高等学校教材

环境工程专业英语

大学英语专业阅读教材编委会组织编写

华南理工大学 钟理 主编

化学工业出版社

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前　言

组织编审出版系列的专业英语教材，是许多院校多年来共同的愿望。在高等教育面向21世纪的改革中，学生基本素质和实际工作能力的培养受到了空前重视。对非英语专业的学生而言，英语水平和能力的培养不仅是文化素质的重要部分，在很大程度上也是能力的补充和延伸。在此背景下，教育部（原国家教委）几次组织会议研究加强外语教学问题，制订有关规范，使外语教学更加受到重视。教材是教学的基本要素之一，与基础英语相比，专业英语教学的教材问题此时显得尤为突出。

国家主管部门的重视与广大院校的呼吁引起了化学工业出版社的关注，他们及时地与原化工部教育主管部门和全国化工类专业教学指导委员会请示协商后，组织全国十余所院校成立了本套专业英语教材编委会。在经过必要的调查和研究后，根据学校需求，编委会优先从各校教学（交流）讲义中确定选题，同时组织力量开展编审工作。本套教材涉及的专业主要包括化学工程与工艺、石油化工、机械工程、信息工程、工业过程自动化、应用化学、生物工程、环境工程、精细化工及制药工程、材料科学与工程、化工商贸等。

根据“全国部分高校化工类及相关专业大学英语专业阅读教材编审委员会”的要求和安排编写的《环境工程专业英语》教材，可供环境工程及相关专业本科生使用，也可作为同等程度（通过大学英语四级）的专业技术人员自学教材。

内容与结构　教材分为七部分(PART)，每个部分含4～5个单元(Unit)，共29个单元，每个单元由一篇课文和一篇阅读材料组成（第七部分除外）。阅读材料提供与课文相应的背景知识或是课文的续篇，以进一步拓宽课文内容。根据课文与阅读材料的内容，配有相应的练习题、注释和词汇表。课文与阅读材料共计54篇，均选自原版英文教科书、科技报告、著作、专业期刊、产品说明书、专利及文摘等。体裁较广，从纵横两个方面覆盖环境工程专业的相关内容。其中：

PART 1 为环境工程概述，包括环境工程的历史，环境的研究，城市环境，能源开采与环境，环境分析概况等；

PART 2 为空气污染及控制，包括空气污染物类型及来源，空气污染对气候及生态的影响，空气污染治理的一般性技术和新的处理方法；

PART 3 为水污染及废水处理，包括水污染来源及类型，废水处理技术及方法，废水处理装置控制及优化；

PART 4 为固体废物及处理，包括固体废物种类及来源，有害物质及处理方

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法，固体废物及能量回收；

PART 5 为其他污染及控制技术，包括声音与噪声，噪声控制，能耗与噪声，热污染及控制；

PART 6 为环境影响评价，包括环境影响评价概况，废水对河水影响评价，空气质量环境评价，噪声影响评价等；

PART 7 为专利、广告、说明书，包括专利文摘，化学文摘，销售广告，招聘广告，CD-ROM 的使用说明。

书后附有总词汇表。

词汇与练习 专业英语练习是高等院校理工科《英语教学大纲》所要求的内容，目的是使本科生在专业内容方面进行英语阅读的系统训练。在这阶段英语学习中，主要是提高学生正确、快速地阅读英语科技文献的能力，初步学会专业英语的写作方法，掌握一定数量的科技词汇及其习惯用法，了解专业英语的特点等，把学生学到的基础英语进行专业化训练。本教材包括环境工程专业英语词汇和相当数量的常用科技词汇，词汇复现率较高。习题设有词汇练习，以利学生掌握基本词汇。为使学生学习英语从“形式”用法提高到“实际”运用上来，练习主要以英译汉、汉译英、用英语回答问题及写出课文或某一段落的摘要等主观题型为主，而不是基础英语中的客观题（选择题）为主，从而强化学生用英语书面表达科技信息的能力。

