Gulf Coast Ecosystem Restoration Council
Project Proposal Form

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Project Identification

Project Title: **Gulf-Wide Pollutant Reduction and Water Quality Initiative: Modeling for a Mexican Emission Control Area**

State(s): TX, LA, MS, AL, FL | County/City/Region: Potentially all counties within the Gulf Coast Region

Specific Location: *Projects must be located within the Gulf Coast Region as defined in RESTORE Act. (attach map or photos, if applicable)*

Throughout the 5 Gulf States, specifically within the Gulf Coast Region

Project Description

RESTORE Goals: *Identify all RESTORE Act goals this project supports.*

_S_ Restore and Conserve Habitat
_P_ Restore Water Quality
_S_ Restore and Revitalize the Gulf Economy
_S_ Replenish and Protect Living Coastal and Marine Resources
_S_ Enhance Community Resilience

RESTORE Objectives: *Identify all RESTORE Act objectives this project supports.*

_S_ Restore, Enhance, and Protect Habitats
_P_ Restore, Improve, and Protect Water Resources
_S_ Protect and Restore Living Coastal and Marine Resources
_S_ Restore and Enhance Natural Processes and Shorelines
_S_ Promote Community Resilience
_S_ Promote Natural Resource Stewardship and Environmental Education
_S_ Improve Science-Based Decision-Making Processes

RESTORE Priorities: *Identify all RESTORE Act priorities this project supports.*

_X_ Priority 1: Projects that are projected to make the greatest contribution
_X_ Priority 2: Large-scale projects and programs that are projected to substantially contribute to restoring
___ Priority 3: Projects contained in existing Gulf Coast State comprehensive plans for the restoration…
_X_ Priority 4: Projects that restore long-term resiliency of the natural resources, ecosystems, fisheries…

RESTORE Commitments: *Identify all RESTORE Act Comprehensive Plan commitments that this project supports.*

_X_ Commitment to Science-based Decision Making
_X_ Commitment to Regional Ecosystem-based Approach to Restoration
_X_ Commitment to Engagement, Inclusion, and Transparency
_X_ Commitment to Leverage Resources and Partnerships
_X_ Commitment to Delivering Results and Measuring Impacts

RESTORE Proposal Type and Phases: *Please identify which type and phase best suits this proposal*

__X_ Project ____ Planning ____ Technical Assistance __x__ Implementation ____ Program

Project Cost and Duration

Project Cost Estimate:		**Project Timing Estimate**:
Total :	**$ 2,000,000***	Date Anticipated to Start: _06/2015_
		Time to Completion: _24/2_ months / years
		Anticipated Project Lifespan: __20_ years

*Project is scalable.

Gulf-Wide Pollutant Reduction and Water Quality Initiative:
Modeling Study for a Mexican Emission Control Area

Executive Summary

Numerous US and international studies have shown that shipping emissions of sulfur and nitrogen significantly impact water quality and ecosystem health through deposition. Nitrogen contributes to hypoxia and sulfur is an acidifying agent. The nitrogen load from atmospheric deposition is estimated to comprise 10% to 40% of the total input of nitrogen to many coastal estuaries, including in the Gulf. This project would primarily provide science support to reduce shipping emissions sulfur, particulate matter and nitrogen in the Gulf through Mexico's Emission Control Area (ECA) proposal to either extend the existing North American (NA ECA), which covers US waters in the Gulf, or create its own ECA under the International Maritime Organization (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL) in Mexican waters. An ECA sets internationally agreed standards to reduce emissions of sulfur dioxides/particulate matter and/or nitrogen dioxides from ships. The project would also determine the ecosystem benefits to the US Gulf of a Mexican ECA and significantly contribute to more robust, science-based decision making for restoration.

With the possibility of achieving large-scale reductions of nutrient and acidifying inputs to Gulf waters from shipping emissions at low cost compared to the health costs avoided and costs of compliance with an ECA, this project has the potential to provide near- (within five years) and long-term (for the next few decades), cost-effective Gulf-wide health, water quality, ecosystem, economic and science benefits. The need for this work was also recognized in the Federal and Gulf State consensus-based Gulf Coast Ecosystem Restoration Strategy, which recommended, as a priority, the collaboration with Mexico on assessing and reducing emissions from ocean going vessels in the Gulf.

The US Gulf Coast community stands to benefit economically from the establishment of a Mexican ECA through increased market growth opportunities in the maritime and fuel supply sectors. A Mexican ECA will help level the competitive playing field for Gulf port infrastructure and operations. Without a Mexican ECA there is the possibility that shipping companies would chose to divert shipments from U.S. ports to nearby Mexican ports, where there are no ECA requirements. Also, Mexico does not have the fuel supply to meet the demand that would be created by a Mexican ECA for lower sulfur fuels or alternative fuels, such as LNG. As such EPA estimates that a Mexican ECA would likely create an increased market demand for these fuels in the US Gulf ports.

The health and water quality of US Gulf communities will benefit. Because ship emissions from Mexico travel through the air across the Gulf, deposit to its waters, and thus impact the entire basin, reducing emissions of nutrients and acidifying agents, sulfur and nitrogen, from ships in the Gulf will contribute to restoring and revitalizing the Gulf economy by protecting fisheries and other economic resources contributing to the economic health of the region. Decreasing ship emissions through a Mexican ECA also reduces the potential for exceedances of National Ambient Air Quality Standards in certain Gulf communities, due to international shipping sources not subject to US jurisdiction, and thus provides additional margin for expansion of port and other industrial operations. EPA estimates that a Mexican ECA will reduce pollutant inputs from ships by over five million metric tons of nitrogen oxides (NOx) and almost half a million tons of sulfur oxides (SOx) per year. Health benefits will also be substantial. The avoided

health care costs and work days lost due to the NA ECA were calculated to be $ 100 billion dollars and over 1 million work days per year. Based on these results, EPA estimates that even a small increase in health benefits in the US from a Mexican ECA will translate into health care dollars saved and increased workforce productivity in Gulf Coast States.

The reductions of pollutants to the Gulf Coast achieved through this project are a cost-effective use of Council funding. In addition to the significant reductions in nitrogen and sulfur emissions noted above, EPA estimates that the NA ECA will achieve a 5-to-25 percent reduction in total annual sulfur deposition attributable to international shipping along the Gulf Coast. A Mexican ECA would further increase the reduction of deposition of pollutants to the Gulf, including the Gulf Coast, at a very low cost to the Gulf community and high economic and ecosystem gains.

Even in the event that Mexico is not able to establish an ECA, the project would still have a substantial, positive impact through enabling more robust, science-based decision making for restoration would also facilitate future cooperative efforts with Mexico to continue to monitor the inputs of shipping pollutants to the Gulf ecosystem. The technical analyses and modeling studies would contribute previously unavailable information on US-Mexico maritime shipping pathways and fuel supply, as well as the trans-boundary marine impacts of atmospheric deposition of nutrients and acidifying agents from ships.

Implementation information

The modeling study will consist of air quality, ecosystem and human health impact modeling with a view to establishing a benefit cost assessment for reducing ship emissions through a Mexican ECA proposal and also to assess the benefits to the Gulf. The results would also be provided to stakeholders in the US Gulf region through outreach and education activities. The U.S. Environmental Protection Agency would coordinate the modeling study with assistance from interested partners and has the technical and administrative capabilities to oversee performance of the study under high standards of scientific data gathering and analysis. EPA would seek to issue one or more contracts and grants to Gulf-based entities with the appropriate capacity to undertake the modeling study and to conduct outreach commencing in June 2015 and ending in May 2017.

Measures of success

The project success will be measured by setting clear project outcome and output goals and evaluating performance against these goals. Key outputs from this project will be modeling results quantifying nutrient and acidifying agent input reductions and other benefits achieved through a Mexican ECA to Mexico and the US Gulf States. Key outcomes of the project will be the submission of an ECA proposal to the IMO by the Mexican Government, a report on impacts to the US Gulf States, increased knowledge of atmospheric inputs to the Gulf and raised awareness of the impacts through outreach and education efforts.

Uncertainties and risks

The uncertainties and risks associated with this project are minimal, as the project is based on existing modeling methodologies. The biggest risk is the remote possibility that the current proactive stance of the Mexican Government toward establishing an ECA is reduced. But even in this case, the science benefits derived from this study will be significant. Activities will be undertaken to minimize any risks related to the modeling study, the future action of the Mexican Government to establish an ECA and the advancement of science on atmospheric inputs.

Project Proposal

Introduction

At a cost of about 1 cent of RESTORE Council funding per Gulf Coast acre[1] and the possibility of achieving substantial reductions of nutrient and acidifying inputs to US Gulf waters from shipping emissions, this project has the potential to provide near- (within the next five years) and long-term (for the next few decades) cost-effective Gulf-wide water quality, health, ecosystem, economic and science benefits.

Ships are a significant source of air pollution, including in the Gulf, emitting sulfur dioxides, nitrogen oxides, particulate matter and other pollutants that can affect populations and water quality, especially near coastal areas, but also impacting communities far inland. [2,3,4] Ship emissions in the Gulf of Mexico contribute to air pollution throughout the Gulf region, impacting human health and adversely affecting water quality and Gulf ecosystems through atmospheric deposition. These emissions deposit to Gulf waters causing impacts, including additional impairment of marine and coastal waters and their associated natural resources and services already injured by the Deepwater Horizon Incident.

As has been shown elsewhere in the world, [5] ship emissions are shown to travel very far. They can travel throughout the Gulf and inland to the US, causing deposition of nutrients and acidifying agents to waters and ecosystems throughout.[6]

This project would help reduce the water quality and ecosystem impacts of shipping to the US Gulf by reducing deposition of ship pollutants. It would primarily provide science support to Mexico's proposal to reduce ship emissions by either extending the existing North American Emission Control Area (ECA)[7] or creating its own ECA in Mexican waters under the auspices of the International Maritime Organization (IMO)'s International Convention for the Prevention of Pollution from Ships (MARPOL). A Mexican ECA proposal would extend the human health and ecological benefits of an ECA more consistently throughout the Gulf region. The US portion of the Gulf coastal area would see additional benefits from extending the NA ECA to Mexico or the creation of a Mexican ECA, should this approach be adopted. The US Gulf Coast

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[1] Calculated by multiplying the length of tidal shoreline of the Gulf (17,000 miles) by the depth of 25 miles of Gulf shore and dividing by the cost of this project. Source of tidal shoreline length: Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service.

