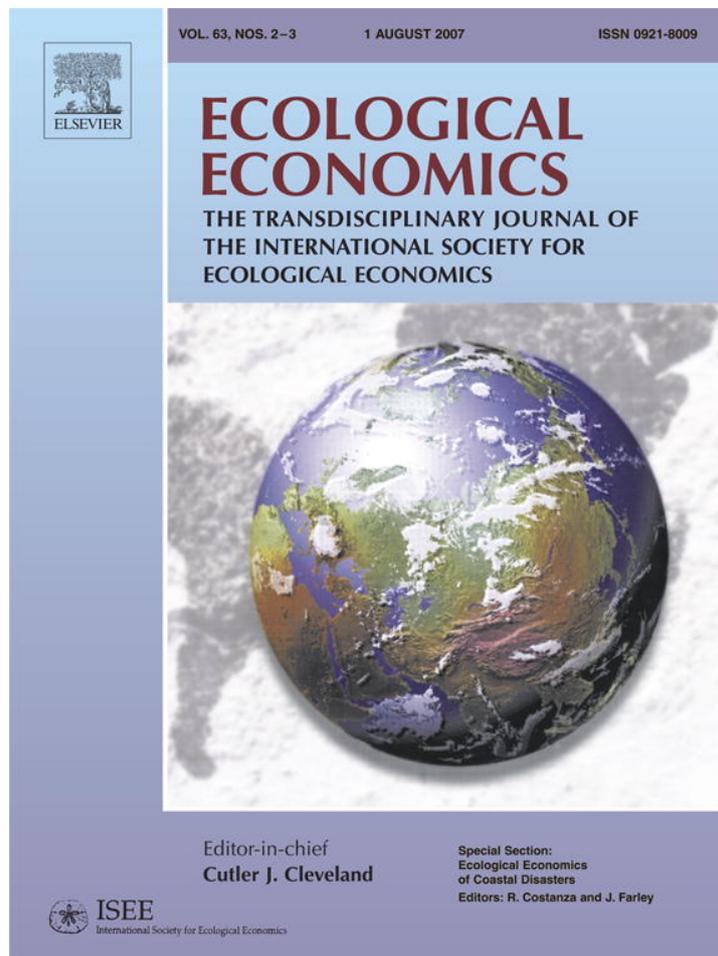


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ANALYSIS

Escaping the “polluter pays” trap: Financing wastewater treatment on the Tijuana–San Diego border

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ABSTRACT

Building and operating infrastructure to address transboundary environmental hazards requires dividing the cost of pollution prevention between bordering states. When cost-burden questions arise, the solution often suggested is the “polluter pays principle” (PPP). However, when political and economic relations between neighboring countries are asymmetrical other cost-burden principles are often adopted. Given the discrepancy between theory and practice, the aim of this study is to identify some of the available cost-burden principles and to examine when they might replace the PPP. The pollution-prevention regime along the San Diego/Tijuana border is used as a case study. It was found that under asymmetrical relations there are several competing cost-burden principles. Some principles are adopted since they are perceived, by some, to be fair while others are adopted since they provide effective wastewater treatment. The ones that were found effective are those that offset, to some degree, existing asymmetries. This explains why the PPP was replaced in the San Diego/Tijuana case with other cost-burden principles that better offset the asymmetries and thus, they provided a more effective wastewater treatment than the PPP.

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1. Introduction

An important element in building and operating facilities to address environmental hazards is the manner in which these facilities are funded. For example, lack of financial resources has often resulted in an inability to build wastewater plants (World Health Organization, 2004; UNEP, 2006). Wastewater treatment plants require a high level of maintenance, thus even in cases where a wastewater treatment plant has been built, lack of funds to operate and maintain the facility has resulted in the continuing flow of untreated sewage (Sanchez, 1995). The funding of such facilities is especially challenging when infrastructure is required to treat transboundary effluents. Funding in these cases requires that the cost be

divided between the parties that generate the wastewater and those adversely affected by it.

When the cost-sharing question arises, the solution often suggested is the “polluter pays principle” (PPP) (Tobey and Smets, 1996; Atkinson, 2000; Franck, 1995; Nash, 2000; Hird, 1993). PPP is a normative doctrine, which means that the polluter should be the one to bear the cost of measures to prevent and control pollution. PPP is assumed to provide economic efficiency and environmental sustainability by internalizing environmental externalities into the costs of production and consumption (OECD, 2002; Rio Declaration on Environment and Development, 1992). PPP was also presented in the last decade as an equitable and fair way for appropriating the cost of pollution abatement (Franck, 1995; Nash, 2000; McLoughlin and Bellinger, 1993).

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Indeed, many international organizations have endorsed the PPP. Among them is the Organization for Economic Cooperation and Development (hereafter *OECD, 2002*), the European Union¹ and NAFTA (*Fernandez, 2004; Tobey and Smets, 1996*). PPP has also been incorporated in a number of international agreements² and mentioned in several protocols and programs, such as the 1992 Rio de Janeiro Declaration, Agenda 21 and the 2002 World Summit on Sustainable Development Implementation Plan (*OECD, 2002*).

However, an examination of the cost of infrastructure to treat transboundary effluents reveals that, in fact, cost-sharing arrangements other than the PPP are often adopted. Even when this principle is applied, the ability of the regime to adequately resolve the pollution problem is unclear. This is especially so when substantial political and economic asymmetries exist between the parties involved. Such was the case in the negotiations over regulating pollution along the Rhine River during the 1960–70s, in which there were asymmetries in the willingness to pay for pollution control between Germany and France, the upstream riparians, and their downstream neighbor, the Netherlands. The Netherlands' insistence on the PPP resulted in decades of negotiation deadlock. An agreement was reached only when an alternative cost-sharing formula was identified and adopted (*Bernaer, 1995*).

Given the discrepancy between theory and practice, the aim of this study is to identify some available cost-burden principles and to examine when alternative cost-sharing formulas might replace the PPP. The paper hypothesizes that by ignoring the asymmetries between the parties involved the PPP's ability to alleviate the pollution problem (thereafter regime effectiveness) is compromised. In response, neighboring countries sometimes supplement or replace the PPP with other cost-burden arrangements that help to offset the existing asymmetries, thereby creating a more politically feasible and environmentally effective pollution control regime.

