

ENVIRONMENTAL POLICY IN MEXICO

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Economía, Organización y Ciencias Sociales

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Abstract

Environmental policy in Mexico is a story of a developing nation struggling to care for its environmental endowment in the face of oppressive global pressures and limited domestic resources. A review of policy and legislative events from the 1990s shows us that the past generation has seen a profusion of formal proclamations and legislative initiatives aimed at enshrining in formal terms Mexico's commitment to the conservation of its own vulnerable waterways, forest lands, and marshes. However, as a systematic review of the country's 32 entities shows us, there remains a lack of robust activity at the state level, and formal declarations are rarely followed up with bureaucratic undertakings that would result in the erection of offices, institutions, architectures and practical compliance mechanisms that might discourage wasteful or slothful individuals and businesses from pursuing their reckless course. This is surely attributable, at least partly, to the country's lack of material resources, but it also shows that other concerns – such as concerns about – sometimes get in the way. Some fledgling efforts have resulted in positive outcomes in the past generation, but Mexican officials need to coordinate more, need to create specialized bureaucratic architectures that privilege enforcement and compliance, and need to recognize the strong link between environmental protection and healthful human growth and development. If they can do these things, then a happy ending can be written to a story that has seen some dark chapters.

Key words: architecture; biospheres; conservation; enforcement; environmental law; environmental proprietorship; pollution.

Resumen

La política ambiental en México es la historia de un país en desarrollo que lucha por su dotación ambiental frente a las presiones globales opresivas y los limitados recursos internos. Una revisión de los acontecimientos políticos y legislativos de los años noventa nos muestra que la generación pasada ha visto una profusión de proclamas formales e iniciativas legislativas encaminadas a consagrar formalmente el compromiso de México con la conservación de sus propias vías de agua, bosques y pantanos vulnerables. Sin embargo, como lo muestra una revisión sistemática de las 32 entidades del país, sigue habiendo una falta de actividad robusta a nivel estatal, y las declaraciones formales rara vez son seguidas por compromisos burocráticos que resultarían en la construcción de oficinas, instituciones, arquitecturas y mecanismos prácticos de cumplimiento que podrían disuadir a las personas y negocios indeseables o perezosos de seguir su curso imprudente. Esto es seguramente atribuible, al menos en parte, a la falta de recursos materiales del país, pero también demuestra que otras preocupaciones -como las preocupaciones sobre negocios o esfuerzos comerciales- a veces se interponen en el camino. Algunos esfuerzos incipientes han dado como resultado resultados positivos en la generación pasada, pero los funcionarios mexicanos necesitan coordinar más, necesitan crear arquitecturas burocráticas especializadas que privilegien la aplicación y el cumplimiento y necesitan reconocer el fuerte vínculo entre la protección ambiental y el crecimiento y desarrollo humanos saludables. Si pueden hacer estas cosas, entonces un final feliz se puede escribir en una historia que ha visto algunos capítulos oscuros.

Palabras clave: arquitectura; biosferas; conservación; aplicación; ley del medio ambiente; propiedad ambiental; contaminación.

Introduction

As previous research has shown, almost to a regrettable extent, environmental policy in Mexico has lagged the country's efforts in other areas – such as determined actions aimed at bolstering its fledgling manufacturing and business sectors. As time and space allow, this book is an inquisition into environmental policy in Mexico and the strengths and weaknesses that lie therein. It is also, by turns, a sharp critique of the extant scholarly literature, insofar as there does appear to be a lack of cogent summations of what Mexico can do to make its internal environmental policies more effective.

Public administration has been an ongoing concern within the nation because of the many generations of insidious corruption, sloth and even outright incompetence occasionally manifested by public officials. It seems paramount that a closer inspection be undertaken of what the various Mexican state governments do (to the extent it can be divined) to manage and advance environmental policy in the country of Mexico. Specifically, what kind of government programs – at the national or federal level, and at the state level – exist, and what are the results of these programs, at least as far as we can bear witness to those results? Furthermore, in a closely related vein, what kind of public policies have been implemented as part of a broad effort to make environmental policy more efficacious in Mexico? These are very important questions which desperately need to be asked insofar as Mexico undeniably has a problem with its environmental situation, and progressive and constructive measures are needed to stop the relentless despoilment and abuse of the nation's vulnerable waterways, arable land, and forest areas. A close, scholarly investigation into the domestic environmental architecture can go a very long way towards preparing Mexico for a better future.

To start, environmental issues are at the forefront of Mexico's internal challenges. While human development problems and widespread poverty warrant deserved attention, environmental deficits should be of priority to everyone. Not least of all, as discussed in another book by this author, Mexico grapples with a serious water deficit problem that is perhaps most conspicuously seen in its teeming urban centers (Herrera, 2017; Mexico News Daily, 2017). Furthermore, the nation – as even casual observers can attest – is plagued by air pollution, and by the massive crowding of its most populous urban areas (Gale Student Resources, 2009). Air pollution is most surely a pressing concern because of the extreme population density that

afflicts the nation and the corresponding risk of air-borne maladies and noxious particles. That such a scourge is an issue in Mexico can be attributed to many factors – a laggard political class, poor policy-making and poor enforcement, the absence of a robust environmental movement that can spur policy changes – but one of the most prominent (and underappreciated) is that the green industry has historically been small in Mexico (thus making it a modest part of the national economy) and therefore has struggled to establish itself as a substantial lobby within the corridors of power (Mumme & Lybecker, 2002). A waxing green lobby, coupled with a more robust civil society, may be just what is needed to put environmental issues on the table when Mexican political elites and policy makers have their attention focused elsewhere. That it is taken so very long for such a combination to even seem credibly possible sheds light on the might and potency of the business and neo-liberal sensibilities that have cut down Mexican environmental policy in the past.

Yet, as with so many of the narratives that swirl around Mexico, even the environmental one cannot be reduced to a simplistic tale of a developing nation that is plagued by many of the same environmental issues – water shortages, air pollution, general despoilment – that similarly impact other nations around the globe just like it. Of especial note, Mexico has, since the late 1990s, established itself as a surprising international leader in orchestrating an improved Green Capacity and Green Economy. To be specific, Mexico has worked hard to bring its environmental policies and practices in line with the United States and Canada; there still appears to be some distance to go as far as actual performance, but Mexico's formal commitment to environmental protection can no longer be said to lag far behind its more affluent northern trade partners. As well, former United Nations Deputy Secretary-General, Achim Steiner, once described Mexico as being one of the international leaders within the developing world vis-a-vis bringing attention to environmental concerns (Healy, VanNinjatten, & Lopez-Vallejo, 2014). Despite this, though, the country continues to be noted most for its heavy dependence on fossil fuels (though it certainly has company in this respect), for its ongoing struggle to prevent land depredation, and for its air pollution struggles within its urban centers (Healy, VanNinjatten, & Lopez-Vallejo, 2014). The nation of Mexico has made impressive strides, at least in terms of announcing its fidelity to the cause of environmentalism, but actual achievements remain modest when weighed against the promises and proclamations.

Given what has been described above, a review of environmental policy in Mexico must be a sober one that acknowledges the promises and aspirations for the future, but which also considers the substantive needs and innovations that are still required if any of these promises are to be truly met. It appears that the recent history of environmental policy in Mexico is one of slowly creating a cultural sensibility that validates and privileges environmental action and conservation; the next step is to be daring enough to make sweeping and comprehensive changes that will consolidate Mexico's fledgling position as an international leader in environmental protectionism. The literature review to come does suggest that some of the vital foundational pieces are now being put into place to make this a reality. It shall also reveal that Mexico can take practical measures to make the near future better than the present.

1. Methodology

The methodology of this booklet coheres around a systematic and wide-ranging literature review that explores peer-reviewed materials, government documents (to the extent such are present in the canon), media reports, and any extant online materials from think tanks or from independent experts. Taken as a collective, these various sources will be used to construct a detailed overview of Mexican environmental policy that explores its recent evolution, its perceived strengths, and some of its notable weaknesses. Although the methodology is not expressly organized in case study format, various examples of some of the more striking or salient features of Mexican environmental policy can be found by looking at policy occurrences in various Mexican states; it is from these vignettes or small case studies that we can see the weaknesses endemic to state responses vis-a-vis the environment, while we can also bear witness to how Mexican federated states can assume leadership roles when the federal government is dilatory or laggard. In total, the literature review will be animated by a concerted effort to draw together the literature in such a way as to paint a coherent and in-depth portrait of Mexican environmental policy that underscores why it has not always achieved enduring success, and why there seems a marked discrepancy between the elevated rhetoric and the actual results.

2. A Look Back: The Emergence of Modern Mexican Environmental Policy: the groundwork of the 1990s

Environmental policy in Mexico has a rather tragic history that shows the struggles of a developing nation that lacks the NGO constellation, regulatory apparatus, and political will (chiefly because of the imperatives of economic growth) to protect its natural endowments as it should. For example, the years from 1985 to 1999 saw a steady increase in the degradation of the natural environment even in the face of burgeoning national wealth and steadily climbing standards of living. According to data from a 1999 Mexican government report entitled, *Sistema de Cuentas Económicas y Ecológicas de Mexico*, rural soil erosion from 1985 onward climbed 89 percent; municipal solid waste climbed by 108 percent; water pollution grew by 29 percent; and urban air pollution grew by another 97 percent. Similarly, the report estimated that the economic costs of environmental degradation between the years 1985 to 1999 averaged 10 percent of GDP per annum – a massive amount considering that the annual rise in economic growth rose only 2.6 percent per annum during the same period (Gallagher, 2004). Mexico's environmental efforts during the 1990s do not appear to have been the sort that elevated the country out of the muck and mire of perpetual despoilment and misuse. Indeed, there is nothing to suggest that they did anything to even curb the relentless growth of soil erosion, the spread of solid waste (albeit this latter phenomenon is a rather difficult challenge to confront when a population is steadily growing), and the spread of water and air pollution.