致谢 本教材在编写过程中得到了化工类及相关专业大学英语专业阅读教材编审委员会、华南理工大学教务处、各编写单位以及化学工业出版社的大力支持。教材是四所院校的六位教师共同劳动的结晶。其中第一和第三部分由华南理工大学钟理编写，第二和第六部分由浙江大学金一中和史惠祥编写，第四和第七部分由郑州工业大学的刘宏和魏新利编写，第五部分由四川联合大学王跃川编写，全书最后由钟理统稿，大连理工大学周集体审阅了全书，并提出了许多宝贵意见，清华大学环境科学与工程系张晓健教授提供了详尽的改进意见，谨在此一并表示衷心感谢。由于时间所限，对张晓健教授提出需作较大调整的内容暂未能改动，在此向张教授致歉。本教材涉及内容较广，可能出现错漏，希望读者不吝指正，使本书在使用过程中不断得到改进。

编 者

1999 年 1 月

内 容 提 要

《环境工程专业英语》是根据《大学英语教学大纲》（理工科本科用）专业阅读部分的要求编写的，供理工科大学环境工程或相关专业学生使用，也可供同等英语程度环境工程师或相关领域的科技人员使用。

全书共分为七部分（Part）。每个部分含4～5个单元（Unit），共29个单元。每个单元由一篇课文和一篇阅读材料组成（第七部分除外），共计54篇。课文和阅读材料均选自原版英文教科书、科技报告、著作、专业期刊、产品说明书、专利、文摘及广告等。其中第一部分1～4课，介绍环境工程概述和历史；第二部分5～9课介绍空气污染及其防治；第三部分10～13课介绍水污染及废水处理技术；第四部分14～17课为固体废物及处理方法；第五部分18～21课介绍其他污染及控制技术；第六部分22～25课为环境影响及其评价；第七部分26～29课为专利、文摘、广告、说明书。每篇课文均配有与课文相对应的练习，主要以主观练习题为主，包括词汇与阅读练习，英译汉与汉译英，写出课文或某一段落的Summery等。为便于学生自学，本书每课配有单词和词组表，并对课文的难点作必要的注释，全书最后附有总词汇表。

Contents

PART 1 INTRODUCTION TO ENVIRONMENTAL ENGINEERING

Unit 1

Text: Environmental Engineering

What Is This Book About?

The objective of this book is to introduce engineering and science students to the interdisciplinary study of environmental problems; their causes, why they are of concern, and how we can control them. The book includes:

- Description of what is meant by environment and by environmental systems
- Information on the basis causes of environmental disturbances
- Basis scientific knowledge necessary to understand the nature of environmental problems and to be able to quantify them
- Current state of the technology environmental control in its application to water, air and pollution problems
- Considerable gaps in our current scientific knowledge of understanding and controlling many of the complex interactions between human activities and nature
- Many environmental problems which could be eliminated or reduced by the application of current technology, but which are not dealt with because of society's lack of will to do so, or in many instances because of a lack of resources to do so.

Some Important Definitions

Where they are first used in this book, definitions are introduced in block form, as shown here, or printed in bold type.

Environment is the physical and biotic habitat which surrounds us; that which we can see, hear, touch, smell, and taste.

System, according to Webster's dictionary①, is defined as "a set or arrangement of things so related or connected as to form a unit or organic whole; as, a solar system, irrigation system, supply system, the world or universe".

Pollution can be defined as an undesirable change in the physical, chemical, or biological characteristics of the air, water, or land that can harmfully affect the health, survival, or activities of humans or other living organisms.

When the goal of improving environmental quality is taken to be improving human well-

being, the word "environment" broadens to include all kinds of social, economic, and cultural aspects. Such broadness is unworkable in many real situations and impractical in a textbook designed for a one semester course. Our examination of environmental problems is therefore limited by our definition of "environment".

