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环境科学与工程
专业英语

English for Environmental Science and Engineering

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前　言

环境科学与工程专业英语是指导学生在环境科学与工程专业领域学会用英语直接查找专业信息或用英语表达研究成果的一个重要的教学内容。当前，尽管大学生的基础英语水平普遍较高，英语四、六级通过率不断攀升，但是对专业英语仍比较陌生，对英语的应用，特别是在专业领域的应用能力较差。具体表现为说专业英语困难，写科技论文更困难。如何改革现有的教学模式，提高专业英语教学质量，从而提高学生对英语的应用能力，是摆在当前专业英语教学中的一个重要任务。

基础英语之后的专业英语教学包括科技英语(English for Science and Techmology，简称EST)和专用英语(English for Specific Purpose，简称 ESP)两部分。

EST 是英语语言的一个变体，它与日常英语并无本质上的不同，它与普通英语的区别体现在“科技”方面。它具有科技文献的普遍特点，具体反映在文体、句法结构、语态、词汇等方面。首先，在 EST 文章中，其明显特点是逻辑性强，在句法上体现为大量因果从句的使用；其特点之二是逻辑思维具有严密性，在句法上体现为长句的使用。另外，在 EST 文体中，客观事实或客观过程被强调，而一般不强调主体即实施者的作用，这也就使得被动语态成为常用结构，由“It”作形式主语的句子结构被常用；再者，从词汇组成特点来看，EST 词汇主要由技术术语、次技术词汇以及功能词如介词、连词、冠词等组成。

ESP 除了包括各类科技专业英语外，还包括各类职业如宾馆、旅游等有特殊用途的英语。我国大学阶段后期的专业英语教学以获取专业知识达到专业交流的目的为主，即以传授专业知识而不是语言知识为主，因此，此阶段的英语教学既涉及各类科技专业，又具有 EST 的启蒙规律和特点，即反映在科技文体、句法结构、语态、词汇，尤其是构词法等方面的特点。

因此，作为专业英语教学的教材，不能仅仅定位于专业领域科技文献阅读，而应该考虑基础英语、科技英语(EST)以及专用英语(ESP)三者之间的有机衔接，更重要的是考虑如何提高大学生应用英语的能力。

本书作者根据各自的专业英语教学实践，依据专业英语特点以及专业英语与基础英语的关系等，整理编写了这本《环境科学与工程专业英语》教材。

本书共分 6 个部分 48 个单元。第一部分为环境科学与工程简介，包括 4 个单元；第二部分为环境与环境问题，包括 12 个单元；第三部分为环境规划与管理，包括 12 个单元；第四部分为污染控制工程，包括 10 个单元；第五部分为学术论文写作，包括 10 个单元；第六部分为本书出现的专业词汇。全书由钱家忠审核、陈众校对。与以往同类教材相比，本书除涵盖了专业文献阅读内容之外，还增加了科技写作和常见的语法内容。全书具有知识点多、信息量大、覆盖面广、应用性强等特点。

中国科技大学俞汉青教授、合肥工业大学葛晓光教授对本书的编写提出了许多宝贵意见；在本书编校过程中，曾得到吴义锋研究生的帮助，在此一并表示感谢！

本书内容涉及领域广泛，资料来源基本上是国外原版的经典文献，限于作者水平，书中难免有不当之处，敬请广大读者批评和指正！

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Part I

Introduction to Environment

Unit 1 Introduction to Environmental Science

What is Environmental Science? Environmental science is the discipline that is concerned with identifying and diagnosing environmental impacts. Environmental scientists first try to understand the patterns or impact or change in the natural environment caused by various human activities. Once, they understand what is occurring, environmental scientists then search for the specific cause or causes. Often, they can also get involved in seeking solutions as well.

Solutions to Environmental Problems While environmental science is critical to understanding the impact of human activities on the natural environment, societies often turn to environmental policy, environmental education, and environmental technology for implementing solutions. Both environmental policy and education are concerned with changing human behavior. Environmental policy does so in a more direct, or controlling, manner. The Clean Air Act, for example, specifies the allowable levels of certain kinds of gases, which can be released by industrial facilities. Environmental education, on the other hand, seeks to change human behavior in more subtle ways. Educating the average consumer about the effects of air pollution from automobiles, for example, may lead some individuals to change their behavior and using less polluting forms of transportation such as walking, bicycle, or public transportation.

