21世纪环境科学
ERSHIYISHIJIHUANJINGKEXUE

环境科学与工程专业英语

HUANJING KEXUE YU GONGCHENG ZHUANYE YINGYU

张晖 张道斌 周丹娜 主编

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内 容 简 介

本书所选文章均出自近年出版的原版教材、专著及其他文献资料，内容几乎涉及环境科学与工程学科的各个方向，主要包括环境化学、环境生态学、环境规划与管理、环境经济学、环境法学、环境工程学等。通过对课程的学习使环境科学与工程专业的学生掌握一定数量的专业词汇，能够较好地阅读、翻译专业文献，提高实际应用英语的能力。

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前　　言

随着我国对外开放的深入和对外交流的发展，以及网络资源的日益发达，对科技人员的外语水平提出了更高的要求，环境科学与环境工程领域亦是如此。然而，在通过大学英语的基础学习之后，大多数学生尚不能熟练阅读和确切理解专业文献资料。这就需要学生增加专业词汇量，熟悉专业英语的特点。然而目前适合环境科学与工程一级学科的专业英语书籍较少，本书正是为此目的而编纂的。

本书旨在扩充环境科学与工程专业学生的专业词汇量，使他们在学习之后能够较好地阅读和理解专业文献，提高实际应用英语的能力。全书共 18 单元，每个单元包括一篇正文和两篇阅读材料。为了方便阅读、扩充专业词汇，每单元在正文和阅读材料之后均设置了单词注释以节省查阅时间，并且在正文之后的练习部分巩固学生对于专业词汇的理解和记忆。另外，本书所选文章均出自近年出版的原版教材、专著及其他文献资料，有助于学生掌握比较标准的专业外语表达方式，并在学习专业外语的同时了解该领域最新动向，让专业外语的学习紧跟科技发展的时代脚步。本书可作为环境科学与环境工程本科专业英语教材，也可供本学科及相关学科研究生和科研人员参考。

本书由张晖、张道斌和周丹娜编写，武汉大学资源与环境科学学院研究生段丽杰、夏强、葛利云、纪录和张翼参与了本书的部分工作，全书由张晖统稿。

感谢科学出版社的编辑们，特别是谭宏宇编辑对本书的辛勤工作。还要感谢两位专家对本书的审阅并提出了非常宝贵的意见和建议，其中有武汉大学资源与环境科学学院副教授吴新国博士。最后感谢武汉大学资源与环境科学学院副院长钱沙华教授对本书的编辑出版给予的关心和支持。

环境科学与工程是一门新兴的交叉学科，其中新的分支学科、新的概念不断涌现。囿于编者知识背景与见识，加之编写时间紧促，书中难免疏漏与不妥之处，恳请广大读者不吝赐教。

张　晖　张道斌　周丹娜
2004 年 3 月于珞珈山

Contents

Unit 1

Introduction of Environmental Engineering and Science

The scope of environmental engineering and science continues to expand both in terms of the number cities and countries of the world where water and air quality problems are in urgent need of attention, and in terms of the pollutants themselves, which now so often seen to have international and global impacts.

Due to diligent efforts of environmental engineers and scientists, great progress has been made in our understanding of the fate and transport of substances that contaminate our air, surface water, soil, and subsurface water systems. That progress has led to better technologies for controlling emissions and for cleaning up contaminated sites. With increased understanding and better technologies, it has been possible to craft more sophisticated legislation to address these problems. And, with a better sense of the enormous costs of cleaning up problems after they are created, we are beginning to focus on pollution prevention. In some parts of the developed world, the result has been air that is getting cleaner, greater areas of surface waters that allow beneficial uses such as fishing and swimming, some improvement in subsurface water quality, and, very important, continued access to safe drinking water. Unfortunately, the numbers of people globally who do not enjoy these environmental benefits continues to grow, some traditional environmental problems still seem intractable, the global implications of greenhouse gases and ozone-depleting substances seem even more threatening, and, in spite of the importance of the work to be done, our public will to face these challenges seems no longer assured.

It is hoped that some of the science, technology, and policy instruments that have enabled parts of the United States to approach clean air and water goals can be applied to the enormous pollution problems that are coming to light as the former Soviet Union and other eastern bloc countries transform their economies. Similarly, the continued rapid population growth and urbanization occurring in the developing countries of the world is causing unparalleled environmental health risks as people flock to cities that lack basic sanitation services and other infrastructure to control air and water contamination. Environmental engineers will play an increasingly important role as these countries attempt to improve their lot.

