



Environmental Responsibility in Mexico

Responsabilidad Ambiental en México

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ABSTRACT:

Environmental responsibility in Mexico is shown to be quite detailed and extensive. The country appears to have an effective legal architecture but lacks in terms of actual operational capacity. The ensuing paper captures the scope, duties, expectations and responsibilities of each level of government, and illustrates how infrastructural and material shortcomings appear to be the key reason for Mexico's unfulfilled promise as a country that might otherwise lead the way in global environmental responsibility and oversight.

Keywords: Environmental responsibility, Mexico, sustainability, environmental enforcement agencies

RESUMEN:

La responsabilidad ambiental en México se muestra bastante detallada y extensa. El país parece tener una arquitectura legal efectiva, pero carece de capacidad operativa real. El documento que sigue capta el alcance, los deberes, las expectativas y las responsabilidades de cada nivel de gobierno, e ilustra cómo las deficiencias infraestructurales y materiales parecen ser la razón clave de la promesa incumplida de México como un país que de otro modo podría liderar el camino en la responsabilidad y supervisión ambiental global.

Palabras clave: Responsabilidad ambiental, México, sustentabilidad, agencias de cumplimiento ambiental

1. Introduction

There can be no question that environmental responsibility is a very serious issue within the Mexican context. For this reason, the ensuing paper captures the scope, duties, expectations and responsibilities of each level of government, and illustrates how infrastructural and material shortcomings appear to be the key reason for Mexico's unfulfilled promise as a country that might otherwise lead the way in global environmental responsibility and oversight. To achieve this, the next several pages offer a systematic review of the literature examining not only who has jurisdiction in various areas, but how the policy and administrative architecture of Mexican society engenders some outcomes, while obviating the emergence of others. Through a comprehensive review of the extant peer-reviewed literature, it becomes possible to see why some trends – environmental despoilment, the mistreatment of waterways and aquifers, persistent pollution issues – continue to wrack the country even after decades of bold pronouncements that something better was in the offing. It also becomes clear that different groups and policy actors and political and administrative elites have somewhat different ideas with regard to what needs to be done, in what order, and to what extent. Mexico is not an easy country to govern, and environmental concerns call to mind all of the things that make politics in this turbulent land so challenging. As a matter of business administration, this paper is elementally about how the business of environmental governance can be advanced in a fashion that makes Mexico a regional – even a global – leader in the establishment of progressive and efficacious management and bureaucracy.

1.1. The situation of Mexico

Mexico does not fare well when compared to other nations. Using the Environmental Performance Index (EPI), it was found that European (and, especially, Northern European) nations fare the best: Finland, Iceland, Sweden, Denmark are at the very top, with other European states – such as Slovenia, Spain, Portugal, Estonia and France – coming in not far behind. These are the nations that not only overwhelmingly meet international environmental standards, but they are also the nations that appear to have the most comprehensive frameworks in place for identifying environmental duties and obligations, and for fulfilling the aforesaid environmental obligations to the fullest extent possible. Mexico is not bad, but ranks well behind Eastern and Western Europe, North America, and even behind South American countries such as Brazil and Argentina (Smith, 2017). Whether this is a reflection of a lack of will, or a lack of resources, is ultimately a matter this paper needs to resolve.

Environmental regulation in Mexico is a relatively recent phenomenon. The Federal Law of Environmental Protection was formulated in 1982. The federal law contained different sections or chapters dealing with air, soil, and water despoilment, and its erected penalties for violators; furthermore, the law created procedures and protocols for private citizens to file complaints. The years between 1982 and 1988 also saw the creation and evolution of the Ministry of Urban Development and Ecology (SEDUE) – the country's first cabinet-level ministry that had environmental protection as a key plank in its operational mission (Gallagher, 2004). The 1980s also witnessed, perhaps rather surprisingly given the comparative dearth of NGOs relative to many other nations (at least in the western world), the emergence of a fairly robust environmental network comprised of NGOs that worked in close tandem with SEDUE to combat industrial and private sector contamination and pollution (Umlas, 1996; Gallagher, 2004). There is very much a sense from the literature that Mexico's increasing commitment to environmental regulation and protection from 1988 onward was very much an outgrowth of the country's NAFTA negotiations with the United States (Díez, 2013).

