Looming Conflicts? Energy Reform Priorities and the Human Right of Access to Water in Mexico

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About the Study: The Rule of Law and Mexico’s Energy Reform/Estado de Derecho y Reforma Energética en México

The 2013 changes to the constitutional framework and the summer 2014 enabling legislation in Mexico’s energy industry represent a thorough break with the prevailing national narrative as well as the political and legal traditions of twentieth century Mexico. Mexico is about to embark on an unprecedented opening of its energy sector in the midst of important unknown factors, as well as a fiercely competitive and expanding international energy market. Mexico is one of the last developing countries to open its energy sector to foreign investment, and although there are important lessons that can be learned from other countries’ experiences, this does not imply that the opening will be necessarily as successful as the government promises or that the implementation of the new laws will go smoothly. Almost certainly, after the enabling legislation goes into effect, important questions of law will emerge during the implementation, and unavoidably, refinements to the legislation will have to take place.

The book “Estado de Derecho y Reforma Energética en México,” published in México by Tirant lo Blanch and written in Spanish, is the culmination of a major research effort to examine rule of law issues arising under the energy reform in Mexico by drawing on scholars and experts from American and Mexican institutions in order to bring attention to the different component parts of the new Mexican energy sector from a legal standpoint.

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Abstract

Constitutional reform of Mexico’s energy sector is targeted, in part, at facilitating access via unconventional recovery efforts to shale gas reserves in northeastern Mexico. The methods—namely hydraulic fracturing—require lots of water, which may be difficult to obtain in regions where water is already scarce. The reform prioritizes energy development, requiring landowners to cooperate with companies developing hydrocarbons. In 2012, access to water was enshrined in the Constitution as a human right, an entitlement the judiciary has shown itself willing to enforce. These conflicting legal priorities create the potential for conflict over water allocation, a situation exacerbated by increasing scarcity due to drought and population and economic growth. This chapter reviews the state of water in Mexico in light of the reform, considers the social conflict that may be precipitated by opposing priorities, and offers recommendations to alleviate tensions as energy production increases.

Introduction

Recent constitutional reforms have begun to open Mexico’s energy sector to the world. The reforms are targeted, in part, at facilitating access to vast amounts of technically recoverable shale gas via unconventional recovery efforts, a massive and expensive undertaking that will require the use of large volumes of water in a region of the country where water is already scarce. The new energy laws prioritize energy development, imposing requirements on landowners to cooperate with companies attempting to develop the resource. Almost concurrently, access to water has been enshrined in the Mexican Constitution as a right for all people, an entitlement that Mexican courts are increasingly enforcing. These legal priorities, in conjunction with increasing scarcity due to drought and increasing demand due to population and economic growth, may potentially lead to social conflict over water allocation and use. This chapter reviews the state of water in Mexico in light of the energy reforms and offers recommendations for legal and policy initiatives that may help alleviate potential tensions as energy production increases in the country.

New Sources of Water Demand: Unconventional Shale Production and the Energy Reform

The constitutional reforms enacted in Mexico in 2013 and 2014 have begun to transform Mexico’s energy sector. The reforms are targeted at facilitating access to—among other resources—vast amounts of technically recoverable shale gas. The U.S. Energy Information Administration (EIA) estimates that 545 trillion cubic feet of this valuable resource underlie Mexico (U.S. EIA 2015). Most of the shale gas is located in the northern part of the country, which is also where much of Mexico’s large-scale agriculture and industry is located. The Secretariat of Energy of Mexico and PEMEX have identified the Burro-Picacho, Tampico-Misantla, and Burgos basins as priority areas with shale oil and gas potential. These basins are situated in the northern states of Chihuahua, Nuevo León, Coahuila, and Tamaulipas. The Burro-Picacho and the Burgos basins are an extension of the Eagle Ford formation in
Texas. The Secretariat believes that the shale oil and gas potential, especially in these three basins, is confirmed and would represent, if developed, several decades of oil and gas production at 2013 production rates (Secretariat of Energy 2015).

Unlike Texas, which has seen extensive exploration and production activity in the Eagle Ford, Mexico has not yet begun to exploit its unconventional resources. Most of Mexico’s easily accessible, on-shore hydrocarbon deposits have been exploited; those that remain will require the use of advanced production technologies, namely hydraulic fracturing. Mexico’s national oil company, Petróleos Mexicanos (PEMEX), has been unable to keep up with the capital requirements and technological advances necessary to exploit these resources, which is a significant impetus behind the energy reform allowing foreign companies to enter the country.

The energy reform in Mexico seeks to provide PEMEX with the legal, contractual, and fiscal tools to facilitate necessary private and public investments for the exploration and exploitation of shale oil and gas, among other sources of energy. The reform sought to remake PEMEX into a new form of legal entity—a state productive company—with financial and administrative autonomy, free to associate with any potential partner and with more leeway to establish its own workers’ salaries and compensation plans. It modified the legal nature of PEMEX so that the company can freely engage in public-private contractual and services agreements, including licensing contracts, production sharing contracts, utility sharing agreements, and any combination thereof. The reform did not modify the Mexican state’s nontransferable ownership over oil and all forms of hydrocarbons in the subsoil: minerals remain the property of the nation. But the constitutional changes do allow Mexico, through its federal government, to assign the exploration and exploitation of natural resources to “state productive companies” or to contract with private companies. The contracts always include language recognizing that the hydrocarbon resources extracted belong to the Mexican state. The petrochemical industry, as well as the transportation and sale of gasoline, gas, and other hydrocarbon by-products—all areas previously reserved to the state—are now opened to private investment. By allowing foreign companies to operate in Mexico—bringing with them vast financial assets and advancements in technology—the energy reforms are likely to bring about sharp increases in Mexican shale gas production. The elephant in the room, however, may be water scarcity.