[2] BOEM, *2008 Gulf-wide Emission Inventory*, OCS Study 2010-45. 2010. http://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Gulf-of-Mexico-Region/Air-Quality/2008-Gulfwide-Emission-Inventory.aspx

[3] 2010 Corbett et al Eyring, V., I. Isaksen, T. Berntsen, W. J. Collins, J. J. Corbett, O. Endresen, R.G. Grainger, J. Moldanova, H. Schlager, D.S. Stevenson, 2010. *Transport impacts on atmosphere and climate: Shipping,* Atm. Env. 44, 4735-4771.

[4] In 2012 international shipping was responsible for 2.2% of global CO_2 emissions, 13% of global NOx emissions, and 12% of global SOx emissions. *Third IMO Greenhouse Gas Study 2014*; International Maritime Organization (IMO), London, UK, June 2014.

[5] 2010 Corbett et al Eyring, V., I. Isaksen, T. Berntsen, W. J. Collins, J. J. Corbett, O. Endresen, R.G. Grainger, J. Moldanova, H. Schlager, D.S. Stevenson, 2010. *Transport impacts on atmosphere and climate: Shipping,* Atm. Env. 44, 4735-4771.

[6] EPA technical document *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulfur Oxides and Particulate Matter, Technical Support Document,* U.S.EPA, EPA-420-R-09-007, April 2009

[7] US Environmental Protection Agency (US EPA), Designation of North American Emission Control Area to Reduce Emissions from Ships, EPA-420-F-10-015, March 2010

is directly impacted by shipping emissions from Mexico, which can travel hundreds of miles from their point of origin and are projected to grow as much as threefold by 2030.

An ECA applies internationally agreed standards to reduce emissions of sulfur dioxides/particulate matter and/or nitrogen dioxides from ships operating in a geographically designated area Parties may choose to submit ECA proposals for consideration for adoption by the IMO, but such proposals must demonstrate how the proposed ECA would benefit human health and the environment in their country, consistent with the criteria in Appendix III to Annex VI. The US proposed an ECA in cooperation with France and Canada (the NA ECA), which was adopted by the IMO in 2010 and became enforceable in 2012.

The NA ECA currently covers about half of the Gulf. Adoption and implementation of Mexico's ECA proposal, essentially resulting in a Gulf-wide ECA, would reduce emissions from shipping throughout the Gulf and is expected to lead to additional benefits to US Gulf human health, ecosystem and water quality by reducing the deposition of nutrients and acidifying substances to the whole basin ecosystem. The US established the NA ECA in part because the globally applicable standards under the IMO treaty, to which the US is a party, are not as protective of US public health and would not have enabled the US to meet its air quality and public health protection requirements. IMO global standards also set standards for fuel quality levels and require emissions reductions, but the requirements are much less stringent than within an ECA.

Mexico also sees the benefits of addressing ship emissions through an ECA and has a work plan to establish one by 2017. Near-term emission reductions will occur as soon as the Mexican ECA goes into effect. This is particularly true for sulfur oxide emissions from oceangoing vessels. Reductions of over 80% sulfur dioxide emissions from a ships and reductions of sulfur dioxide deposition of over 90%[8] can be achieved and result in benefits to human health and the environment. A Mexican ECA would also result in significant, long term reductions over the next few decades and be more protective than the global IMO requirements.

While the Mexican government now recognizes the significance of shipping emissions[9] and has the political will to address them, it requires technical and financial assistance to conduct the analyses required for an IMO ECA designation proposal and to gain the support of Mexican policymakers and stakeholders for an ECA and conduct the modeling studies in support of Mexico's efforts to develop an ECA Proposal. Mexico lacks the professional experts and training to run the complex models needed to make the case for a Mexican ECA. And while the cost of these technical analyses is low by US standards, it is prohibitive for Mexico.

Benefits to US Gulf States

The benefits of this project to Gulf States are multiple, comprise economic, scale and value as well as science benefits and are outlined in the following sections (as depicted in figure 1, which also references relevant figures at the end of the proposal).

[8] Fuel switching reference *U.S.-Mexico Demonstration of Fuel Switching on Ocean Going Vessels in the Gulf of Mexico*, U.S.EPA, EPA-160-R-10-001, December 2010.

[9] On October 21, 2014 Mexico announced its intent to accede to MARPOL Annex VI, the annex on ship air pollution; Mexican Secretariat for Transportation and Communication press release; http://www.sct.gob.mx/uploads/media/COMUNICADO-296-2014.pdf

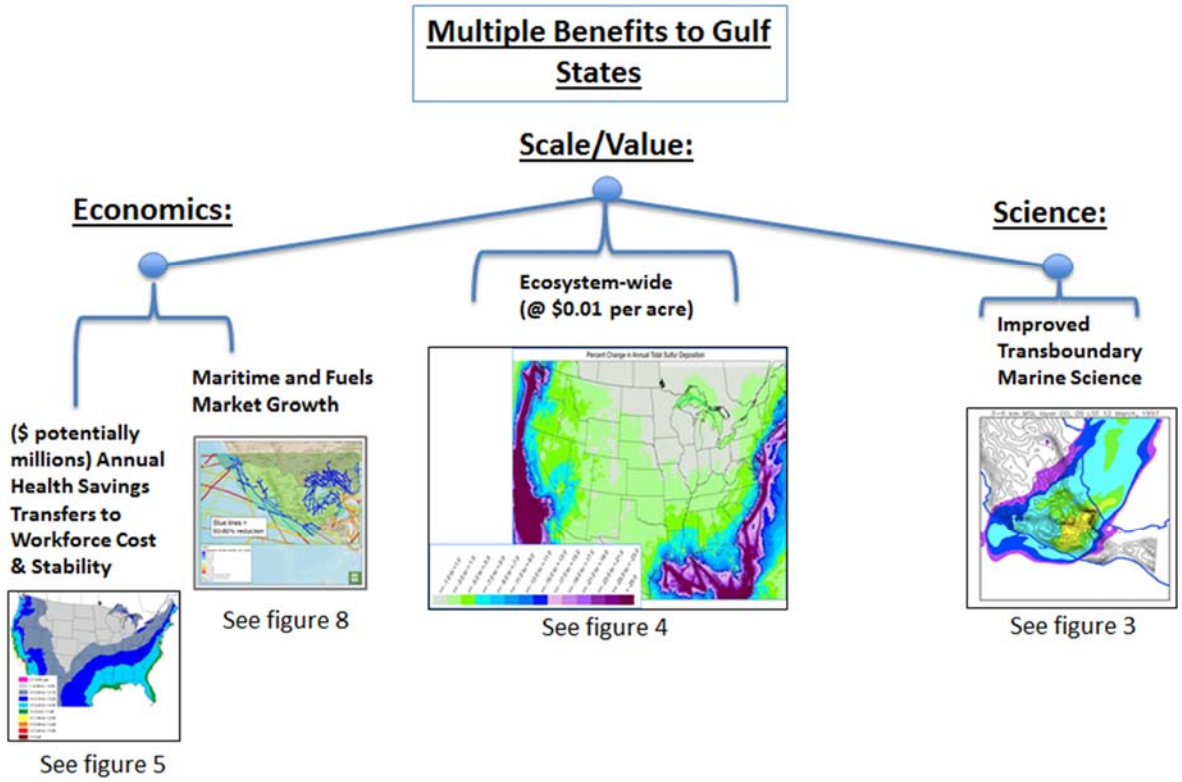

Figure 1: Overview of benefits to Gulf States

Economic Benefits

US Gulf States stand to benefit economically from the establishment of a Mexican ECA through increased market growth opportunities, such as in the maritime and fuel supply sectors. A Mexican ECA will help level the competitive playing field for Gulf port infrastructure and operations, which may cause the selection of some ports over others. Without a Mexican ECA there is the possibility that shipping companies would chose to divert shipments from U.S. ports to nearby Mexican ports, where there are no ECA requirements. An ECA also promotes sustainable shipping practices, which are beneficial to sustainable port operations and galvanize technology innovation and production, such as the development and construction of liquid natural gas (LNG) ships and fueling facilities[10] in the US Gulf. LNG facilities now exist in the Gulf coast in Louisiana, Texas and Mississippi[11,12,13] (see also figure 10) and capacity for

[10] US Department of Transportation, Maritime Administration, *Liquified Natural Gas Bunkering Study*, PP087423-4, Rev 3, September 3, 2014 http://www.marad.dot.gov/documents/DNVLNGBunkeringStudy3Sep14.pdf
[11] FERC, North American LNG Import/Export Terminals, October 14, 2014; http://www.ferc.gov/industries/gas/indus-act/lng/lng-existing.pdf;
[12]Green4Sea, *LNG bunker fuel network gets designed for U.S. Gulf Coast*, press release, October 21, 2014, http://www.green4sea.com/lng-bunker-fuel-network-gets-designed-for-u-s-gulf-coast/
[13] Harvey Gulf, *Harvey Gulf breaks ground with LNG facility*, press release, February 14, 2014; http://harveygulf.com/pdf/press/Harvey_Gulf_BREAKS_GROUND_WITH_LNG_FACILITY.pdf

production of LNG ships has been developing.[14] In 2008 EPA estimated that the additional demand for low sulfur marine fuels (marine gas oil) in a Mexican ECA would be about 1.4 million tons.[15] Analytical work funded by EPA recently estimated that Mexico does not currently have the capacity to meet the demand of the cleaner ships and marine fuels required by an ECA[16] and concludes that it is possible that the demand created by a Mexican ECA may increase sales of ECA-compliant fuel, including LNG, in the US. EPA discussions with fuel suppliers as well as trends expressed in the trade press indicate interest in potential future fuel market growth opportunities.[17,18]

Because ship emissions from Mexico travel through the air across the Gulf, deposit to the waters and thus impact the entire basin, the additional water quality, ecosystem and human health benefits to US Gulf Coast communities from implementation of a Mexican ECA will also have a positive economic impact by reducing stressors on ecosystem services and reducing health care costs and lost work days. Reducing emissions of nutrients and acidifying agents from ships in the Gulf will contribute to restoring and revitalizing the Gulf economy by protecting fisheries and other economic resources contributing to the economic health of the region. Decreasing ship emissions through a Mexican ECA also reduces the potential for exceedances of National Ambient Air Quality Standards in certain Gulf communities, due to international shipping sources not subject to US jurisdiction, and thus provides additional margin, including their port and other industrial operations. Based on 2013 air quality data, several counties in the Gulf Coast area have air pollution levels above one or more of the primary NAAQS pollutants (see figure 11). Growth in industrial and port activities may contribute to increases in air pollutants. A Mexican ECA would address air pollutants from ships Mexican waters from a source which is not within US jurisdiction to control. EPA estimates that a Mexican ECA will reduce pollutant inputs from ships by over five million metric tons of nitrogen oxides (NOx) and almost half a million tons of sulfur oxides (SOx) per year. Health benefits will also be substantial. The avoided health care costs and work days lost due to the NA ECA were calculated to be $ 100 billion dollars and over 1 million work days per year by 2030.[19] Based on these results, EPA estimates that even a small increase in health benefits from a Mexican ECA will translate into health care dollars saved and increased workforce productivity in Gulf Coast States.

