

## 11. CASE STUDIES: PULLING IT ALL TOGETHER

### INTRODUCTION

This chapter shows five examples of how the enforcement principles and tools described in the previous chapters have been applied in real-life situations. Most of these case studies span several years and illustrate how programs evolve over time. In several cases, there was limited enforcement during the first years of managing an environmental problem. Enforcement became a higher priority when substantial noncompliance was documented. In all cases, enforcement was clearly effective in achieving significant increases in compliance and improvements in environmental quality. The case studies show a wide variety of creative solutions to challenging compliance problems.

- In the first case study, officials in Allegheny County, USA, developed several innovative settlement mechanisms to help ensure compliance with air pollution control requirements by facilities with financial limitations. This study also demonstrates how the ability to supplement local efforts with support from higher levels of government can provide the "muscle" needed to overcome challenging obstacles and clear the way for more effective subsequent enforcement at the local level. In addition, this study is a good example of how potentially adversarial relationships in enforcement and dispute resolution can be transformed into resources for achieving success by creating forums for cooperation and dialogue among interested, affected, and concerned parties.
- The second case study concerns enforcement, at the local level, of particular waste disposal requirements in the Netherlands. It illustrates a creative approach that enabled Dutch officials to achieve results despite staff shortages and time constraints involved in the permitting process. The study also shows the importance of considering social and economic factors affecting compliance.
- The third case study describes an evolving program in the Netherlands for controlling disposal of liquid waste from ships. The program has achieved significant initial success but still faces many challenges.
- The fourth case study, from the USA, shows how national and state enforcement efforts succeeded in bringing local municipalities into compliance with wastewater treatment requirements. With support from the Administrator of the U.S. EPA, the states, the public, and the media, federal and state officials were able to create a strong and effective enforcement presence. A carefully thought-out policy and management approach guided the program from its inception. The program permanently altered the common attitude that it was too difficult for the federal and state governments to enforce against municipalities and that such enforcement would not result in environmental compliance.
- The fifth case study concerns enforcement of lead regulations in the United States. This example describes an enforcement program designed to achieve compliance with requirements of an economic incentives-based approach to reduce the lead content of gasoline. Enforcement seems to have had substantial deterrent power in this case.

As these five examples illustrate, every environmental management situation is unique and requires creative application of the many options described in this text to design an effective enforcement program capable of achieving the desired results. These five case studies demonstrate a range of possible approaches to enforcement, but are by no means inclusive. Many other approaches exist. As stated Chapter 1, policymakers must make their own choices within the parameters of the available resources and local cultural factors to develop an effective compliance strategy and enforcement program in any particular situation.

## **CASE STUDY 1: ENFORCEMENT OF AIR REGULATIONS IN ALLEGHENY COUNTY, USA<sup>1</sup>**

### **Introduction**

Allegheny County is located in the state of Pennsylvania and is home to the City of Pittsburgh (see Figure 11-1). Since the early nineteenth century, the County has been a major steel production center in the United States. Because of its industrial success, the area experienced some of the worst air pollution problems in the country. The County was one of the first areas in the country to try to improve air quality and has been in many ways a model for successful air pollution control. Control techniques and standards developed in the County have become models on the national level. Air quality has substantially improved and no annual standards for particulates or sulfur dioxide are now exceeded in the County. Violations of short-term standards are rare and are usually due to breakdown of control equipment. This improvement in air quality is due to strict controls and to a decrease in steel and coke production since the late 1970s. This case study reviews air pollution control in Allegheny County with a focus on the two decades from 1970 to 1990, a period of increased environmental concern and substantial economic change.

### **County Profile**

Allegheny County, Pennsylvania, is located in the northeastern United States (Figure 11-1). The County is approximately 731 square miles (1,893 square kilometers) in area, with a population (in 1990) of just over 1.3 million (down from 1.6 million in 1970). Pittsburgh, located in the center of the County at the confluence of the Allegheny, Monongahela, and Ohio Rivers, is the County's largest city.

The County is located in the foothills of the Appalachian mountains. on a peneplain, i.e., an elevated area flattened by glaciers. Three rivers have carved large valleys into the plain: the Ohio River, the Allegheny River, and the Monongahela River. Weather systems often stall at the Appalachian mountains to the east of the County, creating periods of stagnation in the spring, fall, and sometimes the summer that last for several days. The area experiences about 170 to 200 inversions each year.

The area has been a major industrial center since the early 1800s. The primary industries have been steel, coke, and related industries. There are also a few chemical plants in the County. Coal was burned by residents until the early 1950s, when large gas lines were built to service the area, and by coal-fired power plants (most of which are no longer operating due to the age of some of the facilities and a decreased demand for power). Almost all homes and commercial operations are now gas-fired. Industrial plants are generally located in the river valleys, and residential sections at higher elevations. Of particular concern has been a 25-mile (40-kilometer) stretch of the Monongahela River valley beginning in Pittsburgh and ending at the County line. In the early 1970s, this section contained seven steel mills, including the world's largest coke plant. The steel and coke industries were healthy until the late 1970s, when these industries began to decline throughout the United States due to the availability of steel substitutes and the import of coke. Production declined steadily in the late 1970s and early 1980s and has remained relatively constant since the early 1980s. In the early 1970s, the County had 28 coke batteries; in 1991, only 19 of these were still operating. The County had nine steel mills in the early 1970s; in 1991, only four remained in operation.

### **Air Pollution Control Before 1970**

During the nineteenth century, as Allegheny County developed into a major industrial center, emissions from industrial and residential sources coupled with the area's frequent, stagnant inversions caused severe pollution problems. At that time, the City was described as "hell with its lid off." Even up to the 1940s, the pollution was sometimes so dense that street lights in Pittsburgh had to be turned on in the middle of the day.

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<sup>1</sup>This case study was prepared in conjunction with Charles J. Goetz, Enforcement Division Administrator, Allegheny County Bureau of Air Pollution.

