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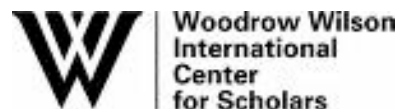
Environmental Protection and Natural Resources

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Mexico and the United States: Confronting the Twenty-First Century

This working paper is part of a project seeking to provide an up-to-date assessment of key issues in the U.S.-Mexican relationship, identify points of convergence and divergence in respective national interests, and analyze likely consequences of potential policy approaches.

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Environmental Protection and Natural Resources

Roberto Sanchez-Rodriguez and Steven Mumme

The current era of global environmental problems is forcing societies to redefine their relationship with nature. The debate of climate change has raised the attention and importance of the environment at international, national, and sub-national levels. The environment has been addressed as an afterthought of economic, physical, and demographic growth. Environmental problems are still considered a technical problem in order to avoid addressing, as much as possible, the socioeconomic and political driving forces creating them and their consequences for societies and nature. The current operational model for the environment followed in many countries, including the U.S. and Mexico, favors fragmented perspectives of complex problems.

We place the discussion of environmental issues between Mexico and the United States within this context. Environmental issues and the management of natural resources have become a significant element of the binational relationship between Mexico and the United States during the last three decades. The environmental challenges now shaping the bilateral agenda for environmental cooperation are formidable and their address engages a rich and diverse set of institutions and stakeholders at multiple levels of government across the international boundary.

This chapter studies environmental issues relevant to the two countries in the 21st century and suggests policy strategies to address them. The first part of the chapter discuss relevant environmental issues common to Mexico and the United States and their potential implications for their relationship in the short and long term. The second part analyzes binational efforts created to manage environmental issues and provide a critical

perspective of their strengths and shortcomings. The last section of the chapter suggests recommendations to address those environmental challenges in the 21st century.

I. Environmental Issues between Mexico and the United States in the 21st Century

Border environmental issues have been the main focus of bilateral environmental agenda during the last 26 years. They are caused by fast and incomplete urbanization and rapid industrialization in Mexican urban areas and to some extent in some U.S. urban areas in the East part of the international border. Growth in Mexican border cities is marked by two important characteristics¹. The first is its inability to keep pace with the demands of a fast-growing population and an accelerated urban expansion, which have resulted in large areas of incomplete urbanization and severe social and environmental problems. The second is the cities' rapid industrialization during the last three decades, which has diversified their urban economy but also modified their urban structure—its daily urban life—and introduced a new set of social and environmental problems. These characteristics have created a peculiar situation: The very factors that give rise to opportunities for economic growth also present obstacles to a balanced development. They have also created fragmented spaces with high spatial segregation that aggravates the social exclusion characteristic of Mexico. Urban spaces at the border are a mosaic of contrasts with a clear division between the formal and informal, the legal and illegal, the rich and poor. Urban growth often takes place outside a framework of urban planning regulations and in risk-prone areas to natural hazards.

Local authorities have little control over small- and large-scale and legal and illegal urban growth. The major driving forces of that growth are associated with

transnational, national, and local socioeconomic and geopolitical processes (international and domestic migration, the operation of transnational industry, violence associated with drug cartels, trade, social and economic crisis, regional disparities, corruption, lack of economic and technical skills of local authorities). Current geographies of exclusion will likely continue during the next decades in Mexico and its border communities.

Environmental problems associated with incomplete urbanization along the border and the management of key natural resources will continue to be a problem at least during the first half of the 21st century.

The case of water

The management of transboundary water resources will become a major component of the binational relations between Mexico and the United States. The centrality of water in the growth and development of the border region insures that water availability and supply remains a critical priority for the governments. It is no accident that this issue-area has generated the greatest contention in the binational environmental relationship and an era of climate change and more frequent and prolonged droughts will continue to test binational resolve in what otherwise stands as one of the success stories in U.S.-Mexico relations, the peaceful management of shared rivers. Water quality concerns have also mounted with the border's urbanization and affect water availability, particularly in meeting the needs of the border's urban areas.

The most serious obstacles in managing binational water resources all have a basis in institutional deficiencies associated with the treaty regime. The 1944 Water Treaty has been justly praised as one of the finest and most enduring components of binational cooperation, securing water supply on the Colorado River and the Rio Grande

and establishing an institutional mechanism for the adjustment of treaty disputes. It is nevertheless 65 years old and fails to adequately address a number of current water supply and water quality problems as well as containing critical ambiguities. These problems, including inadequate procedures for managing persistent drought, failure to secure adequate water for border ecosystems and biodiversity, neglecting to set procedures for sharing common groundwater, and uncertainties bearing on institutional responsibility for sanitation and water pollution, are increasingly important in an era of water scarcity. While advances have been made in addressing these issues, much remains to be done.

Take the case of drought. Chronic drought has afflicted the border region for the better part of two decades, leading national water agencies to downscale expectations for precipitation and long-term water supply on both the Rio Grande and the Colorado Rivers. With the water resources of both major rivers already over-allocated in both countries, treaty mandated water deliveries are more critical than ever. Yet there is presently no effective mechanism for jointly managing the binational watersheds in the interest of long-term, sustainable use of these waters, or dealing with severe sustained drought.

