WATER WARS:

WATER CRISIS DESTABILIZING NORTHERN MEXICO AS THE YAQUI LOSE MAJOR WATER BATTLE IN SONORA

Author Tom Barry

CENTER FOR
INTERNATIONAL POLICY

AUGUST 2015

The Mexican border state of Sonora is expanding its hydraulic society in the face of climate change, an escalating water crisis, and indigenous opposition.

This Center for International Policy investigative and policy report examines Sonora's water crisis and the faltering condition of the state's hydraulic society—a society largely shaped by and dependent on governmental water projects. A close look at the controversy over a new aqueduct pumping water from the Yaqui River illustrates the new water tensions that societies on both sides of the border are experiencing and underscores problematic and unsustainable responses to the water disaster developing across the transborder West. The first part of the report examines the issues directly associated with the Yaqui water war, while the second part examines the mining boom and impacts on the Sonora and Yaqui Rivers.

Part One

I. Introduction

Across the arid U.S. West and Southwest, enthusiasm for traditional hydraulic solutions—from damming rivers, pumping diminishing groundwater reserves, and delivering distant water—through aqueducts, is waning.

Higher temperatures, prolonged droughts, and the long-term dysfunction of hydraulic infrastructure make radical reforms in water policy necessary. Community and government planners are advocating for more sustainable solutions to the spreading water crisis, including voluntary and enforced conservation, groundwater pumping regulation, and more efficient water-distribution systems in the city and countryside.

The transboundary region of the North American Southwest[1] is a mostly arid or semi-arid region that hosts North America's four major deserts—the Chihuahuan, Great Basin, Mojave, and Sonoran Desert. The great arid lands and deserts of North America don't stop at the boundary line between Mexico and the United States, with the Sonoran and Chihuahuan Deserts extending deep into Mexico. Similarly, the transboundary water basins and rivers, including the Yaqui River, flow across the international border.

Northern and north-central Mexican states face the same threats and fears regarding their water future. To varying degrees, most Mexican cities and rural areas are seeing traditional supplies of water become less reliable. Yet despite warnings by environmental organizations and scientists, politicians and governmental officials are meeting water crises with the traditional solutions of hydraulic societies, or societies that have been traditionally reliant on water transfer techniques. Nowhere is this retrograde response as evident as in the border state of Sonora.

Temperatures in Hermosillo, the capital of Sonora, and the Yaqui Valley are regularly rising to record highs. Water basins, notably the Sonora River Basin on which Hermosillo has traditionally depended, are severely depleted. To the west of the city, great extensions of the coastal plains that for four decades were dedicated export-focused agribusinesses now lay abandoned—poisoned by salt residues, and subsiding and cracking as the result of grossly unsustainable groundwater extraction.

For the past five years, a conflict over water has divided Sonora into contending alliances. In 2010, Sonora's newly elected governor, Guillermo Padrés Elías, with financing from the National Water Commission (CONAGUA), proposed an array of water megaprojects supervised by a new bureaucracy, Sonora Integrated System (Sonora SI). The most controversial project was the Novillo-Hermosillo aqueduct, also known as Independencia, a 155-kilometer project that is transferring water from the Yaqui River in the mountainous west into the heart of the Sonoran Desert. The Independencia project has ignited perhaps the most prominent of the water wars in the transborder West.

"No al Novillo" blockade of Highway #15 in June 2013 at Estación Vícam.

Many indigenous communities have been adversely affected by these government-supported megaprojects. The Independencia project would displace and contaminate parts of the desert inhabited by the Yaqui, an indigenous tribe that fiercely resisted Spanish and Mexican occupations. After the governor's proposal, the Yaqui took their place at the vanguard of the "*No al Novillo*" opposition campaign. Their intermittent blockades of Highway #15—western Mexico's main north-south highway—attracted national and international news coverage. The government's disregard for the rights of the Yaqui sparked a national solidarity campaign on behalf of the Yaqui that included other affected communities, dozens of nongovernmental organizations, and Mexico's left, including the Zapatistas in Chiapas.

Meanwhile, the Pilares dam being constructed across the Mayo River by Sonora SI and CONAGUA threatens a less-known indigenous people. The Guajiríos are among those most adversely impacted by the Pilares dam. This diminishing group of deeply impoverished native people inhabit small settlements along the western Sierra Madre in southeastern Sonora and southwestern Chihuahua.

Mexico would do well to look how the breakdown of hydraulic solutions is playing out to its north, given how much it has modeled the modernization of its own arid frontier territories on the U.S experience. Despite the fortified border, U.S. society and economy remain intricately linked to Mexico, especially the border states like Sonora—a principal source of

minerals, produce, and industrial products (like Ford vehicles manufactured in Hermosillo) and home to hundreds of thousands of U.S. residents.

A closer look at the contributing causes of the Yaqui water war may point out ways to avoid other water wars and possible ways to resolve the lingering issues left unresolved by this complicated dispute over the remaining water resources in the border state.

II. Making the Desert Bloom: The Rise of Sonora's Hydraulic Society

When you cross into Sonora from Arizona, you leave one hydraulic society and enter another. Both states are at risk. The water megaprojects— dams, reservoirs, aqueducts, and cement irrigation canals— that have made Sonoran Desert bloom with farms and cities are no longer sufficient. As temperatures rise, evaporation takes its toll, and droughts persist, there is an alarming discrepancy between water demand and available supply.

Since the 1930s, Arizona and Sonora have confidently expanded their desert societies with the conviction that water would always follow money.

Federally funded dams and water-transfer projects transferred water from mountains and river valleys to some of the hottest and driest places in the transborder West, giving rise to such cities as Hermosillo, Guaymas, Ciudad Obregón, Tucson, Phoenix, and Las Vegas.

When surface water has proven insufficient, there has always been groundwater to tap. First, diesel-fueled pumps penetrated deeper into the aquifers and basins. Then, federal governments in Mexico and the United States brought subsidized electricity to rural areas. Scores of well-drilling firms opened previously untapped reservoirs of fossil water.

Mexico's agricultural sector benefits from the highest electricity subsidies for agriculture of all the Latin American and Caribbean nations,[2] so subsidized electricity prevailed throughout the transborder West. In Mexico, however, electricity costs for agribusiness have been especially negligible when calculating profit margins.

Moving Water to Create Desert Societies

Civilizations that emerged in arid regions, such as those in Mesopotamia (Sumerian, Assyrian) and in Arizona (Hohokam) depended on the managed flow of water for their sustenance, channeling river water into canals and ditches to irrigate their crops. These were among the first pre-modern hydraulic societies—cultures that depended on the ingenious transfer of water through canals and ditches to irrigate lands that otherwise could not be cultivated.

But gravity and the physical bounds of siphoning limited the growth of these civilizations. In times of prolonged drought, no amount of clever engineering and social organization could transcend the limits of proximate water resources.

Modern times—with the advent of fuel- and electricity-driven pumps—have birthed hydraulic societies that have transcended the limits of the area's water resources. Even when drought strikes or a society depletes its river basins or groundwater reserves, hydraulics can still come to the rescue by transferring water from other healthier water basins and by drilling to new depths and in distant aquifers. In other words, modern technology and energy systems can still make water flow, albeit at higher financial and environmental costs.

The question facing Sonora and most other states on both sides of the international border across the transborder West is whether governments and inhabitants are willing to accept the expense and impact of sustaining their hydraulic societies. Will the benefits of new water megaprojects outweigh the costs?

With rare exceptions, comprehensive cost/benefit evaluations don't precede governmental decisions to launch new hydraulic projects. A lack of careful assessment of environmental impacts, costs, and social consequences is the norm, not the exception, especially in Mexico. Superficial, self-serving studies are ordered, completed, and accepted in a nod to governmental regulations concerning consultation, financial accountability, and environmental impact, and the government agencies generally move ahead as planned. The Independencia aqueduct is a prime example of this absence of consultation with affected communities and of a lack of credible cost-benefit and environmental impact studies.

As aridlands societies confront all manner of water crises, the operative imperative is to ensure that water gets to those who have the most economic and political power. With the onset of climate change and the deepening realization of the limits of water resources, the long-dominant power and economic equations no longer hold. New questions about prioritization of water needs are altering prevailing power dynamics, as is so evident in the debate over the Novillo-Hermosillo aqueduct.[3]

Hydraulic Societies, Then and Now

Sonora is a classically hydraulic society. The term "hydraulic society" was coined by a German scholar who found that some of the earliest civilizations were based economically, politically, and theologically on water. In ancient hydraulic societies—such as the civilizations in China and those that developed between the Tigris and Euphrates rivers in the aridlands of

Mesopotamia—the central authorities were the water masters. Their power stemmed fundamentally from their role in managing sophisticated irrigation systems and water-supply systems. If their subjects became thirsty, their authority and power would falter.

Closer to home and more immediate is California, which U.S. scholar Donald Worster and others categorize as a hydraulic society.[4] In his paper "Damming of Sonora," University of Oklahoma scholar Sterling Evans noted that Worster had correctly described the U.S. West as a "region characterized by 'a social order founded on the intensive management of water,' 'communal reorganization,' "new patterns of human interaction,' and 'new forms of discipline and authority.'"[5]

The Illusions and Delusions of a Desert City in Sonora

Traveling south from the border at Nogales through the Sonoran Desert and then passing through the Yaqui and Mayo river deltas of Sonora, the fruits of Sonora's hydraulic society are on display.

During the seven hours it takes to travel from the U.S.-Mexico border twin cities of Nogales to Sonora's southern border with Sinaloa, there are no running streams or rivers. The rivers that once flowed perennially from mountains to the sea—Sonora, Yaqui, and Mayo—are now dry riverbeds except immediately after the monsoon rains.

Cactus, mesquite, creosote, and thorn trees define the natural landscape, except for the vineyards and farmlands around Hermosillo, Ciudad Obregón, and Navojoa. Temperatures rise to 120 degrees or higher in the summer. How is it possible that Sonora has long been one of the top three agricultural states in Mexico? For the few who might wonder where the water comes for the desert cities and for the vineyards and the monoculture agriculture, there are few readily discernible answers.

In Sonora, like Arizona, water for the desert comes from sparsely populated narrow river valleys and high mountains to the east in *La Serrana*, and the north. The state's largest dams lie behind mountains to the east of Sonora's main demographic and farming belt along Highway 15—three on the Yaqui River and one on the Mayo River. In the New Sonora that has bloomed in the Sonoran Desert over the past 75 years, the state's four major dams and reservoirs lie out of sight and out of mind.

Hermosillo is the capital and most populous city of Sonora. Situated a bit more than three hours south of Nogales, Hermosillo offers a clear but disturbing view of the past and the future of hydraulic societies in this transborder region.

There are two must-see sites in Hermosillo. The first is the downtown headquarters of Sonora SI. Surging fountains that rise outside the Sonora SI building tell a story of a future made possible by hydraulic technology and infrastructure, with plenty of water for everyone—expanding desert cities, new agroexport industries, and a booming mining sector.

Next, a short drive to the east takes you directly to Hermosillo's very own water megaproject. Constructed in 1949 by the federal government, the Abelardo Rodríguez dam and reservoir were designed to capture Sonora River flows for use by Hermosillo.

If one were to single out one factor that led to the plans to transfer water from the Yaqui River to Hermosillo, it would surely be the Abelardo Rodríguez dam. For the first two decades, CONAGUA pumped the reservoir water to meet the needs of the rapidly expanding agribusinesses in the county of Hermosillo, which spans more than 14,885 sq. kilometers (5,745 sq. miles). However, in the 1980s, as the booming city grew desperate for water, CONAGUA shifted the flow of the reservoir's water to meet urban needs.

Embankment of normally empty Aberlardo Rodríquez reservoir on Sonora River in Hermosillo.

The Hermosillo dam is only one of many cases underscoring how the hydraulics and water megaprojects of modern Sonora have been breaking down. It's a monumental display of how water megaprojects drive increase water demand and then prove insufficient to the resulting new demands for captured water by the still-booming desert cities, mining sector, manufacturing industry, and agribusiness.

When the reservoir went dry in 1996, the city and state's political and economic elite began seriously considering languishing plans to tap the Yaqui River. Running almost the entire length of Sonora—Mexico's second largest state after neighboring Chihuahua—the Yaqui River is several times as long as the state's other river. The magnitude of its average annual flow makes the Yaqui the state's preeminent river, carrying three times the water as the Mayo River and twelve times that of the Sonora River, which are, respectively the second and third largest rivers in Sonora.

Rush to Meet Statewide Water Crisis

In Hermosillo, with the approval and financial support of CONAGUA, the state and city governments, moved to address the escalating water crises around the state with a series of water projects under the Sonora SI umbrella. Among the first projects were three water megaprojects involving the capture and transfer of water in eastern Sonora.

The top- priority project of Sonora SI—counting on CONAGUA funding and the active support of both Governor Padrés and President Felipe Calderón—was the Independencia (Novillo-Hermosillo) aqueduct. Although discussed over the past two decades by Sonora's political elite, when Governor Padrés announced plans for the aqueduct there had been no public discussion or consultation with the Yaqui people and others whose historic dependence on Yaqui River water would be adversely affected.

The Bicentenario Dam (commonly known as Los Pilares) on the Mayo River and the Revolución aqueduct (both of which are under construction), which will transfer Mayo River water to urban, mining, and agricultural interests in the Álamos and Mayo Valley regions were also pushed through without public debate or consultation with affected indigenous communities. In all three cases, the state and federal government agencies responsible for the water megaprojects failed to take the legally required steps.

III. New and Old Sonora: The Hydraulic and Historic Divide

Sonora has two distinct geographical personalities. Old Sonora lies in the semi-arid to sub-humid east, descending south from the U.S. border and paralleling the western Sierra Madre. The flows of the Sonora, Yaqui, and Mayo Rivers made the narrow eastern valleys of Old Sonora the social and economic core of the territory. It is out of sight, seldom visited, losing population—and losing water.

New Sonora is modern Sonora. It emerged in the heart of the Sonoran Desert in the western half of the state, bordered by the Gulf of California to the west and the mountains and river valleys to the east. It is largely flat, broken up by severely eroded mountainous outcrops, and graced with coastal plains formed by river deltas.

The water for the desert cities and agribusinesses of New Sonora comes largely from the rivers of Old Sonora. The damming, draining, and diversion of the state's rivers has sustained the population and economy of western (New) Sonora. Conflicts are emerging as water shortages and mining in desert Sonora in the west are depleting and contaminating the state's rivers.

Most of the territory's indigenous population lived in Old Sonora, also known as *La Serrana* (mountainous place) when the Spanish arrived in the early to mid-1600s. The Spanish found as many as 100,000 Opata as well as Pima indigenous groups living in the thriving agricultural settlements along the Sonora River and nearby river basins. According to scholars,

they constituted the largest indigenous group in Mexico's vast northwest.[6] The native communities had developed efficient systems of ditch irrigation as well as floodplain farming—systems that the Jesuits expanded into Spanish-style irrigation systems that included *acequias madres* (irrigation canals) and ditch gates.

On the gravel terraces above the floodplain, Jesuit missionaries reconfigured the Opata, Pima, and several other related indigenous societies into prosperous missions. These mission churches that rose in the centers of such towns as Arizpe, Moctezuma, and Banámichi remain the most prominent reminders of eastern Sonora's colonial history. And ruins of mule-powered grist-stone wheat mills of *tahonas* (chiseled stone along the Sonora, San Miquel, and Moctezuma (Oposura) rivers linger as testaments to the Jesuit determination to alter the staples of the indigenous diet from corn to wheat, which Spaniards regarded as the staff of life.

Bread and wheat tortillas were not the only food legacies of the Jesuits. Each mission also introduced large-scale cattle ranching into eastern Sonora, beginning the tragic history of overgrazing of the *estancias* (grasslands) and the deterioration of fragile riparian and canyon ecosystems.

The Jesuit missions in eastern Sonora became productive agricultural ventures. Not only were these missions in eastern Sonora self-supporting but they also produced a surplus of wheat and other crops. This surplus of food commodities that indigenous laborers produced under Jesuit supervision fed the Spanish miners that began arriving in the late 17th century, most crossing the Sierra Madre from the mining center in Parral, Chihuahua. By the late 1600s and early 1700s, virtually all the Spaniards living in *La Serrana* were miners, attracted to the mountains and canyons by exposed veins of silver, copper, and gold.

In southern Sonora, the wealthy colonial town of Álamos grew up around the nearby silver mines, giving the city the reputation as the "Silver City" of Mexico's north. During early years of the mining boom, Álamos briefly served as capital of the entire state. The colonial town represented the accumulation of much of the territory's new wealth and became the chosen home of its political elite.

The missions, mining, and mestizo colonization eroded and eventually eliminated the indigenous presence in *La Serrana*. Beginning in the late 1600s, raids of Apache bands from their hidden camps in the Sierra Madre halted this region's demographic and economic growth. Apache plundering victimized not only the region's colonizers but also the pastoral indigenous communities.

Before venturing north into the Opatería and the *rancherías* (hamlets) of the Pima Bajo people, the Jesuits had established a network of successful missions first in the Mayo Valley, and after 1610 in the adjacent Yaqui Valley to the immediate north. Although lying in the lowlands and outside of eastern Sonora, the Jesuit missions in the Mayo river deltas also constituted part of the Old Sonora. Not having developed the irrigation systems found in Opata and Pima communities, the Yaqui and Mayo mainly practiced floodplain farming. They were also hunter/gatherers and many depended on fishing in the sea and estuaries that bordered the Yaqui homeland.

For the most part, the arid western half of the state remained sparsely populated for more than two centuries after the Spanish soldiers, missionaries, and miners made their first appearance in Sonora. The semi-nomadic Seri people, a community of some 5,000 Yunan-speaking peoples who live along the coast, were the prominent exception. Tohono O'odam, or the "Sand People," scratched out a precarious existence in Sonora's northwest—the acutely arid region north of the Gulf of California where the Sonoran Desert reaches out toward the Colorado River delta.

Before the advent of gas- and electricity-driven water wells, dams, cross-country irrigation canals, and aqueducts, the Sonora Desert imposed severe limits on economic development and population growth in western Sonora. By the 1850s, the state's agricultural centers had begun to shift to the west and to the desert. The incipient agribusiness sector, controlled largely by U.S. investors and settlers, discarded the traditional floodplain farming. Instead, the modernized agricultural sector relied on a network of dams, an extensive network of engineered irrigation canals, and batteries of deep wells. Economic modernization has overcome, at least for the time being, the apparent limits of nature, particularly with respect to water availability and distribution.

Today, New Sonora is the demographic and economic center of the state. Whereas Old Sonora was the demographic center of both pre-Columbian and for the first 250 years of post-Columbian Sonora, less than 5% of *Sonorenses* live and work in Old Sonora today.

Of the state's 72 *municipios* (counties), according to the 2010 census, there are just three with a population of more than 10,0000 that are located in eastern Sonora: the old mining and current tourist town of Álamos and the copper mining centers Cananea, and Nacozari de García.[7] Sonora's most populated counties, in the west, are found in the Sonoran Desert, including Agua Prieta, Caborca, Ciudad Obregón (Cajeme), Empalme, Guaymas, Hermosillo, Nogales, Navojoa, Puerto Peñasco, and San Luis Río Colorado.

New Sonora teeters on the edge of unsustainability. The modern Sonora that has bloomed in the desert depends on the unsustainable pumping of groundwater and the diversion of flows from the already over-allocated river basins of Old Sonora.

Illusions of New Sonora

Sonorenses take pride in their prominent role in shaping Mexico. Four of Mexico's post-revolutionary presidents were born in Sonora, including General Álvaro Obregón. Sonorans also boast about how they have defeated the climate and created a new Sonora in the historically uninhabited desert landscapes of western Sonora.

For intellectuals based in Mexico City in the early 20th century, the frontier territories of Sonora and Chihuahua were barbarous places, worlds apart from the more cultured society of Mexico City. When you enter a discussion about their state, you might hear Sonorans offer the following oft-repeated phrase to describe their state: "*La civilización termina donde comienza la carne asada* ("Civilization ends where grilled meat begins.")[8]—the idea being that this is rugged, frontier country.

The mining town of Cananea reflected the brave and barbarous currents in Sonora during the brutal regime of Porfírio Díaz**,** whose decades-long regime fell to the revolution. The 1906 miners' strike at the U.S.-owned Cananea copper mine helped ignite the popular struggle against the hated Porfirio Diaz regime (1876-1910). In fact, "La cárcel de Cananea," ("Jail of Cananea") is one of Mexico's most famous *corridos* (ballads). Despite the jail's central place in Mexican history and culture—it's now a Worker's Museum—it isn't a part of the state's history that is often mentioned by the government or Sonoran elite.

Sonora SI

From the start, Governor Guillermo Padrés linked his administration to the ambitious program of water megaprojects called Sonora SI (Integrated Systems of Sonora).[9] "Sonora SI is "the largest infrastructure and engineering program in the history of our state," the agency states. Sonora SI asserts that its water megaprojects program is "intelligent and visionary—and sustainable."[10]

Sign at Sonora SI headquarters in Hermosillo.

As the standard bearer of PAN (National Action Party), Padrés won the mid-2009 election contest mostly because Sonorans had grown weary of Institutional Revolutionary Party (PRI), particularly in the state capital of Hermosillo. His victory ended a string of 22 PRI governorships in Sonora. PRI figures had occupied the governor's office since 1929, the year that

the PRI was born and became Mexico's ruling party. Although the PRI lost control of the state congress in 1997, the party kept the governorship under its control and the PRI's dominance in Sonora continued long after PAN's Vicente Fox won the presidency in 2000. But Padrés succeeded a discredited and disgraced PRI government in Sonora. In the mid-2009 state elections, voters blamed the PRI government for the ABC Guardería tragedy in which 49 infants and toddlers died in a suspicious fire in an Hermosillo childcare facility.[11] Intra-PRI disputes also sent the ruling party's approval rates plummeting.

For many critics of Governor Padrés, his promises to create "A New Sonora"—the slogan of his six-year administration—is less a sign of Sonoran confidence and pride, and more a manifestation of the arrogance of Sonora's white and mestizo elite and their separate reality. Mexican presidents and governors, limited to six-year terms, often launch showy infrastructure programs as a strategy to distribute favors and to establish their own legacies.

Since the mid-1980s, Sonorans, from the urban poor of Hermosillo to the wealthy agribusiness and industrial magnates, have become increasingly alarmed about the rapidly escalating water crises besieging the state. Leading political and business figures had for three decades been proposing projects and schemes to address the pressing problems of urban water shortages, the salinization of irrigated coastal plains, and lack of water-treatment plants even in large cities.

So widespread is the acceptance in Sonora that water crises can be solved by new hydraulic infrastructure, there has been broad support for a scheme to meet Sonora's water needs by constructing an aqueduct that would allow water from the states of Sinaloa and Nayarit to flow north to Sonora. But a combination of factors—political party discord, competing proposals, and the high costs of desalinization plants, new dams, and aqueducts—stifled progress in addressing the state's water crises through new hydraulic infrastructure until the creation of Sonora SI.[12]

For Padrés, the stars were fortuitously aligned in 2009. From the launch of Sonora SI in 2010, Padrés counted on the highly vocal and active support of President Calderón (2006-2012). The Calderón administration cooperated in fast-tracking permits and impact studies for Sonora SI's megaprojects, especially for its three priorities: the Independencia or Novillo-Hermosillo aqueduct, the Bicentenario or Pilares dam, and the Revolución aqueduct.

The Independencia aqueduct, completed except for last 15-kilometer segment on the northwest side of Hermosillo called the Franja Norte, brings Yaqui River water to Hermosillo; the Bicentenario project, which is under construction, would be the second dam on the Mayo River, increasing irrigated agriculture in the river's upper basin; and the Revolución aqueduct, nearing completion, would bring water to the cities of southern Sonora and increase agricultural development in the Mayo River Valley.

Two events in September-October 2014 combined to cast doubt on the governor's promise to create a New Sonora: the massive contamination of the Sonora River caused by a spill at Grupo México's copper mine west of Cananea, and the media revelation that the governor illegally built dams and reservoirs on his family's ranch in the Sonora River basin on an eastern tributary unaffected by the mining spill.[13] Moreover, a series of revelations about the increased state debt and missing state revenues earned the government the nickname of "Goberladrón" (Governor Thief) among his critics, including an informal nonpartisan movement of dissidents that call themselves the "Malnacidos" (literally the "born bad" ones)— a taunting critique of Sonora's elite and an implicit tribute to Sonora's less-privileged classes.

Even those in favor of the aqueduct regarded the state government's arrest and incarceration of leaders of the Yaqui opposition to the Novillo-Hermosillo aqueduct as a blatant violation of the governor's oft-repeated commitment to enforce the rule of law in Sonora. Tomás Rojo, a Yaqui leader and spokesman for various Yaqui governors, told me: "We are solely demanding that our traditional water rights be respected, and we, unlike Governor Padrés, stand on the side of the law."

The Yaqui River: Where Old Sonora and New Sonora Meet

Before the west was won in Sonora, the Yaqui River ran more than 400 miles from the U.S.-Mexico border along the western Sierra Madre before finally releasing its mountain water into the Gulf of California in southern Sonora. The Yaqui Valley has always been the main focus of agricultural modernization in Sonora, in part because of the presumed fertility of the coastal plain and in part because of easy access to rail transport.

Despite the size and importance of the Yaqui River, finding the river in southern Sonora is a challenge, even with a map in hand. The problem is not that the river is an ephemeral stream that flows only after the monsoon rains of the summer or the winter rains. The difficulty is that the river has disappeared. No longer does it flow by Yaqui villages and westward to the sea.

The river is a victim of the success of Sonora's hydraulic society. Three dams on the Yaqui River have minimized flooding while enabling a reliable, year-round supply of irrigation water to agribusiness by channeling reservoir water through hundreds of kilometers of irrigation canals and ditches. This irrigation schematic has permitted agribusiness to cultivate not just the former river delta but also the desert scrublands that lie far outside the river's traditional floodplain.

The River Gave Life to the Yaqui and Missions

The Yaqui Valley is where Old Sonora and New Sonora merge—where the west meets the east. Flowing over three hundred miles through the mountainous west, the Yaqui River swings west to Sonora's eastern coastal plain. The Yaqui Valley is the only part of eastern Sonora where the Jesuits established missions.

From their first encounter with a Spanish military expedition in 1533, the Yaqui have defended their land and water. As the Spanish expeditionary forces made their way north of Sinaloa (part of Nueva Vizcaya) into the Yaqui coastal plains after 1530, they encountered a native people who immediately made their position clear. The Yaqui had heard how the invaders had ravaged the lands of the Mayo and other indigenous peoples to their south.