The deepening problems above represent the sad outcome of deficits and institutional shortcomings that have plagued Mexico for a period far longer than the one illustrated above. Chiefly, it is reported by Gallagher (2004) that the country's lack of institutional capacity makes regulatory oversight of the environment exceptionally difficult, particularly considering dynamic environmental growth and the substantial economic transformations that have succeeded in largely reshaping the Mexican economy over the last two generations. Thus, even as Mexico has established environmental laws and institutions in the past 30 years, these brave proclamations of environmental stewardship have occurred alongside declining plant-level environmental inspections. To this must be added the fact that real spending on environmental stewardship and regulation has declined markedly since the middle-1990s. In fact, by 1998, Mexico's spending on environmental protection was only about one-third the average spending found in countries (Gallagher, 2004; OECD, 1998). With the imperatives and dictates

of neoliberalism and globalization gaining traction and might, concerns such as the environment – or, presumably, social spending – became less important and, indeed, became little more than afterthoughts. The 1990s, far from being wholly a time of dynamic growth for Mexican industries, may also be described as the dirty 1990s – a period in which the country mortgaged its environmental assets and well-being for a chance to be wealthier than it had ever been previously.

In summing up the 1990s – and, indeed, the years that followed them – it may be said that government proclamations on environmental reform were often of great sound and fury, but signified nothing. For example, the General Law of Ecological Balance and Environmental Protection (LGEEPA) was strengthened in December of 1996 with major amendments aimed at bolstering environmental regulatory reform. These amendments included the following: the institution of integrated permitting; increasing the economic efficiency of environmental regulation through streamlining and reinvigorated best practices; simplifying administrative procedures; bolstering enforcement procedures; extending mechanisms aimed at improving compliance; advancing decentralization and devolution; guaranteeing the right to know about infelicitous environmental problems or breaches; and enhancing public participation (OECD, n.d.). The fact, however, that these measures coincided with a period wherein plant inspections declined and environmental despoilment climbed (Gallagher, 2004), suggests that brave talk has not been met with effective implementation and administration. This does appear to be a defining feature of Mexican environmental policy over time.

Environmental policy implementation during the 1990s (and, again, for many years thereafter) may best be characterized as one of command and control – but with control being a somewhat fanciful descriptor because compliance was quite poor (OECD, n.d.). Although the exact date is not indicated in the above OECD report, it does appear as though Mexico's environmental enforcement agency (PROFEPA) made the determination – because of nettlesome and ongoing issues plaguing Mexican environmental regulation and oversight during the 1990s - to supplement voluntary compliance with enhanced efforts to enforce regulations and permits in a more uniform manner; inspections of enterprises and facilities was also ostensibly increased. In the realm of standard setting, an older approach favoring industry-specific effluent and emissions limits was ultimately pushed aside by one predicated upon the use and “assimilative capacity” of the receiving environment. Thus, it seems 44 older waste water standards were replaced by three standards that set limits predicated upon the downstream use of

the receiving water body. Finally, the newly erected Pollutant Release and Transfer Register and the System of Indicators of Environmental Law Compliance, made emission and compliance data publicly available for the first time and was evidently aimed at making the public both more aware – and more capable of ensuring its own compliance and the compliance of others (OECD, n.d.).

Even if not altogether successful, the 1990s was a time of Mexico at least entering the vanguard of Latin American nations vis-a-vis formally establishing itself as a coherent and rational supporter of the proposition that environmental protection deserved formal recognition. Hence, 1993 saw the country issue Seven Official Mexican Standards to regulate ambient air quality for a host of airborne particles. The years of 1993, 1994, 1995, 1996, 1997 and 1999 also witnessed the promulgation of new Official Mexican Standards for different classes of petrol and diesel vehicles (OECD, 2003). Additionally, the 1990s (especially the years 1992 and thereafter), saw the erection and maturation of a National Air Management Framework that emphasized the use of air emission permits and comprehensive auditing. The latter practice, indeed, was deemed sufficiently rigorous that many industrial firms took it upon themselves to engage in voluntary self-auditing to both control the process somewhat more effectively, and in the hopes of receiving a Clean Industry Certificate that would illustrate the firm's successful achievement of numerous environmental performance requirements. It appears that self-auditing and the awarding of designations for successful integration and implementation of environmental measures was quite prolific and pronounced in the early 2000s (OECD, 2003). However, checked the outcomes, it would be unfair to say that Mexico in the 1990s did not at least make some substantive moves in trying to ensure environmental compliance and security. But, suffice it to say, these measures did not achieve the substantive gains so desperately needed (Gallagher, 2004).

3. Mexican Environmental Policy in the Present Day: A Look at the 32 Federated Entities

3.1 Aguascalientes

It is rather difficult to secure sweeping policy documents that might highlight how the State of Aguascalientes is formulating environmental policy for the challenges of the twenty-first century. What is known, indubitably, is that the City of Aguascalientes is deeply committed to better waste management (which ostensibly means an upgraded and extended sewage and treatment architecture), wants to champion biodiversity, and is seeking diversion and conservation frameworks and best practices apparently aimed at optimizing water use and the management of water and energy consumption (City of Aguascalientes, 2015). Thus, the urban setting suggests a state that is keenly aware that environmental protection is inextricably linked to state quality of life.

Other accrued evidence points to the State of Aguascalientes having a strong understanding of the value of waste management in combating despoilment and environmental decay. For example, Aguascalientes has excellent waste management and is ranked second among all federated Mexican states in terms of its treatment of the environment (OECD, 2015). This is manifest evidence of a state that is certainly wealthy by Mexican standards (OECD, 2015) and it shows that the state takes seriously its duty to bequeath to future generations a measure of biodiversity and eco-systemic stability. It also calls to mind The Law of Environmental Protection for Aguascalientes State.

Chiefly, the general decree makes plain the following items: the establishment and protection of ecological areas of state interest; that there be perpetual environmental auditing of industrial and engineering concerns; that sustainability in environmental growth emphasize the need to guard in perpetuity natural resources for future generations; and environmental assessments of all industrial and human activities for evidence of unsavory environmental impact. Furthermore, the decree holds that the pertinent regulatory and administrative bodies for safeguarding the environment of Aguascalientes be as follows: The Office of the State Governor; the Institute of the Environment of Aguascalientes State; and local Town Councils. The latter act as local vehicles for the facilitation of economic and policy instruments that achieve a balance between economic growth and

environmental conservation. Notably, the Town Councils work in tandem with the State Plan of Development and sectorial correspondent programs to protect both ecological stability and biodiversity when new industries or enterprises take hold (The Free and Sovereign State of Aguascalientes, n.d.). The fidelity of public and bureaucratic officials to the spirit of The Law of Environmental Protection for Aguascalientes State is surely a key reason for the state's relative success in environmental matters.

3.2 Baja California

In this Mexican state, 2008 appears to have been quite a consequential year in the formulation of state environmental policy. That year saw the establishment of a series of collaboration agreements between state functionaries and institutions and leading higher education institutions – three: El Colegio de la Frontera Norte, CICESE and UABC. The product was a series of long-term working groups, regionally based, that committed an analytical framework in which changes and adaptations (or programmatic innovations) would be proposed, benchmarks set in place, and government agents charged with caring for the natural environment would proceed to implement proper safeguards and protections in accord with the advice of leading national experts (Muñoz-Meléndez, 2015).

The architecture of the above-discussed framework can be described thusly: The Baja California Government acts as overall coordinator of interactions between state agencies, NGOs and academics (though it is unclear if an Office of General Coordination exists or not); directly below the state government is a technical secretariat that has direct interaction with the aforementioned elite institutions and their academicians; answering directly to, and interacting directly with, the aforementioned educational institutions are Expert Local Groups, while both the Technical Secretariat, the allied universities (as well as the Expert Local Groups) meet with External Advisors (which can be NGOs). Below these appear to exist sub-agencies and smaller offices that deal with a wide array of environmental matters: climate; public health; agricultural and livestock; water; marine resources; and energy (Muñoz-Meléndez, 2015). Baja thus appears to be in the vanguard of Mexican federated states in terms of offering a complex and sophisticated bureaucratic arrangement that facilitates environmental conservation and protection.

Yet, rather tragically, global success has not been achieved. Namely, the local reliance upon the maquiladora complex has meant that communities such as Colonia Chilpancingo, Colonia Murua, and Nueva Esperanza suffer from

severe air pollution, from over-congestion, from a lack of parkland, and from heavily-polluting industries (Environmental Health Coalition, 2011). Clearly, this is one state that will have to find a way to better balance the dictates of robust industrial growth with the ecological imperatives of the local region. It is an open question if it can achieve any such balance.

3.3 Baja California Sur

Baja California Sur has not shown itself efficacious at crafting a policy architecture – along with affiliated enforcement mechanisms – that protects and buttresses many of its most vulnerable species of wildlife. For instance, the fish populations of the Golfo de California have been depleted through persistent over-fishing. Similarly, turtle species and marine life have both been debilitated by aggressive industrial-scale fishing activities. Yet, lamentably, the state has been slow and dilatory in its response, sparking environmental groups around the globe to pressure the Mexican government to control fishing in the area (Nations Encyclopedia, n.d.). The Cabo Pulmo Reef has also been despoiled through aggressive over-fishing and this is a deeply discouraging development insofar as at least 800 types of marine wildlife make their home in the sprawling Cabo Pulmo network. What adds to the discomfiture is that several large tourism projects have been established in recent years that promise to add even more stress to the area. The government of the state of Baja California Sur has been largely silent in this matter, at least according to available accounts, though several communities and scientific organizations have publicly expressed their disapproval of the works (Zapato-Lillo, 2013).