Scale/Value Benefits

The reductions achieved through this project are cost-effective per Council dollar spent – less than 1 cent per acre of Gulf Coast. In addition to the significant reductions in nitrogen and sulfur

[14] Harvey Gulf, *Harvey Gulf signs contract to build first US-flagged LNG powered vessels*, press release, October 6, 2011; http://harveygulf.com/pdf/press/Harvey%20Gulf%20Press%20Release%20 LNG%20contract%2010%207%2011.pdf

[15] US EPA, *Global Trade and Fuels Assessment – Future Trends and Effects of Requiring Clean Fuels in the Marine Sector*, EPA420-R-08-021, November 2008, p. 8-4. http://www.epa.gov/nonroad/marine/ci/420r08021.pdf

[16] Corbett, J.J., B. Comer, J. Silberman, 2013 Ship Emissions Inventory for Mexico, report submitted to Battelle Memorial Institute under contract to EPA, contract number EPW09024 WA 4-11, June 16. 2014.

[17] US EPA, Brian Muehling personal communication with US Gulf fuel supplier, June 23, 2014.

[18] US Gulf businesses are already positioning themselves to fully service the needs of future clients that will enter the market: Harvey Gulf, *Harvey Gulf Continues Strategic Growth with Expansion into* Mexico, press release, October 10, 2014; http://harveygulf.com/pdf/press/HGIM_Mexico_expansion_Press_Release_10-10-14.pdf

[19] US EPA, *Category 3 Marine Diesel Rule - Facts & Figures*, EPA-420-F-09-075, December 2009 http://www.epa.gov/otaq/regs/nonroad/marine/ci/420f09075.pdf (note: EPA's C3 marine program includes a regulatory program to implement the NA ECA).

emissions noted above, EPA estimates that the NA ECA will achieve a 5-to-25 percent reduction in total annual sulfur deposition attributable to international shipping along the Gulf Coast. A Mexican ECA would further increase the reduction of deposition of pollutants to the Gulf, including the Gulf Coast, at a very low cost to the Gulf community and high economic and ecosystem gains. A study on the nitrogen inputs in the Mississippi River Basin recommends as one of the ways to reduce inputs is the reduction in sources of NOx, which is emitted from ships.[20]

Based on experience with the NA ECA, where the benefit cost ratio of health costs averted versus the cost of compliance is as large as to 90:1, we would conservatively estimate a smaller but still very positive return on the Council's investment in this project to establish a Mexican ECA.

Science Benefits

The modeling conducted in the ECA study would contribute to science-based decision-making processes in the Gulf by assessing the impact of a Mexican ECA on the entire Gulf. It will also enable policy makers to continue to monitor the impact of airborne nutrients and acidifying agents on the US Gulf and evaluate progress and further needs for reducing these stressors.

Even in the event that Mexico is not able to establish an ECA, the project would still have a substantial, positive impact through enabling more robust, science-based decision making for restoration would also facilitate future cooperative efforts with Mexico to continue to monitor the inputs of shipping pollutants to the Gulf ecosystem. The technical analyses and modeling studies would contribute previously unavailable information on US-Mexico maritime shipping pathways and fuel supply, as well as the trans-boundary marine impacts of atmospheric deposition of nutrients and acidifying agents from ships.

To date the importance of nitrogen deposition has been shown in Gulf communities, but origin and nature of the nitrogen deposition and it impacts to the ecosystem are not well understood and further research has been recommended.[21,22] A study in the Tampa Bay area suggests that mobile sources (including ships) are a significant source and ta 50% of the nitrogen depositing in the water shed comes from outside sources, suggesting that region-wide reductions in emissions could have a positive impact locally.[23] The National Oceanic and Atmospheric Administration (NOAA) notes that coastal nutrient pollution is a complex issue and nitrogen inputs to the Gulf of Mexico are an air-water problem, requiring multi-media actions.[24] Furthering the science to

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[20] Mitsch W.J., J.W. Day Jr., J.W. Gilliam, P. M. Groffman, D. Hey, G.W. Randall, N. Wang, *Reducing Nitrogen Loading to the Gulf of Mexico from the Mississippi River Basin: Strategies to Counter a Persistent Ecological Problem*, Bioscience, 51, 5, pp. 373-388. 2001.

[21] Ecological Society of America, *The Role of Atmospheric Deposition in the Gulf of Mexico Hypoxic Zone*, Workshop Report, 1999. http://www.esa.org/esa/science-resources/reports/the-role-of-atmospheric-deposition-in-the-gulf-of-mexico-hypoxic-zone/

[22] Poor, N.D., *Atmospheric Deposition of Nitrogen and Air Toxins to the Tampa Bay Estuary*, Report to the Tampa Bay Estuary Program, September 2002.
http://www.tampabay.wateratlas.usf.edu/upload/documents/AtmosDepositNitroAirToxinsTBE.pdf

[23] Poor, N.D., Cross, L.M., Dennis, R.L. *Lessons learned from the Bay Region Atmospheric Chemistry Experiment (BRACE) and Implications for Nitrogen Management of Tampa Bay*, Atmospheric Environment, in review. 2012.

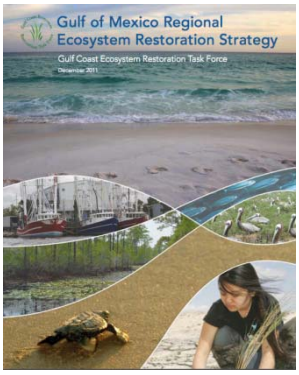
[24] NOAA, *Historical Nitrogen and Phosphorus Loadings to the Northern Gulf of Mexico*, NOAA Technical Memorandum NOS NCCOS 85, November 2008. http://ccma.nos.noaa.gov/publications/GOMnitrogen.pdf

understand the impact of nitrogen deposition from ships will be helpful focusing future Gulf restoration efforts.

Background

On December 5, 2011, the President's Gulf Coast Ecosystem Restoration Task Force presented the President with the Gulf of Mexico Regional Ecosystem Restoration Strategy[25] as directed in Executive Order 13554. Included in this Federal and State consensus-based strategy was the recognized need to advance, as a priority, the collaboration with Mexico on assessing and reducing emissions from ocean going vessels in the Gulf. The excerpt below (pg. 34 of the Strategy), reflects the consensus agreement of the Federal and State programs relative to the broad support for this initiative.

> ***Collaborate with Mexico to assess and reduce emissions from oceangoing vessels in the Gulf that degrade water quality***
>
> *Water quality, particularly in near-coastal waters, can be negatively affected by pollutants emitted from oceangoing vessels. To protect marine and coastal areas, including the Gulf, the United States and Canada adopted the North American Emissions Control Area (ECA) in March 2010. This initiative will put in place lower sulfur marine fuel standards for oceangoing ships operating in the ECA beginning in August 2012, as well as nitrogen oxide standards for engines on ships built in 2016 and later. It will dramatically reduce air pollution from ships and deliver water quality benefits by reducing atmospheric deposition of pollutants to coastal ecosystems. Ongoing efforts will continue with Mexico to increase awareness of the health and environmental benefits of reducing emissions from oceangoing vessels. Data from a recent U.S.-Mexico fuel switching demonstration, for example, show that particulates and sulfur dioxide emissions from container ships can be reduced by up to 80 percent and 89 percent, respectively. This plan presents a unique opportunity to increase the benefits of reducing ship emissions in the Gulf of Mexico.*



Council Goals Supported

The primary RESTORE Council goal supported by this project is ***Restore Water Quality.*** The project also addresses the following goals: ***Restore and Conserve Habitat,*** and ***Restore and Revitalize the Gulf Economy,*** as well as the Council-Selected restoration component objectives of ***"Restore, Enhance, and Protect Habitats," "Restore, Improve, and Protect Water Resources,"*** and ***"Improve Science-Based Decision-Making Processes."*** Further explanation of the scientific basis for the relevance of this proposal to the Council goals is provided in subsequent sections.

A successful application to the IMO to extend the NA ECA to Mexican waters or establish a Mexican ECA would help improve, and protect the Gulf Coast region's fresh, estuarine, and

[25] Gulf Coast Ecosystem Restoration Task Force, Gulf of Mexico Regional Ecosystem Restoration Strategy, December 2011.

marine water resources and habitats by reducing or treating nutrient and pollutant loading from ships that affect water quality and freshwater, estuarine, and marine habitats.

The modeling conducted in the ECA study would contribute to science-based decision-making processes in the Gulf by assessing the impact of a Mexican ECA on the entire Gulf. The study conducted by this project also promotes regional ecosystem-based restoration without regard to geographic location within the Gulf Coast region, due to the potential to address the trans-boundary and dispersive ship air emissions and their deposition to ecosystems and waters within the Gulf.

This study would be the underpinning of an extensive ecosystem restoration activity (establishment of a Mexican ECA and assessment of its impacts on the entire Gulf) that can also directly support the region's ability to withstand, prevent, and quickly recover from future natural or man-made disruptions. The results of the study will be of immediate use to the Council in understanding the conditions that affect restoration of the Gulf.

Impacts on the Gulf from Deposition of Ship Emissions

In 2013 fifty percent by weight of US water-borne foreign trade passed through the Gulf, where four of the ten top ports by foreign trade cargo tonnage in the U.S. are located.[26] Mexico also has major ports in the Gulf. Ship traffic in the Gulf is expected to continue to grow as a result of projected increases in international trade and the opening in 2015 of the expanded new Panama Canal.[27, 28]

Inputs of nutrients and pollutants from atmospheric deposition of air emissions, such as from shipping, contribute to water quality impacts, particularly in near-coastal waters. Areas that are already under stress through excess nutrients or acidification and where ship emissions are deposited are at increased risk of further damage in the future, if deposition of sulfur and nitrogen is not reduced. Nitrogen and other airborne pollutants, such as sulfur in the form of sulfuric acid, alter surface seawater alkalinity, pH and inorganic carbon storage. Sulfur and nitrogen deposition contributes to acidification of terrestrial and aquatic ecosystems. Aquatic effects of acidification have been well studied in the U.S. and results indicate that acidification affects aquatic biota at virtually all levels of the food web.[29] Effects have been most clearly

[26] American Association of Port Authorities, US Waterborne Foreign Trade 2013, http://aapa.files.cms-plus.com/Statistics/U.S.%20WATERBORNE%20TRADE%202013%20BY%20U.S.%20CUSTOMS%20DISTRICT.pdf

[27] The International Maritime Organization (IMO) has found that all business as usual scenarios result in a 50% to 250% increase in maritime CO_2 emissions in the period from 2012 to 2050, directly linked to growth in international vessel activity. *Third IMO GHG Study 2014*; International maritime Organization (IMO), London, UK, June 2014.