Although they did not win many decisive battles in the 16th century, the Yaqui let the Spanish know that any attempt to conquer and occupy the Yaqui homeland wasn't worth their blood and treasure. Where the Spanish military aggression failed, the Jesuits succeeded after the 1610 peace treaty. In 1613, the Yaqui actually invited the Jesuits into their communities after hearing how they had improved the living conditions of other native peoples in Sinaloa and the Mayo River delta.

When Jesuits began establishing their missions in the Yaqui Valley between 1614 and 1620, they found about 30,000 Yaqui living in hundreds of *rancherías* (hamlets) scattered throughout the valley. Most Yaqui, who then had multiple identities as farmers, hunter-gatherers, and coastal fishing communities, made their homes by the floodplain of the Yaqui River. The monsoon floods and late winter floods provided, during the best of years, sufficient water for two annual crops.

The Jesuits converted and temporarily pacified the Yaqui, whose flag is still emblazoned with a black Christian cross. Along the river, the Jesuits established eight missions, gathering together the Yaqui from the dispersed *rancherías* into what became Yaqui villages. The Jesuits established their missions during an era before highways or railroads. Even the wagon

road that headed north from Sinaloa through Sonora didn't pass through the part of the Yaqui Valley with the most *rancherías*.

To this day, these "*ocho pueblos*" (eight towns) are the centers of their culture and governance. But like the river itself, most of these towns are now ghosts of a former era. Only three of the original eight mission settlements—Pótam, Torim , and Vícam, which is the *cabecera,* or traditional seat of governance and religion authority of the Yaqui—have retained their integrity as Yaqui *pueblos*.

The Jesuit mission churches still stand at the center of the other five mission towns—Cócorit, Bácum, Huiribis, Rahum, and Pitaya, also known as Belém. Some, like Cócorit, are no longer indigenous and have become largely *mestizo* towns, while others have suffered from varying degrees of depopulation. Although the mission church still marks Belém as one of the eight Jesuit missions, lack of water has turned the old mission into a ghost town.[14]

Vícam and the Lost River

Crop dusters circle and dive down, skimming the richly watered fields of wheat, alfalfa, and agro-export crops as they spray their load of pesticides. Irrigation canals crisscross the valley, carrying water from the Oviáchic or Álvaro Obregón dam/reservoir, which captures the flow of the Yaqui River 25 miles from Ciudad Obregón. The main irrigation canal, named after President Lázaro Cárdenas, is the *acequia madre* (mother canal) of the valley, skirting the east side of the Yaqui towns of Vícam and Pótam.

Vícam Station is a road-stop that straddles the four-lane federal highway, Highway #15, connecting the U.S. Southwest with all parts south in Mexico. It is here that the Yaqui mounted intermittent blockades of highway traffic in opposition to the Hermosillo- Independencia aqueduct. Vícam itself is located off a two-lane road that intersects Highway #15. Heading west, you leave the uncultivated desert shrub lands and immediately drive into the Yaqui delta, the place where the Green Revolution got its start in hybrid crops, mainly wheat, in the 1940s and 1950s.

My map showed that the Yaqui River also passes immediately to the east of Vícam. But, seeing the bell towers of the old Jesuit mission and the dilapidated CONAGUA water tower as I entered the village, I knew that somehow I had missed it. The town has no sign with its name and population, and the river is missing both a sign and water.

Turning off the road toward the expansive plaza in front of the mission, I hailed a young man, the only person in sight, and asked if this was indeed

was Vícam and, if so, where could I find the river. Eyes glazed by drugs, he held his hand out, asking for 50 pesos. He couldn't remember where the river was.

A wrinkled middle-aged woman was raking up the leaves, branches, and other debris around large acacia tree in front of the deserted *comisariado* (local police station). Getting out of the car, I explained that I came to the land of the Yaqui as part of a research and book project about the water crisis in the U.S. and Mexican borderland states.

But before asking her how I could find the Yaqui River, I was curious about why she was raking and sweeping the dusty ground.

"They told me to clean up here to keep dengue from spreading," Silvia Jacarít Cupíz explained, referring to the male *caciques* (overlords) of Vícam. Dengue, a tropical disease similar to malaria, was spreading through southern and central Sonora in October 2014—apparently a consequence of recent heavy rains. "We're hungry in this village, but they don't pay us for this work," she lamented.

As she continued raking the dirt and gathering up the mostly organic debris into piles, she told me that I had indeed missed the river on the way into town. "But it hasn't flowed in very long time, maybe four decades or more," she said. Furthermore, she added, "when we were children, the river still flowed and life was much better."

"Water is the problem here, and food too. Our life in Vícam changed when the river stopped running," she said. While water still passes by the town in irrigation ditches, it goes to farms that the Yaqui don't control.

"Yes, we have now water pipes connected to our homes. But the water stinks so we can't drink it," continued Jacarít. As evidence of the government's lack of attention to the basic needs of the Yaquis, she pointed to the rusted and vine-covered CONAGUA water tower and to the building that is the source for the town's purified water—both in a grave state of disrepair and abandonment.

For food, she explained that she relies on the meager income her son makes working as a *carbonero,* which, she explained, entails going out to the scrublands, cutting mesquite, and then turning the gathered wood into charcoal. "He comes home covered in soot, black all over. Terrible work, but there are no other options for us," she concluded.

It is the same account one hears from many Yaqui—a story of the Yaqui loss of the river and the land. Scholars have noted: "In Yaqui pueblos, being *jornaleros agrícolas*" (farmworkers) on their own land continues to be one of the main jobs for the Yaqui, followed by work as ranch hands, *carboneros* (coal miners), and fishermen."[15] Another report by researchers from the Colegio de Sonora noted: "Almost all of the lands of the irrigation district that the Yaqui community owns are rented generally by Sonoran agricultural entrepreneurs."[16]

In the Yaqui Valley, Old Sonora and the New Sonora live side by side. It is the contrast—in income, access to water, control of land, and living conditions—that contextualizes the Yaqui water war.

IV. The Damming of the New Sonora

Like other states in the transborder West, population growth, economic development and modernization are products of hydraulic manipulations. Damming, diverting, and drilling have turned the Sonora Desert—which covers nearly 40% of the state—into a green belt for agribusiness and the state's urban core.

The overarching issue of the water war is the escalating water shortage in Sonora. The crisis arises from the overexploitation of aquifers, over-allocation of surface waters, high demographic growth in arid regions, lack of conservation and efficient irrigation, failure of existing hydraulic projects to meet current water needs, and the acute water shortages in Hermosillo. Sonora SI promises to complete 24 water projects, including new dams, irrigation canals, deep wells, and aqueducts.

Not directly addressed in the water war are two overarching problems with water politics in Mexico: first, a belief that increasing water demands can be met by infrastructure and technology, and second, the failure to address the links between water use and the environment. But both sides in the Sonoran water conflict avoid addressing the problem of depleted water resources and the need for common solutions to this shared problem. Neither side acknowledges that their own unsustainable water consumption patterns have contributed to the problem.

Natural and Unnatural Flows

Low annual precipitation rates don't fully explain why Sonora has so little water. Because the desert is so hot and sun-drenched, the high rates of potential evaporation and plant transpiration generally exceed precipitation rates—which is essentially the definition of a desert.[1] In other words, most of the water that falls on the Sonoran Desert neither flows nor seeps. In

Sonora Water Facts

- Sonora has 27 major or mid-sized dams, 18 of which are located in the Yaqui River basin, with four on the Concepción River, three on the Sonora River, and two on the Mayo River.
- There are six water basins associated with six rivers: Río Sonoita, Río Concepción, Río Sonora, Río Mátape, Río Yaqui y Río Mayo.
- Annual precipitation: 427 mm (16.8 inches), compared to the national average of 772 mm (30.4 inches).
- It is Mexico's fifth driest state, following Baja California Sur, Baja California Norte, Coahuila, and Chihuahua.
- Average annual surface water flows were 5,459 million cubic meters (5,459 billion liters) but total annual demand was 5,500 million cubic meters, (5,500 billion liters) constituting a deficit of 41 million cubic meters in 2005.
- Irrigation systems allow the farming of 653,000 hectares of Sonoran arid and semi-arid territory, of which 63% depend on surface water and 27% on wells.

fact, a small percentage of the earth's precipitation seeps into earth, accumulating over the millennia in aquifers and large water basins. In the Sonora Desert and other arid lands, only during extraordinary and extended rain events does the water penetrate the desert's crust. Precipitation usually returns to the skies in the form of vapor.

Most ancient civilizations had to depend on water engineering or hydraulics. Even when communities lived near rivers, in arid regions, river flows were not dependable, necessitating the construction of aqueducts that brought water to population centers from higher elevations. Such was the case, for example, for the Paquimé culture, which reached its height in the 15th century shortly before the Spanish arrived. Situated near the headwaters of the Casas Grandes River in what is now Chihuahua, the society could not have survived without a network of gravity-fed channels and reservoirs transferring water from the eastern slopes of the western Sierra Madre into the center of the Paquimé society. These channels and cisterns remain today as evidence of the ingenuity and central organizing capacity of the Paquimé culture.

By the late 1800s, the hydraulics of commercial agriculture in Sonora no longer depended on gravity alone. Pump-fed irrigation canals opened up new agricultural frontiers, transferring river water to desert scrublands. However, variations in river flows still limited energy-driven hydraulic systems, like those that fed the network of canals in the foreign-owned irrigation districts of the Yaqui Valley from the 1880s to the 1940s. During the autumn and spring dry seasons, there simply wasn't enough water flowing in the Yaqui River to transfer into the newly cleared irrigation-dependent fields.

The building of the Sonoran Railroad, first reaching from Nogales to Guaymas in 1892 and a decade later to Cajeme, had the effect of unleashing new plans of mainly U.S. investors to convert the delta plains of northwestern Mexico into agroexport platforms. Foreign agribusiness companies such as the Richardson Construction Company in the Yaqui Valley started pressuring the Mexican government in the late 1800s and early 1900s to dam the Yaqui River. Only by damming the river could the company realize its plans to extend irrigation canals beyond the delta and throughout the entire semi-arid coastal plain.

Reacting to this pressure and animated by its own modernization ambitions, the post-revolutionary Mexican government launched an ambitious modernization program in the 1920s that included the planned construction of an array of hydraulic infrastructure projects. Mexico closely followed the development model already well underway in the U.S. West.

Under the auspices of the U.S. Bureau of Reclamation (the bureaucratic manifestation of the U.S. Reclamation Act of 1902), the U.S. government had opened the largely arid Western states to agricultural and urban development by constructing dams, reservoirs, and long-distance irrigation canals, thereby enabling the transfer of river water across the desert. The rapidly growing hydraulic society of the U.S. West also served as Mexico's model for the subsidized electrification of the desert cities and irrigation districts of Sonora and elsewhere.

During the administration of President Plutarco Elías Calles (1924-1928), the government promulgated the *Ley de Irrigación con Aguas Federales* (Law for Irrigating Federal Water) that committed the federal government to develop major irrigation projects based on federally constructed dams, irrigation canals, and hydroelectric plants. In 1926, President Elías Calles established the National Irrigation Commission to implement this agricultural development and modernization plan.[2]

Post-revolutionary political turmoil delayed the construction of the planned hydraulic infrastructure. Not until the presidency of Lázaro Cárdenas (1934-1940) did Mexico have the stability and political leadership necessary to embark on this program of economic nationalism and modernization. In 1936, President Cárdenas, closely following the early proposals of the Richardson Construction Company, ordered the construction of Sonora's first dam.

Modeled after the Boulder (Hoover) Dam on the Colorado River, the federal government, with U.S. financing, completed the La Angostura dam and reservoir in the upper Yaqui River basin in 1942, the first of three major dams on the Yaqui river. Baptized the Lázaro Cárdenas Dam, this first water megaproject blocked the natural flow of Bavispe River—the largest northern tributary of the Yaqui River—as it entered the narrow canyon called La Angostura.

The new dam and reservoir controlled the release of river water, thereby enabling irrigation in the Yaqui Valley even during the dry months. Soon after its completion, the farmers of the Yaqui Valley Irrigation District were clamoring for a larger dam that would be built at the start of the lower Yaqui River basin. To further control flooding during major rain events and to ensure an even more dependable supply of irrigation water for the Yaqui Valley, two other larger dams were later constructed: El Novillo and El Oviáchic, the former 145 kilometers to west of Hermosillo and the latter 35 kilometers northeast of Ciudad Obregón.

The federal government assumed control of the Richardson Construction Company and its network of irrigation canals, while also redistributing private and public lands into *ejidos* (collectively owned land grants) throughout the Yaqui Valley and giving the Yaqui people ownership of some 425,000 acres in the Yaqui Valley and in the Mátape Valley to the north.

With El Novillo and Oviáchic dams in place by 1962, it became readily apparent that La Angostura, the first and the smallest of these water megaprojects, had become redundant— although the copper mine near Nacozari had become dependent on water from the reservoir. While all three dams were built with hydroelectric plants, only the generating plant at the El Novillo dam still regularly generates electricity.

By the 1960s, one-fourth of federal spending for irrigation infrastructure had gone to Sonora. As a result, irrigated land in Sonora nearly doubled in two decades.[19] Eleven percent Sonora's land is irrigated, making it the state with highest percent of its agricultural land served by irrigation systems.[20]

Despite its aridness, Sonora became Mexico's second largest agricultural producer—virtually all the result of irrigation.[21] Agriculture accounts for 92.3% of water consumption in Sonora.[22] No other state in Mexico has been so dramatically transformed by the federal government's network of dams, aqueducts, and irrigation canals.

Without such hydraulic projects, the Yaqui Valley wouldn't have won the reputation as Mexico's breadbox, the population of Hermosillo would not have tripled over the past three decades, Ford wouldn't have opened a major manufacturing plant in Hermosillo, San Carlos would not now be a booming vacation spot, and the Nacozari copper mining operations would not have the water needed to expand on such a massive scale. Cynthia Hewitt de Alcántara, one of the most respected analysts of Mexico's agricultural sector, described in her history of Mexican agriculture how Sonora, largely owing to the creation of the hydraulic society established in the 1940s, became known as the "Mesopotamia of Mexico" and the "Agricultural Cornucopia of Mexico."[23]

Solving Water Shortages with More Hydraulic Megaprojects

Throughout Mexico, government entities at the local, state, and federal levels have again been calling for new water megaprojects to address the country's acute water shortages. Sonora—the state that disproportionately benefited from Mexico's hydraulic infrastructure projects—is leading the way to a new hydraulic future with its Sonora SI program.

Sonora's Largest Reservoirs

Name	Known As	Capacity	Year	River
Lázaro Cárdenas	La Angostura	864 h^3	1942	Yaqui
Plutarco Elías Calles	El Novillo	2,963 h^3	1963	Yaqui
Álvaro Obregón	El Oviáchic	2983 h^3	1952	Yaqui
Adolfo Ruíz Cortinez	Mocúzari	1,114 h^3	1955	Mayo
Abelardo Rodríguez		220 h^3	1949	Sonora

Conversion: 1 hm^3 = 1000000 m^3

As the Sonoran government continues its water megaproject program with more than two-thirds financing from the federal government, there is little reflection of the failures and consequences of Sonora's hydraulic society. Instead, most of those involved in the water wars in Sonora—with the exception of small circles of environmentalists and academics—look to inter-state and intra-state aqueducts, along with proposed desalinization plants to solve the intensifying water crisis.

Both sides of the Yaqui water war, for example, support an unimplemented federal plan for an aqueduct that would bring water from the Nayarit and southern Sinaloa, two water-rich states along the Pacific coast, to Sonora. The Northwest Hydraulic Plan (PHLINO) would be a mega-megaproject that would transfer water to the Sonoran Desert and the semi-arid region of northern Sinaloa—areas that receive 5-20% of the precipitation that falls in the tropical state of Nayarit.[24]

In pointing to the PHLINO inter-state aqueduct as the ultimate solution to Sonora's water crisis, proponents ignore concerns by environmentalists that such a massive inter-regional transfer of water would further diminish the state's already decimated rainforests. Similarly, despite the indigenous rights component of the Yaqui water war, support for the PHLINO has not considered the opinions of the Wixárika (Huichol) and other indigenous communities native to Sinaloa, whose land is under siege by water-hungry mining companies.[25]

From the beginning, modern hydraulic projects have had heavy costs and consequences. Because of these megaprojects, Sonora's largest river no longer reaches the sea. Before the government dammed the Yaqui River, the once mighty river reached the coastal plain where the Yaqui live. Water seeped through the alluvium left in the floodplains. Over the millennia, the delta created aquifers of fossil water, recharged year after year as the river flowed to the sea.

Persuaded by government promises that Yaqui communities would receive potable water, in 1991 the Yaqui agreed to allow the state government and CONAGUA to construct the Yaqui-Guaymas aqueduct, to transfer its fossil water to the desert cities to the north. Agribusinesses, agro-industries, and the city of Obregón tap this groundwater, supplementing the water supplies channeled from the Oviáchic reservoir. A battery of pumps feeds the Yaqui-Guaymas aqueduct, delivering water to purification plants serving Guaymas, Empalme, and San Carlos.

But the government only partially complied with its promises to supply the Yaquis with drinking water. As is, the Yaqui receive very little of the

water stored in any of the three reservoirs on the Yaqui River. Virtually all the water that flows to the valley through canals goes to agribusiness and to white or *mestizo* farmers who either own large extensions of valley land or rent Yaqui land. In large part, this deception explains Yaqui opposition to yet another project.

The dams and reservoirs on the Yaqui, Mayo, and Sonora Rivers have each displaced hundreds of families. Most were subsistence farmers with indigenous roots—few of whom were adequately compensated for their losses. Reservoir water now covers many villages of the Old Sonora.[26] Even farmers who are able to remain in dammed river basins are adversely affected. As reservoirs capture river water, not only do farmers suffer from reduced river flows in many areas but they also see groundwater levels drop, forcing them either to drill deeper or abandon their farms.

Among the dozens of Yaqui River communities most affected by reduced access to surface and groundwater, Granados and Huásabas stand out both because of the extent of their water losses and because in 2011, the State Water Commission and CONAGUA claimed that these farmers had sold their water rights, thereby increasing the amount of unallocated river water and permitting the transfer of this water to Hermosillo through the Independencia aqueduct.

The transfer of water from the Yaqui River basin to Hermosillo will make it still more difficult for the Yaqui to pursue their historic claims to water from the Yaqui River. With as much as 75 cubic millimeters (75,000 liters) of Yaqui River water flowing annually to Hermosillo, the Yaqui face yet another obstacle in pursuing demands that the federal government honor the tribe's water rights. The dependence of Hermosillo on its current access to the Yaqui River will likely prove much stronger than the historic water rights of the Yaquis.

Shutting down the Novillo-Hermosillo aqueduct wouldn't mean that the Yaqui River would start flowing through the Yaqui Valley. Nor would it necessarily mean that the Yaqui would reclaim their heritage as farmers. Turning off the flow of water to Hermosillo wouldn't help recharge the shrinking and now badly contaminated aquifers of the Yaqui delta region.

The environmental costs of Sonora's hydraulic society have never been calculated, just as the environmental impacts of Sonora SI's new projects—dams, aqueducts, reservoirs, and a proposed desalinization plant—have been glossed over in declarations about role of these projects in purportedly solving the Sonora's deepening water crisis.[27]

Yaqui River Basin Overview

- By far the largest (encompassing 71,452 km^2 and healthiest in Sonora, with annual flows from tributaries and river averaging 2,852 Mm^3 (measured mid-basin at the Novillo / Álvaro Obregón dam).
- Yaqui River basin accounts for 69% of all the surface water in CONAGUA's Northwest region (covering virtually all of Sonora and a bit of northwest Chihuahua).
- It flowed freely before 1942, when the first of three major dams were constructed by the federal government, primarily to guarantee year-round water for irrigation in the Yaqui Valley and secondarily to control floodwaters during summer monsoons.
- Prior to the damming of the Bavispe tributary in the upper basin (near Nacozari de García), the Yaqui River ran perennially to the Mar de Cortés, creating a coastal ecosystem of floodplains, a broad delta, and estuaries.
- Yaqui River dams/reservoirs: Lázaro Cárdenas (La Angostura); Álvaro Obregón (El Novillo); and Plutarco Elías Calles (Oviachic), finished, respectively, in 1942, 1952, and 1964.
- There is no public registry of water users and water rights in the basin, pointing the failure of the federal and state governments to formulate plans for the sustainable use of its waters.
- Principal water users of basin water in order of usage: Yaqui Valley Irrigation District (41), Ciudad Obregón, Grupo de México (La Caridad mine), Colonias Yaqui Irrigation District (018), and small farmers and ranchers who live along the upper and middle basins.
- Yaqui River flows are also diminished by hydroelectric plants (mainly at Novillo) and evaporation.
- No official or unofficial assessment exists of the quantity of groundwater in the lower Yaqui River basin, although damming the river dried up the delta and virtually ended the recharge of the valley's aquifers by the river.
- There exists no overall assessment of the quantity and quality of groundwater in the Yaqui Valley, although tests of water wells do reveal severe contamination (mostly by agrochemicals).

V. Water Crisis Megaprojects and Alternatives

Creating a new hydraulic society will be as easy as A, B, C, and D, states Sonora SI. That's *Agua*, *Bienestar*, *Crecimiento*, and *Desarrollo*. In this rosy scenario, new hydraulic infrastructure will ensure the delivery of water supplies (***A**gua*), thus producing widespread well-being (***B**ienestar*), economic growth (***C**recimiento*), and development (***D**esarrollo*).[28]

Sonora SI proclaims:

> "In this way, water in Sonora will become the motor of our development. Water will make us much more competitive. Water will also ignite new industrial and commercial operations that will generate employment and opportunities."

Whether this type of positive thinking about the future of water in the transborder region is visionary, as the Sonoran government claims, or fantastical, is a question that is not getting much consideration in Sonora. Many *Sonorenses* are hoping that the government's hydraulic interventions save them from grim scenarios where desert cities and economies wither for lack of water.

Elsewhere, a rising number of local and national governments, together with international institutions, are shifting their focus away from megaprojects like dams. Instead, they are turning their attention to resource-conservation and climate-adaptation strategies. Especially in arid regions, citizens and governments are reevaluating the costs and benefits of hydraulic megaprojects that take into account such factors as evaporation rates and the impact on river-based ecologies and cultures. As climate change advances and natural resources erode, around the world there is a rising understanding of the integral connections between healthy ecologies and healthy societies.

Yet by committing the state to a new array to water megaprojects, the Sonoran state government seems stuck in the old modernization paradigm. They are not reevaluating narrow development and resource-use strategies of the past. In the New Sonora, social well-being is still regarded as going hand-in-hand with growth and resource extraction. The term *sustainability* does appear in the discourses of Sonora SI and Governor Padrés. But the term is never defined, and it is invariably connected to concepts such as competitiveness and growth.

Dimensions of Sonora's New Hydraulic Society

According to the government, there are five major thrusts of the water megaprojects of Sonora SI: Dams, aqueducts, water-treatment plants, improving potable water systems, and increasing reach of irrigation networks.[29]

Dams

- In some cases, new dams will be constructed, including the Bicentenario (Pilares) dam on the Mayo River and a few much-smaller dams and *embalses* (reservoirs) including the Centenario dam near Narcozari de García and in the remote Las Trincheras area near Altar in the state's northwestern territory, where there are new gold mining operations.

Aqueducts

- According to Sonora SI's vision, "Aqueducts are indispensable to distribute water equitably and responsibly among all Sonorans."
- Will provide new sources of water to urban centers in desert and in water-depleted deltas, including Hermosillo, Alamos, Huatabampo, Etchojoa, Navojoa, and Nacozari de García.
- Sonora SI is also overhauling the Yaqui-Guaymas aqueduct and pumps that supply it, even as agrochemical contamination and salinization of the soil worsen.

Aqueducts will be built to conduct water from existing dams, notably from El Novillo on the Yaqui River and from Mocúzari on the Mayo River, the Independencia and Revolución aqueducts, respectively.

Water-Treatment Plants

- Will provide new sources of water or better quality water to Hermosillo, Guaymas, Nogales, Puerto Peñasco, and Navojoa by constructing water-treatment plants.

Improving Potable Water Systems

- Sonora SI includes a plan for a San Carlos-based desalination plant to serve San Carlos and Guaymas.

- Will overhaul water-delivery systems in Cananea and Puerto Peñasco.

Increasing Reach of Irrigation Networks

- Assist the agricultural sector throughout western Sonora by improving irrigation canals (including in Yaqui and Mayo deltas, and outside Guaymas), by new dams that stop flooding in the monsoon season, and by expanding the "agricultural frontier" in Sonora.
- Provide water to all Sonorans in an "equitable and responsible" way— will not involve any reduction of water to the agricultural sector – which consumes 92.3% of Sonora's water.
- The waterworks program will expand the irrigation districts that that currently draw on the Mayo and Fuerte Rivers in the southern corner of the state – bringing as much as 73,000 hectares into cultivation.

Although acknowledging the onset of climate change and the multitude of water crises facing the state, Sonora SI has concluded that a recommitment to water megaprojects is the state's only viable option.[30]

The working premise of Sonora SI for creating the state's new hydraulic society is as simple as it is disconcerting: "Water will not be a limiting factor," not for "this generation or the coming ones."

VI. The Yaqui: Wars, Resistance, and Divisions

Over the past four centuries, the Yaqui have routinely suffered the loss of their land, water, and autonomy despite fierce resistance. Throughout Mexico, the militancy of the Yaqui in the face of Spanish, U.S. and Mexican incursions and occupations is legendary. Even in Sonora, where the Yaqui have suffered campaigns of removal and extermination, they have achieved iconic status. Sculptures and images of Yaqui deer dancers are found everywhere in tourism promotion, on state highways, and on state buildings.

The persistence of Yaqui demands for independence and of their resistance to attempts by investors and colonizers to occupy the Yaqui valley led to these military campaigns to eliminate the Yaqui. The wars against the Yaqui, especially during the *Porfiriato* (1876-1910), were, in effect, ethnocide campaigns. It wasn't until a decade after the Mexican Revolution (1910-1917) that the Yaqui resistance was finally crushed in the revolutionary government's 1926-1929 military campaign.

