



# Arizona-Sonora Environmental Strategic Plan 2017-2021

**PROJECTS FOR BUILDING THE ENVIRONMENT AND THE ECONOMY  
IN THE ARIZONA-SONORA BORDER REGION**

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## LETTER FROM AGENCY DIRECTORS



Dear Colleagues, Friends and Neighbors,

We present to you this first Arizona-Sonora Environmental Strategic Plan for 2017-2021. In June 2016, the Environment and Water Committee of the Arizona-Mexico Commission/Comisión Sonora-Arizona agreed to produce this plan in order to enhance synergies and maximize the effective use of resources. This plan is the latest effort in a long history of cross-border collaboration involving bilateral, federal, state and local agencies, as well as the private sector and non-governmental organizations in Arizona and Sonora.

In addition to the Arizona Department of Environmental Quality and the State of Sonora Ecology and Sustainable Development Commission, supporters and collaborators included the Arizona Game and Fish Department, State of Sonora Water Commission, Arizona Department of Water Resources, Border Environment Cooperation Commission, North American Development Bank, and the North American Research Partnership.

We look forward to working with additional partners from the non-governmental, academic, and private sectors as we move toward implementation of the plan to help us ensure progress.

Sincerely,

Misael Cabrera, P.E.  
Director of the Arizona Department  
of Environmental Quality

Ing. Luis Carlos Romo  
Executive Commissioner, State of  
Sonora Ecology and Sustainable  
Development Commission

## EXECUTIVE SUMMARY

Arizona and Sonora share a number of environmental challenges both along and across their 362-mile shared border. Water, air, solid waste, and wildlife issues do not end at political boundaries, meaning the two states' environmental, water, and wildlife agencies must work together as well as with their federal and bilateral agency counterparts to achieve lasting solutions in the region. The development of the Arizona-Sonora Environmental Strategic Plan emerged from a long history of cross-border collaboration involving bilateral, federal, state and local agencies as well as the private sector and non-governmental organizations in Arizona and Sonora.

In June 2016, in order to enhance synergies and maximize the effective use of resources, the Environment and Water Committee of the Arizona-Mexico Commission/Comisión Sonora Arizona agreed to produce the Arizona-Sonora Environmental Strategic Plan for 2017-2021.

The Arizona Department of Environmental Quality and the Commission for Ecology and Sustainable Development for the State of Sonora were named as the lead agencies, and the Border Environmental Cooperation Commission supported the coordination of the project. Additional state agencies collaborated on specific topics, including Sonora's State Water Commission, the Arizona Game and Fish Department and the

*The objective of the Arizona-Sonora Environmental Strategic Plan is to have one guiding plan for the Arizona-Sonora border region that the various organizations supporting binational collaboration can utilize to enhance synergies and maximize the effective use of resources.*

Arizona Department of Water Resources. Bilateral organizations such as the North American Development Bank and federal agencies such as Mexico's Secretariat for the Environment and Natural Resources and the U.S. Environmental Protection Agency were also consulted during the process.

In addition, it was envisioned that the plan would incorporate elements of the economy and community as these were priority areas for the two states' new administrations. To this end, the North American Research Partnership (NARP), an independent, non-profit research organization, was asked to provide research on economic competitiveness and the environment (in addition to organizing, editing and producing the plan itself).

This plan was developed through a series of conference calls, workshops and individual consultations. Two multi-agency workshops were held in Tucson (September 13-14) and Hermosillo (November 1) to discuss: a) the development and selection of key projects, b) criteria for considering these projects and c) their prioritization.

The plan features sections regarding background on Arizona-Sonora environmental issues and collaboration, economic competitiveness and the environment, strategic projects, additional projects, potential project funding



sources, and collaborating organizations.

The 15 strategic projects selected address a range of issues within the areas of water, air, waste management and wildlife. Fourteen additional projects were selected by the agencies as meriting consideration as time and resources allow and are also included as part of the plan itself.

A monitoring tool is also included with this plan. The tool will be used to track progress on

the implementation of these projects during the 2017-2021 period and will be made public.

A Memorandum of Understanding was developed and subsequently presented at the Comisión Sonora-Arizona/Arizona-Mexico Commission meeting in Hermosillo on December 1-2, 2016. The memorandum will serve as a formal framework for collaboration between the two state governments and for implementation of the strategic plan.

## STRATEGIC ARIZONA-SONORA ENVIRONMENTAL PROJECTS, 2017-2021

ADEQ/CEA Prioritization	WATER
1	Stormwater Control in Nogales, Sonora for the Protection of Binational Infrastructure and Public Health
2	Infrastructure for Metals and E. coli Attenuation in the San Pedro River
3	Implementation of Green Infrastructure in Nogales, Sonora for the Protection of Binational Stormwater Quality
4	Industrial Pretreatment Support in Nogales, Sonora for the Protection of Binational Water Quality
ADEQ/CEDES Prioritization	AIR
1	Installation and Operation of Air Quality Equipment in Sonora Border Communities Phase 1. Rehabilitation of current equipment. Phase 2. Acquisition of new equipment.
2	Ozone Monitoring Pilot Project in San Luis Río Colorado
3	Expansion of Air Quality Smartphone Application to Yuma
ADEQ/CEDES Prioritization	WASTE MANAGEMENT
1	Identification and Cleanup Prioritization of Waste-impacted Sites in Combination with a Solid Waste Management Education Campaign
2	Comprehensive Electronic Waste and Discarded Domestic Appliances Management Program
3	Development of a Comprehensive Master Plan for the Management of Solid Waste, including: (a) Research of urban solid waste infrastructure lag and landfill locations. (b) Provision of municipal solid waste collection, transport, and disposal equipment. (c) Establishment of at least one solid waste recycling plant project.
AZGFD/CEA Prioritization	WILDLIFE
1	Population Study of the Sonoran Pronghorn in Arizona and Sonora
2	Monitoring of the Black-tailed Prairie Dog Population in Arizona and Sonora
3	Improvements to the Mexican Grey Wolf Captive Breeding Program
4	Identification of Priority Areas for Jaguar Conservation in Southern Sonora
5	Bighorn Population Study in Sonora

## ENVIRONMENTAL CONTEXT OF THE ARIZONA-SONORA REGION

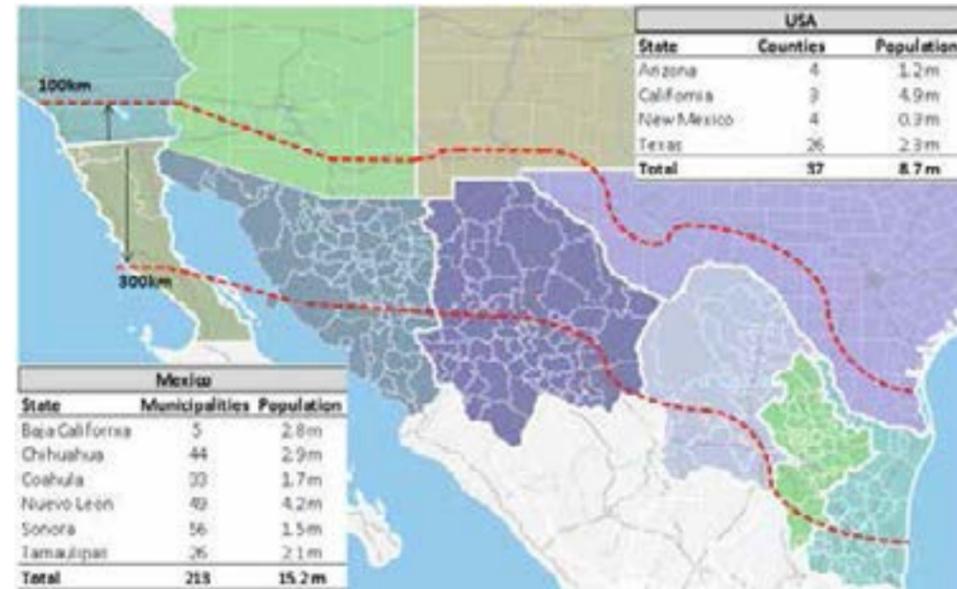
### Environmental Challenges and Opportunities for the Two States

The development of the Arizona-Sonora Environmental Strategic Plan emerged from a long history of cross-border collaboration involving bilateral, federal, state and local agencies as well as the private sector and non-governmental organizations in Arizona and Sonora.

Defining the border region is of primary importance in the management of the border region and its natural resources. The 1983 La Paz Agreement between the United States and Mexico established a border zone that extended 100 kilometers north and 100 kilometers south of the inter-

**Arizona and Sonora share a number of environmental challenges both along and across their 362-mile shared border. Water, air, waste management, and wildlife issues do not end at political boundaries.**

Figure 1: U.S. - Mexico Border Zone



national boundary; the binational Border 2020 program continues to utilize this definition.

Throughout the Arizona-Sonora Environmental Strategic Plan process, the two states followed an updated definition of the U.S.-Mexico border currently utilized by the North American Development Bank and the Border Environment Cooperation Commission and which has been adopted by numerous border environment stakeholders. This definition also extends 100 kilometers north of the boundary but extends the southern boundary 300 kilome-

ters into Mexico.

For Sonora and Arizona, this encompasses 56 municipios (analogous to U.S. counties) in the state of Sonora and four Arizona counties. Differences in population in the border zone are notable: while approximately 18% of Arizona's population lives in the four border counties of Yuma, Pima, Santa Cruz and Cochise, 53% of Sonora's population lives in the municipios included in the border zone, which includes the state capital, Hermosillo. (See Figure 1 above).

Arizona and Sonora share a number of environmental challenges

both along and across their 362-mile shared border. Water, air, waste management, and wildlife issues do not end at political boundaries, meaning the two states must work together as well as with their federal and bilateral agency counterparts to achieve lasting solutions in the region.

Agencies leading state environmental policy include the Arizona Department of Environmental Quality (ADEQ), the Commission for Ecology and Sustainable Development of the State of Sonora (CEDES), and the Sonora State Water Commission (CEA).

ADEQ oversees air quality, waste management, water quality regulations, and regulatory programs. CEDES addresses air quality and waste management programs, while CEA is the authority in Sonora responsible for issues related to water quantity and quality.

General areas of concern to both ADEQ and CEDES are outlined in Figures 2 and 3 at right.

Finding appropriate funding is one of the key challenges for addressing environmental needs. A variety of funding mechanisms exist for border environmental projects in addition to federal, state and local resources. Governmental programs at all levels represent one of the main sources of financing in regards to attending the priorities set by state governments.