Turning away from marine despoilment, one must look at the mangroves of the state as further evidence of how the state has failed to act and employed a passive and inefficacious environmental policy approach. Notably, mangrove restoration is an activity that first began in the middle 1990s after clear cutting had nearly destroyed the groves entirely. While the ensuing nurseries and planting campaigns have borne fruit, it is not clear from the scholarship that the state of Baja California Sur took a lead role in this initiative (Spalding, Kainuma, & Collins, 2010). Be that as it may, the lack of conspicuous leadership when it comes to spearheading conservation efforts may be a partial blessing in the sense that Baja California Sur has steadily developed a vigorous associational culture with a growing number of NGOs and community groups dedicated to preserving sea turtles and other endangered wild life (Schneller & Baum, 2011). Still, state leadership in a host of areas would undeniably help, and that is where it appears Baja California Sur falls short – this despite the fact that the state was the host of the La Paz

talks (and eventual agreement) in 1983 on joint collaboration in environmental matters between US border states and Mexican border states, and this also despite the fact that the state appears to be formally involved in joint efforts aimed at protecting and conserving the ecosystem bestriding both the US and Mexican borders (Muñoz-Meléndez, Quintero-Núñez, & Pumfrey, 2012). It is not felicitous to have a populous Mexican state be so imperfect in protecting its natural and ecological endowment, but it is a regrettable fact of life in Baja California Sur. As per *Temas Actuales* (n.d.), the state only has one stand-alone piece of legislation in place to preserve and secure its natural environment: The Ecological Equilibrium and Environmental Protection Law of Baja California Sur.

3.4 Campeche

Campeche is a very progressive Mexican state when it comes to climate change. As per the scholarly materials, each state in Mexico is obligated to complete a Climate Change Action Plan. In the case of Campeche, the action plan is essentially a product of the state working in tandem with the local university's Center of Ecology, Fisheries and Oceanography. The legal and policy-making architecture the state is focused upon crafting is predicated upon promoting environmental protection and conservation and preserving natural resources. Additionally, the State of Campeche is vigorously promoting public awareness to spark shareholder support. It is furthermore worthy of note that, since September of 1997, Campeche has had in place four natural areas designated for state protection; these large sectors of land comprise around 847,000 hectares. The State Ministry of Environment and Sustainability works to protect natural resources as delineated in Article 24 of the State Civil Service. The ministry includes five departments orientated towards securing and safeguarding the natural environment of Campeche: Environmental Protection; Natural Protected Areas; Ecological Culture, Flora and Fauna, and Inspection and Monitoring (perhaps the most critical department of all). Operating these departments in concert with one another, the State of Campeche has worked diligently to develop climate change adaptation plans in the protected areas that happen to coincide with ongoing restoration projects (Score, 2011). Campeche appears to be that rarest of things: a Mexican federated state that has a robust enforcement mechanism married to a strong relationship between the state and environmental scientists and academics. As well, the focus on drumming up public support and knowledge is a good indication of the state's resolve to create a multi-pronged, multidisciplinary, collaborative and systemic approach to battling environmental despoilment.

The World Bank (2013) has previously sounded that Campeche is vulnerable to global warming and should consider many policy initiatives that the state has been previously reluctant to implement. Such policies, it is contended, will guard the coast of Campeche from the ravages of higher water levels in the decades ahead. These initiatives include the following items: reforestation; relocation of vulnerable infrastructure; relocation of drinking water wells; closer monitoring of marine and beach wildlife; and an early alarm system (World Bank, 2013, second set of internal bullet-points). Overall, Campeche has undertaken an assertive and forward-looking approach, but the state can (as per trans-national observers such as the World Bank) plainly do more to guard against long-term threats to its biodiversity and vulnerable coastlines. It is fair to note, however, that Campeche has been legally responsive when it comes to environmental pollution and despoilment: in the late 1970s, national oil and gas firm, PEMEX, grossly polluted Campeche Sound. This unhappy incident sparked the development of a novel litigation process that eventually saw the establishment of subsidy compensations and damage bio-remediation actions geared towards preventing similar accidental and chronic oil spill events from occurring again (Soto, Botello, Licea-Durán, Lizárraga-Partida, & Yáñez-Arancibia, 2014). Campeche State cannot take credit for spearheading such efforts – it appears as though social and conservation groups led the legal effort against PEMEX at the time (Soto et al., 2014) – but the state certainly seems at the center of a broad movement to ensure preventative best practices and damage bio-remediation activities are the forefront.

The last matter to be discussed vis-a-vis Campeche is its actual legal architecture for protecting the natural environment. Here, the state does seem to be flagging because it only has the Ecological Equilibrium and Environmental Protection Law of the State of Campeche (Temas Actuales, n.d.). A state that has scarred and previously soiled coastlines, and that seemingly is in pursuit of a comprehensive, multidisciplinary approach to environmental protection, should offer a more detailed and extensive roster of stand-alone legislation that specifically addresses air, water and soil pollution – as well as the possibility of oil spills along Campeche's rolling coastlines.

3.5 Chiapas

Chiapas is a state that contains roughly 30 percent of Mexico's freshwater supplies. But it is a state that has been battered by deforestation and by poor agribusiness practices. Fortunately, NGOs such as Conservation International

have taken a leading role in collaborating with local agribusiness operators, municipalities and the federal government to produce a catalog of best practices and a reporting mechanism for the appropriate use of arable land and other naturally-occurring resources (Conservation International, 2017). The Conservation International website, however, makes no mention of the role played by the government of the State of Chiapas in advancing cross-disciplinary and multidisciplinary efforts to protect the local indigenous environment. The state is most likely involved in some capacity, but it does seem curious that local municipalities and agribusiness proprietors are the ones named as being in the vanguard of the concerted effort to protect Chiapas from further depredation.

If nothing else, the state seems committed to allowing considerable space for NGOs to educate and shepherd public responses to environmental phenomena and trends. In the peculiar case of Chiapas, Alianza Mexico REDD+ is one NGO that working industriously to bring environmental and climate change education to the rural and indigenous peoples of the State of Chiapas (Rainforest Alliance, 2014). Another prominent NGO that seems to take a great deal of pressure from the state administration is Friends of the Earth, Mexico. This entity works principally with rural, indigenous and peasant populations in Chiapas and provides training and feedback into agro-ecological practices, into the matter of food sovereignty, into water and energy conservation, climate change phenomena, the imperative of forestry plantations, biodiversity, the concept of ecological debt, and how local and regional coalitions can come together to safeguard arable land and the natural world (Friends of the Earth, Mexico, 2017). NGOs surely figure prominently – or at least in some fashion – in many other Mexican federal states, but the literature on Chiapas seems to especially emphasize the role that these entities play in local conservation. This is both a good thing (it shows, at the least, a robust civil society) and a bad thing: where is the State of Chiapas in assuming a leadership role, and is the state simply derogating or eschewing its responsibilities so that others must bear the burden? Certainly, the state has faltered in the recent past, with Chiapas cancelling a controversial forest protection plan in 2013 that failed to address the primary causes of deforestation and which was regrettably linked to California's extant cap-and-trade program through a complicated carbon offset scheme that ultimately proved unwieldy and impractical (Friends of the Earth, 2013). In fairness, the tense political atmosphere in Chiapas has made it very difficult for the state to pursue the reforestation and conservation objectives it has long articulated. Forestry policy in Chiapas has also been thwarted by the desperate plight (and obstinacy) of many of the loggers involved and the presence of formidable informal local power structures that make rigorous

enforcement quite difficult (Diez, 2006). Given the tense political context, maybe it is not so surprising that the state has been willing to give way to aggressive NGOs in environmental issues.

3.6 Chihuahua

Chihuahua has had, since at least 1998, a state law that emphasizes sanctions and regulations guarding against air pollution occasioned by fixed facilities and motor vehicles. Licensing requirements are in place for manufacturing and industrial concerns, and it appears as though Chihuahua's state law closely follows the national Environmental Law and the Official Mexican Standards (Emerson, Angulo, Shaver, & Rincón, 2000). So far, Chihuahua seems to have much in common with the environmental regulatory framework one finds in Aguascalientes (The Free and Sovereign State of Aguascalientes, n.d.). Yet, unfortunately, even the most well-intentioned efforts in Chihuahua may come to naught.

Specifically, the region has been wracked with devastating, long-lasting droughts and is described as extraordinarily arid and losing greenland at an alarming rate (Tegel, 2012). To this unhealthy morass must be added the state's poor record on human development, its heavy reliance on the maquiladoras that dot its landscape, and rampant urban growth that has not been met with an appropriate bevy of social services that might afford proper sanitation and housing for its teeming masses (OECD, 2012). As a formal matter, Chihuahua's environmental policy is forward-looking; practically, it lacks a great deal because industrial concerns and heavy manufacturing clearly have a seat at the table ahead of ecological preoccupations or issues.

3.7 Coahuila

Arguably the most notable feature of Coahuila's environmental policy architecture is its member status as part of the US-Mexico Border 2020 Environmental Program. Specifically, this is a sweeping partnership between the US EPA, Mexico's SEMARNAT, the ten border states in the two countries, and US border tribes. The partnership or collaboration is rationalized into four regional workgroups which each have three sub-regional task forces. Coahuila belongs in the Texas-Tamaulipas-Nuevo Leon-Coahuila Regional Workgroup (Texas Commission on Environmental Quality, 2017). Immersion in such a workgroup framework has numerous benefits – access to complementary expertise and resources, access to logistical support, access to human resources, as needed – but it also has some drawbacks in terms of the state's capacity to act independently on matters of environmental

degradation and preservation given the close working ties between the various actors and state governments. In a closely related vein, US leadership will often be predominant. For example, methane drainage and recovery efforts at the Conchas Mine Complex in Coahuila, Mexico, appear to be led by the US Environmental Agency, and by the Coalbed Methane Outreach Program – which are not Mexican entities, suffice it to say (United States Environmental Protection Agency, 2015). Coahuila may find, if it has not already, that its efforts at independent environmental policy development and implementation are more likely to be doomed to failure than to success – and very much for political reasons.