Hydraulic fracturing operations require large amounts of water. During the hydraulic fracturing process, fracturing fluids—which can be 99 percent water—are forced into the well at a pressure that exceeds the breaking point of the rock formation, thus “fracturing” the rock and allowing gas to seep out. Drilling a single well may require 400 to 4,000 cubic meters of water ($m^3$) in drilling fluids, which are necessary to maintain hydrostatic pressure inside the hole, cool drill heads, and remove drill cuttings (Gregory et al. 2011). An additional 7,000 to 18,000 $m^3$ of water are then needed for the actual fracturing of the well (Gregory et al. 2011). Other studies, based on drilling in parts of the United States, have calculated that a single well may require between 200 and 2,500 $m^3$ of water to drill, and between 7,000 and 23,000 $m^3$ of water for hydraulic fracturing of the well (Reig et al. 2014).
The wide range of possible volumes is an indicator that there is a high level of uncertainty regarding the possible impacts of hydraulic fracturing on freshwater availability (Reig et al. 2014). The water supplies needed to support hydraulic fracturing operations are a key concern and may act as a limiting factor, particularly in regions that already suffer from water scarcity (Rahm 2011; Freyman 2014).

Although hydraulic fracturing requires vast amounts of water, these figures may represent a very small proportion of state or national water use. However, water use for hydraulic fracturing is highly concentrated in areas where shale oil and gas are concentrated, so local impacts may be felt quite profoundly. A recent report found that many hydraulically fractured wells have been installed in places with high or extremely high water stress and that more than 55 percent of wells were located in areas experiencing drought (Freyman 2014). The report uses the World Resources Institute’s designation of “extremely high water stress,” which is defined to mean “over 80 percent of available surface and groundwater is already allocated for municipal, industrial, and agricultural uses” (Freyman 2014, 6). Ranked sixth among countries with the largest shale gas technically recoverable resources, Mexico is rated to have high average water stress over the shale play area (Reig et al. 2014). Importantly, portions of both the Burgos and Sabinas shale plays are located in parts of Mexico with extremely high water stress (Figure 1).

**Figure 1.** Overlap of Mexico’s Shale Plays with Areas of High Baseline Water Stress


The Mexican Secretariat of Energy estimates that the development of each shale gas well in Mexico will require around 21 million m$^3$ (Secretariat of Energy 2015). In a country where
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rainfall varies greatly by season and is distributed unevenly across regions (see Figure 2), allocating vast amounts of water for unconventional energy development could create conflicts with the agriculture sector and affect supplies needed to meet basic human freshwater needs. UN-Water has identified intensifying water scarcity as the “most pressing problem related to water management in Mexico” (United Nations Food and Agriculture Organization 2013). The greater scarcity is the result of unregulated economic development, population growth, pollution of surface water and groundwater, drought, and the early effects of climate change (UN FAO 2013). Total annual renewable water sources in Mexico are 3,879 m³ per inhabitant (UN FAO 2013). Water scarcity-induced conflict has already manifested in Mexico. In 2009, Mexico City ran advertisements predicting the city would be out of water by February 2010 (Casey 2009), and intermittent drought in the state of Chihuahua over the last few decades has led to the deaths of hundreds of thousands of livestock as well as billions of dollars in crop losses (Watson 2013; Rosenberg and Torres 2012).

Hydraulic fracturing has already been controversial in Mexico. In the summer of 2014, groups opposed to hydraulic fracturing presented the Mexican Senate with a petition signed by more than 10,000 people in support of banning hydraulic fracturing, and some 60,000 marched in the streets of Mexico City to oppose the practice (OOSKAnews 2014). The protests centered largely on concerns over water scarcity, environmental impacts, and security—particularly in light of the extensiveness of organized crime interests in northern Mexico. But in the rush to exploit the shale, water has often seemed a secondary concern. Mexican geologists and petroleum engineers are unconcerned about where and how water resources will be supplied, stating their intent to pipe water in from the ocean or parts of the country with greater water availability, if necessary (Miroff 2014).

The State of Water Resources and the Governing Regime in Mexico

Water is unequally distributed in Mexico, and resource use does not always reflect relative water availability. Some regions of the country do not use all the water they have, and in others water resources are overexploited. The central, northern, and northeastern areas of Mexico together possess less than 25 percent of the total water available in the country, yet these regions consume around 75 percent of water resources and generate close to 80 percent of the country’s GDP (Centro Mexicano de Derecho Ambiental & Environmental Law Institute 2014). It is worth reiterating that the majority of unconventional shale gas production is anticipated to occur in these drier regions of Mexico. Furthermore, 77 percent of the Mexican population lives in regions that, on average, possess only 32 percent of available water supplies in the country. According to the National Water Commission (CONAGUA), per capita water availability in Mexico has plummeted from an average of 18,000 m³ per inhabitant per year in 1950 to less than 4,000 m³ per inhabitant per year in 2013 (CONAGUA 2011). Figure 2 illustrates the variation in distribution between water resources and population/development in Mexico.
Figure 2. Contrast between development and water availability in Mexico

Mexico’s water scenario is characterized by unequal access to water and sewage systems, especially between urban and rural areas; unequal distribution of needs and sources of water across the country; and questions of sustainability. Despite having made advances in recent decades, Mexico still has important shortcomings regarding universal access to clean water and sewage services. Thirty-five million people in Mexico are regarded to have poor water access, both in terms of quantity and quality (Secretariat of Environment and Natural Resources 2014; CONAGUA 2011). CONAGUA, the federal entity charged with the administration of national sources of water, estimates that approximately 9 million people in Mexico do not have access to clean water and 11 million do not have appropriate sewage services (CONAGUA 2011). The 9 million people without access to clean water are mostly rural inhabitants. This data does not consider other water needs, such as environmental, agricultural, commercial, and industrial uses. CONAGUA does not envision that universal coverage can be reached by 2030, given the population growth rate (CEMDA and Environmental Law Institute 2014).