Lastly, environmental technology refers to solving environmental problems by using or substituting tools, techniques, or processes that have less environmental impact. For example, probably the most well known type of environmental technology is the catalytic converter, which is attached to the exhaust system and neutralizes the gases that are emitted by the engine when gasoline is burned or combusted. To solve a specific environmental problem,

societies often turn to environmental policy, education or technology, or a combination of any or all of the three.

The Environment as a System To better understand the natural environment, the impacts that humans are having on the environment, and ways in which humans can alter their behavior and technologies to reduce environmental impact, it is useful to think of nature or natural environment from a "systems" perspective. A system can be viewed as a group of interacting, interrelated, or interdependent elements forming or regarded as forming a collective entity.

Think of the natural environment as a system which is composed of four parts or components, each with its own unique form, arrangement, characteristics and dynamic. These five subsystems include:

• Atmosphere — blanket of gases that surrounds the earth or the gaseous earth;

• Lithosphere — the solid earth, composed of rocks and minerals;

• Hydrosphere — waters of the earth or liquid earth;

• Biosphere — living earth, composed of plants, animals, insects, and all living things except humans.

Remember we said that our language suggests that humans are not part of the natural environment? Humans make up their own subsystem, known as the sociosphere, which includes all people on the earth and all human activity. Kenneth Boulding, a well-known economist described the sociosphere as: "The social system consists of all human beings on the planet and all their interrelationships, such as kinship, friendship, hostility, status, exchange, money flows, conversations, information, outputs and inputs, and so on. It includes likewise the contents of every person's mind and the physical surroundings, both natural and artificial, to which he relates. This social system clings to the surface of the earth, so that it may appropriately be called the sociosphere, even though small fragments of it are now going out into space. The sociosphere thus takes its place with the lithosphere, the hydrosphere, the atmosphere, the biosphere, and so on as one of the systems which enwrap this little globe. It has strong inter-relationships with the other spheres with which it is mingled and without which it could not survive. Nevertheless, it has a dynamic and an integrity of its own. It is rather thin in Antarctica, although present there; it is very dense in New York. It is a network rather than a solid sphere or shelf, yet no part of the earth's surface is very far from it. It is a system of

enormous complexity, yet not wholly beyond our comprehension."

Important Environmental System Characteristics First, the four environmental subsystems—atmosphere, lithosphere, hydrosphere and biosphere—together with the sociosphere, are part of a large, interconnected, inextricably linked system called the earth. Anything that happens in one of these systems affects some other element or phenomena in another system.

Second, these subsystems are anything but static. There are continual interactions and transfers of energy, chemicals, and materials between these five subsystems. Some of these transfers, such as rain, are visible to humans. Others, such as the breakdown of chemicals from former living organisms as they decompose are not.

Third, there is continual change throughout the subsystems. In fact, the only constant is change. Some of these changes are natural. Some of these changes are caused by human activities.

Environmental Impact Humans have impacted the environment for a long time. Some of this impact is deliberate. Clearing a grassland to plant crops is a deliberate alteration of the environment and if the decision is whether to have food to eat or starve, or alter the natural environment, this is a pretty easy decision for most, if not all, humans to make. However, at the same time, there may be unintended environmental impacts with clearing fields. Depending on the slope of the ground, valuable topsoil may run off into nearby waterways, thereby over time making the field less productive for food and possibly choking waterways with sediment.

Environmental Science Emerged Historically Humans have been altering nature or the natural environment for a long, long time. Prehistoric hunters used fire to clear fields to attract wild animals to the young and tender shoots of grass and other types of vegetation. Human interaction with, and deliberate use, of the natural environment goes back a long way. At some point, though, concerns about the indirect or unintended impacts of human use of or interaction with the environment began to emerge.