There are alternatives from commercial and development banks that provide financing opportunities under competitive conditions. One of these banks that has worked for more than 20 years in the U.S.-Mexico border region is the North American Development Bank, which has a loan program for border infrastructure projects which meet basic criteria.

Figure 2: Border Environmental Concerns/CEDES

## BORDER ENVIRONMENTAL CONCERNS IDENTIFIED BY CEDES

CONCERNS
Updating waste management infrastructure
Strengthening the management of waste requiring special handling
Identifying and cleaning up contaminated sites and clandestine dumping sites
Strengthening air quality monitoring systems, outreach and prevention
Studying and recovering priority species

Figure 3: Border Environmental Concerns/ADEQ

## BORDER ENVIRONMENTAL CONCERNS IDENTIFIED BY ADEQ

SHORT-TERM CONCERNS
Stormwater management/control in binational watersheds
Metals discharge in Ambos Nogales wastewater
Solid waste cleanup along riverbanks and washes of binational rivers
Unkown concentrations and transport of ozone in Ambos San Luis
Proper management of electronic waste

## BORDER ENVIRONMENTAL CONCERNS IDENTIFIED BY ADEQ

MEDIUM/LONG-TERM CONCERNS
Fix the International Outfall Interceptor (IOI)
Repair Nogales Wash
Calculate emissions reduction as a result of shorter wait times at ports of entry; calculate emissions reduction as result of port infrastructure improvements; and to pormote economic growth
Banking solar power generation by warehouses for use during peak hours
Solar power for refrigerated inspection bays atl and ports of entry (POEs)
Santa Cruz County and Cochise County, as well as NGOs and EPA requests for information on mining activities with potential binational environmental impacts; requests for watershed boundaries and drainage patterns in response to spills, emergency response
Identify potential sources for vector-borne diseases, e.g. Nogales Wash

## STRATEGIC PLANS OF ARIZONA AND SONORA AGENCIES AND POTENTIAL SYNERGIES

The respective goals and objectives of the agencies participating in the Arizona-Sonora Environmental Strategic Plan process differ in their scope and language but also show significant overlap in the types of projects and activities they promote. These areas of common cause were identified and emphasized throughout the development of the strategic plan in order to maximize the binational impact of planned projects.

The following is a brief overview of each agency's publically-available goals at the time of the strategic plan's development.

With respect to the participating agencies from the state of Sonora, the Commission for Ecology and Sustainable Development for the State of Sonora (CEDES) has four top-level areas on its Strategic Agenda 2016-2021 (see Figure 4 above) as well as 10 strategic objectives that cover general subjects such

Figure 4: CEDES Strategic Areas Overview, 2016-2021



as the promotion of environmental justice and citizen participation, as well as more specific ones such as the implementation of a of a state climate change mitigation action plan and developing landfill, water treatment, and recycling programs. Sonora's State Water Commission (CEA) has five Quality Objectives which include, for example, "Motivate high efficiency among [water] users" and "Develop a water culture that promotes responsible use and conservation." At the Mexican federal level, the National Water Commis-

sion's (CONAGUA) Objectives and National Strategies are numerous and range from objectives related to the evaluation of the effects of climate change on the hydrologic cycle to specific strategies for promoting integrated and sustainable water management.

The FY2017 Strategic Plan of the Arizona Department of Environmental Quality (ADEQ) sets specific, numerical objectives for pollution reduction, percentage of facilities in compliance, compliance time frames, etc., and stresses the agency's adoption of its Lean

Management System. ADEQ's air, water, and waste goals correspond to the strategic plan's air, water, and waste management working groups, and the plan supports Governor Doug Ducey's priorities for the state (see Figure 5 pg. 11). In 2014, the Arizona Department of Water Resources (ADWR) developed Arizona's Next Century: A Strategic Vision for Water Supply Sustainability, which provides a comprehensive water supply strategy for Arizona and creates a framework for addressing potential water imbalances in the state

## STRATEGIC PLANS OF ARIZONA AND SONORA AGENCIES AND POTENTIAL SYNERGIES

over the next 100 years. It also addresses the needs of multiple water users throughout the state.

The Wildlife 20/20 Strategic Plan of the Arizona Game and Fish Department (AZGFD) has objectives that focus primarily on wildlife and species preservation through habitat conservation, including specific objectives for watershed-based management and public lands stewardship.

At the binational level, the U.S. Environmental Protection Agency's (EPA) U.S.-Mexico Border 2020 Program, in collaboration with Mexico's Secretariat for the Environment and Natural Resources (SEMARNAT), has objectives for its Arizona-Sonora Regional Workgroup that are specific both in their timeframes and their numerical goals. The air pollution, safe drinking water, and waste management objectives complement the Arizona and Sonora state agencies' goals

Figure 5: ADEQ Strategic Plan Overview

**ADEQ Mission and Goal-driven Strategic Plan**  
The plan supports priorities outlined for the state by Arizona Governor Doug Ducey

These include:

- 21st Century Economy
- Protecting Our Communities
- Healthy Citizens
- Educational Excellence
- Fiscal Responsibility

and provide key guidance for the types and locations for border environment projects.

Goals 4 and 5, dealing with joint preparedness for environmental response and compliance and environmental stewardship, relate to a number of additional binational programs and initiatives such as the Toxic Release Inventory (TRI), the Joint Contingency Plan, and the National Program for Environmental Auditing. The Strategic Plan of the International Boundary and Water Commission (IBWC) includes objectives similar to those of

Border 2020 and also contains several objectives specific to binational infrastructure and asset management.

Finally, the Arizona-Mexico Commission (AMC) and the Comisión Sonora-Arizona (CSA) have collaborated for over five decades in the region. The two commissions have emphasized working sessions, data sharing, and collaboration. Joint committees of the two commissions develop action items, which tend to follow the timeline of Arizona and Sonora plenaries, typically held twice per year.

The Arizona-Sonora Environmental Strategic Plan was presented as a concept at the annual meeting of the AMC/CSA Environment and Water Committee on June 23, 2016. The idea was for the plan to be formalized with both governments under the auspices of the AMC and the CSA.

The development of a Memorandum of Understanding was also discussed, primarily as a way of formalizing the plan with both state governments and also to monitor the development of the strategic projects outlined in the plan.

## THE ARIZONA -SONORA ENVIRONMENTAL STRATEGIC PLAN PROCESS

The highly collaborative development of this environmental strategic plan emerged from a long history of multi-agency, multi-organization cross-border collaboration involving bilateral, federal, state, and local agencies as well as the private sector and non-governmental organizations in Arizona and Sonora.

In June 2016, the Environment and Water Committee of the Arizona-Mexico Commission (AMC)/ Comisión Sonora Arizona (CSA) agreed to produce an Arizona-Sonora Environmental Strategic Plan, with a key objective being the maximization of limited resources. The Arizona Department of Environmental Quality and the Commission for Ecology and Sustainable Development for the State of Sonora were named as the lead agencies, and the Border Environmental Cooperation Commission and the North American Development Bank were enlisted to help fund the effort.

In addition, the North American Research Partnership (NARP), an independent, non-profit research organization, was asked to organize, edit and produce the plan itself. NARP's interdisciplinary team of analysts have undertaken a significant amount of work over the years in interrelated fields such as the the environment and cross-border competitiveness (specifically cross-border trucking and renewable energy).

Figure 6 at right gives an overview of the strategic plan development process from its conceptualization in June 2016 to its publication and formal presentation in Hermosillo on December 1-2, 2016.

This plan was developed through a series of conference calls, workshops and individual consultations. Two multi-agency workshops were held in Tucson (September 13-14) and Hermosillo (November 1) to discuss a) the development and selection of key projects, b) criteria for considering these projects and c) prioritization. This last aspect was refined during numerous consultations with subject matter experts from participating agencies.

Figure 6: Overview of Strategic Plan Dev. Process, 2016

SEPTEMBER	
Sept. 13-15, First working session held in Tucson, AZ	
Session 1 tasks completed by participants	
Compilation of information by contractor, NARP	
OCTOBER	
Oct. 17, draft of project prioritization sent to participants for review	
Week of Oct. 17, virtual meetings of topic working groups for input on draft document	
Oct. 26, delivery of draft report to participants	
Agencies draft MOU for submittal to AMC/CSA	
NOVEMBER	
Nov.1, working session for final comments on draft from agencies	
2nd week of Nov., final version completed for translation and printing	
Finalize MOUs based on AMC/CSA edits from review	
DECEMBER	
Dec. 1-2, CSA/AMC Summit in Hermosillo - Environment & Water Committee present plan, execute MOU via Governors	

Figure 7: Strategic Plan Working Groups

WORKING GROUPS
Water   Waste Management   Air   Wildlife

The 29 projects selected include 15 strategic projects that the two states' relevant agencies will implement and collaborate on during the 2017-2021 period. Fourteen additional projects were selected for implementation as time and resources allow. The projects represent a range of issues within the areas of water, air, waste management and wildlife (see Figure 7 above). In some cases, two or even more projects were combined into one strategic project.

## IMPLEMENTING THE ARIZONA-SONORA ENVIRONMENTAL STRATEGIC PLAN

The Arizona-Sonora Environmental Strategic Plan is comprised of 15 strategic projects and 14 additional projects that can be initiated as time and resources allow. The plan will be carried out by participating agencies between 2017 and 2021.

A central component of the Strategic Plan process is the Memorandum of Understanding (MOU) presented at the CSA/AMC Summit in Hermosillo on December 2, 2016. The MOU lays out the framework for implementation of the strategic plan in terms of projects, goals, objectives and targeted outcomes. It also underscores the importance of the 15 strategic projects, the 14 additional projects and allows for the possibility of additional projects and binational collaboration to be added to the plan with the agreement of the respective state agencies.

In addition, the MOU serves as the beginning of the operational phase of the Strategic Plan. Specifically, it lays the groundwork for project implementation and follow-up by providing for the use of a monitoring and implementation tool to evaluate progress on each project.