In any case, in 1988, Mexico's environmental enforcement budget stood at US\$6.6 billion; by 1993, that figure was \$77 billion (Offshore International, Incorporated, 2019). Likewise, the number of environmental inspectors in the border area contiguous with the United States stood at a mere 50 in 1988; by the close of 1993, that figure had climbed to 200. Perhaps for the first time in its history, the end of the 1980s, and the early 1990s, saw Mexico closing or shuttering industrial facilities for environmental despoilment and degradation; specifically, the aforementioned period witnessed roughly 2000 facilities provisionally closed for non-compliance, while more than 100 facilities were closed permanently (Offshore International, Incorporated, 2019). Once again, it would certainly appear that Mexico's determination to bolster its environmental architecture and regulatory framework was a product of the structural reforms made imperative by the country's entry into the North American Free Trade Agreement and OECD during this period of time (Organization for Economic Co-operation and Development, n.d.).

The early 1990s also saw a dramatic reshaping of the domestic bureaucracy so that it could more fully protect the natural environment. In 1992, the Secretariat of Social Development (SEDESOL) was furnished with an environmental component or branch (United States Environmental Protection Agency, Office of General Counsel, 1993; Bonnis & Patrón Sarti, 1997). By 1993, it appears as though two autonomous agencies – the National Institute of Ecology (INE); and the Office of the Attorney General for Protection of the Environment (PFPA) – were at work within SEDESOL to advance the cause of environmental regulation and protection (United States Environmental Protection Agency, 1993; Williamson, 1994). So far as can be ascertained, the INE was further sub-divided at this time into the General Directorates of Ecological Planning; Research and Development; Natural Resources and Conservation; and Environmental Standards (United States Environmental Protection Agency, Office of General Counsel, 1993). It need hardly be said that the early 1990s marked a remarkable period of growth in the state administrative and bureaucratic apparatuses devoted to caring for the natural environment.

Today, Mexico has a wide array of regulatory authorities charged with overseeing the treatment of, and dispensation of, the natural environment. As per Creel, García-Cuéllar, Aiza and Enriquez (2019), the pertinent regulatory authorities are as ensues: 1) The Secretariat of the Environment and Natural Resources (SEMARNAT), which enacts and enforces environmental regulation at the federal level (Secretaría de Medio Ambiente y Recursos Naturales, 2019); 2) the National Water Commission (Comisión Nacional del Agua, 2019); 3) The Office of the Federal Prosecutor for Environmental Protection (PROFEPA), which serves as the enforcement arm of SEMARNAT and can carry out inspections, prosecute non-compliance, apply sanctions, enforce environmental laws and regulations, sanction firms and entities (and individuals) under the General Law on Climate Change, and oversee voluntary federal environmental audit programmes (Procuraduría Federal de Protección al Ambiente,

2019; Creel et al., 2019); 4) The National Commission for Natural Protected Areas (Comisión Nacional de Áreas Naturales Protegidas, 2019); 5) The Security, Energy and Environment Agency (ASEA), which overlooks industrial safety and environmental protection, as well as integrated waste management (especially of hydro-carbons) (Agencia de Seguridad, Energía y Ambiente, 2014); 6) and de-centralized administrative departments serving under the co-ordination of SEMARNAT – these encompass the Mexican Institute of Water Technology (Instituto Mexicano de Tecnología del Agua, 2019); the National Forestry Commission (The REDD Desk, 2019), the National Institute of Ecology and Climate Change (Green Growth Knowledge Platform, 2018), and the Climate Change Trust Fund (an entity tasked with financing activities and projects designed to address climate change across the breadth of Mexico) (Creel et al., 2019). It is a most extraordinary evolution, from the enabling legislation that first made possible the establishment of an environmental component of SEDESOL in 1992 (United States Environmental Protection Agency, Office of General Counsel, 1993), to the vast panoply of administrative and bureaucratic entities that oversee environmental responsibility and regulation in contemporary Mexico as of early 2019 (Creel et al., 2019). A great deal more on the national, state and municipal breakdown of environmental oversight and responsibility in Mexico will follow, but what has been disclosed above should clearly capture that Mexico is a country that does have an impressive roster of “alphabet agencies” devoted to the responsible and sustainable use of the country's natural resources.