Environmental sustainability of freshwater sources is an important question and is perhaps the most pressing issue in the near future in connection with the administration of water as a natural resource. While Mexico in the 1950s was a country with abundant availability of water per person, today it is classified as one of limited or scarce availability (Secretariat of Environment and Natural Resources 2014). The gap between water supply and demand by
2030 is projected to be close to 23 billion m$^3$. This accounts for agricultural, urban, and industrial use, as well as future policies expected to mandate a cessation of water extraction from overexploited water bodies and the need for environmental flows in rivers (Secretariat of Environment and Natural Resources 2014). This shortage is a result of population growth; poorly designed economic incentives placed on the administration, exploitation, and purchase of water; and the deterioration of ecosystems that secure the renewability and availability of water. In a climate change scenario, the estimated gap is expected to increase to 36 billion m$^3$. Fifty-four percent of water used for agricultural, urban, and industrial consumption is currently drawn from overexploited underground aquifers. To close the gap, CONAGUA estimates it would be necessary to implement large infrastructure projects, which could cost an estimated 246 billion pesos (National Water Commission 2011).

Population growth, poorly designed economic incentives, and ecological deterioration have caused water quality to decline. Although CONAGUA estimates that 80 percent of national aquifers are of good quality, it recognizes that the system to evaluate the quality of water resources overall in the country is insufficient (CEMDA & Environmental Law Institute 2014). The discharge of residual agricultural waters—contaminated with agro-chemicals—or sewage water into aquifers is still an issue in Mexico (Aguilar and Perez 2008). In 2010, 89 percent of sewage water was recollected and only 43 percent treated. Agricultural use also places quantitative pressure on water supplies. In Mexico, 76.6 percent of water concessions are for the agricultural industry (National Water Commission Digital Water Atlas 2012). The electricity used for pumping water for agricultural districts is subsidized, making use of this water less costly and promoting water use that is both inefficient and damaging to the environment. This subsidy alone costs the government nine times more than CONAGUA’s appropriated budget in 2010. (Organisation for Economic Co-operation and Development 2012).

The legal framework governing water in Mexico is complex and based on a predominantly public or governmental administration model. Events in recent years have complicated the picture—casting doubt on how allocation priorities for water will be implemented and laying the groundwork for potential conflict. On February 8, 2012, Article 4 of the Mexican Constitution was amended to introduce the human right of access to water. Article 4 reads as follows:

Every person has the right to the access, disposition, and sanitation of water for personal and domestic use in a sufficient, salubrious, acceptable and accessible manner. The State shall guarantee this right and the Law shall define the basis, supports and modalities for such access and the equitable and sustainable use of the hydride resources, establishing the corresponding participation of the Federation, the States, the municipalities, as well as that of the citizens to meet those ends.

The transitory articles in the 2012 constitutional reform mandate the passage of a bill addressing the implementation of the human right to access to water in Mexican law. The Mexican Congress was given 365 days from the date the amendment entered into force to
pass a new Ley General de Aguas, or General Law on Water (Diario Oficial 2012). As of the writing of this chapter, Congress had not yet passed the required bill and is now more than 1,000 days late in complying with the mandate.

To fully understand how water is governed in Mexico, Article 4 must be read in conjunction with Articles 25, 27, and 115 of the Mexican Constitution. Article 25 establishes that development of the country must be conducted by the Mexican state in an integral and sustainable manner. This means that decisions regarding water infrastructure, public water and sewage services, and all uses of water sources, must consider the social, economic, and environmental impacts, as well as intergenerational duties (CEMDA & Environmental Law Institute 2013). Article 27 establishes national water bodies and defines them as public goods that are the property of the Mexican state. Finally, Article 115 establishes that municipal governments have the power and duty to provide clean water and sewage public services (United Mexican States Constitution, Article 115 § 1917).

The categorization of water under Article 27 is a key provision underlying the management of water in Mexico. Public goods under Article 27 are inalienable and can only be exploited by private parties through concessions granted by the federal executive branch. CONAGUA, as part of the federal executive branch, determines how water is used (and by whom) via the concessions permitting process. CONAGUA may allocate volumes of water for use by state and local operators and may permit concessions to private users. Article 27 is implemented by the Ley de Aguas Nacionales (National Waters Law 1992), which was passed in 1992 and amended in 2004. The National Waters Law, however, will be superseded by the aforementioned General Law on Water, which the Mexican Congress must enact to fulfill the mandate in the transitory article of the constitutional reform decree regarding the human right to access to water.

The National Waters Law created a public participatory process through the establishment of Water Basin Councils around the country. These councils are composed of representatives of federal, state, and municipal governments in each water basin, as well as representatives of water users (including water facilities) and nongovernmental organizations. Government and nongovernmental participation in each council is evenly divided. The director general of CONAGUA has a decisive vote to resolve any issue if a council cannot reach a decision. A water basin council may recommend preferred uses of water in the basin or options for resolving competing concession requests. The ultimate decision-making authority is vested in CONAGUA.

The National Waters Law establishes that water for public and urban uses has preference over all other uses (National Waters Law Article 22). Water for urban uses encompasses more than water for human consumption and sanitation; it may include water for public parks, commerce, and even urban industries. It is important to underscore that the current National Waters Law allows CONAGUA, by itself or with the recommendation of a basin council, to change or modify the use of water. Thus, CONAGUA may allocate waters to a municipality today for public consumption but later modify the allocation to allow the
municipality to use part of that water for another purpose, such as hydraulic fracturing operations.

Water bodies not listed as national water bodies by the Constitution are considered part of the property through which they flow. However, when a water body flows through two or more properties, state governments have the ability to regulate them (United Mexican States Constitution, Article 27). In the case of groundwater, a landowner can extract the waters found exclusively beneath the landowner’s property. However, even in this case, it is within the president’s authority to establish limitations based on public interest considerations (United Mexican States Constitution Article 27).