Project implementation is a key component of the strategic plan process. At the Hermosillo meeting on November 1, 2016, members of the four working groups began working on detailed project implementation plans that cover the entire project cycle, from the project conceptualization phase to approaching potential funders to initiating operations in the field. Figure 8 below outlines general Strategic Plan milestones for 2017. AMC/CSA plenary and interplenary sessions will serve as a time to discuss updates on individual projects and the overall development of activities proposed under the plan. Action plans will be developed at these sessions. In addition, Figure 9 shows an example of the AMC/CSA Action Plans that will be used to update the Commissions on the status of the plan and its various projects. Finally, Figure 10 shows the monitoring tool example. Such a tool will feature the specific degree of detail that teams will develop for the individual projects, including major project goals, specific objectives, officials responsible for

Figure 8: Overview of Strategic Plan Activities, 2017

JANUARY - FEBRUARY
Primary state agencies coordinate on workplans and prioritize projects for 2017 implementation
Coordinate with EPA and BECC on Border 2020 RFP priorities
Leads, outputs, timelines, project management and progress reporting tools identified
MARCH - APRIL
Engage additional partners and stakeholders to implement projects
Identify other potential sources of support for current and future projects
<b>Meeting of the Arizona-Sonora Border 2020 Regional Workgroup and Task Forces</b>
MAY - JUNE
AMC Summer Summit
EPA releases Border 2020 RFP
Mid-year progress reports for each project implemented
JULY - AUGUST
EPA and BECC select Border 2020 RFP grantees
Planning begins for projects to be implemented in 2018
SEPTEMBER - OCTOBER
Leads for projects begin compiling information for progress reports, including setbacks experienced and actions taken to get back on course
<b>Meeting of the Arizona-Sonora Border 2020 Regional Workgroup and Task Forces</b>
NOVEMBER - DECEMBER
CSA Fall Summit
End-of-year progress report and outline of projects to be implemented in 2018

specific projects tasks, percentage completion for tasks and specific projects, deadlines and dates for follow-up. It is important to note that monitoring timelines will be agreed upon between the relevant Arizona and Sonora agencies.

Figure 9: Example of an AMC/CSA Action Plan and Progress Report



**COMMITTEE: (Name)**

**DATE**



**ACTION PLAN #1: (Title)**

**DESCRIPTION OF THE OBJECTIVE:**

**IMPACT FOR ARIZONA-SONORA REGION (EXPECTED BENEFIT):**

**TARGET COMPLETION DATE:**

**TITLE:**

**DESCRIPTION:**

**DUE DATE:**

**RESPONSIBLE PARTIES:**  
 Arizona:  
 Sonora:

**ACTIONS TAKEN:**

**STATUS:**      \_\_\_ New/Open      \_\_\_ In Progress      \_\_\_ Implemented/To Be Continued      \_\_\_ Discarded

**CORE AREA:**      \_\_\_ Competitiveness      \_\_\_ Sustainability      \_\_\_ Security      \_\_\_ Quality of Life

**FUNDING SOURCES:**      \_\_\_ Federal      \_\_\_ State      \_\_\_ Local      \_\_\_ Private

Figure 10: Project Monitoring Tool Example

Name of Project				
Project Goals	Specific Objectives	Responsible Official	Deadline	Follow-up Date

## ECONOMIC COMPETITIVENESS AND THE ENVIRONMENT IN THE ARIZONA-SONORA BORDER REGION

### OVERVIEW

The genesis of this strategic plan coincided with the beginnings of two new administrations in Arizona and Sonora, both of which have sought to place economic development front and center. The Great Recession affected the state of Arizona in a direct and sustained manner, and immigration politics during the height of this phenomenon did not advance the state's economic case as having a business-friendly climate. Sonora has sought to take greatest advantage of its proximity to the United States while building on its strengths in mining, agriculture, and aerospace. While an exhaustive study of ties between the environment and the economy in the Arizona-Sonora border region is beyond the scope of this strategic plan, we can outline the states' economic strengths, look more closely at which industries are currently concentrated and dynamic in the border region, and briefly discuss industries that are affecting the environment but also ask about business opportunities for firms that treat environmental threats. And finally, we try to answer the question, what do the environmental projects in this plan have to do with local and statewide economic development efforts?

### KEY INDUSTRIES AT THE STATE LEVEL

Both Arizona and Sonora seek to expand their economies beyond the traditional primary sectors of mining and agriculture that have left such significant historical, cultural, and economic footprints on the two states' history and present. The two states are in constant competition with

Figure 11: Arizona-Sonora Megaregion Dominant Industry Sectors

SOURCE: Arizona Commerce Authority
<ul style="list-style-type: none"> <li>Aerospace</li> <li>Automotive</li> <li>Mining</li> <li>Health Technology and Medical Devices</li> <li>Advanced Manufacturing</li> <li>High Technology</li> <li>Biotech/Bioscience</li> <li>Renewable Energy</li> <li>Optics/Photonics</li> <li>Agriculture</li> <li>Information Technology</li> </ul>
SOURCE: State of Sonora Secretariat of the Economy
<ul style="list-style-type: none"> <li>Aerospace</li> <li>Automotive</li> <li>Mining</li> <li>Electronics</li> </ul>

other regions for industries such as automotive, biosciences, electronics and other high-tech industries, to name a few. The state of Sonora's State Development Plan, 2016-2021 specifically focuses on competitiveness as a key attribute: "Efficiency necessarily leads to promoting an economy based on dynamism and competitiveness, which itself is derived from a platform of productivity based on innovation, science and technology" (Plan Estatal de Desarrollo, 6). The document also focuses on the key challenge to "strengthen the economy so that it is more sustainable and competitive via knowledge and innovation, at the same time incentivizing the formation of clusters in agriculture and industry." Likewise, the Arizona Commerce Authority's five-year plan emphasizes the need to grow in high value-added, export-oriented sectors. Target industries include aerospace and defense, semiconductors, optics/photonics, biosciences and, significantly, renewable energy. Both states, then, have a strong focus on economic development that is in concert with the protection of the environment. Figure 11 above lists some of the most significant industries in each state and shows the potential for economic complementarity (as well as competition).

*"Efficiency necessarily leads to promoting an economy based on dynamism and competitiveness, which itself is derived from a platform of productivity based on innovation, science and technology."  
 (Plan Estatal de Desarrollo, 6)*

## ECONOMIC COMPETITIVENESS AND THE ENVIRONMENT IN THE ARIZONA-SONORA BORDER REGION

### FOCUS ON THE BORDER REGION

The Arizona-Sonora border region economy was one of five regions analyzed in the 2015 report *Competitive Border Communities: Mapping and Developing U.S.-Mexico Transborder Industries*, produced by the North American Research Partnership and the Mexico Institute of the Woodrow Wilson International Center for Scholars. The 2015 report looked at industries in the Arizona-Sonora border region, in this case defined as the counties and municipios directly adjacent to the international boundary. Specifically the report looked at data on three variables that are key in carrying out binational cluster-based economic development in the region: industry concentration, industry dynamism and how “binational” similar industries on both sides of the border are. In this section, which relies on the analysis in the report, we will look at two of these variables and briefly

*Table 1: Arizona-Sonora Border Counties and Municipios - 20 Most Concentrated Industries (2013)*

20 MOST CONCENTRATED INDUSTRIES		
Description	Employees	LQ
Metal Ore Mining (2122)	5,933	14.14
Audio & Video Equipment Manufacturing (3343)	3,050	13.63
Aerospace Product & Parts Manufacturing (3325)	17,813	10.86
Hardware Manufacturing (3325)	1,493	9.46
Other Furniture-related Product Manufacturing (3379)	1,663	9.03
Rooming & Boarding Houses (7213)	762	8.58
Semiconductor/Other Elec. Component Man. (3359)	12,724	8.10
Other Electrical Equip./Component Man. (3359)	5,403	7.68
Medical Equipment & Supplies Man. (3391)	11,863	7.62
Seafood Product Preparation/Packaging (3117)	1,219	7.05
RV Parks and Recreational Camps (7212)	751	4.59
Fishing (1141)	2,627	4.13
Technical & Trade Schools (6115)	1,767	3.52
Other Support Activities for Transportation (4889)	236	3.31
Business Support Services (5614)	11,823	3.19
Gambling Industries (7132)	2,469	3.12
Support Activities for Crop Production (1151)	710	2.66
Other Investment Pools & Funds (5259)	60	2.59
Retail Trade of Used Goods/Used Merchandise (4664,4533)	2,216	2.45
Apparel Accessories/Other Apparel Man. (3159)	126	2.42

Source: Wilson, Lee and Bezares-Calderon (2015)

discuss their relevance to the border environment.

#### CONCENTRATION

As a first step in determining key industries for a binational cluster-based economic development strategy, we used a standard measure—location quotient (LQ)—to pinpoint the top 20 most concentrated

industries a) in both Arizona and Sonoran border counties and municipios and b) as one binational region. As seen in Table 1 above, metal ore mining, audio and video equipment manufacturing, and aerospace product and parts manufacturing all have a location quotient of over 10. Hardware manufacturing, fur-

niture manufacturing, rooming, semiconductors, electrical equipment, medical equipment and seafood product preparation round out the top 10. We also see strong evidence of traditional primary sector economic activity in the region including mining as well as tourism (RV parks, rooming houses, fishing).

## ECONOMIC COMPETITIVENESS AND THE ENVIRONMENT IN THE ARIZONA-SONORA BORDER REGION

In terms of employment, aerospace by far is the most significant employer of the top LQ industries in the Arizona-Sonora region, with almost 18,000 employees distributed on both sides of the border. The development of these two industries in neighboring states is an interesting story of highly concentrated, closely located yet unrelated industries. While Arizona’s aerospace industry is mostly defense-related, the industry in Sonora is commercial in nature. Semiconductors, medical equipment and business support services are also significant employers and all have over 10,000 employees.

#### DYNAMISM

The second step for our analysis was to determine which industries were the most dynamic in Arizona-Sonora border region. By employing a shift-share analysis (which looks at national, industry and local growth effects on particular industries) of the region’s employment data from 2009 and 2013, we get an interesting and different picture of the region’s potential areas of economic opportunity. Aerospace and semiconductors—to take two key examples—do not appear in the top 20 in terms of their dynamism. Instead we see industries such as apparel manufacturing, investment pools, and boiler manufacturing, tanks and shipping containers (in that order) assuming significance as particularly dynamic industries.

The Seafood Product Preparation and Packaging industry experienced particularly dramatic employment growth during 2009-2013, adding 1,035 jobs for a percentage increase in employment of 562.5%. Medical devices added more than 5000 jobs between 2009 and 2013 in addition to being a top industry by location quotient, making it an

*Many of the same industries that are most concentrated and dynamic in the Arizona-Sonora border region are those that have a significant impact on the environment.*

excellent candidate for cluster-based economic development. The performance of technical and trade schools indicates the importance of workforce development efforts in the region. The relatively competitive position of fruit and vegetable preserving in the region is worth noting as competition between North American trade corridors is increasing.

While many of these industries are still small, their competitiveness index combined with steep employment growth curves make them industries that megaregions and other economic development stakeholders will want to watch closely in the coming months and years.

#### ENVIRONMENTAL IMPACT OF CONCENTRATED AND DYNAMIC INDUSTRIES

In order to design a more accurate action plan for environmental protection, it is crucial to identify the current state of affairs and determine the industries that have a more direct effect on the environment in the region. Many of the same industries that are most concentrated and dynamic in the Arizona-Sonora border region are those that have a significant impact on the environment. In this section we consider industries that represent a high potential risk to the environment as well as industries that have been developed to minimize the environmental costs.