[28] Sixty-five percent (by cargo tonnage) of the Panama Canal's cargo traffic currently originates in or is destined to the United States, and the opening of the expanded Canal is expected to significantly increase the volume of trade reaching U.S. Gulf and East Coast ports in the United States. Oscar Bazan, "Update on the Panama Canal Expansion", presentation to the American Association of Port Authorities (AAPA) Conference on Shifting International Trade Routes, Jan. 23, 2014.

[29] *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulfur Oxides and Particulate Matter, Technical Support Document,* U.S.EPA, EPA-420-R-09-007, April 2009, p. 3-68

documented for fish, aquatic insects, other invertebrates, and algae. These effects disrupt the natural biogeochemical cycles[30] and thus can affect living marine resources, including fisheries.

Several studies show the importance of atmospheric deposition of nitrogen. Atmospheric deposition of nitrogen is equal to or exceeds riverine nitrogen inputs in many coastal regions, including the Gulf.[31] Some sources confirm that the impact of nitrogen, including from atmospheric sources, is wide-spread and increasing:

"The increased rate of nitrogen input is affecting the quality of the atmosphere and, in many regions, soil, groundwater, lakes and streams, and estuarine and nearshore marine environments."[32]

Nitrogen deposition causes ecological effects in terrestrial, aquatic and wetlands ecosystems from nutrient enrichment and eutrophication that alters biogeochemical cycles and harms animal and plant life such as native lichens and alters biodiversity of terrestrial ecosystems, such as forests and grasslands. Substantial increases in synthetic nitrogen fertilizer production and fossil fuel combustion, and land-use changes involving clearing and conversion, crop cultivation, and drainage of wetlands, among other factors, have significantly altered the global nitrogen cycle.

Nitrogen nutrient enrichment is a major environmental problem facing all U.S. coastal regions, but especially the Eastern, mid-Atlantic, and Gulf Coast regions, as excess nitrogen leads to eutrophication.[33] The nitrogen load from atmospheric deposition is estimated to comprise 10% to 40% of the total input of nitrogen to many US coastal estuaries, including in the Gulf, and could be higher for some.[34] Estuaries and coastal waters tend to be nitrogen-limited and are therefore inherently sensitive to increased atmospheric nitrogen loading.[35] There is broad scientific consensus that nitrogen-driven eutrophication of shallow estuaries in the U.S. has increased over the past several decades, including from atmospheric deposition, and that environmental degradation of coastal ecosystems is now a widespread occurrence. [36, 37] Any additional inputs of nutrients affect the Gulf, as Gulf ecosystems are some of the most sensitive to aquatic nutrient enrichment.[38]

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[30] Doney, S.C., N. Mahowald, I. Lima, R.A. Feely, F.T. Mackenzie, J.-F. Lamarque, and P.J. Rasch. 2007. *Impact of anthropogenic atmospheric nitrogen and sulfur deposition on ocean acidification and the inorganic carbon system.* Proc. Natl. Acad. Sci. U S A 104(37): 14580-14585. <http://www.pnas.org/content/104/37/14580.full.pdf+htm

[31] Atmospheric Deposition of Nitrogen: Implications for Nutrient Over-enrichment of Coastal Waters, Hans W. Pearl, Dennis R. L., Whitall, D.R., Estuaries, Vol. 25, No. 4b, p. 677-693, August 2002.

[32] SeaWeb, *Ocean Issue Briefs: Gulf of Mexico Dead Zone,* http://www.seaweb.org/resources/briefings/dead_zone.php

[33] *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulfur Oxides and Particulate Matter, Technical Support Document,* U.S.EPA, EPA-420-R-09-007, April 2009, p. 3-49.

[34] *Integrated Science Assessment for Oxides of Nitrogen and Sulfur – Ecological Criteria,* U.S.EPA, EPA/600/R-08/082F, December 2008, page 4-24.

[35] Howarth RW; Marino R (2006). Nitrogen as the limiting nutrient for eutrophication in coastal marine ecosystems: evolving views over three decades. *Limnol Oceanogr,* 51, 364-376.

[36] Paerl HW. (2002). Connecting atmospheric deposition to coastal eutrophication. Environ Sci Technol, 36, 323A-326A.

[37] Paerl HW; Dennis RL; Whitall DR (2002). Atmospheric deposition of nitrogen: Implications for nutrient over-enrichment of coastal waters. *Estuaries,* 25, 677–693.

[38] *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulfur Oxides and Particulate Matter, Technical Support Document,* U.S.EPA, EPA-420-R-09-007, April 2009, p. 3-50.

Nitrogen deposition contributes to eutrophication of estuaries and coastal waters which result in toxic algal blooms and fish kills.[39] In general, ecosystems that are most responsive to nutrient enrichment from atmospheric nitrogen deposition are those that receive high levels of nitrogen loading,[40] such as the Gulf of Mexico coastal area. A study in Finland showed that ship nitrogen deposition impacted annual phytoplankton biomass and nitrogen fixation by cyanobacteria.[41]

Benefits to the Gulf

The primary benefits to the Gulf from implementation of a Mexican ECA are substantial ecosystem and water quality improvements derived from reducing the emissions and deposition of sulfur oxides and nitrogen from shipping. For example, once a Mexican ECA enters into force, substantial reductions of nutrient and acidifying inputs would occur, starting initially with a more than 80% reduction of sulfur oxides from ships. These pollutants impact Gulf waters basin-wide and especially coastal areas. Studies to estimate these and other reductions are explained below.

> ***EPA Fuel Switching Demonstration (2010):*** An EPA fuel switching demonstration conducted in April 2010 in the Port of Houston and off the coast of Mexico documented the significant benefits of implementing ECA regulations in US and Mexican waters.[42] During the demonstration, ships calling on several U.S. and Mexican ports in the Gulf of Mexico switched from high sulfur bunker fuel to lower sulfur marine distillate (0.1% fuel sulfur) as required by the IMO treaty in ECAs as of 2015. Emissions before, during and after fuel switching were measured and modeled. In-stack ship monitoring showed reductions of particulates and sulfur dioxide emissions by up to 80 percent and 89 percent respectively. Air quality modeling at the Port of Veracruz showed a 24-fold reduction in 24-hour average sulfur dioxide concentrations and a seven-fold reduction in 24-hour concentrations of PM 2.5 when ships switched to lower sulfur fuel. Deposition modeling showed reductions of sulfur dioxide deposition to a sensitive reef system in the Gulf of Mexico near the Port of Veracruz of over 90% annually. Ships complying with a Mexican ECA would be expected to achieve reductions of particulates and sulfur dioxides similar to those seen in the study.
>
> ***EPA-sponsored Base Year 2011 Mexican Ship Emissions Inventory (2012):*** In the summer of 2012, through EPA's ongoing work with Mexico, a technical team made some initial estimates of the environmental benefits of combined North American and Mexican ECAs. The team found that nearly one third of shipping routes and 40 per cent of shipping emissions in the North American region are close to Mexico. The analyses showed that if adopted, Mexico's ECA proposal would have the potential to reduce 25

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[39] *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulfur Oxides and Particulate Matter, Technical Support Document,* U.S.EPA, EPA-420-R-09-007, April 2009, p. 3-57.
[40] *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulfur Oxides and Particulate Matter, Technical Support Document,* U.S.EPA, EPA-420-R-09-007, April 2009, p. 3-59.
[41] Raudsepp, U., J. Laanemets, I. Maljutenko, M. Hongisto, J. Jalkanen, *Impact of ship-borne nitrogen deposition on the Gulf of Finland ecosystem: an evaluation*, Oceanologia, Volume 55, Issue 4, Pages 837–857, 15 November 2013.
[42] *U.S.-Mexico Demonstration of Fuel Switching on Ocean Going Vessels in the Gulf of Mexico*, U.S.EPA, EPA-160-R-10-001, December 2010.

percent of the emissions of all ship routes close to Mexico and 60 percent of emissions from ships that call on ports in Mexico. And the costs to Mexico would be minimal.[43]

Emission estimation results confirm the potential for significant reduction of pollutants from implementation of an ECA in Mexican waters. Utilizing results from the 2012 EPA-sponsored inventory[44] conducted of shipping emissions in Gulf and Pacific waters with and without a Mexican ECA, EPA estimated emissions of sulfur dioxides, nitrogen oxides and particulate matter in a Mexican ECA in the Gulf (see table 1). EPA estimated a total of 301,000 metric tonnes of sulfur dioxides emitted from ships annually in base year 2011 within the area of a potential Mexican ECA.[45] By 2030 with no Mexican ECA, these emissions would grow to 788,000 metric tonnes annually. If a Mexican ECA were to be established in the Gulf, annual emissions within the Mexican ECA area in 2030 would be much less by comparison, only 155,000 metric tonnes, a decrease in annual emissions of over 480,000 metric tonnes of sulfur dioxide and 79,000 metric tonnes of particulate matter (PM) compared to the no Mexican ECA scenario (see table 1). These extensive reductions would be achieved even as ship traffic is projected to more than double in the Gulf by 2030.

Table 1: EPA Estimation of the reduction of Pollutant Emissions from Ships operating in a Mexican ECA in the Gulf (metric tonnes)

Emissions by Year	NOx	SOx	PM
2011 Baseline	2,597,000	301,000	42,000
2030 No Mexican ECA	6,815,000	788,000	111,000
2030 Mexican ECA	1,269,000	155,000	32,000
Emissions reductions associated with a Mexican ECA	5,546,000	633,000	79,000

EPA-sponsored Base Year 2013 Mexican Ship Emission Inventory (2014): In 2014 EPA conducted an update of the emission inventory[46] to calculate ship emissions in Mexico for base year 2013 and conduct an initial assessment of low sulfur fuel availability in Mexico. NOx, SOx and PM emissions in a potential Mexican ECA in 2013 were about 9 percent higher than in 2011. The report also found that the fuel demand in the potential Mexican ECA area is seventy times greater than the quantity of fuels currently sold to ships by Mexico. This implies that Mexico does not currently have the capacity to meet the demand for lower sulfur fuels in a Mexican ECA and it is likely that the demand could be met in part by increased sales of this fuel in the US. Comparing

[43] *Opportunity to Extend North American ECA Benefits to Mexico*, Presentation by Dr. James Corbett to Mexican Government on behalf of U.S.EPA and Battelle, May 31, 2012.
[44] Corbett, J.J., Ship Emissions Inventory Scenarios for US-Mexico technical exchange on reducing shipping emissions, memorandum submitted to Battelle Memorial Institute grantee to EPA, Grant number X4-8337601, December 17, 2012.
[45] Calculated by US EPA based on results from Corbett, December 2012 and Corbett 2006.
[46] Corbett, J.J., B. Comer, J. Silberman, 2013 Ship Emissions Inventory for Mexico, report submitted to Battelle Memorial Institute under contract to EPA, contract number EPW09024 WA 4-11, June 16. 2014.