2. Methodology

This paper is predicated upon a systematic literature review that focuses attention upon reviewing and synthesizing peer-reviewed source materials that examine the nature (and the background) of environmental regulation within Mexico. Much of the material will necessarily be drawn from the years 2000-2019, inclusive. However, critically acclaimed or well-received scholarship from before that period in time will certainly be considered for inclusion if it offers historical, schematic or epistemological insights or contributions not readily found anywhere else. Leading scholars or contributors in this field of study will certainly be given ample attention, and different perspectives and schools of thought will be consciously pursued. The sources which will inform this paper may be quantitative or qualitative – or they may be both – but they will analyze to what progress has been made in the discussion of the topic, and what prospects exist for meaningful advance in the future.

When assessing the materials for inclusion, materials were analyzed for quality of source materials consulted; the comprehensiveness of controls imposed upon variables; the depth and scope of the research subjects consulted; and the reproducibility and dependability of the study findings. Because of the limited space that a study such as this one offers, not every study can be explored exhaustively. But all will certainly be subjected to the criteria set forth above.

3. Results

Many are the laws that deal with environmental matters in the Mexican context. The most prominent one of all, of course, is the General Law on Ecological Equilibrium and Environmental Protection (LGEEPA) that establishes expectations and confers broad jurisdiction and power to all three levels of government in matters pertaining to the environment (Diario Oficial de la Federación, 2015). Some of the obligations and tasks assigned to each level of the government will be delineated later in this paper. But the key point to take away from any review of the LGEEPA is that it appears very much to be the ultimate document for establishing duties and rights and responsibilities for state actors; it is, to put the matter another way, akin to a constitutional document, but one that sets forth how environmental issues are to be addressed (in the main) within Mexico (Diario Oficial de la Federación, 2015).

Other prominent federal statutes and pieces of legislation also set out national guidelines (and federal prerogatives) for the protection of the environment and for the maintenance and continuation of sustainable practices. The ensuing list encompasses the most prominent: 1) the National Waters Law (Diario Oficial de la Federación, 2016); General Wildlife Law (Diario Oficial de la Federación, 2015); the 2003 General Law on the Prevention and Comprehensive Management of Waste (with clean-up and disposition tasks not specifically falling under the purview of the federal government being assigned to the state and municipal levels of government (Basurto & Soza, 2007); the 2014 Law of the National Agency of Industrial Security and Environmental Protection for the Hydrocarbon Sector (Ley de la Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector Hidrocarburos) (Diario Oficial de la Federación, 2014b); and the 2012 General Law on Climate Change (Averchenkova & Guzman Luna, 2018). These laws are essentially prescriptive templates for how the federal state – and those state and municipal governments subordinate to it – must address environmental issues and what responsibilities it is lawfully charged with satisfying. But the foregoing

list is far from exhaustive.

To explain, another conspicuous and important law is the Federal Law on Environmental Liability (Ley Federal de Responsabilidad Ambiental), that was first published on 7 July 2013, and which is most notable for establishing that there is a statutory limitation of 12 years (instead of five years) on actions precipitating environmental damages (Bustamante, 2016; Creel et al., 2019). A law of equivalent pre-eminence within the Mexican context is The Law of Dumping in Mexican Marine Areas (Ley de Vertimientos en las Zonas Marinas Mexicanas) which was promulgated in January of 2014 and brought into force on 16 July 2014 (Creel et al., 2019; Diario Oficial de la Federación, 2014a). This law – as of 2019 – is wholly concerned with environmental administrative errors and sets out explicit requirements for the acquisition of permits to dump specific substances into Mexican marine areas (Creel et al., 2019; Diario Oficial de la Federación, 2014a). When seeking to understand in full the scope and compass of Mexican environmental responsibility, one must look carefully at the federal laws that set forth how the state must comport itself when dealing with environmental issues. If these laws are lacking in any way or, much more likely, if they are sloppily administered or enforced, then “environmental responsibility” becomes a hoary cliché, at best.

