

The difficult transition to a market economy presents Ukraine with many environmental challenges. Chief among these is the need to decouple environmental pollution from economic output. The country's current decrease in environmental pollution is essentially linked to the collapse in industrial output.

Public awareness of threats to Ukraine's environment sprouted from the Chornobyl accident, and independence has brought greater public participation in decisions affecting the environment, but more is needed. The Ecological Television Center (ECO-TV) in Ukraine was established to do both. At the request of the Ukrainian Ministry of the Environment, ECO-TV produces programs providing up-to-date global, national, and regional environmental information to the Ukrainian public. The primary focus has been on community-based projects and increasing public awareness. In addition, the U.S — Ukraine Binational Commission's Environmental Working Group, co-chaired by the U.S. Environmental

Protection Agency, has been established to respond to urgent environmental problems such as highly contaminated "hot spots". The accident at Chornobyl and its lingering environmental effects will serve as a constant reminder for Ukraine of the need to protect the environment. The challenge in the years ahead will be to find a balance between Ukraine's energy needs and strengthening the country's commitment to environmental protection.

4. One of the most resonant environmental issues in Ukraine is Chornobyl as a whole complex of problems. Read the following text and organize a panel discussion covering the issues indicated below.

- Nuclear disaster. Essence and circumstances.
- Immediate aftermaths of the disaster.
- Long-term consequences.
- Ecological situation in Chornobyl nowadays; water, land and air pollution, wildlife and forests, health issues.
- Broadcasts and perspectives.

The Lessons of Chornobyl

Many years after the world's worst nuclear accident at the Chornobyl power plant in Ukraine, the arguments are still continuing over the effects of the disaster on human health and ways to make the plant safe.

The present sarcophagus that covers reactor number four — built to last 30 years — is in danger of collapsing. The metal has rusted and much of the concrete is badly cracked, allowing rain and snow to gel inside. It was built in a hurry and the quality of work is poor. If it were to collapse — an earthquake would almost certainly destroy it — large amounts of radioactive dust would be released into the atmosphere, creating another ecological disaster. A decision has been taken to

devise an ecological replacement to the crumbling sarcophagus that surrounds the destroyed reactor, the "super sarcophagus" which will be built over the existing one and will cost as estimated more than $ 300 million.

It has become clear that the story of Chornobyl has been one of disinformation, unnecessary delays and incompetence. The blame lies with many people, among them the plant's designers and operators, and the leaders of the former Soviet Union. Critics also blame Western governments for failing to provide proper financial and scientific support.

In the first place, the Chornobyl reactors were not originally designed for civilian use. Their design is used on a military reactor, built to produce materials for nuclear weapons. Moreover, the reactor has a design flaw which makes it unstable unless it is operating at full power. The Chornobyl reactors also did not conform to international safety standards. all safety mechanisms could be switched off manually (they had been switched off just before the explosion); and there was no protective structure around the reactors to limit the effects of an accident.

The aftermath could have been avoided, or at least reduced, if the situation had been dealt with openly and properly. The two explosions took place at 1.23 a.m. on 26 April 1986, a statement was issued that evening well over 12 hours later, saying that measures were being taken to deal with the accident. In reality, little was being done. The explosion had instantly killed two people, and all the firemen who fought the blaze were to die within the next two weeks, having been exposed to enormous doses of radiation.

The evacuation of villages near the reactor began about 40 hours after the explosions. It was only by 2 May, nearly a week later that the evacuation zone was extended to 30 kilometres around the plant.

The operation to seal off the reactor started three days after the explosions, and took ten days to complete. A concrete slab had to be laid beneath the reactor core, to prevent contamination of the ground below. The sarcophagus had to be buili to surround the reactor.

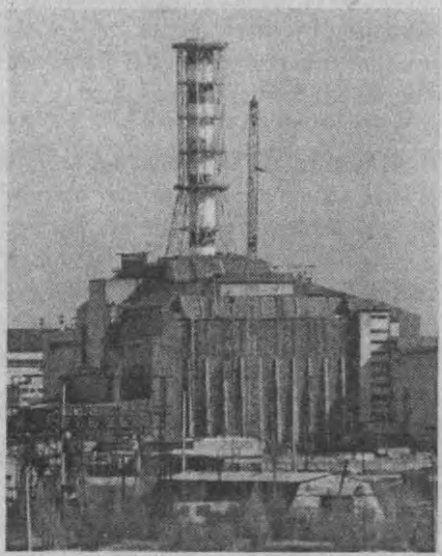
Soviet officials claimed only 31 people died from the accident and about 200 were seriously injured. But in the early 1990's, Ukrainian officials estimated that 6,000 to 8,000 people died as a result of the explosion and its aftermath. The disaster has caused high rates of cancer and other illnesses. The extent of the impact on the inhabitants of the region surrounding Chornobyl will also never be known. Of the 400,000 workers who cleaned up after the blast, an estimated 30,000 have fallen ill.

