高等学校“十二五”规划教材

给排水科学与工程专业应用与实践丛书

给排水科学与工程专业英语

蓝 梅 ■ 主编

陈 新 苏馈足 ■ 副主编

化学工业出版社

高等学校“十二五”规划教材

给排水科学与工程专业应用与实践丛书

给排水科学与工程专业英语

蓝 梅 主编

陈 新 苏馈足 副主编

常州大学图书馆
藏书章

化学工业出版社

·北京·

丛书编委会名单

主　　任：蒋度鹏

副 主 任：彭永臻　章北平

编委会成员（按姓氏汉语拼音排列）：

董春娟　蓝　梅　李　军　刘俊良　唐朝春　王　宏

王五军　徐得潜　杨开明　张林军　赵　远

内容提要

本书涵盖了给水排水科学与工程专业给排水管网、水和废水处理技术、污泥的处理处置以及建筑给排水系统，知识结构全面合理。具体包括六个部分。第一部分是水系统循环概述，第二部分为供水及输配水系统和污水（雨水）收集与排水系统，第三部分为水的物理化学处理法，第四部分为污水的生物处理法，第五部分为污泥的处理利用与处置，第六部分为建筑给水排水系统。

全书 23 个单元，每个单元包括一篇课文，两篇阅读材料，并附有难点注释、词汇表、练习题。希望能使读者掌握阅读翻译专业文献资料的基本技能和技巧，获取国外与本专业有关的科技信息。

本书可供给排水科学与工程专业、市政工程专业和环境工程专业的师生使用，也可作为相关行业人员的阅读参考资料。

图书在版编目（CIP）数据

给排水科学与工程专业英语/蓝梅主编.—北京
化学工业出版社，2013. 1
高等学校“十二五”规划教材
(给排水科学与工程专业应用与实践丛书)
ISBN 978-7-122-16263-2

Ⅰ. ①给…　Ⅱ. ①蓝…　Ⅲ. ①给排水系统-英语
Ⅳ. ①H31

中国版本图书馆 CIP 数据核字（2013）第 003733 号

责任编辑：徐　娟　　　　装帧设计：关　飞
责任校对：宋　夏

出版发行：化学工业出版社（北京市东城区青年湖南街 13 号　邮政编码 100011）
印　　装：大厂聚鑫印刷有限责任公司
787mm×1092mm　1/16　印张 13　字数 328 千字　2013 年 3 月北京第 1 版第 1 次印刷

购书咨询：010-64518888（传真：010-64519686）　售后服务：010-64518899
网　　址：http://www.cip.com.cn
凡购买本书，如有缺损质量问题，本社销售中心负责调换。

定　　价：32.00 元

版权所有　违者必究

丛书序

在国家现代化建设的进程中，生态文明建设与经济建设、政治建设、文化建设和社会建设相并列，形成五位一体的全面建设发展道路。建设生态文明是关系人民福祉，关乎民族未来的长远大计。而在生态文明建设的诸多专业任务中，给排水工程是一个不可缺少的重要组成部分。培养给排水工程专业的各类优秀人才也就成为当前一项刻不容缓的重要任务。

21 世纪我国的工程教育改革趋势是“回归工程”，工程教育将更加重视工程思维训练，强调工程实践能力。针对工科院校给排水工程专业的特点和发展趋势，为了培养和提高学生综合运用各门课程基本理论、基本知识来分析解决实际工程问题的能力，总结近年来给排水工程发展的实践经验，我非常高兴化学工业出版社能组织编写全国几十所高校的一线教师编写这套丛书。

本套丛书突出“回归工程”的指导思想，为适应培养高等技术应用型人才的需要，立足教学和工程实际，在讲解基本理论、基础知识的前提下，重点介绍近年来出现的新工艺、新技术与新方法。丛书中编入了更多的工程实际案例或例题、习题，内容更简明易懂，实用性更强，使学生能更好地应对未来的工作。