Interaction of Systems

A number of different environmental problems are associated with water, air, or land systems. Many of these problems will apply only within one of these systems, justifying the breakdown into these categories. Such a classification is also useful for easier comprehension of related problems within one system. Moreover, it is sensible because, for managerial and administrative reasons[2], such subfields as air pollution, water supply, wastewater disposal, and solid waste disposal are often dealt with separately by governmental agencies.

Unfortunately, many important environmental problems are not confined to an air, water, or land system, but involve interactions between systems. A current example is the acid rain problem stemming from the emission of sulfur dioxide and nitrogen oxide gases into the atmosphere from the stacks of generating stations[3], smelters, and automobile exhausts. These gases are then transported by air currents over wide regions. Rainfall "washes them out", creating acid rain which is harmful to aquatic life, forests, and agricultural crops. Two examples of interaction between systems that cause major environmental disturbances are presented-the buildup of atmospheric carbon dioxide, a global problem, and the acid rain problem, normally of regional nature.

Environmental Disturbances

Many major improvements to our standard of living can be attributed to the application of science and technology. A few examples are noted here. Can you think of others?

- The production of more and better quality food
- The creation of housing as protection from extremes from climates and as living space
- The building of fast and reliable means of transportation
- The invention of various systems of communication
- The invention of machines to replace human or animal power
- The supply of safe water and the disposal of wastes
- The elimination of many infectious diseases
- The elimination of most water-borne diseases in the developed world through improved water technology
- The availability of leisure time through greater productivity, providing the opportunity for cultural and recreational activities
- The protection from the worst effects of natural disasters such as floods, droughts, earthquakes, and volcanic eruptions.

With these improvements, however, have come disturbing side effects, such as lost arable land, disappearing forests, environmental pollution, and new organisms resistant to controls.

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Many effects originally considered to be just nuisances are now recognized as potential threats to nature and to humans. In an agrarian society, people lived essentially in harmony with mature, raising food, gathering firewood, and making clothing and tools from the land. The wastes from animals and humans were returned to the soil as fertilizer. Few, if any, problems of water, land, or air pollution occurred.

The cities of ancient times, particularly those of the Roman Empire④, had systems to supply water and to dispose of wastes. The aqueducts supplying the ancient city of Rome (population about 1 million) with safe water from the Cloaca Maxima⑤, the best known and one of the earliest sewers to be built, are examples of such systems. The municipal technology of ancient cities seems to have been forgotten for many centuries by those who built cities throughout Europe. Water supply and waste disposal were neglected, resulting in many outbreaks of dysentery, cholera, typhoid, and other waterborne diseases. Until the middle of the nineteenth century, it was not realized that improper wastes disposal polluted water supplies with disease-carrying organisms. The industrial revolution in nineteenth-century Britain, Europe, and North America aggravated the environmental problems since it brought increased urbanization with the industrialization. Both phenomena, urbanization and industrialization, were and are fundamental causes of water and air pollution which the cities of that time were unable to handle.

Rapid advances in technology for the treatment of water and the partial treatment of wastewater took place in the developed countries over the next few decades. This led to a dramatic decrease in the incidence of waterborne diseases⑥. Note that all wastes discharge into the environment, and thus pollute our water, air, and land systems.

Selected from "*Henry, Gray W. Heinke. Environmental Science and Engineering, Prentice-Hall International Editions, Pretice. Hall Englewood Cliffs, NJ, USA, 1989*"

Words and Expressions

smelter ['smeltə] *n.* 熔炉；冶金厂，冶炼者
aqueduct ['ækwidʌkt] *n.* 渠；水管
dysentery ['disəntri] *n.* 痢疾
cholera ['kɔlərə] *n.* 霍乱
typhoid ['taifɔid] *n.* 伤寒；*a.* 伤寒的
sulfur dioxide 二氧化硫
nitrogen oxide 氮氧化物
carbon dioxide 二氧化碳
arable ['ærəbl] *a.* 可耕的；*n.* 耕地
agrarian [ə 'grɛə riən] *a.* 土地的；农民的；农业的
urbanization ['ə:bənaizeiʃən] *n.* 城市化
harmony ['hɑ:məni] *n.* 协调，一致
environmental disturbance 环境破坏