In the case of Coahuila, it seems as though the state's most consequential agency when it comes to environmental issues is the Secretariat of the Environment. Housed within the Secretariat of the Environment is the Office of the Director of Conservation, and there are ostensibly close ties between the Secretariat and the Attorney General of the State (TCEQ, n.d.). Coahuila's environmental policy architecture conspicuously coheres around its membership in the US-Mexico Border Program, and this seems to manifest itself when one considers documents such as the one above, where Coahuila's leading bureaucrats and political elites essentially take their cues from the disposition and inertia of the larger body. This might explain why Coahuila has only two stand-alone pieces of legislation dealing with environmental concerns: The Ecological Conservation and Environmental Protection Law of the State of Coahuila de Zaragoza, and the Law on the Prevention and Integrated Management of Wastes (Temas Actuales, n.d.). There does not appear to be any discrete, stand-alone legislation pertaining to water, soil, and air pollution and management. Coahuila seems to be a state which has been blessed to associate itself with an interlocking and complementary border group that allows it entree to the resources of other states within and without Mexico. At the same time, as one member of a larger group that does include powerful and populous US states, it is a real matter of concern to what extent Coahuila is able to get its priorities met.

3.8 Colima

Contrary to many Mexican states, Colima does seem to have found success in protecting biodiversity and its fragile indigenous ecosystems from modern-day depredation. For example, in 2003 Colima received a federal grant establishing a system requiring industries to track pollutants – a vital step forward for the state. Likewise, the state went to some length to create the Sierra de Manantlan Biosphere Reserve – a huge reserve that straddles the border with Jalisco. It is stated that more than 2700 species of plants –

nearly half of which are native to Mexico – are protected there. About one-fourth of Mexico's species of mammals and one-third of its bird species find habitat within the reserve. Colima, to its great credit, is one of the most protected areas in North America for biodiversity (Nations Encyclopedia, 2010).

On balance, Colima appears to be one state that, whatever else its failings in the areas of social development and security, has done a credible job of safeguarding its indigenous environment through the efforts undertaken above. A review of the literature does not indicate that the state grapples with any more serious issues vis-a-vis air or water pollution than most other Mexican states, though desertification and soil erosion (Tegel, 2012) do appear to be ongoing concerns. There is also a growing fear of polluted or despoiled water, though new wastewater plants have recently come into development in Colima (United States of America, Department of Commerce, 2016a), thus indicating the state is making this matter a priority.

3.9 Durango

In 2003, Durango began a program requiring industries to track pollutants they generate via manufacturing. Additionally, there is a forest preserve, called the La Michilia Biosphere Reserve, on the eastern side of the Sierra Madre Occidental (Nations Encyclopedia, 2007a). It also appears as though new highways and major developments in Durango are the subject of significant environmental assessment efforts. Specifically, it seems as though environmental impact statements for proposed projects are integrated into the environmental impact procedure of the National Ecology Institute – which is a decentralized body of the Ministry of the Environment, Natural Resources, and Fisheries – and fall under the auspices of the Federal Highways Bureau of the Ministry of Communications and Transportation (Pisanty-Levy, n.d.). Thus, any new manufacturing concerns or endeavors are carefully vetted, but it would seem that the vetting process is something conducted (or at least spearheaded) by the federal government and not by the State of Durango. It is not stated in the literature, but the lack of state presence in these environmental assessments is likely because of limited human and material resources. Nonetheless, if there is a way for the state to develop the capacity to execute such assessments itself, it would most certainly be welcome.

Finally, while Durango does appear to slip under the radar somewhat, its willingness, and ability, to ensure pollutants are tracked, coupled with its large biosphere preserve and EIA activities (even if administered primarily by

the federal government) speak to a firm commitment to protect the environment. The state also has a burgeoning silviculture and frequently works with US-based NGOs to build diversity and sustainability into its forest lands (Forest Stewards Guild, 2017). On balance, its environmental policy architecture suggests sensitivity and a pronounced concern for the future. For this, it should be commended.

3.10 Guanajuato

Guanajuato seems like many other Mexican states in that it resolutely proclaims its intentions to safeguard and protect its natural environs, but the practical application of these proclamations falls well short of original expectations. In the case of Guanajuato, it was not until 1996 that the state established an environmental regulatory institution capable of enforcing The General Law of Ecological Equilibrium and Environmental Protection: The State of Guanajuato Ecology Institute. Lamentably, this institute has been chronically undermanned and underfunded since its inception (Blackman & Sisto, 2005). Be that as it may, Guanajuato state has not stopped at the aforementioned measures: it also established, back in the 1990s, the State Water Commission of Guanajuato (in 1991) and the Environmental Attorney General's Office for the State of Guanajuato (back in 1996). Despite this, at least at the municipal level, it seems that the regulation of industrial effluents into the environment very much relies upon the self-monitoring of the various business enterprises (Blackman & Sisto, 2005). Environmental policy in Guanajuato would appear to have the bark of enforcement zeal, but lacks the appropriate teeth. This is borne out by the fact that effluent discharge remains a problem – for instance, in the large City of Leon, which has a substantial tannery industry – and numerous committees and working bodies have been struck over time that have singularly failed to resolve the issue (Blackman & Sisto, 2005).

3.11 Guerrero

Within the State of Guerrero, there is marked deterioration of the Tecomate Lagoon, with ecological succession and salinity instability (Villeras-Salinas, Violante-González, García-Castro, & Alonzo-Guzmán, 2016). The available research does not indicate a direct link between this state of affairs and pollution, but it is manifest that the state has done a poor job of protecting its lagoon system. Similarly, despite so many forest land acres falling under state control, there is a long history of deforestation and poor forest land management within Guerrero State (Merino, 2000). Any legislative efforts are thus hamstrung by the poor administration and regulatory oversight that

seems to afflict Guerrero. As a matter of course, while it would seem that all Mexican states are subject to The General Law of Ecological Equilibrium and Environmental Protection, as well as to the country's Environmental Quality Standards, the reality in Guerrero State is that accompanying or ancillary environmental laws have largely been non-existent, and enforcement – of both state and federal laws - has been exceptionally lax. This state of affairs precipitated a massive deforestation during the 1990s, and has also been blamed for widespread water shortages (Estévez, 2008). Guerrero State is thus a Mexican state has shown itself to have a parlous environmental policy framework that simply does not work as it should.

3.12 Hidalgo

Within Hidalgo, there appear to be two predominant laws: The Ecological Technical Norm Establishing Maximum Permissible Limits for Gaseous Emissions by Automotive Vehicles Using Gasoline & LPG as Fuel; and the Environmental Protection Law of the State of Hidalgo (Temas Actuales, n.d.). The latter law actually dates all the way back to 1991, and establishes environmental standards for industrial concerns, emphasizes the state's focus on protecting water, air and terrestrial resources, and lays down the expectation that a close schedule of auditing and inspections will greet businesses in the state (Government of the State of Guerrero, 2002). On the surface, having two such significant pieces of legislation appear a vital step forward, though there does appear to be a comparative lack of ancillary or auxiliary laws and pieces of legislation emanating from this state – which is a characteristic which may be found in many Mexican federated states (Temas Actuales, n.d.). In any event, the current policy architecture has not been overly efficacious: the state has a serious air pollution problem – particularly courtesy air-borne pollutants emanating from Mexico City (Tovalin et al., 2010) – and it is also wracked by high levels of arsenic in its waterways (Ravenscroft, Brammer, & Richards, 2011). The laws in place appear insufficient to address the medley of problems confronting the state in the realm of pollution and despoilment, and this should be cause for unrest. As well, enforcement appears to be perfunctory, at best.

3.13 Jalisco

Jalisco seemingly wrestles unhappily with significant effluent discharge into its surface lakes and streams and rivers. Although industrial effluent is most often cited in Mexico as a primary reason for this, the truth is that it appears effluent from residential areas is a major issue (Greenberg, Shear, de Anda Sanchez, & Ortiz-Jiménez, 2008). There are also ongoing challenges posed by

poor soil quality (International Business Publications, 2009) and by fears of pervasive air pollution (Ramírez-Sánchez & García-Guadalupe, 2012). In fairness, however, Jalisco has become the site for significant soil remediation projects in recent years (International Business Publications, 2009). Still, this is a state that does have many of the environmental and ecological issues that bedevil other jurisdictions in Mexico.

In terms of how it is combating the challenges faced, Jalisco's regulatory framework and legislative architecture is worthy of some note. Echoing what one finds in other federated states within Mexico, Jalisco has its own Environmental Protection Law of the State of Jalisco. It also has The Law on Integrated Management of Wastes as part of its environmental portfolio (Temas Actuales, n.d.). But Temas Actuales does not list any specific water usage or water conservation law for the state, and neither does it list a specific law pertaining to air pollution. Presumably, given the lack of scholarly material regarding this matter, the state's Environmental Protection Law has codicils and sections outlining how to protect these two natural resources. Be that as it may, the lack of stand-alone state legislation in areas that are of grave environmental concern suggests that compliance and enforcement are generally lacking in Jalisco when it comes to (at a minimum) air and water pollution.

3.14 Mexico State

As is the general case for Mexican states, the State of Mexico oversees vehicle inspections and maintenance (primarily for emissions standards), regulates the zoning of land, operates an air monitoring system, delineates emergency planning when environmental conditions are sufficiently problematic to warrant the handle of “emergency”, and oversees the responsible extension and organization of the public transit system. It does appear as though Mexico City has a Metropolitan Environmental Commission (CAM) that moderates interactions between federal agencies and bureaucracies and local agencies and bureaucracies; state-owned firms and businesses are also a part of the aforementioned commission. Overall, it seems as though the CAM functions to ensure comity between what works best for the local situation, and what can be done feasibly at the state and federal level to make pollution issues – especially air pollution – more manageable (Materials Systems Laboratory, n.d.).

