



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Muddling Through while Environmental Regulatory Capacity Evolves: What Role for Voluntary Agreements?

Allen Blackman and Nicholas Sisto

April 2005 • Discussion Paper 05-16



RESOURCES
FOR THE FUTURE

Resources for the Future
1616 P Street, NW
Washington, DC 20036
Telephone: 202-328-5000
Fax: 202-939-3460
Internet: <http://www.rff.org>

© 2005 Resources for the Future. All rights reserved. No portion of this paper may be reproduced without permission of the authors.

Discussion papers are research materials circulated by their authors for purposes of information and discussion. They have not necessarily undergone formal peer review or editorial treatment.

Muddling Through while Environmental Regulatory Capacity Evolves: What Role for Voluntary Agreements?

Allen Blackman and Nicholas Sisto

Abstract

The city of León, Guanajuato, is Mexico's leather goods capital and a notorious environmental hotspot. Over the past two decades, four high-profile voluntary agreements aimed at controlling pollution from León's tanneries have yielded few concrete results. To understand why, this paper reconstructs the history of these initiatives, along with that of local environmental regulatory capacity. Juxtaposing these two timelines suggests that the voluntary pollution control agreements were both motivated by—and undermined by—gaps in the legal, institutional, physical, and civic infrastructures needed to make regulation effective. Our analysis offers a concrete definition of environmental regulatory capacity, provides insights into how it evolves, and demonstrates its importance. Moreover, it sheds light on the question of whether voluntary environmental agreements—an increasingly popular regulatory tool—are likely to be effective in developing countries.

Key Words: environment, voluntary agreement, regulatory capacity, Latin America, Mexico

JEL Classification Numbers: Q53, Q56, Q58, O13, O54

Contents

| | |
|--|-----------|
| 1. Introduction..... | 1 |
| 2. Leather Tanning in León..... | 4 |
| 2.1. Economic Profile | 4 |
| 2.2. Environmental Impacts | 4 |
| 3. Evolution of Environmental Regulatory Capacity | 6 |
| 3.1. Federal..... | 6 |
| 3.2. State..... | 9 |
| 3.3. Municipal | 10 |
| 4. History of Pollution Control Efforts | 11 |
| 4.1. Heightened Demand for Pollution Control | 11 |
| 4.2. Convenio I..... | 12 |
| 4.3. Convenio II | 15 |
| 4.4. Parque PIEL..... | 17 |
| 4.5. The Presa de Silva Bird Die-Off..... | 17 |
| 4.6. Convenio III..... | 18 |
| 4.7. Convenio IV..... | 21 |
| 5. Conclusion | 24 |
| References..... | 28 |
| Figures..... | 32 |
| Tables | 34 |

Muddling Through while Environmental Regulatory Capacity Evolves: What Role for Voluntary Agreements?

Allen Blackman and Nicholas Sisto*

1. Introduction

In the city of León, Guanajuato—Mexico’s leather goods capital—hundreds of tanneries dump untreated effluents directly into municipal sewers. The resulting ground- and surface-water pollution has earned the city a reputation as one of the Mexico’s worst environmental hotspots. Concerted efforts to control tannery pollution began two decades ago, prompted by a national campaign to improve water quality in the Lerma–Chapala River basin. The centerpiece of these efforts has been a series of high-profile voluntary pollution control agreements, all backed by top federal, state, and local authorities. Unfortunately, these agreements have yielded few concrete results. Why?

We argue that voluntary pollution control efforts in León have been both spurred by—and undermined by—gaps in four types of infrastructure that environmental regulators require to be effective:

- *legal infrastructure*, such as regulations implementing federal and state laws;
- *institutional infrastructure*, such as state and municipal environmental regulatory institutions;
- *physical infrastructure*, including facilities for the treatment of liquid and solid waste; and
- *civic infrastructure*, such as environmental advocacy groups and an environmentally aware citizenry.

The lack of such infrastructure has effectively ruled out reliance on conventional command-and-control approaches to pollution control that require regulators to enforce

* Blackman (corresponding author; blackman@rff.org) is a fellow at Resources for the Future (RFF); Sisto (sisto@itesm.mx) is an Assistant Professor in the Department of Economics at the Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), Monterrey, Mexico. The authors are grateful to the Tinker Foundation for financial assistance and to Arne Kildegaard and Edgar Isusquiza for assistance with field research.

mandatory emissions and technology standards.¹ Environmental authorities have attempted to overcome this constraint by negotiating voluntary compacts in which tannery representatives and other stakeholders have committed to implementing various pollution control measures by specified deadlines. But the lack of regulatory infrastructure also undermined these voluntary agreements. It did so in at least three ways. First, it implied that the tanners who acceded to the agreements needed to commit to constructing much of the requisite physical infrastructure from scratch, a costly enterprise that they were not likely to undertake without strong incentives. Second, it implied that regulators could not credibly threaten tanners with mandatory command-and-control regulation if they failed to comply with their voluntary agreements. Such “background threats” typically constitute important incentives for compliance with voluntary initiatives. And finally, the lack of a wide range of types of regulatory infrastructure, many of which were interdependent (for example, a competent local enforcement institution and clear written regulations) implied that most, if not all, of the key signatories needed to simultaneously make good on their commitments in order for the agreement to be successful, a situation that inevitably led to bottlenecks and finger pointing.

This paper makes two contributions to the literature. First, it clarifies the concept of environmental regulatory capacity. Increasingly, conventional wisdom dictates that the key to improving environmental quality in developing countries is augmenting such capacity (Eigen-Zucchi et al. 2003, Wheeler et al. 1999). Consequently, it has become a major focus of international environmental aid. Yet the concept remains murky. This analysis offers a concrete definition of environmental regulatory capacity, provides insights into how it evolves, and demonstrates how it affects efforts to regulate polluters.

Our paper also contributes to the literature on voluntary environmental agreements. Such agreements have attracted considerable attention from both policymakers and academics in recent years (Lyon and Maxwell 1999; Khanna 2001). Some observers have argued that they represent a new cooperative—as opposed to sanction-based—approach to environmental management made possible by, among other things, the coming of age of a new, more environmentally conscious generation of private-sector managers. Most academic researchers, however, have focused on the self-interest of the parties involved in negotiated voluntary

¹ Lack of regulatory infrastructure has also ruled out reliance on less conventional economic incentive pollution control instruments such as emissions charges and tradable permits. Economic incentive instruments are generally considered to be at least as demanding of regulatory infrastructure as command-and-control instruments and have a decidedly mixed record in developing countries (Blackman and Harrington 2000; Bell 2003).

agreements. They argue that regulators resort to such agreements when political or technological constraints prevent them from using conventional regulation. For example, Lyon (2003) argues that the U.S. Environmental Protection Agency relies on voluntary programs to control greenhouse gases because political support and/or scientific underpinnings for mandatory regulation are insufficient. For their part, polluters participate in voluntarily agreements either because regulators offer inducements or threaten sanctions. For example, in Maxwell et al. 2000, polluters collectively volunteer for self-regulation in order to preempt even more restrictive mandatory standards. Similarly, in Segerson and Miceli 1998, a “background legislative threat” motivates participation in voluntary agreements. In such models, voluntary regulation is only effective in motivating firms to cut pollution when the threat of future mandatory regulation is credible.

Our paper presents a rare case study of voluntary environmental regulation in a developing country (Rivera 2002; ten Brink 2002). We argue that in León, conventional explanations for voluntary agreements apply—but with an important twist. In León, as in industrialized countries, regulators have relied on voluntary agreements because they lack the capacity to enforce mandatory regulations. Also, as often happens in industrialized countries, these voluntary agreements have failed because polluters do not face a credible threat of future mandatory regulations. The twist in León is that regulatory capacity has been so limited that voluntary agreements have been used to address basic conventional pollution problems, not just relatively exotic greenhouse gases and toxics. As a result, the failure of these agreements has had much more obvious consequences.

The methodology for our analysis is qualitative and historical. We use a variety of sources—including an original survey of 137 tanneries in León, interviews with key local stakeholders, and primary and secondary documents—to reconstruct the history of environmental regulatory capacity at the federal, state, and municipal levels from 1980 to 2001, and of tannery pollution control initiatives in León during the same time period. We analyze and juxtapose these two histories, using the four categories of regulatory infrastructure listed above as an organizing framework.

The remainder of the paper is organized as follows. Section 2 presents background information on the leather tanning sector in León, including its economic importance and environmental impacts. Section 3 discusses the evolution of environmental regulatory capacity in Mexico, Guanajuato, and León between 1980 and 2000. Section 4 presents a brief history of recent efforts to control tannery pollution, focusing on the voluntary environmental agreements of 1987, 1991, 1995, and 1997. Finally, Section 5 sums up and offers conclusions.

2. Leather Tanning in León

2.1. Economic Profile

The state of Guanajuato in north central Mexico is the country's leather tanning and shoemaking capital, accounting for about 65% of national output of all leather goods. The state's leather tanneries are heavily concentrated in León, a sprawling industrial city with a population of 1.1 million, and to a lesser extent, in the much smaller neighboring cities of San Francisco del Rincón with a population of 100,000 and Purísima del Rincón with a population of 45,000. (To make the analysis more manageable, we restrict our attention to the city of León). Leather tanning and shoemaking are the dominant industries in the León, employing 12% and 59%, respectively, of the city's economically active population (INEGI 1990).

The exact number of tanneries in León is not known, mainly because a sizable percentage are "informal," that is, unlicensed and unregistered, a status that enables them to elude Mexican tax authorities and other regulators. Guanajuato's environmental regulatory authority estimates León supports approximately 800 formal tanneries and 400 informal ones, all scattered throughout the city (Villalobos 1999). Although their size distribution is not known with certainty, by all accounts the vast majority are small-scale. In a sample of 137 formal tanneries surveyed in January 2000, more than three-quarters had 15 or fewer employees (Blackman and Kildegaard 2002). On average, León's informal tanneries are undoubtedly smaller than formal tanneries. The large number, small size, dispersion, and informality of León's tanneries make them a difficult target for regulatory authorities. In addition, the leather industry's status as the economic mainstay in the region gives it considerable public support and significant sway in both the state and municipal politics, a factor that further complicates environmental management initiatives.²

2.2. Environmental Impacts

Leather tanning consists of two meta-processes: wet blue production and finishing. The former involves removing unwanted substances from a rawhide, trimming it, treating it to impart the desired grain and stretch, and finally soaking it in a chromium bath to prevent decomposition.