One matter which must not be thrown to the margins without regard is Mexico's Official Norms (NOMs) which also serve the cause of environmental responsibility in the pan-Mexican context. Notably, NOMs are defined (briefly) as technical standards that are issued by administrative authorities which establish binding values, specifications, characteristics and standards applicable to any and all products, facilities, processes, activities, services, methods of production, or systems (Creel et al., 2019; Grajeda, 2019). On the particular matter of the environment, the Mexican Official Norms are not silent: they set forth maximum allowable pollutant amounts for air, soil, for hazardous waste effluent, for man-made industrial substances, and maximum allowable pollutant amounts for water; they also establish pollutant limits for endangered species (Creel et al., 2019). Another thing to be noted about NOMs is that, as much as they place a regulatory burden upon bureaucrats and regulatory bodies to ensure compliance, they also place a considerable burden and expectation upon private firms: firms can, of course, lessen their own likelihood of falling afoul of the law by embracing the voluntary category of standards known as the “Mexican Norms” which serve as useful criteria and benchmarks/guidelines on technical issues (Grajeda, 2019; Creel et al., 2019). The formal scope of Mexico's environmental laws, as has been hinted at above, is a lengthy one, and extends in all directions.

Creel et al., 2019 make it abundantly clear that there is a very sophisticated bureaucratic composition to environmental responsibility in Mexico. Before proceeding to review their findings, one must initially appreciate the entangling bureaucratic nightmare that is contemporary Mexico: the country has 31 states, as well as the federal district of Mexico State (Organization for Economic Co-operation and Development, 2019); it also has 2457 municipalities (Organization for Economic Co-operation and Development, 2019), and Mexico City alone has 16 administrative divisions or sub-units (Ezcurra, Mazari-Hiriart, Pisanty, & Aguilar, 2002). The Federal Congress has the capacity to legislate the establishment of the “concurrent authority” of the federal, state, and municipal governments – all of which, as it turns out, have statutory obligations to protect the environment, preserve and restore the ecological balance, and provide for the repair of environmental damage and compensation/restitution when wrongdoing occurs (Creel et al., 2019; Assetto, Hajba & Mumme, 2003). An initial cursory review of Mexican federal law, as delineated by Creel et al. (2019) does not make it plain at first glance what levels of government have control over what specific activities that fall under the purview of Mexican environmental statutes, but it is established that local authorities are charged with regulating the prevention of, and control of, environmental contamination generated by industrial stationary sources situated within their jurisdictions; indeed, it is established that they are also tasked with the responsibility of preventing (or at least regulating) effluents and contamination in mobile sources that are not expressly under federal jurisdiction (Creel et al., 2019). Ultimately, a fuller review of what tasks fall to each level of government will be furnished later in this paper when examining the General Law of Ecological Balance and Environmental Protection as it was penned back in 1988 (Diario Oficial de la Federación, 2015).

In any event, it is reported that regulations to enforce environmental laws are issued by the administrative agency that stands responsible for a specific sector (hazardous waste, water, air emissions, protected areas, et cetera) (Creel et al., 2019). It is also revealed by the literature that environmental regulations have been – and continue to be – issued in the various Mexican states and within specific municipalities (Creel et al., 2019; Gonzalez Márquez, 2017). One thing which is not immediately clear from Creel et al. (2019), is whether these local and state laws (but, especially, local laws) are merely supplementary, or whether they are discrete and distinct pieces of local legislation (with supreme standing under the law) that expressly deal with specific local conditions – though, hopefully, in a manner consistent with national or federal standards. While it certainly does appear as

though state and local laws are subordinate to federal law (and to federal standards and expectations), and while it also seems manifest that regulatory agencies operating at the local and municipal level must adhere to federal standards and statutes, Gonzalez Márquez (2017) indicates that the states are free to issue their own environmental laws, while municipalities are permitted to dictate local ordinances and regulations on environmental issues. Such matters will be discussed in somewhat greater detail a little later in this paper.

Moving along, Creel et al. (2019) do assert that state legislatures are permitted to regulate the environmental impact of activities that fall outside federal jurisdiction; indeed, the projects that are designated for state Environmental Impact Assessments (EIAs) are projects which almost invariably tend to be on a smaller scale – and which have not been reserved or designated for federal regulation (Creel et al., 2019; Palerm & Aceves, 2004). Activities or works that fall indubitably under federal jurisdiction – and which are thus subject to federal EIAs and to direct federal regulation – are those endeavors or exertions that a) have the potential to cause “grave” or possibly “irreparable” imbalance to the local or national ecology; b) have the ability to produce a harmful effect on public health or upon domestic ecosystems; and c) exceed the limits and conditions established in the laws that regulate/oversee the preservation of ecological equilibrium (Creel et al., 2019). Although it is not mentioned directly in the above source material, it is manifest that poor, or sloppy, EIAs can lead to the potential mis-classification of works or activities in various areas of the country that could, in the worst-case scenario, engender very real environmental damage that might otherwise have been fairly easily avoided. This is an always-present danger in a developing country with limited resources, but scholarship exploring the general competence of the Mexican bureaucracy vis-a-vis environmental regulation and responsibility seems to suggest that things have broadly improved since the establishment of the Federal Agency for the Protection of the Environment (PROFEPA) (Saragoza, Ambrosi de Haro, & Zárate, 2012).