This problem most recently came to a head on the Rio Grande River where, after 2000, the procedure for meeting Mexico's treaty water obligation proved highly unsatisfactory to the United States (CSIS 2003). In this case, Mexico failed to deliver its obligatory water quota after 1992 on the basis of low precipitation in the Rio Grande's Mexican headwaters. When Mexico justified its action on the basis of "extraordinary drought" the U.S. initially rolled the debt over and then claimed foul. The "extraordinary

drought” concept found in the Treaty was never defined, unfortunately, nor was any provision made for adjusting Mexico’s quota under such conditions. A series of bilateral meetings under the auspices of the IBWC led to partial payments and the development of a binational conservation plan in the Rio Conchos drainage, a plan supported conceptually and financially by the BECC and NADB and overseen by the IBWC (IBWC 2002, Vina 2005). Mother Nature did the rest, replenishing national conservation capacity in the Rio Grande’s international storage dams in 2005 (IBWC 2005).

The solution here is indicative of both the problems and possibilities associated with the treaty system and emergent multi-governance environmental management along the border. On the one hand, treaty provisions for Rio Grande drought management are ambiguous, particularly the concept of extraordinary drought and its application. Nor does the 1944 Treaty stipulate the need for integrated watershed management of the river basins or broad participation of stakeholders in international rivers management. On the other hand, neither does Treaty exclude these possibilities should the federal governments see fit to define its terms and adopt such practices. Moreover, the Rio Grande drought deliberations drew on the institutional capacity of the BECC and NADB as well as the IBWC to create a new Water Conservation Infrastructure Fund (WCIF) to improve water conservation in the region (CSIS 2003, Vina 2005), while noting the need to establish a binational watershed board on the Rio Grande to advise the IBWC on river management.

The recent problem on the Rio Grande sets a precedent that can become critical in the 21st century in light of the potential impact of climate change on the availability of water on the Rio Colorado and the Rio Grande. These two water basins are considered among the most vulnerable rivers to climate change in the U.S. (Schaake 1990, Gleick

1993). The appropriation of water in these two basins exceeds the availability of water. They have also complex institutional and legal rules constraining their management. Climate change will be imposed on top of those non-climate related stress. The Colorado river and the upper Rio Grande are snowmelt driven basins and the availability of water depend on the timing of runoff that results from changes in snowfall and snowmelt dynamics. Expected rising temperatures from climate change will impact snow dynamics on those basins. Recent studies estimate climate change could reduce runoff in the Colorado River between 10 to 20 percent (Frederick and Gleick 2001).

Gleick's (1988) study on the implications of climate change for the international agreement between Mexico and the United States over the Colorado River concludes that climate change will put unanticipated stress on the treaty. He recommends clarifying in the treaty certain key points related to shortages, resolving disputes and salinity.ⁱⁱ Nash and Gleick (2001) studied the potential impact of climate change on water quality in the Lower Colorado River. They considered the water quality standards for water delivered to Mexico. Salinity was evaluated at Imperial Dam. Their results suggest that increases in salinity were disproportionate to decreases in runoff: an 11 percent decrease in runoff resulted in a 20 percent increase in salinity. The expected drop in runoff under climate change scenarios would aggravate existing salinity problems in water delivered to Mexico from the Colorado River.

Other studies provide additional evidence about the future importance of transboundary water resources between Mexico and the United States. A recent study on patterns of drought in the Colorado River uses a hydroclimatic index to study drought occurrence in the basin (Ellis et al. 2009). Their results show that the past century was

characterized by an increase in the area of drought during the warm portion of the year almost exclusively as a result of climatic warming. In recent decades, the drought coverage increased earlier in the year during spring primarily as a function of warming, but in combination with a decline in precipitation for a significant portion of the basin. Their results support those from previous studies highlighting the impact of temperature increase on the snow dynamics and the availability of runoff in the basin mentioned above.ⁱⁱⁱ Colorado River runoff is sensitive to climatic variability and change in part because of the arid nature of the region, the high levels of demand for water from the river, and the way the system is operated. Several studies concluded that climatic changes would, under the current rules known as the "Law of the River," have dramatic effects on water availability and quality (Glieck and Cahlecki 1999).

The impact of climate change on surface transboundary water resources will increase the pressure on groundwater along the U.S.-Mexico border in the 21st century. Numerous human settlements rely on groundwater underlying the international boundary but this too is one of those lacunae in the 1944 Treaty (Mumme 2002). In 1973, in what is still a controversial decision, the governments linked groundwater to the Treaty in their solution to a binational crisis over the salinity of treaty water on the Colorado River. Since then, little progress has been made towards reaching a comprehensive agreement on groundwater management along the boundary. The absence of any agreement on groundwater has contributed to binational disputes at several locations on the border, most notably in the case of a U.S. initiative to line the All-American canal with impermeable concrete so as to avoid future seepage from the canal. The canal since 1942 has been the conduit for Colorado River water destined for California's Imperial Valley

and runs nearly 20 miles just north of the international line. Unfortunately, Mexican farmers depend on this seepage as do several wetland way stations for migratory birds just south of the border. Further west, in the Santa Cruz river basin at Ambos Nogales, Mexican pumping south of the border and efforts to reclaim wastewater that now flows south to the United States threaten wetlands and vegetation along the Santa Cruz River. The groundwater problem is most acute at El Paso and Ciudad Juarez which jointly depend on several aquifers linked to the Rio Grande. Both of these contiguous cities are heavily dependent on underground supplies and presently engaged in what amounts to a dangerous race to the bottom of the aquifers.