本套丛书于“十二五”期间出版，对各高校给排水科学与工程专业和市政工程专业、环境工程专业的师生而言，会是非常实用的系列教学用书。

2013 年 1 月

前　言

为了提高高等学校给排水科学与工程、环境工程和环境科学专业学生阅读和翻译英文专业文献的能力，扩大专业词汇量、掌握学科发展的动态、参加国际交流以及今后在工作学习中获取专业知识，我们感到非常有必要编写一本专业性较强并结合当今水处理新技术的专业英语教材。因此我们根据大学专业英语教学大纲的要求，结合给排水科学与工程专业英语教学实践的经验和体会，根据给水排水行业的发展状况编写了本书。

本书英文文献选材针对性强，兼顾专业性和学术性，题材范围广泛、难度适中，紧密结合学生学习的专业知识和当今给排水科学与工程的新理论、新技术。考虑到专业技术的发展、课堂教学的时间以及学生知识结构能方面的因素，本书主要包括六个部分。第一部分是水系统循环概述，第二部分为供水及输配水系统和污水（雨水）收集与排水系统，第三部分为水的物理化学处理法，第四部分为污水的生物处理法，第五部分为污泥的处理利用与处置，第六部分为建筑给水排水系统。涵盖了给水排水科学与工程专业给排水管网、水和废水处理技术、污泥的处理处置以及建筑给排水系统，知识结构全面合理。建筑给水排水是给排水科学与工程专业一个非常重要的组成部分，针对目前面市的给水排水专业英语教材中基本没有或很少涉及建筑给水排水内容的情况，本书特增加该部分课文和阅读材料。希望通过学习和练习使学生掌握阅读翻译专业文献资料的基本技能和技巧，获取国外与本专业有关的科技信息。

本书由河北工程大学蓝梅主编，苏州科技学院陈新、合肥工业大学苏馈足副主编，合肥工业大学王玉兰，常州大学赵玲萍，北京建筑工程学院冯利利，河北建筑工程学院王淑娜，东北石油大学林红岩，内蒙古农业大学杨红，徐州工程学院万蕾，黑龙江建筑职业技术学院李丽参加编写。全书由蓝梅统稿。本书在编写过程中，得到河北工程大学李清雪教授的大力支持，在此表示由衷的谢意！

鉴于编者水平所限，书中难免有疏漏和不足之处，恳请广大读者和同行专家给予批评指正。

编者

2013 年 1 月

此为试读，需要完整PDF请访问：www.ertongbook.com

目 录

Part One
Introduction

Unit 1 Hydrologic Cycle

The hydrologic cycle (Figure 1.1), also known as the water cycle or H_2O cycle, describes the continuous movement of water on, above and below the surface of the earth. Water can change states among liquid, vapour, and solid at various places in the water cycle. Although the balance of water on Earth remains fairly constant over time, individual water molecules can come and go, in and out of the atmosphere. The water moves from one reservoir to another, such as from river to ocean, or from the ocean to the atmosphere, by the physical processes of evaporation, condensation, precipitation, infiltration, runoff, and subsurface flow. [1] In so doing, the water goes through different phases: liquid, solid, and gas.