To summarize, the federal government administers national waters through CONAGUA, which is in charge of infrastructure projects for the use and transportation of national waters. The agency is administratively organized into water basins, and it assigns volumes of national waters to state and municipal governments and authorizes private uses of water through administrative concession agreements. States can regulate underground waters, and municipalities are in charge of providing water and sewage public services. Large municipalities usually have water utilities, and states have water agencies or commissions to administer state waters and serve a coordinating role between CONAGUA and the municipal governments. Close collaboration between CONAGUA and local governments is necessary especially regarding public water services and other uses. Figure 2 provides a graphic representation of key water actors in Mexico, their responsibilities, and relations to one another.
As noted above, the Mexican Congress has thus far failed to enact the implementing legislation required by the amendment to Article 4 of the Constitution. Attempts have been made, but the proposed bill was controversial and encountered stiff opposition. In March 2015, the Congress’s lower house, the Chamber of Deputies, decided to pull back the bill before it was voted on due to strong opposition by academic and social groups to the drafted version (Flores 2015; Economiahoy.mx 2015). The controversy concerned whether the bill effectively implemented the human right. Other related concerns were whether the bill allowed for the privatization of water rights, whether water needs in rural and indigenous areas would be neglected, whether environmental welfare would be overlooked in favor of industrial uses, and questions about watershed transfers, among other issues (Planeta CNN 2015).

Regardless of the bill that ultimately passes in the Congress, what is clear is that the Mexican courts already have, and will continue to have, a more proactive role in construing the Mexican water legal regime. The constitutional provision enshrining access to water as a human right opens a new level of involvement for the Mexican courts through the amparo (protection) proceeding and other constitutional remedies. In 2012, the Segundo Tribunal Colegiado del Decimo Octavo Circuito—a federal court—issued a decision in an amparo review holding the Municipal Government of Xochitepec in the state of Morelos.
and its water authority constitutionally liable for failing to provide access to clean water to a citizen, as mandated by paragraph 6 of Article 4 of the Mexican Constitution [Amparo en revisión (AR AD 381/2011)]. The claimant lived in a low-income neighborhood that lacked water infrastructure and was adjacent to wealthier neighborhoods that were receiving water provision services from the municipal government. The Circuit Court found that this violated the claimant’s constitutional right of access to clean water and that there was no justified reason for the Municipal Water Authority to provide unequal treatment to the claimant in comparison to adjacent neighborhoods.

The court read the recently enacted constitutional right in light of international treaty obligations adopted by Mexico, such as the International Covenant on Economic, Social, and Cultural Rights. The court found that the right of access to water is a fundamental first-generation right necessary for the enjoyment of other human rights and that it is a right establishing a performance or service obligation on behalf of the government. Such performance or service obligations must comply with international standards and be provided according to the means and modalities established by law. The laws of the Mexican state of Morelos and the municipal regulations of Xochitepec clearly articulated that the entities were in charge of providing the service. The court ordered the Xochitepec Water Authority to approve and implement the plans already drafted to extend water services to the neighborhood and to provide water to the claimant via water trucks, in sufficient amounts and quality, for as long as it took the water authority to implement the water infrastructure plans.

Subsequent litigation over whether the Xochitepec Water Authority had complied with the judgment ultimately reached Mexico’s Supreme Court of Justice. In December 2014, the Supreme Court issued a judgment holding that the water authority had not complied with the decision and that a lower court had erred in holding that it had. The decisions set a precedent construing and applying the constitutional right to access to water and sanitation. The Supreme Court included in its reasoning the development of evolving standards to address the differing needs and interests involved in realizing the right. As a standard for reasoning the capacity of the municipality in these terms, it also opened the door to set criteria for federal authorities in the allocation of national waters to municipal authorities for water services. Further, it also confirmed the standard of equal treatment for adjacent communities.

The Supreme Court decision is a strong precedent signaling the direction that Mexican courts may take in construing the new constitutional regime adopted through the general human rights reform of 2011. Pursuant to the 2011 reform, Article 1 of the Constitution established that every person in the Mexican territory enjoys not only the human rights established by the Constitution, but also those in international agreements to which Mexico is a party. These human rights must be construed as providing the highest degree of protection in favor of the person at issue (the “pro-homine principle”) and cannot be restricted except for the explicit limitations established in the Constitution. As construed by the Mexican Supreme Court, human rights established in the Constitution and in the treaties to which Mexico is a party constitute the standard of constitutional (regulatory) control to
review the validity of all other rules and acts that form part of the Mexican legal system (Mexican Supreme Court Chamber Decision P.J. 21/2014).

Looming Conflicts in Water Allocation and Environmental Protection

Regardless of the approach taken, decision-making around water is considered under the National Waters Law to be an issue of public interest and a matter of public order (National Waters Law Article 1). Under the proposed Senate bill for the new General Law on Water during the Spring 2015 congressional session, water allocation and administration were also defined as national security issues and therefore as matters of public order (Chamber of Deputies 2015, Article 8). These definitions set up an interesting and important potential conflict of priorities, since the constitutional energy reform maintained the designation of the energy sector as a strategic economic sector. Exactly what these designations mean or how they could be reconciled by the courts if energy development needs clash with claims regarding the human right to access to water or water allocation issues is difficult to know. There now exists a potential clash between energy as a strategic priority and (1) the human right to access to water and (2) water allocation decisions as a matter of public interest or, potentially, national security.

For example, in affirming that the public power to rescind contracts by energy authorities at the administrative level without compensation is not a matter that may be subject to private arbitration, courts have based their decisions on the constitutional designation of energy development as a strategic economic sector. In other words, a private contractual right must give way to the legal right of the state to rescind a contract when the state is acting to protect a constitutionally designated development priority that potentially affects the public at large. The interesting question for our purposes is how an issue like this would be resolved if it were to come into conflict with a human rights claim under the Constitution.

Further, transitory Article 8 of the constitutional energy reform establishes that, pursuant to the strategic character of energy development, exploration and exploitation of hydrocarbon resources are matters of “social interest and public order.” As such, these activities, according to the transitory article, will have preference over any other that involves the use of the ground or underground of lands affected by these activities. The implementing laws address the manner upon which payment for the occupation or grounds affectation or corresponding compensation will be made. If water runs underground a land identified for energy exploration and exploitation, would the preference still prevail?