While bilateral cooperation on groundwater has been elusive at best, there are recent signs of movement toward binational cooperation, however modest these may be. In 2006, the U.S. Transboundary Aquifer Assessment Act was signed into law authorizing up to 20 million USD for studies of select border aquifers including those at El Paso and Cd. Juarez and the Santa Cruz (TAAA 2006). In an unusual but promising departure, Mexico was expressly named a partner in these studies, to be completed by 2016. Funding for the first stage of this project is now in place. In other localities local initiatives to conserve groundwater are also beginning to emerge that take advantage of the La Paz process.

Concern for the ecological uses of treaty water has surfaced since the mid-nineties in response to growing water scarcity along the border and its adverse impact on ecosystems. The 1944 Treaty in its Article 3 prioritization of water uses failed to recognize these claims on shared water resources, effectively assigning them to a catchall category of “all other beneficial uses” of treaty water (Treaty 1944 Art. 3, Mumme

2002a). Pressed by environmental groups and other stakeholders, the two governments have established a binational task force to look at the situation in the Colorado River Delta where U.S. conservation measures upstream threaten the survival of the Delta's ecosystem which provides vital ecosystem services to both countries (Culp and Glennon 2002, IBWC 2000). Solutions, if they are to be found, are likely to involve complex energy-environment trades and innovative uses of urban and agricultural wastewater involving BECC and NADB resources and considerable diplomacy at the level of the governments and the IBWC.

In sum, cooperation on water resources will remain a core component of the binational environmental agenda in the 21st century. The sustainable management of shared rivers and streams and transboundary aquifers benefits from a strong treaty system though much needs to be done in adjusting the treaty mechanism to meet present and future needs within the major river basins. Newer institutions including the BECC and NADB now enhance binational capacity to craft solutions to pressing border water problems but generating the political will for reform where water is concerned is still an uphill battle, particularly in the United States where water policy is dominated by state and local interests.

Border environmental problems

The rapid growth of urban areas drives most contemporary environmental cooperation initiatives along the border. Population growth on both sides of the border has long exceeded national average, with the population of Mexican municipios developing at a rate of 3.9 percent and U.S. population at 2.9 percent for the period 1950-

2000. More than 12 million people reside along the border with numbers nearly equally divided between the two countries according to the 2000 census (Anderson and Gerber 2008: 36). As scholars rightly note, much of this demographic growth is attributable to industrialization along the Mexican side of the border, particularly the assembly manufacturing industry, or maquiladoras (Kohout 2009). The stresses of rapid development were very much in evidence prior to 1994 when the NAFTA agreement took effect and as many analysts supposed have amplified since. The environmental dimension of rapid growth has meant rising threats from hazardous and toxic substances, particularly in the form of industrial wastes, contamination of water supplies arising from unregulated industrial discharge and poor public sanitation, degradation of air sheds, and the deterioration of landscapes and ecosystems supporting vegetation and wildlife. Urban growth also meant greater hazards, whether from the transportation and storage of toxic products, industrial accidents, or natural hazards (Liverman et al. 1999, Sanchez 2002). However, not all of those problems will have an impact on the binational relations in the 21st century. Those problems with consequences across the international border will continue to be a source of conflict between Mexico and the U.S. The case of sewage as a source of transboundary pollution illustrates the dynamics of environmental problems in the bilateral relations. Sewage will continue to be a problem for Mexican border communities but its impact on binational relations will decline in the near future. Spills of uncollected raw sewage flowed across the international border representing an important source of bacterial pollution for years^{iv}. The control of those sources of pollution have played a central role in binational environmental cooperation. Major investments have been made to control this problem during the last two decades. Although current capacity

to collect and treat raw sewage from Mexican border communities lags behind the demand created by urban and population growth, its importance as a major source of transboundary conflict will likely decline in the coming decades due to two factors: sewage is and it will become a major resource to expand scarce water resources along the border^v; urban growth in the Mexican border communities is shifting South of the border where land is still available.

In contrast, air quality will likely increase its importance as a source transboundary pollution. Although air quality was one of the initial problems that triggered binational negotiations leading to the creation of the 1983 Binational Agreement, it received significantly less attention and investment compared to the control of wastewater. Despite some early success in the control of point sources, other non-point sources and new point sources will remain sources of transboundary pollution during the 21st century. Urban growth in both sides of the border and the difficulties to control sources of air pollution in the U.S. and Mexico are obstacles likely to continue during the first half of the 21st century^{vi}. The trend to relocate energy facilities (power plants, and gas plants) to the Mexican side of the border will continue to become a source of concern and potential controversy in the bilateral relations between Mexico and the U.S.

