

POINT SOURCES OF POLLUTION: LOCAL EFFECTS AND CONTROL

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Summary

Point sources of pollution are the major causes of degradation of ecosystems, and may have significant effects on human health if they are not properly controlled. They can be classified in terms of sources, the discharged media, and the pollutants themselves. Broadly speaking, the sources include municipal and industrial sector activities, and the media include water, air, and solids. Noise is also an important form of pollution. Pollutant compositions from point sources can be vast, varied, and complex, and can vary between different countries and regions.

Strategies for controlling point sources of pollution can be categorized in terms of legislative regulation, management improvement (including economic incentives), and technology applications. Setting laws, regulations, and standards has proved the most successful control strategy in most countries around the world. Management improvement is attracting increasingly wide attention, and is often found to be a very cost-effective supplement to law enforcement. There are a substantial number of technologies available for reducing pollution loads from point sources, but the emphasis has largely shifted from “end-of-pipe” treatment to cleaner production and sounder

industrial ecology. These approaches have shown significant potential for preventing pollution, and need more continuous development effort. For the control of air pollution sources, the available technologies are largely classified as particle control systems, and gas and vapor control systems. Technologies for removing pollutants from wastewater mainly include physical, chemical, and biological treatment processes. For the control of solid wastes landfill, incineration, and composting predominate.

1. Introduction

Pollution sources can be broadly categorized as *point* and *nonpoint* sources. Point sources of pollution are generally defined as all dry-weather pollutants that discharge into the receiving environments through an identifiable discharge point. This definition, however, could apply in a different way to wastewater, air, and solids, and there is no clear distinction between point and nonpoint sources. Municipal and industrial discharge pipes are good examples of point sources. Diffuse pollutants, such as from agricultural land, urban surface runoff, and acid rain are typical nonpoint sources, and are much more difficult to identify and control.

Point sources of pollution are the major causes of degradation of ecosystems, and can have significant effects on human health if they are not properly controlled. Historically, initial attempts at pollution control were primarily directed towards point sources: they are readily identifiable, and economic pressure and adverse publicity could be brought to bear on the individual bodies responsible. Experience in developed countries revealed that successful pollution control could be achieved through effective regulation of point-source pollution. In most countries, the regulation is the responsibility of the national or local environmental agency, whose duties include identifying point sources of pollution, negotiating the permissible levels of pollution allowed from each source, and enforcing the terms of discharge permits. The institutional management of nonpoint sources of pollution control can be more complex, however, and involve more sectors.

Point sources of pollution can be classified differently in terms of sources, the discharged media, and the pollutants themselves. The sources include the municipal and industrial sectors; the media include water, air, solids, and noise. With the development of effective controls for gross pollutants (for example, organic matter and nutrients), control of point sources of pollution is increasingly focused on toxic chemicals, persistent organic matter, and heavy metals, which often occur in very low concentrations.

This theme begins with a brief discussion of various point sources of pollution, as well as their local effects. Strategies for controlling point sources of pollution are then presented in terms of legislative regulation, management improvement (including economic incentives), and technology applications. Setting laws, regulations, and standards has proved a most successful pollution control practice in most countries. Management improvement is attracting increasingly wide attention, and is often found to be the most cost-effective practice to supplement law enforcement. Under a given legislation and policy framework all pollution control will, however, eventually be dependent upon engineering or technological facilities. Nowadays, many technologies are available for reducing pollution loads from point sources. Recently emphasis has

largely shifted from “end-of-pipe” treatment to cleaner production and sounder industrial ecology. The latter has shown significant potential for preventing pollution, and needs more continuous effort. Technologies for the control of air pollution sources are largely classified as particle control systems, and gas and vapor control systems. Technologies for removing pollutants from wastewater mainly include physical, chemical, and biological treatment processes. Landfill, incineration, and composting are the usual methods for controlling and disposing of solid wastes.

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Biographical Sketches

Chen Jining is Professor and Head of the Department of Environmental Science and Engineering at Tsinghua University, Beijing, People's Republic of China. Professor Chen holds an honorary first degree in Environmental Engineering from Tsinghua University (1986) and a Ph.D. in Environmental System Analysis from Imperial College, London (1993). His current research interests include environmental systems analysis; identification of environmental models; water resources and environmental policy; integrated river basin planning and management; nonpoint source pollution control; and sustainable cities. He is presently a member of the governing boards of several Chinese technical associations, including the Chinese Environmental Engineering Society Deputy, of which he is Deputy Chairman. He is also a member of the scientific committees of several environmental journals.

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