The first efforts at air pollution control began in the late nineteenth century, but were ineffective until the late 1940s, when a 1941 Pittsburgh smoke control law was finally enforced. This ordinance regulated both industrial and residential combustion sources. One of the main thrusts of the law was a requirement that both industry and residences burn clean fuels. Similar pollution control measures were subsequently instituted in other parts of Allegheny County.

The Allegheny County Health Department took over the duties of the City Smoke Control Bureau in 1957 and assumed responsibility for air pollution control throughout the County. In 1960, the County passed Article XIII, which established a Bureau of Air Pollution Control under the Health Department and created some of the strongest particulate control regulations in the nation.

During the 1960s, residents and leaders in Allegheny County, as in other areas of the United States, became increasingly concerned about the state of the environment. The state of Pennsylvania authorized Allegheny County to regulate gaseous pollutants. The County passed a new and more encompassing regulation, Article XVII, in 1970.

### **Authority for Air Pollution Control, 1970-1991**

On the national level, increasing citizen concern for the environment in the 1960s resulted in the creation in 1970 of the U.S. Environmental Protection Agency (U.S. EPA), the federal agency responsible for ensuring environmental quality. The 1970 national Clean Air Act required the U.S. EPA to establish health-related National Ambient Air Quality Standards, and it required each state to develop and enforce a State Implementation Plans (SIP) to meet these air quality goals.

Because of Allegheny County's long involvement in air pollution control, the state of Pennsylvania granted the County the authority to develop and implement the air pollution control program for the County. The County proposed a program that was approved by the state of Pennsylvania and subsequently by the U.S. EPA. With these approvals, the County program and regulations became part of Pennsylvania's SIP and are therefore enforceable by the county, state, and federal governments. This relationship has been in effect since 1972. The state and federal governments have become involved in enforcement only in situations where a state or national presence was important to achieve results.

### **Allegheny County Air Quality Regulations, 1970-1991**

In Allegheny County, regulations are developed by the County Department of Health. They are submitted to the Air Pollution Advisory Committee (which includes representatives from industry, academia, city government, and the public—see below) for review and comment. The Board of Health then proposes final regulations to the County Commissioners who either approve or disapprove the regulations, but may not change them. Because of the County's responsibility as part of the SIP for Pennsylvania, County regulations must be approved by both state and federal governments.

During the period from 1970 to 1991, Allegheny County has enacted and amended air pollution control regulations several times, in response to changes in federal requirements and as a result of lessons learned through implementation and enforcement of the air pollution control program. Article XVIII was passed in 1972 in response to the 1970 national Clean Air Act, and amended several times in the next few years. Article XX was enacted in 1981 in response to the 1977 amendments to the national Clean Air Act. These regulations (and subsequent amendments) govern air pollution control in Allegheny County in 1991.

Following are some examples of how the County regulations have been changed to meet new federal requirements, to address newly discovered air pollution problems, and to improve the enforceability of the regulations:

- A mechanism was provided to allow industrial growth in areas that do not comply with air quality standards. The mechanism allows industrial growth in such areas under certain specified conditions but only if the emissions from the new source(s) are stringently controlled and there is a net improvement in air quality.
- Emission standards were established for hazardous air pollutants such as asbestos and mercury.
- Regulations were adopted to address newly recognized air pollution problems, such as emissions from the burning of waste-derived liquid fuels and emissions from abrasive blasting to remove old paint (often containing lead) from bridges, water tanks and other structures.

- Standards were established for particulate emissions from "nontraditional" sources such as roads, unpaved parking lots, and storage piles.
- Certain sources were required to install monitoring equipment to continuously measure emissions and report the results to the County.

### **The Air Pollution Control Advisory Committee**

The Air Pollution Control Advisory Committee (APCAC) was established by Article XIII in 1960 to recommend changes to County air pollution control regulations and to advise the County Bureau of Air Pollution Control and the County Board of Health on air pollution control matters. The APCAC also provides a forum for citizen opinion about the performance of the Bureau of Air Pollution Control and a forum where the public can air their general concerns about air quality in the County. The APCAC is strictly advisory in nature. It consists of 19 persons, including representatives from academia, environmental and public interest groups, and industry. All members are appointed by the County Commissioners. Industry representation is limited to five members.

The Committee holds six to eight public meetings each year. The Committee reviews and comments on proposed new or revised regulations developed by the Bureau of Air Pollution Control. The Committee also reviews the County's portion of the Pennsylvania State Implementation Plan, proposed air monitoring programs, and other proposals connected with ensuring ambient air quality. The APCAC has provided an important mechanism for involvement of the various sectors concerned with and affected by air pollution control. The up-front involvement of these sectors in regulatory development has contributed to the success of subsequent enforcement efforts.

### **Standards and Methods**

The County regulations established emission standards and specific methods for determining compliance. Both the nature of the standards and the specificity of the methods have provided an important basis for effective enforcement.

**Two Types of Emissions Standards.** The regulations provide two main types of standards: one type that is based on exact measurements of pollution (e.g., emission standards measured in pounds per hour) and a second type that provides a more general gauge of pollution (e.g., opacity of emissions). The first type is expensive and resource-intensive to measure, and often requires some days of analysis before results are obtained. Compliance with the second type can be readily determined (e.g., compliance with opacity can be determined by one inspector in about one hour's time). The second type of standard has provided County officials with an important and practical enforcement tool to help ensure compliance.

**Specificity of Procedures and Methods.** The County regulations define the procedures for inspection and measurement. This has helped ensure that regulated industries are treated fairly and that results are consistent (avoiding a situation, for example, where one method would find a facility out of compliance while a different method would find that same facility to be in compliance).

### **Enforcement Mechanisms**

The County's air pollution control regulations were enacted with the realization that not all regulated sources would automatically take the steps necessary for compliance. The County therefore carries out an inspection program that evidences a real presence at the sources and that enables the County to have a continuing awareness of each source's compliance status. In addition, the County takes appropriate enforcement actions when necessary to ensure compliance.

The various regulations established a number of enforcement mechanisms that provided County officials with the authority and tools they have needed for successful enforcement. The broad variety of mechanisms enabled County officials to negotiate agreements that could realistically accommodate the technical and financial situation of a company while still providing meaningful deadlines and disincentives for noncompliance.