Since Mexico City is newly federated, the development of its legal framework is still in the embryonic stages. There is, it appears, a notable absence of local legislation geared towards industrial pollution regulation and vehicular

congestion; there is also no apparent framework for green policies or for the measured and sustainable use of public space (Rios, 2016). This is a rather curious statement to be made in light of the fact that *Temas Actuales* (n.d.) lists roughly five dozen environmental statutes and pieces of legislation for the Federal District, covering everything from waste management and the incineration of specific items, to air pollution, to tobacco control, to wastewater discharges, to waste packaging. Nonetheless, it might be more accurate to state that the State of Mexico is taxed by trying to create a viable and practical implementation and regulation architecture in light of the new designation of Mexico City as an autonomous entity and the fact that the city's pollution levels have reached their worst state in at least a generation (Rios, 2016). Overall, there are many statutes on the books, but the unwieldiness of having so many actors involved with CAM might well be a disruptive factor in effective management.

3.15 Michoacán

Michoacán is another Mexican state that does seem to have concerns about environmental despoilment. For example, there have been public concerns expressed about water pollution in Zirahuén Lake within the State of Michoacán (Armendáriz Arnez & Martínez Villalba, 2016). The flooded grassland for which Michoacán is famous has been preserved largely intact – though the literature noting this fact does not indicate precisely what, if any, legislative statutes have made this possible – but there has been considerable deforestation of the surrounding forest land (World Wildlife Fund, 2017). It does appear as though the state has put economic concerns ahead of environmental ones insofar as the state's massive and overweening avocado orchards have been a direct cause of enormous deforestation across Michoacán (Associated Press, 2016). All in all, Michoacán does not seem to have an optimal architecture in place to ensure that deforestation and water pollution are mitigated to the fullest extent possible. This is quite unfortunate in light of the fact that Michoacán does have in place its own Ecological Equilibrium and Environmental Protection Law that appears to echo the standard-based expectations of more prominent federal statutes (*Temas Actuales*, n.d.). It may be put forth that the state finds itself in the same unhappy state as so many Mexican states: the formal will to orchestrate meaningful change is written in formal writing, but the actual bureaucratic and practical implementation is sorely lacking.

3.16 Morelos

Morelos is an often-overlooked state in Mexico, but it is nonetheless indicative of the measures and optimistic efforts of Mexican administrators, environmentalists, and lawmakers to protect the natural bounty bequeathed to the country and its inhabitants. To start with, designated Lagunas de Zempoala National Park is a good example of formal efforts to safeguard the state's invaluable volcanic crater lakes. Likewise, Cacahuamilpa National Park exists to protect dramatic natural caverns. All told, there are six national parks maintained within Morelos (Nations Encyclopedia, 2007b). This certainly speaks well of the local commitment to maintaining and safeguarding natural wonders, but it is sobering to discover that Morelos also has a serious arsenic problem inasmuch as elevated levels of arsenic exist in its groundwaters and aquifers (Murcott, 2012). In a similar vein, the state seemingly has an issue with high levels of air pollution (Mexico News Daily, 2016), and this grim fact may not be the worst of it: there is evidence, sadly, that high levels of lead have been located within the state, especially in smaller communities such as Alpuyeca (Farías et al., 2014). This all suggests that bureaucratic oversight is lacking, particularly when Morelos does have a general environment law and also a law regulating municipal and solid waste (Temas Actuales, n.d.). Perhaps further laws on specific matters of concern – such as air pollution from vehicular emissions – are needed, but such laws will have no appreciable impact without some kind of architecture for maintaining compliance and for creating deterrence.

3.17 Nayarit

Nayarit appears, on the surface, to be doing fairly well as an environmental bastion. The Riviera Nayarit, for example, has the following credits: The Clean Tourism Designation; EarthCheck Certifications among at least some of its resort sites; Certified Clean Beaches designations; Banderas Bay Tourism Services recently oversaw the restoration and preservation of Isla del Coral; and various tourism and resort enterprises within Nayarit have received international commendation for their work at protecting and preserving the natural environment (Jiménez, 2017). Admittedly, it is hard to see to what extent the state government has made all this possible, but it seems accurate and appropriate to note that Nayarit officials have, at the very least, not interfered with efforts to create a positive environmental legacy in the riviera. The state has also become noteworthy, albeit on a more modest scale, for its path-breaking efforts in the realm of e-waste management; to wit, the e-waste Selective Collection Program developed as a case study at the Autonomous University of Nayarit has attracted scholarly attention and

a measure of praise (Saldaña, Messina, Rodriguez-Lascano, García, M., & Ulloa, H., 2016). The positive details above, though, do suggest that it may well be private enterprise – not state leadership – driving Nayarit's intrepid efforts.

Namely, a close look at the available evidence indicates that Nayarit only has (at least when a cursory search is conducted) one piece of legislation pertaining to environmental protection: The State Ecological Equilibrium and Environmental Protection Law of the State of Nayarit (Temas Actuales, n.d.). Given this, it seems that Nayarit's environmental policy has been very much an architecture crafted by businesses and resort sites eager to maintain the goodwill of affluent foreign tourists. It also is fair to ask if Nayarit's efforts to protect the environment would be the same if the state was situated within the interior of the country and not a tourist hotspot?

3.18 Nuevo León

Although it seems smaller, decentralized entities do exist to manage environmental issues at the local level (a state of affairs that is far from unknown in the rest of Mexico), Nuevo Leon's chief tool (from a bureaucratic and regulatory perspective) is the Environmental and Natural Resource Protection Agency. Despite the presence of this organization, and its apparent willingness to work with US authorities and bodies in coming up with effective joint actions on environmental issues, Nuevo León has been troubled by high emissions of CO and PM from vehicles. Part of the reason why air pollution is such an issue in Nuevo Leon is that Nuevo Leon is part of a rather massive regional workgroup for environmental issues that includes Texas, Coahuila, Nuevo León, and Tamaulipas; getting all of these moving parts to work in careful synchronicity with one another is no easy task – even if, rather remarkably, it is stated that Mexican federal air quality standards have ostensibly not been broken by the members in question! (Muñoz-Meléndez et al., 2012).

In any case, Nuevo León does warrant some acclaim because, unlike a number of other Mexican federated states, it does have a range of statutes that pertain to protecting the environment from despoilment and harm. For instance, there is its Environment Law of the State of Nuevo Leon; this is accompanied by a small number of other statutes that regulate the implementation of the aforementioned law, deal with the regulation of potable water and sanitation, or deal with the erection of a decentralized public organ to handle the processing of solid wastes in the urban context (Temas Actuales, n.d.). In light of this, and because of the state's involvement

in a regional works group that does seemingly allow for the exchange of ideas and resources, Nuevo León appears to be in a better position than many less forward-thinking Mexican states.

3.19 Oaxaca

Oaxaca, like Nayarit, seems to have a strong track record on the environment. We learn, upon exploring the matter, that (at least as of 2011), the Minister of Tourism and Economic Development, José Zorrilla de San Martín Diego, emphasized in an interview that the state was committed to its indigenous biodiversity and vegetation zones. He also stressed the value of the Clean Beaches Committee and the state's embrace of an Adopt a Beach initiative aimed keeping the state's beaches clean and secure. That being duly noted, he confessed that more needed to be done vis-a-vis water monitoring programs, educating the public through information signs and environmental recommendations, and bolstering solid waste collection and management in the state's beaches. The gentleman in question also discussed local proposals to neutralize carbon emissions, and the ambitious goal of making it possible for a local tourism destination to become wholly carbon neutral (Huatulco Life, 2011). This seems in keeping with a broader state commitment to environmental protection: to give an example, 2002 witnessed eight communities in Oaxaca unveil local conservation efforts as part of a Community Protected Areas program that sought to preserve the Mexican dry forest on the Pacific coast and the Meso-American Pine Oak forest in Sierra Norte. The Lagunas de Chacahua National Park is also a protected zone within Oaxaca (Nations Encyclopedia, 2013). Rather intriguingly, Oaxaca has only the Ecological Equilibrium Law of the State of Oaxaca as its legislative guide (Temas Actuales, n.d.).

3.20 Puebla

Puebla appears to be a state that struggles to offer a clear and coherent plan for clean energy production and for urban mass transport. The state has not been able to establish a renewable energy infrastructure that weans it from fossil fuel use. In fairness, the past decade has seen Puebla make a concerted effort to boost its lighting energy efficiency, and has witnessed a turn towards solar-powered public lighting. The city of Puebla, furthermore, has an integrated recycling and reuse program for waste – though it seems it, and other state cities, lack anything close to a coherent plan for reducing vehicular congestion and the emissions it causes (Siemens, 2009). This is a curious and unfortunate state of affairs for Puebla, insofar as the state does

appear to have a number of appreciably law and comprehensive laws on the books that deal with sustainable development, eco-friendly urban development, and the integrated management of urban and industrial waste (Temas Actuales, n.d.). It becomes clear that Puebla is yet another state that offers many formal promises and guarantees, but lacks the forceful administration and bureaucratic expertise (and regulatory expertise) to make those promises real.

3.21 Querétaro

Within the State of Querétaro, the Sierra Gorda Biosphere Reserve is the most prominent example of conspicuous public efforts to preserve and protect the natural world. The reserve is nearly one million acres in size, and it is a home for various threatened species, including black bears and jaguars. There is also a bevy of other national parks in the state, such as Cerro de las Campanas and El Cimatarío (Nations Encyclopedia, 2009). On the other hand, it definitely does appear that the municipal government of Querétaro is much more focused upon robust business growth than eco-friendly sustainable development; in a 2015 release, government officials stressed making the municipality more globally competitive; environmental best practices and policies were not discussed directly (Calzada, Quizanos, & Aguirre, 2015). The state is clearly walking an uncomfortable line between caring for its natural environmental and ecological bounty, and ensuring that it can attract lucrative outside business interests that might be less committed to environmental best practices than the locals would like.

As far as laws are concerned, the policy approach of the state is ostensibly shaped by two large pieces of legislation: The Ecological Equilibrium and Environmental Protection Law of the State of Querétaro (as amended in 2000), and the Law on Prevention and Integrated Management of Wastes (Temas Actuales, n.d.). There do not appear to be any stand-alone pieces of state legislation pertaining to forest protection and management, water quality and preservation, or air pollution (Temas Actuales, n.d.). Querétaro is a state doing some things right, but evidently overlooking over regulatory and administrative activities that would serve it well.