In 1977, noted Mexican historian Héctor Aguilar Camín observed:

> It is likely that Yaqui history from 1876 to 1930 could have been written as if the Mexican Revolution never happened. *Porfiriato* or revolution, the repression of the Yaquis was driven by the same historical forces and even a similar social context. It was a process in which 'civilization' yanked the tribe from the most fertile lands in Sonora and broke their resistance with a war with mercy whose goal was eradication and extermination."[31]

Novelist and historian Paco Ignacio Taibo II, who wrote the recent book *Yaquis: Historia de una guerra popular y de un genocidio en México (*Yaquis: History of a Popular War and Genocide in Mexico), said: "Through all the years I have spent exploring Mexico's past, I have found infamous and tragic stories but of them all, the history of the Yaquis is at the same time the worst and the most glorious."

Yaqui women at anti-aqueduct meeting.

Ciudad Obregón, which emerged as the center of the anti-aqueduct coalition, was named in honor of the revolutionary general and president Álvaro Obregón—but the original name of the settlement was Cajeme, the name the war name of the Yaqui leader Jose María Leyva. Cajeme led the Yaqui resistance against the Porfírio Díaz regime until he was executed in 1887. Cajeme remains the name of the county that includes Ciudad Obregón and several Yaqui towns. As president of Mexico, Obregón (who was born in the Mayo delta) played a key role in opening the Yaqui valley to foreign agricultural investors.

Survival and Pacification

By some measures, the Yaqui have fared better than other indigenous people in Sonora and elsewhere in northern Mexico. Dozens of other native groups no longer exist or whose small numbers presage eventual extinction. Today, about 30,000 Yaquis inhabit the Yaqui Valley, roughly the same number the Jesuits encountered in the early 1600s. Other Yaqui live scattered throughout Mexico and the United States, including the Yaqui community of Pascua outside of Tucson.

From a certain perspective, the Yaqui have emerged over the centuries as victors since they first repelled the Spanish. Their victories—maintaining their language, gaining rights to a large part of their traditional homeland, and winning guarantees of their rights to half of the water flowing in the upper Yaqui river basin—set them apart from most other indigenous communities in Mexico.[32] One has only to witness a meeting of Yaqui communities presided over by their *gobernadores* (governors) in their native Cahitan language to appreciate their endurance and determination. They maintain rights to one of the most coveted farming regions of northern Mexico despite the long history of occupation, including deportation campaigns, massacres, and enslavement in rubber plantations of Chiapas.

Socioeconomic Overview of the Yaqui in Sonora

- 70% unemployment.
- 96% have incomes less than $450 monthly.
- More than 90% have electricity in homes.
- More than 90% have access to piped but not purified water.

Chronology of Yaqui Valley Agribusiness

- Porfírio Díaz in 1890 gives Carlos Conant Maldonado a concession to open to agricultural development 300,000 hectares of land situated on the banks of Fuerte, Mayo, and Yaqui Rivers.
- Backed by U.S. investors and settlers, the resulting Sonora and Sinaloa Irrigation Company (chartered in New Jersey) in the 1890s constructed 40 kilometers of canals in the Yaqui delta, expropriating traditional Yaqui land.
- In 1905, the Díaz regime turns the immense concession over to Richardson Construction Company after the Sonora and Sinaloa Construction Company go bankrupt following the 1903 flood.
- In 1928, Richardson Construction Company is transferred back to the Mexican government, although U.S. investors and consultants continue to control the agribusiness, which covers 40,000 acres.
- U.S. agribusiness investors in the Yaqui Valley and U.S. financing companies play a major role in pressuring the Mexican government in the 1920s and 1930s to build a major dam on the Yaqui River to regularize the flow of the Yaqui River.
- Mexican government in 1936 begins construction of Mexico's first major dam on the Bavispe River (a major Yaqui River tributary) at La Angostura near Nacozari de García.
- In 1940, President Lázaro Cárdenas decrees that the Yaquis have territorial rights to 5,500 square kilometers (3,418 miles) in the Yaqui Valley and water rights to one half the capacity of the soon-to be-completed Angostura Dam. The measure is part of the post-revolutionary's government commitment to agrarian reform but was also intended to placate Yaqui resistance to the incursion of Mexican and U.S. agribusiness into their homeland.
- In 1942, Presa Lázaro Cárdenas, but commonly called La Angostura dam, reservoir, and hydroelectric plant completed.
- Subsequent to the completion of the dam, reservoir water opens another 60,000 hectares in Yaqui Valley to irrigation.

Sources: Cartron, Jean-Luc E; Ceballos, Gerardo and Felger, Richard Stephen (2005) *Biodiversity, Ecosystems, and Conservation in Northern Mexico*. Cary, NC, USA: Oxford University Press; Robert C. West, *Sonora: Its Geographical Personality*, University of Texas Press, 1993; Sterling Evans, "Damming Sonora: An Environmental and Transnational History of Water, Agriculture, and Society in Northwest Mexico," Produced for Workshop in the History of Agriculture and Environment, University of Georgia, March 25, 2011.

But survival is a low measure of success. Relative to dominant *mestizo* and *ladino* (white elite) Sonoran society, the Yaqui are a marginalized people whose future prospects are grim. Unemployment is more than 70%, and 85% of Yaquis are impoverished. Few Yaqui have more than sixth-grade education. Infectious diseases, cancer, skin rashes, and digestive disorders run rampant through Yaqui communities. Many factors explain the social marginalization and impoverishment of the Yaqui people, mirroring more or less the same desperate circumstances facing most of Mexico's indigenous population. But socioeconomic studies aren't necessary to identify a central factor in keeping the Yaqui on the margins of the economic development that surrounds them.

Since the late 1930s, the Yaqui have generally acceded to the government's modernization projects. The pacification of the Yaqui dates back to the initiatives of the Lázaro Cárdenas administration (1934-40) that included dams, agrarian reform and nationalization of foreign enterprises. Key to the government's success in pacifying the Yaqui were two decrees by President Cárdenas: 1) granting the Yaqui title to 5,500 square kilometers (3,418 miles) of land, stretching from near Ciudad Obregón north to Guaymas; and 2) granting the Yaqui rights to half of the water to be captured by the La Angostura dam and reservoir.

As anthropologist Tonatiuh Castro Silva noted: "The *Cardenista* restitution of Yaqui territory in 1937-40 constituted a dike against an eventual armed rebellion." But the "inconsistency" of the state's position with respect to the Yaqui, he observed, with respect to both land and water rights, has amounted to a major deception that might lead to social explosion. Castro observed that Yaqui land rights have been violated, the promised "half of La Angostura never came," and the Yaqui River is nothing but puddles—and no longer deserves to be called a river.[33]

Illustrative of Yaqui acceptance of projects that adversely affected their land and water rights was the 1991 agreement by the Yaqui leadership to permit the construction of the Yaqui-Guaymas aqueduct. In exchange for the promises that the government made to provide Yaqui communities with potable water, the Yaqui leadership, with minimal dissent, consented to a CONAGUA-funded project to drill a battery of water wells on Yaqui land to supply water to water-starved Guaymas, Empalme, and San Carlos. So when the federal, state, and local governments proceeded with plans for the Yaqui Valley-Guaymas aqueduct in the 1991, there was only scattered opposition.

For the most part, the Yaqui communities have access to piped water. But the water is not purified, and is contaminated with agrochemicals, arsenic, and nitrates. Simply because there are water pipes, it doesn't mean that water flows to Yaqui households. One third of those interviewed reported that there was never enough water—a problem that always gets worse during droughts. Referring to decades ago, Yaqui people interviewed by Colegio

de Sonora researchers said: "Before there was never shortages of water but no longer. Now we have to struggle for water. It is contaminated with arsenic [according to the Instituto Tecnoloógico de Sonora], and isn't drinkable. We lack water in our homes and in our communities, and it is for the lack of water [in the river and in the overexploited aquifer] there are hardly any trees anymore."[34]

The Mayo people echoed Yaqui complaints about water availability and quality. They said that they now need to buy water to ensure that they don't get sick, and that all the water in the wells, river, and irrigation canals is contaminated. In dry times, they claimed that the aquifer shrinks and that the water pipes get clogged with dirt.

Another finding of the Colegio de Sonora report on indigenous communities and water was a condition that is readily observable in the deltas of the Colorado River (the traditional homeland of the Cucapás), Yaqui River, and Mayo River. "What stands out is access to land, which has fallen under the dominance of an agroindustrial type of development." They note that water is the cross-cutting theme of indigenous survival and identity in Sonora.

In marked contrast to the construction of the Yaqui Valley-Guaymas aqueduct, the Yaqui and the members of the Yaqui Valley Irrigation District reacted immediately and in unprecedented unity to the announcement of the planned Novillo-Hermosillo aqueduct. The Citizens Water Movement, based in Ciudad Obregón in southern Sonora, counted on the economic and political clout of the agribusiness sector of the Yaqui Valley.

The north and south highway blockades of Vícam formed the frontlines of the Yaqui water war. Despite tremendous economic and political pressure to let the traffic and commerce flow freely, the Yaqui together with their allies in the "No al Novillo" coalition refused to accede, keeping up the blockades even when summer temperatures soar to 110 or 120 degrees or more. This water war also played out on numerous other fronts, each of which sheds light on the shadows that obscure and diffuse the rule of law and democratic governance in Mexico.

VII. Sonora's Water Warriors

No one factor explains the outbreak of the Yaqui Water War. But they certainly include the following: the arrogance of the Padrés administration, the historical split that set Ciudad Obregón and the Yaqui Valley against the state's political and economic center of power, and the spreading movement for indigenous rights in Mexico. Coursing through the campaign to support the Independencia aqueduct is a sense of injustice that Sonora's largest river is not more equitably shared. With those raising their voices

saying "No al Novillo" or "Sí al Independencia," all both believe that they have law, reason, and justice on their side.

Supporters of the aqueduct believe that the aqueduct would find a purpose for unused and unallocated water in the Yaqui River and address the constitutional right for all Mexicans to access drinking water over the agribusiness sector, which has priority use of commercial crops in the Yaqui Valley. Hermosillo residents, construction companies, industries, and agribusiness resoundingly approved of the new aqueduct, which reached the city in late 2013. However, in the lower Yaqui River basin, the traditional and current beneficiaries greeted the proposal to transfer water from the Yaqui River with an angry "No." The Yaqui soon became the militant vanguard of the "*No al Novillo*" coalition opposing the construction and operation of the aqueduct. The focus of the anti-aqueduct coalition was the planned transfer of 75 million cubic meters (75 Mm^3) of water from the Yaqui River Basin to the badly depleted Sonora River Basin, which opponents of the project believe will leave irrigators short of water, especially in drought years.

Aqueduct opponents raised a variety of other issues surrounding the agricultural sector's priority use of the Yaqui river; the right of the Yaqui to half of the water captured by the Angostura dam that has never been honored; failure of the government to consult with the Yaqui; and a federal law that in theory does not permit the transfer of water from one water basin (Yaqui River) to another (Sonora River). Opponents believe that each water basin should be managed through separate *cuenca* (basin) councils.

"The Yaqui are the last users of the water in the Yaqui River basin," José Luis Moreno, a water expert at the Colegio de Sonora, notes. As such, they will be the ones ultimately most adversely affected by up-river water usage and transfers. If we look at a map of the basin, which begins partly in Arizona and partly in Chihuahua, the river flows south and fills the reservoirs behind the dams, and at the end are the Yaqui. If you take away water from the river, the last user gets what's left." Moreno notes that the Yaquis and *Hermosillenses* share this fate, since Hermosillo residents, industries, and agribusinesses are also the last beneficiaries of a river—not the Yaqui River, but what's left of the Sonora.

Enough Water to Go Around?

Like other historic hydraulic societies, water management in Sonora has been primarily shaped by the needs of agriculture. The demands of industry and especially mining have also been major players in making the government keep the water moving to the most economically powerful sectors.

Yet Sonora SI's water megaprojects are also part of an increasingly desperate attempt on the part of government to meet the increasing water deficits in municipal water systems—not only in Hermosillo but also in other cities experiencing water crises and rising discontent, including Nacozari, Puerto Peñasco, Cananea, and Alamos. There is a palpable fear that sooner or later the city will be left without any access to water.

Moreno notes that aqueducts are short-term solutions to unsustainable demands for water.[35] According to Moreno, the proponents of dams and aqueducts generally project at least a 50-year life for such water megaprojects. "But these aqueducts, including the Independencia, don't constitute a long-term solution at all. The reality is that they usually don't even last ten years [before other water megaprojects are needed]," he observed, pointing to examples in Monterrey, Los Angeles, and Tijuana.[36]

While the Novillo-Hermosillo conflict has focused on water flows of the Yaqui River, there has only been passing attention to issues of waste, distribution efficiency, and conservation either in the Yaqui Valley or in Hermosillo. As much as 40% in Hermosillo's municipal water distribution is lost through leaks that often go unrepaired for days or weeks. Nicolás Pineda Pablos, a professor of public policy at the Colegio de Sonora observed that "the management problem is worse" than the problems posed by the actual supply of water. Prioritization is also a core management problem of limited water resources, according to Pineda. Water managers in Hermosillo or in state government have done virtually nothing to decrease water flows to agribusiness in any of the agribusiness centers of Sonora. "If you want to have big-city growth, you can't also have agriculture," Pineda told the *New York Times*.[37]

Although not often mentioned in the debate over the Novillo-Hermosillo aqueduct, climate change also set the stage for the conflict that has divided Sonora into political, economic, and social factions. A prolonged drought starting in 1996 and continuing through 2005 and then hitting hard again in 2010, combined with rising average temperatures had the result of creating widespread concern throughout the state about the diminishing water resources.[38] And intensive pumping of groundwater over the past two decades has left a devastated landscape. Water levels have dropped by many meters—as many as 25 meters in some locations—leaving a barren land as scrub oaks and most other flora can no longer tap the aquifers.

An emerging collection of nongovernmental organizations, academics, and citizen movements are expressing their alarm that the Mexican government, despite its rhetoric about global warming and sustainable development, is stuck in the past with myopic solutions to water shortages and distribution inequities. NGOs such as the Mexican Movement of People Affected by Dams and in Defense of Rivers (MAPDER) and the

Coalition of Mexican Organizations for Citizen Water Rights, point to the environmental, social, and economic folly of continuing unsustainable water policies. However, as fears escalate about a future without water, the government still holds the upper hand in framing national and local water debates.

Anti-Aqueduct Coalition

The Citizens Water Movement in Ciudad Obregón organized the first marches under the "No al Novillo" slogan immediately after the governor announced his decision to construct the aqueduct in March 2010. From the formative weeks of the "No al Novillo" movement, anti-aqueduct leaders acknowledged the reality of Hermosillo's pressing water crisis. But they asserted that numerous alternative solutions were possible, including the fast-tracking of a proposed inter-state aqueduct.

Opponents from the "No al Novillo" campaign dispute the notion that there is more than enough water in the Yaqui River basin to regularly supply Hermosillo with sufficient river water. In dry years, which are increasingly common, the water consumers in the lower Yaqui River basin would experience severe water shortages, opponents contend. The monsoon season can sometimes deliver more rain than the dams can manage—in 2013, for example, the reservoirs on the Yaqui River held 44.9% of their capacity in late June, but ten years previously, the reservoirs contained just 9.2% of their capacity at the same time of the year, with El Novillo holding just 8.1% of its capacity.

Festering indignation over the government's deception when it constructed the first aqueduct that tapped Yaqui water also galvanized the opposition. More than any other argument, the failure of the government to honor the promise by President Lázaro Cárdenas that the Yaqui would receive half the water captured by La Angostura dam gave the "No al Novillo" movement a moral authority. For the Yaqui Valley agribusiness owners, the alliance with the Yaquis allowed them to leverage this moral authority, so they could claim that their opposition to the aqueduct didn't emanate solely from their business concerns as the main beneficiaries of Yaqui River water that flowed to the valley in huge concrete canals. These farmers associated with the Yaqui Valley Irrigation District also regarded their association with the militant anti-aqueduct as a tactical advantage, given how the blockades and Yaqui opposition elevated the campaign nationally and internationally.

At no point was the "No al Novillo" campaign an anti-dam or anti-water megaproject movement. Nor did it oppose the concept of a hydraulic society based on dams, canals, and aqueducts. Rather, its supporters cite water rights and water needs based on historic distribution of the dammed Yaqui

Chronology of Independencia Aqueduct Conflict

- On Feb. 10, 2010, Governor Padrés presents plan for the El Novillo-Hermosillo aqueduct as part of the newly formed Sonora SI office.
- PAN and PRD state legislative members declare their support for the aqueduct, while members of PRI, the state's main opposition party during the Padrés government, opportunistically expressed reservations, thereby setting the political framework for the water conflict.
- In mid-February 2010, the Water Users Union in Hermosillo marches to express their opposition of a proposed desalination plant while expressing their support for the aqueduct.
- In late February and in early March 2010, 469 persons from the hamlets are flooded during the construction of El Novillo and petition for solidarity in their struggle to receive adequate compensation from the government.
- On March 5, the newly formed Citizens Water Movement organizes a large march in Ciudad Obregón protesting the aqueduct plans with the slogan "No al Novillo." At the same time, the movement expresses their support for two other water megaprojects: a desalination plant to supply water to Hermosillo and the interstate aqueduct system called the Hydraulic Plan of the Northwest (PHLINO).
- On April 20, during a Mexico City meeting at Los Pinos, directors of various federal agencies, including CONAGUA, reportedly tell Governor Padrés and Sonora SI that they can accelerate the construction of the controversial aqueduct.
- On May 6, the *Pacto del Río Yaqui* (Yaqui River Pact) is signed, bringing together the Citizens Water Movement of Ciudad Obregón, Yaqui leaders (signed for the Yaqui by governor of Vícam and secretary for the town Loma de Bácum), and agricultural producers of the Yaqui Valley. The Yaqui River Pact establishes the Yaqui as the "permanent civil guard" of the alliance, whose objective is to ensure that the Yaqui River will be used principally to produce food to meet domestic consumption needs in Hermosillo.
- A May 7 protest march in Ciudad Obregón bringing together more than 30,000 aqueduct opponents alarms the state government. The State Water Commission (CEA) responds with a declaration (published in Sonoran newspapers) that Sonora SI wasn't going to take water from anyone, with the warning that "it's necessary that no one is permitted to distort the truth and deceive the people with manipulative reports that have no basis in fact."
- Later in May, to fortify the official position, the state government announces that the State Water Commission (CEA) is buying up water rights from small producers in the middle Yaqui River basin, using federal funds, and thereby ensuring that sufficient water would flow to the Yaqui Valley.
- In June 2010, Sonora SI announces that the Novillo-Hermosillo aqueduct— which for the first time called Independencia— will not reduce flows to the river's low basin because sufficient water rights had been purchased in the middle basin. Yet neither CEA nor CONAGUA is able to document that those benefiting from the water rights purchases will in fact draw substantial quantities of water from the Yaqui River.
- On Aug. 2, 2010, the Agrarian Tribunal of District 35 in Ciudad Obregón issues an order ordering the suspension of aqueduct construction in a ruling stating that until the demands of the Yaqui concerning their water rights were considered there could be no new pumping of river water.
- In January 2015, a Supreme Court judgment rules that the water rights deals are valid and that the aqueduct is legal, although they also mandate a new environmental impact study.

River. Those opposed to this transfer of water to Hermosillo correctly observed that this and other Yaqui River dams were constructed primarily for water consumers in the Yaqui river valley. The Yaqui-Guaymas aqueduct has been transferring water from deep wells in the Yaqui Valley to Guaymas, Empalme, and San Carlos— but an estimated 90% of Yaqui homes remain without potable water according Yaqui *vocero* (spokesperson) Mario Luna.[39]

In the struggle to defend their indigenous rights and their rights to the Yaqui River, the Yaqui have won the support and solidarity of many NGOs, citizen movements, and intellectuals. As the water war evolved, they have also gained the support of other indigenous groups (including representatives of the Tarahumara and Tepehuan of Chihuahua). One of the most consistent allies of the "No al Novillo" movement was the Cananea Mineworkers Union, which has for many years alerted state and federal authorities about the lack of environmental and occupational safeguards at Grupo México's Cananea copper mine. Rarely mentioned is that since the construction of La Angostura, mining operations have boomed in the Yaqui River basin, principally the copper and zinc operations of Grupo México and, more recently, gold mining.

Yaqui woman in Vícam, where the Yaqui River no longer runs.

The immediate victims of Sonora's hydraulic society—more than 400 women and men who had been displaced from their homes by the Novillo reservoir—also raised their voices as the "No al Novillo" movement coalesced. For more than 40 years, they have been demanding compensation from the government and asked the beneficiaries of the dam in the Yaqui Valley express solidarity for these claims.

Yaqui highway blockades at Vicam Station have a long history, and over the past two decades regular travelers along the highway have grown accustomed to groups of Yaqui, usually young men, obstructing the free flow of traffic while holding out empty cans rigorously asking for contributions on the grounds that travelers should compensate the Yaqui for passing through their territory.

Clearly, the highway blockades served to raise the profile of the "No al Novillo" coalition, especially outside of Sonora. Within Yaqui communities, while most oppose the aqueduct, many felt uncomfortable with tactics that adversely affected those who had nothing to do with the aqueduct. Blockade militancy didn't serve to broaden support within Sonora for the anti-aqueduct cause or for the plight of the Yaquis. The inconvenience caused by the Yaqui blockades angered many *Sonorenses* and others traveling north-south along Highway 15 to the United States or farther south into Mexico's interior. As Arturo Cayetano of Potám observed: "We are opposed to the aqueduct but we are also opposed to tactics that affect the rights of others [who are forced to wait hours behind the intermittent blockades]."

To varying degrees, many view the highways blockades as another symptom of social disorder and illegal activity in Mexico. Highway blockades are emblematic of the absence of the *estado de derecho* (rule of law) in Mexico and the limits of the country's system of democratic governance. Travelers in most parts of Mexico also increasingly encounter highway barricades with armed men (often in black masks). Typically, especially on back roads, travelers approaching these highway blockades aren't entirely certain whether men with guns are police, soldiers, highway bandits, cartel members, or dual identity gunmen.

Increasing violence and crime in the Yaqui Valley have also contributed to diminishing support for the Yaqui highway blockades. Further complicating the effectiveness of the Yaqui highway stoppages are the charges and countercharges concerning government repression of Yaqui leaders and opposition reprisals against supporters of the government. While there is little clarity about the credibility of these accusations, it is commonly understood that the government and two leading political parties have played key behind-the-scenes roles in supporting various Yaqui factions.[40]

Besides becoming the most vociferous presence in the coalition's marches, rallies, and blockades, the militant anti-aqueduct Yaquis formed alliances throughout Mexico with other popular movements protesting water diversions, water contamination, and the violation of indigenous rights. In August 2014, the main figures of the Yaqui opposition, including Tomás Rojo, led a caravan to Mexico City, where they presented their demands to congressional commissions and federal agencies, notably the environmental ministry SEMARNAT.

Leaders of the anti-aqueduct campaign opposition also insist water in each river basin should remain in that basin. The "No al Novillo" campaign, citing provisions of Article 27 of the Mexican Constitution, noted that national water law, as enshrined in the constitution, considers a water basin as an autonomous unit of property and water that should be managed by a council of basin stakeholders. What they don't readily acknowledge, however, is that such *Cuenca* (basin) councils are rare, and, furthermore, there are many cases of inter-basin transfers of water, including in the Mexico City region.

Opposition in the Cajeme (Ciudad Obregón) region has been widespread, but it was never unanimous. Several agroindustrial associations, *ejido* unions, and organizations representing taxi and bus drivers, among others, voiced support for aqueduct. From the beginning, partisan politics were key to understanding the configuration of the anti-aqueduct movement, whose members and leaders (including the Yaqui) had enduring links with the PRI.

In many cases, those supporting the PAN administration and Sonora SI depended on state government subsidies and favors. Support for the

aqueduct, for example, came from UNORCA, a government-sponsored *campesino* group, in the Yaqui valley, which regarded (at least until mid-2014) that its best interests lay with the government in power. The traditional governors of the Mayo people also supported the Sonora SI aqueducts.[41] For many, opposing the governor at the beginning of his six-year term was not regarded as politically or economically wise.

The January 2015 ruling by the Supreme Court affirming the essential legality of the aqueduct wasn't unexpected but was severe blow to an already discouraged anti-aqueduct movement. Increased rain the later half of 2014 resulting in full or overflowing reservoirs had already undercut the force of arguments that transferring a portion of the Yaqui River would put the crops of Yaqui Valley farmers at risk. Resentment against state government and against Hermosillo and other cities benefiting from transfers of surface and groundwater from the Yaqui River basin persists, especially among the Yaquis and the members of the Yaqui Valley Irrigation District. The militant anti-aqueduct faction of the Yaqui has continued intermittent traffic blockades.

Pro-Aqueduct Forces

Responding in mid-2010 to the alliance and its militancy, Governor Padrés and Sonora SI moved quickly to establish a pro-aqueduct campaign in Hermosillo. The city's commercial, construction, industrial, and agricultural elite and their associations stood at the forefront of statewide campaign, "*Agua Para Todos*" ("Water for Everyone") including, for example, the influential Sonora Business Center. Another proponent of the aqueduct was the *Unión de Usuarios* (Union of Water Users) in Hermosillo, which had previously opposed the construction of a desalination plant on the grounds that the resulting water would be "bad and expensive" while water from the Novillo reservoir would be "good and cheap."

The Hermosillo business leadership, working closely with municipal and state government officials, repeatedly attempted to organize pro-aqueduct citizen organizations and movements. But these top-down initiatives repeatedly failed to generate a credible citizen movement independent of the city's economic and political elite.

In part, these failures are due to the business- and government-led identity of these citizen associations. Yet these unsuccessful organizing initiatives might also be explained by absence of a tradition of citizen activism in the state's capital, partly explained by the integration of many into the state's power structure and partly due to the fact that most *Hermosillenses* are first or second generation residents of this steadily growing metropolis. In contrast, there is a more widespread sense of regional identity in the Yaqui

valley, which has deeper roots in the history of Sonora and where there exist stronger links between the urban and agricultural economies.

The pro-aqueduct campaign also counted on the support of the State Water Commission (CEA) and CONAGUA, which provided most of the funds for the aqueduct. The State Water Commission (CEA) argued that even if the aqueduct annually transferred the maximum 75,000 cubic meters (75 million liters) of water to Hermosillo, this would represent only 2.5-3% of all the water in the river basin. Thus, according to CONAGUA, remaining available Yaqui River water could be used to meet "the basic needs of the city and permit its development."