As per Esparza Romero & Huerta Ruiz (2019), there are offices in charge of environmental protection at every level of government. At the federal level, the design of environmental policy and all accompanying instruments lies with the Ministry of Environment and Natural Resources (SEMARNAT); the Federal Attorney Office for Protection of Environment (PROFEPA) handles all monitoring, compliance, and sanctioning issues pertaining to environmental legislation and acts issued by SEMARNAT (Esparza Romero & Huerta Ruiz, 2019), though PROFEPA has long been hamstrung in the discharge of at least some of its duties by persistent staffing shortages (Carillo-Páez, 2018). Be that as it may, when reviewing Esparza Romero & Huerta Ruiz (2019) more closely, it seems that a state-level, and municipal-level, office – with a corresponding legal enforcement office – is the arrangement at the two subordinate levels of government, as well. And this brings us back to the matter, first discussed in the previous paragraph, about what each level of government is truly responsible for when ensuring that the environment (and attendant ecosystems) of Mexico remain viable and secure for future generations.

Under Article 5 of LGEEPA, there is clearly some overlap between some duties and those of the subordinate government, and there is also some imprecision with the language itself – what after all, to give but one example, constitutes a “highly risky” endeavor when the relevant Article 149 does not set forth a definition of such (Diario Oficial de la Federación, 2015) - but the general sense that one takes away from the catalog above is that the federal state (through the machinery of SEMARNAT and its auxiliaries) determines the national posture with regard to environmental protection and responsibility, and creates standards, expectations and obligations that must be recognized by those at the lower levels of governance.

Having exhausted our discussion of what the federal government's responsibilities – in the main – are vis-a-vis environmental responsibility, it seems useful to look at the responsibilities and duties of those governments that are immediately subordinate to it. The first of these, of course, are the governments of the various states. Lastly, one must turn to examine the duties and environmental responsibilities of the municipal governments. Examining the LGEEPA at length (Diario Oficial de la Federación, 2015). From all of this, the laws that define and bring into sharp relief obligations and environmental responsibilities for the three levels of government are such that – while exacting details are not provided in the LGEEPA – there should be ample guidance informing decisions at all levels with regard to protecting and sustaining the natural environment.

One possible reason why Mexico lags behind other nations in terms of ensuring appropriate and decorous treatment of, and accountability for, environmental issues is rooted in the fact that Municipal Mayors can only serve for three years as per the national constitution, and cannot be re-elected; some observers are of the view that this is a significant impairment to long-term municipal environmental programs and plans (Organization for Economic Co-operation and Development, 2013). Other critics are quick to charge, using some of PROFEPA's perceived shortcomings as an example, that there are insufficient human resources present to ensure that environmental regulation

and compliance are strictly maintained – most especially when it comes to the illicit trafficking of wildlife (Carillo-Páez, 2018). Problems such as these are also aggravated by the fact, most painfully witnessed in rushed or sloppy environmental impact assessments, or in the slipshod implementation of mitigation strategies, that Mexico has long grappled unhappily with poor implementation of environmental plans and proposals, with poor compliance control, and a curious lack of coordination among the various governmental agencies tasked with seeing such plans and projects through to completion (Tortajada, 2012).

As an entree, one can do worse than to consider the situation involving the nation's canal and distribution system, where years of bureaucratic neglect have left it over-extended and have made it a substantial net polluter of carbon dioxide (Explorando México, 2015). To draw expressly from an earlier paper penned by this author, there is persistent evidence of evermore noxious and contaminated air in the Mexico City Metropolitan Area (MCMA), as manifested by foliage, bark and xylem damage of *Abies Religiosa* within the basin of Mexico (Terrazas & Bernal-Salazar, 2002), and there is enduring evidence of air pollution in the forests surrounding Mexico City (Zambrano, Nash III, & Herrera-Campos, 2002). To add this troubling catalogue, there is evidence of high levels of oxidants in pines in Mexico City (Miller, de Bauer, & Hernández-Tejada, 2002), and this matter is made even more distressing when one considers the high nitrate levels in the drainage waters of the Mexico City Air Basin (Fenn, de Bauer, Zeller, Quevedo, Rodríguez, & Hernández-Tejada, 2002).