In the thirteenth century, we began to see concern expressed in England about the unintended impacts of using wood and coal to heat homes. This smoke from wood and coal fires, both within and outside the house, is perhaps the earliest recorded example of pollution. Over the next several hundred years, legislation, parliamentary studies, and literary comments appeared sporadically in

England. By the early 1800s the smoke nuisance in London and other English cities was of sufficient public concern to prompt the appointment in 1819 of a Select Committee of the British Parliament to study and report upon smoke abatement.

Nonetheless, the number of air pollution incidents continued to increase. In 1873 an air pollution episode occurred in London where several thousand people died and in the autumn of 1909 in Glasgow, Scotland it was estimated that 1063 deaths were attributed to noxious air conditions. Concern about air pollution culminated in December 1952 in London, when the deaths of some 4,000 people were attributed to an air pollution incident.

Sustainable Development To respond to the various impacts that environmental change and pollution have had on the natural environment at local, urban, regional, national and global scales, a new mode of human existence has been suggested. This new mode seeks to provide for the needs of the current generation of humans without compromising the ability of future generations to meet their own needs and is known as sustainable development. As described in the 1987 publication"Our Common Future", sustainable development is"a process of change in which policy and institutional adjustments, technological development, and the direction of investments are harmonized with the exploitation of resources" .

Sustainable development is based upon the following set of assumptions:

• Environmental stresses are interconnected—deforestation not only destroys natural habitats, but threatens the global atmosphere and increases runoff and accelerates soil erosion and siltation of rivers and lakes;

• Ecological and economic concerns are interdependent, therefore environment and economics must be integrated from the start;

• Environmental and economic problems are linked to many social and political factors, and ...;

• Ecological impacts do not respect political boundaries.

When Is, and When Isn't, Sustainable Development Sustainable?

Activities are sustainable when they:

• use materials in continuous cycles;

• use continuously reliable sources of energy, and ...;

• come mainly from the potential of being human — communication, creativity, coordination, appreciation, and spiritual and intellectual development.

Activities are not sustainable when they:

- require continual input of non-renewable resources;
- use renewable resources faster than their rate of renewal;
- cause cumulative degradation of the environment;
- require resources in quantities that could never be available for people everywhere, and ...;
- lead to the extinction of other life forms.

Sustainable development is difficult to fully conceptualize, understand and be put into everyday practice. It may help to think of sustainable development as a direction, like north, for example. You can point to it, there may be many ways to get there, you can see how far you've come, and you have some idea of how far you've got to go.

(据 http://student.ccbc.cc.md.us,2001)

New Words and Expressions

dynamic	[dai'næmik]	n. adj.	动力,动态,动力学的
atmosphere	['ætməsfiə(r)]	n.	大气圈,空气,气氛
lithosphere	['liθəˌsfiə]	n.	岩石圈
hydrosphere	['haidrəsfiə]	n.	水圈
biosphere	['baiəusfiə(r)]	n.	生物圈
kinship	['kinʃip]	n.	亲属关系
hostility	[hɔs'tilti].	n.	敌意
artificial	[ˌa:ti'fiʃəl]	adj.	人造的,人工的
cling	[kliŋ]	v.	附着,粘紧
integrity	[in'tegriti]	n.	完整,完整性
Antarctica	[ænt'a:ktikə]	n.	南极洲
impact	['impækt]	n.	影响,冲突,冲击,碰撞
		vt.	对…发生影响
catalytic	[kætə'litik]	adj.	接触反应的
converter	[kən'və:tə(r)]	n.	转炉
interdependent	[intədi'pendənt]	adj.	相互依赖的,互助的
collective entity		n.	集合体
noxious	['nɔkʃəs]	adj.	有害的
air conditions		n.	大气环境
tender shoots		n.	嫩芽
abatement	[ə'beitmənt]	n.	消除

sustainable	[sə'steinəbl]	adj.	可持续的
harmonize	['ha:mənaiz]	v.	协调
deforestation	[di,fɔris'teiʃən]	n.	采伐森林

Notes

1. Environmental science is the discipline that is concerned with identifying and diagnosing environmental impacts. 环境科学是研究和评价环境影响的一门科学。
2. While environmental science is critical to understanding the impact of human activities on the natural environment, societies often turn to environmental policy, environmental education, and environmental technology for implementing solutions. 鉴于环境科学对理解人类对自然环境影响的重要性,社会通常依靠环境政策、环境教育以及环境技术来解决环境问题。
3. It includes likewise the contents of every person's mind and the physical surroundings, both natural and artificial, to which he relates. This social system clings to the surface of the earth, so that it may appropriately be called the socio-sphere, even though small fragments of it are now going out into space.