To examine this hypothesis the study focuses on the evolution of cost-sharing, and its underlying reasons, of the pollution abatement regime along the twin border cities, Tijuana and San Diego. This case represents one of the earliest regimes to stop transboundary hazards in North America, a problem that is now one of the focal points of US/Mexico environmental relations. Interviews were conducted with the key players involved in the case history and the contemporary attempts to regulate the pollution along this border were also examined. In addition, many primary historical documents were reviewed, including the negotiation transcripts as they appear in the US Congressional Records and in the personal files of Manuel Ybarra, the retired Secretary of the US section of the International Boundary and Water Commission (IBWC).

The difficulties and the partial success in stopping Tijuana from polluting the river have been studied from various perspectives. Among them is the influence of the boundary on

the willingness of Mexico and the US to act (*Kelly, 1994*); the effect of interests, linkages and uncertainties on the regime formation and effectiveness (*Mart, 2001*); and the role of place and scale in the Tijuana/San Diego boundary water quality process (*Michel, 2000; Brown, 1998*). However, the evolution of the choice of the cost-burden principles and its underlying reasons have been largely overlooked. In particular, the extent to which PPP was replaced with other principles in order to offset the asymmetrical relations between the US and Mexico and the impact of this on the effectiveness of pollution control regime have not yet been studied. Such a study would provide policy makers with tradeoff options when seeking effective cost-burden arrangements for controlling transboundary pollution, especially given the growing importance of this issue in US–Mexico relations.

The paper begins with a brief review of the potential barriers to adopting the PPP. Section 3 discusses the Tijuana/San Diego case study itself. It outlines the existing border asymmetries, then it shows how the adoption of a regime based on the PPP ignored many of these asymmetries, as well as its adverse implications. Finally, it explores the replacement of the PPP with other options that better address the asymmetries. Section 4 identifies and discusses the range of choices for cost-burden principles, their effect on asymmetries and their underlying reasons.

2. The barriers to adopting the PPP

The PPP has been found to be difficult to implement. This failure is often attributed to several impediments, among them the political process, legal clarity as to what the PPP means, its alleged conflict with justice and bargaining under asymmetrical political and economic conditions.

There are several studies that highlight some of the impediments that originate in the political process. *Tobey and Smets (1996)*, in their study on institutional arrangements and agricultural subsidies in the European Union, found that because of the strong agricultural lobby industrial countries endow agricultural producers with the right to pollute. The result is that governments often pay agricultural producers for pollution prevention. Often it is also the difficulty to prove specific injury and causality (*Franck, 1995*), especially in dealing with non-point pollution sources and the strong agricultural lobby. For example, *Seymour et al. (1992)*, in their study on PPP's applicability to nitrate pollution in water in the UK, highlight the uncertainty concerning the causes of nitrate leaching, which restricts the adoption of PPP.

Others have stressed the legal ambiguity of PPP that complicates its applicability. *Aickin (1987)* pointed out that the lack of legal clarity over how much, for what and when the polluter should pay has complicated the implementation of the theory of enterprise liability under which the manufacturer should provide safe products, or else pay for the cost of injury to the consumers. Another example is the discord over the legal interpretation of PPP with respect to the use of environmental subsidies in different economic sectors, which raised the need for developing an alternative principle that would be accepted by all sides (*Stevens, 1994*). In addition, disputes may arise concerning the appropriate process to be

¹ The PPP is one of the basic principles of the EU's environmental policy (*Martin, 1994*). In addition, the EU recently approved the Environmental Liability Directive that is based on the PPP.

² For example, the Convention of the Protection of the Marine Environment of the Baltic Sea Area, the Convention of the Protection of the Alps and the Protocol on Water and Health.

used to determine how the polluter should pay, i.e., through compensation, pollution prevention, etc. Indeed, many oppose the PPP interpretation that allows the polluter to pay (as long as he compensates the victim) because it disregards future generations (Franck, 1995).

Inspired by Rawls' theory of justice (Rawls, 1958, 1971), another perspective on why PPP is not adopted is rooted in the debate over what cost-burden principle is fair and equitable rather than efficient (Bromley, 1997; McLoughlin and Bellinger, 1993). PPP may allow us to use the resource most efficiently, but may also result in an inequitable distribution of the cost burden.

Thus, it is not surprising that cost allocation methods should be viewed by the players as fair (Dinar and Howitt, 1997) otherwise, as shown in the study of Lejano and Davos (1995), the construction of efficient wastewater facilities may be delayed. It implies that, there will be a need to choose a principle among a variety of fairness principles (some based upon equality and proportionality) that brings distributive justice. Indeed, Rose et al. (1998), in their study on rules for distributing tradable carbon dioxide emission permits, outlined several competing cost-burden equity criteria (in addition to the PPP), some based on welfare economics or inherent rights and others on fairness of the process or its outcome. Hence, in the environment area often a compromise is struck between PPP and other principles, such as the ability to pay or beneficiary pays (Loefstedt, 1993). Yet, it seems that determining which of the principles is equitable and fair is not clear-cut since equity is often a function of who the recipients of justice are (Dobson, 1998). Thus, the outcome may be fair to a group of parties within a local or issue-specific context but unjust from a broader perspective (Albin, 2002).

Many experts have stressed that the reasons for the difficulty in implementing the PPP increased when costs need to be allocated across international boundaries. This is the case when dividing the cost of all global problems, whether climate change, ozone layer depletion, endangered species, or transboundary problems, such as acid rain and river pollution. This difficulty is rooted in the lack of relevant international laws and a central authority that can identify the polluter or mandate enforcement (Knox, 2002; Kettlewell, 1992), as well as a disagreement on property rights that states who has the right to pollute and who is entitled to a clean natural resource (McKean, 1996; Barrett, 1996). The lack of international laws that endorse the PPP led many international bodies, from as early as the 1960s, to promote the principle of "no significant harm" to reinforce the PPP. This principle was finally included in the 1997 UN Convention on Non-Navigational Use of International Water Courses. However, not only has this convention not yet come into force but it includes the "equitable and reasonable use" principle along with the "no significant harm" principle — without stating which principle precedes the other (McCaffrey, 1998). Moreover, it seems that the "no significant harm" principle has not yet become normative in water treaties, as in the majority of water treaties it does not appear (Conca, 2006). Thus, the outcome is likely to be bargaining over competing principles for the cost burden (Franck, 1995).