It is critical to emphasize that studies carried out at the start of this decade illuminate that the State of Aguascalientes has pervasively high levels of chronic kidney disease among its infant children – this is especially so in the struggling municipality of Calvillo – and the phenomenon seems linked to the state's incapacity to prevent large concentrations of xenobiotics, arsenic, fluorides and metals from despoiling the drinking water of Calvillo and surrounding environs (Arreola Mendoza et al., 2011).

Glancing at the state of Baja California, one soon apprehends that environmental compliance mechanisms appear constrained by the omnipresence of (and heavy state reliance upon) high-polluting manufacturing industries that make it rather nettlesome for the state to aggressively enforce pollution (and to perpetuate environmental responsibility) when those industries are the economic lifeblood of the region (Environmental Health Coalition, 2011). As per Muñoz-Meléndez (2015), Baja California does have a rational architecture in place to protect its water and air sector, one which features a Technical Secretariat that interacts with state institutions and Expert Local Groups in addition to state/federal universities and NGOs – and trans-national bodies; the state also has in place a medley of sub-agencies and smaller offices that deal with environmental issues and responsibilities in the realms of water and marine resources, climate and air pollution, and public health (Muñoz-Meléndez, 2015). Thus, the architecture is there, and the formal responsibilities are neatly delineated, but practical enforcement and compliance fall well short of the mark, as manifested by the state's ongoing struggle to reduce asthma-inducing air pollution (de la Fuente-Ruiz, Quintero-Nunez, Ahumada, & Garcia, 2009).

If one probes further, it is soon apparent that Mexico's problem lies not with a lack of formal responsibility vis-a-vis environmental issues, but with the absence of the necessary wealth that would facilitate and advance regulatory and operational compliance, and that would allow agencies and departments to carry out their remit thoroughly. For elaboration, states such as Baja California Sur are notorious for water conveyance leakage occasioned by an antiquated and over-burdened water distribution system (McEvoy, 2014). And Baja California Sur is especially rebuked (though chiefly, it seems, for reasons of financial shortfall) for embracing robust and sprawling real estate and tourist developments in its parlous and vulnerable marine and coastal areas (Zapato-Lillo, 2013). Next to this one must situate the state's large mining industry, which poses challenges and complications of its own with regard to air pollution, but which obviously faces no prospect of being shut down any time soon (Spalding, 2015).

Reviewing the situation in Mexico, it does not seem fair to argue that there is poor formal synchronicity between the various levels of government; as this paper has outlined at some length, there are laws, duties and responsibilities enshrined in the law for all three levels. The real challenge is that, grimly, practical or operational synchronicity is confounded by a sheer lack of resources. States such as Chiapas, Guerrero, Oaxaca, Tabasco and Veracruz are sufficiently impoverished that they cannot even furnish – at least according to one recent study – anywhere from one-quarter to one-third of their residents with a formal water conveyance architecture (Barraque, 2011). Formal writs may well be in place which task various state bodies with overseeing and protecting the natural environment, but the extant scholarship seems to be of the view that local agribusiness proprietors, NGOs, operators, and perhaps even the federal government, are all more engaged with combating pollution and effluent management than is the state of Chiapas (Conservation International, 2017; Rainforest Alliance, 2017).

3.1. Discussion

From the materials harvested above, it seems very evident that Mexico is confronted with a serious lack of synchronicity, by an apparent inability to craft effective and practicable measures for resolving issues at the local level, and by a failure to craft a regulatory regime that actually ensures compliance and effective functioning at the local and regional levels. This may all be more a result of the country's relatively limited resources than poor decision-making, but the responsibility of any government is finding ways to arrive at the best possible outcomes with the resources available. A case can be made that Mexico has faltered in this regard, and it has faltered because it has not found a way to redistribute existing resources – or to create new ones – that make first-world environmental regulation and oversight a reality.