#### NEGATIVE EXTERNALITIES OF INDUSTRIAL AGGLOMERATION

The benefits of industrial agglomeration (businesses taking advantage of proximity to one another) can be significant as they represent important sources of employment and economic development. However, it has been documented that industrial agglomeration can have negative impacts on the environment (Sun and Yuan, 2015; Grazi, 2016).

The activities linked to the deterioration of the environment include the manufacturing sector as well as agriculture, forestry, mining, fishing, transportation and storage, and electricity and gas

## ECONOMIC COMPETITIVENESS AND THE ENVIRONMENT IN THE ARIZONA-SONORA BORDER REGION

supply, industries which are considered the most important generators of pollution in the U.S. (EPA, 2015). Within the manufacturing sector, certain industries generate more emissions and have a bigger environmental footprint than others.

In Table 1 on page 16, we see the industries that are more concentrated in the Arizona-Sonora border region and which have exhibited more intense growth between 2009 and 2013. While an exhaustive analysis of these industries and their environmental impact is beyond the scope of this strategic plan, there is clearly some correlation between the region's most concentrated and dynamic industries and impacts or at least potential impacts to the environment.

As an example, the mining industry has been long known for its environmental effects. Some of the impacts of this industry are the emission of pollutants, such as PM10 and PM5, water pollution, in addition to disturbance of ecosystems. In Arizona, the border county that generates more PM10 and PM5 as a result of mining activity is Pima County (EPA, 2015). Sonora is the state in Mexico with the largest participation in the mining industry, generating 1.28% of the state GDP (Ministry of Economy, 2014).

The fishing industry also appears within the most important industries in the Arizona-Sonora border region. However, overfishing and harmful fishing problems are becoming major issues for the Gulf of California, threatening species such as the vaquita.

Numerous manufacturing-based industries also have strong presence among the most concentrated industries in the Arizona-Sonora border region. These industries depend mostly on electricity and natural gas for their operations. Finding viable opportunities for more efficient energy production may be an alternative to reduce the environmental footprint of these energy-intensive industries. Transportation-related industries that have grown in tandem with manufacturing on the Mexican side of the border are both energy-intensive and major producers of emissions.

*Waste management is a critically important issue on both sides of the border, and numerous stakeholders have worked on a variety of issues within this area (waste tire management, illegal dump sites, and hazardous materials management, among others) in recent years, most notably within the binational Border 2020 framework and its antecedents.*

### ENVIRONMENT-RELATED INDUSTRIES

Yet opportunities exist for industries to address the effects of industrial agglomeration in the border region. Below we consider several.

#### Waste Management

Waste management is a critically important issue on both sides of the border, and numerous stakeholders have worked on a variety of issues within this area (waste tire management, illegal dump sites, and hazardous materials management, among others) in recent years, most notably within the binational Border 2020 framework and its antecedents.

In Mexico, there exists legislation at the national level that regulates the disposal of solid waste and hazardous waste. However, as the management is carried out at the state level, available resources continue to present challenges to implementation. In addition, there is no specific regulation either at the federal or the state level regarding electronic waste, which represents an important source of pollution (Rojas-Bracho et al., 2010).

In the United States, while regulations on waste management are established at the federal level by the Environmental Protection Agency, legislation on electronic waste is handled at the state level. In Arizona, there is currently no legislation on e-waste management, even if there are some efforts to promote recycling of electronic components as well as legislation on lead-acid batteries to avoid their mixing with solid waste (see Electronic Waste State Resource Locator, 2016; Proposal HB2614: Large Electronics Recycling Program, 2010; ADEQ, 2016).

## ECONOMIC COMPETITIVENESS AND THE ENVIRONMENT IN THE ARIZONA-SONORA BORDER REGION

Waste management activities are classified under NAICS code 562-Waste Management and Remediation Services. In the Arizona-Sonora border region, these industries do not exhibit a high location quotient (LQ). Nevertheless, their presence increased between 2009 and 2013, with an increase of employment of 48% seen in the waste collection industry.

#### Food Banks

Food banks may help to reduce the amount of food waste that is generated in the region. Although most of the employment related to food banks is concentrated in Arizona, and particularly in Pima County, Sonora has seen some development of this sector. However, it remains to be seen if these food banks will continue developing: between 2009 and 2013, they saw a 19.5% decrease in employment.

#### Water Sewage and Water Treatment

Water, Sewage and Irrigation Systems have an LQ larger than 1.7 in the Arizona-Sonora border region and presented an increase of 45.18% in terms of employment from 2009-2013. This sector mostly represents management of sewage systems by government. However, there are growth opportunities in the water treatment sector.

#### Environmental Consulting Services

Even though this sector does not exhibit high levels of concentration, this industry has some presence in Arizona, particularly in Yuma County, where it generates fewer than 300 jobs (2014). This lack of firms in the border region may be offset by firms oriented to this sector that are established mainly in the larger cities on both sides of the border but which also serve the border region as well.

In summary, the border region presents unique challenges associated with its economic development model, the different regulatory frameworks, different governance, and the industrial agglomeration they present. Yet the border region is a microcosm of both the past and the future of the Ari-

zona and Sonora economies. The challenge facing the two states is how to manage the environmental issues that arise with industrial agglomeration and the hoped-for development of transborder industry clusters. If the states are able to accomplish this, the robustness of the environment could act to reinforce regional competitiveness, with new high value added industries locating in the region precisely because of the environment and the high quality of life that workers increasingly demand.

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## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021

### OVERVIEW

The 15 strategic projects that appear in this section were developed and selected as high-priority projects by the relevant Arizona and Sonora agencies. The projects address a range of issues within the areas of water, air, waste management and wildlife. They will be implemented between 2017 and 2021 and are presented in order of their priority within their specific areas. Following the list of prioritized projects by area, there is a more detailed description of the background relevant to each one of them, as well as their identified environmental, social, economic and health impacts in the binational context. A section detailing 14 additional projects for future consideration then follows.

### STRATEGIC ARIZONA-SONORA ENVIRONMENTAL PROJECTS, 2017-2021

ADEQ/CEA Prioritization	WATER
1	Stormwater Control in Nogales, Sonora for the Protection of Binational Infrastructure and Public Health
2	Infrastructure for Metals and E. coli Attenuation in the San Pedro River
3	Implementation of Green Infrastructure in Nogales, Sonora for the Protection of Binational Stormwater Quality
4	Industrial Pretreatment Support in Nogales, Sonora for the Protection of Binational Water Quality
ADEQ/CEDES Prioritization	AIR
1	Installation and Operation of Air Quality Equipment in Sonora Border Communities Phase 1. Rehabilitation of current equipment. Phase 2. Acquisition of new equipment.
2	Ozone Monitoring Pilot Project in San Luis Río Colorado
3	Expansion of Air Quality Smartphone Application to Yuma
ADEQ/CEDES Prioritization	WASTE MANAGEMENT
1	Identification and Cleanup Prioritization of Waste-impacted Sites in Combination with a Solid Waste Management Education Campaign
2	Comprehensive Electronic Waste and Discarded Domestic Appliances Management Program
3	Development of a Comprehensive Master Plan for the Management of Solid Waste, including: (a) Research of urban solid waste infrastructure lag and landfill locations. (b) Provision of municipal solid waste collection, transport, and disposal equipment. (c) Establishment of at least one solid waste recycling plant project.
AZGDF/CEDES Prioritization	WILDLIFE
1	Population Study of the Sonoran Pronghorn in Arizona and Sonora
2	Monitoring of the Black-tailed Prairie Dog Population in Arizona and Sonora
3	Improvements to the Mexican Grey Wolf Captive Breeding Program
4	Identification of Priority Areas for Jaguar Conservation in Southern Sonora
5	Bighorn Population Study in Sonora

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 WATER PROJECTS

ADEQ/CEA Prioritization	PROJECT NAME		
1	Stormwater Control in Nogales, Sonora for the Protection of Binational Infrastructure and Public Health		
2	Infrastructure for Metals and E. coli Attenuation in the San Pedro River		
3	Implementation of Green Infrastructure in Nogales, Sonora for the Protection of Binational Stormwater Quality		
4	Industrial Pretreatment Support in Nogales, Sonora for the Protection of Binational Water Quality		
<b>STORMWATER CONTROL IN NOGALES, SONORA</b>		<b>PRIORITY 1</b>	
<p><b>BACKGROUND</b> While green infrastructure and other sustainable solutions are important for stormwater control, formal flood control mechanisms are needed to protect municipalities from flooding associated with extreme rainfall events, particularly during the summer monsoon. Stormwater gabions and other such structures help control and direct stormwater flows—especially those of high volume and/or intense duration—away from critical infrastructure and into areas where they can diffuse naturally or pose no threat to life or property.</p> <p>In Ambos Nogales, flooding threatens not just private property but also crucial binational infrastructure. Gabions have previously been constructed in the area as per U.S. Army Corps of Engineers and the U.S. International Boundary and Water Commission recommendations, in conjunction with CONAGUA and supported by Border 2020. Maintenance and operation considerations pose challenges to their sustainability.</p> <p>This project aims to support maintenance of existing gabions; promote new stormwater gabions as appropriate, and evaluate other formal flood-control alternatives. The goal is to protect the residents of Ambos Nogales and secure its municipal assets by strengthening the region's stormwater management infrastructure while reducing the risk of stormwater-induced sanitary sewer overflows (SSOs).</p> <p><b>KEY COMMUNITIES</b> Ambos Nogales (primary); other communities as needed</p>			
<b>PROJECT IMPACTS</b>			
<p><b>ENVIRONMENTAL</b></p> <ul style="list-style-type: none"> <li>• Binational infrastructure protection</li> <li>• Reduced SSOs</li> </ul>	<p><b>HEALTH</b></p> <ul style="list-style-type: none"> <li>• Reduced public exposure to SSOs</li> <li>• Protection of surface water and ground-water resources from contamination</li> </ul>	<p><b>SOCIAL</b></p> <ul style="list-style-type: none"> <li>• Engage public on matters related to public health and water resource management</li> </ul>	<p><b>ECONOMIC</b></p> <ul style="list-style-type: none"> <li>• Lowered operation and maintenance costs for municipalities</li> <li>• Protection of wastewater infrastructure investments</li> </ul>
<p><b>TECHNICAL ADVANCES</b> Gabions have already been constructed in Nogales, Sonora in accordance with recommendations prepared by Army Corps of Engineers and U.S. International Boundary and Water Commission (via support from CONAGUA and Border 2020). These have had short term positive effect, but operation and maintenance remains a challenge to sustainability.</p>			