Since last decade, there have been a number of significant studies and actions that are changing the way we think about and deal with our environmental challenges. *The Clean Air Act Amendments* [1] of 1990, for example, are shifting the approach taken to emission controls from the traditional "*command and control*"[2] methods, in which government dictates the use of technology, to a more market-based approach that allows major sources to buy and sell emission allowances. In the area of groundwater cleanup, which has received much of the research funding and offered a significant fraction of the professional environmental engineering work in the last decade, a 1994 *National Research Council*[3] report concluded that the most commonly used remediation technologies have little hope of ever restoring many of our contaminated aquifers to drinking water quality. Our perceptions of "how clean is clean?" are changing. *The Comprehensive Environmental Response, Compensation, and Liabilities Act* [4] that created Superfund, which deals with such sites, has been only moderately successful and has been severely criticized as providing too little risk reduction for too many dollars. Partly in response, the concept of "*brownfields*" [5], with more flexible cleanup goals and much more limited liability to owners who redevelop abandoned urban industrial sites, is emerging as a way to stimulate local economies while speeding cleanup of modestly polluted sites.

In the area of global atmospheric contamination, the impact of the *Montreal Protocol on Substances that Deplete the Ozone Layer* [6] is beginning to be felt as the ban on production and use of ozone-depleting substances takes effect. The atmospheric concentrations of the most important chlorofluorocarbons are no longer increasing, and models suggest that the ozone layer will begin to repair itself in the early twenty-first century. The apparent success of the Montreal Protocol is serving as a model for negotiations on the other global atmospheric problem, global warming. The 1996 assessments by the *Intergovernmental Panel on Climate Change* (*IPCC*) [7] have concluded that the current global warming trend is not entirely natural in origin. Our understanding of the implications of continued warming, how fast it will occur, and how extensive it will be is fraught with uncertainties. How we make decisions about adaptation or mitigation for such a potentially critical environmental problem, given those uncertainties, is sure to be a contentious issue in the coming years.

(Adapted from Masters GM. Introduction of Environmental Engineering and Science, 2nd Edition. Prentice Hall, Inc., 1998)

New Words and Expressions

scope [skəup] *n.*	(活动)范围,机会,余地
diligent ['dɪlɪdʒənt] *adj.*	勤勉的,用功的,细心而继续不断的
contaminate [kən'tæmɪneɪt] *v.*	污染
craft [krɑːft] *vt.*	手工制作,构思
sophisticated [sə'fɪstɪkeɪtɪd] *adj.*	复杂的,成熟的
enormous [ɪ'nɔːməs] *adj.*	巨大的
intractable [ɪn'træktəbl] *adj.*	难处理的,难控制的
deplete [dɪ'pliːt] *vt.*	耗尽,使衰竭
bloc [blɒk] *n.*	政治组织,集团
unparalleled [ʌn'pærəleld] *adj.*	无比的,无双的,空前的
sanitation [sænɪ'teɪʃən] *n.*	卫生,卫生设施
infrastructure ['ɪnfrə'strʌktʃə] *n.*	基础设施
amendment [ə'mendmənt] *n.*	改善,改正
remediation [ˌrɪˌmɪdɪ'eɪʃən] *n.*	补救,纠正,修复
aquifer ['ækwɪfə] *n.*	含水土层,蓄水层
moderate ['mɒdərɪt] *adj.*	适度的,适中的
ban [bɑːn] *n.*	禁令
chlorofluorocarbons ['klɔːrəuˌfluːərə'kɑːbəns] *n.*	氯氟烃
negotiation [nɪˌgəuʃɪ'eɪʃən] *n.*	商议,谈判
mitigation [ˌmɪtɪ'geɪʃən] *n.*	缓解,减轻

Notes

[1] The Clean Air Act Amendments：清洁空气法案修正案。

[2] “command and control”：“管制手段”。

[3] National Research Council：美国国家研究委员会(NRC)。

[4] The Comprehensive Environmental Response, Compensation, and Liabilities Act：综合环境反应、补偿和责任法(CERCLA),即 Superfund 法。

[5] brownfields：**“棕地”**,即工业废弃地。**“棕地”**一词于 20 世纪 90 年代初期开

始出现在美国联邦政府的官方用语中，用来指那些存在一定程度污染已经废弃或因污染而没有得到充分利用的土地及地上建筑物。美国国家环保局(EPA)对棕地有一个比较明确的定义：棕地是指废弃的、闲置的或没有得到充分利用的工业或商业用地及设施，在这类土地的再开发和利用过程中往往因存在着客观上的或意想中的环境污染而比其他开发过程更为复杂。