² The following anecdote illustrates the attitude of León's citizens towards tanneries. In 2002 the municipality received a nuisance complaint against 22 tanneries operating in a working-class neighborhood, a rare event. In response, the municipality organized a local referendum on a proposal to relocate these tanneries: 188 resident families voted against and only 8 voted in favor (*Correo de Hoy* 2002).

Finishing involves splitting, shaving, re-tanning, and dyeing the wet blue. The wet blue process generates considerable water pollution including chemical oxygen demand (COD), biological oxygen demand (BOD), sulfur, and heavy metals.³

Aside from water pollution, leather tanneries also produce solid waste including sludge, trimmings, and fleshings.⁴ The solid waste that has received the most attention is sludge, which is deposited in the simple concrete sedimentation tanks tanneries employ to keep drain pipes from clogging. Tannery sludge contains significant amounts of hazardous pollutants, including chromium VI—a highly toxic by-product of the chromium III used by tanners—sulfur, and phosphorus (Maldonado Vega et al. 2001).

Even though tannery liquid and solid wastes are highly polluting, almost all are uncontrolled and untreated. The vast majority of León's tanneries employ no in-house pollution control devices aside from sedimentation tanks. A January 2000 original survey of 137 tanneries found none with in-house treatment facilities (Blackman and Kildegaard 2002). Thus, tannery liquid wastes are dumped untreated into municipal sewers. Until late 2000 when León's first municipal wastewater treatment plant began operation, these wastes flowed untreated into the Gómez River, a tributary of the Turbio River. Like most Mexican cities, León has no proper hazardous waste disposal facilities.⁵ Privately contracted tanker trucks collect and dispose of most tannery sludge. Until 2001, these trucks unloaded their contents directly into local creeks and rivers (see e.g., *Correo de Hoy* 2000a).

Pollution from León's tanneries degrades both surface water and groundwater. The Turbio River—which receives León's wastewater by way of a tributary called the Gómez—is considered “excessively contaminated” for two of five types of uses (human consumption and supporting water life) and “strongly contaminated” for the remaining three uses (agriculture,

³ Collectively, each year León's tanneries release approximately 11 million metric tons of chemical oxygen demand (COD), 3 million metric tons of biological oxygen demand (BOD), 17 million metric tons of dissolved solids, 0.3 million metric tons of sulfur compounds, and 0.1 million metric tons of chromium (CIATEC 1996; CEASG 1999).

⁴ Collectively, León's tanneries produce approximately 22,000 tons of solid waste per year (*Heraldo de León* 1999b).

⁵ The nearest hazardous waste disposal facility is 700 kilometers away in Mina, Nuevo León, near Monterrey.

industry, and recreation) (CEASG 1999).⁶ Tannery pollution also degrades underground aquifers. A 1987 study of León's drinking water found that 72% of the city's wells contained chromium VI (Hernández 1987). The principal cause of degradation of the city's aquifers has been infiltration from solid waste dumps (CEASG 1999).

3. Evolution of Environmental Regulatory Capacity

To understand how gaps in regulatory infrastructure have impeded pollution control in León, this section sketches the evolution of environmental regulatory capacity at the federal, state, and the municipal levels over the past several decades. Figure 1 highlights milestones in the development of this infrastructure.

3.1. Federal

3.1.1. General Law and Institutions

The evolution of Mexico's federal environmental infrastructure has been complex and somewhat circuitous. The country's first comprehensive environmental law—the Law for the Prevention and Control of Environmental Contamination—was passed in 1972. The institutional capacity needed to implement it at the state and municipal levels was slow to develop, however. Such gaps in local administrative capacity are pervasive in Mexico. Since its inception, a defining characteristic of Mexican government has been a concentration of legal authority, power, and resources at the federal level (Rodriguez 1997; Lybecker and Mumme 2002). This deep-rooted structural problem aside, in its earliest incarnation, federal environmental regulatory authority was weak. It was split between two existing federal agencies neither of which was devoted principally to environmental regulation.⁷ The 1982 Federal Law for the Protection of the Environment mitigated this problem by unifying federal environmental regulatory authority in a new agency: the Secretariat of Urban Development and Ecology (*Secretaría de Desarrollo*

⁶ Average levels of BOD and COD in 1994 and 1995 were 500 mg/L and 800 mg/L, respectively (CEASG 1999). The river is also polluted with toxics. In 1997, the federal environmental enforcement agency (*Procuraduría Federal de Protección al Ambiente* [PROFEPA]) carried out a detailed analysis of a site on the Gómez River just downstream from León that was widely known as an informal dump for tannery sludge. The study revealed levels of chromium III in the river from 40 to 14,040 times the maximum federal standard of 0.05 mg/L and levels of chromium VI from 63 to 343 times the maximum federal standard of 0.016 mg/L (*Correo de Hoy* 2000a)

⁷ These two agencies were the Secretariat of Health and Welfare (*Secretaría de Salubridad y Asistencia*) and the Secretariat of Human Settlements and Public Works (*Secretaría de Asentamientos Humanos y Obras Públicas*).

Urbano y Ecología [SEDUE]). SEDUE's purview, however, was not exclusively environmental. Also, regulatory authority remained heavily concentrated at the federal level.

In the early 1980s, recognizing that the concentration of power and resources in Mexico City was impeding effective provision of all sorts of public services including environmental protection, Mexico initiated a gradual process of transferring powers to states and municipalities. Known as "decentralization," this reform culminated in a set of two constitutional amendments in 1987. Among other things, these amendments required the federal government to adopt legislation that would grant local (state and municipal) governments authority over certain environmental matters.

New comprehensive federal environmental legislation passed in 1988, the General Law of Ecological Balance and Protection of the Environment (*Ley General del Equilibrio Ecológico y la Protección al Ambiente* [LGEEPA]), met the requirements laid out by the 1987 constitutional amendments. Although the LGEEPA, which remains in force today, left considerable room for interpretation in determining what issue areas are under federal control, it drew the following broad distinctions. The federal government alone was charged with handling hazardous wastes and water pollution discharged into most bodies of water (rivers, lakes, oceans, and so on), whereas local governments were charged with regulating nonhazardous solid wastes as well as discharges into local sewer systems.⁸

Changes in environmental regulatory institutions in the late 1980s and early 1990s complemented the LGEEPA. The National Water Commission (*Comisión Nacional del Agua* [CNA]) was created in 1989. Housed in the Secretariat of Agriculture and Hydraulic Resources (*Secretaría de Agricultura y Recursos Hidráulicos* [SARH])—not in SEDUE—the CNA assumed jurisdiction over both water quantity and water-quality issues, including enforcing standards on industrial discharges and wastewater treatment. The CNA has satellite offices in some but not all of the 31 Mexican states.

The federal environmental regulatory system was restructured in 1992. SEDUE was recast as the Secretariat of Social Development (*Secretaría de Desarrollo Social* [SEDESOL]). Within SEDESOL, one subsecretariat, the Federal Attorney General's Office of Environmental Protection (*Procuraduría Federal de Protección al Ambiente* [PROFEPA]), was charged with

⁸ For other areas such as air pollution and environmental impact review, federal and local government were to divide jurisdiction based on factors such the location and nature of the source and the severity of pollution. The LGEEPA also conferred upon states and municipalities all environmental powers within their jurisdictions not expressly reserved to the federal government (ELI 1996).

enforcement; a second, the National Institute of Ecology (*Instituto Nacional de Ecología* [INE]), was charged with standard setting.

In 1994, the environmental bureaucracy was restructured yet again to streamline federal environmental policymaking. The key change was to create a new environmental agency, the Secretariat of the Environment, Natural Resources, and Fisheries (*Secretaría de Medio Ambiente, Recursos Naturales y Pesca* [SEMARNAP]), which brought together under one roof all of the key federal offices and agencies related to the environment and natural resources, including the environmental protection offices formerly housed at SEDESOL, the CNA, and agencies concerned with fisheries and forests.

In 1996, LGEEPA was reformed to further decentralize environmental responsibilities, establish the right of access to environmental information, and modernize regulation by promoting a multimedia approach and integrated permitting, among other things. The most recent major change in federal environmental infrastructure occurred in 2000, when the Fox administration stripped SEMANAP of its jurisdiction over fisheries and renamed the agency the Secretariat of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales* [SEMARNAT]).

3.1.2. Hazardous Waste and Water Pollution Law and Institutions

From the point of view of controlling tannery pollution, the most important aspects of federal environmental law are the provisions covering hazardous wastes and liquid effluents. Regarding hazardous waste, one development was critical: the 1993 promulgation of federal regulations (*Normas Oficiales Mexicanas* [NOMs]) implementing hazardous waste provisions in the 1988 LGEEPA. According to state-level regulators in León, before these regulations were implemented, hazardous waste law was so piecemeal and confused as to be incomprehensible and virtually useless to enforcement authorities (Hernández 2002).⁹

With regard to water pollution, as noted above, under the 1988 LGEEPA, the federal government—through the CNA—is charged with regulating discharges into all national waters (in practice, virtually all surface and groundwater), and local governments are charged with regulating discharges into public sewer systems. For both federal and local authorities, regulation

⁹ Two 1993 implementing regulations (NOM-052-ECOL-1993 and NOM-053-ECOL-1993) established detailed criteria for classifying waste as “hazardous,” and three others (NOM-055-1993 through NOM-058-1993) laid out procedures for the storage, handling, transport, and disposal of such wastes. The most important regulation for tanneries was NOM-052-ECOL-1993, which classified the by-products from approximately 144 different industrial processes as “hazardous,” including all solid wastes and sludge produced by leather tanneries.

consists of establishing effluent standards, issuing permits, keeping an inventory of dischargers and discharges, collecting discharge fees, monitoring compliance with permits, and sanctioning violations. As with hazardous waste, before the early 1990s, federal laws governing water quality were confused and, therefore, generally ignored at the local level. In León, for example, according to state regulators, there was absolutely no effort on the part of any regulatory authority to enforce of effluent standards until 1990 (Oliverio 2002).