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 WATER PROJECTS

ADEQ/CEA Prioritization	PROJECT NAME		
1	Stormwater Control in Nogales, Sonora for the Protection of Binational Infrastructure and Public Health		
2	Infrastructure for Metals and E. coli Attenuation in the San Pedro River		
3	Implementation of Green Infrastructure in Nogales, Sonora for the Protection of Binational Stormwater Quality		
4	Industrial Pretreatment Support in Nogales, Sonora for the Protection of Binational Water Quality		
<b>INFRASTRUCTURE FOR METALS &amp; E. COLI ATTENUATION IN THE SAN PEDRO RIVER</b>		<b>PRIORITY 2</b>	
<p><b>BACKGROUND</b> The Upper San Pedro watershed spans the Sonora-Arizona border and includes at its southernmost expanse the community of Cananea, Sonora, located at a distance of approximately 25 miles from the U.S. border. Monitoring of San Pedro River water quality in the border community of Charleston, Arizona has revealed chronic impairment for E. coli and dissolved copper relative to U.S. surface water quality standards and resulted in the river being classified as "High" priority. Research by the University of Sonora has linked historical mining activities in Cananea to contaminated sediments along the length of the San Pedro River in Sonora. In addition, raw sewage discharges may contribute to downstream exceedance of bacterial standards in both countries. Respective contaminants may be mobilized along the length of the river during high flow events.</p> <p>This project is designed to protect the San Pedro River from metal and E. coli contamination by implementing stormwater detention features to mitigate contaminated sediment remobilization and lessen the effects of cross-border sewage flows. Features such as those installed on the San Bernadino Ranch east of Agua Prieta in Sonora can help control the migration of contaminated sediments. Strategies will be investigated and implemented as appropriate through coordination with CONAGUA and CEA and with technical support provided by ADEQ as appropriate.</p> <p><b>KEY COMMUNITIES</b> Sierra Vista; San Pedro Riparian National Conservation Area; Cananea</p>			
<b>PROJECT IMPACTS</b>			
<p><b>ENVIRONMENTAL</b></p> <ul style="list-style-type: none"> <li>• Mitigates contamination of the San Pedro River</li> <li>• Addresses issue in waterbody recognized under the Clean Water Act as impaired with E. coli</li> </ul>	<p><b>HEALTH</b></p> <ul style="list-style-type: none"> <li>• Reduces risk of public's direct contact with contaminated waters leading to gastrointestinal diseases, other health effects</li> </ul>	<p><b>SOCIAL</b></p> <ul style="list-style-type: none"> <li>• Publically recognized problem</li> <li>• NGO engagement is already occurring in the border region</li> </ul>	<p><b>ECONOMIC</b></p> <ul style="list-style-type: none"> <li>• Environmental study may be necessary</li> </ul>
<p><b>TECHNICAL ADVANCES</b> Examples exist; technical details available from: <a href="http://cuencalosojos.org/">http://cuencalosojos.org/</a> and <a href="http://borderlandsrestoration.org/">http://borderlandsrestoration.org/</a>.</p>			

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 WATER PROJECTS

ADEQ/CEA Prioritization	PROJECT NAME		
1	Stormwater Control in Nogales, Sonora for the Protection of Binational Infrastructure and Public Health		
2	Infrastructure for Metals and E. coli Attenuation in the San Pedro River		
3	Implementation of Green Infrastructure in Nogales, Sonora for the Protection of Binational Stormwater Quality		
4	Industrial Pretreatment Support in Nogales, Sonora for the Protection of Binational Water Quality		
<b>IMPLEMENTATION OF GREEN INFRASTRUCTURE IN NOGALES, SONORA</b>		<b>PRIORITY 3</b>	
<b>BACKGROUND</b> Flooding can have severe negative effects on the communities of Nogales, Sonora and Nogales, Arizona. Uncontrolled stormwater flow damages businesses, private residences, and municipal assets, creating public health issues and threatening key binational infrastructure. Urban development contributes to impervious and denuded terrain, which decreases stormwater infiltration and compounds the risk of downstream flooding. Green infrastructure offsets this problem by improving infiltration and putting stormwater to beneficial use for the creation and sustainability of green spaces. The "City of Green Creeks: Sustainable Flood Management Alternatives for Nogales, Sonora" report, created by Arizona State University, proposed a number of green infrastructure projects at specific sites in Nogales, Sonora. This project will support implementation of green infrastructure strategies and projects outlined in that report.			
<b>KEY COMMUNITIES</b> Ambos Nogales (primary); other communities following			
<b>PROJECT IMPACTS</b>			
<b>ENVIRONMENTAL</b> <ul style="list-style-type: none"> <li>• Binational infrastructure protection</li> <li>• Reduced SSOs</li> <li>• Protection of investment in the International Outfall Interceptor (IOI)</li> <li>• Green Space creation</li> <li>• Microhabitats</li> <li>• Surface water quality</li> <li>• Regional water resource development</li> <li>• Reduced flooding risk</li> <li>• CO<sup>2</sup> reduction</li> </ul>	<b>HEALTH</b> <ul style="list-style-type: none"> <li>• Reduced public exposure to SSOs</li> <li>• Protection of surface water and groundwater resources from contamination</li> <li>• Green space benefit to public health</li> <li>• Water supply security</li> <li>• Improvement in air quality at pumping sites</li> </ul>	<b>SOCIAL</b> <ul style="list-style-type: none"> <li>• Community engagement and stewardship</li> <li>• Creation of recreational areas and local ownership of the same</li> <li>• Training opportunities that can be translated into new jobs</li> <li>• Improvement in urban aesthetic</li> <li>• Raises consciousness of reuse and water resource management</li> </ul>	<b>ECONOMIC</b> <ul style="list-style-type: none"> <li>• Technical exchange creates potential for new businesses and development</li> <li>• Flood mitigation aids municipality</li> <li>• Property protection</li> <li>• Property value augmentation</li> <li>• Recreational benefits</li> <li>• Cost savings for businesses</li> <li>• Lowered cost of infrastructure investment, operation, and maintenance</li> </ul>
<b>TECHNICAL ADVANCES</b> (a) Is currently being successfully implemented by Watershed Management Group at one (Nogales, Sonora) site through a Border 2020 grant, but needs to be multiplied throughout the city for maximum impact; see City of Green Creeks report for other potential sites and ideas: <a href="http://server.cocef.org/Final_Reports_B2012/20044/20044_Final_Report_EN.pdf">http://server.cocef.org/Final_Reports_B2012/20044/20044_Final_Report_EN.pdf</a> (b) Feasibility study may be necessary; similar work has been done both in U.S. and Mexico; ADEQ has already performed some project evaluation and conceptual work.			

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 WATER PROJECTS

ADEQ/CEA Prioritization	PROJECT NAME		
1	Stormwater Control in Nogales, Sonora for the Protection of Binational Infrastructure and Public Health		
2	Infrastructure for Metals and E. coli Attenuation in the San Pedro River		
3	Implementation of Green Infrastructure in Nogales, Sonora for the Protection of Binational Stormwater Quality		
4	Industrial Pretreatment Support in Nogales, Sonora for the Protection of Binational Water Quality		
<b>INDUSTRIAL PRETREATMENT SUPPORT IN NOGALES, SONORA</b>		<b>PRIORITY 4</b>	
<b>BACKGROUND</b> Over the last two years, heavy metals in Ambos Nogales wastewater have chronically exceeded the allowable headwork loadings for the Nogales International Wastewater Treatment Plant (NIWTP). The NIWTP is located in Rio Rico, Arizona, but Nogales, Sonora contributes the majority of wastewater treated at the plant. The NIWTP discharges treated wastewater to the Santa Cruz River in Arizona. Historical exceedances for metals in wastewater have been linked to industrial discharges from metal plating operations in Nogales, Sonora. At times, metals pass through the NIWTP to the river. Water quality and wildlife monitoring suggest environmental impacts linked to respective discharges.  The Nogales, Sonora Potable Water and Wastewater Utility (OOMAPAS-NS) reports it is complying with Mexican Federal requirements for monitoring and enforcement of industrial discharges. However, it recognizes that respective activities may not be sufficient to address the needs of the NIWTP for protection of the Santa Cruz River. Both OOMAPAS-NS and the regulated community have expressed a willingness to partner on a solution.  Given the binational nature of receiving infrastructure, federal coordination and support is needed. This project aims to leverage federal resources to strengthen institutional pretreatment processes in Nogales, Sonora so that contaminant loadings can be mitigated at their source. Respective processes include wastewater monitoring in the binational conveyance for source characterization, information exchange with the regulated community, and support of Mexico's Industrial Wastewater Discharge Limits (NOM-002) where needed.			
<b>KEY COMMUNITIES</b> Ambos Nogales			
<b>PROJECT IMPACTS</b>			
<b>ENVIRONMENTAL</b> <ul style="list-style-type: none"> <li>• Reduction in pass-through of heavy metals to the Santa Cruz River</li> <li>• Lowers risks related to surface water and groundwater quality posed by metals and SSOs</li> </ul>	<b>HEALTH</b> <ul style="list-style-type: none"> <li>• Reduces public exposure to SSOs</li> <li>• Protection of downstream potable water resources (both surface and ground)</li> </ul>	<b>SOCIAL</b> <ul style="list-style-type: none"> <li>• Engages public on matters related to public health and water resource management</li> <li>• Improves communication and response with regulated community to help mitigate respective issues</li> </ul>	<b>ECONOMIC</b> <ul style="list-style-type: none"> <li>• Improved pretreatment represents an opportunity for new business ventures</li> <li>• Significant cost savings through avoidance of plant upsets and increased O&amp;M costs</li> <li>• Reduction of biosolid disposal costs (utilization vs. disposal)</li> </ul>
<b>TECHNICAL ADVANCES</b> In Nogales, historical binational support through Border 2020 has been demonstrated to be effective, although results require continued investments. Effects may be measured by metal loadings monitoring by IBWC at the border with Mexico as per permit requirements; municipality views as federal issue, and oversight is limited to local (Mexican Federal) requirements due to a lack of sustained binational support.			