**Variance Board.** One challenge of enforcement is often that a large number of facilities are suddenly in violation when new regulations are issued. To handle this situation, Allegheny County regulations established a five-person Variance Board in 1972 to review and approve compliance schedules with

noncomplying industries. The Board was appointed by the County Commissioners and had to have at least one attorney, one engineer, and one public health specialist. Facilities that were suddenly out of compliance when new regulations were passed were given a certain number of months to file a petition, with the Variance Board, that defined a plan and schedule for coming into compliance. These petitions were reviewed in public hearings in which the company would formally present its plan and the Bureau of Air Pollution Control and the public would comment on the plan. The Variance Board would then decide whether to accept the petition. This proved to be a very successful mechanism for ultimately achieving compliance with regulations that immediately put many facilities out of compliance when the regulations were first enacted. The Board was discontinued in 1981 because most industries were in compliance by that time. Compliance programs for the remaining noncomplying sources were usually established through the new regulations or by the Bureau of Air Pollution Control through negotiations or administrative orders.

**Ability to Seek Penalties.** The regulations provide County officials with the ability to seek penalties through a magistrate's court and through a Civil Penalty Hearing Board. In such actions, the County presents its case and industry presents its case. Decisions can be appealed to a higher court.

**Ability to Issue Administrative Orders.** County officials have found that the ability to issue administrative orders has been an important element in the success of enforcement efforts. Administrative orders have proven a valuable mechanism to circumvent lengthy court proceedings. Many orders are consent orders, i.e., the facility agrees to the terms of the order. Some orders have been unilateral. The company can appeal unilateral orders; in such cases, the County tries to resolve differences through a negotiation process.

**Ability to Negotiate Creative Settlements.** The County has used several innovative approaches in consent decrees to help ensure compliance:

- **Performance Bonds.** Some companies are asked to post a performance bond. They forfeit the bond if they subsequently fail to meet the terms of the consent decree.
- **Escrow Accounts.** Some companies were required to establish special escrow accounts to ensure that monies would be available to pay any penalties that might accrue.
- **Research Requirements.** In some cases, facilities are asked to perform a study to determine how they could best come into compliance.
- **Credit Projects.** As a substitute for payment of a penalty, companies sometimes agreed to reduce emissions beyond the levels required by the regulations.
- **Delayed Compliance Orders.** These orders set forth schedules for pollution sources to achieve compliance but protect the sources from further enforcement action as long as the sources remain on schedule with the orders.
- **Stipulated Penalties.** Some consent decrees and consent orders contain provisions for the payment of stipulated penalties if the decrees or orders are violated. Such provisions set forth agreed-upon fixed or graduated penalties for various types of violations.
- **Self-monitoring.** Consent decrees often contain provisions for self-monitoring. The goal of self-monitoring requirements is to increase the company's awareness about their state of compliance with the hope that the company will then take steps on their own to correct any violations. To encourage companies to accurately record the data, self-monitoring data are rarely used by the County for enforcement. Companies are required to report any violations they detect and, at times, are permitted to reduce the amount of self-monitoring as a reward for, or in recognition of, good performance. Self-monitoring, in effect, extends the limited inspection resources of the County.

**Ability to Consider Economic Factors.** The County has used several approaches in its enforcement actions that consider economic conditions or circumstances:

- **Pilot Projects.** In some cases where a company argued that certain measures were not technically or economically feasible, the company and the County agreed that the company would implement these measures on one or two of their plants as a test of feasibility. Appropriate measures to bring the rest of the company's operations into compliance were negotiated once the pilot results were obtained.
- **Phased-in Approach.** Companies are not always required to implement all control measures at one time. Sometimes a phased approach has been negotiated.
- **Extended Schedules.** When a company would have genuine difficulties achieving compliance with a standard schedule, extended schedules can be negotiated. In one case, the County required installation of expensive controls (\$30 to \$40 million) that never really worked

effectively. After a certain period of time, the County began to negotiate with the company to install new controls. In return for a commitment by the company to replace the old control systems, County officials allowed the company to discontinue use of the old controls and use a relatively inexpensive interim system while taking steps to install more effective equipment.

- Maximizing Existing Systems. In cases where a company was on the brink of shutdown due to financial difficulties, the County often waived a requirement for installing new equipment (which would likely have put the company out of business) and instead required that existing control equipment be used as effectively as possible.
- Deferred Control Expenditures. Certain economically depressed industries were permitted to defer air pollution control expenditures for limited periods of time if such monies were invested in new plants and equipment.
- Penalty Payment Schedules. Some companies in financial difficulties are allowed to make penalty payments for violations over a period of time rather than paying the entire amount of the penalty at the time the enforcement action was settled.
- Limited Life Policy. As an alternative to installing expensive pollution control equipment, obsolete, violating facilities that are scheduled to be permanently shut down are permitted to continue to operate for limited periods of time while using interim control measures.

## **Resources**

The Bureau of Air Pollution Control's 1991 budget was just over \$3 million. About half this budget comes from the federal government, \$1 million from the County (derived largely from property taxes), about \$0.5 million from permit fees, and over \$100,000 from penalties. A special High Priority Fund provided by the U.S. EPA is set aside for high-priority projects. Budgeting for using this Fund does not have to go through the normal County administrative budget process.

The Bureau of Air Pollution Control has a staff of 55 (as of 1991). The Bureau is divided into four divisions (Enforcement Division, Air Quality Monitoring and Source Testing Division, Engineering and Planning Division, and Computer Services and Data Analysis Division) and an Administrative Services and Training Section.

## **Monitoring**

Fifteen full-time staff of the Air Monitoring and Source Testing Division are responsible for monitoring. The Division measures air quality using both continuous and intermittent monitors.