The first step in sorting out this confusion was to promulgate federal discharge standards. This process began in 1993 (NOM-031-ECOI-1993) and continued with a series of superceding industry-specific standards (NOM-001-ECOL-1993 through NOM-073-ECOL-1993 and NOM-001-ECOI-1996). Finally, in 1997, a simplified system was established for all types of users in which effluent standards depended on the type of receiving body of water (OECD 1998). Notably, the CNA agreed to 4- to 14-year grace periods for the enforcement of all of these effluent standards.¹⁰ The 1996 federal regulations also provided a national “blueprint” for municipalities to use in establishing industry-specific standards for discharges into their own sewer systems.

3.2. State

Although the 1987 amendments to the Federal Constitution and passage of the LGEEPA the next year established a legal foundation for the transfer of environmental authority to the local level, real decentralization has proceeded slowly as a result of the low priority that states often give to environmental issues, lack of experience, and limited budgets (OECD 1998; Lybecker and Mumme 2002). The first step in environmental decentralization was for states to establish a legal basis for state-level environmental protection by passing their own comprehensive environmental laws. Guanajuato, León’s home state, passed such a statute in 1990 and significantly amended it in 1993. It was not until 1996, however, that the state of Guanajuato established an environmental regulatory institution to enforce this statute: the State of Guanajuato Ecology Institute (*Instituto de Ecología del Estado de Guanajuato* [IEEG]). By all accounts, this institution has been chronically underfunded and undermanned. For example, from 1997 to 2002, it employed seven inspectors for all media and had an operating budget of less than \$500,000 per year (Oyarvides 2002). Moreover, questions have been raised about the

¹⁰ Large effluent sources such as municipal sewer authorities were to comply by 2000, medium sources by 2005, and small ones by 2010 (OECD 1998).

institution's independence. According to federal regulators, it has often taken the side of the powerful industrial lobbies in disputes about compliance with federal environmental agencies (Oyarvides 2002; Azuela 2002). Along with the IEEG, Guanajuato state established two more federal environmental regulatory institutions in the 1990s: the State Water Commission of Guanajuato (*Comisión Estatal del Agua de Guanajuato* [CEAG]) in 1991 and the Environmental Attorney General's Office for the State of Guanajuato (*Procuraduría de Protección al Ambiente del Estado de Guanajuato* [PPAEG]) in 1996.

3.3. Municipal

Decentralization of environmental authority permeated to the municipal level in the early 1990s. The city of León passed a municipal environmental regulation in 1991 and a year later created a regulatory institution to implement it.¹¹ Municipal authorities only have jurisdiction over one type of tannery pollution: discharges of liquid effluents into municipal sewers. The city of León built the legal infrastructure needed to regulate this pollution between 1985 and 1998. Although the city of León has been responsible for sewerage since the 1980s (along with nonhazardous waste management and drinking water supply), it established a formal water and sewer authority (*Sistema de Agua Potable y Alcantarillado de León* [SAPAL]) only in 1985. In theory, in 1993 the CNA made SAPAL responsible for ensuring discharges in the city's sewers meet federal standards. However, as discussed above, federal guidelines on industrial discharges into local sewers were not established until 1996, and the city of León did not promulgate regulations governing discharges into the sewer system until two years later in 1998. The 1998 regulations rely mainly on command-and-control approaches, namely, permitting and discharge standards for more than a dozen specific pollutants. Although environmental authorities presumably inspect plants periodically, enforcement mainly depends on self-monitoring.¹²

¹¹ Originally named the Municipal Ecology Commission of the City of León, Guanajuato (*Comisión Municipal de Ecología de la Ciudad de León, Guanajuato*), this organization was renamed as the Office of Ecology and the Environment of the City of León (*Dirección de Medio Ambiente y Ecología del Municipio de León*).

¹² Facilities are supposed to install water flow gauges, sample discharges for various pollutants, and have the samples analyzed at an accredited laboratory. Noncompliant facilities are obliged to present a detailed plan to SAPAL for meeting emissions standards. Facilities failing to do so, or failing to make progress in implementing their plans, are subject to fines of 100–500 times the minimum daily wage (roughly US\$300–500), depending on the nature and severity of the violation. The 1998 regulation also establishes—but does not immediately implement—a schedule of fines for simply failing to comply with the emissions standards, regardless of any progress the facility has made toward this end.

In addition to controlling tannery discharges *into* the sewer system, the municipal government of León is also responsible for meeting federal standards for discharges *from* the sewer system into the Gómez River. To meet these standards, SAPAL needed to construct and operate a wastewater treatment plant. SAPAL tendered bids for the construction and operation of such a plant in late 1992, and granted a contract to ECOSYS III, a private German–Mexican consortium, in 1994.¹³ Unfortunately, the Mexican financial crisis of 1994–1995 significantly delayed the project, and the plant did not come on line until fall 2000.

In 2001, a second municipal treatment facility was opened: the Parque de Lodos, a solid waste treatment center built, financed, and operated by CICUR, the tannery trade association. The facility has very little infrastructure or management, however. Essentially a collection of simple open-air pits, it provides no protection against seepage and groundwater contamination (Correo de Hoy 2000b).

In addition to the mandates contained in the 1998 regulation on use of the municipal sewer system, as discussed in below, the city of León has attempted to control tannery pollution by requiring certain types of tanneries to relocate to specified sectors of the city. The legal underpinnings for this approach—the municipal Regulation on the Zoning and Use of Land in León, Guanajuato—were put in place in 1998, the same year that the sewer system regulations were finally passed. Unfortunately, however, this regulation mostly enshrined the existing patchwork of land uses rather than reshaping them into more desirable patterns.

4. History of Pollution control Efforts

4.1. Heightened Demand for Pollution Control

Developments on the national, regional, and local level dramatically boosted demand for environmental quality in León in the mid-1980s and gave rise to the first concerted efforts to control tannery pollution in the city. Several of these developments relate to the institutional and legal evolution discussed below. On the national level, an important impetus was the creation of an improved legal and institutional infrastructure for environmental management, most notably the passage of the 1982 the Federal Law for the Protection of the Environment, and the creation

¹³ The contract gave ECOSYS III the right to raise private capital for the project, to design and build the plant, and to operate it for a period of ten years during which it charges SAPAL, the owner of the plant, a “cost-plus” fee, and collects treatment fees from dischargers.

of SEDUE. On the regional level, an important driver was an effort to improve surface water quality in the severely polluted Lerma–Chapala River basin and to restore Lake Chapala, Mexico’s largest lake (Webster et al. 2002). The federal and state bureaucrats who focused attention on this issue in the mid-1980s viewed untreated industrial and municipal discharges emanating from León—the largest population and industrial center in the northern section of the river basin—as a major contributor to the problem (Oliverio 2002; Oyarvides 2002; Hernández 2002).¹⁴ On the local level, concern about tannery pollution was heightened by the establishment of a municipal water and sewer authority, SAPAL, in 1985. SAPAL’s first order of business was to deal with the continual clogging of the León’s antiquated sewer system that resulted from the high concentrations of suspended solids in tannery liquid effluents (Oliverio 2002).

4.2. *Convenio I*

4.2.1. Background

“Convenios”—voluntary written agreements among public- and private-sector agents—are fairly common in Mexico and are often used to promote coordination in areas where jurisdiction and legal underpinnings are fuzzy. For example, SEMARNAT has signed convenios with all 31 state environmental authorities to facilitate federal intervention where a state lacks the infrastructure or resources needed to implement environmental regulations on its own. Convenios are also signed to encourage polluters to improve their environmental performance. For example, SEMARNAT has signed convenios with PEMEX, the state-owned oil giant, and with several industry subsectors, including coffee processing and textiles (OECD 1998; ELI 1996).

As discussed in the introduction, we argue that the 1987 convenio covering tanneries in León—like the three similar convenios that followed it—represented an attempt to compensate for missing legal, institutional, physical, and civic infrastructures that would normally be used to control tannery pollution. The state of such infrastructures at the time of the first convenio can be gleaned from Section 3. With regard to legal infrastructure, Mexican hazardous waste law was hopelessly confused, and standards for industrial discharges into León’s sewers had not yet been established. Very little institutional infrastructure for environmental management existed at the

¹⁴ This growing concern about the Lerma–Chapala basin was reflected in the 1984-1988 National Ecology Program (*Programa Nacional de l’Ecología*), a broad six-year plan laying out the de la Madrid administration’s environmental goals.

local level. With regard to physical infrastructure, no treatment facilities for liquid waste or hazardous solid waste existed. Finally, with regard to civic infrastructure, there is little evidence that tanners were aware of their legal responsibilities for environmental protection in 1987. Nor is there any evidence that tanners or the public were aware of the need to control tannery pollution.

The first convenio was signed on July 8, 1987, by a collection of federal, state, municipal, private-sector, and quasi-public institutions including SEDUE, the federal environmental regulatory agency, the state of Guanajuato, SAPAL, León's water and sewer authority, and the three tannery trade associations.¹⁵ Table 1 is a complete list of signatories. The convenio consists of 12 clauses that lay out the obligations of the signatories in implementing a tannery pollution control program for León. The entire program was scheduled to be completed in just 21 months, by February 1989. The main points of the convenio, categorized according to the type of infrastructure they promote, are described below and are summarized in Table 2.

4.2.2. Legal Infrastructure

The three federal signatories—SEDUE, SARH, and SSSS—were charged with establishing legal standards for tannery liquid and solid wastes by November 1987.

4.2.3. Institutional Infrastructure

SAPAL, the local sewer authority, was charged with both enforcing emissions standards to be promulgated by the federal signatories and meeting the federal standards for municipal wastewater released into local rivers. In addition, the convenio established a new advisory committee called the Regional Committee for Promotion and Technical Assistance (*Comité Regional de Promoción y Asesoría Técnica*) composed of all representatives of the signatories of the convenio. The committee was made responsible for analyzing various pollution control and prevention projects, obtaining financing for these projects, submitting quarterly progress reports to SEDUE and SARH, and modifying the cleanup plan if necessary. The committee's decisions were subject to review by SEDUE and SARH.

¹⁵ Agreement for the Prevention and Control of Pollution from the Tanning Industry in León, Guanajuato, and Its Metropolitan Area (*Convenio Realizado para Prevenir y Controlar la Contaminación de la Industria Curtidora de León, Guanajuato, y su Area Metropolitana*).