What sort of model, therefore, can be created within the Mexican context that will allow Mexico to draw much nearer to its desired goals? It would seem that the Mexican Federal Government should allocate additional funds to parlous and impoverished states – a state such as Tlaxcala is one striking example of a state gravely limited in what it can actually do on the environmental front because of poverty and shrunken resources (Knoema, 2017) - so that they can ensure their state and local agents have the resources needed to fulfill the scope of their duties. And Mexico should aggressively seek out partnerships with NGOs and trans-national bodies whereby they can receive additional financial aid and expertise that might allay some of the burden presently shouldered by under-funded and under-staffed municipal and state agencies and offices. A fraternal, collaborative framework in which those with more give non-priority resources and wealth to those that have less (or to those whose needs have dramatically changed) seems the best way to achieve a model that can sustain and endure. It is known that the state of Zacatecas, dominated by mining interests, was able to mandate retrofitting, able to enforce compelled or mandatory relocation, and able to enforce measures that mitigated the emissions caused by brick kiln firms within the state (Blackman, 2006). The ability to actually enforce these measures (at least to some extent) made them more than empty threats (Blackman, 2006), and offer hope for other states in Mexico: if money and resources and people are distributed in the right fashion, then even moneyed and powerful interests can be convinced to acquiesce to environmental protection measures.

Moreover, Mexico can learn from the mistakes of states such as Yucatan and encourage – and subsidize – state-level multidisciplinary research groups that can offer varied and esoteric advice on such issues as (to give but one example) water management and water protection (Lopez Maldonado, 2016). And the Mexican state should use its comparative heft to encourage, subsidize and support state-level biosphere reserves that embrace and privilege conservation principles (Doyon & Sabinot, 2014). It may likewise be asserted that Mexico can work with states – even larger municipalities – to see to it that strong and robust collaborative relationships are established between learning and educational institutions and state/sub-state actors: the state of Veracruz, for instance, has suffered historically because of the lack of such partnerships or relationships (Organisation for Economic Co-operation and Development, 2016). And, once more using Veracruz as an example, the federal government can identify states which appear to have particularly wide divergences between their formal ordinances and laws, and the actual levels of despoilment and dumping that occur within their environs. Veracruz is very bad in this latter case (Rupe, 2014), and it might require customized and intensive attention from the federal government to ascertain why formal responsibility does not translate into actual, quantifiable and verifiable, gains or advances on the ground.

Lastly, remaining briefly with the state of Veracruz, this is a state that warrants some commendations because it has been a national leader in air quality monitoring and assessment networks that have called attention to air quality pollution and have led directly to air pollution mitigation (González Roca, Cervantes Pérez, & Baldasano Recio, 2016). Perhaps other Mexican states can, with federal aid and support, create customizable and scalable assessment and monitoring programs in environmental areas of particular importance, or develop preventative heuristics and practices that stop persistent issues from becoming debilitating ones. A team-based, collaborative and complementary relationship between and among Mexican states – facilitated by the Mexican government – could be profoundly effective at making formal environmental responsibility translate into real-world gains. Of course, all of this will require money, and that is where Mexico must seek innovative ways of directing discretionary funds toward environmental protection and away from items that serve more short-term interests.

4. Conclusions

The conclusions to be derived from this study seem clear enough. Mexico lacks a formidable architecture for the establishment of an efficacious environmental responsibility architecture. There is

an expansive legal architecture setting forth duties, responsibilities and expectations, and it exists for (and at) all levels of government, but the ability to actually turn environmental responsibility into stalwart environmental protection and maintenance is lacking. The reason for this seems linked to finite resources, and perhaps also to a marked inability to disposition available resources in a way that those states, regions and territories most at-risk are given the tools and monies they need to effect positive change. Environmental responsibility is sharply demarcated (for the most part) across Mexico, but the real gray area lies within the state's enforcement and regulatory channels and bodies and its accompanying funding mechanisms.

Because not all government records in Mexico are readily available to the public, there are legislative items, minutes, possibly codicils, and maybe even enabling legislation that have not found their way into this study. Furthermore, a review of this kind is rather enervated because of the absence of interviews with leading political figures, bureaucrats and academics who have a keen insight into why environmental responsibility in the Mexican context is so often fraught with complication and even rancor. Future studies will be greatly benefited by including questionnaires and surveys as a primary research component that will aid in gaining greater insight into how to make things better within Mexico.

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