The countries worst affected by the radiation included Ukraine, Belarus, Russia, Georgia, Poland, Sweden, Germany and Turkey. But radioactive particles were carried much further away. Even Japan and US, on the other side of the globe, received measurable amounts of radiation afl;er the accident. The total amount of radiation released will never be known, but it is hundreds of times greater than that released by the atomic bombings of Hiroshima and Nagasaki.

Before reading the second text, pay attention to the words below. Make sure you know their meaning. Use them in your panel discussion.

Uranium fuel, highly radioactive graphite, a continuous plume of lethal radionuclides, set off radiation alarms, plutonium isotopes, a halflife of 24,360 years, depositing radioactive material, subjected to enormous doses of radiation, specialist radiological wards, "liquidators", to decontaminate the poisoned landscape of Ukraine, reactors already online, to keep the reactor core cool, a 1,000 megawatt RBMK reactor, moderating graphite arranged into columns, boron carbide control rods, to modulate the rate of reaction, the workhorse of Soviet atomic energy, containment building, biological shield, torn apart by the first of several catastrophic hydrogen explosions, severed 6,000-volt cables, red-hot wreckage of the reactor hall, radiation emitted by the lumps of uranium fuel and graphite, fatal dose of radiation, 20,000 roentgen an hour, to reach meltdown temperature, 30 km exclusion zone, to build a heat exchanger (subterranean heat exchanger), to prevent meltdown, in the immediate aftermath of the accident, to capture radioactive particles on the ground, the Sarcophagus (prefabricated steel and concrete shell).

Chornobyl 20 years on



At 1.23 a.m. on 26 April 1986, a series of explosions destroyed Reactor No 4 of the Chornobyl nuclear power station, three kilometres from Pripyat in the then Soviet Republic of Ukraine. Fifty tons of uranium fuel from the reactor core vaporised immediately, and were blasted high into the atmosphere; a further 70 tons of uranium and 900 tons of highly radioactive graphite were dispersed into the area around the reactor, starting more than 30 fires; the 800 tons of graphite that remained in the

eactor core caught fire at once, creating a radiological inferno that would burn for 0 days, sending a continuous plume of lethal radionuclides roiling into the sky. The oviet government would wait nearly three full days before acknowledging that an ccident had taken place, and did so only after the drifting plume set off radiation larms in a nuclear plant in Sweden. The contaminants, which included plutonium sotopes with a halflife of 24,360 years, eventually travelled around the globe, depos- ing radioactive material as far away as the lakes of Japan and the hill farms of north Vales. It was not merely the most devastating accident in the short life of the nu- lear power industry; it was the greatest man-made disaster in history.

There were 176 operational staff on duty at the Chornobyl plant that night, nd the subsequent efforts to contain the results of the disaster would eventually volve more than half a million men and women. Many of them were subjected to normous doses of radiation; some were killed instantly; others died agonising eaths soon afterwards in the Ukrainian capital Kyiv, and in the specialist radio-)gical wards of Hospital No 6. The doses received by the hundreds of lousands of soldiers and reservists — " liquidators" — who decontam inated the « > iso n ed landscape o f Ukraine and neighbouring Belarus were either classified or « v e r officially recorded.

The long-term health effects of the accident continue to be the subject of sta- stical debate and manipulation by governments, NGOs, scientists and doctors •ound the worid. Now, more than 20 years after the disaster, the survivors of homobyl are scattered across the former Soviet Union, gradually succumbing to incer and eariy heart attacks.

Twenty kilometres from Chornobyl, the ancient Ukrainian town from which le power station would take its name, Pripyat had been built from scratch in *)70* to house the staff of the nuclear plant; the average age of the new town's jpulation was 27. The station — with four reactors already online and a fifth id sixth under construction — was planned as the largest nuclear power plant the worid, and regarded as a prize posting for engineers. Pripyat was a mod- town, renowned as one of the finest places to live in the entire Soviet Union, liose who visited at the time would later remember it idyllically, filled with ■ses and children.