The control of hazardous substances and waste has special importance in the US-Mexico border region. Rapid industrial growth of the maquiladoras during the decades, together with the lack of resources for environmental protection, has expanded the amount of pollution caused by the mismanagement of hazardous waste throughout the region. Mexico's very limited capacity to dispose of hazardous waste should be regarded as a major bottleneck to improve environmental protection in this region. Although most

of these problems are local to the Mexican side of the border, they could have consequences across the border like in the case of illegal dumping of hazardous waste in the sewage system, the contamination of groundwater, emissions of organic compounds common in several industrial sectors of the maquiladora and Mexican industries, and environmental contingencies caused by industrial hazards. The illegal export of hazardous waste will remain a source of binational concern in the coming decades.

Other environmental risks associated with hazardous substances and hazardous waste arise from the limited amount of control on the use of pesticides in the agricultural areas of the border (Mexicali, Nogales, Ciudad Juárez, and the Lower Rio Grande/ Río Bravo). Although there are no detailed studies of the environmental problems created by the use of pesticides along the border, health problems have been associated with the indiscriminate use of these compounds.

Municipal solid waste is one of the most apparent environmental problems in the Mexican border cities with some transboundary implications (the burning of solid waste, and as breeding ground for vector-borne diseases). But binational controversy is likely to occur by the location of landfills close to the border area, particularly on the U.S. side. Urban areas will continue to struggle to reduce the volume of waste generated and its appropriate care. The not in my back yard syndrome encourages the location of those facilities along the border area. This problem has sparked controversy in several border communities in the past and its likely to continue to be a problem in the future.

Natural hazards will likely become a major area of transboundary collaboration in the 21st century. A significant number of border community on both sides of the border are vulnerable to the negative impacts of climate variability and climate change. Disasters

resulting from climate related events or other natural hazards (earthquakes in California and flooding in Mexican cities) will increase due to the difficulty to improve and balance the path of growth of border communities. Reducing their vulnerability and enhancing their adaptation to climate variability and climate change will depend in part of transboundary collaboration.

Health issues have often not considered within the analysis of environmental issues. But many of those problems are associated to environmental hazards and it is worth including them in this discussion. Health consequences of incomplete or deficient urbanization (water-borne diseases, respiratory diseases, pests), climate variability and climate change (vector-borne diseases, heat stress, respiratory diseases, water-borne diseases), natural hazards, or the social dynamics of the border communities (infectious diseases), have transboundary consequences and require binational attention and coordination. Efforts to construct integrated and multidimensional perspectives of border environmental problems will enhance the visibility and attention to health issues in the bilateral relations.

The border area is also characterized by widely divergent ecological zones and habitats, ranging from salt and freshwater marshes to volcanic deserts and mountain peaks. The ecological functions provided by these areas underpin the regional economy, as in the case of the Gulf of California and the Laguna Madre of Tamaulipas that serve as important breeding grounds for commercial species of fish and shrimp. There are also protected areas in the Mexican side that are contiguous with protected areas on the U.S. side of the border^{vii}. Conservation efforts of bio resources has been a source of collaboration rather than conflict in the bilateral relations. The importance of those

resources in the 21st century will enhance the role collaboration in the bilateral agenda. Critical in this regard is the construction of integrated perspective of how those efforts interact with other elements of the bilateral agenda. The controversy surrounding the construction of the border fence in large parts of the border area fragmenting natural habitat of species extending across the border illustrates the importance of comprehensive and integrated perspectives of the bilateral agenda between Mexico and the U.S.

II. The Institutional Dimension of Binational Environmental Cooperation

The bilateral framework for addressing shared environmental challenges along the U.S.-Mexico border is today crafted around a triptych of agencies and programs with distinct missions whose role and functions have become increasingly complementary in the NAFTA era. The oldest of these, with particular relevance to the management of border water resources, is the International Boundary and Water Commission, United States and Mexico (IBWC), whose mandate is found in the 1944 U.S.-Mexico Water Treaty. The IBWC oversees the allocation treaty water resources, hydropower operations on the Rio Grande River, and flood control infrastructure on both the Rio Grande/Rio Bravo and Colorado Rivers in their boundary reach. It also has a hand in the management of sanitation and water quality along the border. The 1983 U.S.-Mexico Border Environment Cooperation Agreement, popularly known as the La Paz Agreement, provides the basis for binational dialogue and programs addressing water quality, urban and industrial environmental problems, biodiversity protection, environmental education, environmental enforcement, and environmental justice. Complementing the La Paz framework and contributing to its implementation, the Border Environment Cooperation

Commission (BECC) and the North American Development Bank (NADB), established in 1994, provide leadership, technical support, and financing for needed border environmental infrastructure projects along the border. While these are the leading agencies and programs guiding binational cooperation on environmental matters, other agencies, the Border Health Commission (BHC) and the Commission for Environmental Cooperation (CEC), also established in 1990's, enrich the institutional mix and contribute to binational capacity for environmental protection along the international border.