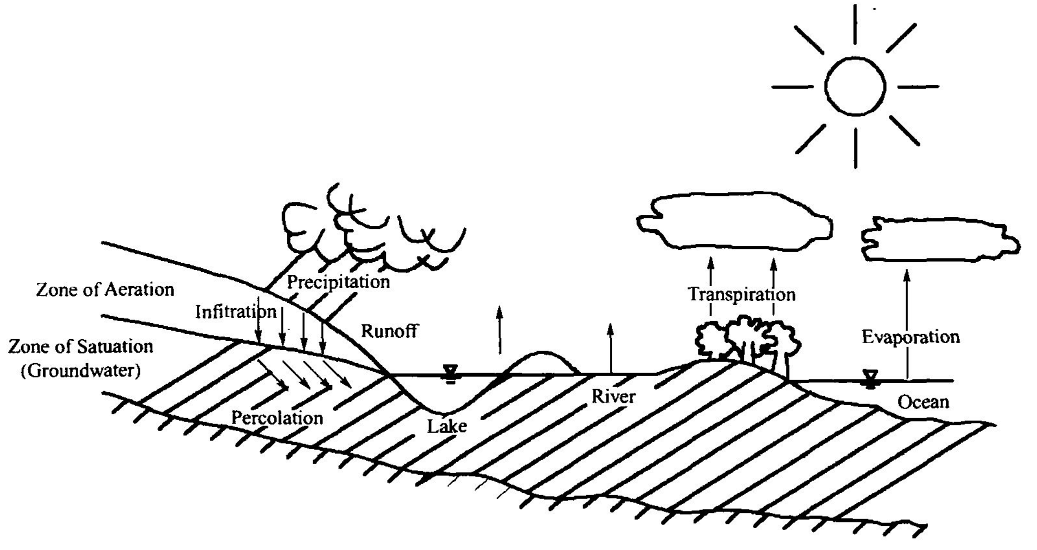

Figure 1.1 The hydrologic cycle

The water cycle involves the exchange of heat energy, which leads to temperature changes. For instance, in the process of evaporation, water takes up energy from the surroundings and cools the environment. Conversely, in the process of condensation, water releases energy to its surroundings, warming the environment. The water cycle figures significantly in the maintenance of life and ecosystems on Earth. Even as water in each reservoir plays an important role, the water cycle brings added significance to the presence of water on our planet. By transferring water from one reservoir to another, the water cycle purifies water, replenishes the land with freshwater, and transports minerals to different parts of the globe. [2] It is also involved in reshaping the geological features of the Earth, through such processes as erosion and sedimentation. In addition, as the water cycle also involves heat exchange, it exerts an influence on climate as well.

The sun, which drives the water cycle, heats water in oceans and seas.Water evaporates as water vapor into the air. Ice and snow can sublimate directly into water vapor. Evapotranspiration is water transpired from plants and evaporated from the soil. Rising air currents take the vapor up into the atmosphere where cooler temperatures cause it to condense into clouds. Air currents move water vapor around the globe, cloud particles collide, grow, and fall out of the sky as precipitation. Some precipitation falls as snow or hail, sleet, and can accumulate as ice caps and glaciers, which can store frozen water for thousands of years. Most water falls back into the oceans or onto land as rain, where the water flows over the ground as surface runoff. A portion of runoff enters rivers in valleys in the landscape, with streamflow moving water towards the oceans. Runoff and groundwater are stored as freshwater in lakes. Not all runoff flows into rivers, much of it soaks into the ground as infiltration. Some water infiltrates deep into the ground and replenishes aquifers, which store freshwater for long periods of time. Some infiltration stays close to the land surface and can seep back into surface-water bodies (and the ocean) as groundwater discharge. Some groundwater finds openings in the land surface and comes out as freshwater springs. Over time, the water returns to the ocean, where our water cycle started.

The residence time of a reservoir within the hydrologic cycle is the average time a water molecule will spend in that reservoir. It is a measure of the average age of the water in that reservoir. Groundwater can spend over 10,000 years beneath Earth's surface before leaving. Particularly old groundwater is called fossil water. Water stored in the soil remains there very briefly, because it is spread thinly across the Earth, and is readily lost by evaporation, transpiration, stream flow, or groundwater recharge. [3] After evaporating, the residence time in the atmosphere is about 9 days before condensing and falling to the Earth as precipitation. The major ice sheet-Antarctica and Greenland-store ice are for very long periods. Ice from Antarctica has been reliably dated to 800,000 years before present, though the average residence time is shorter.