Over the years ambient monitoring has become more sophisticated. The County now operates a monitoring network of 39 sites monitoring six gaseous pollutants and four measures of particulates. The gaseous pollutants are sulfur dioxide, carbon monoxide, ozone, nitrogen oxides, hydrogen sulfide, and benzene. Air quality is measured continuously by the monitors in the field and collected about six times per minute by data loggers located at the sampling sites. A central computer polls the data loggers once each hour using dial-up telephone lines to obtain real-time data. This computer permanently logs the data and processes it for use. For example, the computer processes the data by calculating an Index for sulfur dioxide, carbon monoxide, and ozone that is used for daily reporting of air quality to the public.

There are four measures of particulates. Two are continuous and two are intermittent. One of the continuous methods, the tape sampler, was developed locally in the 1970s to provide inexpensive real-time hourly data and is used to calculate the particulate Index for the public. The other samples fine (i.e., health-related) particulates, referred to as PM-10, and is used at two sites. Both types are connected to the central computer in a manner similar to the gaseous pollutants.

The two intermittent particulate sampling techniques measure either total suspended particulates or the finer health-related fraction. These require sampling for 24 hours and then several days for analysis of the filters in the laboratory. The filters are also used to determine ambient levels of lead, benzo(a)pyrene, other heavy metals, chlorides, sulfates, and nitrates.

Although the federal standards for particulates are for suspended, fine (i.e., health-related) levels of particulates in the air, the public is often concerned about dust falling on their property from nearby sources.

The County employs an inexpensive technique to help detect and screen such problems. Dustfall cans are set out for 30 days and the dust collected is then weighed and, often, examined microscopically in the laboratory.

### **Emissions**

One important aspect of the Bureau's work involves tracking emissions from sources. Several staff are assigned to developing and maintaining a computerized emission inventory. The inventory includes data on source names, types, locations, capacity, emission parameters, and emission rates for both actual and allowable emissions. These data are often obtained by stack sampling. The County usually observes stack tests conducted by industries to assure correctness and will split samples with the industries when doing its own laboratory analysis; however, the County is capable of conducting its own tests when needed.

The emission inventory data are often used in computerized diffusion modeling. The modeling allows the County to predict air quality under various conditions by adjusting parameters in the model, but modeling is difficult in Allegheny County due to its river valley topography which is not simulated well by most models.

### **Inspection**

Approximately 1,600 permits were issued to air pollution sources in Allegheny County in 1991. These include 100 to 150 major sources. About 200 sources are inspected each year. Other, mostly smaller, sources are believed to be in compliance based on periodic or occasional inspections, self-reporting, the nature of the operation, or the fact that no complaints have been received.

Inspections generally focus on the major pollution sources. Historically, the federal government has determined priorities for inspection. In 1991, Allegheny County submitted its own priorities to the U.S. EPA for approval. The County has three full-time inspectors and one engineer dedicated to inspecting coke plants; six engineers who inspect other industrial sources; and four full-time inspectors who respond to citizen complaints. The number of plant inspectors has stayed relatively constant since the early 1980s. Although there are fewer sources in 1991 than earlier, the inspections have become more complicated.

Most sources on the priority list for inspections are inspected at least once a year. A typical inspection is unannounced, with the inspector spending about one day checking plant records and control equipment. Some sources are inspected on an as-needed basis (e.g., when a complaint is received). When an inspector finds a potential violation, he or she fills out a form documenting the alleged violation, and provides a copy to the source and a copy to the Legal Section of the Enforcement Division. The Legal Section determines whether a violation has occurred and, if so, decides whether and how to pursue the case. The inspector may be called on to obtain additional information and/or testify.

### **Role of the State and Federal Governments**

To help implement Pennsylvania's State Implementation Plan, the U.S. EPA has supplied funding to Allegheny County. Allegheny County has used these funds to hire additional staff and to purchase equipment. The County has also received technical assistance from the U.S. EPA. Generally, the state and federal agencies approve the County's regulations and air pollution control program and then let Allegheny County manage and enforce the program. In the early 1970s, however, the state and federal governments did become involved in a challenging enforcement situation concerning coke plants. These sources were very large and difficult to control. Because compliance required substantial emission reductions and investment in pollution control equipment, the industry was generally unresponsive to initial enforcement efforts by the County. The industry argued that it was not technologically possible to meet the standards. This argument was difficult for the County to counter, since County officials did not have a broad national or international knowledge about the available technology for reducing air pollution in this industry.

The state of Pennsylvania and, eventually, the federal government became involved in a series of joint actions against the major coke industry polluters. The national implications of the case were another stimulus for federal involvement; effective enforcement in this part of the country would send a signal to the coke industry in other parts of the United States that the federal government was committed to taking whatever measures were necessary to achieve compliance. As compliance was achieved, the state and federal governments reduced their level of involvement. Now that most of the coke plants are in or near compliance, the County is once again becoming fully responsible for enforcement.

## **Role of Environmental Groups and the Public**

Allegheny County has several environmental groups that have been active and effective. One of the most active groups, the Group Against Smog and Pollution (GASP), was formed in 1969. The County's progress in air pollution control is partly due to the efforts of environmental groups to ensure public awareness and government action, and to their willingness to participate by serving in a voluntary capacity on the Advisory Committee and its various Subcommittees.

During the 1970s, enforcement was aided by strong public support for environmental protection. In the 1980s, the primary public concern in the County shifted to employment and economic development, which was sometimes a source of conflict. Nevertheless, concern and support for protecting the environment remained strong.

## **Role of Industry**

In the early 1970s, industry was at first resistant to compliance. Enforcement and penalties were needed to demonstrate the government's commitment to achieving compliance. Industry's role has reversed since that time. Most industries now recognize the need for air pollution control, and their approach is to achieve compliance at a reasonable cost rather than avoid compliance. Local industries now serve on the Advisory Committee and participate in regulatory development. Their experience and expertise has been directed toward solving air pollution problems.

To the extent possible, industry has been allowed to choose how it will comply. For example, if more than one type of control system will properly control emissions, industry can usually choose the system it prefers. Industry is encouraged to be sensitive to citizen concerns, to foster good community relations relative to environmental matters and to be acutely aware of the impact of their emissions on their neighbors. The County acknowledges that in the final analysis it is industry that actually reduces air pollution; the County attempts to provide public recognition of companies that have exemplary environmental control programs or projects.