However, what aqueduct opponents find so infuriating is that Hermosillo has neither cared for its own water basin nor prioritized the domestic consumption of the water of the Hermosillo *municipio*, where only 2% of the water is for human consumption while 84% goes to agribusiness in the Hermosillo coast and elsewhere in the county.

Supporters point to the years of above-average precipitation or periods after the summer monsoon rains, when the reservoirs capture even more water than their cement curtains can contain, obligating CONAGUA and state water managers to release excess water and allowing water to flow into the Gulf of California. Such arguments, though, failed to persuade opponents, who counter that the river was already over-committed and such estimations didn't consider such factors as increasing and more prolonged droughts, evaporation losses, and unknown quantities of unregulated water extractions by mining companies, ranchers, and farmers.

Governor Padrés brandished what has been a winning pro-aqueduct argument for most Sonorans, namely that, "Water is now for all *Sonoroenses*, and not longer for just a few." It is an argument that resonates with the Mexican Constitution's guarantee of potable water access for all Mexicans. It frames the Yaqui water conflict as a struggle between greedy farmers and needy citizens.

These urban water deficits are in part linked to a construction boom fueled by developers who build new subdivisions and condominium complexes (notably in Puerto Peñasco) without any guarantee that there will be enough water. It's a national problem, according to the former president of the Mexican Construction Industry Chamber, who said that developers are building thousands of new subdivisions where there is no reliable supply of water.[42]

But the Padrés administration realized that government pro-aqueduct propaganda, along with the imposition of the will and power of the state government, wasn't enough to dissuade the opposition. Thus, the Padrés

administration began loosening the state government's purse strings along with federal grant money to create a legal facade for the draining of the Yaqui River. CEA staring buying water rights from small landholders along the middle Yaqui river basin as well as offering payouts to valley producers who would agree, at least rhetorically, to yield their water rights.[43] Other government payouts to those who would express support for the aqueduct created divisions in the Yaqui valley, including among Yaqui themselves, particularly those with a history of working for state government programs.

The State Water Commission counted on the firm backing of CONAGUA during the Calderón administration. In a July 2010 visit to Hermosillo, President Calderón gave the presidential blessing to the assertion by CONAGUA that it had secured almost 52 cubic milimeters (52,000 liters) of water from the Yaqui river basin that were not accounted for or distributed and which could therefore be transferred through the planned aqueduct.[44]

The rush to construct the aqueduct in less than two years, then, is best explained by the coinciding of PAN governments in Sonora and in Los Pinos. President Felipe Caderón's term was set to expire in December 2012 while the *sexenio* of Governor Padrés would end three years later. As José Luis Moreno, a water expert at the Colegio de Sonora, observed: "The [aqueduct] conflict originated in the decision to finish this water project at any cost before the federal elections in July 2012."[45]

After the Calderón *sexenio* ended in 2012, CONAGUA became pronouncedly more distant from Padrés and CEA. But the federal government under President Enrique Peña Nieto has continued granting funds for Sonora SI projects, including aqueducts and dams. Even as support for the governor plummeted in late summer 2014, public support outside of the Yaqui Valley region for the governor's projects to dam and transfer water to water-poor urban and rural areas was little affected—although the support came coupled with demands that these projects abide by the rule of law.[46]

Main Institutional Players

State

The chief institutional protagonists are the federal government and the Sonora state government. As governor, Guillermo Pádres has been the leading advocate of the Novillo-Hermosillo aqueduct, acting through the governor's office, the newly created state agency Sonora *Sistema Integral* (Sonora SI), and the State Water Commission (CEA), as well as state offices, such as the attorney general's office and other agencies that provide basic services and rural development assistance (to pacify and divide the Yaqui).

Federal

While Governor Padrés and Sonora SI have been the most visible state government proponents of the Yaqui River water transfer, the Independencia aqueduct would not have been possible without the federal government, which is a strong proponent of new aqueducts and dams to address water shortages. But more than advocating hydraulic solutions, CONAGUA provides at least two-thirds of the funding (usually more than 90%) for these projects, including the contested aqueduct in Sonora.

Aside from the financing, federal agencies, including SEMARNAT and its decentralized arm PROFEPA, rubber-stamped the construction plans for the aqueduct, without giving any consideration to environmental impact of the water transfer. CONAGUA never seriously evaluated how much water was being legally drawn with valid permits from the Yaqui River, how much water belonged to the Yaqui, or the impact of climate change and prolonged droughts on Yaqui River flows.

Local

The city and county of Hermosillo have been prime advocates of the aqueduct but have no official role. The counties of Cajeme and San Ignacio Río Muerto in the Yaqui Valley took their case against the aqueduct to the Supreme Court and lost on the fundamental question about the legality of the aqueduct. However, the Supreme Court did find SEMARNAT's environment impact study woefully lacking, and ordered it to produce another more credible evaluation.

The Yaqui have no legal standing within Mexico as an autonomous government. Instead, the Yaqui must pursue their interests through the political structures of the mestizo-controlled *municipios* and *ejidos*. Yaqui communities do have their own form of governments with governors, secretaries, and spokesmen. Yet these communities and their leadership are divided with different factions having their own leadership. This absence of a legally-recognized central government makes the Yaqui and other indigenous communities subject to manipulation by local, state, and federal governments as well as by those with special economic and political interests.

The Yaqui Valley Irrigation District, representing most large farmers and agribusinesses, together with the PRI provided logistical and other support for traffic disruptions.

Political Parties

The dynamics of the Yaqui Water War have in no small degree been shaped by the political ambitions of the two leading political parties, the PRI and

the PAN, and to a lesser extent by less influential parties in Sonora, notably PRD.

With the launching of Sonora SI and the construction of the Independencia aqueducts and other hydraulic megaprojects, PAN has hoped to solidify its hold on the Sonoran electorate, given the broad support for such projects, especially in Hermosillo and other the desert cities.

The political dynamics changed after PRI's Enrique Peña Nieto succeeded PAN's Felipe Calderón as president. PRI politicians, although historically strongly supportive of such hydraulic projects and in particular the long-standing Yaqui River aqueduct plan, have since 2010 criticized the aqueduct, albeit mainly with respect to budgetary and legal issues rather than over the need for the aqueduct.

Meanwhile, CONAGUA and other federal agencies have not backed away from their support even as tensions between the PRI and PAN in Sonora and between the federal and state government escalate. It is unlikely that either party would currently or in the future support any definitive closure of the aqueduct, given the depth of support for the aqueduct outside the Yaqui Valley.

CONAGUA is a Principal Player

Sonora's water crisis can ultimately be attributed to the lack of due diligence by CONAGUA. Without ensuring that the Novillo-Hermosillo aqueduct counted on all the proper state and federal permits and impact studies, CONAGUA financed and supported the aqueduct's construction and operation at least until 2013. Without guaranteeing that the aqueduct would not adversely affect the water rights of the Yaqui or even consulting the Yaqui, CONAGUA gave the go ahead to inter-basin water transfer. What's more, CONAGUA provided critical backing to the fictitious backstory created by Sonora SI and the state water commission (CEA) in the face of widening opposition. CONAGUA echoed the state government's claims that most of the aqueduct water came either from unappropriated Yaqui river water or from the purchase of water rights from small landholders and *ejidatarios* (members of collective land holdings called *ejidos*) in the middle basin.

It is true, as CONAGUA officials are apt to assert, that national water law decentralized the control and monitoring of water use, giving state and local authorities more participation and responsibility. Yet CONAGUA is not some distant bureaucracy in Mexico City. Not only does CONAGUA have extensive offices in Hermosillo, all water drilling and water-diversion permits in Sonora, as well as all major hydraulic projects, come under the jurisdiction of the Hermosillo-based *Organismo de Cuenca Noroeste*

(Northwest Basin Agency). In theory, this agency protects the sustainability of water resources in each of the state's major water basins. Indeed, CONAGUA's Sonora branch consists of separate planning offices for Sonoyta, Concepción, Sonora, Yaqui, Mátape, and Mayo basins.

In other words, it is not the state government, whether controlled by PRI, PRD, PAN, or the *Partido Verde* (Green Party), that bears ultimate responsibility for the sustainability of Sonora's hydraulic society. Rather, it is the federal government through CONAGUA—and not only because it authorizes water megaprojects and even individual wells, but also because it and the federal government's central budget provide the principal funding for all major water works in Sonora.

Supreme Court Decision in Favor of the Aqueduct

Since the aqueduct conflict began, supporters and opponents have argued that they stand on the side of the law, citing clauses from the Mexican constitution and numerous court rulings. Most of the court rulings, however, have found irregularities and illegalities with the processes the state and federal government used to approve and construct the aqueduct.

Superficial environmental impact studies, lack of consultation with Yaquis and others who might be adversely affected, and the absence of the required permits resulted in a series of district and national court decisions against continued construction and functioning of the aqueduct. International and national expressions of solidarity by nongovernmental organizations and prominent intellectuals also contributed to the determination of the anti-aqueduct opposition.

But Sonora's state government and the involved federal agencies (including SEMARNAT, PROFEPA, and CONAGUA) ignored these rulings. After a series of legal victories over four years, the long-awaited Supreme Court ruling in January 2015 against two *municipios* in the Yaqui Valley was widely regarded as a major blow against the anti-aqueduct forces. The ruling vindicated the government's aggressive pro-aqueduct campaign and Sonora SI. Virtually all the social and economic sectors in Hermosillo jubilantly greeted the ruling, relieved that the desperately water-short city could now count on the injection of up to 75,000 cubic meters of water annually from the Yaqui River. While domestic water users, industry, construction companies, and agribusiness might otherwise have little in common, all believed that they had a legal and moral right to draw water from the distant Yaqui River.

The high court decision undercut opposition claims that this mountain to desert cross-basin transfer of water was illegal and a gross breach of the rule-of-law. The anti-aqueduct coalition has declared its commitment to

continue to oppose the aqueduct, but the Supreme Court ruling limits its options. Before the ruling, the Yaqui could more persuasively argue that rulings by lower courts against the aqueduct were not being enforced and thus militant civil disobedience was their only recourse.

Theoretically, the political process could result in a governmental decision to shut down the aqueduct. PAN, for its part, has deepened its popular support in Hermosillo, the Sonora River Valley, and elsewhere because of the Padrés government's unwavering determination to push through the controversial aqueduct. If the PRI remains the opposition party in Sonora after the June 2015 elections, it might continue its anti-aqueduct political posturing.

However, as a governing party, PRI would almost certainly revert to the party's longtime support for water megaprojects—a position reinforced by Peña Nieto government's backing of new dams and aqueducts and dismissal of indigenous rights. Theoretically, Peña Nieto could have exercised his executive authority and shut down the aqueduct, either permanently or until the involved federal agencies complied with their obligations.

Mexico's dubious commitment to the rule of law helps explain how and why conflicts routinely are resolved in favor of the most powerful and play out in the street as well as in the courts and in the arena of party politics. It is unlikely, therefore, that the PRI or any other party will chart a new and more sustainable plan for water management in Sonora, at least in the near future.

VIII. Water Rights and Indigenous Rights

Article 1 of Sonora's Constitution, known as the "Law of Rights and Culture of Indigenous People," states: "The state recognizes the pluricultural composition of its population and particularly the existence of the communities that gave birth to our region, and will do whatever is necessary to ensure respect for their languages, cultures, practices, customs, resources, specific forms of social organization, and guarantee the effective access to the justice of the state, in this way aiming to consolidate these aspects of our national identity." Yet the state of Sonora has done everything but honor the intent and letter of these constitutional guarantees. Sonora offers a good case study in how the Mexican government has responded to its indigenous people.[47]

In matters of land and water, U.S. and state laws and regulations routinely include mention of the rights and existence of Native American tribes and communities, albeit not always respecting those rights. But this is rarely the case in Sonora, reflecting national attitudes and practices.

In a 2012 report on water and the state's indigenous communities, Colegio de Sonora researchers concluded from their field studies that throughout the state they observed the indigenous displacement from their traditional territories and natural resources, and that the water conflicts involving their subsistence are steadily worsening, thereby increasing their vulnerability and destabilizing the already precarious ecosystem-based or biocultural societies in these regions.[48] Furthermore, the authors concluded that the concept that water is a shared national resource and a right of all Mexicans is a myth, especially for indigenous communities.

Yaqui Rights in Theory and in Practice

The Yaqui water war was, and continues to be, an intensely local conflict, pitting diverse factions of Sonoran farmers, domestic water users, indigenous peoples, agribusinesses, and citizen movements against each other. Yet this water war in south-central Sonora is also an increasingly prominent national issue in part because it involves varying and often ambiguous interventions of federal courts and an array of federal environmental ministries and agencies, including CONAGUA. The high national profile of the Yaqui water war can also be explained by the rise of the new indigenous opposition movements to protect their land and water against an array of government megaprojects (including dams, mining complexes, and tourism), and energy projects.

The credibility and strength of the Yaqui opposition to the Novillo-Hermosillo aqueduct were not simply products of Yaqui militancy. More fundamentally important was their insistence that this water conflict is a rule-of-law issue, not a power struggle between sectors each of which wants more water. For the Yaqui, the rule of law must include the honoring of rights as indigenous people. However, both CONAGUA and the state government mounted their own legal proceedings but based their arguments on the fact that the water rights were obtained and that the aqueduct was already underway.

One of the strongest arguments against the aqueduct was that its construction and the transfer of water from the Yaqui River were clear violations of indigenous water rights. The promise of President Cárdenas is not disputed but in Mexican water law there is no mention of indigenous water rights. In other words, there are no laws that give the Yaqui or other indigenous communities special water rights because they were the original users of a region's water resources or for any other reason.

With respect to water law and water rights, instances of this disrespect of indigenous rights abound. For the most part, the very existence of the state's native peoples is ignored in law and in governance. The National Water Law stipulated that water basins should be cared for by their residents and water users—organized by type of users, including agricultural, industrial, and urban—but in Sonora there is no special place given to indigenous peoples in the water basin councils.

A presidential decree in 1940 guaranteed the Yaquis the right to 50% of the water captured by the state's first dam, La Angostura, but as we have seen, this right has never been quantified, honored, or even acknowledged by the state. The creation of the Yaqui River Irrigation District in 1956 also failed to address this right, even though the district was the prime beneficiary of the damming of the Yaqui River.

A special irrigation district was established for Yaqui communities in an attempt to pacify rising Yaqui demands that the 1940 decree be honored but it only encompassed a third of the irrigable lands that were the Yaqui's due allocation. Moreover, the government has facilitated the appropriation of these Yaqui district lands by nonindigenous renters.

Rentismo (rental of Yaqui lands by non-Yaquis) is about 90%, and an estimated 73% of the economic benefits of agricultural activity on Yaqui lands leaves the Yaqui communities as profit, leaving the original users of the Yaqui River with environmental degradation and health problems, primarily for children and adolescents, resulting from the unregulated use of agrochemicals.

Modeling their claims in part after indigenous water rights law in the U.S. West, the Yaqui have made a variety of water rights claims that have legal standing, including their primordial rights for water to farm their traditional homeland in the Yaqui delta. They have also pointed to the land and water rights that President Lázaro Cárdenas granted in 1940, and their rights (stipulated by Mexican law and international law) to be consulted on matters that affect their livelihood, especially development plans that may adversely affect their land, water, and other natural resources.

Both international treaties and the Mexican constitution guarantee the Yaqui and other indigenous communities the right to prior and informed consultation before projects that affect their livelihood are undertaken. A 2012 Supreme Court ruling that obligated the federal government to consult the Yaquis about the impact of the water megaproject on their communities had lifted the spirits of the anti-aqueduct coalition. The surprising ruling—which recognized right of indigenous people to be consulted about projects that affect their sustenance and cultural survival—came after the aqueduct was already under construction.

The federal government did initiate a flawed consultative process that has, thus far, not resulted in any clarity about the consensus opinion among the Yaquis about the impact of the aqueduct. Yaqui anti-Novillo leaders and supportive nongovernmental organizations have rejected the validity of consultative processes for a variety of reasons, including assertions that government-sponsored consultations were ordered only after the aqueduct was constructed and that government manipulation and repression of aqueduct opponents undermine the integrity of these opinion surveys.

The Mexican government has repeatedly manipulated Yaqui assertions of autonomy to deny them fundamental rights and to divide Yaqui communities into competing factions.[49] The Yaqui are not constituted into governing jurisdictions that are recognized by the government. As a result, the Yaquis are beholden to non-Yaqui authorities and leadership of the *municipios* and *ejidos* where they live. This explains why the Yaquis have standing before the Interamerican Human Rights Court but not the Mexican Supreme Court. Lawyers from two *municipios* in the Yaqui Valley argued anti-aqueduct case before the Supreme Court while the Yaquis, although theoretically autonomous, lack the same legal standing. In his effort to push through the aqueduct, Governor Pádres argued that the Yaqui really didn't even exist legally.

At the same time, all instances of Mexican governance—federal, state, and local—have used Yaqui autonomy against the Yaquis by using government programs and handouts to create or support compliant leadership factions. As Mexican anthropologist Enriqueta Lerma Rodíguez wrote: "Without doubt the divisions [within Yaqui communities] facilitates the intervention of governmental power, which seizes the opportunity to define which [Yaqui internal] governments are 'traditional,' 'legitimate, and 'truly Yaquis,' while qualifying those that aren't useful to them as illegitimate."[50]

The existence of two or more governors and retinue of counselors and spokesmen has also raised questions about the claims of the leaders of anti-aqueduct's "permanent civil guard" that they represent all Yaquis, the Yaqui traditional governors, or the legitimate Yaqui governments. As Rodríquez observed: "In the context of the Independencia aqueduct, the divisions become significant—and not positive—since there always are those who argue that those Yaquis of Vícam Estación who are the organizers of the resistance are illegitimate. In these circumstances, the potential of constructing a strong opposition movement is limited by internal differences and also by personal interests."

Among the Yaqui communities, there is widespread indignation about their continued marginalization from the economic development of the Yaqui Valley and the long history of the government's failure to honor promises. Despite widespread Yaqui distrust of the government and opposition to the new aqueduct, the Yaqui communities are not united under one leadership or a common development agenda. This common indignation and dissatisfaction has not produced a consistent unity among Yaquis with respect to their political agendas, political party allegiance, and response to government development programs. Yaqui communities are divided into many factions that routinely criticize one another for their political opportunism.

There remains some lingering hope that a new environmental impact study, a new consultative process with the Yaqui, and a possible electoral

defeat of PAN in the June 2015 state elections could create new political and legal problems for the aqueduct's continuing functioning. Yet the scope of a new environmental impact statement will be narrow and will not likely address the long-term environmental and cultural impacts of the diminished flow of the Yaqui River.

The Yaqui water war has focused almost exclusively on current water-distribution issues. While these issues are contentious and complex, yet more complicated and fundamental are the ways that access to water sustains the cultures, ecologies, and biodiversity of Sonora.

With respect to these underlying issues, a report from Colegio de Sonora noted:

> "One can observe the pattern of dislocation of indigenous people from their traditional homeland and from their natural resources, and that conflicts over water for subsistence are becoming increasingly severe – all of which exacerbates the vulnerability of these communities and the disintegration of their traditional biocultural frameworks."[51]

The report states in conclusion that "the issue of access to good water highlights the social inequity in Mexico… and it must be said that the theme of water also shows the ethnic inequality that prevails in society." Taking note of how water has been converted into an inert piece of merchandise that is sold and bartered, researchers observed how this has led to a profound change in the indigenous "*cosmovisión*," inducing a process of disjuncture between symbols and praxis.[52]

IV. Conclusion: Unsustainability of Water Megaprojects

The Yaqui water war, while centered at least rhetorically on the access to traditional water supplies, underscores how much water has become a commodity to be fought over rather than common resource that sustains life in these arid lands. Despite rising water conflicts throughout the state, including those that have emerged because of new water megaprojects on the Yaqui and Mayo Rivers, the core principles of the hydraulic society of Sonora count on broad support. Rarely, even among groups opposing the new water megaprojects are there fundamental concerns about the impact on the riparian environment or the coastal waters.

Despite rising understanding about the unsustainability and short-term life of hydraulic projects, there are few voices advocating that the government begin disassembling its hydraulic infrastructure. In the protests against Los Pilares dam and Independencia aqueduct, few are advancing counter visions in which rivers would again run free so that floodplains, deltas, and aquifers be recharged. Although indigenous rights are core issues to the campaigns against these projects, there is no associated vision of a social economy in Sonora in which the Yaqui, Mayos, and Cucupás would

be principals in sustainable farming ventures based on traditional water sources.

The modernization paradigm embodied in the water megaprojects of Sonora SI has also excluded any broader pre-project discussion of how the *bienestar* (well-being) of healthy communities is closely related to the health of the environment. Scholars and environmentalists variously describe this connection between societies and the environment as biocultural diversity, biocultural evolution, cultures of habitat, or cultural sustainability.[53] Water planners in Sonora and elsewhere in the transborder West would do well to consider the links between healthy societies, cultures, and environments. By doing so, governments would likely avoid igniting water wars. They might also help prevent more of type of socio-environmental disasters (often related to water use patterns and water shortages) that are mounting in Sonora—from the river valleys to the coastal plains, from the cities to endangered rural communities.

Megaprojects in Mexico cannot be understood solely by examining their stated objectives or the adequacy of their financing.[54] Look behind any megaproject, or most any infrastructure project, and you will likely to find a web of political and business connections. Because of the lack of transparency in most government-funded projects, these connections rarely come to light until after the money is spent and the political officials are leaving office. That politicians have friends in business, including former high political officials, is to be expected most anywhere.

In Mexico, however, the fact that good-old-boy networks benefit from infrastructure spending is usually not the most serious concern. Rather, it is often the case that the very objective of megaprojects is to distribute government funding to family members, friends, and business colleagues. Too often a megaproject is deemed a success, then, not because it is well-constructed and meets well-considered objectives but rather because it distributes government funding on a grand scale.

As for the all-important bottom line: government-financed hydraulic projects allow water to flow uphill toward money. Rarely are cost efficiencies, rights of traditional water users, or environmental impacts considered in the rush to construct hydraulic or any other megaprojects in Mexico. Tapping government funds to boost the fortunes of the economic elites is a fundamental part of politics as usual in Mexico, and governors and presidents regard megaprojects as the foundation of their legacies.

Often, the megaprojects—whether roads, ports, dams, aqueducts, housing complexes, or tourism centers—begin to deteriorate soon after construction is finished, thereby creating new imperatives to contract the same construction and engineering firms to maintain or revamp these megaprojects. In the case of Sonora SI, the Padrés government initiated an array

of water megaprojects without having to explain the source of all the necessary expenditures. Approaching his last year in office, the governor was leaving the state debt-ridden and without the operating funds for regular government services.

Water megaprojects in Mexico are also increasingly becoming privatized. While the water in reservoirs, aqueducts, and municipal water distribution systems remains a nationally owned resource, the private firms that construct and operate these water infrastructure projects function as profit-making enterprises. In many ways, La Angostura dam and reservoir in the upper Yaqui River basin serve as part of Grupo México's mining, smelting, and hydroelectric operations—all of which freely use the river water, half of which was promised to the Yaqui.

Private firms closely associated with Grupo México were given the contracts to construct the Independencia aqueduct. There is no public information about the continuing involvement of private companies in the aqueduct. There are reasonable fears in Sonora that the aqueduct and control over its water will in effect be privatized, similar to the central role of Grupo Higa in the construction and operation of the new aqueduct to Monterrey.

The spreading water crises in the region are not ultimately resolvable without recognizing how unsustainable water-use and water-management practices set the conditions for heightened tensions. Adding to the challenge will be setting forth solutions that consider how the onset of climate change in arid regions obligate societies to institute adaptation strategies that ensure sustainability and survival of the cultures and societies in arid regions throughout Mexico.

Part Two

The treasure of the Sierra Madre still beckons. But the miners are no longer coming to these rugged mountain ranges of northern Mexico with picks and shovels. Nor are they searching for veins of precious metals on mules and horses, animated only by their dreams, delusions, and desperation.

Such dreams were made infamous by movies such as 1927's *The Treasure of Sierra Madre:* "I think I'll go to sleep and dream about piles of gold getting bigger and bigger and bigger," remarked Fred C. Dobbs, played by Humphrey Bogart. Illusions of making it rich by mining the treasures of Mexico are coming true, as never before.

The Mexican government is making modern mining dreams come true. Nonexistent or unenforced regulations— whether regarding occupational

safety, environmental degradation, water extraction, and control of hazardous wastes— make Mexico one of the world's most profitable countries for the mining industry. Government agencies, both federal and state, that have authority over the mining industry serve as mining boosters rather than as regulators.

Today's mining ventures differ substantially in scope than the prospecting ventures depicted by B. Traven in *The Treasure of the Sierra Madre*. Most are multimillion-dollar operations, and some like the Cananea and Nacozari de García copper mines of Grupo México are multibillion-dollar ventures.

But many similarities remain. Then, as now, most mines, from the smallest artisanal ventures to the monstrously large open-pit mines that consume entire landscapes, are found in remote mountainous regions far from major population centers and transportation routes. The new rash of gold, silver, zinc, and copper mines are tearing up canyons, mountain slopes, and forests out of sight of most Mexicans. Even though Sonora and Chihuahua lead Mexico in the number of new mining operations, few *Chihuahuenses* or *Sonorenses* have ever been close to a mine.

Most mines are tucked into the folds of remote *bajadas* that cut down from the mountains or spread across gravel terraces by the sides of rivers flowing through sparsely inhabited canyons and valleys. And the places where the mining industry consumes land and water in its search for treasure are generally poor and often indigenous communities that often lack political power or influence.

Yet as Joaquin Rojo de la Vega, president of the Sonora Miners Association (AMSAC) observed in a speech to mining executives and government officials: "I can assure those that haven't seen it that for Sonora, mining is the principal industry."

I. Mexico's Mining Boom

Mining and mineral exploration is booming throughout Mexico— it has more than doubled between 2007 and 2012. It's an explosion of mineral extraction and mineral exploration with no modern precedent. Nowhere is Mexico's mining boom so evident and palpable as in arid northwestern Mexico. Between 2001 and 2012, production by mineral and metallurgy industries increased 773%.[55]

Foreign mining firms, mostly Canadian, are leading the charge to exploit Mexico's mineral wealth. Most of the new mineral exploration and extrac-

tion operations are occurring in northern Mexico, but the mining boom has spread across the country. Transnational mining companies (both Mexico-based and foreign-based) are scouring the eastern and western Sierra Madres for the gold and silver that lured the Spanish to northern Mexico in 16th and 17th centuries. But today Mexico is also a major producer of copper, zinc, molybdenum, among other minerals and metals.