That night, Reactor No 4 was due for a long postponed safety test, to assess the stems' ability to keep the reactor core cool in the event of a power cut.

No, 4 was a 1,000 megawatt RBM K reactor — a colossal structure composed 1,660 10-metre-long channels filled with uranium fuel, separated by 1,700 tons moderating graphite arranged into 2,488 columns. The power of the reactor was gulated by 211 boron carbide control rods, raised or lowered into the reactor ire to modulate the rate of reaction. Protecting the station workers from the ra- ation of the reactor was a steel and concrete biological shield three metres thick d 17 metres in diameter. The technicians called this the pyatachok, or "five ipek piece".

The RBMK was regarded as the workhorse.of Soviet atomic energy, thrifty and reliable — and safe enough to be built without an expensive containment building that would prevent the release of radiation in the event of a serious accident. In fact, the reactor had serious design faults. when run at low power it was dangerously unstable and difficult to control; additionally, for the first four seconds after being inserted, the control rods would do the opposite of what they were supposed to — instead of slowing reaction, they would cause a sudden power surge. Under normal conditions these faults were not regarded as dangerous; but were the reactor ever to be pushed beyond its normal limits, they could prove catastrophic.

And in the early hours of 26 April, the safety test commenced with the unstable reactor operating at low power, with five separate safety systems disabled or disconnected and all but five of the control rods withdrawn. When the experiment caused an unexpected power surge, the emergency shut-down button was pressed, sending 211 control rods into the core. Within four seconds, steam pressure and power readings went off the scale. And at 1.23.58, the reactor was torn apart by the first of several catastrophic hydrogen explosions. the 500-tonne pyatachok was hurled into the air, exposing the core.

It was an apocalyptic sight. flames shot into the sky; sparks showered from the severed 6,000-volt cables hanging from the smashed circulation pumps; burst water and nitrogen tanks dangled in the air above the red-hot wreckage of the reactor hall; and from the centre of the building, an unearthly, delicate, blue-white light shot upwards into the night — a shaft of ionising radiation from the exposed core.

The hot debris from the exploding reactor set light to the bitumen-covered roofs of the surrounding buildings, threatening to spread the blaze into the kilometre-long turbine hall, and — even more catastrophically — to neighbouring Reactor No 3.

A fatal dose of radiation is estimated at around 400REM — which would be absorbed by anyone whose body is exposed to a field of 400 roentgen for 60 minutes. On the roof of the turbine hall, both gamma and neutron radiation was being emitted by the lumps of uranium fuel and graphite at a rate of 20,000 roentgen an hour; around the core, levels reached 30,000 roentgen an hour. here, a man would absorb a fatal dose in just 48 seconds. It was a full hour before the first firemen were relieved and rushed away by ambulance. When they died two weeks later in Hospital No 6, it became known that radiation had been so intense the colour of one fireman's eyes had turned from brown to blue; the other sustained such severe internal radiation burns there were blisters on his heart. Their bodies were so radioactive they were buried in coffins made of lead, the lids welded shut.

During the early hours of 26 April, 37 fire crews —186 firemen and 81 engines — were summoned to Chornobyl from all over the Kyiv region. By 6.35 a.m. they had extinguished all the visible fires around the buildings of Reactor No 4.

The deputy fire chief of Kyiv reported that the emergency was over; and yet, from around the displaced disc of the pyatachok came an ominous red glow. Reactor No 4 was gone; in its place was a radioactive volcano of molten uranium fuel and burning graphite — a blaze that would prove all but impossible to extinguish.

The graphite in Reactor No 4 had been burning for almost 24 hours when the Chornobyl Commission decided the only way to extinguish the fire was to smother it. The scientists suggested sand, boron and lead, to absorb radiation and cool the melting core — 4,000 tons would do it, dropped into the blazing reactor from the air. On the afternoon of the 27th, two Mi-8 helicopters from Kyiv began the first of hundreds of firefighting sorties. By 1 May, they had dropped 4,450 tons of sand into the reactor.