aquatic life 水生物
discharge [dis'tʃɑ:dʒ] *v.* 排出；*n.* 排出物

Notes

① Webster's dictionary 韦氏词典，由美国 Merrian-Webster 公司出版。该公司出版的《韦氏国际英语大词典》和《韦氏大学词典》等是世界公认的权威性工具书。
② for managerial and administrative reasons 行政管理上的原因。
③ stacks of generating stations 许多发电站，这里 stacks of 相当于 lots of。
④ Roman Empire 罗马皇帝。
⑤ Cloaca Maxima 古罗马的大排泄沟，污秽物的普通储藏库 (the main drain of ancient Rome)。
⑥ waterborne diseases 水传染的疾病，如痢疾、伤寒等。

Exercises

Based on Reading Material:

1. *Put the following into Chinese.*
   life expectancy poverty-stricken smog-laden air global conditions haves and have-nots underprivileged savanna predator environmental disruptions
2. *Put the following into English.*
   农药 化肥 有机废物 微生物 衰减
   阻滞的 稀释 添加剂 合成塑料 再生
3. *Translate the part of "The Human Condition" into Chinese.*
4. *How many kinds of environmental problems are there according to the Reading Material?*

Reading Material: Studying the Environment

The Human Condition

Consider the state of humankind on Earth, the planet we call home. In the past, life was hard and short for most people. Then, at the beginning of the twentieth century, rapid progress in medicine, agriculture, and industrial techniques seemed to promise that everyone might soon be able to enjoy long life, decent food, satisfying employment, and adequate housing. This promise has not been realized. In 1982 there were about 5 billion people on Earth. One quarter of them had a greater life expectancy and lived in greater luxury than anyone a hundred years ago would have believed possible. But at the same time three quarters of all people had inadequate or unsatisfactory water and shelter, and more than one third suffered from malnutrition and hunger. More people starved to death in 1982 than in any year since the beginning of time.

Most of the people who starve to death live in poverty-stricken developing nations. But now, at the end of the twentieth century, the wealthy nations are in trouble too. According to

most estimates, the average standard of living in North America and Western Europe peaked in about 1967. Even the wealthiest nations are running out of fuel, hardwoods, and some minerals. As a result, necessities such as housing, food, and fuel are demanding more and more of the family budget, leaving less available for luxuries. Pollutants contaminate cities, towns, and even rural environments. Sewage or poisonous pesticides in waterways, smog-laden air, and garbage in streets or parks lower the standard of living of everyone, no matter how wealthy.

Our vast and swiftly growing population consumes the Earth's resources of agricultural land, minerals, water, and fuel faster than natural processes can replace them. This is a serious problem in itself. But global conditions are further endangered because these resources are not distributed evenly. One quarter of the population, those that live in the developed nations, use nearly 80 percent of the resources consumed by humankind in any one year. The other three quarters of the population consume only about 20 percent of the resources used in a year. The gap between the haves and the have-nots is growing wider. Today, when transistor radios are to be found even in the most remote African villages, the world's poor know how underprivileged they are. This knowledge produces political instability. Years ago, political upheaval in one nation meant little to the rest of the world. But times have changed, because modern technology ensures that nearly all nations possess weapons that can wreak havoc far beyond their own borders. As a result, no nation can afford to ignore the problems of another.

Classifying Environmental Problems

Environmental problems are always interrelated. Sometimes a solution to one problem actually creates another problem. For example, when people are sick and dying from disease, it is natural to want to improve human health. When health is improved and infant mortality is reduced, a population explosion may result. To feed this growing pollution, natural habitats are often destroyed by turning them into farmland. As natural habitats are destroyed, the wild plants, predatory animals, and parasites that once lived there are killed as well. Because of the lack of predators and parasites, outbreaks of insect pests become more common. Farmers use pesticides to control the pests and protect the crops, but in the process the environment becomes polluted. The development of this entire cycle in itself consumes fossil fuel supplies that are becoming scarce. In addition, when fuels are burned, air pollutants are generated.