At least one enforcement program in the County encourages increased industry involvement. There are three coke plants in the County. These plants have a combined total of 19 operable batteries. Each coke battery is usually inspected at least 30 times a year by County inspectors. After the end of each calendar quarter, the County sends each plant manager a written summary of the inspection results during that quarter along with an offer to "settle" any violations through payment of penalties and/or taking appropriate remedial actions. County technical and inspection staff meet with the plant operators during each quarter to review performances, identify problem areas, and discuss corrective programs. This program has contributed to an increased awareness of environmental performance by plant management and production workers. In at least one case, the program has encouraged the use of problem-solving teams in the plant to achieve performances that are significantly better than those required by the regulations.

## **Results**

In the early 1970s, air quality standards were often exceeded. In one location in the Monongahela River valley, air quality exceeded the short-term particulate standard about every third day. About 12 times a year the County Health Department issued high air pollution alerts that required industry throughout the valley to curtail production.

Enforcement efforts in the early 1970s required diligence. Court action was often necessary to ensure that companies would live up to the terms of the consent decree they had signed. As a result of the Bureau of Air Pollution Control's enforcement activities, industries throughout the County began to install control equipment and take other measures to curb pollution.

By the mid-1970s, particulate emissions had been reduced by 65% and sulfur dioxide emissions by 57% compared to 1970 levels. Air quality continued to improve and, by the late 1970s, frequent air pollution alerts had ended.

In the 1980s, air quality has improved further due to continued strict enforcement efforts, improved control actions by industry, and a general decline in industrial activity. By the late 1980s, there were no

exceedances of the annual average and only occasional short-term violations usually associated with the breakdown of control equipment. The three-year average ozone standard is exceeded about once a year.

In 1990, all of Allegheny County was in attainment of federal ambient air quality standards for ozone, carbon monoxide, nitrogen dioxide, and lead, but not for sulfur dioxide and inhalable particulate matter. The annual average standards for inhalable particulate matter, sulfur dioxide, and nitrogen dioxide were met. However, there were 12 short-term (24-hour) exceedances for two pollutants in 1990, compared with 14 exceedances for three pollutants in 1989.

### **Factors Influencing Success**

Many factors have contributed to successful air pollution control in Allegheny County since 1970. County regulations clearly defined the standards and measurement methods. These regulations also provided a variety of enforcement mechanisms that enabled County officials to effectively take action against violators and to negotiate creative settlements that, while strict, enabled companies to come into compliance within the limits of their resources. Also, the Variance Board was important in helping County officials effectively manage enforcement of the large number of companies that were suddenly in violation when the regulations were passed.

Strong public support for air quality provided a climate that supported enforcement efforts and created a social pressure for compliance. The establishment of the Air Pollution Control Advisory Committee created an important forum for cooperation and dialogue between the various sectors concerned with or affected by air pollution control. This forum has helped turn potentially adversarial relationships into a resource for effective regulatory development and program implementation.

The relationship with the state and federal governments has also been an important factor. Because the County is enforcing a federally sanctioned and required program, the federal government has provided financial resources and technical assistance that have enabled the Bureau of Air Pollution Control to hire additional personnel and purchase monitoring equipment. Also, the involvement of the federal and state governments enabled the County to successfully prosecute some particularly difficult enforcement cases, which sent a strong deterrent message to other members of the regulated community.

## **CASE STUDY 2: RESPONSIBLE PROCESSING OF DERELICT CARS IN THE NETHERLANDS**

### **Introduction**

Because the Netherlands is so densely populated, environmental problems are often exacerbated. With the substantial growth in waste generation during the 1960s and 1970s, available space for waste dumping was rapidly depleted, and existing dump sites began to cause serious pollution problems. Consequently, dumping was no longer considered a responsible disposal option.

An increasing number of people in the Netherlands have become involved in dismantling old cars. As a result, the number of derelict cars has risen sharply, leading to three interrelated problems:

- **Environmental Problems.** Liquids (such as motor oil, coolants, and battery acid) have contaminated the soil. Burning of old cars contributed to air pollution. The large numbers of old wrecks also caused aesthetic problems.
- **Economic Problems.** Too many people have become involved in demolishing old cars as a side line. Under these circumstances, environmentally responsible operations could not be commercially viable.
- **Social Problems.** Many of those engaged in dismantling old cars have little respect for authority. The wrecker yards generally operated without a permit and did not comply with environmental requirements. The government tended to avoid intervention since these groups could be expected to respond aggressively.

The environmental problems could be solved only if the economic and social problems were tackled simultaneously. This case study examines how one province in the Netherlands, the province of North Holland, developed and implemented a plan to solve the environmental problems associated with derelict cars.

## **Regulations**

The Waste Substances Act was enacted in the Netherlands in the late 1970s. Under this Act, companies engaging in waste processing are required to have a permit. In judging whether a company may be granted a permit, the authorities consider whether it is technically and economically feasible for a facility to operate in an environmentally responsible manner. Thus, this law provided the authority to tackle both the environmental and the economic problems.

## **Derelict Cars Plan**

Each province in the Netherlands was asked by the national government to draft a plan indicating how it would restructure wrecker yard operations. The province of North Holland had its first plan ready in 1986. The plan aimed to promote:

- Efficient and thus commercially viable execution of demolition activities.
- Compatibility of the wrecker yards with land use plans.
- Environmentally responsible operations.
- As much recycling and reuse of old car parts as possible.

Implementation of the plan was expected to put many yards out of business. Reduced competition would enable the remaining yards to do enough business to finance the measures needed to protect the environment. The permit system provided an instrument for achieving these aims, and subsidies were available to help close down unprofitable yards and, in some cases, to take environmental measures.

## **Implementing the Plan in North Holland**

The province's first inventory showed 198 derelict car sites. That number has since grown to 210, partly due to reports by area residents and images on aerial photographs.