   "both natural and artificial" 是插入语, "to which" 引导定语从句,修饰 "physical surroundings"。

   它同样包括每个人的内心世界和与其相关的物质环境(不管是自然的还是人造的),社会系统是和地球表面紧密联系在一起的,所以将之称为社会圈更为贴切,尽管它的一小部分正逐渐进入太空。
4. ..., it is useful to think of nature or natural environment from a "systems" perspective. 从"系统"方面来认识自然或自然环境是有用的。
5. Some of this impact is deliberate. 某些环境影响是人为造成的。
6. This new mode seeks to provide for the needs of the current generation of humans without compromising the ability of future generations to meet their own needs and is known as sustainable development. 这种新的模式既试图满足当代人的需要,同时又不损害子孙后代自给自足的能力,这种模式被称为可持续发展。

Reading Material: Environment Goes Global

The focus of environmental concerns between 1960 and 1980 were national scale issues focused on specific environmental media—air, land, and water—or systems. The 1980's ushered in a new era of environmentalism, transboundary environmental issues, and so environment al issues moved from a national to international and global scale.

By early 1980s, there was growing awareness that human societies were becoming increasingly more interdependent and linked and also that the world could not maintain the population and economic growth it had seen in the 1970's. There simply weren't enough resources for everyone and there was a growing awareness of the ability of humanity to fundamentally alter the earth's natural support systems. In 1982, the National Aeronautic and Space Administration, or NASA, published a report in which the concept of "global change" became linked with the environment. The report stated "This is a unique time, when one species, humanity, has developed the ability to alter its environment on the largest (global) scale and to do so within the lifetime of a single species member. This report is concerned specifically with changes that may affect the habitability of the earth: the ability of the planet to support communities of plants and animals, to produce adequate supplies of food, and to sustain and renew the quality of air and water and the integrity of the chemical cycles essential for life."

The term "global change" refers to global environmental change and since 1982 many different approaches and definitions of global change have been proposed. Despite the differences of all these approaches and definitions, however, there are some common elements. The essential characteristics of global change are:

• It is caused by human activity, although the effect on global systems is inadvertent rather than deliberate;

• Effects are expressed, in different forms, worldwide;

• the changes are progressive, with little evidence that the rate of change will diminish in the foreseeable future;

• The changes are taking place rapidly;

• Several of the changes that may have the greatest impact on humanity are cumulative and probably irreversible beyond a certain threshold.

Global change refers generally to the effects of human activity on the landscape, sea-level and ocean circulation, the atmosphere, and terrestrial and marine organisms, superimposed on naturally-occurring changes.

(据 http://student.ccbc.cc.md.us,2001)

Unit 2 Introduction to Environmental Impact

Introduction This course is concerned with the interactions between the sociosphere and the earth's four natural systems. These interactions frequently results in impacts of the earth's natural physical environment. We know that humans have impacted the environment for a long time. Some of this impact is deliberate. Clearing a grassland to plant crops is a deliberate alteration of the environment and if the decision is whether to have food to eat or starve, or alter the natural environment, this is a pretty easy decision for most, if not all, humans to make. However, at the same time, there may be unintended environmental impacts with clearing fields. Depending on the slope of the ground, valuable topsoil may run off into nearby waterways, thereby over time making the field less productive for food and possibly choking waterways with sediment.

The Formula for Environmental Impact There is a formula used for estimating or calculating the level of environmental impact. Environmental impact is a function of three things:

• Number One—The population or number of people utilizing the natural environmental or resources. The more people there are in a place, the more likely that environmental impact will occur.