How does a person begin to study such a network of interlocking problems? To make the task a bit more manageable, we will divide environmental disruptions into five main types.

(a) Overpopulation. Overpopulation may be defined as the presence in a given area of more people than can be supported adequately by the resources available in that area. Many people argue that the population explosion that has taken place in the twentieth century is now the most important problem we face. It is important first because overpopulation is a

major cause of all other environmental problems: Fewer people would use less oil, chop down fewer trees, and pour less sewage into rivers. Second, overpopulation and the starvation that accompanies it are generally higher on our list of priorities than other environmental concerns. It is hard to argue that an area should be set aside as parkland to preserve a vanishing forest or savanna when that land might be used to raise crops that would prevent fellow human beings from starving to death.

(b) **Pollution.** Pollution is a reduction in the quality of the environment by the introduction of impurities. Smoke pollutes the air; sewage pollutes the waters; junk cars pollute the land. We know that such contamination exists; it can be seen, smelled, or even tasted. The effects of pollution on human welfare or on the economy, however, may be matters of considerable disagreement.

There are two distinctly different types of pollution.

1. *Concentration of Organic Wastes.* All living organisms produce waste products; wastes are associated with the act of living. Upon death, the entire organism becomes a waste product. Before modern civilization, most organic wastes did not accumulate in the environment because they were consumed by other organisms and thereby recycled. In modern times, the natural decomposition of organic wastes does not always operate efficiently.

2. *Introduction of Synthetic Chemicals into the Environment.* Everything is make of chemicals people, eagles, trees, lakes, plastic-everything. Although many natural chemical compounds have existed for billions of years, peopled have recently learned to make new chemical compounds, called **synthetic chemicals.** The quantity and variety of new synthetic chemicals are staggering. They are present in paints, dyes, food additives, drugs, pesticides, fertilizers, fire retardants, building materials, clothes, cleaning supplies, cosmetics, plastics, and so on.

Synthetic chemicals are noted for the variety of their properties. Some of them are drugs that save millions of lives every year, and others are poisons. But because most of them are new to the environment, the traditional patterns of decay and recycling do not necessarily apply. Some synthetic chemicals break down rapidly in the environment by the action of sunlight, air, water, or soil, and some are eaten by living organisms. Such processes may take place over a span of minutes, hours, or days. A material that decomposes in the environment as a result of biological action is said to be **biodegradable.**

Many compounds, however, do not disappear so readily. Synthetic plastics, for example, remain in the environment for a long time because organisms that feed on them and break them down are rare. Plastic shampoo bottles may produce unsightly litter, but they are not biologically active. Many other synthetic chemicals, however, are harmful. For example, DDT was developed as an insecticide, but experience with it has shown that it has undesirable environmental effects as well.

(c) **Depletion of Resources.** A resource is any source of raw materials. Fuels, minerals, water, soil, and timber are all resources. A material is depleted, or used up, as it becomes

less available for its intended function. Material resources can become depleted in three different ways. First, a substance can be *destroyed*, that is, converted into something else. Fuels are destroyed when they are used: Coal is converted to ashes and gas; uranium is converted to radioactive waste products. The ashes or waste products are no long fuels.

Second, a substance can be lost by being *diluted*, or by being *displaced* to some location from which it cannot easily be recovered. If you open a helium-filled balloon, the gas escapes to the atmosphere. Not one atom of helium is destroyed, but nevertheless the gas is lost because it would be impossible, as a practical matter, to recover it. The same concept of loss by dilution applies to minerals.

Third, a substance can be rendered unfit for use by being *polluted*. In this way pollution and depletion are related to each other. If industrial or agricultural wastes are discharged into a stream, or if they percolate down through soil and porous rock to reach a supply of groundwater, then these water resources become less fit for drinking or, in the case of the stream, for recreation or for the support of aquatic life.