Comprehensive permitting followed by enforcement would have been the most important means for realizing the plan's goals. However, a shortage of qualified officials, together with the problems at the wrecker yards, made it likely that it would be many years before all the yards were permitted. To prevent further environmental degradation, the provincial government and the Public Prosecutor decided to bridge this period by prescribing so-called "rules of conduct" for the yards (in anticipation of permit requirements at a later date). These rules prohibited the burning of wrecks and cables, required that liquids be drained out of and batteries removed from vehicles, and mandated responsible storage and disposal of oil. The provincial government informed the wrecker yards in writing about the Waste Substances Act, the anticipated permit requirements, and the rules of conduct.

The provincial government also established an intensive inspection program. The manpower and resources needed were estimated, and a computer system was set up to store and process the results. The yards were inspected three times in the first year. The first round of inspection provided information to the wrecker yards; the second and third inspections checked for compliance with the rules of conduct.

Figure 11-2 summarizes the results of these inspections. When a violation was found, the yard received a formal warning and the Public Prosecutor and police were notified. If violations were found again during the third and following rounds, charges were brought. The first inspections showed that only 50 percent of the wrecker yards were in compliance with the rules of conduct. Since then this fraction has risen to 75 percent. Charges have been brought against 40 companies. Appropriate sanctions are being considered. Closure of the yards with repeated violations is one option (under criminal law); imposition of fines for every day a yard is out of compliance is another (under administrative law).

Sixty-five wrecker yards have been granted permits, and are being monitored for compliance with the permit requirements. Thirty-five yards that applied for permits were refused, and 70 permit applications are being processed. Thirty yards were provided with financial support that enabled them to cease their activities, and an additional 10 stopped on their own initiative.

## **Conclusions**

Dutch authorities have drawn several conclusions from this case study:

- Environmental problems cannot be solved in isolation from other social problems.
- Solving these problems requires time, manpower, and perseverance.
- Implementation requires a good written plan with attention to permitting and enforcement.
- The plan must indicate the amount of manpower and resources needed for its implementation.
- Activities should be planned and monitored; the approach should be evaluated periodically.
- Phased introduction of the requirements the companies have to meet raises the companies' motivation to comply and allows the manpower available for enforcement to be used more effectively.
- Clear and consistent enforcement is essential to achieve compliance; successful enforcement requires that agreements be made with the agencies involved (the environmental department, Public Prosecutor, and police).
- Execution of the plan was aided by the availability of financial support.

### **CASE STUDY 3: COLLECTION AND PROCESSING OF HAZARDOUS WASTE FROM SHIPS IN THE NETHERLANDS**

#### **Introduction**

Liquid wastes from ships, such as used oil, bilge oil and bilge water, slobs, washwater, and ballast water, can cause major environmental problems if they are not collected and processed in a responsible way. In the Netherlands there are 1.7 million tons of wastewater containing oil and 300,000 tons of hazardous waste from both ocean-going ships and ships confined to the inland waters. Discharge of these wastes into surface water causes a real environmental burden. Until recently it was unclear how the ships were getting rid of these wastes. There were also no clear regulations that could be used to tackle this problem. Analysis of the problem showed that:

- A large number of companies collected this type of waste. Consequently, the market was spread too thinly to allow for commercially viable collection in all cases. The collection companies did not always have the financial resources to undertake the necessary environmental investments. Bunker ships played a significant role in collecting these wastes; they accepted oily waste streams, often free of charge, as a service to their customers. However, it was unclear what these bunker ships ultimately did with the hazardous substances they collected in this way. The large number of companies involved made monitoring very difficult.
- The ships were required to deliver their wastes containing oil and/or chemicals to companies with permits. However, the permit holders were not required to accept the wastes. Only attractive loads were accepted. High fees were charged for acceptance of other wastes. So it was not really surprising that a lot of this liquid waste was discharged overboard, secretly, at night and during foggy weather.
- The large numbers of ships and their mobility made enforcement difficult.
- The ship operators and the government had different opinions about the danger posed by the liquid waste. Ship operators tended to regard waste with a high oil content as a product rather than a waste. If the liquid consisted mainly of water with just a little oil, then the ship operators did not see any problem with dumping it overboard.

#### **The Decree on Collection of Wastes From Ships**

A new regulation was developed to end to this situation. The decree on "hazardous wastes from ships" became effective in 1985. Its purpose was to limit the number of permit holders entitled to collect and process ship wastes, so that waste disposal would be more economically viable and thus collectors and processors could afford to conduct their business in an environmentally responsible manner. The regulation also made it mandatory for the permit holders to accept waste. The new permitting system made it possible to distribute the collection companies all around the country so that ships' operators could dispose of their waste legally no matter where they were. A notification requirement for both the ship's operators and the collection companies

was included as an aid to enforcement. All these measures were designed to substantially improve compliance and enforcement.

### **Enforcement Approach**

By 1989, the restructuring of the collection and processing system was nearly complete. The permits had been granted, and the ship operators had been informed about the new regulation and had received a brochure with the names and addresses of waste collectors. The time was ripe for intensive enforcement because:

- The regulated community understood the requirements.
- Inspections would reveal how effective the new collection system was.

Two types of inspections were conducted:

- Inspections of ships to check for illegal discharges and waste deliveries to companies without the necessary permit.
- Inspections at the companies collecting and processing waste from ships.

The shipboard inspections were to be carried out on the water by the river police. The government decided to hire a private agency to inspect the collection and processing companies because:

- There was not enough skilled manpower available within the government at that time.
- It was expected that a number of intensive inspection rounds would result in radical improvements in compliance, so that less manpower would be needed for future inspections.
- The inspections had to be started in the near future.

An enforcement program was drawn up. The companies to be inspected were divided into two categories. One group, the collectors and cleaners, which collect for commercial purposes, would be inspected three times a year. Most ship wastes end up with these companies. The other group, the bunker companies, terminals, refineries, and wharves, would be inspected twice a year. Collection is a side line for them, often provided as a service to their clients.

The inspections were standardized, primarily to facilitate the subsequent transfer of inspection activities from the private to the public sector, but also to help ensure clarity and effectiveness. A checklist was developed to ensure standardization.