When the relations between neighboring countries are asymmetrical the result of bargaining over competing cost-burden principles is a deadlock in negotiations, where one side leans toward the PPP while the other promotes dividing

the cost differently (Carraro, 1997, p. 1–8; Kettlewell, 1992). Thus, in these cases cost allocation is not merely an exercise in mathematics, but a practical problem that calls for translating institutional constraints into mathematical language (Young, 1994). To address this problem of strong asymmetry in the willingness to cooperate side payments and issue linkages are frequently endorsed (Just and Netanyahu, 2004; Weinthal and Marei, 2002; Dinar, 2006). In side payments, money is directly exchanged for environmental protection while in issue linkages other benefits are given to a polluter with no incentive to cooperate. Indeed, Dinar (2006), in his study on the effect of the border configuration on the nature of water regimes, has found that in the majority of treaties characterized by upstream–downstream relations, side payments often take place from downstream to upstream. Yet, it is important to note that side payments are also problematic as they appear to deviate from the PPP and endorse the victim pays principle (Dombrowsky, 2005). Furthermore, the anticipation of side payments may provide incentives for strategic behavior by the party advantaged by the status quo in order to extract even larger payments of this kind (Mäler, 1990:85f). Finally, linkages and side payments were found to have detrimental implications when the background conditions change during the implementation phase of the regime (Fischhendler et al., 2004).

The next sections demonstrate that besides the political and legal disagreements over the PPP, its adoption may ignore the political and economic asymmetries between neighboring countries, which in turn compromise the adequate wastewater treatment. Thus, PPP is often replaced by other cost-sharing principles that offset, at least in part, existing asymmetries. It is for this reason that the cost-sharing evolution of the pollution-prevention regime along the San Diego/Tijuana border is analyzed.

3. The San Diego/Tijuana cost-burden evolution

3.1. The San Diego/Tijuana case and its asymmetries

There are several asymmetries between the border cities of San Diego and Tijuana. The Tijuana River, which is 17 miles long and whose basin is 1668 square miles in size, originates in Mexico about 11 miles southeast of the city of Tijuana. From there it flows northward through the city and subsequently crosses the US/Mexico boundary. In the US, it flows for 5 miles before emptying into the Pacific Ocean (Fig. 1). This upstream–downstream geographical relation enables Tijuana to pollute the river without bearing the consequences of pollution. Furthermore, Mexican environmental policy has been traditionally overridden by development objectives. These differences in policy emphasis resulted in Mexican water quality standards that, until revised in 1988, were considerably lower than its neighbor's (Mumme and Nalven, 1988). Yet, it is important to note that until the Clean Water Act was passed in the US in 1972 standards in the US were also low. These factors set an asymmetrical willingness to pay for pollution control; it was often the US, needless to say, that sought transboundary pollution abatement (Integrated Environmental Plan, 1991).



Fig. 1—Location map and phases of wastewater infrastructure.

Another dimension of asymmetries is in the ability of both sides to pay for pollution control. The Mexican federal government traditionally has not prioritized financial allocations for solving both internal and border pollution, and Tijuana's pollution in particular (Ybarra, 2004). In addition, the Mexican distribution of funds is often a response to political and economic events which are largely unrelated to local needs (Ingram et al., 1995 in Carter, 1999). Mexico's overall ability, in fact, to raise revenues via state taxes and to collect user fees is very limited (Carter, 1999). In contrast, in the US the Environmental Protection Agency (EPA) established several grants programs³ to financially support US states' efforts to build wastewater plants. These factors, coupled with the general

³ The EPA's construction grants program is the prime source of capital for wastewater treatment facilities. It was replaced with the Clean Water State Revolving Fund Program.

striking economic disparity between both nations, created an asymmetry in the ability to pay for pollution control along the entire border (Kantor, 1993).

Other asymmetries relate to operational capacities to stop pollution. The Mexican wastewater treatment operation and maintenance practices are limited compared to those in the US (Friedkin, 1986). Between 1963–86 the Mexican wastewater treatment works in Tijuana experienced 33 breakdowns (Friedkin, 1986). Many of these occurred because of Mexico's limited ability to enforce its environmental laws, regulations and plans, from pretreatment through the entire treatment process.

Finally, there is the striking power asymmetry between the two nations that can be reflected in the economic, political and power superiority of the US over Mexico. Since the effect of the power asymmetry on negotiation of a regime often varies from one case to another, depending on the local

Table 1 – Pollution control asymmetries between San Diego and Tijuana during the 1920s–90s

Asymmetries in ability to address pollution	Indicators	San Diego	Tijuana
Willingness to pay	Location Water quality standards	Downstream High	Upstream Low
Ability to pay	User fee collection Economic capacities	High High	Low Low
Operational capacities	Availability of technology Ability to enforce pretreatment	High High	Low Low
Power balance	Economic, political and military power	High	Low

context, this asymmetry better reflects which is the weak and which is the strong party in general, rather than the specificity of each case study.

Since the US still enjoys economic and political superiority over Mexico, many of the asymmetries described above still continue today.

Table 1 shows the different asymmetries in ability to address pollution between Tijuana and San Diego and their indicators.

Next, the cost-burden evolution of the wastewater treatment initiatives between San Diego and Tijuana is presented. In particular, the adoption of the PPP, its failure to provide effective wastewater treatment through offsetting the existing asymmetries and its replacement with other principles that better address the asymmetries are outlined.

3.2. Early cost-sharing regime

The first municipal wastewater system was a septic tank constructed in Tijuana in 1928 with a capacity to serve 500 inhabitants. Already in 1933 the system was overloaded, so the city expanded the facility to treat a population of 5000 (Meyer, 1983). Within a short while the system was again overloaded, and sewage became a problem in the Lower Tijuana River Valley (Mart, 2001), fouling the stream and groundwater. Complaints flowed in from the US side of the border (Duemling, 1980). As a response to pressure from San Diego on US federal officials by the late 1930s, a system was devised that collected the partially treated sewage from the Mexican side of the border to its outfall in the US — shown as phase 1 in Fig. 1 (Kelly, 1994, p. 168). Most of the outfall capacity was for the 16,000 people now living in the city of Tijuana. The portion of the collection system within Mexico was funded by the Mexican Northern Territory of Baja California while the outfall and the other parts of the project within the US were paid for by the US Federal Public Works Administration (Kelly, 1994, p. 170). This construction cost was divided on the basis of the expected benefits to the US and its superior ability to pay (Ybarra, 2004). Since Mexico had an interest in addressing the power asymmetry between both sides by being seen as an equal partner to the US, the Territory of Baja California and the County of San Diego shared equally the costs of the wastewater plant operation and maintenance (Ybarra, 2004).