What has emerged with the NAFTA era is, in fact, a new politics of multi-level governance and growing intersectoral coordination among many agencies, national and international, for the purpose of environmental protection along the border. This pattern of environmental governance has been nurtured and shaped by the La Paz process which allows for incremental advancement on environmental concerns as the governments consent. Within any particular environmental area it varies according to pre-existing institutional commitments and national interests and capacities and is shaped by the political mobilization and participation of stakeholder communities that today include a rich mix of state and local governments and non-profit, citizen based actors. Yet it is still a work in progress in a policy arena where problems often outstrip capacity for achieving long term, sustainable solutions.

The hallmarks of this intensified level of cooperation were money—in the form of shared federal financing for border projects—and a set of goals and practices best expressed by the new Border XXI Program's core components: “public involvement, decentralization of environmental management through state and local capacity building, and improved communication and cooperation among federal, state, and local

government agencies,” each element advancing the goal of sustainable development. The governments vowed to contribute nearly 500 million annually through the environmental ministries and the newly created Border XXI Program, and even more in the form of project assistance through BECC and NADB (EPA 1996: Appendix 4). While these commitments fell well short of the 22 billion in estimated environmental infrastructure needs at the border, they nevertheless represented an unprecedented increase in federal attention and a new level of binational cooperation for environmental improvement at the border.

The La Paz process provides the framework but BECC has become the institutional centerpiece of the new binational system for environmental cooperation. Structured as a truly binational agency with rotating national directors, BECC and its projects model civic virtue. Environmental groups, originally represented on BECC’s board, effectively championed openness and transparency in BECC proceedings. BECC’s primary mission from the outset has been to focus on water and wastewater infrastructure by certifying and assisting in financing eligible projects.

In the field of water and sanitation, the BECC partnering with NADB and EPA had certified 40 projects, investing nearly a billion dollars in needed infrastructure. On air quality, the JAC produced a comprehensive strategic plan setting priorities for air shed improvement at El Paso Juarez, established air quality monitoring networks along the border, developed air quality management plans for Cd. Juarez, Mexicali, and Tijuana, monitored vehicular emissions at key border crossings, and initiated an Emissions Inventory Development Program to strengthen Mexican capacity for monitoring and assessing air quality problems in the border region (EPA 2001: 21).

With the Border 2012 Program many of these gains have continued, while others have floundered. The La Paz Process was re-crafted as a new ten-year program, Border 2012, concentrating on environmental protection and shaving off the earlier issue-based, border-wide and binational workgroups in favor of a more decentralized, bottom-up model of localized binational task forces, regional and border-wide workgroups, and border-wide policy fora (USEPA 2003). The majority of BECC's 157 projects through the summer of 2009 have been in this area. These projects, most supported in some aspect from NADB funds, entail nearly 3 billion dollars in total investment originating largely from government sources (BECC/COCEF 2007). Conservation partnerships were left to the appropriate federal and state agencies operating under the auspices of the Mexico-US-Canada Trilateral Committee and supported by the CEC.

Institutional Challenges

The deepening of binational environmental cooperation since the mid-1990's is certainly one of the success stories in U.S.-Mexican relations. Yet the political momentum supporting these initiatives that came with the NAFTA accords has stalled since the late 1990s, a victim, in part, of institutional deficiencies, but mostly owing to changing national priorities.

The institutional challenges associated with binational environmental cooperation arise in part from the mandate and design of the agencies and programs outlined above. In the case of binational water management the treaty system overseen by the IBWC was designed primarily to secure national water supply on the Colorado and the Rio Grande Rivers. The IBWC's mandate was fundamentally structured around water accounting

and delivery; it was not meant to function as a comprehensive, basin wide water management agency on either river. Until the 1990s, reliable precipitation postponed the need to confront certain problems in treaty interpretation. Other assigned responsibilities like sanitation were originally thought to be residual functions. Over time, however, the role and functions of the IBWC have changed. Rapid demographic growth and prolonged drought have ushered in new demands on the treaty system requiring adaptation and adjustments in treaty understanding and greater enmeshment with institutional partners in crafting binational solutions.

If we turn to the institutional problems of urban environmental management and environmental health we find a range a mix of binational structures and practices designed to address a broad spectrum of environmental problems that are biased in the direction of binational dialogue and procedural engagement and remain highly dependent on the willingness and economic, financial and technical resources of the two federal governments to invest in support of these projects and programs. Much as they were faulted in the run-up to NAFTA, the La Paz process and the successive programs intended to give it effect may still be criticized as a congeries of ad hoc or disparate measures focused on specific environmental problems but lacking in strategic vision and staunch binational commitment to this vision. There is no doubt that the level of binational commitment and the range of these programs increased markedly after 1995. In their implementation, however, the various programs remain heavily dependent on domestic agencies that are not always well integrated intersectorally and thus liable to bureaucratic rivalry. The BECC and NADB may be seen as a partial exception to this rule

as they were structured as genuinely binational organizations with respective mandates to develop and fund needed border environmental infrastructure projects.