During the first year, inspections were performed to promote compliance by increasing awareness of the program and informing companies if they were out of compliance. Companies received written notice of violations. It was agreed with the Public Prosecutor that charges would be brought in the second year. A standard charge has been developed for this purpose. Ninety companies have been inspected two to three times during the past year.

### **Enforcement Results**

A comparison of the first and last rounds of inspections of collectors and processors reveals a sizable improvement in compliance. Enforcement has had the expected effect. Many companies have applied for and been granted permits, although they do not carry out any activities in this area or, in the case of the bunker companies, perform them only as a service for their best clients. The fees charged for collection and processing were found to vary widely.

The situation is not nearly as good with respect to prevention of illegal discharges. Forty percent of ship operators admit to discharging wastewater containing oil illegally. They still see no reason to deliver watery waste streams to processors. They also believe that it is too much trouble to dispose of their waste legally (because of long waiting times, or even detours).

They have major problems with the prices they have to pay, especially when they compare the situation to other countries where waste can be disposed of legally without any charge.

The collection structure is not yet sufficient to prevent illegal discharges. The approach of information-oriented inspections seems to have resulted in more clarity about the requirements after collection. There is reasonable compliance with the rules applying to collection and processing.

The creation of a free waste reception facility in every port would prevent illegal discharges. The cost incurred for disposing of these wastes could be covered by the port mooring fees.

## **CASE STUDY 4: ENFORCEMENT OF MUNICIPAL WASTEWATER REQUIREMENTS IN THE UNITED STATES OF AMERICA**

### **Background**

Under the Federal Water Pollution Control Act of 1972 and subsequent amendments, the U.S. EPA established specific effluent limitations for municipal wastewater treatment plants. In general, municipal wastewater treatment plants must provide a minimum of secondary treatment. During the 1970s and much of the 1980s, the U.S. EPA provided substantial federal funding (up to 85% of the capital costs) to municipalities for construction of municipal wastewater treatment facilities. Nevertheless, by 1977, less than half of all POTWs were in compliance with the requirements. A 1979 program to address this problem was unsuccessful. Two factors contributing to the failure were:

- The U.S. EPA readily extended deadlines for compliance.
- The U.S. EPA and the states were reluctant to enforce against municipalities that had not received federal grants to build new facilities.

Several government studies revealed a severe noncompliance problem. The U.S. Congress and the public became increasingly concerned about the problem and, as a result, the U.S. EPA and the states created a work group in 1982 to develop a new strategy for dealing with municipal noncompliance. This strategy was a sharp contrast to previous policies: Enforcement would now be the key tool to achieve compliance, and all municipalities were expected to comply regardless of whether or not they had received federal financial assistance. This new policy — the National Municipal Policy (NMP) — became effective in January 1984.

The policy was backed by amendments to the Clean Water Act that greatly restricted the conditions under which extensions could be granted. The amendments allowed no extensions beyond July 1, 1988.

### **Enforcement Activities**

With the initiation of the NMP, enforcement by the U.S. EPA and the states became the single most effective tool to bring POTWs into compliance. A list of noncomplying facilities was developed, and the U.S. EPA and the states pursued enforcement against them. By 1987 almost 80% of all NMP facilities (including major and minor facilities) were under an enforcement order, either administrative or judicial. After this point, all POTWs subject to enforcement action that had not started construction were dealt with primarily by judicial action, since these facilities would be incapable of meeting the July 1, 1988, compliance deadline. By the second quarter of 1988, almost 20% of all NMP major facilities were subject to judicial referrals (see Figure 11-3). On average, NMP facilities received 1.5 state or federal enforcement actions. This means that almost all NMP facilities have been under some sort of enforcement action.

### **Results**

The NMP was a highly successful program targeted at 1,478 POTWs, many of which were very large. Over 71% of these 1,478 facilities came into compliance by the July 1, 1988, deadline for achieving required treatment (see Table 11-1). As of that date, NMP facilities were removing an estimated 2.325 million more pounds (1.053 million more kilograms) per day of conventional pollutants and 15,000 more pounds (6,800 more kilograms) per day of toxic pollutants than in 1984.

The NMP brought the total population of major treatment plants in compliance to 90%. Even more impressive were the resulting environmental benefits. By 1984, 95% of the total sewage processed in the United States was receiving secondary or better treatment, affecting 108 million people.

Some 650 (43%) of the 1,478 targeted facilities contributed to known water quality problems and, consequently, were required to install advanced wastewater treatment technology. Of these facilities, 525 POTWs, affecting an estimated 8,000 stream miles (12,800 stream kilometers), met the July 1988 deadline because of the NMP.

### **Reasons for Success of the National Municipal Policy**

**TABLE 11-1. COMPLIANCE STATUS OF NMP FACILITIES  
(as of July 1988)**

	<u>Number</u>	<u>Percentage</u>
Total Major POTWs	3,731	
Not in Compliance by 1984	1,478	100%
In Compliance by 1988	1,055	71%
On Enforceable Schedule by 1988	235	16%
Judicial	195	
Administrative	40	
Not on Enforceable Schedule by 1988	188	13%
Judicial - Filed	60	
Judicial - Referral, not Filed	38	

The NMP owed its success almost entirely to direct enforcement efforts. Before the NMP was implemented, municipalities typically believed that compliance was achieved by acquiring grant funds. Permittees believed that the availability of federal funding was a key part of determining whether the federal government and the states would enforce the regulations. Enforcement actions did not follow a consistent pattern until the National Municipal Policy was developed. The NMP program was successful largely because of several elements in the enforcement plan:

- First, a team of U.S. EPA managers and staff was specifically assigned to make the effort succeed.
- Second, the media, public, and the Administrator of the U.S. EPA supported the NMP.
- Third, the media gave wide coverage to enforcement initiatives and penalty results.
- Fourth, a unified state/federal policy was established at the outset and the states generally supported the strong enforcement measures.
- Fifth, the program established a fixed universe of facilities to target and tracked individual facilities on a case-by-case basis, continuing to pressure facilities until compliance was reached.
- Sixth, there was a clear statement and follow-through on the policy that there was no link between grant funding and statutory compliance.