After the first wastewater facility was built, in 1945 the US and Mexico signed a water treaty (1944 Treaty) and established the International Boundary and Water Commission (IBWC), comprised of a Mexican and an American section. The Treaty included the so-called “minute” mechanism as a means for the two nations to agree to clarify or supplement the treaty to solve an issue, establish a policy, or authorize a capital project (Eaton and Hurlbut, 1992). The treaty obliged the two governments to find solutions to the border sanitation problems and gave the IBWC the authority to meet this obligation (1944 Treaty, articles 2, 3, 24). Yet, the treaty did not set guidelines for how to achieve this goal financially and how to divide its cost.

3.3. Leveraging a PPP regime

Two decades after the early regime was established, and as the population of Tijuana significantly grew, quantities of sewage increasingly overloaded the existing US outfall (Mart, 2001; Meyer, 1983). Mexico rejected a US suggestion to build a single integrated system in the US where the cost would be shared according to the PPP. Instead, it preferred a unilateral solution that was cheaper (Graves, 1985). As a result, in 1958 San Diego built its own wastewater facility in Point Loma and Mexico built two pumping stations that shifted the raw sewage west, along a bypass route, to the Pacific Ocean at a point several miles south of the international border, shown as phase 2, in Fig. 1 (Mart, 2001). Because of operational problems the Mexican facility often malfunctioned (Minute, 270). As Mexico ran out of funds the pipe was not completed and the water was discharged down a little gully without any treatment (Delaney, 1984). As a result of Mexico's inability to operate its wastewater facility in 1965 both governments signed a 20-year agreement (Minute 222) that established an emergency connection of Tijuana's sewage system to the San Diego metropolitan sewage system — shown as phase 3 in Fig. 1. Mexico agreed to fund and build the pipeline on its side, but since it claimed that it could not pay the true cost of treatment in the US, it was agreed that payment for the use of San Diego facility would be set at a fixed rate, regardless of the expected escalation cost (Frauenfelder, 2004). The difference was to be paid by the US section of the IBWC.

However, during the 1970s and early '80s the wastewater facility in Tijuana and the Mexican bypass system both broke down and the emergency connection reached its capacity limits (Graves, 1985). This led to several miles of San Diego beaches being placed under quarantine (Graves, 1985), and hampered US attempts to recover the Tijuana River Estuarine Sanctuary (Douglas, 1984). Despite several environmental framework agreements signed between both governments in this period, a solution to the Tijuana pollution and a cost-sharing formula had to be found since all existing agreements had avoided the question of how the costs of transboundary wastewater treatment would be divided (Table 2).

The solution suggested by the US during the 1980s was to build an international water treatment plant (IWTP) and a deep ocean outfall that would carry the treated sewage of the IWTP out to sea. Taking into account the asymmetries in capacities to run the plant, it was proposed that it be built in the US and employ US technology and personnel. The plant was also to address the cities' different water quality standards by adopting

Table 2 – Framework agreements, year of initiation and their cost-burden principle

Framework agreements	Year initiated	Cost-sharing principle
1944 treaty	1945	Not addressed
Memorandum of understanding for cooperation on transboundary environmental problems	1978	Not addressed
Minute 261 to resolve the pollution problem	1979	Polluter pays, with options for exceptions
La Paz agreement for the protection of the environment	1983	Polluter pays, with option for exceptions
NADBank and BECC agreement	1993	Equal payment
Integrated environmental plan for the US–Mexico border	1992–1994	Equal payment
Minute 294	1995	Soft version of beneficiary pays and ability to pay
Memorandum of understanding and Minute 304	2000; 2002	Equal payment (only for projects in Mexico)

secondary wastewater treatment, which in the US had become a requirement with the 1972 Clean Water Act. The cost of the facility was estimated at \$730 million (Lowry and Associates, 1983). The US Congress expected Mexico to foot \$390 million of the bill, to cover its treatment expenses (Deddeh, 1984). The US administration did not offer any financial aid for the Mexican participation in the international facility or for improving its existing wastewater system (Reavis, 1984), thinking in terms of the PPP (Mart, 2001, p. 282).

However, the Mexican administration viewed this PPP-based cost-sharing formula as unrealistic as it ignored the difference in ability to pay during an economic crisis in Mexico (Romero, 1984 in Mumme and Nalven, 1988). Furthermore, Mexico was loath to support the international facility because it was the higher water quality standards of the US than it was expected to uphold (Saxod, 2004).

Mexico thus stalled the negotiations for several years (Baumli, 1984, p. 32) and finally offered its own solution: it chose to implement the PPP through further development of its existing wastewater system. A unilateral PPP solution was cheaper for Mexico than a binational plant (Kelly, 1994, p. 278). Moreover, it would contribute to the Mexican economy as federal money would be spent domestically (Onorato, 1985) and it would serve national pride since Mexico would not be seen as a nation that receives foreign support (Ybarra, 2004). The authorities planned to convey Tijuana's effluents uphill, towards the south, apply primary treatment (the San Antonio plant) and then dump them into the ocean. In addition, Mexico also agreed to build a second sewage facility – the Rio Alamar plant – in return for US support for a Mexican loan from the Inter-American Development Bank (IDB)⁴ for expanding the potable water supply in Tijuana (Metzner, undated).

Finally, in 1985, Minute 270 and Annex I to the La Paz agreement were signed. The former was a two-phase plan to build the coastal San Antonio plant, the latter paved the way for construction of the inland Rio Alamar plant — phase 4 in Fig. 1.

3.4. Living with PPP

In 1985, Mexico started building the San Antonio plant, soon after the US complained that the coastal lagoon's location and shape were inappropriate for such a facility. In addition, during that winter the three canyons west of Tijuana discharged wastewater because of malfunctioning in the city's collection system (McCann, 1986). These problems resulted in the US building defensive measures that capture about 3 mgd spills in four canyons, that carry sewage emanating from the Tijuana River back to Mexico — phase 5 in Fig. 1. (Lowry and Associates, 1983).

However, it was quickly realized that the “return to sender” policy was not viable since the existing and future Mexican facilities were not capable of treating the sewage and thus it would ultimately find its way back to the US (Fege, 2004). Also, the planned Rio Alamar became a source of concern since Mexico was about to treat the wastewater with the same technology used on New River, which had proved a failure (Delaney, 1987). Even if the Rio Alamar plant would work, Mexico refused to process the water beyond primary treatment since it viewed the US requirement for more stringent standards as a US domestic matter (Gunaji, 1988).