2013 shipping emissions within a potential Mexican ECA with other sources of emissions in Mexico shows that ship emissions are equivalent to all land-based emissions (mobile sources, power plants, etc.) for NOx, double the mobile source emissions for PM2.5 and 16 percent of the mobile source emissions for black carbon.[47] This underscores that shipping emissions in Mexico are significant, even compared to other sources of pollutants in Mexico and that addressing them would be protective of the Gulf.

The human health benefits of reducing ship emissions are also substantial. Shipping emissions have the potential to impact a significant portion of the human population of the Gulf region of the U.S. EPA modeling has shown that shipping emissions can be transported by air currents hundreds of miles inland and thus ship emissions from Mexican waters are expected to impact human health in US Gulf States. Based on modeling conducted for the North American ECA, the U.S. and Canada expect by 2020 to prevent 14,000 premature deaths and provide health-related benefits of $100 billion dollars per year.[48]

The North American ECA will achieve a 5-to-25 percent reduction in total annual sulfur deposition attributable to international shipping along the Gulf Coast.[49] The additional benefit of a Mexican ECA on the Gulf would be determined by this project.

Mexico's Interest in Establishing an ECA

On October 21, 2014, Mexican officials publicly announced that they have submitted a formal request to the Mexican Senate to accede to MARPOL Annex VI,[50] the annex pertaining to ship air pollution, a signal of Mexico's recognition of the importance of reducing ship emissions. But they have also said that more technical analysis is needed for the Mexican government to convincingly make the case for establishing a Mexican ECA. Mexico's modeling capability is still emerging and its agencies would require additional training, time and resources currently not available in Mexico to conduct a study.

This ECA study would raise awareness and help eliminate potential policy barriers within Mexico to a Mexican ECA proposal. Without the ECA study, Mexican government agencies would not likely be able to convince the Mexican legislature and key industry stakeholders to support a Mexican ECA proposal. A strong ECA proposal would demonstrate the magnitude of the benefits to the natural resources and ecosystems of the Gulf of Mexico and public health and would increase the prospects for support domestically in Mexico and at the IMO.

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[47] Corbett, J.J., 2013 Ship Emissions Inventory for Mexico, webinar presentation to EPA, Battelle Memorial Institute and the Mexican Government, contract number EPW09024 WA 4-11, June 24, 2014.

[48] *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulfur Oxides and Particulate Matter, Technical Support Document,* U.S.EPA, EPA-420-R-09-007, April 2009

[49] Ibid. *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulfur Oxides and Particulate Matter, Technical Support Document,* U.S.EPA, EPA-420-R-09-007, April 2009

[50] Mexican Secretariat for Transportation and Communication press releases and video, October 21, 2014.

http://www.sct.gob.mx/despliega-noticias/article/ratifica-mexico-adhesion-al-convenio-de-la-omi-para-prevenir-contaminacion-por-buques/

http://www.sct.gob.mx/uploads/media/COMUNICADO-296-2014.pdf

http://new.livestream.com/accounts/4426843/events/3393947

EPA and SEMARNAT, Mexico's environment ministry, have developed a work plan and a Memorandum of Understanding to ensure long-term collaboration on this work.[51] The MOU was signed in September 2012 to support bilateral environmental cooperation on aquatic and coastal ecosystems, including the ongoing work to develop a Mexican ECA proposal. In addition, the US, Mexico and Canada are also working trilaterally in the North American Free Trade Agreement's Commission for Environmental Cooperation (CEC). The CEC work supported the initiation of the technical analyses for a Mexican ECA and builds upon EPA-sponsored studies described above. The ongoing CEC work is not sufficient to complete the required analytical work for an IMO proposal.

EPA believes that the resources and work products provided through the RESTORE project will build upon the work conducted to date and in fact lead to a Mexican ECA.

Implementation methodology

The modeling study will be conducted in three somewhat overlapping phases that are designed to provide the most critical information needed for the Mexican ECA proposal first, while also planning for additional important analyses and outreach. The first phase will consist of air quality, ecosystem and human health impact modeling with a view to establishing a benefit cost assessment for reducing ship emissions for use in a Mexican ECA proposal to the IMO (June 2015 – June 2016). The second phase will determine Gulf-wide basin benefits of a Mexican ECA and will begin to address key questions about the contribution of atmospheric deposition to marine inputs in the Gulf (April 2016 – April 2017). The high resolution models to be employed through this project will produce accurate quantitative projections of air quality, water quality, ecosystem and health benefits per unit of reduction in sulfur dioxide and nitrogen. The third phase will be an outreach and education effort to provide study results and information to key Gulf stakeholders, such as the public, Tribes, Federal and State agencies, and academia (May 2016 – May 2017).

To ensure a rigorous scientific analysis, the modeling conducted in this study will follow EPA methods, used in the North American ECA study to determine the adequacy of chosen modeling methodologies.[52] By relying on proven modeling methodologies, standard EPA quality assurance and control of the modeling[53] to verify model performance in predicting impacts and EPA's Scientific Integrity Policy, the project will be conducted under rigorous performance criteria, monitoring, and other mechanisms to generate accurate and reliable results.

EPA's Guidance for Quality Assurance Project Plans for Modeling outlines a two-step process to ensure the success of modeling projects utilizing existing models. The first step is to use systematic planning to determine modeling needs and project-specific requirements and select the existing models to achieve these needs. The purpose, objectives and output specifications are determined and the associated quality objectives and performance criteria are selected. EPA aims

[51] *Memorandum of Understanding between the Environmental Protection Agency of the United States of America and the Ministry of Environment and Natural Resources of the United Mexican States Concerning Environmental Cooperation in Coastal and Aquatic Ecosystems*, signed September 28, 2012.

[52] Gilliam, R. C., W. Appel, and S. Phillips. The Atmospheric Model Evaluation Tool (AMET): Meteorology Module. Presented at 4th Annual CMAS Models-3 Users Conference, Chapel Hill, NC, September 26 - 28, 2005.

[53] *Guidance for Quality Assurance Project Plans for Modeling*, U.S. EPA, EPA/240/R-02/007, December 2002.

to use the same or equivalent modeling approach as was employed in the NA ECA study.[54] Air quality and deposition modeling was conducted using the Community Multi-Scale Air Quality model.[55] Another air quality model that could be used that is comparable and often more widely used outside of the US is the Weather Research and Forecasting (WRF) Chem model.[56] Costs were estimated through human health benefits modeling using BenMAP[57] and fuel supply and demand modeling would be conducted using the World Oil Refining Logistics and Demand (WORLD)[58] model, which has been used by EPA and IMO to estimate fuel supply and demand.

The technical analyses in Phases one and two will apply the existing models or equivalent models as described above. The models are run, the output is tested and peer reviewed or verified with existing monitoring data or the results of comparable modeling analyses using the same models. The results are summarized and documented. Because the models used in the NA ECA study are well known, commonly used and constantly updated, the ECA study will refer to these ongoing efforts to improve and quality test these models.

Modeling results and data will be disseminated through outreach and education activities in Phase three. The modeling information will be provided to Mexican government officials. Information will also be provided to key, interested US Gulf stakeholders, such as States, academia, and NGOs. This outreach will build upon existing information dissemination mechanisms to the extent possible. For example, in the past, EPA study results on work with Mexico on ships have been disseminated through such mechanisms as the Coastal America Learning Center Network and EPA's web site.

The U.S. Environmental Protection Agency would lead this effort with assistance from interested partners, and has the technical and administrative capabilities to oversee performance study under high standards of scientific data gathering and analysis. EPA would seek to issue one or more contracts and grants to entities with locations in the Gulf and with the appropriate capacity to undertake the modeling study and conduct outreach.

The project would be a two year effort, commencing in the June of 2015 and ending in the May of 2017.

Measures of success

The project success will be monitored and measured via contracting oversight mechanisms and by setting clear project outcome and output goals and evaluating performance against these goals. Key outputs from this project will be modeling results, summary reports and outreach materials. Modeling results will quantify nutrient input and air pollutant reductions throughout

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[54] *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulfur Oxides and Particulate Matter, Technical Support Document,* U.S.EPA, EPA-420-R-09-007, April 2009

[55] US EPA. Community Multi-Scale Air Quality (CMAQ) model. CMAQ is an active open-source development model developed by the U.S. EPA that consists of a suite of programs for conducting air quality model simulations. CMAQ is widely used in the air pollution community in understanding and forecasting the magnitude of the air pollution issues and to develop air quality policies and programs. See: www.cmaq-model.org.

[56] National Center for Atmospheric Research. Weather Research and Forecasting (WRF) Model coupled with Chemistry. www2.acd.ucar.edu/wrf-chem

[57] US EPA. Environmental Benefits Mapping and Analysis Program (BenMAP). Developed by U.S.EPA, BenMAP estimates health impacts and economic benefits due to changes in air quality and can be used in U.S. and non-U.S. situations. See: www.benmap-model.org.

[58] Ensys Energy. World Oil Refining Logistics and Demand Model. www.ensysenergy.com/world.

the entire Gulf region achieved through a Mexican ECA. Key outcomes of the project will be the submission of a Mexican ECA proposal to the IMO and the subsequent establishment. The ECA, which Mexico would like to establish in 2017, will result in near-term, quantifiable reductions of pollutants. The project will also contribute to the understanding of the incremental human health and ecosystem benefits to the U.S. of reducing shipping emissions of ships traveling through a Mexican ECA. Additionally, a key outcome will be increased awareness of US Gulf stakeholders of the impact of ship emissions in the Gulf through conducting outreach and education activities.