The government's Ministry of the Economy is luring new investment with an array of subsidies, financing, training, and technical assistance, and by reminding mining companies that 70% of the country remains unexplored for its mineral treasures. Major foreign firms such as Alamos Gold, GoldCorp, MagSilver, Agnico Eagle, and Newmont Mining, along with Mexican-owned giants such as Grupo México, Industrías Peñoles, and Grupo Frisco, have exploration permits for more than 15% of Mexico's territory. In the arid northern states of Chihuahua and Sonora, cut north to south by the Sierra Madre mountains, as much as 30% of the territory is under mining exploration or extraction contracts.

In 2012, the five states of Mexico's mountainous north—Sonora, Zacatecas, Chihuahua, Durango, and San Luis Potosí—accounted for 71% of total mineral production.[56] But the mining boom is spreading down from the border to Mexico's south. The largely indigenous states of Guerrero and Chiapas have experienced the most rapid expansion of mining operations, and rank, respectively, as Mexico's seventh and tenth most important mining states.

During the *Porfiriato* (1876-1910), the Mexican government opened the country to foreign mining and agricultural and commercial investors, giving these U.S. investors a free hand in exploiting Mexico's human and natural resources. The repression of a 1906 mineworkers' attempt to organize by the Arizona Rangers and Mexico's rural police helped sparked militant opposition to the Porfírio Díaz regime, prefiguring the 1910-1917 Mexican Revolution.

The rush of foreign mining companies into Mexico and the government's open-door policy for all mining investment recalls the greed of the pre-revolutionary regime. Yet the largest mining firms in Mexico are Mexico-based companies owned by the country's leading plutocrats. Whether foreign-owned or Mexico-based, the mining industries share a disregard for the country's scarce water resources and for the environment. Mining companies regard communities near mineral reserves and water sources as obstacles to making mining dreams come trues, and its leaders and activists are among the nation's many victims of human rights abuses.

News from Mexico about organized crime, widespread violence, and police and military impunity has overshadowed other trends that are roiling the stability of the northern states. Among the most disturbing trends are the following:

1) Escalating crisis over access to scarce water supplies;

2) Increasing concentration of rural land among relatively few landholders, mirroring pre-revolutionary land tenure patterns;

3) The transnational mining industry's rush to extract Mexico's mineral reserves without regard to adverse impacts on the environment and rural communities and without facing the counterweight of an organized workforce; and

4) Disproportionate impact on indigenous communities from the mountains and the deep *barrancas* of the Sierra Madre Occidental to the rainforests of southern Mexico.

II. Sonora's Mining Boom

Nowhere has Mexico's mining boom been so deeply apparent as in northern Mexico, particularly in the border states of Sonora and Chihuahua—states divided from one another by the mighty Sierra Madre Occidental. But the mining boom is also rumbling through other northern states whose most dominant geographic feature are the two Sierra Madre mountain ranges—Occidental in the west and Oriental in the east— that range north-south through north-central Mexico. These include the border state of Coahuila and the north-central arid states of Zacatecas, Durango, and San Luis Potosí. By the last official count (2012), 50.2% of mining occurs in the states along the U.S.-Mexico border.[57]

Sonora leads Mexico in the number of mining permits and production. Of overall production value in the mining sector (including metallurgical processing), Sonora accounted for 29.2% of the national total, followed closely by Zacatecas, and then Chihuahua, Durango, Coahuila, and San Luis Potosí—states also bisected by the Sierra Madres.[58]

Reflecting the national trend, Canadian firms dominate the foreign mining sector in Sonora, while the Mexico-based transnational Grupo México dominates mining and metallurgical operations in the state—mainly because of its copper and molybdenum mines and processing plants in the northern *municipios* (counties) of Cananea and Nacozari.[59]

From the beginning of post-Columbian history, mining has vied with agriculture has Sonora's top wealth-producing industry. The political and

Overview of Mexico's Mining Boom

- Mexico is currently the world's 14th largest mineral-exporting nation, and the fourth largest in Latin America.
- Mexico is among the world's top ten producers of 16 minerals.
- World's leading silver producer; second largest for bismuth and fluorite; third for celestite and wollastonite; fifth for cadmium, lead diatomite; and molybdenum; seventh for gold, zinc, and gypsum; eighth for barite and graffite; ninth for salt, and tenth for copper.
- Between 2010 and 2012, non-oil extraction increased at an annual rate of 11.8% — one of the most dynamic sectors in the national economy.
- The Fideicomismo de Fomento Minero (FIFOMI) or Mexico's Mining Development Trust, in its bid to attract more mining operations, notes that only 30% of the country has been explored for minerals, leaving 70% available for exploration and mineral extraction.
- Mining sector (including processing minerals) constituted 4.9% of domestic gross product in 2012.
- $30.8 billion invested in Mexico's mining sector between 2001 and 2012, with a record-breaking $8 billion in 2012 alone.
- La Secretaría de Economía (Ministry of the Economy) projects that $35 billion will be invested in mining sector during the *sexenio* (six-year term) of President Peña Nieto.
- Mining is Mexico's fourth largest source of foreign exchange, reaching $22.7 billion in 2012. Ranking above mining as a source of foreign exchange are the automobile industry, electronics and electricity industries, and oil industry.
- Employment in mining increased at an average annual rate of 1.3% between 2001 and 2012, higher than the national average for total employment growth.
- Mineral and metallurgical exports increased more than 800% from 2001 to 2012.
- According the state's General Mining Directorate (Dirección General de Minas, DGM), the federal government issued 28,807 minerals exploration and mining permits between 2001 and 2012 — covering 61.8 million hectares. The Ministry of the Economy issued 198 permits each for 50,000 or more hectares to the transnational mining companies, most of which received multiple permits.

Sources: "Acuerdo por el que se aprueba el Programa de Desarrollo Minero 2013-2018," Diario Oficial, May 9, 2014; "Mining Industry in Mexico: A Golden Opportunity," Negocios ProMéxico, February 2014; Anuario Estadístico de la Minería

economic elite of Sonora made their homes in the southeastern town of Álamos, the northernmost of the Spanish empire's silver towns in Latin America.

The ostentatious wealth and political power of Álamos would, however, not been possible without the bounty of the indigenous agricultural communities of the Sonora, Mayo, and Yaqui River basins that hugged the Sierra Madre to the north and those of the Yaqui and Mayo deltas to the northwest and west.

Unlike the Spanish *conquistadores*, colonizers, and mining groups, the Jesuit missionaries sought out the indigenous communities of Sonora because of their farming traditions and their belief that the Jesuits could improve their living conditions through improved farming techniques. The mining centers of Nueva Vizcaya (northern territory that encompassed Sonora) and the Jesuit missions (and the associated indigenous communities) experienced a complementary yet sometimes conflictive relationship.

The relationship was complementary because silver and gold mining depended on forced indigenous labor and on the food produced by the native communities. But the mining centers conflicted with the Jesuit missions due to Jesuit and indigenous resistance to the demands, taxes, and repression of the mining-based power centered in Álamos. On both sides of the Sierra Madre Occidental, indigenous communities rose up in rebellion as the Spanish and then Mexican miners expropriated indigenous land for their mining operations and conscripted native labor.

As the political and economic power of the Jesuit missions grew, based largely on the agricultural wealth of their missions among indigenous communities, tensions mounted, leading to the expulsion of the Jesuit order in 1767. With the Jesuits gone, the more politically and economically compliant Franciscans assumed control of the indigenous missions. The mining boom of the 1600s and 1700s came to a halt as Apaches stepped up their raids on new settlements and mining enterprises throughout the region.

Over the past two decades the mining industry has again become the dominant force in the mountains, canyons, and valleys of eastern Sonora. The mining boom is largely out of sight in western Sonora. In contrast, the industry's massive opencast mines, mountains of tailings, water consumption and contamination, and guarded enclaves have become the most striking and alarming feature in the landscape of Old Sonora— the mountainous region to the east of the Sonoran Desert and the source of virtually all of Sonora's surface water.

Foreign mining companies—more than 90% of which are Canadian—have led the surge in mining exploration in Mexico. In Sonora, too, Canadian firms dominate mining exploration in the state. Throughout Sonora and Chihuahua, there is rising indignation over the aggressiveness of the Canadian mining firms. But the major mines in Sonora are Mexico-based, Mexican-owned transnational corporations.

Copper mining occurs primarily near the U.S.-Mexico border in the *municipios* of Nacozari de García, Santa Cruz, and Cananea—presenting issues of transboundary contamination of the Santa Cruz and San Pedro rivers and of transboundary aquifers.

III. Making Mining Dreams Come True

Mexico is one of the world's most profitable countries for the mining industry. The February 2014 cover article of *Industrias ProMéxico*, an English-language promotional magazine distributed to foreign investors boasts, "The Mining Industry in Mexico: A Golden Opportunity." The article points to Mexico's "500 years of tradition" of opening up the country to the "global mining industry."[60]

Aside from its mineral wealth, Mexico is attractive to the mining industry for what is euphemistically termed its "competitive" investment environment. Among 25 mining nations, Mexico ranked fifth in having the best mining investment conditions," according to an industry study.[61] Among the factors that figure into the competiveness rating is the cost of production, including mineworker wages, and the degree of social tensions, including community opposition and environmental activism, experienced by investors.

In Latin America, Mexico ranked third behind Chile and Brazil. The mining industry is attracted to Mexico because of lax and unenforced government regulations concerning the environment, water, and occupational health and safety. Mexico's proximity to the U.S. and Canadian markets also attract mining investment to Mexico.

At the Ministry of the Economy in Mexico City, Mario Cantú Suárez directs the Mining Coordination Office (*Coordinación General de Minería*), which includes the FIFOMI, a semi-autonomous government trust, that together with other branches is entrusted with monitoring and regulating mining operations in Mexico. Yet rather than monitoring or regulating the country's booming investment in mining, the Mining Coordination Office oversees the governmental efforts to promote and develop the mining sector.

Mining Boom in Sonora

- Sonora leads the nation in the number of active mining firms (129), followed by Chihuahua (73), Durango (87), Coahuila (49), and Zacatecas (47).
- There are more permits for mining operations in Sonora – 4,213 – than for any other state.
- Production in Sonora dominates national production in these minerals: Copper (66%), Gold (29%), Molybdenum (100%), Wollastonite (100%), Graphite (100%), Selenium (100%) Anthracite carbon (100%).
- 30.2% of Sonora is covered by mining concessions, or 5.7 million hectacres, doubling from 2007, when mining concessions covered 16.0% of the state, or 2.8 million hectares to 5.7 million hectares.
- Mining concessions rose between 2007 to 2012 from 3,844 concessions to 5,390 concessions.
- Value of mineral production in Sonora increased from 30 billion pesos to 72.4 billion in 2012 – the latest information available.

Negocios ProMéxico cited Cantú Suárez on "the conditions that favor mining investment and development" in Mexico: "There is an advanced regulatory framework, on par with those of major mining powers, which gives legal certainty and security to the industry with clear rules and efficient administrative processes." The magazine is a product of ProMéxico, an investment-promotion agency created by President Felipe Calderón in mid-2010 under the joint supervision of the economy and foreign relations ministries.[62]

But regulation in the sense of enforcement of occupational-safety, environmental, and permit restrictions fall far outside actual mission of the Mining Coordination Office. This was apparent in the recent environmental and occupational safety disasters provoked by the reckless mining practices of Grupo México in Sonora and Coahuila.

The Mexican government, which formerly owned most of the mining industry as the result of its nationalization and *Mexicanización* initiatives in the 1960s and 1970s, maintains its close association with the mining sector. Yet more than cooperating with the mining sector, the federal government from the offices of the Ministry of the Economy (*Secretaría de Economía*.) in Mexico City functions as the industry's public-relations agency, source of credit and risk capital, source of technical assistance and training programs, and much more.

Through the ministry's Mining Coordination Office, the Mexican government has taken it upon itself to provide mineral maps to mining companies, develop an infrastructure of mining-service businesses to serve the major mining corporations, help construct a nationwide network of mining industry associations, revive abandoned mines to facilitate new investment in these mines, and develop "mining districts" that function as hubs for mining operations by foreign and Mexico-based mining firms.

It is in this way that government agencies—both federal and state—that are responsible for the mining industry serve as mining boosters rather than as regulators.

Government Stands Behind Mining Industry

ProMéxico is typical of the type of investment-promotion agencies found in the commerce and economic ministries of most governments. It sells the advantages of Mexico's investment climate and competitiveness, highlighting the available investment and tax incentives, the lack of labor unrest, the low cost of labor, the government bureaucracy established to serve business, and the lack of enforcement laws on the books.

Foreign and national investors have come to expect such red-carpet treatment. But Mexico offers much more than a warm welcome. Through FIFOMI, the federal government's Ministry of the Economy and its mining coordination office offer existing and prospective mining corporations and mine-service firms what can best be described as "development aid."[63] But this development aid goes not to the impoverished and disadvantaged but to well-heeled investors who seek to increase their wealth.

As a testament to its success in fueling Mexico's mining boom, FIFOMI noted in 2012 that the Metal Economic Group (MEG) ranked FIFOMI as the most successful government agency in Latin America for promoting mining exploration, while holding the fourth spot worldwide. In its capital fund, FIFOMI counts on more 4,700.5 million pesos ($313.3 million) to provide financing, credit, and risk capital to Mexican and foreign mining firms.[64]

FIFOMI has laid the foundation for Mexico's mining boom by offering mining business, small and large, an attractive package of development tools, including:[65]

- Direct financing of new and expanding mining ventures.
- Financing the "development of [industry] providers" or service companies.
- Training and technical assistance of management and labor.
- Creation, promotion, and participation in "risk capital" funds for the mining industry.
- Taking charge of the public relations campaigns for the mining industry. Unlike ProMéxico, FIFOMI's program does not serve to attract investment but to sell the benefits of the mining industry to other sectors of the Mexican government, the Mexican public, and affected communities.

If you tune into the local radio stations in the mining districts of Chihuahua or Sonora, you are likely to learn how the mining industry is the foundation of economic development in these states, providing plenty of employment opportunities, and taking care of environment. Such publicity, paired with newspaper ads, glowing accounts in the print media, and televised public service announcements about the industry's contributions aren't likely paid for by the mining companies but rather by FIFOMI's Program for Promotion and Publicity. In 2012, FIFOMI spent 3 million pesos on publicity for the mining industry to counterbalance accounts of the industry's record of environmental destruction and displacement of communities.

One of the latest initiatives of FIFOMI is to two-pronged strategy to create and financially support local and state mining associations that in effect are extensions of the state government's own mining promotion offices. One example is the partnership between the General Mining Directorate of Sonora's Ministry of the Economy and the Sonora Miners Association (AMSAC).

FIFOMI has also played a key role in the creation of what it calls the State Mining Councils. FIFOMI says that state mining associations, and mining councils, along with the new program of creating mining clusters and strategic promotional directorates in the major mining states represent a coming together of government, business, and civil society, this purportedly inclusive program is narrow and self-selecting.

Not included—or perhaps intentionally excluded—are such civil society sectors as leaders of communities affected by mining, university researchers specializing in the impact of the mining industry, mineworkers' organizations, impacted indigenous communities, and environmental organizations with mining sector expertise. Instead, these councils and clusters include as their civil society representatives mining consultants, directors of mining associations, and mining engineers.

FIFOMI is directly promoting a surge of mining operations around Mexico through its "*clúster*" program. The concept of using FIFOMI resources to develop clusters of mining operations completed with service providers, infrastructure, and water is closely linked to FIFOMI's program of reactivating old mines. Both initiatives count on the federal and state government, together with FIFOMI financing, to spark a surge in mining exploration and excavation. The mining cluster program is modeled after a similar program in Chile called the Chilean Mining Cluster (*Clúster Minero de Chile*) and one in Peru.

From the perspective of FIFOMI, "The creation of mining clusters is a priority task in our country since it involves a multisectoral coalition that joins forces." Zacatecas and Chihuahua have established mining cluster organizations, and FIFOMI has also played a key role in creating mining councils in the country's most conflictive states such as Guerrero and Michoacán. These are states where organized crime has assumed control of the main mining operations.[66]

In the case of Chihuahua, FIFOMI has made available 8 million pesos "for the support of mining" through the recently established Mining Cluster of Chihuahua (CLUMIN). Collaborating with CLUMIN and FIFOMI, the Chihuahua state government has sponsored the development of a new

mining district in the Sierra Tarahumara, which since 2013 has been region most affected by drug-related violence by organized crime and security forces.[67]

Aside from using the trust's resources to build powerful government-mining industry pressure groups, FIFOMI can also point to other successes in accelerating Mexico's mining boom, including:

- Technical assistance and consulting to 830 mining firms in 2012.
- Reactivation of 127 mines from 2007 to 2012.
- Training and capacity-building assistance in 2012 to 2,234 firms involved in the mining sector.
- Financing 176 mining businesses during first six months of 2014, amounting to 560.3 million pesos.[68]

FIFOMI says that it directs its assistance mostly to small- and medium-size firms. What it does not make clear is that in its goal to "develop a productive chain" for the mining sector, it works closely with the largest mining companies, including Peñoles and Grupo México, to ensure that their mining and metallurgical complexes can count on a chain of service providers, many of which are subsidiaries of these mining giants.[69]

In the historical context, Mexico's mining boom is the product of a series of government initiatives that date back to the nationalization initiatives of President Lázaro Cárdenas. Among these initiatives was the creation of the Mining Development Commission (*Comisión de Fomento Minero*, COFOMI), which, after several ideological turns, transitioned into today's FIFOMI. In other words, a government agency that had its ideological roots in nationalist goals became an instrument to create and foster Mexican mining oligarchs who were closely tied by credit, markets, and debt to transnational capitalism. Just one example of this role of government support for the country's economic elite was Grupo México's acquisition of Southern Peru Copper – the mining transnational whose social and environmental irresponsibility provoked a militant rebellion in Peru in 2015.

The structural and financial integration of Mexican mining giants with foreign capital has been the main accomplishment of COFOMI-FIFOMI. In its current iteration, FIFMONI has built the government's public trust to promote the exploitation of Mexico's mineral resources, both for Mexican and foreign owned mining firms.

Boosting Mining in Sonora

The state government's role as a booster for the mining sector rather than a regulator helps explain the almost total lack of information about the impact of mining on Sonora's environment and water resources. The one state government agency that has most information about the state's mining industry is the Ministry of the Economy.

The Ministry of the Economy has four separate programs that work closely with Mexican and foreign mining firms with the stated goals of:

1) fomenting growth of the mining industry;

2) providing training courses (in association with the Ministry of Labor (*Secretaría de Trabajo*) and education institutions for mine staff and workers,

3) Offering technical assistance and consultations

4) Helping mining businesses grow with state assistance.[70]

Over the past decade, the state government has dramatically stepped up its programs to boost the mining industry, creating a series of quasi-governmental entities and *fideicomisos* to aid and abet mining operations.[71]

The General Mining Directorate, which is the office of Ministry of the Economy in Hermosillo that interacts with mining companies, doesn't concern itself with the adverse impacts of mining. The decree establishing the office makes no mention of water use, water contamination, land restoration, or occupational safety and health. Instead, the decree authorizes the state government's mining office to work closely with the mining industry. Its mission is not to monitor or to regulate but rather of series but rather to "*fomenter," proponer," "apoyar," "impulsar," "coadyuvar," "proporcionar," "brindar," "promover," "publicar," "difundir," and "desarrollar*." In English, that is: to strengthen, to recommend, to support, to impulse, to contribute, supply, dedicate, promote, publish, disseminate, and develop.

The Ministry of the Economy hosts fairs and forums to promote mining in Sonora and serves as a public relations agency for the state's mining industry. More than a cheerleader for the advance of mining operations in Sonora, the state government works to boost the industry by providing direct and indirect assistance.

The General Mining Directorate provides technical assistance, undertakes exploration studies, trains technical workers, and generates sources of credit and financing. And when the industry's aggressive development of new mines encounters obstacles, the state's mining office works to remove

these obstacles by collaborating with public and private entities to "prevent and resolve mining problems."[72]

Over the past decade the state government of Sonora has created a series of *fideicomisos*—decentralized semi-autonomous public trusts that answer to the governor's office. These mining *fideicomisos* function as governmental partners of the private mining companies, clearing the path for mining operations and assisting the firms with services that involve the expenditure of state revenues.

In November 2007 the state legislature passed the Law for Promoting and Development Mining in the State of Sonora ("*Ley de Promoción y Fomento Minero para el Estado de Sonora").* The main thrust of this mining law was to establish a process to provide funding, financial and logistical support, technical studies, and fiscal incentives for the mining industry. To provide this assistance, the law authorized the creation of a new state fund to promote and provide incentives to mining companies.

Fiscal and non-fiscal incentives provided to mining companies—large or small, foreign or national—include: tax and fee exemptions and reduction; financing for modernization; training; technical assistance; business expansion; acquisition of goods and services; investment and feasibility studies; infrastructure; development aid; and mining and metallurgical studies. Neither the state nor federal government provide any accounting of the incentives and support for the mining industry.

In June 2011, Governor Padrés issued a decree to create a new decentralized state organization called the Promotora para el Desarrollo Regional de la Minería—PRODEREM or Regional Mining Development Promoter whose mission is to "strengthen the industry."[73] This strengthening extends to all phases of mining operations, ranging from mining extraction and processing (smelting, refining, etc.) operations to transportation and even sales.

Government subsidies, infrastructure construction, and tax incentives are nothing new in Sonora. Since the 1880s, the government of Sonora has facilitated the extraction of copper, gold, and silver by mining companies. In the early 1880s, Sonora exempted mining firms from taxes for twenty years. More than anything else, however, mine investors have demanded that the Sonoran government guarantee that they can extract their minerals in peace.

Referring to the need to establish a stable climate for mining and economic modernization, in 1882, Sonora's governor lamented the uprisings of "*bár-*

baros" and "the abnormal situation presented by the Yaqui and Mayo tribes who are holding fast to the river banks."[74]

Mining, Megaprojects, and Metrosexuals in Sonora

Public officials in Mexico routinely boast about the megaprojects they undertake during their administrations. Presidents, state governors, and mayors assert that their leadership brings major infrastructure projects to Mexican communities, thereby boosting social well-being and economic growth. The operating assumption is that the bigger the megaproject, the better Mexico is. Since the 1930s, this megaproject logic has served as a driving force in the country's development plans.

To some extent, the political economy of megaprojects can be found all over the world. But in few other countries do public officials so unabashedly brandish the term "*megaproyecto*" to promote their own political legacies as in Mexico. Politics and megaprojects are inextricably linked—regarded as a political necessity because these construction megaprojects provide jobs to constituents and government revenues to the allies, friends, and families of politicians in the business community. Rarely are the announcements of new megaprojects preceded by any cost-benefit evaluations or even rigorous assessments of need or budgets.

Dams and the building of tourism centers (such as Cancún or Los Cabos) have long been among some of the most favored type of megaprojects in Mexico. In the case of Sonora, Governor Guillermo Padrés points to the water megaprojects of Sonora SI (dams and aqueducts) and the natural gas pipeline from the U.S. border as among his top accomplishments.

Measured by most any standard—quantity of investment, associated infrastructure, contracts and subcontracts, and land and natural resources affected—mining projects are certainly *megaproyectos*. Never, however, do Mexican presidents or governors refer to the major mining operations that are initiated or expanded on their watch as part of their megaproject legacy, even though most of the mining projects depend on the close cooperation of the government through the provision of water, roads, subsidies, and technical assistance.

Conflicting Narratives about Mining's Impact

The larger mines generally involve displacement of existing communities and the creation of company towns. In Sonora, Cananea and Nacozari de Cananea (where a Grupo México copper mine is located) are prime examples. To the east, in Chihuahua, the Bismark zinc mine owned by Industrías Peñoles sits next to the company-owned town of Bismark where the mineworkers and service staff live not far from the U.S.-Mexico border.

Nongovernmental organizations involved in environmental protection and indigenous issues point to mines as among Mexico's most socially and environmentally destructive megaprojects. They also note that transnational mining corporations, including Mexico-based companies like Grupo México, almost exclusively reap the benefits.

"Mining is the megaproject that has cost the most lives in [workplace and environmental] accidents all over the world," wrote Gustavo Castro Solo of the Red de los Afectados por la Minería (REMA) or Network of Communities Impacted by Mining. Furthermore, "Mining is the megaproject that consumes the most energy and water, and is the largest cause of environmental contamination." Mining projects invariably involve corruption, the loss of indigenous cultures, community divisions, according to REMA.[75]

There exists a huge disconnect between the huge social and environmental impact of the mining boom and the attention of government to those impacts. Both the federal and state governments—through agencies associated with the ministries of economy—closely collaborate with the mining industry in providing easy access to land, water, and rural communities.

This disconnect is readily evident when listening to the prevailing narrative about the mining industry as told by the mining industry and the state's General Mining Directorate, a subagency of the economy ministry in Hermosillo.

Over the past decade, as the mining industry's presence in Sonora has more the doubled, the social and environmental impacts of mining have grown exponentially—as evident in the rising complaints registered by mineworkers, environmentalists, university researchers, and affected communities. However, it wasn't until the massive spill of toxic water into the Sonora River basin by Grupo México's Buenavista copper mine in Cananea that this gap between the official story and the reality of the costs of this boom in mining exploration and extraction.

AMSAC includes most of the major mining companies in Sonora, including the big three of Mexican mining companies: Grupo México, Grupo Frisco, and Industrías Peñoles. The membership roster of the association also includes less well-known mining firms such as the gold-mining firm Agnico Eagle and Minera Cascabel. In most cases, the Sonora-based mining firms are fronts for foreign mining corporations—almost all of which are Canadian.[76]

Such is the case of Minera Cascabel. The exploration firm has functioned as a front for the Canadian mining firm Mag Silver. The two companies have come under sharp public scrutiny in Chihuahua after the October 2012 murders by *sicarios* (hired killers) of two anti-mining activists, a married couple. The victims belonged to the organization of small farmers and ranchers called El Barzón and led the community's opposition to the

mining operations in the Benito Juárez *ejido*, which is located in the northwestern part of the state. "From the beginning, we have known who were involved in the murders. The mining company (Mag Silver and its associate Minera Cascabel) used their funds to buy *sicarios* and killed them," according to the murdered couple's family.[77]

The Sonora Miners Association also maintains close relations with the state government. The chief of the General Mining Directorate is a member of the association. The director of the state government's mining office is on the board of directors. And one of the most powerfully connected members of Sonora's business class, Miquel Ángel Áyala Guerrero, serves as the AMSAC liaison to the state government. Ángel Áyala is owner of several construction companies, including construction and railway company *Terracerías Construcciones* y Vías Férreas (Tecovifesa), which is invested in the expansion of Grupo México's Buenavista copper mine in Cananea.