As suspected by the US, just after the San Antonio facility was built it became clear that its conveyance system leaked, that the wastewater treatment level was inadequate and that its operational capacity was already insufficient to deal with the quantities of sewage being sent there. Because of these problems, in 1987 the San Antonio plant was taken out of operation for a year and Mexico was informed by the US that the second phase of the plant would not go into effect (Manager's Report, 1988). As a result, untreated wastewater continued to flow into the Tijuana River (Metzner, 1987).

3.5. Escaping PPP

Many of the Californian agencies were aware that the PPP could not offset the existing asymmetries between the two countries. Thus, there was a need to seek a new cost-burden formula that could provide effective solutions in the form of the IWTP (Delaney, 1984; Reavis, 1984).

In order for the US to pay for the Mexican share of the project, special congressional appropriation was required because facilities to treat wastewater from Mexico were not eligible for regular grants under existing federal or state laws (Obey, 1993). To overcome this obstacle, a coalition was built that incorporated four San Diego congressmen, the governor of California, the US section of the IBWC, the mayor of San Diego and the EPA (Gunaji, 2004). This coalition already in 1984 solicited the Appropriation Committee to allocate \$50 million to the first phase of the international facility (Martinez, 1984, p. 65). Yet, the administration, under President Ronald Reagan, was willing to contribute only \$32 million, matched by another \$5 million in state funds, to start construction of the international facility.

⁴ The IDB is an international organization that works to promote the economic and social development of Latin America.

The possibility of the US financing a facility in the US to treat wastewater from Tijuana became real in 1987 when Washington passed the Clean Water Quality Act, section 510 of which allows the IBWC US commissioner to seek a grant from the administrator of the EPA for the construction of an international plant to deal with the Tijuana problem. It implies that up to 55% of federal funds could be made available to the plant to process Tijuana sewage (Metzner, 1987). Consequently, in 1987 the US section of the IBWC resumed negotiations with Mexico on the basis of the IWTP proposal as the long-term solution (Mart, 2001, p. 275).

US IBWC Commission Narendra Gunaji realized that for Mexico to agree to the IWTP the cost-sharing formula would need to deviate from the PPP while for the US congress to agree some of the cost would be born upon México (Gunaji, 2004). To reconcile these conflicting needs Gunaji argued that the proposed international plant should be in lieu of Mexico's promised construction of the second phase of the San Antonio plant, as well as a replacement for the promised Mexican treatment plant on the Rio Alamar River (Gunaji, 1988). Mexico's share would be at a cost equal to that which it would have spent on the building and operating of these two plants (hereafter "beneficiary pays the difference"); in addition, the ocean outfall would be paid for by the US federal government and San Diego (Gunaji, 1988). To help Mexico pay its share, the State Department suggested that it should be given credit for many of its previous wastewater works (Aronson, 1990).

Given the strong local pressure to adopt a more flexible cost-sharing formula, the US administration, now headed by George Bush, in July 1989 agreed to support the federal funding for the IWTP (Silva, 2004). An important argument for the US paying the lion's share of the pollution treatment was the economic cost of sewage contamination (Mart, 2001) and the fact that the plant would be built on the US side to ensure control over the wastewater treatment process (Saxod, 2004).

Subsequent to a meeting between both countries' presidents on October 3, 1989, construction of the IWTP was agreed upon and on July 2, 1990 Minute 283 was signed (phase 6 in Fig. 1). The minute stipulated that Mexico would share in the construction, maintenance and operation of the IWTP according to the principle of "the beneficiary pays the difference". This implied that Mexico would pay only for the pollution abatement it was supposed to undertake anyway — the construction, maintenance and operation of stage II of the San Antonio plant and the construction of the Rio Alamar plant. The rest (or the difference) was to be paid by the US. This is in contrast to the "beneficiary pays" principle that refers to the US' benefit from heightened pollution control and its need to subsequently cover the entire cost of the IWTP. In addition, Mexico was to be given credit for the sewage treatment works provided at the time in Tijuana, covering part of its operating costs by supplying electrical energy for the plant. The land and the ocean outfall costs would be paid by the US.

The construction of the IWTP was completed in 1997, though the ocean outfall was only completed in 1999. The total cost of the plant swelled to \$383 million, of which Mexico paid \$16 million (Perciasepe, 1994).

4. The new cost-burden regime

To deal with the difficulty of financing the border pollution problems that in 1993 were estimated at \$5–12 billion (Audley, 1993), several bills were introduced to the US Congress by the bordering states in the early 1990s.⁵ Their aim was to authorize the EPA to appropriate funds for the construction of wastewater treatment without Mexico's contribution, on the basis of the US' economic and operational comparative advantage (Bingaman, 1994) or on a case-by-case basis (House Resolution, 1992). Yet, none of them were enacted. In addition, the resources for "Integrated Border Environmental Plan,"⁶ initiated in 1992, were not committed (Spalding, 2000).

The turning point in financing the border pollution and offsetting the asymmetries was the negotiations over the North America Free Trade Agreement between Mexico, the US and Canada (NAFTA). During the negotiations many supported a new binational bank that would finance a border cleanup fund. The fund was to be free of the appropriation constraints that were set in the Tijuana/San Diego case and with a capacity to bridge the striking economic asymmetries between Mexico and the US (Kantor, 1993). To achieve this, the US was to provide two-thirds of the bank capital, and accordingly expected to receive two-thirds of the voting rights on the Board of Executive Directors (House Congress Resolution, undated). However, fears that such a voting percentage might discourage Mexico from participating in the fund (Hinijosa, 1993) and that such a formula may be perceived as foreign help (Browne, 1996) resulted in a formula based upon equal payment, whereby both sides would contribute equally to the bank capital and thus were equally represented. The equal payment principle of cost was also assumed to give Mexico an incentive to sign up for the greater use of user charges that the polluter pays (Shafer, 1993). Indeed, in 1994 the North American Development Bank (NADBank) was established. Both nations have each committed \$225 million "paid in capital" and have pledged to back the NADBank with \$1.275 billion of "capable" capital. A Border Environmental Cooperation Commission (BECC) was established to evaluate the feasibility, efficiency and effectiveness of proposed projects to the bank (Killgore and Eaton, 1995).

Another turning point in financing infrastructure to address border pollution and offsetting the asymmetries was when, starting in 1995, the EPA establish the Border Environmental Infrastructure Fund (BEIF) that extended funding to projects on both sides of the border. The EPA wanted the majority of the money to be spent on projects in Mexico, where the money is more urgently needed, while not being seen as foreign aid, which might block Congressional support of the program. Thus, the US called on Mexico's agencies to match the grants (Memorandum, undated) and required the projects that are located in Mexico to have a US side benefit and those

⁵ Among them are amendments to the Water Pollution Control Act and the Safe Drinking Water Act.