3.22 Quintana Roo

Quintana Roo is a coastal state, and that means that tourism is a likely consideration in any efforts to conserve and protect the natural environment. Glancing at the available literature, it is soon clear that

Quintana Roo relies heavily upon a participatory coastal and marine management process or system that urges or encourages developers seeking to exploit the Quintana Roo coastal ecosystem to use best practices and sustainable practices. There are multiple levels of government involved in crafting policy and enforcement mechanisms in the area, but there are also (or have been in the past) a large number of public participatory bodies, as well (Bezaury et al., 1998). Although it has been a number of years, it is quite remarkable that, far back in the late 1990s, developers really did have considerable latitude because of the lack of enforcement mechanisms. This is striking because it shows that a long-standing internal culture exists that may prove extremely difficult to change. After all, formidable business enterprises that have long been accustomed to exercising their own discretion will be loath to give up that discretion even as environmental concerns deepen.

Additionally, Quintana Roo is notable for permitting its aboriginal and indigenous communities to serve as land stewards within its considerable arboreal holdings. These communities have established permanent zones of responsibility, have organized forest management authorities, have promoted community forest enterprises, and have worked diligently to reverse deforestation trends and to create sustainable forest management best practices (Nunez, 2009). At the same time, regrettably, Quintana Roo has ostensibly proved relatively inefficacious at weaning itself from the tourism sector and seems very much in the thrall of developers and business interests (Pelaez, 2011). As a result, these developers are hardly confronted with any state pressure (at least of an appreciable sort) to embrace sustainable practices; in short, if they do take positive measures to protect the local ecology, it most likely has little to do with any fears of state-driven punishment. If unfolding events in Cancún are any indication, the inability to compel sustainable best practices from business elites and developers means that reckless waste dumping and despoiling activities that harm local biodiversity will persist largely unabated (Pelaez, 2011). All in all, it may be argued that Quintana Roo is, in many respects, somewhat of a junior partner to well-heeled and formidable moneyed interests that can easily ensure that tourism dollars flow somewhere else. All of the policy papers, formal pieces of legislation, and codicils in the world are of no value if state officials are unprepared to marry words with deeds. This means, of course, that the state will have to find a way to diversify its economy so that it is less vulnerable to threats from various quarters.

3.23 San Luis Potosí

San Luis Potosí does appear to be one state that does create the avenue for cutting-edge facilities in the realm of resource management and treatment – at least when it comes to water. For instance, municipal wastewater treatment plants within the state have been recently upgraded, though it is not clear how much the state has driven this process and how much has been driven by the federal government (United States Of America, Department Of Commerce, 2016). Moving forward, the federal agency, CONAGUA, has overseen the construction of new potable plants within the state of San Luis Potosí, albeit this process seems to be part of a much larger, multi-state effort in which the potable plant facilities in numerous Mexican states are also being upgraded at a current cost of around US \$100 billion (United States of America, Department of Commerce, 2016b). These are positive developments, but the state still ranks in the bottom 20 percent of Mexican federated states for environmental protection and quality (OECD, 2017). The incongruity between the state's situation and internal efforts to address at least some of the local, indigenous environmental issues becomes starker when one contemplates that the Autonomous University of San Luis Potosí is a national leader in developing evidence-based intervention programs geared towards reducing local exposure to environmental contaminants (National Institute of Environmental Health Sciences, 2015). Moreover, the state does have a general Law of the Environment, as well as a promulgation pertaining to water regulation and use, a law to protect non-smokers, and a broad-based Health Law for inhabitants of the state (Temas Actuales, n.d.).

3.24 Sinaloa

Sinaloa is a federated state that does seem to do a comparatively good job of respecting the environment. Drip irrigation, coupled with no-till practices, are widely utilized in the agricultural sector. The state also has a best practices architecture in place for commercial crops across its environs. And it seems the state has worked productively with the federal government to create a GHG Emissions Inventory and to craft mitigation technologies for environmental conservation (CGSpace, n.d.). But the state does have a worrisome recent history of heavily using dangerous pesticides and toxins for agribusiness activities, and Sinaloa (though fairly wealthy by Mexican standards) seems to lack – as does so much of the rest of Mexico – adequate reporting and monitoring standards for pesticides and other chemicals (Arellano-Aguilar, Betancourt-Lozano, Aguilar-Zarate, & Ponce de Leon-Hill, 2017). The literature does not much deign to discuss air or water pollution in Sinaloa, but the discussion of toxic pesticides in the water is most definitely

indicative of the dangers such agribusiness products are perceived to pose to the well-being of Sinaloa's residents. Interestingly, Sinaloa has a General Law professing its fidelity to the principle of protecting the natural environment, but no state law expressly regulating and delimiting pesticide use (Temas Actuales, n.d.).

3.25 Sonora

In Sonora, as opposed to Sinaloa, the chief environmental threat appears to be air pollution. The city of Nogales, Sonora, is home to a Research and Planning Institute which takes a keen interest in air pollution and particulate contamination. And the city engaged upon a significant infrastructure modification in the 2000s that reduced the number of unpaved roads that were seen as partly responsible for unhealthy levels of air pollution across the state (Woodhouse, 2016). The state should also be warmly commended for its reforestation and revegetation initiatives – particularly around Nogales – and its close work with Mexico's National Forestry Commission in this regard. In a related vein, Nogales also has a vigorous recycling program at the municipal level, and complements this with school-based recycling initiatives (Monroy, 2006). From what may be gathered, the state is in the vanguard in terms of combating air pollution, but recent events have shown that it lacks the regulatory architecture to protect itself wholly from serious compromises of its water quality; in short, the Sonora River has been wracked by at least one major toxic spill in recent years that placed at least 800,000 inhabitants within Sonora at grave risk (Telesur TV, 2015). Sonora, as it turns out, does not have a multitude of state-level laws geared towards environmental protection. It has an Environment Provision for the state, and it has the Ecological Equilibrium and Environmental Protection Law of the State of Sonora (Temas Actuales, n.d.). But it has nothing specific orientated towards air, soil or water pollution. This might explain, in part, the aforementioned river spill, though it seems manifest that the state has made some progress in terms of combating air pollution and deforestation.

3.26 Tabasco

Tabasco is an oil-producing area of Mexico that has a grim history of major oil companies treating the indigenous environment with disdain. For instance, Mexico's national oil company, PEMEX, has sparked howls of outrage by declining to properly maintain its spiderweb of pipes and conveyance tools. Oil wells, pipelines, and separation stations dot the landscape of Tabasco. PEMEX also has a history of wanton corruption, and there is a sad tale to be told of Tabasco officials allowing PEMEX to get away

with environmental despoilment while also permitting the company to gain a seedy entree into the back corridors of the policy-making process (Town & Hanson, n.d.). Wetlands and mangroves have also been poorly maintained in Tabasco and have fallen into despair as a result (Stea, Bustillo, Davies, & Elguea, 2011). Air and water pollution cannot be discounted, either: within Tabasco, the main aquatic ecosystems are wastewater receptors that receive industrial and residential discharges. The Seco River, a major waterway in the State of Tabasco, is particularly noteworthy for having a high degree of physico-chemical and biological pollution (Ferrer-Sánchez et al., 2014). Although air pollution is less frequently discussed, scholarly studies in the past decade have emphasized the heavy loads of heavy metals in the Tabasco lowlands as the consequence of indiscriminate use of DDT and other agrochemicals in the past (Fiedler et al., 2009). To its credit, the state does have at least a handful of major legislative pieces offering formal protection to the environment, as well as a promulgation that delineates criminal sanctions for environmental despoilment and degradation (Temas Actuales, n.d.). But, as we can see, a legal architecture, and public proclamations from officials, do not lead to efficacious environmental policy if the enforcement apparatuses are not in place. The problems with the Seco River should make this abundantly clear.

3.27 Tamaulipas

As it pertains to environmental policies and coordinated efforts along the vast US-Mexico divide, Tamaulipas is part of a regional work group that is situated just below national coordinators, the United States's EPA and Mexico's SEMARNAT. It works with the constituent members of the regional work group (comprised of Mexican border states and the American states of Arizona, California and Texas) to craft harmonious policies and standards in areas like air, water, material management, emergency preparedness, and cooperative enforcement and compliance. Joint task forces charged with looking at different environmental items are put together by all contracting members of the regional work group, Tamaulipas included (United States Environmental Protection Agency, 2017). Thus, the state warrants some acclaim for identifying that environmental issues are quite often cross-border ones, and for working in tandem with other government jurisdictions to come up with a bi-national and multidisciplinary approach to fighting environmental degradation and contamination.

Further, the state should be commended for being among the early wave of Mexican states that undertook to craft legislation and promulgated laws that highlighted the state-wide commitment to fighting environmental

despoilment. The most prominent of these pieces of legislation are as follows: the 1991 Law of Ecological Equilibrium and Environmental Protection; the Public Service Law of Drinking Water, Sewage, Drainage, Treatment and Disposal of Treated Water (1992); the Agriculture and Forest Law (1994); The Law of Environmental Protection for Sustainable Development (2004); the Water Law (2006); and the Law of Sustainable Forest Development (2007). It also seems as though the state constituted the State Water Commission of Tamaulipas in 2006, and the Environmental Agency for Sustainable Development in 2008 (Castro-Ruiz & González-Ávila, 2012). Even with the presence of all of these laws – and multiple regulatory bodies and associated architectures – air pollution remains a serious concern (most especially in southern Tamaulipas) (Zumaya Escobedo, 2017), while bodies of water such as the Laguna del Carpintero in Tampico, Tamaulipas, have been degraded and debased by high concentrations of waste produced (in part) by human activity (Hernández-Sánchez, García-Navarro, Bautista-Vargas, Gómez-Carpizo, & Hernández-Martínez, 2015). It is an old refrain by now, but an esoteric medley of laws means nothing if the enforcement mechanism is not aggressive, comprehensive and generates significant penalties for those who act recklessly.