Among other work, Tecovifesa builds the dams and terraces for mine tailings—including the one that failed so spectacularly on August 6, 2014 and flooded the Sonora River with toxic waste—what a federal government official called the "worst natural disaster in Mexico's mining history." Tecovifesa is also part of the consortium of companies, *Exploraciones Mineras del Desierto*, which holds the state contract to build the controversial (and nearly complete) Novillo-Hermosillo aqueduct.[78] Ángel Ávila's company has received numerous state contracts, including for construction related to mine maintenance.[79]

Facts and Fantasies from Sonora's Mining Association

A 2011 public letter by AMSAC's president Joaquin Rojo de la Vega Ulloa illustrates the perspective of the mining industry with respect to workers, youth, environment, water use, and security.

In his 2011 public letter and speech, he said, "Sonora is the top mining state in Mexico, and mining far surpasses any other industry" in the benefits it provides to the state population and economy.[80] With respect to the foreign exchange from exports by the state's mining industry, this assertion is certainly true with respect to any other nonagricultural industry, such as manufacturing. Rojo de la Vega's assertion about how the mining industry benefits Sonora mirror the laudatory declarations by the state government's own mining agency, the General Mining Directorate

Although the figures cited by AMSAC and the General Mining Directorate likely reflect the industry's production and sales, there is a fantastical quality to assertions about the industry's social and environmental benefits, as evident in the dubious assertions by AMSAC's president, such as the following:

- "We are the industry with the most certifications as a clean industry."
- Government agencies recognize us as agencies that don't contaminate and which conserve the environment—and all of this documented."
- "More than any other industry, we take care of water resources."
- "We don't contaminate the water, as our detractors assert."
- "If our standards for responsibly caring for water were applied to the agricultural or cattle industries, they couldn't even operate nor meet our [environmental care] requirements."
- "The mining industry plants and conserves more trees than other industries. Our tree nurseries plant and conserve millions of trees. We aren't killers of trees, we are reforesters."

Rojo de la Vega did, however, acknowledge that "all isn't beautiful and right" with the industry. One major problem, he underscored, was that "young people today don't want to work in the mining industry because "they only want to work in an office, to wear suits, to stay out of the bad weather, and to eat and sleep when they choose." Summing up this major challenge for the mining industry, Rojo de la Vega regretfully observed: "*Lo metrosexuales nos ha ganado*." ("The metrosexuals have won.") He noted that nowadays "comfort prevails over personal and professional growth."

Many Sonorans, especially after the Grupo México's August 2014 mining disaster in the Sonora River Valley, might also take issue with his statement: "We are an industry oriented to the environment; we are an industry of labor peace; we are an industry of open and honest communication."

Rojo de la Vega gave the example of the copper mines in Cananea as a model for what could occur across the state. Mining in Cananea is "generating an flood of economic wealth that is shaking treasure boxes the world over," he waxed in his paean to the glories of mining in Sonora. Closing his address, he underscored the importance of the Cananea model, pointing out that the "transnationals are there" in Cananea but only the "most intelligent" Mexican firms. Yet, in the mining sector, "there is opportunity for everyone."

There exists no single truth about the security of mining megaprojects in Mexico. As is readily observable, most mining operations are highly controlled enclaves to which there is no public entry. Guards stand at the ready at all the entrances to the mines, such as Grupo México's La Caridad mine in Nacozari, even though the mines operate on public land and use public water supplies. It might be said that in Mexico there are no other businesses that operate within such tightly secured perimeters. But there

are at least several different ways to view the relationship between the mining sector and organized crime.

Throughout the Sierra Madre and all of Mexico, mining companies often maintain collaborative relations with organized crime. In some states, organized crime organizations own or control all extractive industries. A report by InSight Crime stated: "Criminal organizations now control the right to mine in at least five Mexican states, according to those working in the sector, in another example of illegal groups expanding into resource exploitation in areas where state presence is weak." The states cited with proven links between the mining industry and organized crime included Tamaulipas, Chihuahua, Guerrero, Morelos, and Michoacán.[81]

The only part of Rojo de la Vega's 2011 speech that attracted national press attention was his observation about security. Here, too, the reality of mining in Mexico and the official story often don't correspond to what is readily apparent to those living in mining regions, particularly the most remote mines in the Sierra Madres. According to his narrative, the mining industry is under assault by organized crime, and the federal government has not provided adequate security for mining operations, especially for the transportation of precious metals. As a result, the mining industry in Sonora suffered a 15% increase in cost of doing business.

Some of those costs, de la Vega explained, came from the purchasing and operation of security cameras. But most costly, he said, has been the creation of private security forces. "We have experienced the need to create our own paramilitary forces." As long as we don't have tranquility and the rule of law, Rojo de la Vega said, "We have had to create our own systems of security." Neither the federal or state governments have made information about the extent of these mining-related paramilitary forces or about their purview, weaponry, or violent incidents.[82]

Yet another perspective comes from mining sector expert Miguel Valencia at the Monterrey Technology Institute (Instituto Tecnológico y de Estudios Superiores de Monterrey, ITESM). Valencia observed that profits from mining in Mexico are so high that any problems related to crime and violence don't detract from the incentives of capturing so much wealth. "It is such a profitable business that although crime may cost the companies some money and they have to pay for more security, the flow of investments will continue," he said.[83]

IV. Sonora's Mining Bust

Sonora is leading Mexico's mining boom—with more of its land covered by federal mining permits than any other state.[84] Yet it wasn't this boom that first drew state, national, and international attention to Sonora's mining industry. Nor was it the massive expansion of the mining and metallurgical

operations of Grupo México that sparked media interest and the scrutiny of the company by congressional committees and environmental organizations.

Rather it was the dramatic mining bust of Sonora's largest mine, Buenavista, on August 6, 2014.

That's when 40,000 cubic meters of toxic copper sulfate acid waste burst out of an earthen dam holding back an immense tailings pond at Grupo México's immense copper mine near the border town of Cananea. The tailings pond burst open and flooded down one of Mexico's most beautiful river valleys. Mexico's environmental secretary called it the "worst natural disaster provoked by the mining industry in the modern history of Mexico."[85] It was only after this disaster that *Sonorenses* and the Mexican public began to fully consider the environmental consequences of virtually unregulated mining in Sonora and across the nation.

Grupo México's Buenavista mine—the world's fourth largest copper mine—spreads out across the upper Sonora River Basin. Three months after the catastrophe, Rodolfo Lacy Tamayo, deputy secretary of the environmental ministry SEMARNAT, observed that the decontamination of the river and the valley's wells could take up to ten years.[86] Grupo México asserted that the cleanup operations in the Sonora River Valley were almost complete, but Lacy Tamayo underscored the extent of the catastrophe. She observed: "The entire ecosystem was affected, and not only the Río Sonora itself but also the soil, the alluvium, and the dam El Molonito which was totally impacted by the spill, and now has to returned to its original state—which is the work that has to be done now."[87]

The flood of toxics—including copper, arsenic, aluminum, cadmium, chromium, manganese and lead—poisoned more than 300 water wells throughout the river valley, leaving more than a dozen small riverside towns without any water to drink, bathe with, to irrigate their crops, or to give their cattle.

The some 800,000 residents of Hermosillo, the state capital and most populous city, weren't directly affected by the environmental disaster, even though the Sonora River channel heads directly through the mountain valley into the desert city

Like Sonora's other major rivers—the Yaqui and Mayo Rivers—the Sonora River hasn't been a free-flowing river for more than five decades. Two dams now block the river: El Molinito dam, which lies 23 kilometers (14.2 miles) north of Hermosillo and the older Abelardo Rodríquez dam, which rises from the city's eastern edge. Designed to capture water for agribusiness, the two dams and their reservoirs later became Hermosillo's last hope

to quench the rising water demands of the booming urban population and the city's expanding industrial sector, including the Ford automobile factory.

Though dams prevented the flood of poison from entering the city and from contaminating its wells and canals, the incident confirmed to *Hermosillenses* that the only way to access the clean water they so desperately needed was through tapping the Yaqui River.

During the past three years, the anti-aqueduct coalition and even CONAGUA (before the August 2014 contamination incident) had been advocating that Hermosillo make increased use of the water captured in El Molinito, particularly in wet years and after major rain events in the valley. But then CONAGUA halted the release of water from the El Molinito reservoir because of dramatically increased levels of contamination.

The environmental disaster served as a belated wake-up call for Hermosillo about the quality of water flowing down the Sonora River. There was increased awareness that all water flowing down the river valley from Cananea was likely to be contaminated to some degree by mine wastes, as numerous studies prior to the environmental disaster noted.

At the same time, complaints by communities of the Yaqui River basin that the boom in mining operations was contaminating the river and its tributaries. In addition to concerns about Grupo México's reckless environmental practices at its La Caridad operations, there were rising concerns about the huge open-pit gold mine of Los Alamos Gold in the central Yaqui River basin. Los Alamos Gold has a mining concession that extends over more than 30,000 hectares near the community of Mulatos and along the Aros-Mulatos tributaries of the Yaqui River.

The spring at the origin of the Sonora River is contaminated by Grupo México's Cananea copper mine.

Los Alamos Gold, a Canadian company, bought the concession for $10 million in 2003, and by 2012 had produced one million ounces of gold and more than $1 billion in revenue from its Mulatos Mine.[88] The mining offices at both the federal and state levels provide a wealth of statistics about mineral production, revenues, employment generation, and more. But nowhere within the Mexican government bureaucracy—including its environmental agencies—is there any data about the impact of the mining boom on the country's water and other natural resources.

Los Alamos Gold reports that it is now producing about 200,000 ounces of gold from its mine on the western foothills of the Sierra Madre Occidental. But they do not say how much land they must excavate to produce an ounce of gold. Nor do the responsible Mexican oversight agencies provide

this data. A common estimate states that producing each ounce of gold requires the excavation and processing of approximately 79 tons of earth.[89]

Los Alamos Gold boasts that its Los Mulatos gold mine, operated by its Mexican subsidiary Mina del Oro Nacional, is one of the "lowest cost gold-producing mines in the world and consistent and significant cash-flow generators."[90] But the mine is also one of the major sources of mining contamination in Mexico. For more than a decade, the community of Los Mulatos has been complaining about the careless mining practices of Los Alamos Gold that pollute the arroyos (creeks) and the river.[91] In August 2013, a truck carrying 16,000 liters of cyanide, used to purify gold, overturned, spilling an estimated 3,000 liters, en route to the mine, contaminating the river and causing several communities to evacuate.[92]

However, it wasn't until after Grupo México's massive contamination of the Sonora River that state and federal government agencies began paying attention to the charges that the mine was contaminating water flowing down from the Sierra Madre Occidental. In November 2014, the National Commission for Human Rights (CNDH) condemned the contamination and asked that the government consider suspending the mine's permit until it abided by national environmental regulations—but Grupo México has continued its mining operations despite continuing protests and new charges about the company's systemic contamination of the river basin.

In the wake of the mining catastrophe, Governor Padrés washed his hands of any responsibility for monitoring the environmental safeguards at Buenavista, pointing the blame instead at the federal environmental agencies. The governor correctly asserted that the federal government is primarily responsible for environmental protection, regulating the mining industry, and monitoring the quality and quantity of the country's water resources.

While laying the blame for the catastrophe on the federal government, the governor failed to mention the Sonora state government's maintains close relationships with the mining sector. The state government, instead of serving as a regulator, is a promoter, creditor, planner, financier, and source of technical and logistical support to the mines, and also provides training and subsidies for the mining sector. The state government actively promotes the mining industry through the mining coordination office of the Ministry of the Economy and FIFOMI.[93]

The Padrés administration also did not acknowledge that it had received numerous complaints from local officials about Grupo México's waste-management program and the resulting contamination of the river. The state government has not taken any role in protecting the state from the adverse social and environmental impacts of mining, despite knowing well

that the federal government's regulatory and monitoring operations were far from sufficient.

Consequences of Contamination

For the most part, the focus in the aftermath of Cananea environmental disaster was on the impact on the residents and agricultural economy of the upper and mid Sonora River basin. Wells for drinking water and irrigation were contaminated, so the some 25,000 residents of the valley were left without drinking water, while farmers and ranchers had no well or river water to irrigate their crops or nourish their cattle.

The mining disaster highlighted the precariousness of Hermosillo's sources of water—not only the increasing scarcity but also the worsening quality. After the 2014 mining disaster, both sides of the conflict hardened their positions. In Hermosillo, the break in the tailings pond was alarming for many reasons. At first it was mostly a concern about how close to the city the toxins had come.

But the repercussions of the mining industry's "worst natural disaster" quickly extended far beyond the contamination of upper and mid Sonora River basin. Within a day or two, both sides of the Yaqui water war were reconfiguring their arguments for and against the Novillo-Hermosillo aqueduct. In the end, while confidence in the governor and state and federal water agencies plummeted, support for the Novillo-Hermosillo aqueduct deepened. (See Part 1 of this report for a more detailed look on the water war that erupted around the construction of this aqueduct.)

In a joint statement following the August 2014 contamination of the Sonora River, the Yaqui anti-aqueduct leadership, other members of the anti-aqueduct coalition, and Grupo México's mineworkers in Cananea stressed that Grupo México's mining operations adversely affected the quality of water flowing in both the Yaqui and Sonora Rivers, as well as severely diminishing the quantity of water flowing in the Yaqui River.

At an August 25, 2014 press conference, Tomás Rojo Valencia, a spokesperson for some of the Yaqui governors, and Sergio Tolano, general secretary of the mineworkers organization at the Buenavista mine, jointly asserted: The mining corporations "have lived a life in a paradise of impunity in conspiracy with the state government." They called for the federal government to end Grupo México's mining concession in Cananea and to close down the Independencia aqueduct.[94]

Soon, media attention and political disputes brought the public's attention to fact that copper mining in Cananea had been contaminating the Sonora river basin for many decades—with a history of water sampling by university researchers to prove it. Also, officials in the affected towns and

mineworker leaders in Cananea told the media that they had complained to company, state, and federal officials about other spills and about the lack of environmental safeguards at the mine. The State Water Commission and Sonora Technological Institute issued a comprehensive report on the Sonora River that concluded that "heavy metals issuing as a byproduct from mining exploration and the inadequate management of the river had been contaminating the river for years."[95]

Meanwhile, Sonora's mining sector unsurprisingly rejected the assertion that the tailings pond break was a major environmental disaster.[96] In the more than a hundred years since the first Cananea strike, little has changed—despite the changing ownership of the infamous copper mine. Whether owned by U.S. investors, the Mexican government, or a Mexican firm, working conditions and pay have been deplorable, worker resistance brutally repressed, and the environment and water resources treated as free, expendable factors of production.

Transboundary Implications

Historically, the adverse environmental impacts of copper mining and smelting on borderland water, land, and air have affected the Mexican side of the border more than the U.S. side. Yet as mining operations dramatically expand in the northern borderland states—from Coahuila to Baja California—the environmental consequences to the borderland environment have been given relatively little binational consideration.

But in September 2014, two more separate spills, one by truck and another by train—of toxic chemicals from Grupo México operations in Sonora raised concerns about the possible contamination of the San Pedro and Santa Cruz rivers, both of which flow north into Arizona, in addition to the contamination already flowing from the Sonora River in Mexico.[97] Moreover, the mine's water use threatens the sustainability and recharge rates of the San Pedro river basin—a transborder river basin that in Mexico is usually just a dry gravel river bed.

In his 2008 Colegio de Sonora thesis, Florentino Garza Salazar painted a grim picture of environmental devastation and unsustainable water usage by the Cananea copper operations, noting that at the junction of the Sonora River headwater and the San Pedro River more than 3,000 hectares have been denuded by the mine with no attempts to reforest the barren riparian area.[98]

Post-Disaster Future

It remains to be seen if the worst natural disaster provoked by the mining industry in Mexico's history precipitates a reevaluation of the government's favored treatment of Grupo México and the mining industry in general.

But that's a doubtful scenario. It is highly unlikely that the Mexican government will cancel the firm's mining and water permits, as many nongovernmental organizations have demanded. The enormous economic and political power of Grupo México also protects the company against criminal charges for its willful disregard of governmental safety, environmental, and water laws.

Any satisfactory resolution of the Yaqui Water War is hard to envision. It seems unlikely, though, that the government—either federal or state—will ever turn off the spigot that lets Hermosillo drink from Yaqui River. Sooner or later, however, all *Sonorenses*—whether living in the Yaqui, Sonora, or any other water basin—will need to reevaluate the privileged status of the mining industry as water consumers and water contaminators.

V. Mining Giants and their Megaprojects

The three richest men in Mexico—Carlos Slim Helú, Alberto Bailléres González, and Germán Larrea Mota-Velasco—are also the owners of Mexico's top three mining corporations. These three mining oligarchs have mining and other enterprises throughout Mexico. All three men and their companies are prominent presences in Sonora.

Larrea, who *Forbes* magazine called the "King of Copper," owns 51% of Grupo México, Mexico's leading mining company. Bailléres owns Grupo Bal, whose mining subsidiary Industrias Peñoles is Mexico's second largest mining firm. Slim, the world's richest man for the fourth consecutive year, according to *Forbes*, owns Minera Frisco among numerous other Mexican companies.[99] All three companies and their owners are major economic players in Sonora. However, Grupo México is by far the leading mining corporation in the state. Its huge copper and molybdenum mining and processing operations in Cananea and Nacozari de García dominate the state's mining sector. These giants of Mexican mining are leaving huge footprints throughout Sonora.

Previous government ownership of Grupo México's mining operations in Sonora helps explain the legacy of unregulated water extraction, environmental contamination, and general lack of regulatory oversight that continues to benefit this now-privately-owned company. Even before the Sonora River disaster, Grupo México and its majority owner Germán Larrea had badly tarnished reputations for their disregard for the environment and their workers. The Cananea mineworkers have repeatedly gone on strike, starting in 2004 because of wage, occupational safety, and environmental concerns. The strike launched in 2007 by Section 65 of the independent national miners union ended with 2010 when the company replaced the

striking workforce with imported contract workers with the assistance of the federal police.

Grupo México renamed its Cananea operations Buenavista de Cobre. Grupo México's copper mine in Nacozari de García also a felicitous name, La Caridad (meaning charity), which operates without a union. Part of the La Caridad complex in the Yaqui river basin is a large metallurgical complex. At both the Buenavista and La Caridad mining centers, Grupo México also mines and processes molybdenum. The company is also a major producer of zinc, gold, silver, and lead. Industrias Peñoles is Mexico's largest gold, zinc, and lead producer, and the company is expanding rapidly in Sonora. In a partnership with two of the world's most environmentally destructive mining companies—Fresnillo (Great Britain, and formerly a wholly owned subsidiary of Peñoles) and Newport Mining (U.S.)—Peñoles has many gold and silver exploration operations in Sonora. Peñoles also has joint minerals exploration initiatives in Peru and Chile with Fresnillo, which owns the largest silver mine in Mexico.

Peñoles also owns Mexico's largest zinc mine, which is located near the international border on the Chihuahua side of the Sierra Madre Occidental. It's subterranean mine has is depleting the aquifers in the border *municipio* of Ascensión and is reportedly threatening the water supplies of Ciudad Juárez. In Sonora, Peñoles operates three gold mines: *Herradura*, Soledad-Dipoloes, and *Noche Buena*, all of which are open-pit mines. In the border *municipio* of Santa Cruz, Peñoles is expanding its copper mining operations at its Milpillas mine, and the company is developing another copper mine near Caborca called Los Humos.[100] In its 2013 annual report, Peñoles acknowledged that water shortages present a major obstacle for its operations in Sonora and other arid states, notably Chihuahua, Zacatecas, and Durango.

Carlos Slim's Minera Frisco has been expanding its open-pit copper mine in the Cananea area since 1980 through its Minera María subsidiary. In 1999 the company's operation in Cananea started processing cathodic copper.[101]

Mining Oligarchs Made by Mexican Government

The three giants of Mexico's mining sector are products of the neoliberal reordering of the Mexican economy in the late 1980s and early 1990.[102] As part of the wholesale privatization of government-owned companies, ownership of Compañía Refractarios Mexicanos passed to Industrias Peñoles in 1988. Through its subsidiary Grupo Frisco, Carlos Slim's Grupo Carso took over the Mexican government's stake in Química Fluor, Minera Lampazos, and Minera Real de Ángeles in 1989.

In the mid-1990s, during the presidency of Ernesto Zedillo, these mining giants acquired control over Mexico's railway system. Grupo México gained control over the nation's largest railways, including the Ferrocarril Pacífico Norte and Chihuahua Pacific, while Industrias Peñoles acquired the Coahuila Durango line and Grupo Frisco received Ferrosur.

The country's two largest copper mines in Cananea and Nacozari de García were government-controlled—albeit heavily indebted and effectively owned by U.S. banks—before they were transferred to Grupo México in 1989 and 1990. As part of the nationalization of the Cananea Mining Company, the government obtained an $80 million loan from Chase Manhattan Bank and First National City Bank through the federal government's mining development commission and governmental financing agencies. By the time Grupo México took over, the government had invested more than $1 billion in the Cananea mine—most of it in the form of foreign loans. While the reins of the company were in government hands, U.S. banks retained financial control of the Cananea copper mine.

Grupo México was likely the biggest winner in the Mexico's privatization sweepstakes. The group's Minero México gained ownership of Mexicana de Cobre in Nacozari in 1989 and Cananea Mine in 1990 at bargain-basement prices. Privatization also gave Grupo México oligopolistic control of the nation's railroads with its acquisitions of the major railways of the national railroad company (Ferrocarriles Nacionales)—what became Ferromex.

As with virtually all of the privatizations under President Salinas, the transfers from the public sector to the private sector were insider deals—part sales, more giveaways. The Salinas administration didn't open the privatization process to competitive and transparent bidding among Mexico's capitalists. Instead, most of the state's mining and other assets went to members of Mexico's national bourgeoisie who were closest to Salinas and PRI.

Grupo México bought Mexicana del Cobre for $475 million, even though the federal government's credit office had set its value at $2 billion the year before the purchase. The administration of President Carlos Salinas de Gortari (1988-1994) had rejected a prior purchase offer for more double the price that Grupo México offered.

Until the late 1980s, Grupo México's mining complexes were government-owned mining corporations. Yet while the federal government held the title to these massive operations, they were heavily financed through NAFINSA, the government's development bank, with most of the debt held by foreign investors and banks. When the government privatized La Caridad, the enterprise was heavily indebted—owing $1.36 billion to foreign banks.[103]

The transfer of the government corporations occurred as part of a neoliberal restructuring process. Yet the term privatization doesn't adequately capture what was happening in Mexico in the late 1980s and early 1990s. For one, the Mexican government had only nominal ownership of the companies it was privatizing. The government companies like Mexicana del Cobre were highly indebted to foreign banks including Chase Manhattan—a debt that had accumulated through government financing and development programs such as COFOMI and its successor and related government credit agencies such as FIFOMI. *Mexicanización*, as it turned out, hadn't been nationalization at all but rather substituting direct foreign investment largely with foreign debt, along with passing out favors to allies.

What is more, most of the mining and other firms "sold" to Mexican capitalists such as Larrea, Bailléres, and Slim already counted on these investors as partners. As became apparent during the privatization process, the Salinas government wasn't so much selling nation's mining assets to the national bourgeoisie so much as to an inner circle of the country's political and economic elite. "It soon became evident that the true objective of state policy was to strengthen and leading sector of mining capital, converting it into one of the most successful of monopoly capital in Mexico and the one with the greatest international presence," wrote scholars Raúl Delgado Wise and Rubén Del Pozo Mendoza.[104]

Foreign and Mexican Mining Companies

Prior to the 1910-1917 Mexican Revolution, foreign mining companies, mainly U.S. firms, defined the shape and character of Mexico's mining sector—its treatment of mineworkers, privileged status with the government, disregard for the environment, displacement of communities and indigenous groups, and the immense profits that flowed north to the United States.

Despite the recent proliferation of foreign mining firms, Mexican investors and Mexican "social capital" still constitute the core of Mexico's mining sector. The Mexico-based mining companies account for about three-fifths of the nation's minerals production. Their privileged relationship with the government and its regulatory agencies has set the pattern of favored treatment that the new mining investors also enjoy.

The federal government's Ministry of the Economy publishes a list of mining companies with foreign capital that only lists only mining companies based outside Mexico. By not including Mexico-based companies such as Grupo México that also include foreign investment, the Secretary of the Economy's listing, "Mining Projects in Mexico with Foreign Capital" per-

Evolution of Control and Ownership of Mexico's Mining Sector

- When Cananea mineworkers protested low wages and working conditions in 1907, Mexico's mining sector was nearly totally in foreign hands.
- In 1908, Mexico had 1,030 mining companies, of which 840 were U.S.-owned.
- President Cárdenas, as part of the post-revolutionary government's nationalization and modernization plans, attempted to moderate foreign control of the mining sector by creating COFOMI— and creating a national mineworkers' union in association with the ruling party. However, the country's mining sector remained largely in foreign hands.
- COFOMI drained government revenues and relied on foreign credit to finance mining development by Mexican capitalists and government corporations.
- In 1961, the Mexican government passed what is known as the Ley de Mexicanización de la Minería, which aimed to increase the participation of Mexican capital in the mining sector by limiting foreign ownership to 49%. New mining concessions were largely limited to Mexican citizens and companies with majority-Mexican ownership.
- With financing, logistical, and other support from COFOMI, the Mexican government beginning in the mid-1930s fostered the creation of new mining companies owned by nation's leading capitalists.
- Major foreign mining companies, including ASARCO and American Metal Climax, one of the world's largest mining companies, found ways to make the nationalization or what was commonly called the "*Mexicanización*" of the mining sector work for them. Government-guaranteed financing increased profit even though they shared ownership with Mexican capitalists.
- La Ley Minera de 1975 facilitated direct governmental participation in mining exploration and development, a prime example being La Caridad mine in Sonora, opening up a rush of government funding into the mining sector not just for mineral extraction but also for metallurgical plants. But most of these revenues came from foreign creditors.
- *Mexicanización* resulted in increased government dependence on foreign credit and financing from mainly U.S. banks, such as Chase Manhattan and First National City Bank.