[6] Montreal Protocol on Substances that Deplete the Ozone Layer：关于损耗臭氧层物质的蒙特利尔议定书。

[7] Intergovernmental Panel on Climate Change (IPCC)：政府间气候变化专门委员会。

Questions and Discussions

1. What is the scope of environmental science and engineering?
2. Which progress has been made in the field of environmental science and engineering? And how do we benefit from the progress?
3. How do we change the way we think about and deal with our environmental challenges?
4. What is the main idea of Montreal Protocol on Substances that Deplete the Ozone Layer?
5. As an environmental science/engineering undergraduate student, what is your opinion on your major?

Reading Material A

What is Environmental Research?

Environmental research is a complex blend of pursuits that have several objectives. To some, the highest form of environmental research is that which seeks only to extend knowledge and is driven by a combination of curiosity and disciplinary traditions. It seeks to describe the structure and function of the natural world, as well as the relationship between this world and humans or human civilization. This is the body of research that provides much of our understanding of biology and earth systems science. Thoughtful research with similar motivations also informs us of how humans relate to nature and how our beliefs, attitudes, and values affect that relationship. Between these two extremes, there is a beautiful continuum of research in the sciences, social sciences, and humanities that relates to the "environment", broadly defined. Another form of environmental research focuses on the changes that are taking place in the natural and human environments as a result of human activity, either to understand these changes or to seek solutions. For the past 30 years or so, this type of research has come to dominate the agenda of government agencies that support environmental research. Encouraged by funds appropriated by governments that are motivated by public interest, researchers have turned their research to evaluate damage or potential damage to the "environment" — to humans, other species, or systems that need to be protected. The presumption is that we can measure this damage, which we have come to call impact, and determine its cause. Sometimes this is so, and the cause-and-effect relationship is clear. Increasingly, however, it is becoming extremely difficult to make this judgment accurately because the system is so complex, and we do not have a full understanding of the "system" before the impact.

If the impact is serious enough, that is, the risk is high by some standard, then we make an attempt to mitigate the impact. We have actually become pretty good at this in some cases, but in other cases, our hands are tied because the systems we are forced to deal with are so complicated. As a result, we are often forced to use models of the systems that we are studying. Mice instead of real humans, single fish in a laboratory rather than fish in the wild, smog chamber rather than an urban airshed, or a microcosm rather than a real ecosystem. Seldom do we really have supreme confidence in these models. Verifying them is just too expensive, so we often resort to uncertainty or bounding analysis. This means that the information that we give to the general public does not appear to be clear, cut, especially to those who are not scientists. The current debate over global warming is a good example, but there are many others. Often, this uncertainty throws the decision-making process into the political arena or the courts, and in this environment, the role of science is compromised. Scientists get pulled into the political debate over the interpretation of the data, raising issues of bias and conflict of interest. It is often said that that science cannot provide the answers, only inform. Unfortunately, to some, that means, "we don't really believe that science has the answers at all."

Occasionally, we pass a rule to eliminate the cause of the impact, such as taking DDT or tetraethyllead off the market, but more often, we strike some sort of compromise. We just regulate the level of the agent or minimize the action that is causing the problem. The prevailing paradigm has become, how can we minimize risk? Implicit in this is our resignation to the fact that the problem will probably not go away, so we will have to accept and deal with it. In other words, we agree to work within the constraints of our society as it has evolved over the past few centuries, especially since the industrial revolution — a society that was not designed with environmental protection in mind. We do our best.

There is a growing belief that this problem — this poorly designed society — will be replaced by one that is designed with new principles in mind. William McDonnough, Amory Lovins, and others have described these new design principles and are attempting to lead us in applying them. The idea is pretty simple. Rebuild every sector of human society using energy and materials resources that will have as little impact as possible. Don't use toxic or earth system-disrupting substances that will seep into the environment; don't discharge such substances into our waters, air, or soft. Don't disturb the habitat of keystone species. Design all products so that they will be recycled. Don't rely on energy sources or materials that are not using the energy of the sun in real time. Don't just tweak our current system by making it less polluting, redesign it.

If this is the new paradigm of environmental protection, as many claim, what is the role of research in this process? More to come.