In hydrology, residence times can be estimated in two ways. The more common method relies on the principle of conservation of mass and assumes the amount of water in a given reservoir is roughly constant. With this method, residence times are estimated by dividing the volume of the reservoir by the rate by which water either enters or exits the reservoir. Conceptually, this is equivalent to timing how long it would take the reservoir to become filled from empty if no water were to leave (or how long it would take the reservoir to empty from full if no water were to enter). An alternative method to estimate residence times, which is gaining in popularity for dating groundwater, is the use of isotopic techniques. This is done in the subfield of isotope hydrology.

Human activities that alter the water cycle include：

- Agriculture
- Industry
- Alteration of the chemical composition of the atmosphere

此为试读，需要完整PDF请访问：www.ertongbook.com

• Construction of dams
• Deforestation and afforestation
• Removal of groundwater from wells
• Water abstraction from rivers
• Urbanization

Effects on climate: The water cycle is powered from solar energy. 86% of the global evaporation occurs from the oceans, reducing their temperature by evaporative cooling. Without the cooling, the effect of evaporation on the greenhouse effect would lead to a much higher surface temperature of 67℃ (153℉), and a warmer planet.

Aquifer drawdown or overdrafting and the pumping of fossil water increases the total amount of water in the hydrosphere that is subject to transpiration and evaporation thereby causing accretion in water vapour and cloud cover which are the primary absorbers of infrared radiation in the Earth's atmosphere. [4] Adding water to the system has a forcing effect on the whole earth system, an accurate estimate of which hydrogeological fact is yet to be quantified.

Important Words and Expressions

hydrology [hai'drɔlədʒi] n. 水文学，水文地理学
reservoir ['rezəvwaː] n. 蓄水池；储液器；储藏；蓄积
evaporation [iˌvæpə'reiʃən] n. 蒸发，发散；消失
condensation [ˌkɔndən'seiʃən] n. 冷凝；冷凝液；凝结的水珠；节略
precipitation [priˌsipi'teiʃən] n. 匆促；沉淀；（雨等）降落；某地区降雨等的量
figure ['figə] n. 数字；算术；图解；轮廓 vt. 估计；推测；认为
replenish [ri'pleniʃ] vt. 补充；重新装满；把…装满
sedimentation [ˌsedimen'teiʃən] n. 沉淀，沉降
sublimate ['sʌblimət] n. 升华物 vt. (使某物质)升华；使净化；纯化
infiltration [ˌinfil'treiʃən] n. 渗透
residence time 停留时间
deforestation [ˌdiˌfɔri'steiʃn] n. 采伐森林，森林开伐
afforestation [əˌfɔri'steiʃən] n. 造林，造林地区
aquifer ['ækwifə] n. 地下蓄水层，砂石含水层

Notes

[1] 由于蒸发、凝结、降水、入渗、径流、潜流等物理过程，水从一个蓄水池到另一个，比如从河流到海洋，从海洋到大气。

[2] 通过水从一个蓄水池到另一个，水循环净化了水，为陆地补充了淡水，把矿物质运送到地球不同的部位。

[3] 土壤中储存的水停留很短暂，因为土壤水薄薄地分布在地表，通过蒸发、蒸腾、河川径流和地下水补给而容易消失。

[4] 地下水位降低或者超采以及化石水的抽取增加了水圈中水的总量，水圈中的水易于蒸腾和蒸发，从而产生水蒸气以及云量的堆积，这些是地球大气中红外辐射最主要的吸收体。

Exercises

1. Answering the following questions in English according to the text:

(1) How many physical processes happened in hydrologic cycle according to the text?

(2) Try to explain the method of estimating the residence time of the water.