Finally, conservation is often seen as a measure whose benefits will be realized later, perhaps only by our children or grandchildren, and not all makers of policy are equally concerned about future generations.

(d) Changes in the Global Condition. Scientists have begun only recently to wonder whether human activities might affect the global environment. Aerosol sprays and aircraft exhaust may be destroying the ozone layer in the atmosphere that filters out ultraviolet radiation. Burning fossil fuels releases carbon dioxide that could affect planetary weather patterns. Pollution of the oceans destroys plant life that produces oxygen, and such pollution might eventually reduce the oxygen content of the air we breathe. Throughout much of the world, forests, jungles, shrublands, and other natural systems are being converted to farmland. In many areas, this process is depleting the fertility of the soil, altering the climate, and causing the extinction of literally thousands of species of plants and animals. Except in emotional terms, people often do not know precisely what has been lost when a species becomes extinct. Scientists are convinced that many endangered species of plants or animals should be saved because they may be essential in breeding valuable crops or domestic animals.

(e) War. In many ways, war is a combination of all environmental problems rather than a separated category. From time immemorial, overpopulation and want have led human groups into wars over food, land, or some other coveted resource. In modern times war and the preparation for war have led to pollution and depletion of resources that are far more extreme than any single peacetime activity. War reduces population, although the effect is trivial: more people were born in 6 months in 1982 than were killed throughout the first and second world wars. Finally, a nuclear war places the global systems of the Earth, human civilization, and even the human species itself at risk.

Selected from "*Jonathan Turk, Amos Turk. Environmental Science, Third Edition, Saunders College Publishing, The Drylen Press, USA, 1984*"

Unit 2

Text: Historical Overview of Hazardous Substance Disposal in the USA

Hazardous substance disposal practices in the United States have traveled full circle. Prior to 1978 there were few if any regulations regarding the disposal of these materials. Improper disposal of many of these chemicals resulted in health problems for many citizens, contaminated water supplies, and destruction of wildlife. With the enactment of the Resource Conversation and Recovery Act (RCRA)[①] of 1978, manufacturing facilities now have an obligation to account for all waste materials that are generated by the facility. Implementation of RCRA has been slow.

From the very early industrial period in the United States, which started about 1920, until several years after the Second World War, there was little concern for the proper methods of disposal of waste materials that were generated as by-products during manufacturing processes. Up until the 1960's it was quite common to find fresh water rivers and streams fouled with waste chemicals from manufacturing, salt water from oil production wells and waste acids from steel mill activities. Virtually every conceivable waste oil, solvent, or resin waste could be found in the rivers. The laws of the time were either non-existent or not enforced. The literature has many examples of health problems of individuals as well as destruction of fish and wildlife habitat. Many other cases occurred that were not reported in the literature.

Other waste materials were dumped haphazardly in makeshift excavations either at the factory side or throughout the country side. Because of ignorance and lack of economic incentives to do so, the factories made no attempt to prevent contamination of underground water supplies by the chemicals that were disposed of. In fact, knowledgeable scientists of the time accepted land irrigation and percolation into the porous underground formations as methods of waste treatment. Although these treatment methods may have been intended for non-hazardous materials, they were employed for hazardous materials as well. Again, there were no governmental regulations protecting the underground aquifers from these practices.

The problem of disposal of hazardous chemicals did not improve with the creation of the Environmental Protection Agency (EPA)[②] in 1966. The first task of the new agency was to clean up rivers and streams. Unfortunately, no one in power in the government at the time had insight into the problems that were to be created by the new agency.

The EPA was quite successful in those early days in the enforcement of the many water pollution laws that evolved. As the practice of the dumping of hazardous materials into the rivers and streams was eliminated, those same materials created other disposal problems.

Many of the chemicals saved from the sewer were either worthless or of such a low value

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