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 AIR PROJECTS

ADEQ/CEDES Prioritization	PROJECT NAME		
1	Installation and Operation of Air Quality Equipment in Sonora Border Communities Phase 1. Rehabilitation of current equipment. Phase 2. Acquisition of new equipment.		
2	Ozone Monitoring Pilot Project in San Luis Rio Colorado		
3	Expansion of Air Quality Smartphone Application to Yuma		
<b>INSTALLATION AND OPERATION OF AIR QUALITY EQUIPMENT IN SONORA BORDER COMMUNITIES PRIORITY 1</b>			
<b>BACKGROUND</b> The Arizona border communities of Nogales, Douglas and Yuma are adversely impacted by air pollutant emissions originating in their Sonora sister cities of Nogales, Agua Prieta and San Luis Rio Colorado, which have historically contributed to their designation as nonattainment areas for PM10 (all three communities) and PM2.5 (in the case of Nogales, Arizona). ADEQ currently operates PM monitoring stations on the Arizona side of the border and operated a few stations across the border until 2011. For a brief period of time, CEDES operated and maintained its own monitoring stations in different Sonora border communities; however, it was forced to discontinue its monitoring efforts due to a lack of resources. CEDES is currently operating a PM monitoring station in Nogales, Sonora with technical assistance from ADEQ and is interested in re-deploying existing equipment in other Sonora border communities. The existing equipment is in need of repair, the extent of which is currently unknown.  In addition to re-deploying the existing equipment, CEDES plans to acquire additional equipment to expand its border air monitoring network as far south as Cananea. Air monitoring in border communities is vital to justify and secure funding for air quality improvement projects in the border region. In the past, air quality monitoring data have been used as supporting information to obtain funding for landfill closures/relocations, paving projects, revegetation programs and other air quality improvement activities in the Arizona-Sonora border region, leading to improved social and economic conditions.			
<b>KEY COMMUNITIES</b> Sonora border communities; binational airsheds			
<b>PROJECT IMPACTS</b>			
<b>ENVIRONMENTAL</b> <ul style="list-style-type: none"> <li>Address cross-border air pollution</li> <li>Develop and enhance the availability of data</li> <li>Share data institutionally and binationally</li> <li>Provide data to support environmental projects/activities that will lead to better air quality conditions in the border region</li> <li>Improve air quality control</li> <li>Enhance Mexican personnel's capacity to monitor air quality</li> <li>Enhance understanding of air quality issues in shared, binational air basins</li> </ul>	<b>HEALTH</b> <ul style="list-style-type: none"> <li>Address respiratory ailments, such as asthma, as well as cardiovascular problems and allergies caused by air quality issues, especially in sensitive populations (i.e. older adults, children and immunocompromised individuals)</li> </ul>	<b>SOCIAL</b> <ul style="list-style-type: none"> <li>Enhance understanding of a recognized issue in numerous border communities</li> </ul>	<b>ECONOMIC</b> <ul style="list-style-type: none"> <li>PM nonattainment areas in the U.S. are required to implement various pollution control measures that may be detrimental to local economic development</li> <li>Reliable air monitoring data can be used to support air quality improvement projects, leading to economic prosperity in the region</li> </ul>
<b>TECHNICAL ADVANCES</b> Equipment available; ADEQ to provide technical support.			

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 AIR PROJECTS

ADEQ/CEDES Prioritization	PROJECT NAME		
1	Installation and Operation of Air Quality Equipment in Sonora Border Communities Phase 1. Rehabilitation of current equipment. Phase 2. Acquisition of new equipment.		
2	Ozone Monitoring Pilot Project in San Luis Rio Colorado		
3	Expansion of Air Quality Smartphone Application to Yuma		
<b>OZONE MONITORING PILOT PROJECT IN SAN LUIS RIO COLORADO PRIORITY 2</b>			
<b>BACKGROUND</b> ADEQ has been conducting ozone monitoring at one location in Yuma County, Arizona for several years. With the upcoming change in the federal maximum standard for ozone pollution from 75 parts per billion (ppb) to 70 ppb, it will be challenging to keep at least part of Yuma County from being re-designated as a nonattainment area for ozone, based on the average ozone concentrations that have been recorded at that site. The Clean Air Act prescribes stricter regulations on ozone nonattainment areas, including the requirement for new or expanding factories above a certain size to buy ozone "offset" credits from current sources. The possible re-designation of a part of Yuma County as a nonattainment area for ozone would further deteriorate the economy in an area that is already struggling with a high rate of unemployment. It is believed that much of Yuma County's ozone problem originates outside of its boundaries (i.e. in southern California and northwestern Mexico), but data are lacking to pinpoint sources. Currently, there are no ozone monitors anywhere in northwestern Mexico. Furthermore, the impending San Luis, Arizona-San Luis Rio Colorado, Sonora Port of Entry expansion calls for additional air monitoring in these border communities.			
<b>KEY COMMUNITIES</b> Yuma/San Luis Rio Colorado			
<b>PROJECT IMPACTS</b>			
<b>ENVIRONMENTAL</b> <ul style="list-style-type: none"> <li>Determine/identify ozone concentration levels</li> <li>Develop informational support for port of entry expansion</li> </ul>	<b>HEALTH</b> <ul style="list-style-type: none"> <li>Address respiratory and cardiovascular problems, as well as allergies caused by impaired air quality, especially in sensitive populations (i.e. older adults, children and immunocompromised individuals)</li> </ul>	<b>SOCIAL</b> <ul style="list-style-type: none"> <li>Enhance understanding of a recognized issue in Yuma/San Luis Rio Colorado</li> </ul>	<b>ECONOMIC</b> <ul style="list-style-type: none"> <li>Provide information to justify an ozone international transport exemption for Yuma County</li> <li>Reduce the severity of restrictions that may potentially be imposed on Yuma County, which could adversely affect its economic development</li> </ul>
<b>TECHNICAL ADVANCES</b> San Luis Rio Colorado project proposal in progress.			

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 AIR PROJECTS

ADEQ/CEDES Prioritization	PROJECT NAME		
1	Installation and Operation of Air Quality Equipment in Sonora Border Communities Phase 1. Rehabilitation of current equipment. Phase 2. Acquisition of new equipment.		
2	Ozone Monitoring Pilot Project in San Luis Rio Colorado		
3	Expansion of Air Quality Smartphone Application to Yuma		
<b>EXPANSION OF AIR QUALITY SMARTPHONE APPLICATION TO YUMA</b>			<b>PRIORITY 3</b>
<p><b>BACKGROUND</b> ADEQ recently released a smartphone app designed to provide Ambos Nogales residents with current levels of particulate matter (PM) pollution, indicating air quality conditions and the way unhealthy PM levels can affect the way we conduct day-to-day activities. The Air Nogales app was modelled after a similar app that was developed and released earlier for Maricopa County. Air Nogales is available from the Apple Store for iPhones and through Google Play for Android devices. Like Nogales, Arizona, Yuma has been designated by the US EPA as a PM10 non-attainment area, thus making the proposed smartphone app for Yuma a useful tool to keep the population informed about current and forecasted air quality conditions and providing a timely warning to sensitive populations about the way they should conduct outdoor activities.</p> <p><b>KEY COMMUNITIES</b> Yuma/San Luis Rio Colorado</p>			
<b>PROJECT IMPACTS</b>			
<p><b>ENVIRONMENTAL</b></p> <ul style="list-style-type: none"> <li>Provide air quality index to citizens living in shared air basin</li> </ul>	<p><b>HEALTH</b></p> <ul style="list-style-type: none"> <li>Address respiratory and cardiovascular problems, as well as allergies resulting from deficient air quality conditions, especially in sensitive populations (i.e. older adults, children and immunocompromised individuals).</li> </ul>	<p><b>SOCIAL</b></p> <ul style="list-style-type: none"> <li>Indirect</li> </ul>	<p><b>ECONOMIC</b></p> <ul style="list-style-type: none"> <li>Indirect</li> </ul>
<p><b>TECHNICAL ADVANCES</b> Existing project in Nogales.</p>			

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 WASTE MANAGEMENT PROJECTS

ADEQ/CEDES Prioritization	PROJECT NAME		
1	Identification and Cleanup Prioritization of Waste-impacted Sites in Combination with a Solid Waste Management Education Campaign		
2	Comprehensive Electronic Waste and Discarded Domestic Appliances Management Program		
3	Development of a Comprehensive Master Plan for the Management of Solid Waste, including: (a) Research of urban solid waste infrastructure lag and landfill locations. (b) Provision of municipal solid waste collection, transport, and disposal equipment. (c) Establishment of at least one solid waste recycling plant project.		
<b>IDENTIFICATION AND CLEANUP PRIORITIZATION OF WASTE-IMPACTED SITES</b>			<b>PRIORITY 1</b>
<p><b>BACKGROUND</b> The location of waste-impacted sites, including open dumps and other solid waste disposal areas, is largely unknown or unreferenced in the Arizona-Sonora border region. This project proposes addressing the issue of uncharacterized waste-impacted sites by first identifying their locations and then prioritizing their cleanup. The identification of the sites will be performed through a geo-referencing program, which will be used to then make determinations as to site cleanup priority based on risk criteria. To complement these efforts, this project is also designed to provide a solid waste management education campaign that includes components such as source separation training and community outreach.</p> <p><b>KEY COMMUNITIES</b> Ambos Nogales; further locations to be identified (opportunity for geo-referencing program)</p>			
<b>PROJECT IMPACTS</b>			
<p><b>ENVIRONMENTAL</b></p> <ul style="list-style-type: none"> <li>Reduce air, water and soil pollution</li> <li>Reduce rural fire risk</li> <li>Garbage separation at source (homes)</li> </ul>	<p><b>HEALTH</b></p> <ul style="list-style-type: none"> <li>Reduce respiratory disease</li> </ul>	<p><b>SOCIAL</b></p> <ul style="list-style-type: none"> <li>Address areas at risk for flash floods, areas of high poverty</li> <li>Cultural change on solid waste management</li> <li>High impact on outskirts of Nogales, particularly in high-poverty zones</li> </ul>	<p><b>ECONOMIC</b></p> <ul style="list-style-type: none"> <li>Reduce cities' waste management costs and rework</li> </ul>
<p><b>TECHNICAL ADVANCES</b> Agreements exist with universities and the Secretaría de Educación Pública (Public Education Secretariat).</p>			

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 WASTE MANAGEMENT PROJECTS

ADEQ/CEDES Prioritization	PROJECT NAME		
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<b>ELECTRONIC WASTE AND DISCARDED DOMESTIC APPLIANCES PROGRAM</b>		<b>PRIORITY 2</b>	
<b>BACKGROUND</b> Through previous Border 2020 projects, informational materials and guides exist regarding effective electronic waste collection and management programs. Updating these materials to include the management of household appliances will address the improper disposal of these materials and extend the life cycle of landfills in border communities.			
<b>KEY COMMUNITIES</b> Border communities			
<b>PROJECT IMPACTS</b>			
<b>ENVIRONMENTAL</b> <ul style="list-style-type: none"> <li>Address border communities' surplus of urban electronic domestic waste</li> <li>Reduce air, water and soil pollution with emphasis on heavy metals and other highly polluting materials</li> <li>Reduce clandestine fires</li> </ul>	<b>HEALTH</b> <ul style="list-style-type: none"> <li>Reduce respiratory disease</li> </ul>	<b>SOCIAL</b> <ul style="list-style-type: none"> <li>Address areas at risk for flash floods, areas of high poverty</li> <li>Address health impacts to waste pickers (pepenadores)</li> </ul>	<b>ECONOMIC</b> <ul style="list-style-type: none"> <li>Opportunity to offset costs for recycling</li> </ul>
<b>TECHNICAL ADVANCES</b> ADEQ electronic waste toolkit.			