2. Using the following each word to make up the sentences, respectively:

(1) Hydrologic cycle

(2) subsurface flow

(3) runoff

(4) residence time

(5) conservation of mass

3. Put the following English into Chinese:

(1) Groundwater is an important direct source of supply that is tapped by wells, as well as a significant indirect source since surface streams are often supplied by subterranean water. Near the surface of the earth, in the zone of aeration, soil pore spaces contain both air and water. This zone, which may have zero thickness in swamplands and be several hundred feet thick in mountainous regions, contains three types of moisture. After a storm, gravity water is in transit through the larger soil pore spaces. Capillary water is drawn small pore spaces by capillary action and is available for plant uptake. Hygroscopic moisture is held in place by molecular forces during all except the driest climatic conditions. Moisture from the zone of aeration cannot be tapped as a water supply source.

(2) In the zone of saturation, located below the zone of aeration, the soil pores are filled with water, and this is what we call groundwater. A stratum that contains a substantial amount of groundwater is called an aquifer. At the surface between the two zones, called the water table or phreatic surface, the hydrostatic pressure in the groundwater is equal to the atmosphere pressure. An aquifer may extend to great depths, but because the weight of overburden material generally closes pore spaces, little water is found at depths greater than 600m (1200ft). The amount of water that will drain freely from an aquifer is known as specific yield.

4. Put the following Chinese into English:

(1) 水循环

(2) 蒸发

(3) 停留时间

(4) 地球上的水不是静止的，而是不断运动变化和相互交换的。

(5) 在太阳辐射和地心吸引力的作用下，地球上各种状态的水从海洋面、江河面、湖沼面、陆地面和动植物表面蒸发、蒸腾变成水汽，上升于空中，或停留在空中，或被气流带到其他地区，在适当条件下凝结，然后以降水形式落到海洋面或陆地表面。

Reading Material A

The Water Balance

In hydrology, a water balance equation can be used to describe the flow of water in and out of a system. A system can be one of several hydrological domains, such as a column of soil or a drainage basin. Water balance can also refer to the ways in which an organism maintains water in dry or hot conditions. It is often discussed in reference to plants or arthropods, which have a variety of water retention mechanisms, including a lipid waxy coating that has limited permeability. [1]

Water balance calculations

Water balance calculations can help to determine if a drainage area is large enough or has the right characteristics to support a permanent pool of water during average or extreme conditions. [2]

When in doubt, a water balance calculation may be advisable for retention pond and wetland design. The details of a rigorous water balance are beyond the scope of this manual. However, a simplified procedure is described herein that will provide an estimate of pool viability and point to the need for more rigorous analysis. Water balance can also be used to help establish planting zones in a wetland design.

Basic equations

Water balance is defined as the change in volume of the permanent pool resulting from the total inflow minus the total outflow (actual or potential). Equation 1-1 presents this calculation.

$$\Delta V=\Sigma I-\Sigma O \tag{1-1}$$

where

Δ= delta or change in

V = pond volume (ac-ft)

Σ = the sum of

I = Inflows (ac-ft)

O = Outflows (ac-ft)

The inflows consist of rainfall, runoff and baseflow into the pond. The outflows consist of infiltration, evaporation, evapotranspiration, and surface overflow out of the pond or wetland. Equation 1-1 can be expanded to reflect these factors, as shown in Equation 1-2. Key variables in Equation 1-2 are discussed in detail below the equation.

$$\Delta V=PA + R_0 + B_f - IA - EA - E_tA - O_f \tag{1-2}$$

where

P = precipitation (ft)

A = area of pond (ac)

R_0= runoff (ac-ft)

B_f= baseflow (ac-ft)

I = infiltration (ft)

E = evaporation (ft)

E_t = evapotranspiration (ft)

O_f = overflow (ac-ft)

Rainfall (P) Monthly rainfall values can be obtained from the National Weather Service climatology at http://www.srh.noaa.gov/mrx/climat.htm. Monthly values are commonly used for calculations of values over a season. Rainfall is then the direct amount that falls on the pond surface for the period in question. When multiplied by the pond surface area (in acres) it becomes acre-feet of volume.

Runoff (R_0) Runoff is equivalent to the rainfall for the period times the efficiency of the watershed, which is equal to the ratio of runoff to rainfall (Q/P). In lieu of gage information, Q/P can be estimated one of several ways. The best method would be to perform long-term simulation modeling using rainfall records and a watershed model.