3.28 Tlaxcala

Here is found a state that, strikingly, has many of the debilities that make it so hard for a great many Mexican states to move efficaciously and assertively on the matter of environmental despoilment. To expand at some length, the state comprises one of the largest metropolitan zones in Mexico and is wracked by massive urban sprawl (far in excess of what municipal and local services can provide for), by poverty and a low-skill labour force, by a lack of responsive and capable metropolitan governance, and by an ecological footprint that local officials lack the resources (and evident wherewithal) to combat (OECD, 2013). Overall, the state seems to be mired in a position that entangles many Mexican states: there may be a formal commitment to resolving environmental problems, but the bureaucratic and administrative skills and resources are not present, and the governance structure does not allow for responsive administration at the local level. As a consequential side-note, Tlaxcala has only one piece of legislation shaping and guiding action in the realm of environmental policy: The Law of Ecology and Environmental Protection of the State of Tlaxcala (Temas Actuales, n.d.). Suffice it to say, it is not at all revelatory to discover that Tlaxcala has bacterial and biowaste pollution in surface waterways such as the Atoyac River (Rodríguez-Tapia & Morales-Novelo, 2017). The truth of the matter is that Tlaxcala is not possessed of the tools it needs to safeguard its natural ecology. Unless these

changes, the state's chances of evading further deforestation, despoilment and degradation remain poor.

3.29 Veracruz

Veracruz is aptly described as a state that has marked income inequalities and a teeming indigenous population that is especially vulnerable to environmental problems. The state appears to lack close collaboration with leading tertiary educational institutions vis-a-vis crafting coherent environmental policy, and it seems to be laggard in addressing troubling concerns about biodiversity within the state's environs (OECD, 2016).

Another thing that must be brought to the attention of readers is that anthropogenic debris is a growing problem in Veracruz along its marine waterways and in its surface waters. The states do have established protected areas for the local ecology, but it does not have established marine protected areas. Similarly, because of the reliance of the state upon foreign tourists, it is probably not a surprise to uncover that plastic and synthetic waste along the state's tourist-thronged beaches is a major problem for which the state has not had a suitable answer for some time (Rupe, 2014). The one plus that may be underlined is that Veracruz does have at least six pieces of legislation regulating and moderating interactions with the natural world – among them being extant laws delineating the proper use and treatment of water, and optimal waste management and disposition of bio-waste (Temas Actuales, n.d.). Veracruz is a state that should be seen as better equipped than most to thwart the onslaught of environmental degradation, but a lack of coordination (at least with environmental experts and academicians who might have bright new ideas for resolving some ongoing problems) and heavy reliance upon tourism hamstringing efforts that might bear fruit.

3.30 Yucatán

The State of Yucatan has only two standing pieces of legislation that oversee interactions with the natural world: the first of these is the Environment Provisions of the State Constitution of Yucatan; the second is the Environmental Protection Law of the State of Yucatan (Temas Actuales, n.d.). There are no stand-alone pieces of legislation that regulate water use, emissions into the air, or effluent that might come into contact with soil or surface water. And the absence of a stand-alone government decree or law addressing deforestation and human interaction with the state's dwindling forest reserves is most distressing in light of the fact that, as of the start of

this decade, roughly thirty percent of the country's forest loss is occurring in the Yucatan (Friedman, 2010). State environmental policy is alarmingly deficient in this area and the Yucatan must aggressively overcome the shortfalls vis-a-vis how it protects its verdant forest land from loggers, from polluters, and from reckless tourists. Another nettlesome concern is the management of the marine resources of the state.

It is stated that Yucatan has a problem with water management and with making available data pertaining to ground water that might shape local and state-wide policies dedicated to preserving and properly treating water resources. The idea of working groups between various stake holders still appears relatively rudimentary and it has only been very recently that efforts have been undertaken to craft large, multidisciplinary research groups that can come up with sustainable solutions for the water shortage and water management concerns that trouble Yucatan (The IUCN Water Knowledge Platform, n.d.). Creating a practical infrastructure for governance and regulation – and discipline – can surely be made far easier if research groups and interdisciplinary collaborative efforts are undertaken to bring many different actors and complementary talents together under one umbrella with the Yucatan's ecological well-being as the overarching goal.

On the positive side, the state does have two biosphere reserves that are nestled comfortably within the Yucatan Peninsula: The Ria Celestun and the Ria Lagartos. There are six local village located within the spacious reserves, and they appear to adhere (albeit imperfectly) to the conservation principles that are supposed to inform and shape human behavior in the above-cited biospheres (Doyon & Sabinot, 2014). The key point here is that responsibility for the biosphere's long-term viability and health has very much been delegated to the local communities – which is something that should be pursued in other areas with more zeal. If the Yucatan wants to protect its natural world more effectively, it should create a sweeping multi-level administrative structure that brings local villages and urban centers into the fold – but with the proviso that they will be watched and evaluated for their actions. A global approach such as this one within the boundaries of the Yucatan could do so much to spare the state its current deforestation and water management problems.

3.31 Zacatecas

Within Zacatecas, advances in automatic irrigation systems and gravitational tank technologies have bolstered irrigation efficiencies while also cutting into energy consumption costs (Ghosh & Desai, 2006). In that sense, there is evidence that Zacatecas policy-making and programmatic efforts have left space for innovation and for technology transfer within the state. On the other hand, the state has 34 aquifers, with 15 of these considered heavily over-exploited. Additionally, environmental management systems (EMS) are not widely known and utilized within the agribusiness sector (Padilla-Bernal, Lara-Herrera, Vélez, Reyes, & González, 2017). Such a congregation of facts leads us to the finding that Zacatecas must clearly do more to inculcate conservationist ideals and principles into agribusiness operators and must do more to safeguard underground aquifers. In the case of the latter, water reclamation and recycling – and diversion – practices and techniques should be made a priority of state policy-makers.

Another serious issue is that contamination – especially mercury contamination – has not been effectively tackled by state authorities. According to one source, the El Pedernalillo Basin has been the repository of massive amounts of mercury over the generations courtesy stream flow and deposition (Stoleson, Felger, Ceballos, Raish, Wilson, & Búrquez, 2005). Why more effort has not been undertaken to divert contaminated streams away from the basin is a mystery, but it may be linked to the fact that the state simply lacks the resources to do what is necessary to prevent such mercury accretions from occurring. In any event, between mercury contamination and over-stressed aquifers, it is manifest that Zacatecas is falling short of where it must be – in a practical sense – if it wishes to provide first-world water services for its inhabitants.

One area where Zacatecas is making progress, however, is in the realm of air pollution. Historically, small-scale brick kiln firms were a serious source of air despoilment. However, recent years have borne witness to the exploration of new policies that mandate retrofitting, the use of different fuels, forced relocation, and mandated propane use as ways of cutting down on the unsavory emissions associated with these sites (Blackman, 2006). These are positive measures, to be sure, but even if air pollution has been mitigated somewhat in Zacatecas, it is hard to see how the state can escape the global air quality problem that afflicts Mexico as a whole. Cross-state and multidisciplinary efforts and collaborations must take place so that collective action can be taken. After all, the forced relocation and mandated retrofitting

of noxious pollutants will be of little impact if polluters can simply set up shop in an adjacent state.

Overall, Zacatecas is doing a decent job in indecent circumstances. Nonetheless, the cities of Zacatecas and Guadalupe retain their heavy reliance upon robust mining industries, and tailing dams in Barones and Pedernalillo show exceptionally high levels of contamination – contamination which has seeped into the local soil (Mireles et al., 2012). This is an area that betrays the state's inability to curb industrial effluent mismanagement and its inability to establish diversion infrastructures that can steer waste away from surface waters and arable soil. Despite this, the state has merely one promulgation dealing with environmental management and conservation: The Law for the Sustainability and Environmental Protection of the State of Zacatecas (Temas Actuales, n.d.). There is nothing explicit dealing with water contamination, soil contamination, or the infiltration of hard minerals and toxins into the aquifers and surface water repositories of the state. Once again, Zacatecas appears to be much like a host of other Mexican states that are similarly poorly-positioned.

4. Discussion

Environmental policy in Mexico is, as seen from the pages above, is hampered by problems that have troubled Mexico for generations. Enforcement mechanisms appear to be fragmentary and poorly resourced, and this is a practical debility that hurts almost all of Mexico's federated states. Absent an aggressive and wide-ranging mechanism for monitoring, reporting, and punishing non-compliant businesses, property owners and individuals, many Mexican states are really in a parlous condition vis-a-vis enforcing environmental conservation and regeneration. The lack of resources within the country explains why formal declarations of concern for the environment are not accompanied by substantive action.

Another issue is that the legislative corpus that oversees and largely regulates environmental policy in Mexico is somewhat thread-bare. *Temas Actuales* (n.d.) provides a worthy list of the stand-alone pieces of legislation found in each of Mexico's 32 entities. When deemed particularly interesting or worthwhile, this list has been referred to at various times within this text. What it seems to reveal is that some Mexican states – Mexico State, Puebla, and Tabasco, most of all – have a comparatively large number of stand-alone pieces of legislation on environmental concerns, while many others are considerably more thread-bare. Some states – such as Aguascalientes, Nayarit, Oaxaca, and Sinaloa – have a single Environmental Protection Law comprising the totality of their steering state legislation vis-a-vis environmental management and conservation (*Temas Actuales*, n.d.). It is tempting to say that more legislation equals more concern, but it is probably more accurate to suggest that more legislation generally means a wider disconnect between the lofty rhetoric and actual results on the ground. One good example of why a more extensive legislative corpus is needed is the State of Querétaro, which has a dearth of stand-alone laws in place for air, water and soil pollution and which appears to be in the thrall of business interests when crafting community strategies (Calzada et al., 2015). Without a doubt, a more extensive catalog of environmental laws would make businesses more amenable and ensure that businesses would be subject to the law – and not promulgators of the law.