Unfortunately, progress in binational environmental cooperation was affected by the tragic events of September 11, 2001, as the U.S. administration intensified its focus on unauthorized immigration and security. The shift in priorities was most apparent in steadily declining revenues for La Paz programs—by 2008 annual U.S. border program funds were just around 10 million USD, just ten percent of where they were in 1997. The Border 2012 operating budget fell to under 5 million dollars for 2009 (USEPA 2008: 11). The financial squeeze was evident across board, from contributions to BECC's project development assistance program to travel funds for Border 2012 task forces along the border (Paterson 2008), sufficiently severe to prompt the U.S. Western Governors Association to appeal to Congress for direct funding of Border 2012 programs (Western Governors Association 2006).

Security unilateralism has further complicated matters. Expansion of the U.S. border fence beyond San Diego-Tijuana and handful of other urban corridors after 2006 posed a serious threat to conservation practices along the international boundary (Davis 2006, Segee and Cordova 2009). As authorized in the U.S. Secure Fence Act of 2006 (PL109-367 2006) the 700 mile multibillion dollar fence is one of the largest infrastructure projects ever undertaken at the border. As the project moved forward, environmentalists and Mexican stakeholders including SEMARNAT expressed concern for its adverse environmental impacts even as the Department of Homeland Security waived U.S. environmental laws and ignored bilateral agreements to push the project forward.

A critical analysis of the success of binational cooperation addressing environmental problems yield mixed results at best. Despite the achievements in building bilateral collaborations, the creation institutions and funding of projects, border environmental problems have increased instead of declined. Even those problems where most of the investment has been concentrated (sanitation services) have at best created short-term solutions to long-term problems. 25 years of binational collaboration do not create a brighter perspective of environmental problems in the 21st century.

As mentioned above, binational environmental cooperation has been built without a clear vision and strategy for a long-term process. It has been based on ad hoc actions designed as responses to political pressures on the two federal governments. The result is a strong imbalance in funding on environmental programs. Over 95 percent of all funding up to 1998 was invested in sanitation services (Sanchez 2002). This situation has not improved significantly during the last decade. Despite the broad structure of binational cooperation and the large number of projects addressing other environmental problems, funding in the solution of those problems has been symbolic.

The lack of a vision and clear strategy for binational environmental cooperation is also due to deficiencies in the two federal agencies coordinating environmental cooperation (EPA and SEMARNAT). The two agencies use a managerial approach to address environmental issues. Several scholars have pointed out the limitations of a managerial approach. Scholars highlight the detachment of environmental management from its political and economic dimensions, the divorce between local environmental policymaking process, the broader issue of governance and regulation of local economies, and attempts to resolve environmental problems in a more ad hoc, piecemeal

fashion (Carley and Christie 1993, Redclift 1994, Gibbs and Jonas 2000).

The above criticisms to environmental managerialism apply to binational cooperation on environmental issues at the US-Mexico border. Binational actions under the La Paz agreement, IBEP, Border XXI, and Border 2012 have been a set of technical reactive responses triggered by political pressures and not as elements of a clear vision and strategy for sustainability. This fragmented approach helps explain the significant imbalance in investment in sanitation services compared to the rest of border environmental issues mentioned above. On the ground, each environmental problem has been considered in isolation from other problems (no multimedia analysis) and detached from its social, economic and political dimension (causes creating those environmental problems and consequences resulting from them). The design of binational environmental projects departed from the physical manifestations of the problem and did not address the social processes behind them. As a result, binational actions achieve only temporally solutions to long- term problems. The complexity of those problems is due not only to the transboundary nature of the environment at the US-Mexico border and the significant cultural, social, political, and economic differences between Mexico and the U.S. It is also due to the dynamic interaction among environmental issues and of these different components.

In summary, the failure of binational actions to address environmental issues within a comprehensive context of development for the border area explains current inability to solve a large number of environmental problems. Binational environmental cooperation has been a self-contained and closed system not coordinated with other sectors involved in the growth and development of the border area (i.e. industry, trade

and services, urban growth, health) at the federal, state and local level. It has been a set of technical responses in an ad hoc fashion. This fragmented perspective of the environmental creates fragmented solutions that do not address the driving forces of the problems or their social and economic consequences. Binational cooperation requires a new approach seeking alternative strategies for development according to the needs of the reality of the border communities. This new approach is particularly critical now that the developments and rapid progress in binational environmental cooperation that came with the NAFTA accords, has slowed even as the border's urbanization and industrialization has accelerated. The beginning of the 21st century is characterized by economic asymmetry, the aggravation of social inequality, global and regional biophysical problems (climate variability and climate change), increasing insecurity and violence, and an intensification of human intervention in natural processes and transboundary ecosystems. These stresses require renewed commitment, creativity, and long-term strategies on the part of the governments and further institutional reform if the gains of recent years are to be consolidated and strengthened in the coming decades.