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 WASTE MANAGEMENT PROJECTS

ADEQ/CEDES Prioritization	PROJECT NAME		
1	Identification and Cleanup Prioritization of Waste-impacted Sites in Combination with a Solid Waste Management Education Campaign		
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<b>DEVELOP COMPREHENSIVE SOLID WASTE MANAGEMENT PLAN</b>		<b>PRIORITY 3</b>	
<b>BACKGROUND</b> Investments have been made in some border communities supporting waste management, with projects such as the construction of landfills and purchase of trash collection vehicles. A lack of adequate waste management practices persists in the region, however, with the proliferation of open dump sites an ongoing concern to authorities and citizens. The State of Sonora has conducted prior studies to identify optimal sites for new landfills. These need to be updated and communicated to the relevant municipalities, followed by the prioritization of landfills to be constructed and the closure of clandestine sites. To facilitate proper collection, transport, and disposal of non-recyclable solid wastes, proper equipment is needed in many areas of the border region. On the recyclable materials side, markets have already been established that would support the operation of a sorting facility for recyclables within communities that have a large enough population and industries to support such efforts. Recycling operations would also extend the life cycle of landfills located in these communities.			
<b>KEY COMMUNITIES</b> Border Zone (Nogales, Naco, Hermosillo, Benjamin Hill, San Luis Rio Colorado, Puerto Peñasco)			
<b>PROJECT IMPACTS</b>			
<b>ENVIRONMENTAL</b> <ul style="list-style-type: none"> <li>Reduce and potentially close clandestine landfills</li> <li>Avoid waste fires</li> <li>Promote best management practices for urban residues – waste</li> <li>Reduce and control the proliferation of harmful species and infection sources/disease</li> <li>Direct impact on water, air, soil pollution</li> <li>Impact on wildlife</li> <li>Increase useful life of landfills through the reduction of disposal</li> </ul>	<b>HEALTH</b> <ul style="list-style-type: none"> <li>Reduce respiratory disease</li> <li>Reduce breeding grounds for noxious wildlife</li> <li>Reduce negative impacts on groundwater sources</li> </ul>	<b>SOCIAL</b> <ul style="list-style-type: none"> <li>Address areas at risk for flash floods, areas of high poverty.</li> <li>Address health impacts to waste pickers (pepenadores)</li> <li>Address demands for quality public services focused on the needs of municipalities</li> </ul>	<b>ECONOMIC</b> <ul style="list-style-type: none"> <li>Opportunity to offset costs for recycling</li> <li>Supports municipalities</li> <li>Reduce landfill management costs</li> </ul>
<b>TECHNICAL ADVANCES</b> ADEQ solid waste accumulation characterization study and guidance document.			

## STRATEGIC ENVIRONMENTAL PROJECTS 2017-2021 WILDLIFE PROJECTS

AZGFD/CEDES Prioritization	PROJECT NAME
1	Population Study of the Sonoran Pronghorn in Arizona and Sonora
2	Monitoring of the Black-tailed Prairie Dog Population in Arizona and Sonora
3	Improvements to the Mexican Grey Wolf Captive Breeding Program
4	Identification of Priority Areas for Jaguar Conservation in Southern Sonora
5	Bighorn Population Study in Sonora
<b>POPULATION STUDY OF SONORAN PRONGHORN IN ARIZONA &amp; SONORA PRIORITY 1</b>	
<b>BACKGROUND</b> Rehabilitation of a priority sub-species for Mexico and the USA through habitat protection via the establishment of a protected natural area. The habitat of the Sonoran Pronghorn is critical in the area known as Sierra Pinta-Sierra Prieta, which faces diverse threats.	
<b>KEY COMMUNITIES</b> Northeast Sonora (Gral. Plutarco E. Calles, Puerto Peñasco y Caborca) y Southeast Arizona (Communities of Organ Pipe National Monument and the Tohono O'odham Nation)	
<b>MONITORING OF THE BLACK-TAILED PRAIRIE DOG POPULATION IN ARIZONA/SONORA PRIORITY 2</b>	
<b>BACKGROUND</b> Rehabilitation of a priority sub-species for Mexico and the U.S. The establishment of an environmental compensation mechanism may be necessary for the owners and settlers of the land that formed the Prairie Dog's habitat. No such examples have been seen since 2012.	
<b>KEY COMMUNITIES</b> North-Northeast of Sonora (Municipio de Cananea) and South of Arizona (Area de Conservación Las Ciénegas)	
<b>IMPROVEMENTS TO THE MEXICAN GREY WOLF CAPTIVE BREEDING PROGRAM PRIORITY 3</b>	
<b>BACKGROUND</b> Rehabilitation of a priority sub-species for Mexico and the U.S. through biotechnological measures designed to improve their reproduction in captivity and in the wild. The Mexican Grey Wolf is considered extinct in the wild. Mexico's Wildlife Conservation Management Group (UMAs) has been successful in such activities.	
<b>KEY COMMUNITIES</b> Corridor spans Sonora and Arizona, including the central plains and mountain chain of the Madrean Archipelago	
<b>IDENTIFICATION OF PRIORITY AREAS FOR JAGUAR CONSERVATION IN SOUTHERN SONORA PRIORITY 4</b>	
<b>BACKGROUND</b> Rehabilitation of a priority sub-species for Mexico and the U.S. through livestock management measures. The death of jaguars has been related to their increased interaction with cattle ranchers.	
<b>KEY COMMUNITIES</b> Southern region of Arizona and Central Sonora (Sahuaripa, Sierra Bacatete y Región serrana de Alamos)	
<b>BIGHORN POPULATION STUDY IN SONORA PRIORITY 5</b>	
<b>BACKGROUND</b> Management, conservation, and controlled hunting of a unique species. There exists an efficient, effective manner of controlled hunt. Requires monitoring and reproductive management by Mexico's Wildlife Conservation Management Group (UMAs).	
<b>KEY COMMUNITIES</b> Southern Arizona (mountains and highlands), Northeast of Sonora (Reserva El Pinacate y Gran Desierto), Sierra Pinta, Sierras y sistemas de cordilleras centrales y la Isla Tiburón.	

## ADDITIONAL PROJECTS FOR FUTURE CONSIDERATION

The 14 projects outlined and listed in order of priority in this section also address water, air, waste management, and wildlife issues. While the 15 strategic projects (see previous section) hold higher priority, these additional projects may be considered for implementation as time and resources allow during the Plan period, 2017-2021.

ADEQ/CEA Prioritization	WATER
5	Protection of Public and Ecological Health through the Construction of a Wastewater Treatment Plant in Cananea, Sonora
6	Flood Control Strategy Development for the Douglas/Agua Prieta Watershed
7	Slag Metal Migration Control in Douglas
8	Recharge Projects at Santa Cruz River Near Mascareñas
9	Finalizing Project for Rehabilitation and Amplification of Treatment Plant and Water Recollection System in Sonoyta
10	Develop a Set of Bilingual Guidance Documents Supporting the Implementation of Stormwater Best Management Practices and Regulation in The U.S.-Mexico Border Region
11	Development of a Groundwater/Aquifer Monitoring Program in Nogales, Sonora
ADEQ/CEDES Prioritization	AIR
4	Identification of Prevention Measures, Mitigation and Control over Air Quality in the Three Shared Air Sheds of the Arizona-Sonora Megaregion
5	Paving Priority Areas to Mitigate Air Pollution
6	Expansion of North and South Road Lanes Leading to the Nogales-Mariposa Port of Entry
ADEQ/CEDES Prioritization	WASTE MANAGEMENT
4	Junkyard Management Plan
5	Waste Tire Management Plan for the Arizona-Sonora Megaregion
AZGFD/CEDES Prioritization	WILDLIFE
6	Recovery of the Ecological Flow of the Río Sonoita: Endangered Binational Watershed
7	Improving Water Quality and Reducing Sedimentation in the Santa Cruz River through Pasture Restoration and Cattle Control Measures