⁶ The plan's aim was to strengthen Mexican enforcement of existing laws and increase cooperation around planning infrastructure. Mexico was to contribute to the program at least \$460 million and the US \$379 million (Carter, 1999).

that discharge to US waters to meet the US water quality standards (Eberhardt, 2004). BEIF with its corresponding match requirement was put in place and functioning by 1997 under the administration of NADBank and BECC. The procedures for the timing, reporting and accounting of the BEIF and Mexican grants were formalized by Minute 304 and its accompanying Memorandum of Understanding in 2000 that allocated the US funds for the project on both sides of the border while the Mexican funds were to be spent only on projects on its side (Memorandum of Understanding, 2000).

5. The post-NAFTA Tijuana/San Diego cost-burden regime

In 1995 the existing Mexican wastewater systems in Tijuana (agreed in Minute 270) became overloaded and the collection system started leaking. As a response, the EPA, supported by several local organizations, suggested improving the San Antonio plant to provide secondary treatment which would reduce the quantity of raw sewage discharged to the sea that can travel north into US waters (Orrin, 1993). It also suggested building a parallel conveyance system as a backup to the Mexican system (Ybarra, 1997) and a connection from the IWTP to the conveyance system in Tijuana in order to return effluents intended for disposal in the ocean off Mexico at times when the ocean outfall under construction was not in operation (Minute 298, 1997).

The US was willing to foot the \$16 million bill for the conveyance system and \$1.5 million for the connection from the IWTP to the conveyance system from BEIF money, with the expectation that Mexico would spend as much on rehabilitating its existing wastewater collection system (Wachtel, 2004). Another condition was that the \$2 million cost of upgrading the existing San Antonio plant and the costs of the conveyance system that exceed the \$16 million would be paid by Baja California. A loan would be provided by NADBank to help Mexico participate in the project (Minute 298, article II). Besides the benefits to the US from a backup system, another advantage of financing the bulk of the project was the assumption that upgrading the San Antonio plant would replace the conveyance of Tijuana's sewage through the emergency connection. The upgrading of the Tijuana system and the parallel system were completed in late 2000 — phase 7 in Fig. 1. Yet, Mexico finally did not fully match the US money to rehabilitate its existing wastewater collection (Wachtel, 2005).

A recent ongoing problem was that, since many of Tijuana's neighborhoods were not hooked up to sewers even after the IWTP and the conveyance system were built, sewage kept flowing to the US side. Consequently, a Congress bill (H. Con. Res. 331) was introduced to force Mexico by international law to share in the burden caused by its sewage. But it was opposed due to fear that punitive action would jeopardize many of the NADBank projects in which Mexico matches US funding (Rodriguez, 1998). Instead, the Tijuana's collection system is now being rehabilitated through a BEIF \$18 million grant, matched by Mexico, and a \$6 million NADBank loan to Mexico (EPA, 2002b) — phase 8 in Fig. 1. In addition, a master plan was developed for Tijuana's sewage treatment (EPA, 2002a) — phase 9 in Fig. 1. The EPA, in response to a

congressional direction, produced the master plan and contributed the majority of its cost (\$2 million). NADBank participated in the master plan project by providing a grant for an assessment of the institutional capacity of the Tijuana Utility. Mexico, in turn, dedicated staff and provided the meeting facilities (Wachtel, 2005).

Finally, another ongoing problem was the EPA and US section of the IBWC requirement that many local organizations and the state of California meet the Clean Water Act by achieving secondary standards for all sewage discharged from the IWTP by December 2000 (Manager's Report, 2002). The Congress and the US president responded to these demands in 2000 through the Tijuana Valley Estuary and Beach Sewage Cleanup Act that authorized \$156 million for an agreement with a private company in Mexico to provide the secondary treatment (Public Law 106–457). Thus, in 2002 a minute was signed between both countries stipulating the possible agreement (Minute 311, 2002). The decision to employ a private company was seen as a win-win solution: for Mexico it would provide reclaimed water (paid for by the US) while not impinging on its sovereignty (Congressional Record, 1999) and the US would benefit from secondary treatment which, nevertheless, would be of a higher quality than if the wastes were treated by the Mexican government (Schlesinger, 2004) — phase 10 in Fig. 1. However, because of disagreements between the US and Mexico concerning the nationality of the private company a solution has not yet been agreed upon (Rascón, 2001).

6. Discussion: Balancing perceived fairness and effectiveness

This study, by incorporating the effect of asymmetries on the negotiation and implementation processes, has found that asymmetries result in competing cost-burden principles: the polluter pays, the beneficiary pays and the ability to pay. It is likely that each country will adopt the principle that best protects its interests dependent on their physical position in the basin in question. It was the US, as the rich and downstream state receiving the pollution, that advocated for the PPP while Mexico, as the poor and upstream state, advocated for the two other principles. In addition, there are also mixed systems that combine these principles. These are the “beneficiary pays the difference,” “equal payment of the cost burden” and a soft version of the PPP.

Table 2 outlines the framework agreements, their year of initiation and how they address the cost-burden issue.

These principles tend to replace each other along time. The current case began with the building of an outfall, the cost of whose construction was divided according to the respective benefits to Mexico and the US and the latter's superior ability to pay (event 1a, Fig. 2), although its operation was on the basis of the equal payment principle (event 1b, Fig. 2). This cost-burden arrangement was replaced with the PPP as Mexico built and paid for its early wastewater system (event 2, Fig. 2). Next, a soft version of the PPP was adopted as Mexico paid for the emergency connection pipeline and some of the operation and treatment costs (event 3, Fig. 2). Twenty years later there was a retreat back to the PPP as Mexico built and funded the entire cost of its own advanced wastewater facility (event 4,