In some Mexican states, concern for the urban ecology is paramount; concerns in this area commonly revolve around the management and disposition of biological waste. A good case in point is the City of Aguascalientes, in the State of Aguascalientes, which devotes much energy to waste management. The State of Aguascalientes, incidentally, seems to

have a coherent and well-established administrative apparatus in place for environmental issues, and this likely explains why it fares better than numerous other Mexican states in protecting its natural endowment (OECD, 2015; City of Aguascalientes, 2015). This is a useful model for other Mexican states: even if resources are meager, careful delegation and clear lines of jurisdiction can allow for existing resources to be utilized to the full. It also helps, as shown in the case of Baja California, if the state can tap into existing academic or think tank institutions and resources for advice and guidance on how to tackle specific biological, ecological and environmental challenges. It seems a small tragedy that more Mexican states have not moved decisively on this front and made academics, think tanks and regional universities indispensable parts of state policy on environmental topics.

In other cases, such as that of Baja California Sur, the state's weakness and dilatoriness is mitigated because of a robust civil society and an associational culture that overcomes the fact that the state's legislation is almost negligible in terms of laws, ordinances, and codicils that protect endangered environmental areas or ecologies (Schneller & Baum, 2011; *Temas Actuales*, n.d.). The ideal, it would seem, is for a Mexican state to marry the vigor and enthusiasm of native civil society with a well-delegated, focused and well-leveraged administrative apparatus. The State of Campeche, occasionally overlooked in discussions on how best to serve the ecological needs of Mexico, is not perfect - as highlighted by trans-national organizations like the World Bank (2013) – but it certainly proactive. If Mexican federated states wish to become more successful at protecting the natural world, they must all become at least as active and aggressive, while welcoming into the policy-making fold local NGOs and non-governmental actors. As discussed previously, the State of Chiapas has been exemplary in allowing NGOs the space they need to educate and guide – as well as obligate and compel – local businesses and citizens towards effective conservation efforts. Partnerships between Mexican states and domestic or international NGOs have long been lacking, but this is precisely from where a great deal of good can come.

The state of Chihuahua does not warrant a lot of attention at this juncture, but the state is probably one of the best examples extant of what happens when crushing climactic conditions exist; in such a scenario, even well-orchestrated plans can come to naught because of crippling droughts and aridity (Tegel, 2012). Still, this is even more reason why the state should consider seriously some sort of engagement with interested international bodies, or immerse itself in a larger corpus of states and jurisdictions that face similar issues and challenges. Being able to leverage the skills and capabilities of others is indispensable to tackling large problems, and that

seems to be where Chihuahua needs to go if it wants to diminish its ecological degradation. It can certainly do worse than to look to Coahuila, which has gained the blessings of membership in a larger associational body courtesy the partnership between US and Mexican states. The only setback is making sure that some allowance is made for Chihuahua so that it can get its own concerns addressed in a timely manner. Coahuila is in this very position, of course, and also needs to look at ways it can be heard through the din of numerous states and jurisdictions arguing about what needs to be done next.

Another thing which needs to be done is that all Mexican states need to take the decision to set aside generous parcels of vulnerable land as habitats that will be guarded and preserved by the state and the full powers reposed in its pertinent offices. There also needs to be a keener realization that social development and human development is inextricably intertwined with combating air and water pollution. If Mexican states want healthy, developmentally normal young people, then it might be a very good idea to couple health departments and environmental departments into associational entities that see virtue in meeting the needs of the latter so that the needs and requirements of the former are met. As an addendum buttressing the point above, Nuevo Leon is a Mexican state that has worked alongside US authorities in the past with some success (Muñoz-Meléndez et al., 2012). And, suffice it to say, a state such as Tamaulipas has been able to gain entree to vital expertise, strategic planning heuristics, and resources that might not be otherwise available to it through its membership in the US-Mexico Border Partnership (United States Environmental Protection Agency, 2017).

In a related vein, close tracking of pollutants through state-wide industrial and business registries is another way that Mexico can strengthen its environmental policies across the nation in all its states. To give this measure some added teeth, it seems advisable to implement across all of Mexico's states what one finds in the State of Guanajuato: An Environmental Attorney General's Office (Blackman & Sisto, 2005) that can focus solely upon penalizing those businesses and industries that decline to follow salutary best practices when emitting noxious fumes, or when exploiting the state's natural resources. A lack of enforcement apparatuses, and poor administration, have conspired to do harm to the best intentions of policy-makers in states such as Guerrero (Merino, 2000; Estévez, 2008), and there is also a need for more stand-alone pieces of legislation that will dedicate – even if the numbers are small – groups of state bureaucrats and functionaries to the task of resolving specific environmental problems (be they air, water or soil-related). Hidalgo and Jalisco, along with so many other states, are just

two cited examples of Mexican states that would be much better off dedicated teams of enforcement officers were in place to at least create the specter of possible sanction for businesses and individuals who decline to follow environmental best practices. In states like Michoacán, a state which faces serious water pollution (Armendáriz Arnez & Martínez Villalba, 2016) and deforestation (Associated Press, 2016) problems, sharper jurisdictional lines may be the answer to getting more out of the existing bureaucratic architecture so that those bureaucrats available can be more optimally focused on resolving specific concerns or issues. The small state of Morelos is still another state that can use a revised constitution of its existing bureaucratic and institutional tools in its struggle to spare its local environment from further ravages.

Last of all, it cannot be pushed aside lightly that Zacatecas is a good example of what can happen when a specific, narrow issue – in this case, air pollution occasioned by brick kiln firms – is confronted and focused upon until mitigated (Blackman, 2006). Once again, having teams of bureaucrats wholly dedicated to resolving narrowly defined issues (with clear jurisdictional lines in place) could be just the thing that many Mexican states need. Perhaps, instead of broad proclamations and universal decrees, Mexican states can achieve more by modestly resolving one small ecological issue at a time until the cumulative impact is felt everywhere.

Reviewing Mexican environmental policy in a state-by-state fashion manifests proof that environmental protection calls for the active involvement and engagement of many actors. For one thing, Oaxaca has been able to stop the loss of biodiversity in its coastal areas by permitting – and ostensibly encouraging – local communities to assume responsibility for natural land (like forest land) otherwise under threat (Nations Encyclopedia, 2013). Getting communities involved, as well as NGOs, is a great way of allowing many hands to take care of a few problems. Quintana Roo has done likewise, allowing indigenous communities to serve as stewards of local arboreal lands (Nunez, 2009) and this kind of proprietary involvement at the grassroots level might just be what is needed to regenerate Mexico's troubled ecology. This is definitely less costly than expenditures into water treatment facilities - as seen in San Luis Potosí (United States of America, Department of Commerce, 2016b) – or new conveyance architecture, and it can conceivably reduce reliance upon existing infrastructure by having local communities assume their share of their burden (through best practices) so that waste and effluents are minimized. Best practices, enforced at the local or communal level, would certainly aid a state such as Sinaloa inasmuch as this state has long struggled with the improper and promiscuous use of

dangerous pesticides on arable land (Arellano-Aguilar et al., 2017). The literature definitely points to the value of allowing locals to police their own, not least of all because of the reduced strain this creates for over-taxed state bureaucracies. Even local recycling programs can make a positive contribution to the overall state of things, as Sonora proves (Monroy, 2006). Getting communities involved is a most positive development, and local villages flourishing within dedicated biospheres in the Yucatan are proof that locals can become credible (if not altogether perfect) stewards of the native land with the right guidelines and regulatory mechanisms in place (Doyon & Sabinot, 2014). Making conservation and preservation something of a proprietary concern to one and all is a very good way for Mexican states to make headway on environmental issues. This is plainly one more thing that the literature tells us unambiguously.

5. Conclusions

After surveying the findings of the literature, there is little remaining doubt that Mexican environmental policy has much room for growth. Mexico grappled with environmental despoilment in the 1990s, and this was very much aggravated by the intense neo-liberalism of the age. A culture of non-compliance, already extant, became even more pronounced during this period and thereafter. What is rather ironic about this is that the Mexican state did establish itself during this decade as a serious and conscientious “eco-friendly” nation – or at least one can derive this from laws promulgated in the country during this period. But, it is one thing to embrace environmentalism in words, and it is quite another to create the enforcement architecture that will allow the state to make good on its many promises. As our review of the 32 federated entities appears to show, the practical sinews of an effective environmental policy have not been present in the Mexican context (with only a very few exceptions).

Manifestly, Mexican states need to look at partnerships with educational institutions, with other states, and even with trans-national bodies, NGOs or even other countries (like the United States). They must marshal resources, build synergies and complementarities, and they must create a comity in the procedural and administrative laws of various Mexican jurisdictions so that enforcement cannot occur over a wide expanse – and so that businesses cannot merely flee to an adjacent jurisdiction and expect relief from compliance guidelines. Local communities should also be pressed into service, and it seems evident that getting as many stakeholders and end users involved as possible will make it harder and harder for non-complying firms, proprietors and individuals to find interstitial space in which to flourish. The literature on Mexico keeps coming back to the same central theme: there is a formal will to achieve something substantive, but now the practical architecture needs to be constructed. The measures proposed above are ones that can allow Mexican states to overcome the finite resources they possess and the fiscal hurdles that come with trying to protect the natural environment.

To close, Mexican environmental policy since the 1990s has followed a pattern of formally enshrining environmental issues as national issues that warrant a concerted bureaucratic response; each of the country's 32 federated entities have followed this pathway and made proclamations, of one sort or another, declaring their fidelity to environmental protection. But, as much as these proclamations are desirable, they are not practicably

helpful if the apparatus is not put in place for ensuring compliance. Mexican states need to carefully consider the strategies outlined above, and they need to identify that subordinating environmental issues to business concerns is a recipe for future disaster. As one scholar reminds his audience, environmental security is inextricably linked to human security (O'Toole, 2017) and Mexico needs to do a more thorough job of making itself wholly secure.

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