Baseflow (B) Most stormwater ponds and wetlands have little, if any, baseflow, as they are rarely placed across perennial streams. If so placed, baseflow must be estimated from observation or through theoretical estimates. Methods of estimation and baseflow separation can be found in most hydrology textbooks.

Infiltration (I) Infiltration is a very complex subject and cannot be covered in detail here. The amount of infiltration depends on soils, water table depth, rock layers, surface disturbance, the presence or absence of a liner in the pond, and other factors.

Evaporation (E) Evaporation is from an open lake water surface. Evaporation rates are dependent on differences in vapor pressure, which, in turn, depend on temperature, wind, atmospheric pressure, water purity, and shape and depth of the pond. [3] It is estimated or measured in a number of ways, which can be found in most hydrology textbooks. Pan evaporation methods are also used, though there are no longer pan evaporation sites active in Knox County. Formerly pan evaporation methods were utilized at the Knoxville Experiment Station.

Evapotranspiration (E_t) Evapotranspiration consists of the combination of evaporation and transpiration by plants. The estimation of E_t for crops is well documented and has become standard practice. However, the estimating methods for wetlands are not documented, nor are there consistent studies to assist the designer in estimating the wetland plant demand on water volumes. Literature values for various places in the United States vary around the free water surface lake evaporation values. Estimating E_t only becomes important when wetlands are being designed and emergent vegetation covers a significant portion of the pond surface. In these cases conservative estimates of lake evaporation should be compared to crop-based E_t estimates and a decision made. Crop-based E_t estimates can be obtained from typical hydrology textbooks or from the web sites mentioned above. A value of zero shall be assumed for E_t unless the wetland design dictates otherwise.

Overflow (O_f) Overflow is considered as excess runoff, and in water balance design is either not considered since the concern is for average precipitation values, or is considered lost for all volumes above the maximum pond storage. [4] Obviously, for long-term simulations of rainfall-runoff, large storms would play an important part in pond design.

Notes

[1] 关于植物或者节肢动物的水平衡也经常被论及，有多种水保持机制，包括有限渗透性的脂蜡质覆盖层。

[2] 水平衡的计算可以帮助确定一个排水区域是否足够大或者是否能够在平常或极端条件下支撑一个永久的水池。

[3] 蒸发速率取决于蒸汽压的不同，而蒸汽压依次取决于温度、风、大气压力、水的纯度、水池的形状和深度。

[4] 溢流被认为是多余的径流，在水平衡设计中，要么因为关心的是平均降水量，不被考虑，要么是作为超出最大池容量的所有容积损失。

Reading Material B

Water Resources Protection

Water resources involve surface water, water below ground and water that falls from the sky. Protecting groundwater resources will be a major challenge in coming years because of increased development pressures and water demands, climate change, and the uncertainty of surface water availability.

Groundwater is a hidden resource, and to learn more about this resource we have to rely on more than our five senses. Fortunately, we do not have to resort to dowsing to gain a better understanding of groundwater. Groundwater mapping and modeling helps us make decisions about how to manage water resources in terms of both water quality and water quantity. [1]

Groundwater is one of the nation's most critical natural resources. It is the largest source of usable water storage in the United States, containing more water than all reservoirs and lakes combined, excluding the Great Lakes. According to scientists, an estimated 1 million cubic miles of groundwater is located within one-half mile of the land surface. Only a very small percentage of groundwater is accessible and can be used for human activities. Most cities meet their needs for water by withdrawing it from the nearest river, lake, reservoir, but many depend on groundwater as well. [2]

Water is already in short supply in many parts of the United States, and the situation is only going to get worse. According to a 1999 United States Geological Survey. Groundwater is the source of about 40% of the water used for public supply and provides drinking water for more than 97% of the rural population in the United States. [3] Between 30% and 40% of the water used for the agricultural industry comes from groundwater. We need to understand groundwater if we are going to continue to make good decisions about sustainable water resources.