4.2.4. Physical Infrastructure

Responsibilities for various pollution control and prevention infrastructure investments were split among various stakeholders. Tanners were only specifically charged with adopting two several relatively low-cost in-plant environmental management devices: sedimentation tanks (which were urgently needed to prevent city sewers from clogging) and the equipment needed to recycle tanning liquors. The deadline for the first investment was October 1987 and the second April 1988. A larger set of signatories—SEDUE, CIATEC, ANACU, and tanners—were made responsible for installing more expensive but less well-defined “equipment needed to comply with discharge standards” by February 1989. Finally, SEDUE, the state of Guanajuato, and tanners were responsible for making the investments needed for environmentally friendly solid waste disposal by September 1988.

4.2.5. Civic Infrastructure

The three tannery trade associations CICUR, ANACU, and AQTCL, as representatives of the tanneries, were charged with meeting applicable standards on liquid, solid, and hazardous wastes; informing tanners of applicable laws; and promoting the installation of various pollution control and prevention equipment, particularly sedimentation tanks.

4.2.6. Analysis

Given the lack of regulatory capacity in 1987, even a well-designed voluntary agreement aimed at significantly enhancing pollution control probably would have been difficult to implement successfully. However, several features of the 1987 convenio appear particularly impractical. First, the convenio implicitly mandated enormous investments in a municipal wastewater treatment plant; in-house pollution control equipment in hundreds of tanneries; and capacity in monitoring, enforcement, and administration. Yet, there were no provisions for financing aside from statement that the three federal signatories will “assist polluters in securing funding for the implementation of necessary measures.”

Second, the convenio deferred important open questions to an advisory committee that had little chance of resolving them. For example, the plan mandated adopting chromium recycling and installing equipment and infrastructure needed to meet emissions standards. But it left to the advisory committee all decisions about what specific investments to mandate and how to finance them. Moreover, the advisory committee had no clear legal authority or fiscal foundation and was made up of a hodgepodge of representatives of 16 institutions.

Third, the timetables for completion of the tasks in the pollution control program were exceedingly ambitious. Fourth, the document was internally inconsistent in that it required

tanneries to comply with existing environmental law, but also charged SEDUE, SARH, and the Secretaría de Salud with establishing new emissions standards. Finally, CICUR, the tanners' principal representative, did not support several critical elements of the program, including investments in chromium recycling, solid waste disposal, and equipment installation needed to comply with emissions standards.

Not surprisingly, none of the first convenio's key goals were achieved. Sedimentation tank use barely increased over the 21-month period contemplated, the specified pollution and waste control measures were not implemented, and authorities did not define standards for discharges. As a result, in 1989, the convenio's original term was extended another two years. Unfortunately, this period only saw one significant accomplishment: the installation of sedimentation tanks. Among a sample of 137 tanneries surveyed by RFF in 2000, 52% had adopted by 1991 (Blackman and Kildegaard 2002).

4.3. Convenio II

4.3.1. Background

By 1991, Mexico's environmental regulatory infrastructure had improved but was still fundamentally inadequate, especially at the municipal level. The main accomplishments between 1987 and 1991 on the federal level were the passage of a new comprehensive environmental law (LGEEPA) in 1988 and the creation of the National Water Commission (CNA) in 1989. At the local level, key milestones were passage of the Guanajuato State Environmental Law in 1990 and the creation of the Guanajuato State Water Commission (CEASG) in 1991.

Signed on October 24, 1991, the second convenio was meant to restart the effort to control tannery pollution after four years of inaction and the failure in 1991 of ECO-AZUL, a private-sector effort to replace wet blue production at hundreds of tanneries in León with a single large facility that would use environmental controls.^{16,17} The signatories differed slightly

¹⁶ The new convenio was frank about the lack of progress since the previous one. Its stated goal was to "determine the actions necessary to follow up on the first convenio" given that there had been "no significant advances" since the first convenio.

¹⁷ ECO-AZUL was backed by several key signatories of the 1987 convenio, including SEDUE, CICUR, CIATEG, and Química Central. By 1991, financing for ECO-AZUL had been secured and construction was 80% complete. Despite this progress, the project was ultimately abandoned in 1991 because a significant number of tanneries in León—mainly small ones specializing in wet blue production—opposed the project; farmers in San Francisco del Rincón, where the plant was to be located, were concerned about the potential hazards of using ECO-AZUL wastewater to irrigate their fields; and the residents of San Francisco del Rincón strongly opposed it (Oliverio 2002).

from those of the first convenio (Table 1). The main points of the second convenio follow (also see Table 2).¹⁸

4.3.2. Physical Infrastructure

The second convenio put most of the burden of investing in physical infrastructure on the tanners. As represented (in all provisions of the convenio) by CICUR and ANACU, they agreed to eventually relocate the wet blue stages of the tanning to an authorized zone reserved exclusively for industry and to install pretreatment facilities needed to comply with effluent standards. The purpose of the relocation was primarily to facilitate private investments in common effluent treatment plants (CETPs); that is, treatment plants shared by more than one tannery (Oliverio 2002). Deadlines for relocation and installing treatment plants ranged from one to three years, depending on where the plant was located. The tanners also agreed to build and then utilize a solid waste disposal facility; within 90 days of the signing of the convenio, they were to submit a plan for constructing the facility as well as a detailed timetable. Finally, SAPAL was charged with designing a wastewater treatment plant within one year and with building it within two years.

4.3.3. Legal Infrastructure

The regulatory signatories were charged with precisely defining the boundaries of the authorized industrial zones.

4.3.4. Institutional Infrastructure

The tanners agreed to register with León's Municipal Development Agency within 30 days of signing the agreement and again pledged to promote compliance with all applicable pollution control regulations.

4.3.5. Analysis

This second convenio introduced two important new strategies: registering all tanneries and relocating them to industrial zones where they could build CETPs, and explicitly assigning responsibilities for constructing a wastewater treatment plant (to SAPAL) and a solid waste

¹⁸ The second convenio was less formal than the first: It was a "memorandum" (*minuta de trabajo*) as opposed to a formal "convenio"; it carried the seal of a state institution (the Executive Office of the State of Guanajuato) as opposed to a federal agency (SEDUE); and it was structured somewhat haphazardly rather than as a legal memorandum.

disposal facility (to the tanners). Despite these innovations, the second convenio suffered the same failing as the first. Critical issues of financing costly pollution control investments were simply left unaddressed. Also, gaps in regulatory infrastructure created critical bottlenecks. The convenio hinged on relocating tanneries to authorized zones, but the necessary first step of defining authorized zones did not actually occur until 1998, seven years later. Perhaps not surprisingly, then, the second convenio, like the first, failed to achieve any of its key goals.

4.4. Parque PIEL

In late 1992, following the tannery relocation strategy introduced in the second convenio, federal, state, and municipal authorities provided seed capital for a new tannery industrial park with pollution control facilities: Parque PIEL. The plan was to sell 250 lots in the park to large-scale tanneries to recoup the initial investment. By 1994, seed funding had been used to acquire unimproved agricultural land. Progress on improving this land was far slower than hoped, however, and as a result, tanneries shied away from relocation (Oliverio 2002; *El Herald de León* 1999b). The first plots in the industrial park were sold in 1996, but it was not until 2001 when the municipal government contributed \$1.2 million in financing for an electric power substation that tanneries actually began to relocate (*Correo de Hoy* 2001). By July 2002, only nine tanneries were operating in the park.

4.5. The Presa de Silva Bird Die-Off

By early 1994, efforts to control tannery pollution in León had almost completely stalled. A widely publicized ecological calamity changed that, however. In late 1994, tens of thousands of native and migratory water birds died while wintering at a reservoir called the Presa de Silva, 35 kilometers downstream from León. A common assumption was that industrial pollution originating in León—particularly tannery pollution—was the cause. By December, national and international media were covering the story. In June 1996, six months after the incident, the Audubon Society and two Mexican nongovernmental organizations petitioned the Commission for Environmental Cooperation (CEC), a trilateral body set up under the North American Agreement on Environmental Cooperation (the Environmental Side Agreements to the North American Free Trade Agreement) to investigate (CEC 1995). Ultimately, the CEC, the CNA, and the Universidad Nacional Autónoma de México (UNAM), Mexico's largest university, all conducted studies of the die-off. The CEC report made a strong link between the die-off and tannery pollution. Among the report's 10 recommendations were strengthening inspection and enforcement of water quality laws, building Parque PIEL, and constructing smaller common-

effluent treatment plants for groups of tanneries outside this industrial park. Although an internationally financed reclamation project eventually restored the Presa de Silva and interest in the incident waned, for two years—1995 and 1996—the incident greatly increased concern about tannery pollution (Oliverio 2002; Azuela 2002; Oyarvides 2002).

4.6. Convenio III

4.6.1. Background

The years between the second and third convenios (1991–1995) were marked by a number of significant legal and institutional developments. On the legal side, the National Water Law was passed in 1992, and implementing regulations were promulgated for discharges from sewer systems into federal waters and for hazardous wastes in 1993. On the institutional side, the federal environmental regulatory authority was drastically restructured in 1992 to create SEDESOL, PROFEPA, and INE and in 1994 to create SEMARNAP. On the local level, Parque PIEL was incorporated in 1992, and the León municipal environmental authority was established in 1994. Finally, a contract to build a wastewater treatment plant in León was granted to ECOSYS III in 1994.

In February 1995, at the height of the Presa de Silva controversy, the CNA and Guanajuato state authorities created a commission called the Turbio River Comprehensive Clean up Program (*Programa de Saneamiento Integral del Río Turbio*) to jump-start efforts to cut tannery pollution in León (Oliverio 2002; CEC 1995). The commission met four times in spring and early summer to hammer out a voluntary action plan, and the third convenio was signed on June 16, 1995, at its fifth meeting.¹⁹ Signatories of the 1995 convenio once again included top federal, state, and local officials (Table 1). The convenio consists of 12 clauses that contained the following substantive elements (Table 2).