III. Advancing U.S.-Mexico Environmental Cooperation in the 21st Century

Advancing environmental cooperation in the 21st century requires a set of complementary short and long-term actions. A fundamental step is the creation of a clear vision and strategy creating alternative paths of growth and opening opportunities for sustainability and development. The strategy should be based on multidimensional incremental and complementary steps leading to achievable goals on the short, middle, and long-term. They should address the social, economic, cultural, political, technical,

physical, and biophysical dimensions involved in environmental protection and the sound use of natural resources. This will help achieve greater attention to the articulation of existing institutions and programs with each other and the better integration of environmental programs with other important policy sectors guided by sensitivity to ecosystems as well as human needs.

Institutions, particularly public institutions, are reluctant to change. Overcoming the institutional challenges mentioned above and providing better opportunities to address environmental problems in the bilateral relations requires policy on two parallel tracks. One set of actions will use the existing institutions taking advantage of the advances in bilateral environmental cooperation created during the last 25 years and particularly after the implementation of NAFTA (working groups in the Border 2012 program, IBWC, BECC, NADB, CEC). These strategies are oriented to consolidate and refine the institutional advances of the post-NAFTA era and increase their fiscal support for environmental cooperation in the years ahead. It is worth stressing the importance of basing these actions on multidimensional and integrated approaches in order to better address the driving forces and consequences of environmental problems. The parallel track will focus on progressive changes in the structure and operation of existing institutions, including the possibility to create new institutions. Governments should recognize the limitations of current institutions and approaches, some of them designed almost 40 years ago. Addressing the challenges of societies in the 21st century requires creative responses. The timing is right. Climate change and other global environmental problems are fostering ideas and debate about governance approaches to response to global, regional and local challenges.

The following policy actions can be addressed in the first track on the short and mid-term.

The recent progress the two countries have realized in the area of water management is indicative of the feasibilities and opportunities for better securing national water endowments and sustainably managing shared water resources. In this issue-area the IBWC and the treaty regime for sharing water resources has been reinforced by its partnerships with the BECC and NADB and its recent movement into the area of water conservation. The following policy actions are needed in the short-term.

IBWC must consider the impact of climate variability and climate change on runoff in transboundary surface and groundwater resources. Data and information of climate change scenarios and the results of studies of climate variability are available and are useful tools to create updated perspectives on the state of transboundary water resources. This perspective will help better address critical pending issues in the treaty.

One outstanding problem is strengthening the Treaty system for ecosystem protection. This problem is exceptionally challenging when measured against the over-appropriation of the rivers, the extraordinary demands now placed on shared water resources, and the decline of runoff caused by climate variability and climate change. Yet, this eventually must be done if the two countries are to preserve and protect their natural systems. Recent institutional development is favorable to certain types of solutions that are now under consideration by government agencies and environmental advocates. The expansion of the BECC and NADB's mandate and geographic jurisdiction, for example, enables these agencies to develop and fund conservation infrastructure dedicated in part to ecological functions. If collapse of the Colorado River

Delta ecosystem is to be avoided, for example, the solutions will almost surely entail some mix of supportive infrastructure development and hydrological exchange associated with urban and agricultural uses of water resources in the lower Colorado River zone.

The problem of salinity should also be considered by IBWC in light of the impact of climate change and the decline of runoff on water quality. It is essential to incorporate in the negotiation of this problem an assessment of the short and long-term availability of water and the match or mismatch with present and future community needs. New innovative alternatives should be considered in the negotiation of this problem.

Short-term policies should enforce the IBWC's own recommendation that the governments create a basin-wide advisory body for the Rio Grande River. Such an advisory mechanism would assist the Commission in collaborating with the full range of stakeholders and advising the federal governments on drought mitigation and watershed protection affecting the international reach of the river and better enable both countries to meet their treaty obligations. Consolidating this advisory principle on the Rio Grande would move the two countries in the direction of more integrated and cooperative river basin management, practices that will be ever more necessary as the two countries confront the challenge of climate change on their transboundary watersheds. Similar actions should also be considered for the Colorado River and other smaller water basins along the border.

Long neglected by the governments, groundwater reform now appears feasible. The Transboundary Aquifer Assessment Act favors binational cooperation in understanding the technical parameters of shared groundwater assets at key locations on the border. Binational agreement on the data is a predicate for any future collaborative

management of these resources. As border cities move to adapt desalinization technology that allows the utilization of low-grade brackish groundwater for municipal and industrial needs there is further incentive to cooperate developing these waters.

Long-term policies will likely require revising the domestic water legislation in both countries and updating and improving the binational treaty, including the revision of the role of the IBWC. The climatic conditions suggested by global circulation models for the region in the second half of the 21st century will aggravate current pressure on water resources and it will likely foster new legal arrangements to manage binational water resources.

The governments should consider criticisms directed at the Border 2012 Program and the La Paz process in the definition of policies strengthening binational environmental cooperation. The sustainability of the border communities is jeopardized by the severity of environmental problems and the availability of water during the next decades. Addressing those problems requires new and creative approaches beyond environmental managerialism mentioned above. The environment cannot continue to be considered an afterthought of economic, population, and urban growth any longer. Nor can fragmented perspectives of environmental problems provide sustainable solutions to them.

