

**Economic  
Incentives to  
Control Water  
Pollution in  
Developing  
Countries**

**How Well  
Has Colombia's  
Wastewater  
Discharge Fee  
Program Worked  
and Why?**

**I**N 1997, COLOMBIA INITIATED AN INNOVATIVE NATIONWIDE PROGRAM TO STEM WATER POLLUTION. Instead of requiring firms to cap emissions of pollutants at specified levels—the conventional command-and-control approach—the new program created economic incentives for emissions reductions by charging polluters a fee per unit of pollution emitted. By some accounts, water quality in key watersheds improved soon after the program was put in place, and several well-known evaluations deemed the program a success. Yet many of these evaluations were based on early data and were conducted by parties involved in the design and implementation of the program. Few objective, up-to-date studies have appeared.

One chapter of a recent World Bank-funded RFF report on Colombian environmental policies, which I co-authored, aims to fill this gap. It assesses Colombia's wastewater discharge fee program from 1997 until 2003, when significant reforms were implemented. The chapter finds that although the program was beset by a number of serious problems during this stage, its reputation as a success is not unfounded. In several watersheds, pollution loads do appear to have dropped significantly after the program was introduced. The reasons typically given for this achievement are not the whole truth, however. While many proponents claim the incentives that discharge fees created for polluters to cut emissions in a cost-effective manner were responsible for reduced discharges, the incentives they created for regulatory authorities to improve permitting, monitoring, and enforcement were probably at least as important.

#### **BROADER SIGNIFICANCE: ECONOMIC INCENTIVES IN DEVELOPING COUNTRIES**

**O**ver the past two decades, a robust debate has emerged among policymakers and academics about the pros and cons of using economic incentive policies instead of—or alongside—command-and-control policies to control pollution in developing countries. The workhorse of environmental regulatory regimes worldwide, command-and-control policies typically require polluting facilities to use specified abatement devices or to cap emissions at specified levels. Economic incentive policies, by contrast, provide financial rewards for facilities that cut pollution without dictating how or how much they should cut.

The two economic incentive policies that have received the most attention are discharge fee programs, which charge firms for each unit of pollution emitted, and marketable permit programs, which assign firms emissions allowances that they may trade with other firms (for example, EPA's sulfur dioxide emissions trading program). Prevailing wisdom holds that both policies reduce the cost that industry pays to control pollution by: leaving firms free to choose abatement strategies that minimize costs; providing incentives for firms that can cut emissions cheaply to shoulder a greater share of the pollution control burden; and making it profitable for firms to develop and adopt less costly strategies to reduce emissions. All these efficiency properties make economic incentive instruments particularly attractive in developing countries, where industry—whether by necessity, choice, or

some combination of the two—has made minimal resources available for pollution control.

However, more than a few high-profile attempts to use discharge fees and marketable permits in developing countries have foundered, and questions are increasingly being raised about whether these economic-incentive policies are workable in such settings. Some observers argue that discharge fees and marketable permit programs are particularly demanding of regulatory capacity, another resource that is in short supply in developing countries. Specifically, they argue that regulatory institutions often lack the technical, political, and financial capacity needed to set fees, allocate permits, monitor emissions, invoice polluters, keep track of permit trades, and collect payment.

The Colombian experience with wastewater discharge fees provides an opportunity to evaluate the advantages and disadvantages of economic incentive instruments.

#### **COLOMBIA'S COMMAND-AND-CONTROL WATER POLLUTION REGULATION**

**C**olombia's 33 *Corporaciones Autónomas Regionales* (CARs)—regional environmental regulatory authorities with boundaries determined in principle by ecological considerations, not political jurisdictions—comprise the country's front line of pollution control. Endowed with considerable fiscal and policy autonomy meant to insulate them from interest-group pressures, CARs carry out policies and programs designed by the environment min-

istry. As a group, they have a decidedly mixed record in implementing longstanding command-and-control water pollution control policies that require dischargers to obtain permits and meet effluent standards. As late as 2002, CARs had issued permits to less than a third of all dischargers. Moreover, monitoring and enforcement of discharge standards has been lax. The lion's share of both municipal and industrial wastewater violates discharge standards. As a result, many of Colombia's most important rivers—including the Bogotá, Cali, Cauca, and Medellín—are severely polluted.