Risks and uncertainties

The uncertainties and risks associated with this project are minimal, as the project is based on existing and proven modeling methodologies. This project has a very high likelihood of success in that it is technically feasible, and the project is strongly anticipated to remain within the proposed budget. The biggest risk is the remote possibility that the current proactive stance of the Mexican Government toward establishing an ECA changes. This project will build on the results of ongoing work and a network of engaged science and policy specialists in the US and Mexico.

The following activities are planned to minimize any risks related to the modeling study and the future action of the Mexican Government to establish an ECA. As with EPA's prior work on the NA ECA and with Mexico, the study will be conducted according to EPA's Scientific Integrity Policy and per EPA's modeling QA/QC procedures as described above in Section I. To support ongoing Mexican Government commitment to establishing an ECA, senior EPA officials are routinely promoting the establishment of a Mexican ECA with their counterparts and other key stakeholders in Mexico and the US.

The science advanced by this project, even if Mexico does not establish an ECA, will be helpful to the Gulf science and policy making community.

Outreach and education opportunities

Modeling results and data will be disseminated through outreach and education activities. As a priority, the modeling information will be provided to Mexican government officials. Information will also be provided to key, interested US Gulf stakeholders, such as States, academia, and NGOs. This outreach will build upon existing information dissemination mechanisms to the extent possible. For example, in the past, EPA study results on work with Mexico on ships have been disseminated through collaboration with the National Oceanic and Atmospheric Administration (NOAA) to provide information to the Coastal Ecosystem Learning Center Network (e.g., through videos at kiosks in the Veracruz Aquarium in Mexico and the Institute for Marine Mammal Studies in Mississippi) and EPA's web site.

Leveraging of resources and partnerships

This project provides opportunities to facilitate the formation of strategic partnerships and collaboration on innovative approaches to ecosystem restoration. It will involve cross-disciplinary experts and organizations throughout the Gulf in conducting and reviewing the ECA study analyses, as well as facilitating successful follow-up implementation of a Mexican ECA and communication of the benefits to the US Gulf populations and ecosystems. Potential partners

include the Commission for Environmental Cooperation, the Gulf research community, State governments, the maritime shipping, emission control and fuel industries, NGOs and Tribes.

Additional Project Benefits

This project will contribute to the scientific understanding of the Gulf ecosystem, including the conditions affecting restoration of natural resources and ecosystems. It will allow documentation of whether the Mexican ECA or other related restoration actions undertaken by the Council are effective. The modeling would also contribute to a baseline going forward, from which to evaluate success of the Mexican ECA in improving Gulf water quality and ecosystem health.

Modeling results can also contribute to be used by interested Agencies and States, such as NOAA or the Bureau for Ocean and Energy Management (BOEM) in fulfilling their priority activities with regards the Gulf of Mexico. Little is known about trends in the contribution of atmospheric deposition of sulfur and nitrogen to water quality changes, such as acidification and a nutrient enrichment in the Gulf. Knowing the extent of atmospheric contribution will assist decision makers in better targeting restoration activities and/or building partnerships with relevant stakeholders that can affect change in these areas.

Location Information

While the impact of a Mexican ECA is Gulf-wide, benefits will accrue to the communities within the RESTORE Council's established geographic boundary, as shown by the following figures.

This project will benefit the US Gulf of Mexico. It will conduct a modeling study to assess the benefits to the US Gulf, if Mexico establishes an ECA.

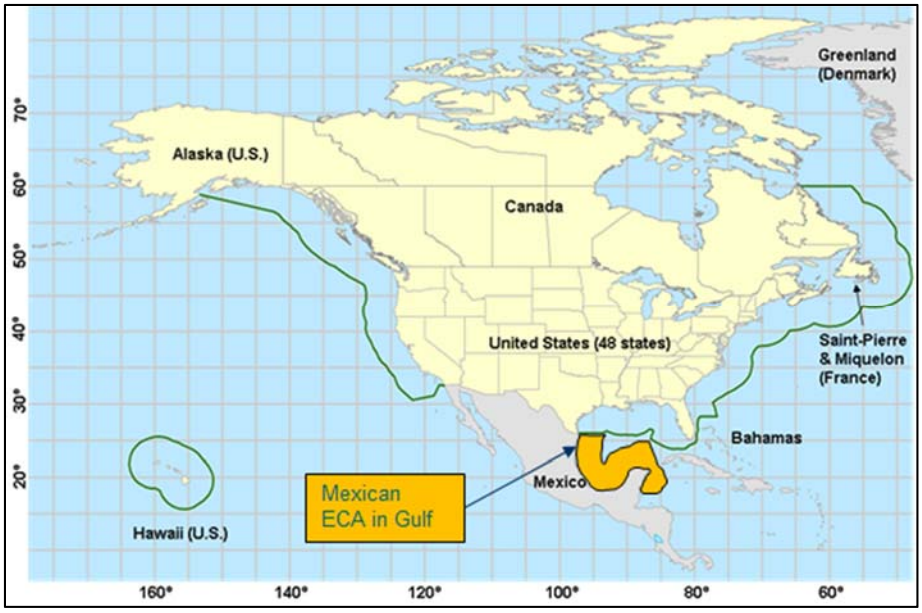

Figure 2: North American Emission Control Area Boundaries (Green Line) and a Potential Mexican ECA (Yellow Area) (Source: US EPA 2014)

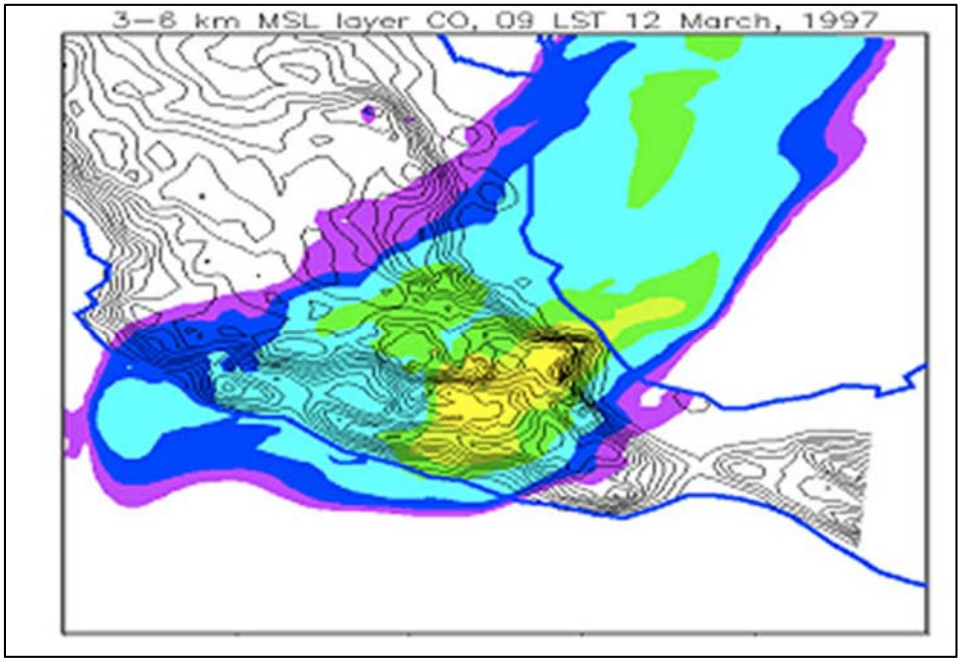

Figure 3: Historical air pollution modeling showing transport of land-side pollution from Mexico over the Gulf (Source: NASA Goddard Space Flight Center)

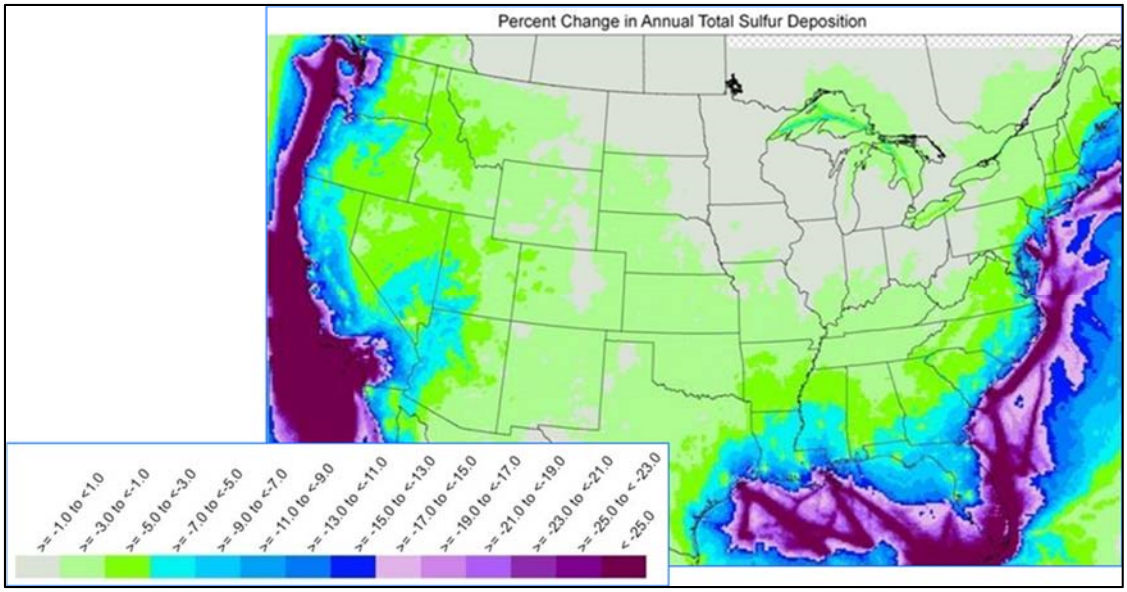

Figure 4: EPA atmospheric deposition modeling showing the percent change in annual total sulfur deposition due to the NA ECA – purple areas show a 25% reduction. (Source: US EPA 2009)