Evolution of Control and Ownership of Mexioc's Mining Sector continued...

- With capital provided by the Mexican government for the new 'Mexicanized' firms, such as the Cananea Mining Company, provide a firm financial foundation due to government-guaranteed debt for new transnational mining ventures involving Mexican capitalists such as Carlos Slim Helú, Alberto Bailléres González, Germán Larrea Mota-Velasco, and others.
- During the 1980s, about 40% of Mexico's mining sector was held by what was euphemistically known as the "social sector"— technically owned by the government but actually owned by foreign banks because they held all the government-issued debt.
- By 1982, Mexico had accumulated a foreign debt of $80 billion in part due to private and international development bank financing for Mexico's government-owned corporations. This crisis precipitated a neoliberal reordering of the Mexican economy, including the selling or handing off companies either completely or largely owned by the government, such as the largest mining firms.
- The primary beneficiaries of this privatization were Mexican capitalists close to the PRI and in particular to President Salinas de Gortari.
- With most of major mining operations already sold to Mexican oligarchs whose companies worked closely with transnational mining companies and banks as part of the privatization and structural adjustment programs, the Mexican government in 1990 passed a new mining law. An estimated 1.8 million hectares of national mining reserves had already passed into hands of Mexico's mining giants by the time the government opened up the mining sector to ownership by foreign mining companies.
- The 1990 law and its amendments through 1996 reversed the nationalization thrust of the Lázaro Cárdenas era and the *Mexicanización* of the 1960s and 1970s that had underwritten partnerships of private capital and government financing, and began opening foreign ownership of mineral resources and mining companies. Over the past two decades, hundreds of foreign firms—more than three-quarters from Canada— have rushed into Mexico, with 75% in gold and silver exploration and mining.

Sources: Raúl Delgado Wise and Rubén Del Pozo Mendoza, "Minería, Estado y gran capital en México," *Economia e Sociede*, Campinas, (16), June 2001; Juan Luis Sariego et al, "La industria paraestatal en México," *El Estado y la mineríamexicana. Política, trabajo y sociedad durante el siglo XX* (México: Fondo de CulturaEconómica, SEMIP) 1988; Homero Urías, "¿Quién controla la minería mexicana?" *Comercio Exterior*, v. 30, n. 9, Sept. 1980.

petuates the myth that Mexico's major industrial firms are purely national entities, whereas the companies have transnational identities and financing.[105]

Underscoring the transnational identity of Mexico's dominant mining firms is their preference for using English rather than Spanish in most of their media releases, stock offering, and company profiles. Any differentiation between Mexico-based and foreign-based firms is also blurred by the transnational flow of credit, capital, income, and profit. Although Mexico's mining giants are headquartered in Mexico City, it's on Wall Street where they do most of their financial business.

Foreign mining firms—which since the mid-1990s have spread throughout Mexico looking for precious metals—follow the lead set by the practices of the Mexican mining giants, whether it be environmentally reckless mining operations, illegal consumption and contamination of water, or abusive treatment of communities near mining sites.

VI. Mining the Rivers of Sonora

Grupo México is likely the single largest water consumer in Sonora. The mining giant almost certainly contaminates more surface water and groundwater than any other private entity. But no one—except Grupo México executives—know how much water the company uses or how much it contaminates.

The public water regulators in Sonora—the State Water Commission (CEA) and the National Water Commission (CONAGUA)—don't actually regulate the company's water use and don't monitor its discharges of contaminated water. The federal government's environmental agencies, SEMARNAT and PROFEPA, are charged with protecting Mexico's natural resources and assessing the environmental impact of commercial and industrial operations, but instead they collaborate with polluters to keep money flowing.[106]

But it is not only this shield of governmental collusion with Grupo México and the mining industry that keeps fundamental facts about the use and destruction of natural resources a secret. Citizens and researchers cannot discern the essential facts of the industry's operations because the Grupo México mining and metallurgical complexes in northern Sonora are heavily guarded enclaves. Only in extraordinary circumstances do some of the dirty secrets of the Grupo México—government collusion come to light. The crisis has only received recognition after the company's massive contamination of the Sonora River in August 2014 or the company's heartless

Transnational Mining Industry in Mexico: Foreign and Mexican Miners

- 70% of exploration investment in Mexico made by foreign-based firms, but 60% of total mining production is by Mexico-based companies, mainly Grupo México, Industrias Peñoles, and Minera Frisco— who are themselves transnational corporations owned in part by foreign investors.
- 268 mining companies with majority foreign investment have mining projects in Mexico.
- 79% of 642 exploration projects are Canadian, followed by U.S. companies with 13% of exploration projects.
- Mexico ranks fourth in the world for attracting foreign investment in mining.
- Fresnillo, the world's largest producer of silver from ore and Mexico's largest gold producer, illustrates the difficulty of distinguishing foreign from Mexican mining firms, given that it was until recently a wholly owned subsidiary of Industrias Peñoles, yet is no longer Peñoles subsidiary and currently has its headquarters in London although most of its mining production is in Mexico.

Sources: www.proveedoresdemineria.com ; *Mining Industry in Mexico*, Deloitte, May 2012, at:http://www2.deloitte.com/content/dam/Deloitte/mx/Documents/energy-resources/mining-industry-mexico.pdf; *Mining in Mexico: Country Mining Guide,*KPMG, 2013.

disregard after 65 mineworkers trapped and died in Grupo México's Pasta de Conchos Mine in Coahuila in February 2006.

Sonora, like its neighboring states on either side of the international border, is caught in a deepening water crisis—one that is largely its own making but now made ever more grim by the onslaught of climate change with its more extreme weather, prolonged droughts, and rising temperatures.

Grupo México is a major player in this crisis because of its massive consumption of water. Until recently, the virtual absence of public, media, and governmental scrutiny of Grupo México's water-use and environmental practices is a testament to the company's privileged status in Mexico and especially in Sonora.

This lack of diligence is all the more stunning given that its two mining complexes are situated in the upper basins of Sonora's two most important rivers: the Sonora River, which houses the Buenavista del Cobre mine in Cananea and feeds the state's capital and most populous city; and the Bavispe River next to La Angostura dam, where La Caridad mining and metallurgical complex at the company town of Nacozari de García and feeding into the Yaqui River. This water sustains the state's most productive agricultural region in the Yaqui Valley.

Recently, Grupo México's expansion of excavation and processing activities in the Cananea region are also increasingly putting the San Pedro river basin at risk, underscoring the cross-border implications and political repercussions of the expansion of this transnational mining company.

Since 2010, a water war has set Sonora on edge (see Part I of this report for an in-depth analysis of this water war.) The Yaqui Water War concerns the historic use and the water rights of the Sonora and Yaqui Rivers by the Yaqui indigenous population. Yet despite the depredation of the water resources of both rivers, Grupo México's central role in depleting and contaminating these two river basins has been largely unexamined.

Government and company secrets obstruct a complete accounting of the extent of Grupo México's depredations of the Sonora, Yaqui, and San Pedro Rivers. Despite the social, economic, and political tensions of the Yaqui Water War and the company's responsibility for the worst environmental disaster in the history of mining in Sonora, there are still only bits and pieces of information available about the role of Grupo México in accelerating the water crisis that is threatening the future of Sonora and the border region. The government, which issues the company hundreds of permits for water consumption and land use, has only the scantiest data about

the company's actual water use and environmental impacts. Probably only Grupo México knows how much surface and groundwater it extracts from the aquifers associated with the Yaqui, San Pedro, and Sonora Rivers.

Thus, SEMARNAT, PROFEPA, CEA, and CONAGUA, the supposed regulators of the nation's water resources are in effect bystanders and enablers in the plundering of Sonora's water resources.

Mining in Cananea Gulps the Public's Water

Since 1997, CONAGUA has issued a stream of permits to Grupo México to extract groundwater in aquifers that the agency itself has repeatedly declared to be severely over-exploited. Extraction rates far exceed natural resource rates. Accepting the official accounts of water usage specified in CONAGUA permits, the copper mining operations in Cananea, according to one media report, use 75% more than the seven municipalities in the Sonora River basin.[107]

Between 2002 and 2005, CONAGUA, under the Vicente Fox administration, granted nine concessions for mining in the Cananea area to Grupo México for water extraction from two aquifers that are included in the federal ban on the drilling of new water wells in the Cananea area, according to media reports in Mexico.[108] The restrictions, issued in 1967 and 1984, prohibited all new water wells unless they were explicitly for urban public use. But these permits allowed for the extraction of 28 million cubic meters of water from these severely exploited aquifers.

Until recently Grupo México held water permits, including five issued by CONAGUA in 2012, for pumping in Sonora river aquifers—notably by the Bacanuchi tributary that was flooded with sulfuric acid in August 2014. According to media reports, CONAGUA granted Grupo México a wide-ranging permit to begin drilling in the San Pedro River basin as part of its multi-billion dollar expansion in the Cananea region in 2013.

Like the previous permits, the latest one, according to a report by *Proceso* and other media reports, the latest permit, like the previous ones, specifies that the water should be used only for urban public consumption ("*uso público urbano*")—not for mining or industrial operations.[109] None of these water-extraction permits grants permission to discharge used water, whether contaminated or not, back into the aquifer. However, upon questioning by congressional deputies, CONAGUA director David Korenfeld did, however, acknowledge that at least between 1999 and 2002, the Buenavista mine used potable water for mining activities under an urban-use permit.[110]

Corruption in Mexico's Water Agency

CONAGUA is one of Mexico's most corrupt, nontransparent, and unaccountable federal agencies. Water permits are bought and sold regardless of water-use restrictions or well-drilling prohibitions.

If a company or an individual secures a legal or even a fraudulently issued permit for one well, this one permit often serves as legal cover to drill a battery of wells. The permits on record in CONAGUA regional offices don't even closely reflect the water-use patterns in any region because of the proliferation of illegal, cloned, or "irregular" permits that exist.

CONAGUA is one of Mexico's most corrupt, nontransparent, and unaccountable federal agencies.

CONAGUA's water-extraction permits for Grupo México's Cananea operations are what are commonly known as "*concesiones irregulars*" (irregular concessions)—permits that don't conform to the national water law. Yet, given restrictions on new wells in overexploited water basins especially in the arid states, there are more irregular water permits than legal ones.

CONAGUA isn't the only federal agency that has allowed Grupo México to mine and process copper outside of the government's environmental and water-use regulations. The Buenavista mine has received more than five-dozen federal permits from SEMARNAT, PROFEPA, CONAGUA, and the Ministry of the Economy. PROFEPA, the federal agency in charge of enforcing environmental regulations, has categorized Grupo México as a "clean industry," thereby facilitating new permits for changes in land-use, such as clearing forested land for mining operations and tailings ponds. Most of the federal permits don't expire until after 2050.

There are at least three examples of collusion between CONAGUA and Grupo México's Cananea operations:

1) The water permits issued in the past two decades have on paper been allotted for domestic use, not for industrial use. This designation has allowed CONAGUA to avoid regulations for major water pumping in the aquifers of Sonora River's upper basin and in the San Pedro aquifer;

2) The domestic-use permits issued did not include permits needed for the storing or dumping of contaminated water; and

3) CONAGUA didn't revoke the permits after reported incidents of groundwater and surface water contamination of the Sonora River basin in the several years prior to the disastrous August 2014 spill into the Bacanuchi, the northernmost tributary of the Sonora River.

In Mexico and in the United States, the impact of Mexico's mining boom over the past two decades has received little attention, in part because drug-related violence by organized crime and law enforcement have dominated the news, but also because the mining industry and the government have refused to divulge vital information about mining operations.

La Caridad as Government Charity

Grupo México's La Caridad mine and metallurgical complex near Nacozari de Garcia is a tightly guarded enclave. Situated next to La Angostura, Sonora's first major dam and reservoir, La Caridad has been the major beneficiary of the dam. La Caridad is just one of the three aqueducts that pumps water from the Yaqui River basin, in Nacozari de García.

The exact amount of water that Grupo México's Mexicana de Cobre complex extracts from the river and by its wells within the vast complex—encompassing 104,990 hectares—is not publicly known. However, the three aqueducts alone extract 123 Mm^3 of water from the Yaqui River basin, which is about 20% more than the total capacity of La Angostura. In 1940 President Lázaro Cárdenas decreed that the Yaqui had water rights to half the reservoir's capacity. But these promised water rights have never been implemented, which helps explains the vehement Yaqui opposition to the Novillo-Hermosillo aqueduct.

According to their annual report, Grupo México does not have to pay for "what it pumps water directly from the reservoir." [111] La Caridad pumps water directly from La Angostura, near the mine and processing plants, so is exempt from paying for its consumption. This constitutes a massive amount of water – not to mention what water may be exempted for the two other water projects on the Yaqui River. The pumping station at La Angostura transfers a reported 26 Mm^3 of water to the company's copper and molybdenum mining operations and processing plants. And under a 1991 agreement between the Yaqui, CONAGUA and CEA, the Yaqui-Guamas aqueduct transfers 22Mm^3 of water from the Yaqui Valley to Guaymas, Empalme, and San Carlos, allegedly for domestic use.

Nacozari de García is a quintessential mining town, and the closest large town to La Angostura, which lies about 20 miles to the city's southeast. Despite its proximity to the reservoir and its role as Grupo México's offices for La Caridad, the city has suffered severe water shortages for decades. While the mine has free access to the reservoir, neither the mine nor the government has created the infrastructure necessary to supply the town of Nacozari with water from Angostura. So while the federal government allows Grupo México to exploit La Angostura as it pleases, the people of the surrounding town can barely get what they need.

The federal government's privileged treatment of Grupo México continues from administration to administration, whether PAN or PRI presides. A recent example of how the federal government gives Grupo México free rein to exploit the country's natural resources is the company's plan to tap into the dam's hydroelectric capacities. In September 2012, the Comisión Reguladoa de Energía (Federal Energy Regulation Commission) granted Grupo México permission to establish a 7.00 MW hydroelectric facility to generate an estimated 41.00 GWh of electricity to serve the needs of La Caridad. According to the permit, Grupo México would begin generating electricity in September 2014.[112] This plan disregards environmental impacts, Yaqui water rights, or impact on other traditional users of Yaqui River water.

There was no fee specified on the grounds that the electricity would not be for sale but for self-sufficiency ("*autobastecimiento*"). The federal energy regulatory commission noted that the "opportune and efficient provision of energy is one of the pillars that supports national development and constitutes a necessary condition to attain its goals of growth." What is more, the use of La Angostura water would "respond chiefly to the company's goals to increase the competitiveness of the production processes of its various businesses."

Before seeking approval of the Federal Energy Regulation Commission on September 29, 2010, CONAGUA had granted Grupo México a water-use permit to "exploit, use, or take advantage of national surface waters amounting to 416,669,000 cubic meters of water annually." CONAGUA reports that La Angostura has a capacity 864 Mm^3 although other CONAGUA reports note that effective capacity because of silt accumulation has decreased to 700 Mm^3.

CONAGUA issued the permit without any environmental impact study. The permit granted Grupo México permission to use such immense quantities of water in the upper Yaqui River basin coincided with the height of the protests against the Novillo-Hermosillo aqueduct. The Yaqui were developing legal cases against the aqueduct that, among other demands, asserted that SEMNARNAT's environmental impact statement on the aqueduct was grossly inadequate, as it did not take into account the impact on the river because of reduced flows.

Understandably, the focus of the anti-aqueduct coalition was on the CONAGUA-approved and financed transfer of water from the Yaqui River basin to Hermosillo in the depleted Sonora River basin. CONAGUA tried to assuage the coalition's concerns that the aqueduct would leave the lower Yaqui River basin without a dependable supply of water, especially during

COMISIÓN REGULADORA DE ENERGÍA

RESOLUCIÓN Núm. RES/379/2013

RESOLUCIÓN POR LA QUE LA COMISIÓN REGULADORA DE ENERGÍA OTORGA A MEXICANA DE COBRE, S. A. DE C. V., PERMISO PARA GENERAR ENERGÍA ELÉCTRICA BAJO LA MODALIDAD DE AUTOABASTECIMIENTO PARA SU CENTRAL LA ANGOSTURA

R E S U L T A N D O

PRIMERO. Que, con fecha 19 de julio de 2012, Mexicana de Cobre, S. A. de C. V., (la Solicitante) presentó ante esta Comisión Reguladora de Energía (esta Comisión) una solicitud de permiso para generar energía eléctrica bajo la modalidad de autoabastecimiento, para su central La Angostura, que estará ubicada en las instalaciones de la Solicitante en la Presa Lázaro Cárdenas "La Angostura", La Angostura, Nacozari, Sonora.

Image of governmental order giving Grupo México's Mexicana de Cobre's mining and metallurgical operations known as La Caridad permission to generate electricity with no fee from a planned hydroelectric plant Grupo México is building on the La Angostura dam.

droughts with the still-unconfirmed story that it had bought existing water rights from small farmers in the middle river basin. What the federal water agency didn't say—and still hasn't acknowledged—is that the highly questionable water permits issued to Grupo México and other mining operations were responsible for vast withdrawals of water from both the Sonora and Yaqui basins.

Prior to the federal energy commission's approval of Grupo México's permission, the company had also succeeded in securing a favorable ruling by SEMARNAT, the federal environmental ministry, in their successful proposal for a hydroelectric plant to be operated by the Mexico Energy Generator (*México Generadora de Energía*, MGE), established in 2005 with approval from the Energy Regulatory Commission. Following SEMARNAT's practice of ignoring the manifold impacts on water quality, wildlife, and the riparian environment, SEMARNAT ruled on January 27, 2011 that "there would be no need for any presentation of a study of environmental impact for its authorization," even though the Union of Concerned Scientists has concluded that hydroelectric plants need to be carefully regulated. If for example, the water used for electricity generation includes water from the lower levels of a reservoir the oxygen level of the released water will be insufficient to maintain river life.[113]

Grupo México told its stockholders that MGE would produce electrical energy to its Mexican open pit mining operations "at a discount of the cost charged by the Federal Electricity Commission." Grupo México boasted that its MGE subsidiary formed part of the company's commitment of strengthening its mining division position as one of the world's low cost producers." Like the "irregular" water permits CONAGUA granted Grupo México, the federal energy regulatory commission's authorization was also irregular. Though the commission did not issue its authorization until September 2013 for the construction of the company's hydroelectric plant, Grupo México had been building the facility since July 2012. That is, Grupo México had probably been tipped off that it would be approved and was midway through construction by the time the official authorization came out. While this process was irregular at face value, it is normal in corporate-governmental relations in Mexico.

Essentially, La Angostura functions as Grupo México's private dam and reservoir. Except for one access road to the reservoir for tourists and fishermen, Grupo México strictly controls all the entry points to the mine and the dam from the west and south. Its history as a heavily indebted government enterprise established a pattern of free access to water and the lack of enforcement of environmental, land-use, and occupational safety regulations.

Although not mentioned by Grupo México, free, easy and under-the-table access to water in Mexico is likely one of the reasons that the transnational firm is one of the world's low cost producers.[114]

What is becoming clear is that the government and the mining industry need to provide accurate public information on the effect of mining on water consumption and water contamination. While primarily a Mexican concern, the boom in mining exploration and extraction in Mexico's northern borderlands—in Baja California, Sonora, Chihuahua, and Coahuila, especially—has international repercussions.

The impact of Grupo Mexico's operations and of other companies including Peñoles and Grupo Frisco don't stop at the international border. They are putting at risk the quantity and quality of transboundary surface water flows and groundwater basins that span the border.

Conclusion: Losers and Lost Opportunities

Through northwestern Mexico and the southwestern United States, temperatures are rising and drought cycles are becoming more intense and prolonged. Water conflicts are breaking out across the transborder West—a region roughly reaching south from Idaho and eastern Colorado through the Mexican states of Coahuila, Chihuahua, Sonora, Baja California, and Baja California Sur and west to the Pacific from west Texas.

Throughout the region, societies and economies are paying the price of unsustainable consumption of surface water flows and groundwater. The reverberations of Yaqui water shortages have spread across the entire transborder West, whose states all face water crises as a result of population growth, declining water reserves, and climate change. Sonora's attempts to address water shortfalls in the desert city of Hermosillo have implications that extend to other arid regions on both sides of the international border.

Like other water conflicts in this immense arid region, the Yaqui water war has been a struggle of competing special interests and water needs. It is a water conflict that raises inevitable questions about the viability of hydraulic societies, the prioritization of water rights, and the future of desert cities and desert agribusiness.

This bitterly fought water conflict has set the Mexican border state of Sonora on edge. There is no end in sight, in part due to the array of special interests involved and in part because the fundamental causes of the war—rising water demand and rapidly decreasing water sup-

ply—were not directly addressed by either side in the aqueduct conflict.

As climate change raises temperatures and depletes water supplies on both sides of the U.S.-Mexico border, this water war may also presage the type of complicated water conflicts and escalating social tensions that will likely dominate the future of politics in the U.S. West and arid regions worldwide.

Old Strategies for New Problems

Apart from the battles between the pro- and anti-aqueduct forces and attempts to manipulate the aqueduct controversy for political gain, the Yaqui water war was more about continuity than change.

Neither the supporters nor the opponents of the aqueduct questioned the basic premises of Sonora's hydraulic society. The anti-aqueduct campaign was narrowly focused on stopping the transfer of water to Hermosillo and didn't broaden the debate to include questions about the value of the three dams on the Yaqui River, their impact on the riparian and coastal ecologies, or how agricultural economy's dependence on irrigation water has killed the river as it enters the Yaqui Valley.

Instead, Sonora SI argued that Sonora's past economic and population growth was the product of water infrastructure projects. The state's network of dams, aqueducts, and water pumping fields enabled the emergence of Sonora's thriving agribusiness centers, half-dozen desert cities, tourism sector, and export-oriented industries. The continuity of such growth depended on still more water megaprojects, in which the government together with private sector investors launch major megaprojects to meet the needs of the state's most powerful political and economic interests.

Furthermore, the dams and aqueducts sponsored by Sonora SI mirrored the federal government's own vision of Mexico's water future, including inter-basin water transfers. The Independencia aqueduct was, they argued, simply following the model of other federally financed aqueducts (such as in Monterrey and Mexico City) that transferred water from relatively healthy water basins to consumers living in depleted water basins.

In the face of increasing water shortages throughout this arid state, the decision by Governor Pádres and CONAGUA to ramp up Sonora's hydraulic infrastructure ostensibly made good economic and political sense -- albeit in complete disregard for indigenous rights, impact on

the Yaqui Valley agribusiness sector, environmental consequences to Yaqui River habitats, among other concerns.

Winners and Losers

Traveling through Mexico's arid north is a trip into the pre-revolutionary past where *latifundia*-like agribusiness ventures fed by unprecedentedly deep wells while small holdings and *ejidos* lie abandoned. A rapacious mining boom, ill-considered water megaprojects including an array of dams and aqueducts, reckless exploitation of groundwater by agribusinesses, and narrow-minded water management practices are increasing land concentration and accelerating a national water crisis.

The opposition alliance's failure to stop the Independencia aqueduct highlighted the enduring power of the hydraulic society and the continuing marginalization of the Yaqui people.

As groundwater reserves shrink and surface water flows diminish, even as the demands for water increase, the Yaqui may not be the only losers in Sonora's bet on the viability of hydraulic society. However successful at first, hydraulic societies eventually face limits posed by the availability of water, population growth, and societal tensions over distribution priorities.

Instead of narrowly focusing the water war on one water megaproject, either side could have used the controversy over the aqueduct proposal to open a more comprehensive debate about water in this new era of climate change. The Yaqui opposition failed, for example, to explain how Yaqui communities would benefit— either immediately or over the long term— in any fundamental way if Yaqui River water stopped flowing through the Independencia aqueduct.

Even in the event that Novillo-Hermosillo aqueduct is shut down, the Yaquis would remain without drinking water and access to the Yaqui River. And even with the water from the aqueduct, the residents, industries, and agribusinesses of Hermosillo remain urgently in need of more water.

As the smoke from the water battlefield starts to clear and the rhetorical battle cries fade, it is becoming increasingly clear to both the Yaqui and *Hermosillenses* that Sonora is quickly reaching the limits of hydraulic fixes. Hydraulic societies on both sides of the U.S.-Mexico border are breaking down under social and environmental pressures.

Expanding awareness about Mexico's increasingly scarce water supplies was also a major factor in the federal government's new effort

to pass the first national General Water Law (*Ley General de Aguas*). If the ruling PRI party succeeds in pushing through the controversial "modernization" of Mexico's water systems, the law will, among other things, certainly result in increased business involvement in all phases of the water use cycle, including drilling, pumping, transfer, distribution, and treatment. The proposed law echoes the pro-aqueduct arguments that the Mexican government has the obligation to supply potable water to all Mexicans and that privately constructed but publicly financed water megaprojects can help the government meet this guarantee.

The political, social, and economic dynamics that have shaped the Yaqui water war and continue to determine water politics in Sonora and throughout Mexico are aggravating the country's deepening water crisis. As a result, social tensions are rising most everywhere as more Mexicans are seeing the first signs of a future without access to the most basic necessity of life.

Close observers warn that, unless the federal and state governments change course, Mexico faces a future where desert cities such as Chihuahua City, Juarez, and Hermosillo are no longer livable, except for those who can pay a premium price for water. It's a water-determined future where the rural population in the vast arid regions of northern and central Mexico will abandon countryside to seek refuge from a precarious existence of dry wells and cisterns in overcrowded cities and across the northern border.

At the very least, the controversy over the Novillo-Hermosillo will likely be remembered as a lost opportunity for Sonora. By more frankly addressing the core issues all Sonorans are facing, more long-terms solutions might have become more apparent.

As water supplies diminish and as Sonora persists in its commitment to traditional water-management frameworks, even the apparent winners of the Yaqui water war will surely also become losers.

Endnotes

[1]William deBuys, *A Great Aridness, Oxford University Press*, 2011.

[2]Banco Mundial, *Los Recursos Naturales en América Latina y el Caribe*, 2010, at: http://siteresources.worldbank.org/INTLAC/Resources/257803-1284336216058/Reporte.pdf

[3]Karl Wittfogel, *Oriental Despotism: A Comparative Study of Total Power* (New Haven: Yale University Press, 1957, as cited in Sterling Evans, "Damming Sonora: An Environmental and Transnational History of Water, Agriculture, and Society in North-

western Mexico," Discussion paper, March 25, 2011, at: http://whae.uga.edu/evans.pdf

[4]Donald Worster, "Hydraulic Society in California," in *Under Western Skies: Nature and History in the American West* (New York: Oxford University Press, 1992).