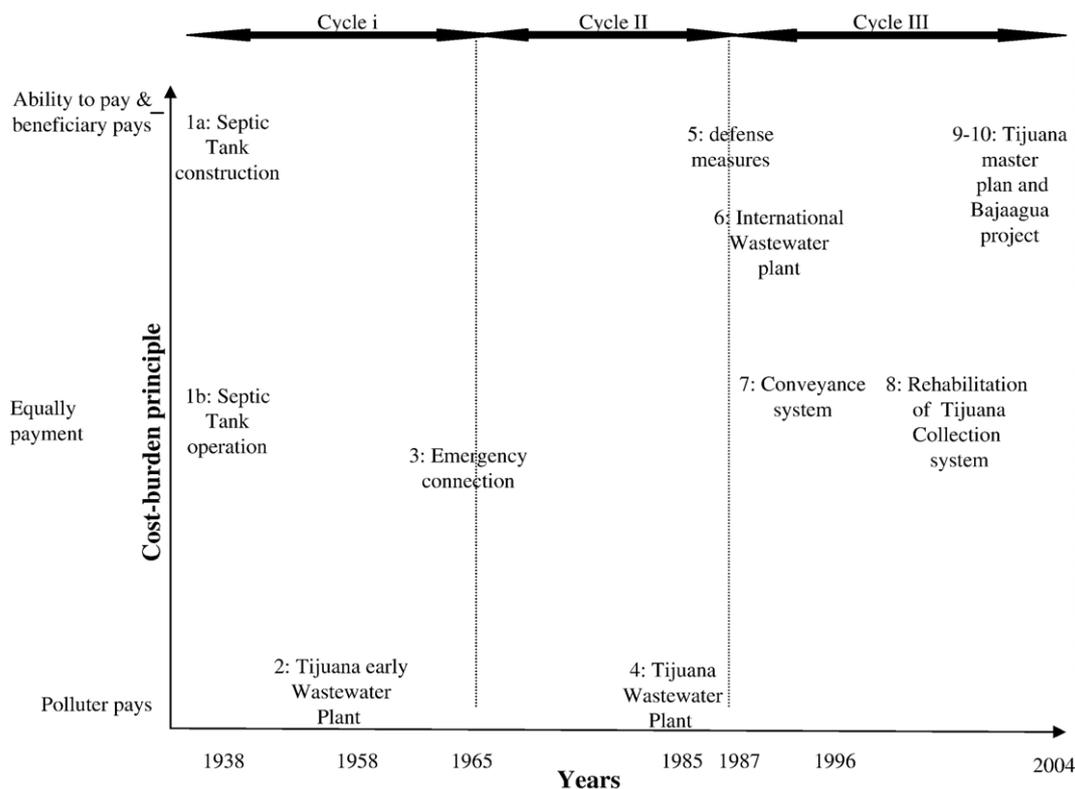


Fig. 2 – Cost-burden evolution of wastewater infrastructure along the San Diego/Tijuana border.

Fig. 2). Again, PPP was soon replaced with the “US pays for the defensive measures” (event 5, Fig. 2) and with “the beneficiary pays the difference” that financed the IWTP (event 6, Fig. 2). Then it was the “equal payment of the cost burden” (leading to the establishment of NADBank and BEIF) that guided the cost-sharing of the Parallel Conveyance System and the rehabilitation the Mexican collection system (events 7, 8, Fig. 2). Finally, there is the Tijuana Master Plan, and the proposed Bajaagua project, whose cost sharing may be the “beneficiary pays” (event 9, 10, Fig. 2).

Fig. 2 delineates the ten Tijuana/San Diego wastewater projects (events) according to their time of establishment and their cost-burden principle. At one pole of the principles is the PPP and at the other is the ability to pay and beneficiary pays. Fig. 2 reveals that there are three cycles in the choice of the cost burden: in each cycle there is a shift from principles ability to pay and beneficiary pays towards the PPP and a retreat backwards. The current cycle (the third) fluctuates between the two poles less than the previous two cycles.

The cycles represent the tension between the US interpretation of fairness in dividing the cost of wastewater treatment and the effectiveness of the cost-burden principles. Both cases of implementing the PPP (events 2, 4) were driven by the US administration imposing its interpretation of fairness. Mexico agreed to accept these solutions based upon PPP because of US political pressure, the financial linkages (that helped Mexico to pay) and the Mexican decision to implement the PPP unilaterally. Yet, PPP, despite serving justice to the US administration, ignored the asymmetries between the US and Mexico in operational capacities, willingness and ability

to pay and power (Table 3). As a result it provided ineffective wastewater treatment. In response, in the former case (event 2) the US replaced the PPP with the soft version of this principle (event 3) and in the latter case (event 4) with the US pays for the defensive measures (event 5) and the “beneficiary pays the difference” principle (event 6). The soft version of PPP allowed the wastewater to be treated according to US technological capabilities and standards, thus offsetting the asymmetry in operation. But it ignored the willingness of San Diego to pay for Tijuana's wastewater and the inability of Tijuana to pay for the expansion of the connection (Table 3). As a result, the connection was terminated after 20 years. The “beneficiary pays the difference” principle addresses the power asymmetries since it did not depict Mexico as a country that receives foreign aid (Christensen, 2004). It also took into account asymmetries in ability and willingness to pay since the formula considered Mexico's limited financial capacities while at the same time forcing Mexico to contribute and thereby satisfying the US administration's concern for that country's financial participation. Finally, it also addressed the asymmetries in capabilities since the US paid most of the cost which in turn allowed the plant to be built on the US side and utilize US technology (Table 3). Addressing the asymmetries both contributed to the effectiveness of the solution and to its political feasibility. Given its success to offset asymmetries it is not surprising that this formula was adopted in other cases, such as the Nogales international plant (Duemling, 1980) and the Laredo/Nuevo Laredo case (Rascón, 2001).

Lately, it seems that the tension between effectiveness and perception, by some, of fairness is reconciled by the adoption

Table 3 – Projects built, their cost-burden principles and the effect of the principles on asymmetries

Projects built and programs adopted	Agreement signed	Cost-burden principle	Effect of cost-burden principle on Tijuana/San Diego asymmetries			
			Power asymmetry	Ability to pay	Willingness to pay	Operational capacities
2 pumping stations Rio Alamar San Antonio	La Paz annex Minute 270	Polluter pays	–	–	–	–
Emergency connection	Minute 222	Soft version of the polluter pays	–	–	–	+
–Outfall operation and maintenance –Conveyance system –Parallel conveyance system –NAD Bank –BEIF IWTP	Minute 298 NAFTA side agreement Memorandum of Understanding and minute 304 Minute 283, 296	Equal payment Beneficiary pays the difference	+	–	+	+
–Outfall construction –PDAF –Defensive measures –Bajagua project –Tijuana Master Plan		Beneficiary pays & ability to pay	–	+	–	+
“–”increase asymmetries. “+”offset or address asymmetries.						

of the principle of “equal payment” (events 7, 8), which means that parties receive identical burdens regardless of differences in needs, preferences or other considerations. This principle provides Mexico with equal footing in NADBank and the BECC, thereby addressing to some degree the asymmetry in power (Table 3). By including in the BECC technological feasibility criteria for project certification (2005) it was assured that operational asymmetries would also be addressed. The “equal payment of cost” has also often been adopted in other cases⁷ and is perceived as an equitable and feasible means for cost sharing. This may be attributed to the virtues of this solution (often also called the egalitarian solution) to provide weak Pareto Optimality, strong monotonic and under certain conditions to coincide with the Shapley value and Nash solution (Thomson, 1994).