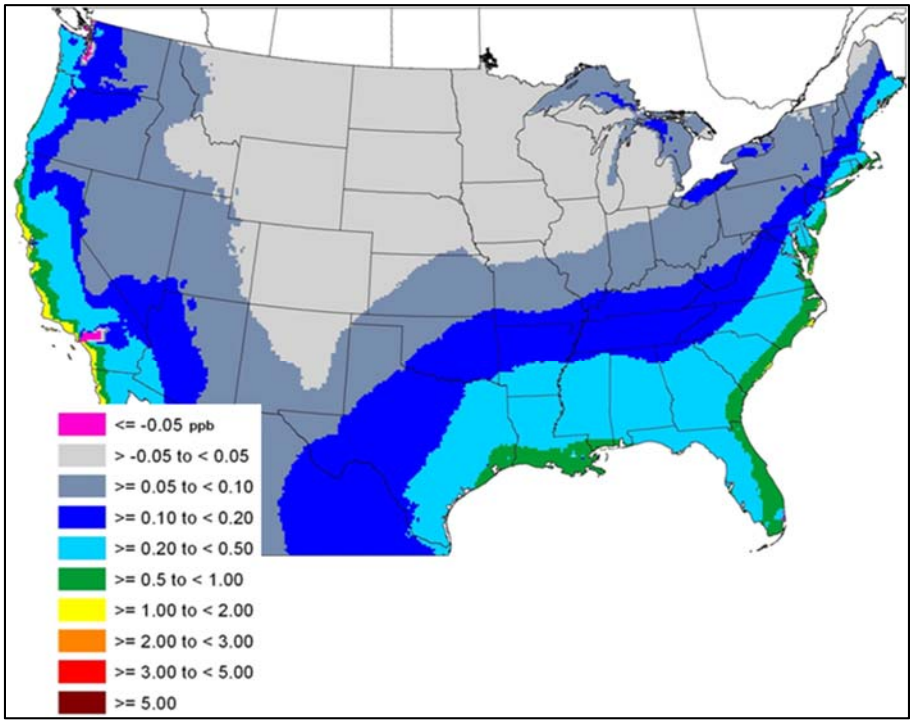

Figure 5: EPA air quality modeling showing the percent change in annual total ozone concentrations due to the NA ECA – impacts are seen far inland. (Source: US EPA 2009)

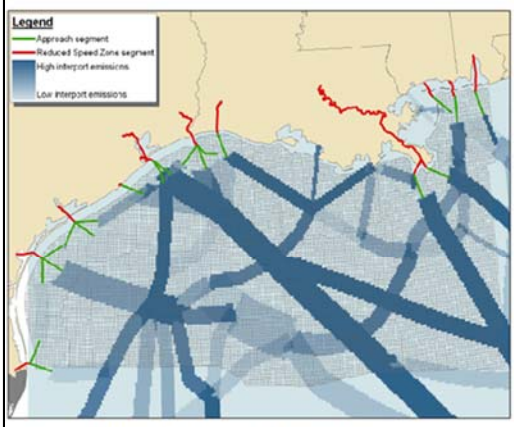

Figure 6-7. Commercial marine vessel shipping lanes.

Source: BOEM, 2008 Gulf-wide Emission Inventory Study Report

Table 8-8

Annual SO_2 Emission Estimates for All Sources

Equipment/Source Category	SO_2 Emissions (tpy)
Commercial Marine Vessels	49,009
Support Vessels	18,221
Drilling Rigs	7,772
Pipelaying Operations	1,789
Military Vessels	1,409
Commercial Fishing Vessels	988
Diesel Engines	711
Vessel Lightering	397
Support Helicopters	275
Drilling Equipment	260
LOOP	219
Survey Vessels	204
Natural Gas Turbines	21
Natural Gas Engines	15
Boilers/heaters/burners	8
Amine Units	3
Combustion Flares	2
Total Emissions (tpy)[a]	81,304

[a] Totals may not sum due to rounding.

Figure 6: BOEM modeling shows that ships are a significant source of SO2 emissions in the Western Gulf. (Source: BOEM 2010)

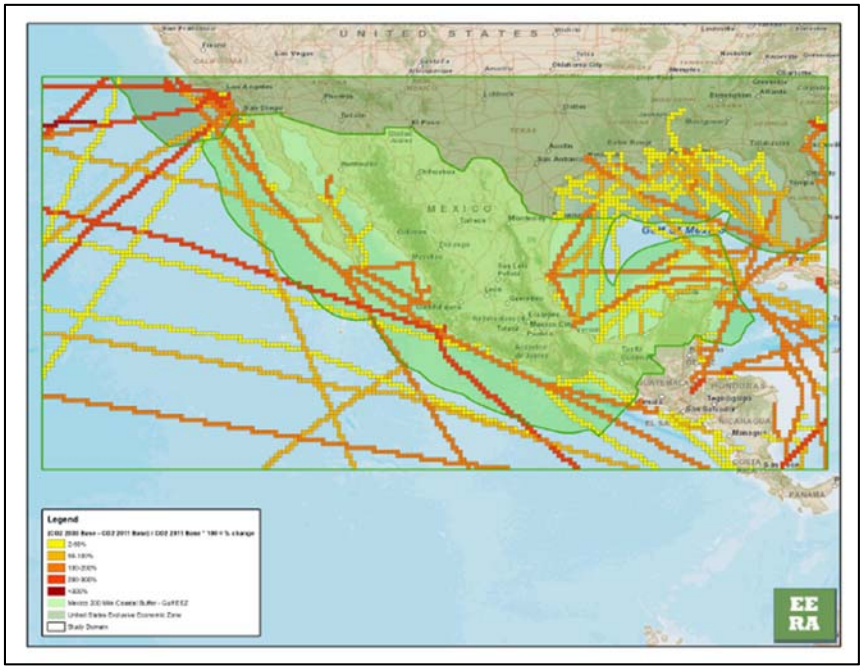

Figure 7: Percent change (increase) by 2030 (baseline 2011) in energy use and/or CO2 emissions attributed to growth in shipping within the Mexican modeling domain – depicted by the green box – red is a 300 percent increase, dark orange a 200 % increase, orange is a 50-100% increase, yellow is a 2-50% increase (Source: Corbett, December 2012)

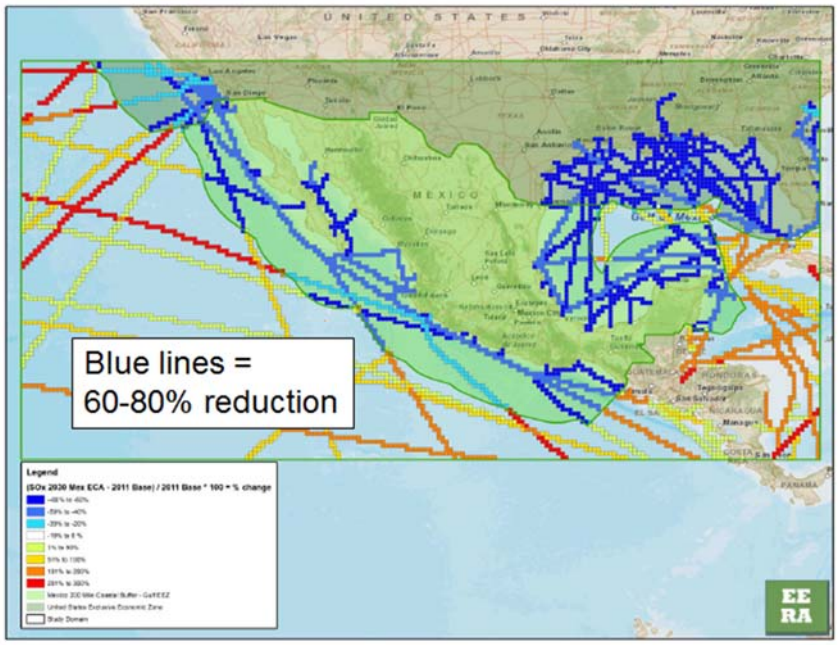

Figure 8: Percent change (increase in warm colors, decrease in cool colors) in SOx emission with a US and a Mexican ECA in 2030 (Source: Corbett, December 2012)

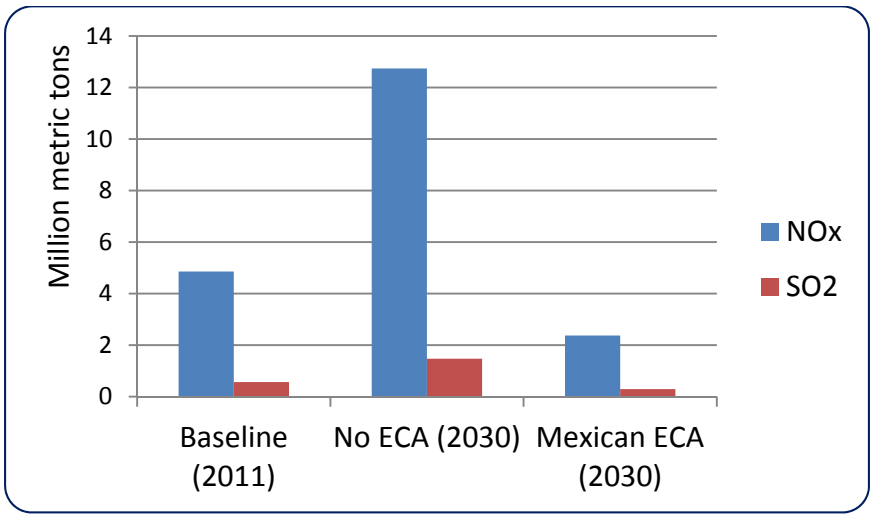

Figure 9: Change in emissions from baseline in a "No Mexican ECA" versus a "Mexican ECA" scenario. Note: these data pertain to Pacific and Gulf emissions reductions (Source: Corbett, December 2012)

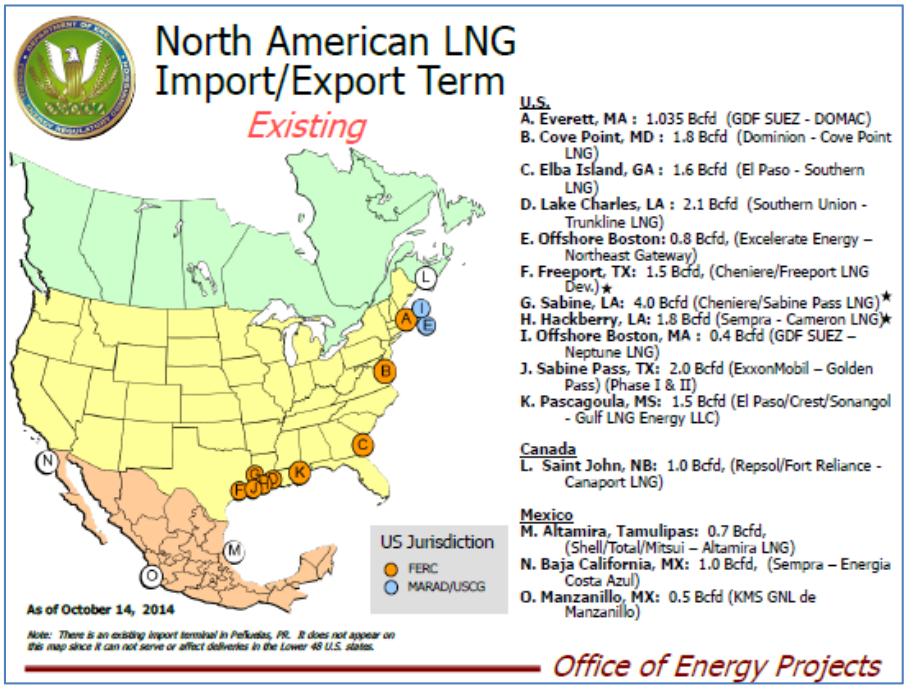

Figure 10: North American LNG Import/Export Terminals (Source: Federal Energy Regulatory Commission