## ECONOMIC-INCENTIVE WATER POLLUTION REGULATION

Although various regional authorities in Colombia have used discharge fees for more than 30 years, it was Law 99 of 1993, a sweeping reform of the country's environmental legislation that established the broad legal basis for the present national discharge fee system. Decree 901 of 1997, an implementing regulation, laid out exactly how the system would work. It mandated that CARs first develop comprehensive inventories of all facilities discharging organic wastes that generate biological oxygen demand (BOD) and total suspended solids (TSS), two of the most commonly measured water pollutants, and that they estimate baseline discharge levels for each facility. Next, CARs were to map key water basins in their jurisdictions and set five-year pollution reduction goals for aggregate discharges into each basin. Having done this, CARs were to charge all polluters a fee per unit of BOD and TSS discharged. The environment ministry was to set a minimum fee, but CARs were to adjust it upward by a specified amount for each six-month period that the pollution reduction target in a given water basin was not met. CARs were to monitor facilities' discharges every six months and invoice them monthly. Finally, every six months, CARs were to present to both their boards of directors and to the environment ministry a report detailing pollution loads, invoicing, and collections.

## PROGRAM IMPLEMENTATION

To help CARs implement the discharge fee system, the environment ministry established a technical assistance program. One pillar of this program was a written manual that provided step-by-step instructions on how to build a discharge fee system. In addition, the environment ministry provided as-needed technical assistance to regional environmental authorities, organized expert groups to provide solutions to implementation problems, and

presented two series of workshops—one for CARs and another at national chambers of commerce representing key private-sector participants, such as the trade associations for coffee growers and manufacturers. Finally, the environment ministry created a peer-to-peer system that encouraged the most successful CARs to share their best practices.

Notwithstanding the environment ministry's considerable efforts, implementation of the discharge fee program was marred by several problems. First, not surprisingly, it was uneven across CARs. According to the environment ministry, by 2003, only nine of the 33 CARs had fulfilled all the principal requirements of Decree 901 and had operated a discharge fee program for at least 18 months. Thirteen CARs were collecting revenue but were implementing the program in an incomplete or inconsistent manner, and 11 had begun implementation but had yet to collect fees.

A second problem was incomplete coverage of dischargers. On average, less than half of polluters were actually invoiced. A third problem was low fee-collection rates. Between 1997 and 2002, just 27 percent of all fees invoiced were actually collected, with rates across CARs ranging from 1 percent to 95 percent.

A fourth problem was persistent noncompliance by municipal sewage authorities, a leading class of dischargers. Between 1997 and 2002, they were invoiced for more than 30 percent of all discharge fees, but only paid 40 percent of the amounts invoiced. This noncompliance was a key barrier to the successful implementation of the program. Private-sector water dischargers in industry and agriculture complained bitterly about being made to pay fees when highly visible public-sector dischargers refused or failed to do so. This contentious situation was greatly aggravated by the fact that noncompliance by municipal sewage authorities prevented many water basins from meeting five-year, total pollution-load reduction targets. Under the rules of the fee program, this led to steep automatic increases in fees charged to all dischargers in the water basin.

A final problem was confusion and controversy surrounding the relationship between new and old water-pollution control instruments. The discharge fee system was layered on top of the pre-existing command-and-control system of permits and discharge standards. Decree 901 mandated that polluters pay fees only on emissions in excess of discharge standards, but there was no clear language in the decree about how to handle facilities that were not complying in the first place.

Despite these implementation problems, a wide range of available evidence suggests that in a number of water basins, discharges dropped significantly between 1997 and 2003. For example, according to the environment ministry, during the

first five years of the program, nationwide BOD discharges from point sources covered in the program fell 27 percent and TSS discharges fell 45 percent.

## WHAT MADE IT WORK

To what extent was the discharge fee program responsible for the emissions reductions that occurred after the program was established? Not surprisingly, proponents award it virtually all the credit, attributing this success to efficiency advantages that make discharge fees less burdensome to polluters than discharge standards. Although these claims are not baseless, the whole truth is far more complex.

Before 1997, permitting, monitoring, and enforcement of water pollution regulations were inadequate in virtually all CARs. To set up discharge fee programs, CARs had to remedy these deficiencies. For example, they had to develop a complete inventory of dischargers, create an information management system, calculate facilities' pollution loads, and develop monitoring systems. Each of these tasks is a precursor to effective implementation of command-and-control emissions standards as well as discharge fees. As a result of this effort, emissions standards in many jurisdictions had a far greater impact after 1997 than before the advent of the discharge fee system.

Consequently, one cannot be certain whether the reductions in emissions that occurred after 1997 were due to the efficiency properties of the new discharge fee program or to more effective permitting, monitoring, and enforcement that enhanced the performance of the new discharge fees as well as the old emissions standards. Although these factors are virtually impossible to disentangle empirically, intuition alone suggests the second factor was critical—permitting, monitoring, and enforcement serve as the foundation upon which both command-and-control and economic-incentive pollution control systems are built.