This provision is both novel and interesting, firstly, because of its placement in a transitory article and, secondly, because of the specific language used. The phrase “orden público e interés social” (social interest and public order) is not found in the text of the Constitution. Rather than “social interest,” the concept used in the Constitution in connection with property is that of “interés público,” (public interest). For example, Article 27 of the Constitution establishes that the state can expropriate private property only upon a cause of
“public interest” and by providing compensation. Article 27 also uses the wording “public interest” as the basis to justify the imposition of “modalidades,” or limitations, on private property in order to seek a more equitable distribution of public resources, secure their conservation, promote more equitable development, and improve residents’ living conditions. These limitations can be exercised in connection with urban planning, the establishment of natural reserves, and uses of land, water, and forests, as well as to preserve and restore environmental balance.

Outside of the Constitution, the technical concept of “public order” is found in Mexican law in connection with the annulment or recognition of foreign judgments and arbitral awards. A cause for annulment or an exception to such recognition is allowed when a foreign judgment or an arbitral award is contrary to public order (United Mexican States Federal Commercial Code, Articles 1457 and 1462). Public order is not defined in the statutes. However, federal courts have established some criteria for applying a public order test for non-recognition or annulment of foreign judgments and arbitral awards (Collegiate Circuit Courts 2005; Collegiate Circuit Courts 2012). The test requires a case-by-case analysis by the judge, appropriate to the place and context prevailing at the moment of the evaluation. It is not enough that a statute expressly declares the provisions to be of public order. The judge should base his evaluation on objective criteria reflecting the fundamental concerns of society and assess whether the award or foreign judgment substantively offends, in essence, the Mexican legal system. In doing so, the judge should consider the essential elements necessary to preserve social harmony in the community—in other words, the minimum rules for appropriate social interaction.

The concepts of social interest and public order imbedded in the transitory article of the energy reform amendment really speak to another case law doctrine. Although the phrase is not in the text of the Constitution, the federal judiciary has developed the concept of “social interest and public order” as an exception in applying the test of the apparent good right. Under this test, in deciding whether to issue a temporary injunction that would prevent the exercise of an act of authority subject to a constitutional challenge under an amparo proceeding, the court must evaluate, before entering into the merits of the case, whether prima facie, the complainant has a sufficiently “good” right to be protected and therefore should enjoy the injunction sought. For example, imagine that an indigenous community brings a constitutional case under the amparo remedy to prevent the construction of a highway through the community’s sacred lands. Prima facie, the case would comply with the apparent good right doctrine because the Constitution establishes certain protections for indigenous peoples and their lands. In terms of public order, a new highway would not ordinarily constitute an interest that could trump the good right doctrine for issuing an injunction. Therefore, in order to prevent potentially irreparable harm to the constitutional rights of the indigenous peoples, the court would issue an injunction to stop the construction of the highway until it resolves the claim on its merits. The prima facie right, then, should be balanced against the social interest or public order that would be affected in the event that the injunction is granted.
Evaluation of the apparent good right is done on a case-by-case basis. The judicial test has now been codified under the Amparo Law. Article 129 of the Amparo Law (2013) defines a number of cases in which an injunction would—per se—cause harm to public order and would be contrary to the social interest. These include, for example, when the injunction would permit the sale of illicit drugs to continue, allow the overpricing of basic staples, or impede governmental measures to prevent or stop an epidemic. The provision, however, does not rule out that courts may consider other public order or social interest issues in applying the “apparent good right” test. It also allows judges to grant an injunction on an exceptional basis even in the face of an explicit public-order statutory provision when, in balance, the social interest and public order protected under the statute would incur less harm, in comparison to that which the constitutional right would suffer if the injunction is not issued. It is important to remember that these issues always arise in the context of human rights claims under the amparo remedy.

The wording of the constitutional transitory article makes sense in this context. The intention was to prevent private landowners from impeding the use of private property for energy exploration and exploitation through the use of amparo proceedings. By declaring that use of the land and subsoil for exploration and exploitation of hydrocarbons is of social interest and public order, the law opens the door for a court, when a property owner files an amparo against the partial or total use of her land for exploration purposes, to deny the injunction based on the social interest and public order doctrine. However, the Amparo Law also provides standing to adjacent communities or nongovernmental organizations to submit a claim to protect collective rights, such as the constitutional human right to access to water or the right to a clean environment. Judges could be faced then with balancing constitutional rights of a collective—instead of an individual—nature with the requirements of public order enshrined in the energy constitutional reform.

In addition, there are some nuances the federal judiciary will have to address and resolve. First, the jurisprudential precedents indicate that merely declaring itself to be of social interest and public order does not, in and of itself, qualify a law or provision to be so (Collegiate Circuit Courts 2005; Collegiate Circuit Courts 2012). The courts must always make such a determination on a case-by-case basis based on the specific facts before them, except, of course, for the cases defined in Article 129 of the Amparo Law (México 2013). However, in the case of the constitutional energy reform, the designation as a matter of social interest and public order is not found in the Amparo Law but in a transitory article of the Constitution, which is the supreme law of the land. Because of its placement, should courts construe the transitory article similarly, as though the provision had been inserted in Article 129 of the Amparo Law? There are no precedents yet and the issue is open for judicial interpretation.

In construing transitory articles in prior laws, the Supreme Court has stated that the provisions constitute an integral part of the law (Collegiate Circuit Courts 2001). Does this interpretation also apply to constitutional amendments? And, more importantly, should it apply to transitory articles of constitutional amendments, which are, in fact, not transitory? Transitory articles have the function of establishing implementing steps or prescriptions
that will be fully satisfied at some point in time, and therefore do not need to be in the text of the amended legislation. The most common type of transitory article is the date of entry into force of the legislation. However, when a transitory article defines a specific activity as preferred over all others—as does the energy reform—the definition is not transitory in character. The language will not become unnecessary or redundant as a function of the passage of time. This raises the question: why was the statement not inserted in the constitutional text itself?