(Adapted from Glaze WH, Environmental Science & Technology, 2001, 35 (11): 225A)

New Words and Expressions

blend [blend] *vt.*	混合
n.	混合,混合物,合金
pursuit [pə'sjuːt] *n.*	追赶,追随,从事
disciplinary ['dɪsɪplɪnərɪ] *adj.*	训练的
extreme [ɪks'triːm] *n.*	极端,极端的事物
continuum [kən'tɪnjʊəm] *n.*	连续统一体,连续介质
dominate ['dɒmɪneɪt] *v.*	支配,占优势
agenda [ə'dʒendə] *n.*	议事日程,记事本,备忘录
evaluate [ɪ'væljʊeɪt] *vt.*	估计,评价,计算
impact ['ɪmpækt] *n.*	影响,效果

mitigate [ˈmɪtɪgeɪt] *v*.	减轻,缓和
tie [taɪ] *vt*.	约束,束缚
smog [smɒg] *n*.	烟雾
airshed [eəʃed] *n*.	机库,风干棚
microcosm [ˈmaɪkrəkɒz(ə)m] *n*.	小宇宙,微观世界
ecosystem [iːkəˈsɪstəm] *n*.	生态系统
supreme [sjuːˈpriːm] *adj*.	最高的,极大的
bound [baʊnd] *n*.	范围,限度
v.	跳跃,限制
arena [əˈriːnə] *n*.	竞技场,舞台
sue [sjuː, suː] *n*.	控告,提出请求
eliminate [ɪˈlɪmɪneɪt] *vt*.	排除,消除
DDT *n*.	二氯二苯三氯乙烷,滴滴涕
tetraethyllead [ˌtetrəˈeθəlliːd] *n*.	四乙基铅
agent [ˈeɪdʒənt] *n*.	代理人,试剂,作用力
prevailing [əprɪˈveɪlɪŋ] *adj*.	占优势的,主要的,流行的
implicit [ɪmˈplɪsɪt] *n*.	暗示的,隐含的
resignation [rezɪgˈneɪʃən] *n*.	放弃,屈从
constraint [kənˈstreɪnt] *n*.	抑制,约束 [条件]
disrupt [dɪsˈrʌpt] *vt*.	干扰,毁坏,使……混乱
seep [siːp] *v*.	渗出,渗漏
tweak [twiːk] *v*.	拧
paradigm [ˈpærədaɪm] *n*.	范例

Reading Material B

The Past, Present and Future of Environmental Engineering Research

Environmental engineering is a branch of engineering concerned with protecting the environment from the potentially deleterious effects of human activity, protecting human populations from the effects of adverse environmental factors, and restoring environmental quality for ecological and human well-being. Traditionally, the environmental engineer has analyzed environmental systems and designed plans, criteria and technologies for the use of air, water, and land.

Currently, environmental engineering research is focused on the fundamental and dynamic factors influencing the detection, transformation, fate and transport of contaminants in both natural and engineered environments. Environmental engineers are involved in a myriad of activities such as quantifying trace levels of chemicals in complex matrices, characterizing microbial communities, identifying key microbial populations and elucidating their functions, developing a broad suite of biological, chemical and physical treatment technologies to meet stringent regulations, and modeling biogeochemical phenomena at various scales and in multiple phases. In addition, environmental engineers, with their understanding of contaminant behavior in the environment, play a key and leading role in the characterization of risk and thus, in the design of effective strategies and regulations to manage residuals.

In looking to the future, environmental engineers will continue to search for creative and economical ways to limit the release of contaminants into the environment, to develop highly sensitive techniques to track pollutants once released, and to find effective methods to remediate spoiled resources. Environmental engineers will also continue to be the vital link between scientific discovery, technological development and the societal need for protecting human health and ecological integrity. The emphasis of their work, however, will shift from managing wastes after they are generated to minimizing the release of residuals by altering production processes and capturing the resource value of wastes through recovery, recycling and reuse. Environmental engineers will be critical members of manufacturing teams where the design and production of goods are developed in full consideration of their environmental impacts during production, use and at the end of their useful life.

At the heart of environmental engineering research, past, present, and future, is the study of biocomplexity. Since exclusive reliance on technology will not provide the extensive range of protective solutions needed, environmental engineering research will find strategies that reintegrate and synchronize human activities with natural cycles and processes. Environmental engineers have the unique set of multidisciplinary skills to find ways that allow for coordinated industrial and economic development, urban redevelopment, and ecological preservation and restoration. Since this set of skills rests on the detailed study of