While the environment ministry's implementation assistance efforts were important, two intrinsic features of the discharge fee system also contributed to improvements in permitting, monitoring, and enforcement. First, the discharge fee program entailed more transparency and accountability

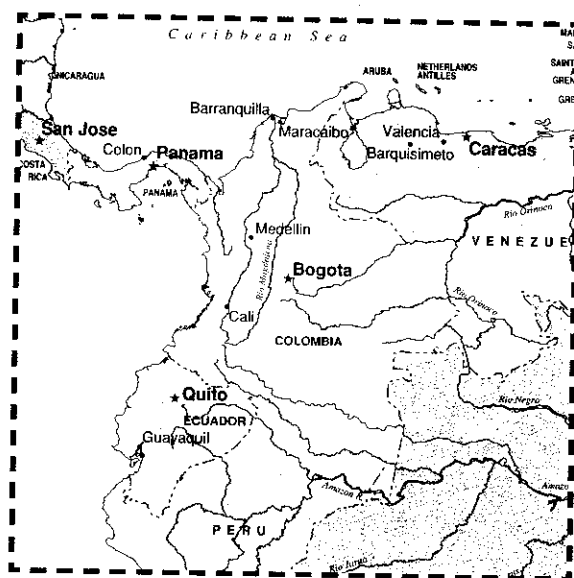
than did the old command-and-control program. CARs were required to report both to their boards of directors and to the environment ministry their progress on a number of fronts, including pollution reduction targets, pollution loads, invoices, and collections. Previously, few CARs consistently kept records of discharges of water users. In a sense, the discharge fee program subjected CARs to performance standards for water pollution control for the first time. Second, by allowing CARs to keep fee revenues, the discharge fee program created an economic incentive for CARs to enforce water pollution control laws.

## POLICY LESSONS

What are the implications of this case study for the debate about the use of economic instruments in developing countries? Discussions of the advantages of using discharge fees in developing countries have focused on their efficiency, while discussions of the disadvantages have centered on the notion that they are more demanding of scarce regulatory resources than many command-and-control instruments. Yet, the evi-

dence presented here suggests that other pros and cons may be equally important. Discharge fees potentially create incentives for regulatory authorities to improve permitting, monitoring, and enforcement. However, grossly inadequate municipal wastewater treatment infrastructure—a pervasive problem in many developing countries—is likely to be a key barrier to implementing discharge fee programs. Among other things, the lack of such infrastructure can greatly hinder efforts to develop a culture of compliance in the discharge fee program.

A second policy lesson from the Colombian experience is that the strategy of setting pollution reduction goals for individual water basins, and then ratcheting up discharge fees until these goals are met, is bound to be problematic when leading dischargers (here municipal wastewater authorities) are unable or unwilling to undertake the pollution abatement investments required to meet these goals. In such cases, fees will increase regardless of the investments made by other polluters, a politically untenable situation that is likely to damage the credibility of the program. ■



# RESOURCES

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PHIL SHARP

## Looking Beyond the Obvious

The value of building an econometric model to analyze a social phenomenon—like sprawl or poverty—probably doesn't seem obvious to non-economists. But, as a former politician, I can attest that robust data matter a great deal. Policy based primarily on anecdote and opinion is destined for the scrap heap.

In this issue of *Resources*, you will find evidence-based counterarguments to the assumptions and conventional wisdom that cloud public discourse. *Example:* Virginia McConnell, Margaret Walls, and Elizabeth Kopits analyzed more than 20 years of land-use data for rapidly growing Calvert County, Maryland, to address a vexing question: What forces drive sprawling housing developments—zoning requirements that encourage siting homes on large lots, or simply consumer demands for more room?

At first glance, many of the things we study might seem obvious to a casual observer, but much lies beneath the surface. *Example:* Urvashi Narain and her colleagues surveyed residents in 60 Indian villages to determine whether the widely held belief that people in developing countries turn more to the marketplace as their incomes rise is true. (It's not.)

We don't shy away from policy debates, such as the one among policymakers and academics about using economic incentives instead of command-and-control policies to control pollution in developing countries. *Example:* Allen Blackman takes a close look at how well Colombia's wastewater discharge fee program worked and why. Early supporters praised the program's efficiency. However, evidence from his fieldwork suggests that the fees also created incentives for regulators to improve permitting, monitoring, and enforcement.

We ask tough questions about annoying subjects, the ones that many folks neglect. In his State of the Union speech, the president said that Americans are addicted to oil and, I might add, to big cars and trucks. So what is it going to take to get us out of our SUVs? *Example:* Kate Probst believes that when we're standing in a showroom choosing a new car, what might help is insight into how much carbon dioxide a given vehicle emits. A simple window sticker rating a car's carbon dioxide output per year could do the trick, she says.

Finally, we provide perspective on current developments, such as a global survey that ranks 133 nations on their environmental performance. In a lively back-and-forth, Jim Boyd and Yale Professor and RFF Board Member Dan Esty exchanged views on what it takes to get policymakers to pay attention to environmental problems in their countries.

These examples are the kind of rigorous, independent analyses that we believe drives lasting change.

# RESOURCES

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