Short-term actions will require strengthening the current structure of binational cooperation with a renewed commitment to provide financial, technical, and human resources to address the broad array of environmental problems along the border. Attention should be given to avoid emphasis on water sanitation in detriment of other environmental problems during the last 15 years. Emphasis should be given to

empowering local communities to allow them a major role solving development pressures and environmental problems. This will involve a multilevel governance process with participation of a broad range of authorities and stakeholders in the two sides of the border at the international, national, state, local level. Multilevel governance will facilitate political and administrative decentralization of financial, technical, and human resources to the local level. It will also involve an active role of the federal and state governments to coordinate and support local policies and avoid malfunction of local strategies.

New approaches for binational environmental cooperation also means addressing non-urban issues along the border. In this respect, binational cooperation on conservation and biodiversity deserves renewed attention. The problem here has long been the bureaucratic fragmentation of agencies with ecological responsibility in the U.S. that complicated budgeting for binational activities and creates rivalry between the EPA and other influential government departments. And yet, the La Paz Agreement explicitly incorporates cooperation in natural resource conservation as part of its mandate (Agreement 1983). At a time when wildlife conservation is increasingly stressed by climate change and human interventions it is imperative that binational and trinational initiatives become better integrated and better supported by the governments. Policies should take advantage of bilateral mechanism provided by the La Paz Agreement for doing so. Linking La Paz authority more concretely to the conservation work of the two governments' federal natural resource agencies would strengthen these programs. Closer ties to the trilateral CEC's biodiversity program should also be expanded. Biodiversity

and habitat conservation along the U.S.-Mexico border area in the 21st century will also required creative approaches and multilevel governance across the international border.

The second part of this chapter identified the failure of the two governments to place binational environmental actions within a comprehensive context of development for the border area as one of the main reasons explaining the current inability to solve a large number of environmental problems. Overcoming this problem requires a long-term strategy capable of creating integrated perspectives of growth and development, including building new border institutions. It is time the two governments recognize the limitations of current environmental institutions managing border environmental problems. Without an integrated perspective of growth and development pressures in the region and its communities, it will be difficult to expect much improvement in border environmental problems. It is worth remembering current institutions were not designed to address the complexity and dynamics of multi-scales and multidimensional problems of the 21st century shared by the two governments along their common border. Improving future conditions at the U.S.-Mexico border area requires creative strategies guiding efforts to solve environmental and development problems. Building new institutions is part of that process.

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ⁱ Historically, much of the border communities' uneven urban growth was due to imbalances in federal policies, which promoted rapid economic growth in the region (by funding highways, energy facilities, communications links, and industrialization) without making parallel investments in social infrastructure (housing, public services, infrastructure, environmental protection).

ⁱⁱ By the same token, Goldenman (1990) study on climate change and international water treaties (including the one between the U.S. and Mexico) concludes that international mechanisms governing shared rivers under conditions of changing climate are immature at best, or non-existent.

ⁱⁱⁱ Thomas (2007) obtained similar results in his study forecasting streamflow in the Lower Colorado River basin under climatic fluctuations.

^{iv} Sewage spills occur because the increase of wastewater generated by the expanding population exceeds the capacity of the existing pipes (Sanchez and Lara 1993). The combination of uncollected raw sewage in slums and low-income neighborhoods, spills in other parts of the city, and gaps in the extension of networks goes far toward explaining the high incidence of water-borne diseases in Mexican border communities. Untreated sewage also poses a constant threat of contaminating surface and groundwater resources. The illegal discharge of hazardous wastes into municipal systems or open waterways adds to the environmental problems and health risks created by deficiencies in

urban infrastructure. Currently there are no comprehensive and systematic water quality programs in any of Mexico's border cities that could clearly identify hazardous waste pollution. This illustrates the importance of multimedia analysis in the study of border environmental issues.

^v The treatment and reuse of wastewater will become a critical resource to increase water availability for urban uses, including drinking water, in the coming decades. Many urban areas around the world have begun considering wastewater a valuable resource. Some border communities have begun to value wastewater (the two Nogales and the Tijuana-San Diego area) and others will likely continue in the near future.

^{vi} Air pollution sources include: fixed sources (power and industrial plants); mobile sources (cars and trucks); particulate matter (windblown dust carried from unpaved roads and eroding areas, the burning of solid waste, aggregate mining and construction, and crop burning in the rural areas). The strange blend of incomplete urbanization and economic growth that characterizes border cities explains the combination of these pollution sources. The added volume of transient vehicles due to the area's high number of border crossings aggravates transboundary air pollution.

^{vii} In Baja California and Sonora, the Alto Golfo and El Pinacate reserves are contiguous with the Organ Pipe Cactus National Monument and the Cabeza Prieta wildlife refuge in Arizona. Two of three new protected areas in the Mexican side of the border Texas (Sierra del Carmen in Chihuahua and Cañón de Santa Elena in Coahuila) are contiguous with Big Bend National Park in Texas; the third one is located in the Laguna Madre of Tamaulipas which is an extension of the Laguna Atascosa in Texas.