In recent years, people have begun to understand that groundwater and surface water are fundamentally interconnected and are integral components of the hydrologic cycle. Nevertheless, most laws governing groundwater issues are based on this notion that groundwater and surface water have nothing to do with each other. In most parts of the country, surface water is governed by doctrines of riparian law or prior appropriation.Groundwater traditionally has been treated as a common resource, with virtually no restrictions on accessing the water. If you can afford to pay someone to drill a well and you happen to hit water, you can do whatever you want with it.

The unregulated pumping of groundwater is no longer a viable option. In many parts of the country, groundwater is being withdrawn at rates that are no sustainable, and the result is a degradation of water quality and quantity. [4] The water level in aquifers is being lowered, and because we keep digging deeper and deeper wells to access the water, the water quantity is further depleted. In coastal areas, intensive pumping of fresh groundwater has caused saltwater to seep into freshwater aquifers.

Groundwater is also critical for the environmental health of rivers, wetlands and estuaries throughout the country. Groundwater withdrawals can result in reduced flows to streams and alter wetland hydrology. Changes in stream flow have important implications for water and flood management, irrigation and planning.

There are hundreds of examples across the country where groundwater is threatened. The California Department of Health Services reported in 2008 that more than 300 public supply sources and an equally large number of private homeowner wells were contaminated and should not be used.[5] In portions of the Southwest, Northwest, and Midwest, arsenic occers naturally in groundwater at levels that exceed drinking water standards and many municipalities are now debating whether to build treatment plants or reservoirs. Either will cost hundreds of millions of dollars.

According to the Arizona Department of Environmental Quality, approximately one-third of Arizona water systems exceed the level set for arsenic poisoning. One long-term impact of the 1988 drought in the Midwest is that many aquifers were overpumped by farmers seeking to save their crops and their way of life. Arkansas residents use groundwater to meet approximately 93% of their water needs.

In many parts of Florida, the existing aquifer is not sufficient to meet the needs of the state's growing population and the needs of the environment, agriculture, and industry. Florida is one of four states in the country that uses more groundwater than surface water.

The Ground Water Protection Council (2007) has defined a broad vision of what it would take to maintain a sustainable source of groundwater. It wrote that the nation needs to: Continue to conduct research and provide information-at a scale that is useful to states and local entities-about such matters as the safe, or sustainable, yield of aquifers (and methods for determining that yield); water-use data; and delineating boundaries and water budgets of three-dimensional watersheds, including scientifically based and cost-effective methods of quantifying interactions between ground water and surface water.

Notes

[1] 地下水的测绘和模型帮助从水质和水量两个方面管理水资源。

[2] 许多城市从最近的河流、湖泊，或者水库中抽水满足他们的需求，但是也有很多是依赖地下水的。

[3] 依据美国 1999 年的地质调查，公共供水中的 40%来自于地下水，地下水为 97%的美国农村人口提供饮用水。

[4] 国内许多地方，地下水的抽取速度是不可持续的，结果是导致了水质和水量的下降。

[5] 加利福尼亚卫生服务部门 2008 年报告：超过 300 个公共供应来源和同样数量的私人水井被污染了并且不能再使用。

Unit 2 Water Legislation and Regulation

The aim of national drinking-water laws and standards should be to ensure that the consumer enjoys safe potable water, not to shut down deficient water supplies.

Effective control of drinking-water quality is supported ideally by adequate legislation, standards and codes and their enforcement. The precise nature of the legislation in each country will depend on national, constitutional and other considerations. It will generally outline the responsibility and authority of a number of agencies and describe the relationship between them, as well as establish basic policy principles (e.g. water supplied for drinking-water should be safe). The national regulations, adjusted as necessary, should be applicable to all water supplies. This would

此为试读，需要完整PDF请访问：www.ertongbook.com