## ADDITIONAL PROJECTS FOR FUTURE CONSIDERATION

WATER PROJECTS/PRIORITIZATION	
<b>CONSTRUCTION OF A WASTEWATER TREATMENT PLANT IN CANANEA, SONORA</b>	<b>PRIORITY 5</b>
<p><b>BACKGROUND</b> The Upper San Pedro watershed spans the Sonora-Arizona border and includes at its southernmost expanse the community of Cananea, Sonora, located at a distance of approximately 25 miles from the U.S. border. Monitoring of San Pedro River water quality in the border community of Charleston, Arizona has revealed chronic impairment for E. coli and resulted in the River being classified as "High" priority for its degree of contamination.</p> <p>The community of Cananea does not have a wastewater treatment plant and, as such, is forced to discharge its untreated sewage into El Barrillito, a tributary of the San Pedro River. Posing both an ecological and a public health threat, such discharges negatively affect wildlife and habitat in the San Pedro watershed as well as the health and wellness of local residents. The construction of a wastewater treatment plant in Cananea, Sonora, would benefit the people of Sonora by improving public health and promoting development, and the people of Arizona by improving the ecological value of the San Pedro River.</p> <p><b>KEY COMMUNITIES</b> Cananea; Sierra Vista; San Pedro Riparian National Conservation Area</p>	
<b>FLOOD CONTROL STRATEGY FOR THE DOUGLAS/AGUA PRIETA WATERSHED</b>	<b>PRIORITY 6</b>
<p><b>BACKGROUND</b> The Douglas/Agua Prieta binational watershed consists of 2,130 hectares (65% in the U.S. and 35% in Mexico) of land characterized by shallow soils, steep hillslopes, and low-to-moderate herbaceous ground cover. The watershed itself is prone to heavy flooding, with the majority of the flood damage occurring in Agua Prieta, Sonora, where property damage and loss of life can result. Unlike in other border regions such as that of Ambos Nogales, the heightened flood risk in Douglas/Agua Prieta does not originate in the increased impervious surface cover associated with human development, but rather with the natural topography of the watershed. Nevertheless, flooding poses a significant health threat to residents of Agua Prieta and inhibits its development. This project proposes implementing a flood control strategy in the Douglas/Agua Prieta watershed.</p> <p><b>KEY COMMUNITIES</b> Agua Prieta; Douglas</p>	
<b>SLAG METAL MIGRATION CONTROL IN DOUGLAS/AGUA PRIETA</b>	<b>PRIORITY 7</b>
<p><b>BACKGROUND</b> Historical slag metal piles are located in the community of Douglas near the international border with Mexico. Sonora has raised concerns about stormwater leaching metals and impacting downstream water resources in Agua Prieta. Presently, the Border Environment Cooperation Commission in coordination with the International Boundary and Water Commission are evaluating flood mitigation alternatives for all of Douglas and Agua Prieta. Consideration may be given to projects that help capture and infiltration runoff from respective slag piles.</p> <p><b>KEY COMMUNITIES</b> Agua Prieta; Douglas</p>	
<b>RECHARGE PROJECTS AT SANTA CRUZ RIVER NEAR MASCARENAS</b>	<b>PRIORITY 8</b>
<p><b>BACKGROUND</b> Nogales, Sonora relies on shallow infiltration galleries located along the Santa Cruz River for much of its water supply. Improved stormwater infiltration can help augment water supplies for the growing population in the border region. Increased infiltration may also improve landscape cover and offset downstream scour which contributes to headcutting of important tributaries.</p> <p><b>KEY COMMUNITIES</b> Nogales, Sonora</p>	
<b>FINALIZING REHAB AND AMPLIFICATION OF TREATMENT PLANT AND WATER RECOLLECTION SYSTEM IN SONOYTA</b>	<b>PRIORITY 9</b>
<p><b>BACKGROUND</b> Population growth in Sonoyta is encroaching on the lagoon wastewater treatment system serving that community. The facility requires rehabilitation in order to address challenges with odors and limited capacity.</p> <p><b>KEY COMMUNITIES</b> Sonoyta (primary); Lukeville via public health and proximity</p>	

## ADDITIONAL PROJECTS FOR FUTURE CONSIDERATION

WATER PROJECTS/PRIORITIZATION	
<b>DEVELOPMENT OF BILINGUAL GUIDANCE DOCUMENTS FOR IMPLEMENTING STORMWATER BEST MANAGEMENT PRACTICES AND REGULATIONS IN THE US-MEXICO BORDER REGION</b>	<b>PRIORITY 10</b>
<p><b>BACKGROUND</b> Stormwater infrastructure projects at the community or municipal scale require sustainable designs and practical implementation to be successful. A number of best management practices for addressing stormwater have been developed by a wide range of agencies and non-governmental organizations (NGOs) in the Arizona-Sonora border region, but no comprehensive stormwater toolkit exists. A bilingual guidance document for implementing stormwater best management practices and regulations would allow stormwater best management practices (BMPs) to be promoted and replicated by community groups, NGOs, and government agencies in the U.S.-Mexico border region, creating a standard for stormwater project design. Such a document, if produced and distributed, would have a multiplier effect on stormwater management in the region by guiding its implementation and standardizing binational approaches.</p> <p><b>KEY COMMUNITIES</b> Nogales, Sonora (primary); other communities as needed</p>	
<b>DEVELOPMENT OF A GROUNDWATER/AQUIFER MONITORING PROGRAM IN NOGALES, SONORA</b>	<b>PRIORITY 11</b>
<p><b>BACKGROUND</b> In 1998, the U.S. International Boundary and Water Commission (IBWC), in close coordination with ADEQ, published a report on the aquifer and groundwater of the Ambos Nogales area. Groundwater monitoring has continued, following the publishing of this report, on the Nogales, Arizona side of the border, but no such monitoring has occurred on the Sonoran side. The state of the aquifer in Nogales, Sonora is therefore relatively unknown.</p> <p>This project proposes the development of a groundwater monitoring program in Nogales, Sonora, so that a full assessment of the aquifer may become possible and future programs and projects benefit from a heightened understanding of the subsurface processes occurring in the area. Without groundwater monitoring, it is extremely difficult to know with certainty what is occurring in the subsurface, what possible sources or plumes of contaminants may exist there, or what the state of the groundwater resources is in general.</p> <p><b>KEY COMMUNITIES</b> Ambos Nogales</p>	

## ADDITIONAL PROJECTS FOR FUTURE CONSIDERATION

AIR PROJECTS/PRIORITIZATION	
<b>IDENTIFICATION OF PREVENTION MEASURES, MITIGATION AND CONTROL OVER AIR QUALITY IN THREE SHARED AIR SHEDS OF THE ARIZONA-SONORA MEGAREGION</b>	
<p><b>BACKGROUND</b> Improved air quality in Arizona-Sonora border communities is vital to their economic and social development and success. Air pollutant levels in border communities are higher than the national average in both countries. The three major Arizona border communities (i.e. Nogales, Douglas and Yuma) have been designated as nonattainment areas for PM10, and Nogales, Arizona is out of attainment for PM2.5 as well. This project proposes conducting a study to identify air pollutant emissions mitigation measures that would help set guidelines for dealing with different emissions sources and potentially lead to better air quality conditions in border communities.</p> <p>Comprehensive air quality binational studies in the Ambos Nogales (i.e. Nogales, Arizona and Nogales, Sonora), Douglas-Agua Prieta and the Western Arizona-Sonora Border region in the late 1990s and early 2000s included the development of air emissions inventories for these three geographic areas. An updated emissions inventory of the Nogales, Sonora area was recently developed as part of the Nogales ProAire initiative. However, the emissions inventories for Douglas-Agua Prieta, Yuma-Somerton-San Luis-San Luis Rio Colorado and Nogales, Arizona are outdated. Updated inventories would help identify areas of need for working toward improving air quality conditions in the Arizona-Sonora border region.</p> <p><b>KEY COMMUNITIES</b> Ambos Nogales, Hermosillo, Douglas/Agua Prieta, Yuma/San Luis Rio Colorado, Cananea</p>	
<b>PAVING AREAS OF PRIORITY TO MITIGATE AIR POLLUTION</b>	<b>PRIORITY 5</b>
<p><b>BACKGROUND</b> Comprehensive air quality binational studies in the Ambos Nogales (i.e. Nogales, Arizona and Nogales, Sonora), Douglas-Agua Prieta and the Western Arizona-Sonora Border region have determined that dust emissions generated by unpaved roads are a major source of air pollution in border cities/towns. Extensive road paving projects have been undertaken in Agua Prieta and Nogales, Sonora. Nonetheless, hundreds of kilometers of unpaved roads remain to be paved in all major Sonora border communities and to a lesser degree in Arizona border communities. Road paving has historically proven to have a positive impact on the health, social and economic conditions of a community, positively impacting quality of life and access to community resources.</p> <p><b>KEY COMMUNITIES</b> Agua Prieta, Nogales, Sonora and San Luis Colorado</p>	
<b>EXPANSION OF NORTH AND SOUTH ROAD LANES LEADING TO THE NOGALES-MARIPOSA PORT OF ENTRY</b>	<b>PRIORITY 6</b>
<p><b>BACKGROUND</b> Traffic congestion leading to the Mariposa Port of Entry (POE) from Sonora has historically been one of the main sources of air pollution in the Ambos Nogales region. This problem is also evident on the Arizona side of the border, particularly during produce season (October through March), when commercial truck traffic hits its highest volume. Even though more lanes have been added to the Mariposa POE for passenger vehicles and major improvements have been implemented in the commercial truck processing area, the roads leading to the POE have not undergone major improvements in many years, thus producing bottlenecks and major traffic congestion problems on both sides of the border.</p> <p><b>KEY COMMUNITIES</b> Ambos Nogales</p>	

## ADDITIONAL PROJECTS FOR FUTURE CONSIDERATION

WASTE PROJECTS/PRIORITIZATION	
<b>JUNKYARD MANAGEMENT PLAN</b>	<b>PRIORITY 4</b>
<p><b>BACKGROUND</b> Junkyards operating in Sonora are currently not managing waste streams as required by law. For example, used oil and batteries are required to be managed as hazardous waste and special waste, respectively. This mismanagement leads to contaminated soils, potential groundwater and surface water impacts, as well as air quality impacts if there is a fire at any of these sites.</p> <p><b>KEY COMMUNITIES</b> Border communities</p>	
<b>WASTE TIRE MANAGEMENT PLAN FOR ARIZONA-SONORA MEGAREGION</b>	<b>PRIORITY 5</b>
<p><b>BACKGROUND</b> The universe of the flow of waste tires with little remaining life cycle in the Arizona-Sonora region has not been conducted. This leads to assumptions about the number of tires being crossed from Arizona into Sonora, where they are crossing, who is crossing them, who is benefitting from the activity, etc. This baseline information is needed to develop a waste tire management plan for the region that takes into account regulatory structures.</p> <p><b>KEY COMMUNITIES</b> Border communities, specifically border crossings.</p>	

## ADDITIONAL PROJECTS FOR FUTURE CONSIDERATION

WILDLIFE PROJECTS/PRIORITIZATION	
<b>RECOVERY OF THE ECOLOGICAL FLOW OF THE RIO SONOITA; ENDANGERED BINATIONAL WATERSHED</b>	<b>PRIORITY 6</b>
<b>BACKGROUND</b> Utilize green infrastructure to reestablish the flow of the Sonoita River and its tributaries in order to improve aquatic and riparian ecosystems as well as key native and endemic biological elements.	
<b>KEY COMMUNITIES</b> Lukeville, Sonoita, and Puerto Peñasco	
<b>IMPROVING WATER QUALITY AND REDUCING SEDIMENTATION IN THE SANTA CRUZ RIVER THROUGH PASTURE RESORATION AND CATTLE CONTROL MEASURES</b>	<b>PRIORITY 7</b>
<b>BACKGROUND</b> Take steps to rehabilitate the Santa Cruz River by means of improved management of pasturelands, specifically through increasing water capture and filtration as well as cattle control and sediment transport.	
<b>KEY COMMUNITIES</b> Santa Cruz County, Nogales, other small towns	

## RESEARCH TEAM

North American Research Partnership: Alma Bezáres Calderón, Héctor Gutiérrez, Martha Rascón, and Erik Lee. Special thanks to Craig Nelson of the Arizona Department of Environmental Quality for his assistance with various aspects of the project.



Gobierno del  
Estado de Sonora



CEA  
COMISIÓN ESTATAL DEL AGUA



North American  
Research Partnership  
2010-2011, 2012-2013 & 2014-2015