The nature of a constitutional text is different from that of an ordinary law because of its foundational character, durability, and force. Therefore, the transitory articles are arguably not, per se, part of the Constitution, as the Constitution consists only of the constitutional text, where the will of the people is expressed in their fundamental agreements. However, for a court to disregard a provision, even transitory, of a constitutional reform approved by the Permanent Constitutional Congress appears contrary to notions of the democratic process. However, giving effect to the provision does not necessarily mean it should be regarded with the same effect as a textual constitutional provision.

Imagine a situation in which a NGO brings a constitutional claim based on the human right to access to water to protect a critical underground water resource located on or near land coinciding with unconventional gas production—with the attendant water supply needs and risks of exposure to contamination. How would this be resolved in court? The government may try to claim that the public order provision of the constitutional energy reform’s transitory articles must be read as a constitutional exception to the human right, and that therefore the injunction should be denied. In such a case, the judge will need to construe first the issue of the nature of the transitory article, and then address whether there is a good right to be protected by the injunction that trumps the public order mandate.

Conversely, the court may not treat the transitory article as an explicit exception to constitutional human rights. At most, it should be regarded as a statutory public order provision similar to those enshrined in the Amparo Law. In such a case, a judge may grant a temporary injunction in exceptional cases where the harm to the constitutional right to be protected may be bigger than the statutory social interest or public order declared.

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1 This is the doctrinal designation for the process of constitutional amendments. It is based on the notion that there is a permanent Constitutional Convention or Congress when the two chambers of the Federal Congress by two-thirds of its members present, and 50 percent plus one of the State Congresses, approve a constitutional amendment.
Table 1. Text of salient water and energy provisions in Mexican law that may come into conflict.

<table>
<thead>
<tr>
<th>Provision of Law (emphasis added by the authors)</th>
<th>Text in Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Constitutional Decree Amendment: Article 8 Transitory</td>
<td>Given their strategic character, exploration and extraction activities and of oil and other hydrocarbons, as well as the transmission and distribution of electricity as a public service, addressed by this Decree, <em>are considered matters of social interest and public order, and therefore will enjoy preference over any other activity</em> that involves the use of the surface and subsoil of the lands involved.</td>
</tr>
<tr>
<td>Hydrocarbons Law Article 1. This Law implements Article 25, paragraph 4; Article 27, paragraph 7; and Article 28, paragraph 4 of the Political Constitution of the United Mexican States, regarding Hydrocarbons.</td>
<td>The Nation holds the direct, inalienable, and imprescriptible property of all hydrocarbons in the subsoil of the national territory, including the continental platform and the exclusive economic zone outside and adjacent to the territorial sea in mantles and deposits regardless of their physical state. (...)</td>
</tr>
<tr>
<td>Article 5. The hydrocarbon exploration and extraction activities included in Article 2, paragraph I of this Law are considered strategic pursuant to Article 28 paragraph 4 of the Political Constitution of the United Mexican States. Only the Nation will conduct them, through Legatees and Contractors, subject to this Law.</td>
<td></td>
</tr>
<tr>
<td>Article 4, Mexican Constitution (Human Right to Access to Water)</td>
<td><em>Every person has the right to water access, use and sanitation for personal and domestic uses, in a sufficient, safe, acceptable, and accessible manner.</em> The State will guarantee this right and the law will define the manner, support and modalities for the equitable access and use of the hydric resources, and will establish the involvement of the Federal government, the states and municipalities, as well as public participation for reaching these ends.</td>
</tr>
<tr>
<td>National Water Law</td>
<td>Article 1. This Law implements Article 27 of the Political Constitution of the United Mexican States on national water; it is to be generally observed in all the national territory, its provisions are of <em>social interest and public order</em> and its object is regulating the exploitation, use or disposal of such water, its distribution and control, as well as its conservation, both in</td>
</tr>
<tr>
<td>National Water Law (continued)</td>
<td>quantity and quality, in order to secure wholesome sustainable development.</td>
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<tr>
<td></td>
<td>Article 2. The provisions of this Law are applicable to all national waters, both surface and underground. They are also applicable to the national property referred to by this Law.</td>
</tr>
<tr>
<td></td>
<td>The provisions of this Law are applicable to Mexican marine zones waters regarding its quality control and conservation, without prejudice of the jurisdiction or concessions under which they could be regulated.</td>
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<td></td>
<td>Article 13. BIS 3. Basin Councils are entrusted with:</td>
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<td></td>
<td>II. According priorities in the use of water with its members and the corresponding Basin Organism pursuant to Article 22, Paragraph 3 of this Law. <em>Water for domestic and urban public use will have priority in every case.</em></td>
</tr>
<tr>
<td></td>
<td>Article 14. BIS 5. The founding principles of the national water policy are:</td>
</tr>
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<td></td>
<td>XXII. Domestic and urban public use will be preferred over any other use.</td>
</tr>
<tr>
<td></td>
<td>Article 17. The exploitation, use and disposal of surface national waters through manual means for domestic use is freely allowed pursuant to paragraph LVI of Article 3 of this Law, subject to not diverting them from the riverbed or altering their quality or resulting in a significant lowering of its flow level, pursuant to the applicable regulations.</td>
</tr>
<tr>
<td></td>
<td>No concession is required for extraction of interior seawater or of the territorial sea for its exploitation, use or disposition, except for desalination purposes, which will be subject of concession.</td>
</tr>
<tr>
<td></td>
<td>Article 22. The Basin Council, in coordination with the corresponding Basin Organism, will propose to “the Commission” the priorities in the use of water for the latter’s approval (...). Domestic and urban public use will always have preference over any other use.</td>
</tr>
</tbody>
</table>
Transitory Article 15. Insofar as Article 22 paragraph 3 of this Law is implemented, the following order of priorities will be observed with regards to water concessions for the exploitation, use and disposal of national waters, superficial and underground, in ordinary circumstances:

1. Domestic
2. Urban public
3. Livestock
4. Agriculture
5. Use for ecological conservation or environmental use
6. Electricity generation for public service;
7. Industrial

Source: Author’s own elaboration.

Recommendations for Policy Initiatives to Address Water Scarcity, Avoid Conflict, and Allow Economic Development in Mexico

Kloster and De Alba found that the major cause giving rise to social conflicts in connection with water in the metropolitan area of Mexico City were related to decisions regarding water use allocation (Kloster 2007). In fact, the number of conflicts caused by water use allocation issues jumped from 40 percent in 1993 to 53 percent in 2000. The next most common cause of social conflict was water infrastructure construction issues (Kloster 2007). Another study analyzed 3,800 national newspapers reports on social conflicts related to water from 1992 to 2002, finding that the northern area of the country had more reported conflicts, including the states of Nuevo Leon, Tamaulipas, Chihuahua, Coahuila, and Durango (Becerra Perez 2006). The major cause of conflict was water availability for personal use, followed by water contamination. In a water-scarce region and with a population potentially hostile to averting water for use in oil and gas production, the Mexican government would do well to consider the potential impact of allocating large volumes of water for hydraulic fracturing operations and design and implement laws and policies that will help to lessen tensions between stakeholders and avert conflict.

The introduction of the human right of access to water in Article 4 of the Constitution and the mandate in the reform decree to enact a new General Law on Water provide an opportunity to transition from a model of water administration based entirely or primarily in engineering as the tool to provide water and necessary human infrastructure, to a model based on a true, sustainable, development-based policy agenda that seeks to secure water

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renewability and availability in the long term. Further, operators who wish to avoid community opposition and unrest while seeking to exploit unconventional resources in northeastern Mexico will need to be creative and flexible in acquiring water resources for use in oil and gas operations. We offer the following recommendations to help the Mexican state navigate these potentially problematic regimes wisely:

1. **The Mexican Government must provide sufficient funding to regulatory agencies, including support for environmental protection and monitoring initiatives, as well as living wages for all regulators.**

The Mexican energy reform has brought with it some degree of reorganization of the government and a redistribution of responsibilities concerning natural resources. The reorganization and attendant shuffling of personnel have raised questions regarding oversight and monitoring capabilities. The newly formed Agencia Nacional de Seguridad Industrial y Protección al Ambiente del Sector Hidrocarburos, created for the purpose of regulating environmental issues related to energy projects, is still quite small relative to the broad responsibilities and powers it has been granted to monitor and enforce environmental laws in the energy sector. The Mexican government must provide sufficient funding for agency operations, including employee compensation at competitive and appropriate levels, in order to lessen any susceptibility to bribery or other compensation for lax oversight. Sufficient funding for agencies must include money to support monitoring activities and enforcement actions in front of knowledgeable and impartial authorities.

2. **Efforts should be made to strengthen the function of basin councils and other vehicles for local control and public participation related to water management; for its part, the Mexican federal government should focus on providing resources to enhance research and understanding of water resources and management processes.**

The potential conflict between the resource allocation priorities of the constitutional energy reform and those of human rights enshrined in the Mexican Constitution will require solutions beyond what engineering and technological advances can supply. As Mexico implements energy reform and adopts the water law amendments mandated by the new constitutional human rights provision, policymakers should draw upon global advances in water management theory and practice. Analysts and scholars examining Mexico’s water governance regime have recommended strengthening elements for a decentralized approach to water management in order to facilitate local decision-making based on good data, analysis, and decision-support (Scott and Bannister 2008; OECD 2012). The federal government, for its part, would do well to focus human and financial resources on facilitating the development of knowledge and understanding related to hydrology, environmental impacts, technology, decision processes, and other fields that will help policymakers and stakeholders make better use of existing resources.
3. The Mexican government should adopt regulations and policies to facilitate and incentivize use of sustainable sources of water and recycling and reuse of water by oil and gas operators.

Advances in technology are increasing the capacity for and reducing the cost of recycling water used or produced in oil and gas operations. A number of companies currently offer technologies that lessen the total amount of water required for hydraulic fracturing operations by recycling used water or replacing the water with other substances. In addition to allowing reuse and thus lessening the need to acquire new water for operations, recycling greater amounts of water also means that less contaminated water must be disposed of via injection wells or otherwise. Lower volumes of wastewater means reduced disposal costs, and less use of injection wells means less risk that injected materials will trigger seismic activity.

In part because of higher costs, commercializing and expanding the use of technological advancements like these often requires legal and institutional frameworks designed to support and incentivize their use and to guard against the risks of their use. Federal law in Mexico has not established any standards for reuse or recycling of water, thus presenting an area in which Mexico could implement innovative legal and policy solutions to help relieve pressure on water resources while facilitating economic activity and avoiding social conflict. On this point, Mexico’s neighbor to the north and fellow occupant of the Eagle Ford-Burro-Picacho-Burgos shale formation, which stretches from Texas into Mexico, may offer a number of instructive lessons.

Recent regulatory developments in Texas have provided structure and support for water recycling by oil and gas operators, in hopes of creating a flexible regime to facilitate the recycling and reuse of wellbore fluids (including produced formation water, completion/workover fluids, and fracture flow-back fluids). Legislation passed in 2013 provided clarity regarding who owns oil and gas waste material undergoing treatment for beneficial use and who is liable in tort for any consequences of the use of the material. That same year, the Texas Railroad Commission (RRC)—the state agency that regulates oil and gas activity—adopted rules to facilitate the recycling and subsequent reuse of water used or produced in operations. Unfortunately, data regarding exactly how much water is being conserved or reused during production is unavailable, as Texas law does not require operators to report that information. However, the RRC has stated that operators are reporting to the agency that the amendments have made recycling efforts more “economically viable” (Texas Railroad Commission 2014). Just over a year after the rule change, companies participating in a May 2014 RRC symposium reported recycling capacity of up to 1.5 million barrels of water per day. Companies claim to have recycled up to 50 million barrels of water since the industry began to increase recycling efforts in 2012 (Texas Railroad Commission 2014). Some are using recycled produced water to account for up to 100 percent of water needs in energy production.

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The new Texas regulations are intended to encourage conservation, recycling, and reuse of liquid and solid waste produced during oil and gas operations by granting operators space within which to innovate while setting clear environmental standards. Clear guidelines concerning who owns the waste (and is thus liable for problems) help companies to allocate and minimize risk. Recognizing that differences in legal systems and culture may affect the reception and implementation of new regulations, the Mexican government may be able to create a regulatory environment that lessens operator demand for fresh water and eases public opposition to hydraulic fracturing by crafting policies or rules to encourage operators to innovate and invest in technologies that will enhance alternative water sourcing. Some of the foreign companies bringing advanced technology to Mexico will have operated in the Texas shale and will be familiar with requirements or expectations regarding the recycling of water.

4. **The Mexican government should support efforts to better understand brackish resources in Mexico and facilitate the use of those resources for operations where feasible.**

Another option for shale operators in arid or water-scarce areas may be to utilize brackish water resources that are unsuitable for other uses. The decision to use brackish water in hydraulic fracturing operations depends on a number of factors, including the accessibility and quality of the brackish water. Traditionally, fracturing fluids have tended to perform best in fresh water, as the composition of the water used in the fluids can affect the wellbore, lessening the well’s productivity and causing potential environmental damage. However, the oil and gas industry has made advances in formulating chemical solutions to accommodate more saline waters for use in hydraulic fracturing. Improvements in the efficiency of chemical additives to fracturing fluids have allowed for use of more saline waters (Nicot and Scanlon 2012). Other factors in the decision to use brackish water include handling costs (transporting brackish water may be more expensive than fresh water), potential competition with other users, and concerns over the impact that mining brackish water resources may have on fresh water aquifers.

While decisions about whether to use brackish water in hydraulic fracturing operations are business decisions rather than matters of public policy, the Mexican government could enact measures to make the resource more attractive to operators. Increased understanding of brackish supplies—groundwater and surface water—can help companies understand their options, and good public policy can both remove impediments to and provide incentives for use of the resource. A full-scale analysis of Mexican environmental law is beyond the scope of this chapter, but laws that provide protections and safeguards for the environment surrounding the use of brackish resources, authorize and facilitate safe disposal of brine or other waste products, and—perhaps—reallocate concessions of fresh water based on use or limit water allocation for energy purposes to water drawn only from the same basin, coupled with other sustainability measures, could help move operators toward brackish water. And, if hydraulic fracturing operations in the northeastern part of the country are to experience strong long-term growth, funding for research to characterize and measure brackish resources could be a wise investment on the part of the Mexican government.
5. The Mexican government should support investment in non-water alternatives for hydraulic fracturing operations.

A final technological option for unconventional production is to conduct operations using carbon dioxide or liquefied petroleum gas (LPG) rather than water. Fracturing without water is not new but has never been widespread. Canadian Fracmaster, an oilfield services company based in Calgary, demonstrated in the 1990s that using CO₂ for fracturing operations could be more productive than using water, but the company went bankrupt before the research could mature. Companies and university researchers continue to work on the technology. Work by Ishida et al. (2012) has shown that the injection of supercritical CO₂ into granite blocks creates more extensive fracture patterns, theoretically performing better than conventional water-based fracturing techniques. Pei et al. (2015), studying the use of CO₂ in shale gas operations, concluded that a CO₂-based fluid offers a number of advantages, including reduced water consumption, averted reservoir damage, and expedited fracturing fluid flow-back. Fracturing with CO₂-based fluid also may offer possibilities for sequestering greenhouse gases. When a well is finished producing, it can be sealed up, leaving the CO₂ underground, which may reduce the amount of CO₂ being emitted into the atmosphere. In 2014, GE announced a $10 billion research effort, in partnership with Norway’s Statoil ASA, to investigate the application of CO₂—in a chilled state known as “super-critical fluid, which is neither a liquid nor a solid—for use in place of water to carry proppants used to create and maintain fissures in the formation. GE admits that widespread waterless fracturing using CO₂ is some distance away, but ultimately the hope is to be able to use the technology to fracture a well and then collect it at the wellhead for repeated reuse.

Issues slowing the development and use of CO₂ for operations include higher costs and difficulties in transporting the gas to areas that lack pipeline infrastructure. Unfortunately, the cost of CO₂ and methane (CH₄) are key factors in determining the profitability of enhanced gas recovery processes, with the cost of procuring CO₂ the biggest expense (Pei et al. 2015). Thus, the technology may only be viable if natural gas prices are higher or if CO₂ prices decrease (Pei et al. 2015). Another challenge to using CO₂ for fracturing operations is transporting CO₂, a compressible gas, in large quantities for use in wells that may be located far from pipelines. CO₂ operations are currently used in places like Wyoming, which already has CO₂ pipeline infrastructure (Bullis 2013). For places like Mexico that do not already possess the necessary infrastructure, the enactment and implementation of public policies to support the technologies would be crucial.
Conclusion

The energy reform in Mexico, following closely on the heels of the adoption of access to water as a human right, has created a situation in which water resource allocation—already a tense subject in the country—may become a source of conflict and social tension. Expanding nonconventional oil and gas operations via the use of hydraulic fracturing methods—a goal of the 2013-2014 constitutional energy reform—will require vast supplies of water, which may cause conflict between the water allocation priorities inherent in the human right guaranteeing access to water and the preferential status bestowed on energy production by the energy reforms. These competing legal priorities, in conjunction with increased water scarcity due to drought and increasing demand due to population and economic growth, create a potentially difficult situation for Mexico.

The mandate to enact a new General Law on Water that accompanied the adoption of the new human right provision provides an opportunity to transition from a model of water administration based entirely or primarily in engineering as the tool to provide water and necessary human infrastructure, to a model based on a true, sustainable, development-based policy agenda that seeks to secure water renewability and availability in the long term. As the Mexican government oversees the energy reform, it must consider how best to prioritize water use in accordance with the law and allocate supplies thoughtfully. Improving public participation processes and facilitating use of alternative supplies via advances in technology are important steps in lessening or averting conflict over water supplies in the country.
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