[5]Sterling Evans, "Damming Sonora: An Environmental and Transnational History of Water, Agriculture, and Society in Northwestern Mexico," Discussion paper, March 25, 2011, at: http://whae.uga.edu/evans.pdf

[6]For an excellent examination of Sonora's split geography and how this geography has shaped history and development in Sonora, see: Robert C. West, *Sonora: Its Geographic Personality* (Austin: University of Texas Press, 1993).

[7]Doolittle, William E., "Settlements and the Development of 'Statelets' in Sonora, Mexico," *Journal of Field Archaeology*, II, 1984, pp. 13-24.

[8]See blog "Ciudad Obregón en Sonora," Aug, 29, 2010, at: http://obson.wordpress.com/2010/08/29/la-civilizacion-termina-donde-comienza-la-carne-asada/

[9]"Decreto qe crea un Organismo Público Descentralizado Denominado 'Fondo de Operación de Obras Sonora SI,'" 3 de junio de 2010, at: http://sonorasi.mx/descargas/Decreto_de_Creacion_Fondo_Sonora_SI.pdf

[10]See Sonora Sistema Integral (Sonora SI), at: http://sonorasi.mx/web/

[11]Will Grant, "Guardería ABC: la tragedia que México no olvida y que "puede ocurrir de Nuevo," June 5, 2014, *BBC Mundo*, at: http://www.bbc.co.uk/mundo/noticias/2014/06/140603_mexico_quinto_aniversario_guarderia_abc_jcps.shtml

[12]Pineda Pablos, N. (2007). Construcciones y demoliciones. Participación social y deliberación públicaen los proyectos del acueducto de El Novillo y de la planta desaladora de Hermosillo 1994-2001. *Región y Sociedad*, XIX(Especial), 89-115.

[13]Enfrenta gobernador de Sonora 3 procesos por presa: Conagua." Atando Cabos, Nov. 25, 2014, at: http://www.radioformula.com.mx/notas.asp?Idn=458593&idFC=2014#sthash.vG1BHGgD.dpuf

[14]The eight pueblos initially all had names in the Yaqui language. Some like Vícam are derivations of the original name, in this case Bikam. Some, like Pótam, retain their original name. In the case of Belém or Pitaya, the original Yaqui name (Béene) has faded into the past.

[15]Luque , Diana et al, "Política ambiental y territories indígenas de Sonora," Centro de Investigación en Alimentación y Desarrollo, Marzo 2012, p. 273.

[16]Luque, Diana et al, "Pueblos indígenas de Sonora: el agua, ¿es de todos? *Región y Sociedad*, Número especial 3, 2012.

[17]"The Sonora Desert: Background Information," Arizona-Sonora Desert Museum, 2007.

[18]Sterling Evans, "Damming Sonora: An Environmental and Transnational History of Water, Agriculture, and Society in Northwest Mexico," Produced for Workshop in the History of Agriculture and Environment, University of Georgia, March 25, 2011; Robert C. West, *Sonora Its Geographic Personality* (Austin: University of Texas, 1993).

[19]Refugio I. Rochin, "Mexico's Agriculture Crisis: A Study of its Northern States," *Mex-*

ican Studies 1, 1985, p. 257; Gary Paul Nabhan and Andrew R. Goldsmith, "State of the Sonoran Desert Biome: Uniqueness, Biodiversity, Threats, and the Adequacy of Protection in the Sonoran Bioregion, " p. 34, cited by Evans, p. 6.

[20]Sustainability in the Yaqui Valley, A project of Center for Environmental Science and Policy, Stanford Institute for International Studies, Stanford University, at: http://yaquivalley.stanford.edu/; Margaret Reeves, "Yaqui Fields of Poison," PAN North America, Summer 2006.

[21]Cynthia Hewitt de Alcántara, *La modernización de la agricultura mexicana*, 1940-1970 (Mexico City: Siglo XXI, 1978), p. 131; Cited in Evans, *Damming Sonora*, p.6.

[22]*Análisis sobre el uso y manejo de los recursos hidráulicos en el estado fronterizo de Sonora,* Comisión Estatal de Agua (CEA), Octubre 2005.

[23]Cynthia Hewitt de Alcántara, *La modernización de la agricultura mexicana*, 1940-1970 (Mexico City: Siglo XXI, 1978).

[24]*El Plan Hidrauico del Noroeste,* Instituto Mexicano de Tecnología del Agua and Semarnat, at: https://www.imta.gob.mx/historico/instituto/historial-proyectos-wrp/rd/2009/fi-rd0821-3.pdf

[25]"The Huichol (Wixárika) People's fight against multinational mining companies," Geo-Mexico, Nov. 14, 2014, at: http://geo-mexico.com/?p=12177

[26]In "Damming Sonora," Evans recounts the tragic case of the community of Casa de Teras community that was forcibly relocated to the Yaqui Valley to make way for La Angostura reservoir. This process of dislocation starting with La Angostura in the late 1930 was repeated in the construction of the other major dams in the state into the early 1960s. Even small dams like El Molinito (completed in 1991) on the Sonora River displaced stable communities of small farmers and *ejidatarios*. See, for example: Rolando E. Díaz Caravantes and Ernesto Camou Healy, "El agua e Sonora: tan cerca y tan lejos. Estudio de caso del ejido Molino de Camou," *Región y Sociedad*, No. 34, 2005.

[27]Sustainability in the Yaqui Valley, A project of Center for Environmental Science and Policy, Stanford Institute for International Studies, Stanford University, at: http://yaquivalley.stanford.edu/; Margaret Reeves, "Yaqui Fields of Poison," PAN North America, Summer 2006.

[28]Sonora SI, "Acueducto Independencia," Fondo de Operación de Obras, August 2012, at: http://www.sonorasi.gob.mx/eb/images/SONORA_SI_apuntes_31_08_2012.pdf

[29]Sonora SI, "Folleto Sonora SI," at: http://issuu.com/gobiernosonora/docs/folleto-sonorasi?e=3267347/4339871#search

[30]Sonora SI, "Acueducto Independencia," Fondo de Operación de Obras, August 2012, at: http://www.sonorasi.gob.mx/web/images/SONORA_SI_apuntes_31_08_2012.pdf

[31]Cited in Adolfo Gilly, "Sonora La nueva guerra contra los yaquis," *La Jornada*, Feb 215, 2015, at: http://www.jornada.unam.mx/2015/02/25/opinion/020a1pol

[32]Among the major armed Yaqui rebellions were those of 174041,1764-67, 1825-33, 1840, 167-68, 1889-91, 1912-3 1918-19, and 1927-28. See Tonatiuh Castro Silva, "Las persistencia de la nación yaqui entre anhelos y despojos," Sonora Biodiversidad, June 4, 2013.

[33]Sonora Bioversidad, at: http://sonoradiversidad.blogspot.com/2013/07/la-persistencia-de-la-nacion-yaqui-un.html

[34]For a view of PRI's historical role with the Yaquis, see: Marcelino Pérez Arenas,

¿Quién inició los conflictos por el agua?, July 2013, at: *http://www.infocajeme.com/noticias.php?id=23329*. Also: Tonatiuh Castro Silva, "La persistencia de la nación yaqui : un anhelo, infinitos despojos," July 10, 2013, *Sonora Diversidad*, at: http://sonoradiversidad.blogspot.com/2013/07/la-persistencia-de-la-nacion-yaqui.htm

[35]Luque et al, p. 81.

[36]José Luis Moreno Vásquez, *Despojo de agua en la Cuenca del río Yaqui* (Hermosillo: Colegio de Sonora, 2014), at: http://www.colson.edu.mx/Difusion/default.aspx?seccion=Publicaciones&tipo=1&codigo=2655

[37]Interview with José Luis Moreno Vásquez, "Acueducto Independencia si afecta al los Yaquis," January 23, 2015, at: http://www.kioscomayor.com/

[38]David Agren, "When a Green Revolution Runs Out of Water," *New York Times* Dec. 5, 2012.

[39]Ana Luisa Pacheco, 21 de julio de 2013, "Sonora: 72 años de pugnas entre regiones por el agua," *La Jornada*.

[40]Jeanneth Jiménez, 23 de julio de 2013, Consume agua insalubre el 90% de los yaquis.*www.uniradionoticias.com*

[41]See, for example: "Exigen indígenas aplicar ley a Tomás Rojo," June 20, 2014, *Diario del Yaqui*, at: http://indigenouspeoplesdevelopment.com/wp-content/uploads/2014/07/06-20-14_2_Exigen-ind%C3%ADgenas-aplicar-ley-a-Tom%C3%A1s-Rojo.pdf ; and "Criminalización de la lucha Yaqui," Sept. 15, 2014, at: http://moverunrio.org/

[42]*El Imparcial*, May 3-9, 2010, cited in Moreno, P. 12.

[43]*El Imparcial*, May 19, 2010, cited in Moreno, p. 10.

[44]A state government press release stated that the state had paid 17 million pesos to residents of Huásabas and Granados in exchange for their Yaqui River water rights and the beneficiaries would be the 900,000 residents of Hermosillo, as reported by El Kioscommayor.com, September 29, 2013, at: http://www.kioscomayor.com/vernoticiasateriores.php?artid=53228&relacion=&tipo=principal1&cat=12

[45]See communication from CONAGUA: press release, July 28, 2010, and Oficios No. BOO.OO.RO3.04.2.-1679 and 1680, cited in Moreno, p. 15.

[46]José Luis Moreno, "Conflicto por el agua entre la agricultura y la ciudad: el caso del acueducto presa El Novillo-Hermosillo," Paper presented at the Segundo Congreso de la Red de Investigadores Sociales sobre el Agua," Chapala, Jalisco, March 21-23, 2012.

[47]See Secretaría de Gobernación, *Presupuesto Federalizado: Sonora 2014*, at: http://www.inafed.gob.mx/work/models/inafed/Resource/369/1/images/SONORA.pdf

[48]See: Diana Luque et al, "Política ambiental y territorios indígenas de Sonora," Colegio de Sonora, April 2012.

[49]Luque, Diana, Martinez Yrizar, A. et al, "Pueblos indígenas de Sonora: el agua, ¿es de todos?," in *Región y Sociedad*, 3, 2012, at: http://www.redalyc.org/articulo.oa?id=10223024002

[50]See, for example: "Se presento nuevo secretario de Gobierno con los Gobernadores Yaquis," April 23, 2015, at: http://www.kioscomayor.com/vernoticias.php?artid=65636&relacion=&tipo=principal4&cat=52

[51]Enriqueta Lerma Rodríguez, "Notas para el análisis de la Resistencia yaqui en contra del Acueducto Independencia," *Sociológia*, vol. 29, no. 82, mayo/agosoto 2014. This paper is the best summary analysis of problems associated with governmental

manipulation of Yaqui autonomy and with determining the legitimacy of Yaqui leadership structures.

[52]Luque, Diana et al, "Pueblos indígenas de Sonora: el agua, ¿es de todos?" *Región y Sociedad*, No.3, 2012.

[53]Luque et al,, p. 86.

[54]Luque, Diana et al, "Pueblos indígenas de Sonora: el agua, ¿es de todos?" *Región y Sociedad*,, No.3, 2012. For an excellent treatment of this biocultural framework for sustainability (with field studies of Seris and Tohono O', see: Gary Paul Nabhan, *Cultures of Habitat: On Nature, Culture, and Story* (Counterpoint, 1997). For a broader treatments, see, among others: E. Boege, *El patrimonio biocultural de lost pueblos indígenas*, Mexico, INAH, 2008; Luisa Maffi, *On Biocultural Biodiversity: Linking Language*, Knowledge and the Environment, Smithsonian Institute Press, 2001.

[55]Scott Robinson, "Las presas y otros megaproyectos," *La Jornada*, June 23, 2012, at: http://www.jornada.unam.mx/2012/06/23/cam-minas.html

[56]Border states – mainly Sonora, Chihuahua, and Coahuila — account for 50% of Mexico's mineral and metallurgical production, dominating Mexico's mining sector. However, mineral production and extraction is increasing at a still faster rate in the center-north and southern regions of Mexico. The states of Guerrero, Oaxaca, and Veracruz – which have large indigenous populations – experienced a 1,413% increase in mining sector production in 201-2012. Data from "Acuerdo por el que se aprueba el Programa de Desarrollo Minero 2013-2018," *Diario Oficial*, May 9, 2014.

[57]*Anuario Estadístico de la Minería Mexicana*, Edición 2013, Coordinación General de Minería, Secretaria de Economía, p. 7, at: http://www.economia.gob.mx/files/comunidad_negocios/industria_comercio/informacionSectorial/minero/anuario_mineria_mexicana_2012_ed2013.pdf

[58]Servicio Geologico Mexicano, *Anuario Estadístico de la Minería Mexicana*; Servicio Geológico Mexicano, *Panorama Minero del Estado de Sonora, 2013*.

[59]Acuerdo por el que se aprueba el Programa de Desarrollo Minero 2013-2018," *Diario Oficial*, May 9, 2014.

[60]*Anuario Estadístico de la Minería Mexicana*, Edición 2013, Coordinación General de Minería, Secretaria de Economía, p. 14, at: http://www.economia.gob.mx/files/comunidad_negocios/industria_comercio/informacionSectorial/minero/anuario_mineria_mexicana_2012_ed2013.pdf

[61]Servicio Geologico Mexicano, *Anuario Estadístico de la Minería Mexicana*; Servicio Geológico Mexicano, *Panorama Minero del Estado de Sonora, 2013*.

[62]*Negocios ProMéxico*, (Pro-Mexico: Mexico City), February2014.

[63]Study by Behre Dolbear in 2013, cited in "The Mining Industry in Mexico: A Golden Opportunity," *Negocios ProMéxico*, February 2014.

[64]ProMéxico's mission is: "To promote the attraction of direct foreign investment and export of goods and services, as well as the internationalization of Mexican companies in order to contribute to Mexico's economic and social development and to strengthen the country's image as a strategic business partner." ProMéxico, at: http://www.promexico.gob.mx/en/mx/mision-vision-valores-objetivos

[65]FIFOMI, Informe del Director Enero-Febrero 2014; "Auerdo por el que se aprueba el Programa de Desarrollo Minero 2013-2018," Viernes 9 de mayo de 2014 DIARIO OFICIAL (Segunda Sección) 27; "Auerdo por el que se aprueba el Programa de Desarrollo Minero 2013-2018," Viernes 9 de mayo de 2014 DIARIO OFICIAL (Segunda Sección) 27.

[66]FIFOMI, "Informe del Director, Enero-Febrero 2014," at: http://www.fifomi.gob.mx/web/images/fifomi/documentos/carpetas/2014/sesord158/anexo_2%20_inf_direc_ene-feb2014.pdf

[67]FIFOMI,"Misión y Visión,"at: http://www.fifomi.gob.mx/

[68]Consejos Estatales de Minería have been established in Sonora, Sinaloa, San Luis Potosí, México, and Guererro, while FIFOMI is working with government and business to create similar councils in Michoacán, Chihuahua, Hidalgo, Nayarit, Jalisco, Oaxaca, Queretaro, and Campeche.

[69]"Refuerza el sector minero la economía estatal," Juárez Noticias, Sept. 27, 2014; "Inicia construcción de complejo minero en la sierra tarahumara," *El Milenio*, Nov.3, 2014; "Anuncia director de FIFOMI recursos por 8mm de pesos para minería," Informex, Nov. 24, 2014, at: http://informados.com.mx/noticia.php?id=96319

[70]"Memoria Documental," Coordinación General de Minería, Oct. 30, 2012;http://www.fifomi.gob.mx/web/images/fifomi/documentos/infgeneral/Rendicta/lblanco/asistencia%20tecnica%20y%20capacitacion.pdf

[71]See, for example: Rebeca Ramírez, "Ejerce el Fondo de Fomento Minero en Coahuila 850 mdp de 1,8000 millones," *Vanguardia*, May 8, 2014.

[72]Secretaría de Economía, "Minería Programas," at: http://www.1economiasonora.gob.mx/sectores/minero

[73]There are private and public *fideicomisos* in Mexico. Both state and federal governments can create *fideicomisos* for a variety of social and development objectives that involve spending government revenues. In practice, the proliferation of *fideicomisos*, particularly on the state government level, further shields the government from transparency and accountability. For a definition of a*fideicomiso público* see: http://definicionlegal.blogspot.com/2012/11/el-fideicomiso-publico.html

[74]Secretaría de Economía, Artículo 15, Atribuciones y indicadores de gestión de la Dirección General de Minería," at http://transparencia.esonora.gob.mx/Sonora/Transparencia/Poder+Ejecutivo/Secretar%C3%ADas/Secretar%C3%ADa+de+Economia/Atribuciones+e+Indicadores+de+Gesti%C3%B3n/Atribuciones+de+la+Direcci%C3%B3n+General+de+Miner%C3%ADa.htm

[75]PRODERM succeeds another *fideicomiso* of Sonora's executive branch called the Fideicomiso de Apoyo al Programa de Exploración Minera en el Estado de Sonora (FAPEMIN).

[76]ProMéxico's mission is: "To promote the attraction of direct foreign investment and export of goods and services, as well as the internationalization of Mexican companies in order to contribute to Mexico's economic and social development and to strengthen the country's image as a strategic business partner." ProMéxico, at: http://www.promexico.gob.mx/en/mx/mision-vision-valores-objetivos

[77]Gustavo Castro Soto, "La minería y la Resistencia en México," Jan. 13, 2013, at: http://www.cronicadechihuahua.com/Deudos-de-barzonistas-asesinados,31651.html

[78]AMSAC, "Directorio de Miembros," at: http://amsac.com.mx/dir_miem.htm

[79]Deudos de Barzonistas asesinados denucian el pacto del gobierno con el narco," *La Crónica de Chihuhua*, Oct. 22, 2014, at: http://www.cronicadechihuahua.com/Deudos-de-barzonistas-asesinados,31651.html

[80]Sonora SI, "Curículum de la empresa," at http://www.sonorasi.mx/index.php?option=com_content&view=article&id=253&Itemid=145

[81]Sonora SI, "Fondo de Operación de Obras," at: http://www.sonorasi.mx/index.php?option=com_content&view=article&id=256&Itemid=145

[82]Carta del presidente at: http://amsac.com.mx/cartapresidente.htm See his 2011 speech to the annual AMSAC meeting at: http://youtu.be/daRFWgLY_Hk

[83]"Control Narcotráfico Minas en 5 Estados," 24 Horas, Aug. 16, 2013, at: http://www.24-horas.mx/controla-narcotrafico-minas-en-cinco-estados/; "Mexican Organized Crime Controls Mining in Five States," InSight Crime, August 18, 2013, at: http://www.insightcrime.org/news-briefs/mexico-organized-crime-controls-mining-in-five-states

[84]Arturo Vega, "Ahora narco va por oro y plata; mineras arman grupos,"*Excélsior*, May 1, 2012.

[85]Blanca Estela Botello, "Irregular, 30% de mineras," Crónica.com, May 20, 2013, at http://www.cronica.com.mx/notas/2013/754413.html

[86]*Anuario Estadístico de la Minería Mexicana*, Edición 2013, Coordinación General de Minería, Secretaria de Economía, p. 14, at: http://www.economia.gob.mx/files/comunidad_negocios/industria_comercio/informacionSectorial/minero/anuario_mineria_mexicana_2012_ed2013.pdf

[87]"Cananea in Sonora: one of the largest open-pit mines in the world," Geo-Mexico, Oct.2, 2014, at: http://geo-mexico.com/?p=11932

[88]"Afectados por derrame tóxico toman alcaldía en Sonora," *Proceso*, Dec. 2, 2014, at: http://www.proceso.com/mx/?p=389671

[89]Gaspar Navarro Ruiz, "Siguen revueltas las aguas del Río Sonora," Terómetro, Dec. 1, 2014, at: http://www.termometroenlinea.com.mx/vernoticiasN.php?artid=43466&cat=201#.VIe9tGTF8Xd

[90]For the company's own technical report on the Los Mulatos mine see: http://www.alamosgold.com/files/doc_downloads/Mulatos%20-%20Technical%20Report%20(2012).pdf

[91]See "Peso del oro," Movimiento Mesoamericano Contra el Modelo Extractivo Minero (M4), 4 de abril de 2014, at: http://www.movimientom4.org/2014/04/el-peso-del-oro/ Also see the video: *El Peso del Oro*, at: www.youtube.com/watch?v=2_1qsdkYK94&feature=youtu.be

[92]Los Alamos Gold, at: http://www.alamosgold.com/mines-and-projects/producing-mine/mulatos-mine-mexico/default.aspx#overview

[93]For a good overview of the contamination of the Mulatos gold mine and its impact on the community, see: "La mina Mulatos envenena la region," No a la Mina, April 24, 2014, at: http://www.noalamina.org/latinoamerica/mexico/item/12576-mina-mulatos-envenena-la-region

[94]Daniel Sánchez Dórame, "Evacuan márgenes del Río Yaqui," Excelsior, August 27, 2013, at: http://www.excelsior.com.mx/nacional/2013/08/27/915616

[95]See Tom Barry, "Mining Industry Boosterism in Sonora," Oct. 29, 2014, at: http://

borderlinesblog.blogspot.com/2014/10/sonora-chronicles-mining-boosterism-in_29.htm

[96]*Eje Central*, August 25, 2014, at: http://www.ejecentral.com.mx/descarrila-tren-con-240-ton-de-acido-sulfurico-en-sonora/#sthash.k3X9huDG.dpuf

[97]Comisión Estatal del Agua, "Análisis sobre el uso y manejo de los recursos hidráulicos en el estado fronterizo de Sonora," October 2005, p. 35.

[98]"Calificar de peor desastre, es exagerado: Sector Minero," *El Imparcial*, Dec. 6, 2014, http://www.elimparcial.com/EdicionEnLinea/Notas/Sonora/01122014/915615-Calificar-de-peor-desastre-es-exagerado-Sector-minero.

[99]Érika Ramírez, "Empresarios mineros, los más ricos de México," *Contralinea.com*, 23 de abril de 2013, at: http://contralinea.info/archivo-revista/index.php/2013/04/23/empresarios-mineros-los-mas-ricos-de-mexico/

[100]Industrias Peñoles, *Reporte Annual 2013*, at: http://cs.penoles.com.mx/cs/groups/public/documents/document/bmv0/mda0/~edisp/prodextranet004678.pdf

[101]Minera Frisco: Minera María, at: http://www.minerafrisco.com.mx/ES/Unidades_mineras/Paginas/minera_maria.aspx

[102]The following section relies extensively on the work on the excellent overview of Mexican mining capital in Raúl Delgado Wise and Rubén Del Pozo Mendoza, "Minería, Estado y gran capital en México," *Economia e Sociede*, Campinas, (16), June 2001.

[103]"Mine Sold in Mexico," Nov. 4, 1988, *New York Times*, at http://www.nytimes.com/1988/11/04/business/mine-sold-in-mexico.html

[104]Raúl Delgado Wise and Rubén Del Pozo Mendoza, "Minería, Estado y gran capital en México," *Economia e Sociede*, Campinas, (16), June 2001, p. 105.

[105]"Lista de Proyectos Mineros en México con Capital Extranjero," Secretaría de Economía, at: http://portalweb.sgm.gob.mx/economia/es/mineria-en-mexico/lista-de-proyectos.html

[106]SEMARNAT is the Secretaría de Medio Ambiente y Recursos Naturales, while PROFEPA (Procuraduría Federal de Protección al Ambiente) is a decentralized branch of SEMARNAT that inspects, monitors environmental agreements, and is charged with enforcing the country's environmental regulations.

[107]*Proceso* online, Sept. 23, 2014; Georgina Howard, "Permite Conagua desorden minero," *Reporte Indigo*, Sept. 30, 2014. Media reports cite a PRD congressional commission investigating the August 6, 2014 contamination.

[108]Angélica Enciso L, "Minera Buenavista del Cobre opera en Cananea con permisos de agua irregulars," *La Jornada*, Sept. 23, 2014.

[109]*Proceso* online, Sept. 23, 2014 Georgina Howard, "Permite Conagua desorden minero," *Reporte Indigo*, Sept. 30, 2014. Media reports cite a PRD congressional commission investigating the August 6, 2014 contamination.

[110]Grupo México, Southern Peru Copper, "Formulario 10-K 2013," Submitted in Washington, DC., at http://www.southernperu.com/esp/relinv/2013/10K/10k131231e.pdf According to Grupo México: Los derechos por uso de agua se establecen en la Ley Federal de Derechos, la cual distingue varias zonas de disponibilidad con diferentes tarifas por unidad de volumen, dependiendo

de cada zona, con la excepción de Mexicana de Cobre. Todas nuestras operaciones tienen una o varias concesiones de agua y bombean de pozos el agua que necesitan."

[111]"Resolución por la que la Comisión Reguladora de Energía ortorga a Mexicana de Cobre, S.S. de C. V., permiso para generar energía eléctrica bajo la modalidad de auto-bastecimiento para su central La Angostura," Comisión Reguladora de Energía, Núm. RES/379/2013, 19 de septiembre de 2013.

[112]"Resolución por la que la Comisión Reguladora de Energía ortorga a Mexicana de Cobre, S.S. de C. V., permiso para generar energía eléctrica bajo la modalidad de auto-bastecimiento para su central La Angostura," Comisión Reguladora de Energía, Núm. RES/379/2013, 19 de septiembre de 2013.

[113]Union of Concerned Scientists, "Environmental Impact of Hydroelectric Plants," at http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/environmental-impacts-hydroelectric-power.html#.VHIywVfF8Xc

[114]Grupo México, press release, n.d., at: http://gmexico.com.mx/files/PRMGGEINICIAVENTAING.pdf Before it began work on the hydroelectric plant, MGE, which is based on Grupo México's property alongside La Angostura, was operating two gas-fired electricity generating plants at the La Caridad and Buenavista mining complexes. The Federal Energy Regulatory Commission had approved the creation of MGE in 2005 for the purpose of operating gas-fired plants, and it wasn't until later in the decade that Grupo México came before the commission with the request for a MGE-run hydroelectric plant." S&P Rates MGE," Reuters, Nov. 16, 2012, 2012.

This report is possible thanks to funding from the Christensen Fund.

Center for International Policy
2000 M Street NW, Suite 720, Washington, DC 20036
(202) 232-3317 | www.ciponline.org