All these factors produced a strong and effective enforcement presence. The NMP set examples and precedents through federal and state enforcement actions and through favorable rulings on important cases. These cases and the significant penalties associated with them permanently altered the commonly held attitude that it was improper for the U.S. EPA and the states to enforce against municipalities. For the first time, enforcement actions and penalties became realistic expected responses to noncompliance, and this created the possibility of future benefits from deterrence among municipalities.

## **CASE STUDY 5: ENFORCEMENT OF MARKETABLE REDUCTIONS OF LEAD IN THE UNITED STATES OF AMERICA**

### **Background**

Because of the clear adverse effects of lead on human health, the U.S. EPA embarked on a program (the Lead Phasedown Program) to reduce the lead content of gasoline. Gasoline lead was first controlled in the United States in October 1979 by limiting the average concentration permitted in a refinery's total gasoline pool. As knowledge of the severity of the negative health effects of lead grew, the U.S. EPA evaluated the effectiveness of these regulations, and in October 1982, created tighter standards and a trading system that allowed refineries requiring less lead than the standard to sell their excess to other less technologically advanced refineries.

In 1985, the standard for lead was tightened further, and a banking system was introduced. Under the banking provisions, a refiner was allowed to store in a bank account the difference between the standard and the larger of either actual lead usage or 0.10 gplg (grams per leaded gallon). The banked lead rights were available for use or transfer to other refiners or importers during any future quarter through 1987.

### **Enforcement Activities**

Compliance was monitored through a self-reporting system. The U.S. EPA checked the internal consistency of reports and corroborated them with independent reports from manufacturers of lead additives. At the end of 1986, the U.S. EPA began conducting the first full-scale audits of refiners.

In the Lead Phasedown Program, a high degree of voluntary compliance could have been expected because detection was more likely based on the required self-reporting which could be corroborated with an outside source of information (manufacturers of lead additives) to verify refiners' reports. Further, the regulated universe was primarily large refiners that were vulnerable to public opinion. The danger from lead toxicity was becoming a prominent public concern, which increased the likelihood of public condemnation of violators. However, two factors reveal that voluntary compliance was far below a desirable level:

- The initiation of the audit program late in 1986 revealed substantial noncompliance.

- Violations fell sharply after the audit program had been in place long enough to exert a deterrent effect (see Figure 11-4).

Distribution of violations through time shows that audits uncovered earlier instances of severe noncompliance while deterring new violations. In 1985, before the initiation of audits, violations were at their highest level, probably because of the opportunities for illicit profit presented by the accumulation period of the banking program. Most of these violations went undetected until EPA initiated the audit program in late 1986.

Many of the violations detected through audits were large, and the enforcement actions taken against the violators were given wide publicity. During 1987 when publicity would have drawn the attention of potential violators, there was a sharp decline in new violations to a level about one-third of that seen in 1986 (see Figure 11-4). This pattern suggests that the audits and the resulting Notices of Violation (NOVs) successfully reduced new illegal activity through their deterrent effect.<sup>2</sup> This pattern occurred even though the audit program had become more sophisticated in 1987 and therefore more likely to detect violations.

When audits were initiated, the penalty policy was changed to make violations much more costly to the perpetrator. This also helped deter violators. For example, 17 NOVs were issued in 1987 after the audit program was introduced. A total of \$54.4 million in penalties had been issued by the autumn of 1987, 18 times the average of the previous four years. The largest settlement during this period was for over \$2 million.

## **Results**

By the end of 1987, the Lead Phasedown Program as a whole had removed a cumulative total of 380 billion grams of lead from gasoline production (see Figure 11-5). Enforcement actions were responsible for removing 150 million grams of these 380 billion grams in the form of lead rights that had been permanently removed from the market. This reduction represents health benefits (see Table 11-2) estimated to be worth about \$40 million (in 1983 dollars).

## **Deterrence**

The principal elements generally considered necessary for deterrence were strongly present in this enforcement program. First, there was a credible likelihood of detection. Before regulations became complicated enough to require audits, monitoring was easy because the number of regulated entities was reasonable and lead manufacturing reports were available as an independent source of information on the extent of compliance. Banking and trading made detection of violations difficult, which correlated with an increase in violations during this period. The introduction of individual audits made detection of violations much more probable once again, and violations dropped.

Second, the consequences of detection were serious. With the initiation of audits for individual operations, a new penalty policy in mid-1986 that raised penalties, and the resulting high settlements, the consequences of violating the law became quite significant.

Third and fourth, the audit program ensured a fair and quick response: audits revealed violators immediately, using a consistent standard of tests applied to each refinery audited anywhere in the country. NOVs resulting from the audits received wide publicity in both the public media and trade press. For an industry dominated by large companies vulnerable to public opinion, negative publicity was very effective. The combined presence of these elements created the necessary environment for successful deterrence.

## **Conclusion**

The Lead Phasedown Program forced refineries to reduce lead use in gasoline through a series of tighter regulations between 1979 and 1985. At the same time, the program introduced new methods of compliance including trading of lead rights, and later, banking of these rights — methods of compliance that offered flexibility, but made detection of violations more difficult. Although the emission reductions from

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<sup>2</sup>This drop in detected violations may also be explained in part by the fact that suspected violators were targeted for audits first. As time went on, refineries were more randomly selected for audits.

**TABLE 11-2. ESTIMATED HEALTH BENEFITS FROM THE 150 MILLION GRAMS OF LEAD REMOVED FROM GASOLINE PRODUCTION AS A RESULT OF DIRECT ENFORCEMENT**

<u>Condition</u>	<u>Estimated Number of Cases Eliminated</u>
Cases of adult hypertension	7,417
Myocardial infarctions of adult males	22
Strokes - adult males	5
Deaths - adult males	21
Children with blood levels of 30 ug/dL	202
Children with blood levels of 25 ug/dL	674
Children with blood levels of 20 ug/dL	2,225
Children with blood levels of 15 ug/dL	6,859

<sup>1</sup>mg/dL = micrograms per deciliter

direct enforcement were large, the sharp decline in new violations after 1986 suggests that enforcement had an even larger impact through deterrence.