But on 2 May, the engineers and physicists at Chornobyl made a horrifying discovery. the temperature of the core and the volume of radionuclides rising from it were both increasing. They suspected that the whole helicopter operation had been a terrible mistake. the sheer weight of everything they had dropped on the reactor from the air — including 2,400 tons of lead — had not only caused structural damage but was pressing the hot reactor core against its concrete base. And if the uranium reached meltdown temperature — 2.900C — a single sphere of molten fuel would burn through the concrete foundations of the reactor building, and keep going until it reached the water table. At that moment, there would be another explosion, exponentially more devastating than the first; the three remaining reactors would be destroyed in a nuclear blast that would render Ukraine uninhabitable for decades to come.

A plan was devised to freeze the earth around the reactor with liquid nitrogen, and then build a heat exchanger in the ground beneath it to cool the core and prevent meltdown. Miners were summoned from the coalfaces of Donetsk and the subway projects in Kyiv to dig tunnels beneath the reactor. The scientists feared that pneumatic drills could disturb the foundations of the reactor, so they worked with hand tools, in conditions where wearing protective clothing was practically impossible, amid extraordinary fields of radioactivity. To freeze the ground, all the liquid nitrogen in the western Soviet Union was sent to Chornobyl.

On 10 May, the fire finally subsided; it now seems possible that the graphite simply burnt itself out. The nitrogen was found, and the subterranean heat exchanger built, but by mid-May the temperature of the core had dropped to 270°C; the exchanger was never even turned on.

In the weeks following 26 April, hundreds of thousands of scientists, soldiers and civilian workers were sent by train to Chornobyl from every republic of the USSR. They camped in settlements and tents in the newly established 30 km exclusion zone, or were billeted on Black Sea cruise ships moored on the River Pripyat.

A new station management was charged with containing the wreckage of Reactor No 4, protecting the population of Ukraine and Belarus from the contami-

nation spread across the landscape, and restarting the three remaining reactors of the station, shut down in the immediate aftermath of the accident.

During May and June 1986, the 600,000 liquidators were set to work. soldiers were sent to Kyiv to cut the leaves from every bush and tree in the city and bury them; helicopter crews sprayed a special polymer film from the air to capture radioactive particles on the ground; the Pripyat was dammed to prevent irradiated water flowing into the Dnieper; 135,000 people were evacuated from the exclusion zone; 70 villages were so contaminated that they were flattened and buried in their entirety.

To collect pieces of fuel and graphite from the roofs around Reactor No 4, three lightweight robots were bought in Germany for one million gold roubles. But up on the roofs, the machines were useless. Their electronics failed in the intense fields of radioactivity; they got bogged down in the melted bitumen and became entangled in abandoned fire hoses.