4.6.2. Legal and Institutional Infrastructure

Many of the legal and institutional provisions of the third convenio repeat or amplify those of the first two convenios. The city of León and the state of Guanajuato committed to creating the legal and institutional infrastructure that SAPAL would need to regulate discharges

¹⁹ The title of the third convenio is “Act of the Fifth Ordinary Session of the Commission for the Comprehensive Cleanup of the Turbio River” (*Acta de la Quinta Sesión Ordinaria de la Comisión para el Saneamiento Integral del Río Turbio*)

into municipal sewer systems. Specifically, the city of León was to compile an inventory of industrial facilities discharging into the sewer system, promulgate regulations governing such discharges, and establish “administrative systems” to enforce these regulations; the state of Guanajuato agreed to undertake the legal reforms needed to authorize SAPAL to monitor and enforce compliance with these regulations. The third convenio also included similar provisions aimed at putting in place the legal infrastructure that the CNA would need to regulate discharges of wastewater (mainly by SAPAL) directly into the Turbio River. The CNA committed to establishing specific standards for such discharges by June 30, 1995, making an inventory of such discharges by July 31, 1995, and intensifying monitoring and enforcement of the national water laws. The tanners—represented in all provisions of the convenio by CANACINTRA, CICUR, and ANACU—agreed to register with SAPAL and also to present a pollution control plan. They also agreed to register with INE as solid waste generators and to comply with hazardous waste treatment procedures outlined in a new compliance document.²⁰

4.6.3. Physical Infrastructure

SAPAL and the city of León committed to building a wastewater treatment plant for León as well as requisite water mains. The CNA was charged with monitoring compliance with this obligation. Parque PIEL, for its part, agreed to build and begin operating a treatment plant by July 1997. The city of León would guarantee financing for the plant and would “support” the relocation of tanneries to the park. SAPAL agreed to operate the treatment plant and to “assist in” relocating firms to the park. The convenio’s provisions for pretreatment facilities in tanneries are vague and noncommittal.

4.6.4. Civic Infrastructure

Provisions regarding civic infrastructure focused on registration, education, and research. The city of León agreed to finance an education and research center. SEMARNAP, the state of Guanajuato, and the municipality of León were to contribute equal shares toward a trust fund that would finance research on local environmental issues, particularly water pollution. FUNDAE was charged with compiling relevant existing information and research, interfacing with NGOs and other organizations for this purpose, and promoting environmental awareness at the educational center. Finally, SEMARNAP, the state, and the municipalities all made vague

²⁰ The Manual for the Integrated Management of Tannery Solid Wastes (*Manual para el Manejo Integral de Residuos Sólidos de Tenería*).

general commitments to educate citizens about environmental issues, particularly the need keep toxics out of municipal sewers.

4.6.5. Analysis

The 1995 convenio is notable for provisions and issues that are *not* mentioned. Most striking, there is no explicit discussion of the industrial zones, relocation, or the solid waste disposal facility that were the centerpieces of the 1991 convenio. As noted above, several of the 1995 convenios' provisions more or less repeat those of earlier convenios. Other provisions are new, however: The CNA was to establish specific standards for and to monitor wastewater discharges into the Turbio River watershed, SAPAL was to be legally empowered to enforce pollution control laws, the city of León and SAPAL agreed to take a number of steps to promote Parque PIEL, and tanners were to register with INE and comply with new hazardous waste requirements. Finally, unlike the agreements that preceded it, the third convenio emphasized education and research and included plans to establish a center and a trust fund to support these activities.

Several of the problems that characterized earlier convenios are evident in the 1995 agreement. Once again, the important financial obligations are ill defined, most notably, those concerning pretreatment plants.²¹ At least as important, the convenio does not even acknowledge, must less resolve, inconsistencies that were likely to create bottlenecks. For example, SAPAL was charged with meeting standards for discharging into federal rivers despite the fact that standards for discharges into its sewer system had yet to be established, and even though there were no clear provisions for or prospects of tanners installing pretreatment facilities. Similarly, tanners were charged with abiding by a manual describing their obligations with regard to hazardous waste even though no such manual existed at the time. Also, the convenio called for the immediate relocation of tanneries to Parque PIEL even though at the time, the park had no electricity infrastructure, much less a functional treatment plant.

The 1995 convenio had several positive impacts but ultimately failed to significantly enhance pollution control. SAPAL made a concerted effort to register tanneries and make them commit in writing to a pollution control plan. By February 1996, 217 tanneries had submitted a form committing them to one of eight pollution control options (*Dinámica de la Curtiduría* February 1996). A second positive impact was an effort to inform tanners of the relevant legal

²¹ SEMARNAP, the state, and the municipalities agreed only to “support to firms seeking financing,” whereas the state committed to “financially support the municipalities’ cleanup initiatives.”

standards and procedures needed for compliance. In 1996, CIATEC, the local leather tanning research institute, produced a document detailing this information (CIATEC 1996). Although this document faithfully describes the existing regulation, it is only as complete and consistent as those regulations, and it leaves open a number of important questions about how the regulations apply to tanneries. SAPAL, in collaboration with federal and state regulators, undertook a more ambitious project: producing a document explaining in plain language how federal hazardous waste regulations apply to leather tanneries and making recommendations for handling, transporting, and storing tannery wastes. This manual was not completed and distributed until December 1997, however, nine months after the fourth convenio.

4.7. Convenio IV

4.7.1. Background

Although only 20 months passed between the third and fourth convenios, a number of developments significantly enhanced regulatory capacity in León. The IIEG (the Guanajuato state regulatory authority) was established in 1996 along with PPAEG (the office of the state attorney general for the environment). In addition, in 1996, LGEEPA (the federal comprehensive environmental law) was revised to promote further decentralization of environmental authority, establish the right of access to environmental information, and modernize regulation.

The stated purpose of the fourth convenio, signed on March 7, 1997, was once again to clean up the Turbio River watershed.²² The signatories were the same as those of the third convenio with a few exceptions (Table 1). New signatories included the two new state-level regulatory authorities—the IIEG and the PPAEG—while old signatories that dropped out included Parque PIEL and FUNDAE. The 1997 convenio consists of 16 clauses which contained the following substantive elements (Table 2).

4.7.2. Legal and Institutional Infrastructure

The parties once again promised to finish promulgating the liquid waste regulations. As in the previous convenio, the state of Guanajuato agreed to undertake the legal reforms needed to enable SAPAL to monitor and enforce water pollution laws, and the municipalities agreed to formulate standards for discharges into local sewers. The CNA agreed to conclude by July 1997

²² The convenio was titled “Convenio de Coordinación y Concertación.”

studies needed to set standards for direct discharges into the river by SAPAL and industrial facilities. With regard to hazardous waste, authorities agreed to complete the above-mentioned compliance manual, and the tanners agreed submit applications for permits to INE 30 days thereafter. The signatories also agreed to establish a working committee to monitor compliance with the convenio and to deal with disputes. Finally, once again, both the CNA and the municipalities were charged with developing a list of industrial wastewater dischargers and tanners agreed to register with the local water authority as such and to register with INE as generators of hazardous waste.

4.7.3. Physical Infrastructure

The key innovation of the 1997 convenio was a plan to build a series of public and private plants to treat industrial liquid wastes. Individual tanneries were to segregate their wastewaters by pollutant and pipe them in dedicated sewer lines to new treatment plants that would remove salt, sulfurs, and (potentially) chromium. The salt and chromium plants were to service the entire city, and sulfur and chromium plants would service industrial parks. SAPAL was charged with designing, building, and operating the new plants by July 1, 1999. Because the sulfur and chromium treatment plants would only service authorized industrial zones, tanneries outside of these zones agreed to (a) stop producing wet blues within one year, (b) relocate to authorized zones, or (c) install the pretreatment equipment needed to meet SAPAL's forthcoming standards for discharges in the sewers. With regard to solid and hazardous waste, once again, the state and INE committed to creating a disposal facility within three months. They also agreed to develop plans to rehabilitate sites affected by hazardous wastes. With regard to municipal wastewater treatment, SAPAL and the municipality of León agreed once again to build a plant. The deadline for completion was set at January 1998 and for operation at April 1998.

Who was to finance all this investment? Tanners agreed to pay fees that would facilitate the construction of treatment facilities. Once again, the state, municipalities, and SAPAL agreed to "support" relocation of the tanneries to industrial parks. Although most of the language was noncommittal, SAPAL was charged with building new sewer mains needed to segregate effluent streams as well as associated infrastructure for the industrial parks and with adhering to a strict timeline in doing so.

4.7.4. Civic Infrastructure

SAPAL agreed to promote the recycling of wastewater, and the city of León agreed to carry out information campaigns on the dumping toxics into sewers and to strengthen

educational centers. Finally, León was to issue monthly reports on the collection of fines imposed by the PROFEPA for violations of environmental standards.

4.7.5. Miscellaneous

Three miscellaneous provisions of the convenio are noteworthy. First, whereas trade organizations represented the tanners in previous convenios, individual tanners had the option of signing the 1997 convenio. There was an important incentive: Enforcement would be less stringent for tanners that signed.²³ Second, unlike some previous convenios, the 1997 convenio had an expiration date (Nov. 30, 2000)—presumably, an implied threat to resume “strict” enforcement of existing regulations. Third, the convenio contained a provision that if the municipal sewer authorities failed to meet federal standards for wastewater discharges (NOM-001-ECOL-1996), then federal authorities could collect the resultant fines by deducting monies from the federal funds allocated to the municipalities. Finally, INE agreed to promote economic incentives for reducing tannery pollution, including an exemption from tariffs on imported pollution control equipment and accelerated depreciation of environmental investments.

4.7.6. Analysis

In many respects, the fourth convenio simply restated provisions from earlier convenios. However, there were also a number of important innovations. First, the convenio moved toward resolving a key sticking point in earlier convenios: assigning responsibility for investments in treating tannery effluents to remove industrial wastes. The de facto assumption in previous convenios was that tanners themselves would bear this burden, a provision that practically guaranteed they would not cooperate. The 1997 convenio established a plan that relieved tanners of the responsibility for financing up-front construction costs. The local sewer authorities would finance and build the dedicated sewer mains and treatment plants and would recoup some of the costs through treatment fees. However, tanners outside of approved industrial parks would still need to relocate in order to have access to at least some of the industrial pollutant treatment plants, namely, those for sulfuric effluents and potentially for chromium.