• Number Two—The greater the level of consumption of natural resources —such as water, energy, minerals, land, rocks and trees—the greater the likely environmental impact.

• Number Three—The type of tools, techniques, processes, or technologies used by humans to provide a service or material good also effects the level of environmental impact.

The formula for environmental impact can be expressed as follows:

EI =	***Population*** ×	***Consumption*** ×	***Technology***
Env. Impact	(Number of People)	(Amount of Resources Consumed)	(Tools or Techniques Used)

While this formula is simplistic, it is nonetheless a valuable tool for understanding the relationship of human activity and environmental impact.

Environment Change & Pollution There are different levels and types of

environmental impact, many of which will be covered over the course of the semester. There are, however, two major categories of environmental impact, environmental change and pollution.

Environmental change refers to the unintended consequences of human activity that result in a change or alteration of the natural environment. For example, clearing a grassland to plant crops is a deliberate change of the natural environment. If the same crops, however, are planted in that field year after year, that plot of ground will lose many of its nutrients. This loss of nutrients is considered to be unintended change. If techniques are not used to control soil erosion, valuable topsoil may run off the field, another unintended environmental change.

Nature, however, operates in such a way so that natural systems can be used and will replenish themselves as long as they are not over-utilized. If that same field is left fallow, or unused, for a period of time, the nutrients may be restored. Leaving the field unused for a longer period of time, may help to replenish some of the topsoil lost. Irreversible environmental changes can result, however, if the land is continuously over-utilized, by human activity, thereby leaving the field worthless to humans to produce food as well as permanently altering the chemical or structural composition of the soil. The difficult part is finding the right balance to use the field in such a way without permanently altering it's natural components as well as providing a long term food. This type of approach is known as a "sustainable" approach. The concept of sustainability will be explored in greater depth in section.

Over-utilization of natural systems, that is to say, not using them in a sustainable way, is not the only manner in which humans can impact the natural environment. The other way in which humans impact the environment is pollution. Pollution refers to unwanted solid, liquid, or gaseous chemicals produced as by-products or wastes when a resource is extracted, processed, made into products or used. Pollutants don't always have to be chemical in nature. Pollution can also take the form of excessive heat, noise, light, or radiation.

Pollutants can enter the environment naturally. Volcanic ash, for example, can be viewed as a "natural" pollutant. Most natural pollution, however, is dispersed over a large area and is often diluted or broken down to harmless levels by natural processes. In contract, anthropogenic pollution tends to occur where there are lots of humans, such as in or near industrial areas where large volumes

of pollutants are concentrated in small volumes of air, water, and soil. Some pollutants contaminate the areas where they are produced. Others are carried by wind or flowing water far away from their original sources.

Sources of Pollution Some environmental pollutants come from single, identifiable sources, such as a smokestack or sewer pipe. These are referred to as " point sources of pollution", because they come from a single point or location.

Other pollutants enter the air, water, or soil from dispersed sources called non-point sources. Examples of non-point sources include automobile exhaust, runoff of fertilizers and pesticides from lawns and farms, and the flow of various sorts of chemicals and oil from urban streets and parking lots into nearby rivers and streams.

Effects of Pollution Pollution can have a number of unwanted effects. These include:

• Nuisance and aesthetic insult, such as unpleasant odors and reduced atmospheric visibility;

• Property damage, such as the corrosion of metals, and the weathering building and monument materials;

• Damage to plant and animal life, for example decreased tree & crop production or harmful effects on animals;

• Damage to human health, such as the spread of infectious diseases, respiratory system irritation and diseases, genetic and reproductive harm, and cancers;

• Disruption of natural life support systems at local, regional, and global levels which would include climate change and decreased natural recycling of chemicals as well as other undesirable effects such as increased levels of ultraviolet radiation reaching the surface due to deterioration of the ozone layer by chlorofluorocarbons and halons.

Severity of Pollution Three factors determine how severe the effects of a pollutant will be. They include:

• Chemical nature of the pollutant — how active and toxic it is to humans, plants and animals;

• Concentration — the amount of the chemical per unit volume of air, water, soil;

• Persistence or longevity — how long the pollutant remains in the environment in its harmful form.