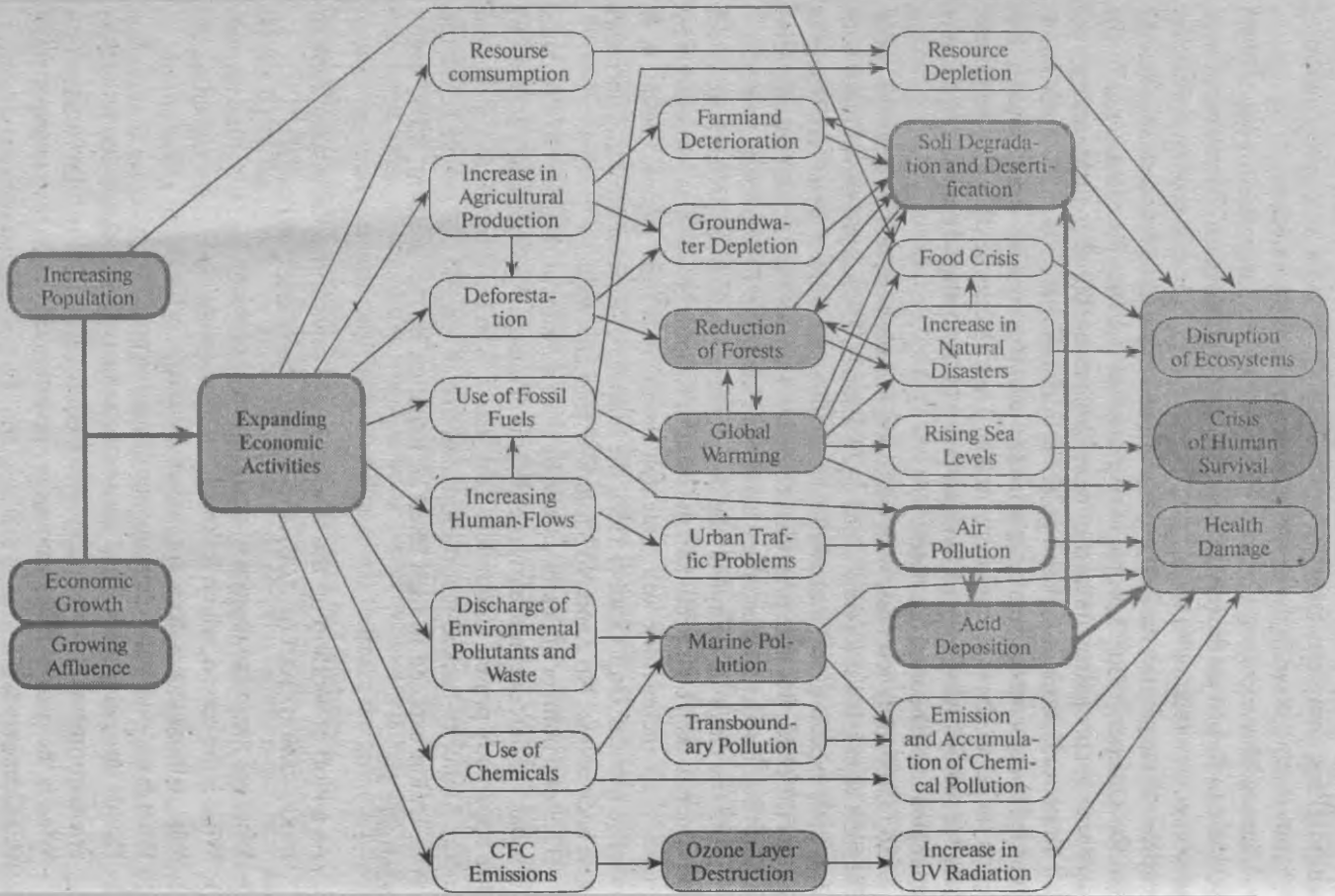
So, 3,400 army reservists with picks and shovels were sent to clear the roofs. The men were given strict time limits — 20 seconds, 25 seconds, two minutes — to limit their exposure, and makeshift lead clothing made from metal torn from the walls of the plant. But little practical protection was possible. It could reduce radiation by two or perhaps three times, but it wasn't enough. The dose was immense.

With the clean-up complete, the Sarcophagus — the huge prefabricated steel and concrete shell built to contain the ruins of Reactor No 4 – was put together by cranes; a six metre-thick wall protected the builders from gamma radiation. It took five months. On 1 October 1986, the turbines of Reactor No 1 at Chornobyl came back online; No 2 and No 3 followed soon afterwards.

The total number of deaths caused by the explosion of Reactor No 4 remains the subject of fierce debate; early predictions of hundreds of thousands of fatalities have apparently proved unfounded. Last year, a WHO and International Atomic Energy Authority-backed report estimated that of the 600,000 people across the Soviet Union exposed to high levels of radiation by the accident, 4,000 would eventually die.

5. As a kind of winding up the discussion of environmental issues, look at the following chart (p. 108) and answer the questions below.

1) What are the initial reasons of environmental problems?
2) What is the reason, which follows form these initial ones?
3) What consequences does, e.g. use of chemicals, bring to?
4) What is an immediate consequence of marine pollution?
5) Divide into pairs and ask and answer the same type of question about the other environmental problems depicted in the chart using the following pattern. What is the reason of (transboundary pollution)? What is the consequence of (CFC emissions)?
6) What are the final consequences of the environmental problems?


Increasing Population
Economic Growth
Growing Affluence
Expanding Economic Activities
Resourse comsumption
Increase in Agricultural Production
Deforesta-tion
Use of Fossil Fuels
Increasing Human-Flows
Discharge of Environmental Pollutants and Waste
Use of Chemicals
CFC Emissions
Farmiand Deterioration
Groundwa-ter Depletion
Reduction of Forests
Global Warming
Urban Traf-fic Problems
Marine Pol-lution
Transboundary Pollution
Ozone Layer Destruction
Resource Depletion
Soli Degrada-tion and Deserti-fication
Food Crisis
Increase in Natural Disasters
Rising Sea Levels
Air Pollution
Acid Deposition
Emission and Accumula-tion of Chemi-cal Pollution
Increase in UV Radiation
Disruption of Ecosystems
Crisis of Human Survival
Health Damage