Second, the 1997 convenio contained a number of provisions meant to ratchet up pressure for compliance. Individual tanners were invited to sign the convenio and pledge to adhere to its

²³ In enforcing environmental regulations, PROFEPA and PPAEG agreed to “consider as attenuating factors the fact that firms are executing programs of activities to correct irregularities as regards their wastes, in conformity with the commitments subscribed to in this Convenio” (*Dinámica de la Curtiduría* 1997).

provisions, and the convenio was set to expire in November 1999, presumably setting a time limit on the grace period that tanners could enjoy. In addition, the federal authorities made it clear that they would deduct fines for noncompliance with municipal wastewater standards from the municipalities' federal budget allocations. Finally, the municipalities were charged with issuing monthly reports on the number and amount of environmental fines.

Although these innovations represented some degree of progress, the 1997 convenio was plagued by many of the same problems and internal inconsistencies as the first three convenios. Most important, although relocating tanneries to industrial parks was a lynchpin of the clean-up strategy, it was still not clear who would pay for the relocation expense or even where these parks would be located; as noted above, municipal zoning regulations were not published until 1998. Furthermore, although tanners agreed to comply with regulations for industrial wastes, the manual on these regulations discussed in the previous convenio had still not been published and a hazardous waste facility had not been built. Finally, the timing of several of the provisions was vastly ambitious.

In the three and a half years before the convenio's expiration in November 2000, no discernable progress was made on its single most important provision: building industrial wastewater treatment plants for salt, sulfur, and chromium. Thus, the fourth convenio, like the preceding convenios, failed to have a significant impact on inorganic tannery pollution. The only significant progress in controlling tannery pollution that occurred during the term of the fourth convenio resulted from initiatives that had long been in the works. On the day the convenio expired, the SAPAL municipal treatment plant for organic wastes finally came on line. Also, as noted above, SAPAL finally promulgated standards for discharges in the city sewers in February 1998.

5. Conclusion

We have argued that environmental regulatory capacity comprises the legal, institutional, physical, and civic infrastructure needed to facilitate effective regulation. Focusing on León, Guanajuato, we have sketched the evolution of this infrastructure between 1980 and 2000 and have juxtaposed this history against that of high-profile efforts to control tannery pollution in León during the same period.

We found that key components of the infrastructure needed to regulate tanneries were only put in place in the last few years of this 20-year period, and some are still missing. For example, the legal infrastructure needed to successfully regulate tanneries included clear regulations governing both liquid discharges into municipal sewers and the classification,

handling, and storage of hazardous wastes. The former were not promulgated until 1998. Although hazardous waste regulations were promulgated in 1993, written materials clarifying how they applied to tanneries were not available until 1997. The institutional infrastructure needed to regulate tanneries included capable state and municipal regulatory authorities. Yet state-level environmental institutions in Guanajuato were not established until the mid-1990s, León's water and sewer authorities were not founded until 1985, and municipal environmental authorities were not established until the next decade. The physical infrastructure needed to control tannery pollution included facilities to treat inorganic liquid wastes (salt, sulfur, and chromium), organic liquid wastes, and hazardous solid wastes. Of these three types of infrastructure, to date, only one (a facility to treat organic wastes) has been built. It did not begin operating until 2000. The civic infrastructure needed to control tannery pollution includes public support for—or at least acquiesce to—regulating tanneries in León. This infrastructure is difficult to measure. That said, there is virtually no evidence that citizens of León have ever placed significant political pressure on tanners to improve pollution control. Nor is there much evidence, that—aside from the Presa de Silva incident in the winter of 1994–1995—environmental advocacy groups have pressured tanners.

Given these gaps in regulatory infrastructure, regulators have had considerable difficulty applying conventional regulatory tools in León. This difficulty had been heightened by the fact that tanners, as major political force in León, have doggedly resisted efforts to regulate them. This political dynamic has highlighted the gaps, inconsistencies, and weaknesses in environmental regulatory capacity. For example, whereas a less powerful group of polluters might have been compelled to install wastewater pretreatment facilities despite gaps in municipal water pollution laws, tanners have been able to demand that these laws be promulgated before making such investments.

Given the difficulty of using conventional regulatory tools to control tannery pollution, regulation relied principally on a series of voluntary environmental agreements. Why? As discussed in Section 1, the literature on voluntary environmental agreements suggests that such agreements are rooted in the self-interest of participating parties. The motivation of the regulators is apparent from the above discussion: The legal, institutional, physical, and civic infrastructures needed to enforce conventional regulations were wanting, and voluntary agreements represented an alternative means of addressing an urgent environmental problem.²⁴

²⁴ A more cynical—and not necessarily mutually exclusive—interpretation is that the *convenios* provided political cover to local regulators who were unable or unwilling to use conventional regulatory tools.

As for the tanners' motivations for participating, each of the convenios made vague promises of subsidies for investments in pollution control equipment and infrastructure. Probably more important, each convenio entailed a "grace period"—temporary relief from enforcement of conventional water pollution and hazardous waste regulations. Although this *quid pro quo* was only explicit in the fourth convenio, according to local stakeholders, it was implicit in the first three (Oliverio 2002). Put slightly differently, each of the convenios contained an implied threat that tanners would be subjected to strict conventional regulation if they did not participate in or comply with the convenios.

Unfortunately, however, the lack of environmental regulatory infrastructure not only motivated regulators to rely on voluntary agreements but also ultimately undermined these agreements. We argue that it did so in three ways. First, it implied that the cost of constructing the requisite physical infrastructure would be daunting because it would need to be constructed from scratch. For example, except for in-house facilities in a handful of tanneries, infrastructure for treating industrial wastewater in metropolitan León did not—and still does not—exist. All of the various options for building such infrastructure (in-house individual treatment plants, common-effluent treatment plants for groups of tanneries along with infrastructure needed to connect the tanneries to the treatment plants, and relocating tanneries to industrial parks) are exceptionally costly. Although they contain vague, noncommittal language about public-sector financial assistance, the four convenios implicitly assigned responsibility for these investments to the tanners. (Only the fourth convenio split responsibility between tanners and municipal authorities.) Tanners were very unlikely to incur the costs of these commitments without strong incentives.

Second, the very obvious lack of environmental regulatory infrastructure implied that regulators could create not such incentives in the typical fashion—that is, by threatening polluters with mandatory regulation if they failed to comply with their voluntary commitments. Indeed, the 20-year history of efforts to control tannery pollution summarized here is notable for the almost complete absence of enforcement actions against tanners (the only exceptions being consistent enforcement of rules mandating sedimentation tanks and much more sporadic enforcement of rules on illegal dumping of sludge). As each failed convenio was followed by not sanctions but a new convenio, the credibility of the threat of stepped-up enforcement diminished further.

Third, the lack of a wide range of types of interdependent regulatory infrastructure virtually guaranteed that bottlenecks would arise and that the signatories to the voluntary agreements would dodge their commitments by making their own compliance contingent on that of others. For example, the ability of regulators to meet key commitments such as promulgating

discharge standards and financing wastewater treatment facilities was constrained by a host of factors, including a chronic scarcity of fiscal resources and the glacial pace of the federal and state legal and institutional reforms needed to create effective municipal regulations and regulatory institutions. These failings provided tanners with excuses—as well as valid reasons—for abrogating their own commitments to investing in pollution control equipment.

What general lessons can be drawn from this case study? First, the León experience suggests that the current emphasis in policy circles and academia on building environmental regulatory capacity is well founded. As we have shown, lack of such capacity undermined decades of concerted pollution control effort. Second, our case study suggests holistic approaches to building environmental regulatory policy are likely to be most effective. To be more concrete, our case study suggests that building each of the four types of infrastructures that contribute regulatory capacity—legal, institutional, physical, and civic—is a necessary, but insufficient, condition for effective regulation. For example, a complete and consistent legal foundation for regulation is useless without strong regulatory institutions. But strong laws and regulatory institutions may be insufficient if requisite physical infrastructure is not in place. Finally, even strong laws, capable institutions, and requisite physical infrastructure may be insufficient without civic infrastructure—political support for pollution control. Unfortunately, it is extremely difficult to put all of these different types of infrastructure in place simultaneously. As a result, regulatory capacity will almost inevitably be a time-consuming and iterative process.

Finally, our case study sheds light on the limitations of voluntary regulation. Some have argued that in developing countries where the capacity for conventional environmental regulation is weak, alternative approaches to environmental management, including voluntary regulation, may be able to take up some of the slack (Wheeler et al. 1999). Some case studies suggest that one of the key mechanisms by which such alternative approaches operate is raising the public profile of pollution problems. Public awareness is then translated into public pressure for improved environmental performance. The León experience points to a different conclusion, however. The *convenios* repeatedly failed to produce concrete results and did little to incite public pressure. In fact, they may have had the opposite impact: By creating the appearance of progress and providing political cover for the participants, they deflected public pressure for improved environmental quality. In addition, they have undoubtedly eroded the reputation of voluntary agreements as a credible environmental tool.

References

- Azuela, A. 2002. Personal communication from A. Azuela, former director of Procuraduría Federal de Protección al Ambiente (PROFEPA) and Secretaría de Medio Ambiente, Recursos Naturales y Pesca (SEMARNAP), Austin, TX, to A. Blackman, May 6.
- Bell, R.G. 2003. Choosing Environmental Policy Instruments in the Real World. Paper prepared for OECD Global Forum on Sustainable Development: Emission Trading. Organisation for Economic Co-operation and Development: Paris, France.
- Blackman, A., and A. Kildegaard. 2002. Clean Technological Change in Developing Country Industrial Clusters: Mexican Leather Tanneries. RFF Discussion Paper 03-12. Resources for the Future: Washington, DC.
- Blackman, A., and W. Harrington. 2000. The Use of Economic Incentives in Developing Countries: International Experience with Industrial Air Pollution. *Journal of Environment and Development* 9(1): 5–44.
- Cabrera-Mendoza, E. 2000. Mexico's Local Governments in Transition. *American Review of Public Administration* 30: 374–388.
- CIATEC (Centro de Innovación Aplicada en Tecnologías Competitivas). 2000. *Directorio de Industria del Curtido*, January. León, Guanajuato, Mexico: CIATEC.
- . 1996. *Apéndice Ecológico para la Industria del Cuero*. León, Guanajuato, Mexico: CIATEC.
- CEASG (Comisión de Agua y Saneamiento de Guanajuato). 1999. *Diagnóstico de la Situación Hidráulica del Estado de Guanajuato y Estrategia en Materia de Agua*. León, Guanajuato, Mexico: CEASG.
- CEC (Commission for Environmental Cooperation). 2003. *Summary of Environmental Law in North America*. http://www.cec.org/pubs_info_resources/law_treat_agree/summary_enviro_law.
- . 1995. *CEC Secretariat Report on the Death of Migratory Birds at the Silva Reservoir (1994–95)*. Oaxaca, Mexico: CEC.
- Correo de Hoy*. 2002. Permite Cabildo Uso de Suelo a Tenerías Instaladas en Colonia La Piscina, Guanajuato. Dec. 5, 19.

- . 2001. Con una Inversión de 12 mdp Terminaran Subestación Eléctrica del Parque Piel. September 4, 16.
- . 2000a. Autoridades Federales Interpondrán Demanda Penal contra CICUR. May 21, 19.
- . 2000b. Aun No Concluye la Primera Etapa del Parque de Lodos. May 30, 21.
- Dinámica de la Curtiduría*. 1999. Untitled. October, No. 97. León, Guanajuato
- . 1997a. Excerpt from April 9 speech by Raul Arriaga. May, No. 77. León, Guanajuato
- . 1997b. Letter to Julio Carabias. May, No. 77. León, Guanajuato, Mexico.
- . 1996. Untitled. February, No. 62. León, Guanajuato, Mexico.
- Eigen-Zucchi, C., G. Eskeland, and Z. Shalizi. 2003. Institutions Needed for More Than Growth. *Finance and Development* 40(2): 42–45.
- ELI (Environmental Law Institute). 1996. *Decentralization of Environmental Protection in Mexico*. Research Report No. 931500. Washington DC: Environmental Law Institute.
- Heraldo de León*. 1999a. Hoy, Solución al Problema de Convenio Ecológico. Feb. 4, 5.
- . 1999b. La Crisis Frena la Compra de Terrenos en el Parque Industrial Ecológico. April 12, 7.
- Hernández, J. 1987. Situación Actual del Problema de Contaminación en la Región. *Calzatecnia* 9. CIATEC: León, Guanajuato.
- Hernández, M. 2002. Director de Verificación Normativa, Procuraduría de Protección al Ambiente del Estado de Guanajuato. Personal Interview with Allen Blackman and Nicolas Sisto, May 29. Guanajuato, Mexico.
- INE-DGGIA (Instituto Nacional de Ecología, Dirección General de Gestión e Información Ambiental). 1996. *Manual de Estimación de Emisiones, Prevención de la Contaminación y Normatividad Ambiental para la Industria del Curtido y Acabado de Cuero y Pieles sin Depilar*. Mexico City, Mexico: INE.
- INEGI (Instituto Nacional de Estadística Geografía e Informática). 1990. *Anuario Estadístico del Estado de Guanajuato*. Available from <http://www.inegi.gob.mx>.
- Khanna, M. 2001. Economic Analysis of Non-mandatory Approaches to Environmental Protection. *Journal of Economic Surveys* 15(3): 291–324.

- Lybecker, D., and S.P. Mumme. 2002. Decentralization and Environmental Protection on Mexico's Northern and Southern Boundaries. *Journal of Environment and Development* 11(4): 402–429.
- Lyon, T. 2003. Voluntary versus Mandatory Approaches to Climate Change Mitigation. Issue Brief 03-01. Washington, DC: Resources for the Future
- Lyon, T.P., and J.W. Maxwell. 1999. Voluntary Approaches to Environmental Regulation: A Survey. In *Environmental Economics: Past, Present, and Future*, edited by M. Franzini and A. Nicita. Aldershot, Hampshire, UK: Ashgate Publishing, Ltd.
- Maldonado Vega, M., et al. 2001. Evaluación de dos Tipos de Composta Aplicados en Lodos. Working Paper, Universidad Tecnológica de León, Instituto de Ciencias Agrícolas.
- Maxwell, J.W., T.P. Lyon, and S. Hackett. 2000. Self-Regulation and Social Welfare: The Political Economy of Corporate Environmentalism. *Journal of Law and Economics* 43(2): 583–617.
- Oliverio, C. 2002. Personal communication from C. Oliverio, director, Tecnología Ambiental, Universidad Tecnológica de León, Guanajuato, Mexico, to the authors, May 30.
- OECD (Organisation for Economic Co-operation and Development). 1998. *Environmental Performance Review for Mexico*. OECD: Paris, France.
- Oyarvides, A. 2002. Personal communication from A. Oyarvides, former director, Guanajuato Delegado, Procuraduría Federal de Protección al Ambiente (PROFEPA), to the authors, May 31.
- Rivera, J. 2002. Assessing a Voluntary Environmental Initiative in the Developing World: The Costa Rican Certification for Sustainable Tourism. *Policy Sciences* 35: 333–360.
- Rodríguez, S. 2002. Personal communication from S. Rodríguez, director, Comisión Ambiental, Cámara de la Industria de Curtiduría del Estado de Guanajuato, Mexico, to the authors, May 23.
- Rodríguez, V.E. 1997. *Decentralization in Mexico*. Boulder, CO: Westview Press.
- Romero-Lankau, P. 2000. Sustainability and Public Management Reform: Two Challenges for Mexican Environmental Policy. *American Review of Public Administration* 30: 389–399.
- Segerson, K., and T. Miceli. 1998. Voluntary Environmental Agreements: Good or Bad News for Environmental Protection? *Journal of Environmental Economics and Management* 36: 109–130.

ten Brink, P. 2002. *Voluntary Environmental Agreements: Process, Practice, and Future Use*. Brussels, Belgium: Institute for European Environmental Policy.

Villalobos, J.L. 1999. Personal communication from J.L. Villalobos, subprocurador, Verificación Normativa, Procuraduría de Protección al Ambiente del Estado de Guanajuato (PPAEG), Mexico, to the authors.

Webster, P., M. Burton, and E. Mestre. 2002. *Managing Water Transition in the Lerma–Chapala Basin, Mexico*. Battaramulla, Sri Lanka: International Water Management Institute.

Wheeler, D., et al. 1999. *Greening Industry: New Roles for Communities, Markets, and Governments*. New York: Oxford University Press.

Figures

Figure 1a. Evolution of Regulatory Capacity in León, Guanajuato, Mexico, 1972–1991

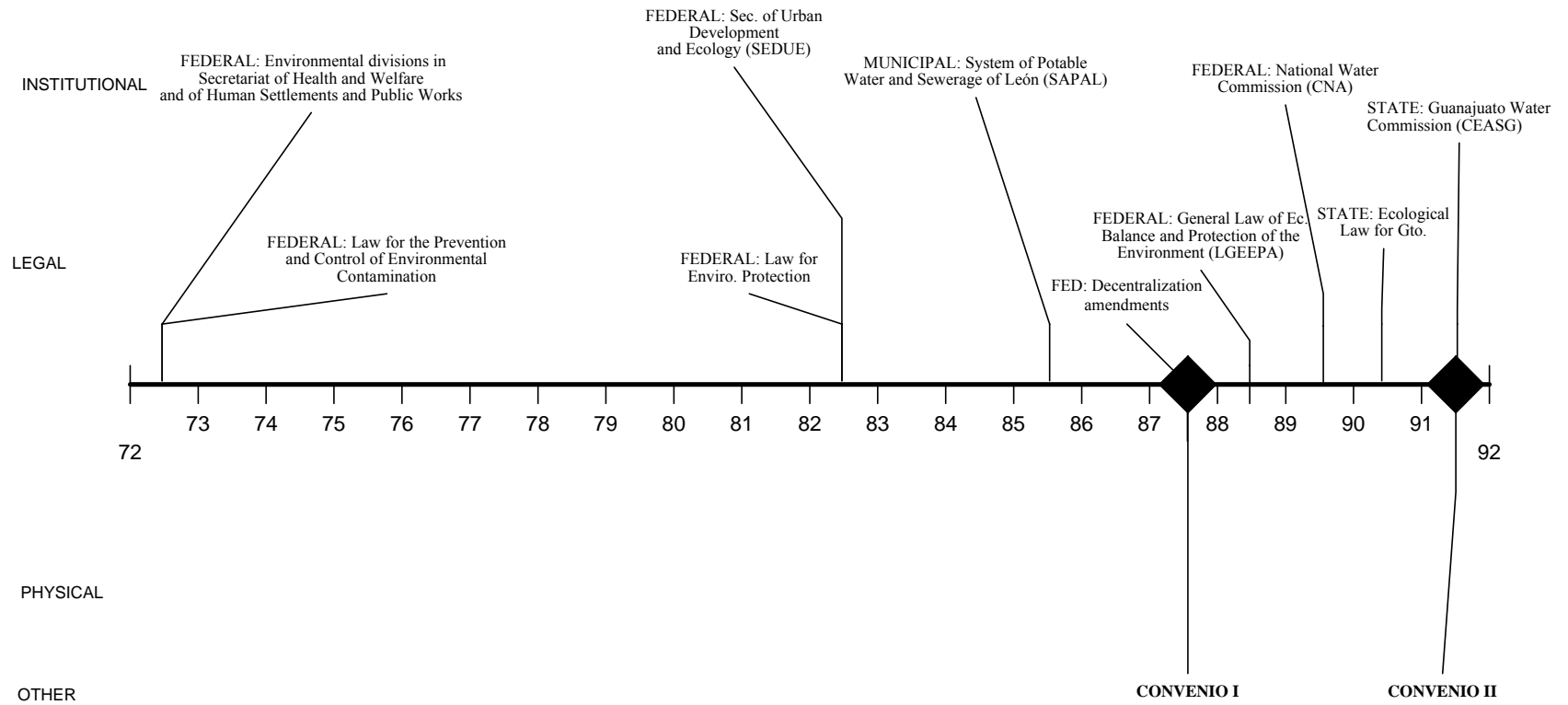
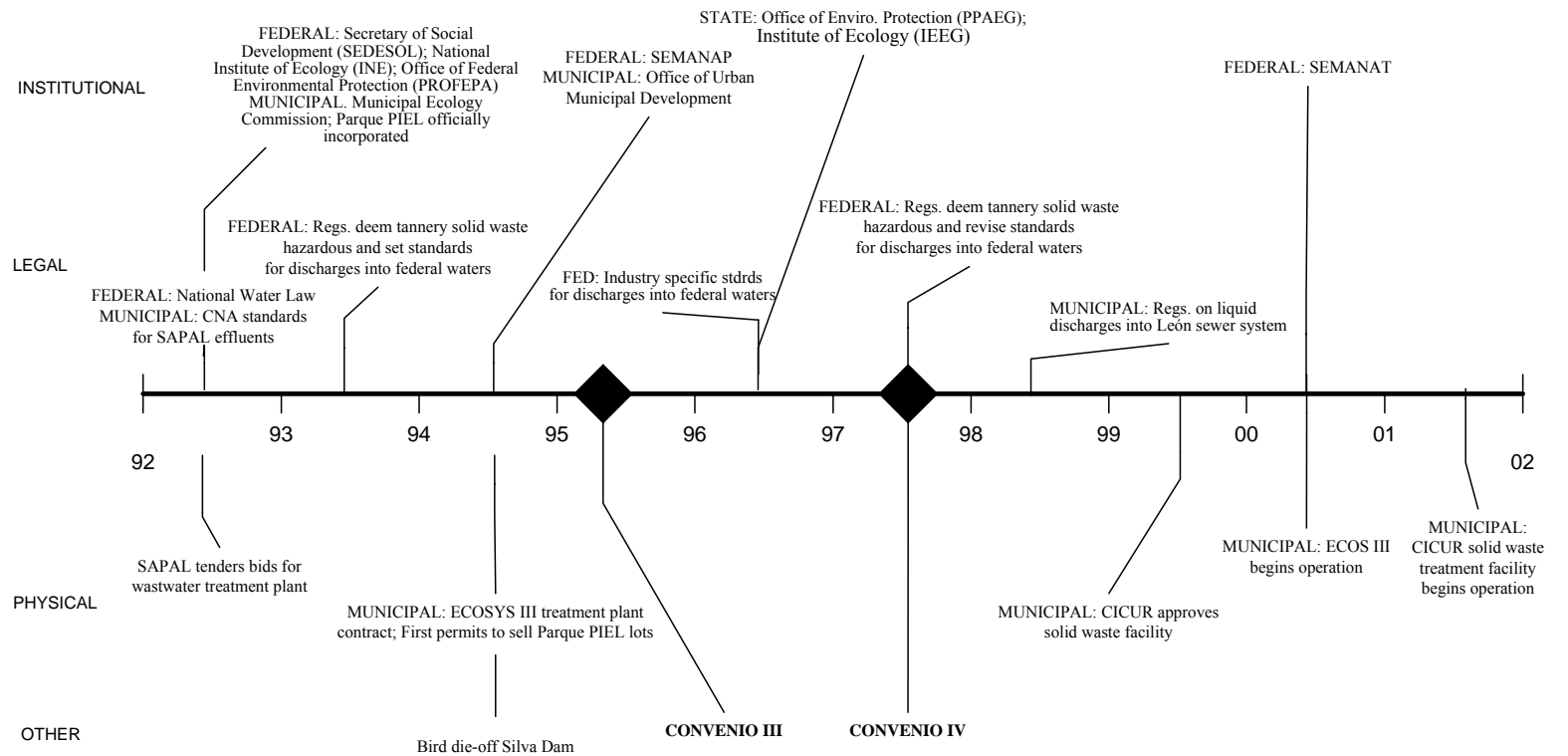


Figure 1b. Evolution of Regulatory Capacity in León, Guanajuato, Mexico, 1992–2001



Tables

Table 1. Convenio Signatories

| Signatory | Convenio | | | |
|--|----------|-----------|----------------|----------|
| | I, 7/87 | II, 10/91 | III, 6/95 | IV, 3/97 |
| <i>Federal</i> | | | | |
| Enviro. Agency (SEDUE / SEMARNAP) | X | X | X ^a | X |
| Attny. General for Enviro. (PROFEPA) | n/a | n/a | X ^a | X |
| Nat. Institute of Ecology (INE) | n/a | n/a | | X |
| Ag. & Water Resources Agency (SARH) | X | X | | |
| Secretariat of Health and Social Security (SSSS) | X | | | |
| National Water Commission (CNA) | n/a | X | X ^a | X |
| <i>State</i> | | | | |
| State of Guanajuato Executive | X | X | X ^b | X |
| Health and Social Security Dept. | | X | | |
| Development and Public Works Dept. | | X | X | |
| Water and Health (CEASG) | n/a | | X | X |
| Institute of Ecology Guanajuato (IEEG) | n/a | n/a | n/a | X |
| State Attny. General for Enviro. (PPAEG) | n/a | n/a | n/a | X |
| <i>Municipal</i> | | | | |
| City of León Executive | X | X | X ^b | X |
| Water and Sewer Auth. León (SAPAL) | X | X | X | X |
| City of San Francisco de Rincón Executive | X | | X | X |
| Water and Sewer Auth. S.F. de Rn. (SAPAF) | n/a | n/a | X | X |
| City of Purísima del Rincón Executive | X | | | X |
| Water and Sewer Auth. Pur. del Rn. (SAPAP) | n/a | n/a | n/a | X |
| <i>Private Sector</i> | | | | |
| Tanners trade assn. (CICUR) | X | X | X | X |
| Tanners trade assn. (ANACU) | X | X | X | X |
| Quimica Central de Mexico, S.A. de C.V. | X | | | |
| Nat. Chamb. Comm., León (CANACINTRA) | | | X | |
| Parque PIEL | n/a | n/a | X | |
| Fideiconiso Cd, Industrial de León | | | X | |
| <i>Other</i> | | | | |
| Leather research institute (CIATEC) | X | | | |
| University of Guanajuato | X | | | |
| Assn. of Leather Professionals (AQTCL) | X | | | |
| Fundación Ecológica de Guanajuato, A.C. (FUNDAE) | | | X | |

Notes: n/a = not applicable; institution not yet established. Acronyms for Mexican organizations are defined in text.

^aFederal office as “witness” only, state and regional offices as “participant.”

^b “Witness” only, not “participant.”

Table 2. Provisions of the Four Convenios, by Infrastructure Type (▶ = key provision)

| <i>Topic</i> | <i>I, 7/87</i> | <i>II, 10/91</i> | <i>III, 6/95</i> | <i>IV, 3/97</i> |
|----------------------|---|---|---|---|
| <i>Legal</i> | | | | |
| Standard setting | ▶ Federal signatories to set new tannery effluent standards | • No concrete provisions | ▶ City to set standards for discharges into sewers ▶ CNA to set standards for discharges into rivers | • City to set standards for discharges into sewers • CNA to set standards for discharges into rivers ▶ Authorities to establish new regs. on tannery solid wastes |
| <i>Institutional</i> | | | | |
| Enforcement | ▶ SAPAL to enforce liquid effluent standards | • No concrete provisions | ▶ State to pass laws to make SAPAL responsible for regulating discharges into sewers | • State to pass laws to make SAPAL responsible for regulating discharges into sewers ▶ City to publish records of enforcement activities |
| Registration | • Not addressed | ▶ Tanners to register with city authorities | ▶ Tanners to register with SAPAL and submit compliance plan ▶ Tanners to register with INE as hazardous waste generators | • Tanners to register with SAPAL and submit compliance plan • Tanners to register with INE as hazardous waste generators |
| New committees | • Committee established to analyze and finance pollution control projects | | | • Committee established to monitor compliance with convenio |
| <i>Physical</i> | | | | |
| Pretreatment | ▶ Tanners to install sedimentation tanks and recycling | • No concrete provisions | • No concrete provisions | ▶ Wastewater segregation and common effluent treatment plants to eliminate need for individual investments at plants in authorized industrial zones • Tanners to pay fees for wastewater treatment |

Resources for the Future

Blackman and Sistos

| <i>Topic</i> | <i>I, 7/87</i> | <i>II, 10/91</i> | <i>III, 6/95</i> | <i>IV, 3/97</i> |
|------------------------|--|---|---|---|
| Relocation | <ul style="list-style-type: none"> • Not addressed | <ul style="list-style-type: none"> ▶ Tanners to relocate wet blue processes to authorized industrial zone. Authorities to define zones | | <ul style="list-style-type: none"> • Tanners to relocate wet blue processes to authorized industrial zones |
| Industrial parks | <ul style="list-style-type: none"> • Not addressed | <ul style="list-style-type: none"> • Not addressed | <ul style="list-style-type: none"> ▶ Parque PIEL to build treatment plant within 2 years | <ul style="list-style-type: none"> • Treatment facilities to be built in authorized industrial zones |
| Municipal wastewater | <ul style="list-style-type: none"> • SAPAL charged with meeting federal standards | <ul style="list-style-type: none"> ▶ SAPAL to build wastewater treatment plant within 2 years | <ul style="list-style-type: none"> • SAPAL to build wastewater treatment plant within 1 year | <ul style="list-style-type: none"> • SAPAL to build wastewater treatment plants within 1 year |
| Solid waste | <ul style="list-style-type: none"> • No concrete provisions | <ul style="list-style-type: none"> ▶ Tanners to finance new solid waste disposal facility | <ul style="list-style-type: none"> • No concrete provisions | <ul style="list-style-type: none"> • State and INE to build disposal site • Tanners to hazardous waste permits from INE • Tanners to finance new solid waste disposal facility |
| <i>Civic</i> | | | | |
| Tannery representation | <ul style="list-style-type: none"> • CICUR and ANACU | <ul style="list-style-type: none"> • CICUR and ANACU | <ul style="list-style-type: none"> • CICUR and ANACU | <ul style="list-style-type: none"> ▶ Tanners may join individually; nonjoiners face immediate strict enforcement |
| Education and research | <ul style="list-style-type: none"> • Not addressed | <ul style="list-style-type: none"> • Not addressed | <ul style="list-style-type: none"> ▶ City to finance education and research center ▶ Federal, state, and municipal authorities to establish trust fund for environmental research ▶ Public education on use of municipal sewer | <ul style="list-style-type: none"> • Public education on use of municipal sewer |