However, since this formula ignored the Mexican limited ability to pay already in 1995 Mexico did not transfer its \$56 million share to the bank and nowadays finds it difficult to pay its 50% share in the BECC operation (Rascón, 2001). Furthermore, Mexico often does not have the money to match the US BEIF program and finds the NADBank market-based interest rates too high. To address these difficulties the EPA in several cases enables Mexico to match funds by crediting it for its past wastewater treatment (Eberhardt, 2004) and allows Mexico a flexible timing arrangement of funding.⁸

The Mexican difficulty in paying advanced the establishment of Project Development Assistance Program (PDAP), a US funding program established recently by the EPA for waste-

water treatment development activities and providing drinking water (Carter, 1999). The program does not have the matching requirement, with the exception of design costs where the program is limited to 50% of the cost, not to exceed \$500,000 (Wachtel, 2005). By paying the majority of the cost it ensures that projects in Mexico are technically, environmentally and financially sound so that the EPA can be comfortable funding their construction and allow for consistency in project development (Wachtel, 2005). The Tijuana Master Plan (event 9) is an example for the ongoing trend of the US paying the majority cost to strike the balance of effectiveness versus perceived fairness in favor of environmental effectiveness (Wachtel, 2004). The US paying the cost offsets Mexico's limited ability to pay, as well as its operational capacities, and allows the US to influence the technology used and the standards adopted. Yet, this ignores the willingness of Congress to support such programs and the power asymmetry since it may present Mexico as a nation that receives foreign aid (Table 3).

Table 3 summarizes the projects built, how they were formalized, how their cost was divided and the effect of the cost-burden principles adopted on asymmetries.

Given the finding that a cost-burden principle that ignores asymmetries is not likely to provide effective wastewater treatment, it is not surprising that the border communities which are directly affected by the pollution advance alternatives to the PPP. This was the position of San Diego congressmen in the IWTP negotiations. It is also the current position of several NGOs for the need to reform the BEIF and NADBank in a manner that allows the US to spend more money in Mexico (e.g., Sierra Club, 1993; Texas Center for Policy Studies, 2001). Which principle they prefer depends on the asymmetries they prioritize to offset. For example, to change the power asymmetry equal payment may be adopted

⁷ For example, the US and Canada divided the salmon harvests equally in the Frazer River Convention.

⁸ These arrangements are worked out beforehand, prior to expenditure of funds, are typically not based on past work, and done only on a case-by-case basis.

while to offset the operational capacities the beneficiary pays the difference or ability to pay is likely to be adopted.

In the last decade a greater part of the cost has been allocated to the private sector in financing transborder wastewater infrastructure (event 10). The private sector, assumed to have a larger capacity to collect user fees and to operate advanced technology, is perceived to have the ability to offset operational capacities as well as to address the ability to pay asymmetry. Some even argue that if private international entities would manage transboundary aquifers that may address the power asymmetry since the different parties sharing the aquifer will have to cooperate in order to get the best possible deal from the franchisee (Feitelson and Haddad, 2001). But their success is yet to be proven, especially since there is not a single case worldwide of an international private entity that manages a transboundary natural resource.

7. Conclusion

To understand the choice of the cost-burden principle there is a need to look beyond the traditional debate on what principle is efficient, fair or normative and to situate the regime in a broader international political and economic context. This means focusing on how the cost-burden principles address the various asymmetries between the countries involved and thus affect the effectiveness of the regime. Cost-burden arrangements that are more effective are the ones that address the asymmetries. This is why, as hypothesized, the PPP was replaced with other principles that better address the asymmetries.

Each of the principles that replace the PPP addresses the asymmetries differently. In the Tijuana/San Diego case, “beneficiary pays” addresses the ability to pay and the operational asymmetries but ignores the US willingness to pay and Mexican power inferiority. “Equal payment” on the other hand, addresses the willingness to pay and Mexican power inferiority but ignores the asymmetries in ability to pay. The “beneficiary pays the difference” principle addresses many of the asymmetries but is criticized for not addressing the need to treat the water at the source of the pollution at a lower cost (Michel, 2000). The failure of Mexico to implement the “equal payment” principle suggests that this principle may not be practical in the context of economic asymmetries between states and thus should not be considered despite its current widespread popularity. “Equal payment” may also receive additional scrutiny because of its juxtaposition with the other principles, especially when the harmed country must incur some of the costs — but so does the harming country.

The finding that the different cost-burden principles affect the asymmetries differently and thus correspond with perception of fairness and effectiveness differently explains why there are cycles in the cost-burden formulas. The cycles represent projects whose funding was based on the US administration's notions of fairness that were replaced by projects whose funding is based on notions of effectiveness. The replacement of the PPP with the other cost-burden principles is one example. Finally, it also highlights why financing agreements are often “packages,” since they are based on several criteria of justice each tries to offset a

different asymmetry. The adopting of the beneficiary pays the difference that capture both the PPP and the ability to pay principle is one example.

Yet, there is a need for further study to identify which of the principles replacing the PPP is more effective, especially in light of political and economic changes in the background conditions. In other words, there is a need to examine whether addressing the power asymmetry by adopting the equal payment principle is more effective in the long run than offsetting the ability to pay by allowing the US to foot the lion's share of the wastewater infrastructure. In addition, the study findings concerning the effect of the various principles on the capacity asymmetries are inconclusive and, thus, should be explored further.

It was also found that each principle has different spatial implications. Insisting on the PPP implied that unilateral Mexican projects in Mexico were to be built by Mexican technology and standards. This has necessitated the construction of end-of-pipe emergency measures on the US side of the border. In contrast, allowing the US to pay the bulk of the cost allowed joint projects to be conducted in the US.

In conclusion, the study demonstrates that often the PPP is not adopted because of its lack of legal clarity, political feasibility or perceptions of fairness, but rather because of its inability to address the existing asymmetries and thus to provide environmentally effective pollution control. This study thus stresses the need to examine and analyze the effect of the cost-burden principles on all economic and political asymmetries before determining and implementing any given pollution control measures.

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