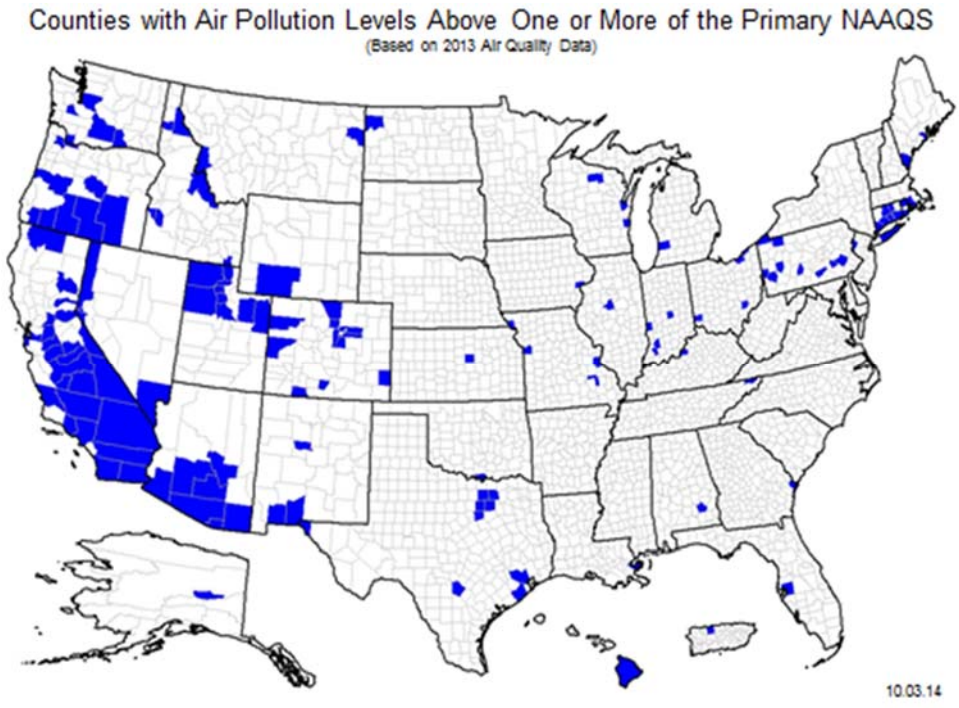

Figure 11: Counties with air pollution levels above NAAQS (Source: US EPA Office of Air and Radiation, October 3, 2014)

High-Level Budget Narrative

EPA is requesting funds from the RESTORE Council to conduct the ECA Modeling Study over two years starting in the June 2015 and ending in the May 2017. The funds will be obligated through one or more possible contract and grant mechanisms with partners with the required expertise and with locations in Gulf States. The Clean Water Act (CWA) 104(b)(3) allows EPA "to make grants to State water pollution control agencies, interstate agencies, other public or nonprofit private agencies, institutions, organizations, and individuals" for the following purposes, which are listed in CWA 104(a)(1): research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of pollution. The Clean Air Act (CAA) 103(b)(3) gives EPA similar grant making authority for CAA purposes. EPA will provide in-kind the staff resources to manage the contractual and grant project management workload. EPA will require limited travel funds for project management purposes.

Use of the ECA modeling study in Mexico's application to the IMO and subsequent establishment of an ECA would result in significant water quality, health, economic and science benefits and a high cost benefit ratio for the RESTORE funds invested compared. Based on experience with the NA ECA, where the benefit cost ratio of health costs averted versus the cost of compliance is as large as 90:1, we would conservatively estimate a smaller but still very positive return on the Council's investment to impact public health. The project also builds on past and current in-kind and financial contributions of the Environmental Protection Agency, the Mexican Government and the Council on Environmental Cooperation, estimated to be at least $ 1 million dollars. The project also significantly advances the scientific understanding of trans-boundary atmospheric marine inputs and impacts independent of any action on the part of Mexico to establish an ECA.

> **Project Implementation Funds: $2M for two years** to be obligated to a three-phase project consisting of modeling for the Mexican ECA, assessment of benefits of a Mexican ECA to the US Gulf, and an outreach and education program. The modeling study will be conducted by partners with locations in the Gulf States, where possible and expertise is available, and with results delivered to the Mexican Government and RESTORE Council members. This funding level may be scaled based on funding availability.
>
> **Contractual:** ***$1.995 million (includes contractor hours, fees, overhead)*** The project has three phases: phase 1 (Mexican ECA technical analyses) -- $ 1 million; phase 2 (US Gulf Benefits Assessment) - $ 800,000; phase 3 (outreach and education - $ 195,000). The contractor will conduct air quality modeling, human health and ecosystem benefits modeling. Funds will also support the sharing of data, development of reports and other materials for information dissemination, such as for outreach and education.
>
> **Travel:** ***$ 5,000*** Project Management and Oversight (one trip to Mexico to present the results -- $2,500; two trips to the Gulf from DC to manage the project contractor, one trip to launch, one trip to obtain interim results – each trip cost $ 1,250)

Total Program Request: $2 million for 2 years (The project is fully scalable, subject to availability of funds)

Environmental Compliance Checklist

Please check all federal and state environmental compliance and permit requirements as appropriate to the proposed project/program.

Environmental Compliance Type	Yes	No	Applied For	N/A
FEDERAL				
National Marine Sanctuaries Act (NMSA)		X		
Coastal Zone Management Act (CZMA)		X		
Fish and Wildlife Coordination Act		X		
Farmland Protection Policy Act (FPPA)		X		
NEPA – Categorical Exclusion		X		
NEPA – Environmental Assessment		X		
NEPA – Environmental Impact Statement		X		
Clean Water Act – 404 – Individual Permit (USACOE)		X		
Clean Water Act – 404 – General Permit(USACOE)		X		
Clean Water Act – 404 – Letters of Permission(USACOE)		X		
Clean Water Act – 401 – WQ certification		X		
Clean Water Act – 402 – NPDES		X		
Rivers and Harbors Act – Section 10 (USACOE)		X		
Endangered Species Act – Section 7 – Informal and Formal Consultation (NMFS, USFWS)		X		
Endangered Species Act – Section 7 - Biological Assessment (BOEM,USACOE)		X		
Endangered Species Act – Section 7 – Biological Opinion (NMFS, USFWS)		X		
Endangered Species Act – Section 7 – Permit for Take (NMFS, USFWS)		X		
Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) – Consultation (NMFS)		X		
Marine Mammal Protection Act – Incidental Take Permit (106) (NMFS, USFWS)X		X		
Migratory Bird Treaty Act (USFWS)		X		
Bald and Golden Eagle Protection Act – Consultation and Planning (USFWS)X		X		
Marine Protection, Research and Sanctuaries Act – Section 103 permit (NMFS)		X		
BOEM Outer Continental Shelf Lands Act – Section 8 OCS Lands Sand permit		X		
NHPA Section 106 – Consultation and Planning ACHP, SHPO(s), and/or THPO(s)		X		

Environmental Compliance Type	Yes	No	Applied For	N/A
NHPA Section 106 – Memorandum of Agreement/Programmatic Agreement		X		
Tribal Consultation (Government to Government)		X		
Coastal Barriers Resource Act – CBRS (Consultation)		X		
		X		
STATE		X		
As Applicable per State		X		

Data / Information sharing plan

Project specific data and or monitoring data will be gathered and will be available for sharing among RESTORE Council members and other interested parties. Ultimately, project partners will work together to identify the most efficient data sharing methodologies and reporting mechanisms.

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ELIGIBILITY REVIEW

Bucket 2 – Council Selected Restoration Component

PROPOSAL TITLE

Gulf-Wide Pollutant Reduction and Water Quality Initiative: Modeling for a Mexican Emission Control Area

PROPOSAL NUMBER

EPA-1

LOCATION

Potentially all counties and parishes within the Gulf Coast region

SPONSOR(S)

Environmental Protection Agency

TYPE OF FUNDING REQUESTED (Planning, Technical Assistance, Implementation)

Implementation

REVIEWED BY:

Bethany Carl Kraft

DATE:

November 18, 2014

1. Does the project aim to restore and/or protect natural resources, ecosystems, fisheries, marine and wildlife habitat, beaches, coastal wetlands and economy of the Gulf Coast Region?

(●) YES ( ) NO

Notes:

This modeling study will consist of air quality, ecosystem and human health impact modeling with a view to establish a cost-benefit assessment for reducing ship emissions through a Mexican ECA proposal and also to assess the benefits to the Gulf.

2. Is the proposal a project?

(●) YES ( ) NO

If yes, is the proposed activity a discrete project or group of projects where the full scope of the restoration or protection activity has been defined?

(●) YES ( ) NO

Notes:

3. Is the proposal a program?

○ YES ◉ NO

If yes, does the proposed activity establish a program where the program manager will solicit, evaluate, select, and carry out discrete projects that best meet the program's restoration objectives and evaluation criteria?

○ YES ○ NO

Notes:

4. Is the project within the Gulf Coast Region of the respective Gulf States?

◉ YES ○ NO

If no, do project benefits accrue in the Gulf Coast Region?

○ YES ○ NO

Notes:

Funds are being requested to conduct the ECA modeling study, which will be conducted by partners with locations in the Gulf States.
Note: The ECA is outside the Gulf Coast region of the respective Gulf States
Note: The study area is outside the Gulf Coast region

Eligibility Determination

Eligible

Additional Information

Proposal Submission Requirements

1. Is the project submission overall layout complete? ***Check if included and formatted correctly.***

A. Summary sheet	☑	F. Environmental compliance checklist	☑
B. Executive summary	☑	G. Data/Information sharing plan	☑
C. Proposal narrative	☑	H. Reference list	☑
D. Location information	☑	I. Other	☐
E. High level budget narrative	☑		

If any items are NOT included - please list and provide details

Location info does not include where the activities proposed will occur (eg. where the modeling will take place). It does identify where benefits after implementation are expected to accure and identifies the proposed ECA.

2. Are all proposal components presented within the specified page limits (if applicable)?

◉ YES ○ NO

Notes: