Energy Efficiency, Renewable Energy and Transportation: Project Opportunities in the U.S. – Mexico Border Region

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SECTION 1: INTRODUCTION

This white paper describes the current deficit in the U.S.-Mexico border region in terms of renewable energy, energy efficiency, and transportation projects focused on the reduction of greenhouse gases (GHG). In the presentation, the argument is made that the primary reason this project deficit exists is due to:

1. limited resources for project development,
2. lack of capacity building, at the most fundamental level, in the public and public-private sectors, and
3. lack of technical assistance program to address this deficit

Specifically targeting a technical assistance program for renewable energy, energy efficiency, and transportation projects to achieve GHG reductions would be invaluable in promoting an environment for effective climate action in border communities. A proposed technical assistance program could help public sector entities build the bases on which they can develop both mitigation and adaptation greenhouse gas projects.

Mitigation projects are the priority of the program since they are intended to directly reduce greenhouse gas emissions. Adaptation projects are important as well, and it is recommended they be developed as "capacity building" initiatives to assist municipalities better manage the current realities of climate change. Ultimately, these project types do need technical assistance funds, and the funds will need a highly capacitated and experienced program manager.

The most important activities carried out in the development of this white paper were the interviews with numerous state environmental, energy and transportation border agencies of the U.S. and Mexico. The interviews were held between December 2010 and May 2011. The information obtained from these interviews provides the general market of project opportunities analysis in the region.

SECTION 2: UNDERSTANDING THE REGION

U.S.-Mexico Border Context

The U.S.-Mexico border region for the purposes of this white paper extends 100 kilometers to the north of the border from California to Texas, and 300 kilometers to the south from Baja California to Tamaulipas. This region encompasses portions of 10 states, of which six are in Mexico and four are in the U.S. As a region, it has developed a significant identity through the cultural, historical, economic, and environmental commonalities it shares unto itself. The commonalities linking the two countries are crucial to understanding and appreciating the U.S.-Mexico border context.

Although the region is economically distressed, the northern Mexico border zone is considered more developed than most parts of Mexico, and the southern U.S. border zone is one of the poorest regions in the country. The economic drivers to migrate north are still considerably strong since wages are higher in the U.S. border compared to the Mexico side of the boundary.[1]

Growth in Mexican border-states increased from 18.19 million in 2005 to 19.9 million in 2010, a 9.4% growth rate. While this is primarily an urban population, there are 44,000 population centers of which only 82 have more than 10,000 inhabitants[2]. This indicates an enormous rate of dispersion and significant challenges in providing the most basic infrastructure for a dignified life.

On the American side of the border, there are 47 counties in 4 states, with a population of 14 million according to the 2010 Census. Of this total, 2.2 million, or 16.3%, live under the poverty level. The population growth for the four border-states went from 61.67 million in 2000 to 70.85 million in 2010, a 14.9% growth rate.

The GDP of the bi-national border region is equivalent to 23.7% of the combined GDP of Mexico and the U.S.[3]. Even considering the combined GDP of the border region, there is still considerable disparity between both countries, which to remedy will require substantial financial investment, including in many U.S. communities.

Utilizing 2007 figures, for the 47 U.S. border counties, the median household income was $38,840, which is $18,189 below the national average of $55,029[4]. Meanwhile for Mexican border municipalities, the median household income was $8,025[5], which is $30,810 below their U.S. county counterparts.

Considering the tremendous population growth pressures since the early 1990's, communities on both sides of the border have co-existed under similar economic and environmental challenges. And when you view the two sides as one region, it is clearer to see the challenges that have been experienced by border communities in both countries, especially in the arena of environmental infrastructure.

The environmental problems caused by shared watersheds and air sheds along the border have been exacerbated due to limited resources and institutional capacity to develop appropriate planning studies and implement beneficial solutions.

[1] "At the Cross Roads: U.S./Mexico Border Counties in Transition" U.S./Mexico Border Counties Coalition, March 2006.
[2] Source: *Censo de Población y Vivienda* 2010 INEGI.
[3] Basurto Álvarez Rodolfo (2007).- "El Modelo Sub-regional de la Frontera Norte.- in *Revista de la Universidad de Sonora*. Pp. 8-11.
[4] Source: U.S Census Bureau web page.
[5] Source: Calculated by BECC in 2008 with data from INEGI.

Border State Climate Change Activities

Until the creation of the Border Environment Cooperation Commission (BECC) and the North American Development Bank (NADB) in 1993, there had not been a bi-national institution dedicated to solving environmental infrastructure problems and needs for border communities. To date, the priority focus of both institutions is on developing high-quality environmental infrastructure in water, wastewater, and solid waste to improve the environmental and living conditions of border residents.

While the BECC and NADB have made significant strides in improving the basic infrastructure needs of many border communities, there is a growing concern by these same communities, and their respective states, in developing solutions for their contributions to climate change as municipios, cities, counties, state governments and federal agencies. Examples of these concerns were documented in a 2010 Arizona State University survey of border communities that identified their views regarding climate change.

The Environmental Protection Agency (EPA) and the *Secretaría de Medio Ambiente y Recursos Naturales* (SEMARNAT) Border 2012 Program is a financing mechanism to develop projects that address environmental problems, among them green house gas reduction projects.

A leading example of this new interest by state governments has been a technical assistance initiative with the six Mexican states, facilitated and funded by the BECC and in collaboration with the Center for Climate Strategies, the *Instituto Nacional de Ecología* (INE), and SEMARNAT, in which statewide greenhouse gas (GHG) inventories were developed. Those inventories were completed in June 2010 and, as of late 2011, the BECC with Border 2012 funds assisted the states of Baja California, Sonora and Coahuila in the process of developing a stake holder based State Climate Action Plan. Currently the only state to have a climate action plan is Nuevo Leon.

Figure 1 presents the distribution of GHG emissions by Mexican border-states which are detailed in the Greenhouse Gas Emissions State Inventories and Reference Case Projections 1990-2025.

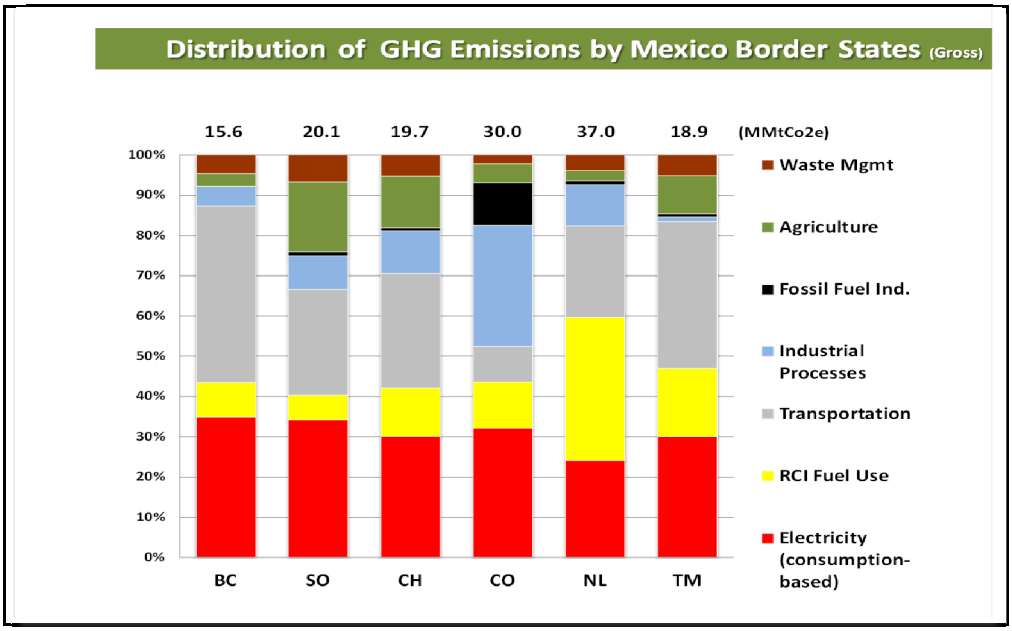

Figure 1: Distribution of GHG Emissions by Mexican Border States in 2005

On the U.S. side of the border, three of the four states have completed greenhouse gas inventories and action plans.[6] The states of Arizona, New Mexico, and California are pursuing various GHG reduction targets through a range of voluntary and mandatory efforts. Figure 2 presents the U.S. border-states GHG emissions taken from each states climate action plan. The Texas emissions data was developed by the Houston Advanced Research Center as part of a study and is intended only as an estimate as a more comprehensive state GHG inventory is needed.

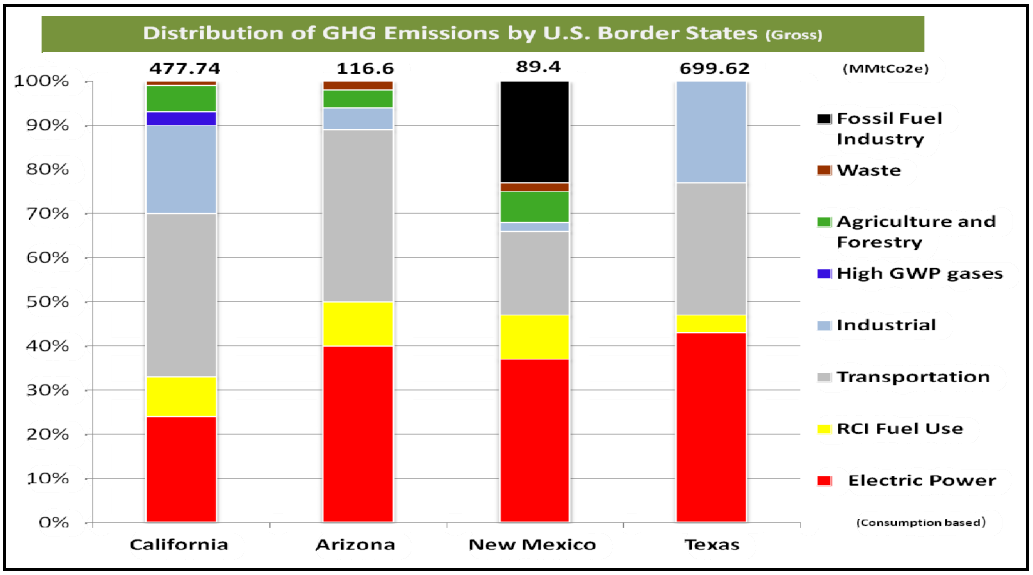

Figure 2: Distribution of GHG Emissions by U.S. Border States

[6] U.S. border state climate action plans were completed for Arizona and New Mexico in 2006 and for California in 2008.

Arizona's GHG Reduction Goals.

In Arizona, electricity use and transportation are the principal GHG emissions sources. Together, these two sectors accounts for nearly 77% of the state's gross GHG emissions. The remaining emissions come from fossil fuel use in the residential, commercial, and industrial sectors (11%); agricultural activities (5%); industrial processes (5%); and landfills and wastewater management facilities (2%).

Early action and an aggressive approach to reduce Arizona's GHG emissions to 2000 levels by 2020 are policy recommendations of the state's Climate Change Advisory Group (CCAG). Preliminary analysis suggests that in 2000, Arizona emitted approximately 80 MMtCO2e of net GHG emissions. The Advisory Group recommended 49 policy options to reduce GHG emissions by more than 69 MMtCO2e in 2020.

The recommendations recognize that significant GHG reductions are associated with energy efficiency and the use of renewable energy in the residential, commercial, and industrial sectors and by increasing the use of cleaner transportation technologies and fuels. In addition, reducing Arizona's GHG emissions would likely result in significant economic benefits for the state, green job creation and increased economic development opportunities. Between 2007 and 2020, the overall net economic cost savings from the CCAG's recommendations are estimated at $5.5 billion.

New Mexico Greenhouse Gas Reductions.

The New Mexico Climate Change Advisory Group (CCAG) recommended GHG reductions of 35.4 MMtCO2e by 2020. It also recommended 69 policy options to help meet the state's GHG reduction goals. The recommendations are projected to create net economic savings of over $2 billion for the state's economy over the period 2007-2020. Some of the policy options are centered in demand side management, energy efficiency and integrated resource planning, transit oriented development, and truck stop electrification and anti-idling projects.

The production of electricity and fossil fuels accounts for the majority of New Mexico's gross GHG emissions from power plants and electricity (63%); other sector emitters include transportation (17%); use of fossil fuels and in residential, commercial and industrial processes (11%), and the remaining 9% are emitted in agriculture and waste.

Given that New Mexico is an exporter of energy, of the state's estimated 83 MMtCO2 of gross GHG emissions in 2000, about one third was associated with energy production in excess of the state's needs. Excluding this factor, of the remaining GHG emissions, 58% are associated with residential, commercial and industrial (RCI) energy consumption, 29% with transportation fuel use and 13% with agricultural and waste management. The high level of emissions associated with the RCI and transportation sectors point to energy efficiency and renewable energy in these sectors to reduce GHG and meet the state's goals.

California Scoping Plan

The State of California Scoping Plan calls for a reduction in California's carbon footprint to transform the state's economy into one that runs on sustainable technologies and green energy. The state proposes to reduce 80 MMTCO2e statewide to reach the goal of emitting 427 MMTCO2e by 2020. To meet the state's 2020 GHG reduction measures, recommended measures are concentrated in the transportation sector, energy efficiency and renewable portfolio standards.

Among the key elements of California's 29 recommendations for reducing its emissions by 2020 include expanding and strengthening existing energy efficiency programs as well as building and appliance standards; achieving a statewide renewable energy mix of 33 percent; developing a cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system and establishing targets for transportation-related GHG emissions. The measures to address climate change also provide for investment in building new green technology, which produces jobs at a higher rate than investments in comparable conventional technologies, and a wide range of additional public health and environmental benefits. By 2020, the economic value alone of the additional air-quality related benefits are projected to be on the order of $4.4 billion.

Texas GHG Inventory

The State of Texas has not developed a comprehensive GHG inventory, and the inventory it developed was completed in 2002, which has limited relevance at this point in time.

GHG Emissions in the Border

In order to comprehend the border environmental context pertaining to greenhouse gases, it is beneficial to understand the key contributors to GHG emissions from border-states. According to a May 2009 review conducted by Ross & Associates for the EPA of GHG inventories from Arizona, New Mexico, California, Baja California, and Sonora the leading emission sectors (in order of significance) are: non-transportation energy use, transportation energy use, industrial processes, agriculture, waste management, and forestry/land use. [7]

Within the larger set of sectors, there are ten key emission sources that are generally responsible for the majority of emissions in these five border-states. The top ten key emission sources are: electricity production, residential/commercial/industrial energy use, transportation (gasoline cars and trucks), transportation (diesel trucks), fossil fuel industry, cement industry, agriculture (organic decomposition processes), agriculture

[7] "U.S.-Mexico Border Region Greenhouse Gas Inventories and Policy" Ross & Associates, May 2009: p. 2.

(soil use/management), municipal solid waste management/landfills, and wastewater management.[8]

The Ross and Associates report was the first effort to comprehensively analyze the border region's GHG emissions profile and contribution sources. Border-states and communities are beginning to move forward on tangible efforts through projects and policies that begin to reduce their respective GHG footprints to the extent they can. That situation, however, is hampered by limited resources to develop projects and build institutional capacity. Within this context, the border region has a common set of challenges to progress on GHG reduction, but also has a set of extraordinary opportunities with a BECC technical assistance program and project funding from the NADB.

SECTION 3: LIMITED PROJECT DEVELOPMENT RESOURCES

Mitigation and Adaptation: GHG Reduction Project Types

To understand the larger picture, we must focus on the process surrounding GHG inventories and action plans. It is here where most projects that begin to reduce the public sector's contribution to GHG emissions are identified and developed. Much of that process is then translated to project-level activity at both the state and the local level in cities and municipios, regional air districts and wastewater utilities.

There are two broad categories in climate action: mitigation and adaptation. Mitigation projects are directly focused on reducing the amount of carbon produced (i.e. switching from fossil fuel sources to renewable energy sources), while adaptation is a longer-term process to prepare for the climate change impacts that cannot be avoided through mitigation. Mitigation deals with avoiding further future climate change, and adaption focuses on engaging current and near-term impacts of climate change.

The primary projects that the public sector can focus its development efforts on to reduce emissions are in renewable energy, energy efficiency and transportation, and in this white paper these sectors will be referred to as the focus sectors. And the priority category to reduce emissions will be mitigation. However, it is important to highlight adaption projects that can be prioritized by the public sector.

Adaptation projects are important to consider in the border region due to arid conditions and ever-shrinking water supplies (surface and groundwater). Adaptation projects are important in the context of environmental justice due to a priority to protect the most vulnerable populations in communities. A detailed analysis of the projects listed in Table 1 has not been conducted as part of this white paper, but a next step would be to see which projects and or measures could be applicable in border-

[8] "U.S.-Mexico Border Region Greenhouse Gas Inventories and Policy": p. 7.

states based on cost, benefits, and priorities. However, as mentioned previously the primary focus of this white paper was on mitigation projects and their technical assistance needs.

Table 1: Sample List of Public Sector Adaptation Projects

Project Sector	Examples of Adaptation Measures
Human Health	• Public health programs including training, surveillance, and emergency response to diseases exacerbated by climate change • Urban tree planting due to moderate temperature increases
Coastal Areas and Sea Level Rise	• Developing plans for shore protection through dikes, bulkheads, beach nourishment, and natural areas • Improve early warning systems and flood hazard mapping for storm surge zones
Ecosystems and Wildlife	• Protecting migration corridors to allow species safe migration as climate changes • Identify management practices that will ensure the attainment of conservation goals
Water Resources	• Improving water use efficiency and planning for alternative water resources (i.e. treated wastewater and desalinated seawater) • Conserving soil moisture through mulching from green waste programs at municipal level • Protecting coastal freshwater from saltwater intrusion
Waste Management	• Develop "green waste" programs for mulching and compost • Implement recycling programs of inorganic waste to reduce raw material consumption and promote reuse of materials as a less energy intense feedstock commodity
Energy	• Increasing energy efficiency to offset increases in energy consumption • Protecting power generation facilities against extreme weather events • Diversifying power supply in the event of power plant failures due to excess demand created by extreme heat, or by extreme weather events

A Resource Deficit

One of the largest challenges for any local entity responsible for mitigation and adaptation is the availability of adequate resources for project development. These sectors are not dissimilar to traditional water, wastewater, and solid waste. Project screening, planning, feasibility studies, environmental review, and designs are essential project development activities, and frequently limited funding inhibits many worthy projects from proceeding through development to implementation.
It is advisable to have a source of technical assistance funding exclusively dedicated to the clean energy, energy efficiency, and transportation sectors specifically targeted to projects in the U.S-Mexico border region. The lack of a program has only exacerbated the challenging situation of border public entities that are interested in developing these types of projects. Additionally, border communities and public entities many times lack the capacity to develop, implement, and manage innovative energy or transportation projects. They lack the basic knowledge of these sectors just as many communities did in water when the BECC and NADB began developing water and wastewater projects in 1995.

Considering the resource deficit for project development and capacity building in the border region, progress on energy and greenhouse gas management is a great challenge. Border communities will have difficulties committing to these new sectors without financial resources to assist them resulting in fewer projects, fewer GHG emission reductions, and fewer "green" jobs being developed. What that means for border communities are – limited resources equal limited opportunities.

Energy and GHG Management Efforts

The concept and practice of energy and greenhouse gas management by a *municipio*, city or county is still a relatively new concept. Border residents expect that water and wastewater services are provided efficiently and effectively by the public sector and the public sector is realizing that they are also responsible for their role in energy management as a result of their respective operations (i.e. water treatment, transportation, public facilities, etc.).

Additionally, the interest in responsible energy management is being driven not only by a desire to reduce energy consumption to save limited financial resources, but also for offsetting forms of greenhouse gas emissions primarily from fossil fuels. This is a growing dynamic that is both voluntary (Mexico border state GHG action plans) and mandatory (AB 32 and SB 375 in California) in border-states.

An example of this dynamic is the initiative by the State Energy Commission of Baja California, calling for the state government to self-impose a renewable portfolio standard to require by 2013 that 50% of all electricity used by the state government

originate from renewable sources. In order to accomplish this, the state is developing a 77MW wind energy project. The current state government carbon footprint is estimated at 116,395 tons of CO2 annually, which after the wind energy project's implementation in 2012 will reduce the annual carbon footprint by 97,334 tons of CO2.[9]

The Range of Opportunities

Within the clean and efficient energy and transportation sectors, there is a broad range of opportunities that public sector entities can develop and implement. That effort can be part of an energy management plan, transportation mobility plan, or projects identified under a larger umbrella-type greenhouse gas management plan. It can also include education and awareness-building initiatives such as school-level programs to educate students about climate change, its regional impacts, and what they can personally do to have a positive impact. No matter the source of the project opportunity, the border region has potential to sustain a variety of green projects that are viable not only their cost savings but their greenhouse gas reductions as well.

There is not a comprehensive renewable energy assessment of the border region. However, there is general knowledge about the resources and potential for particular renewable energy types. The most abundant source of energy in the border region is solar. Some of the best solar resources in North America exist in the western half of the border on both sides. Wind energy is a resource being sought out for development in the Baja California-California and Tamaulipas-Texas zones. Biomass energy potential exists in most border-states from either agricultural waste or municipal solid waste. Also, the potential for biogas-to-energy is broadly believed to be a next growth opportunity for municipalities either through anaerobic digesters at wastewater operations (not utilizing aerator systems) or methane production from landfill operations. There is no shortage of renewable energy resources that cannot be tapped by the public sector.

Energy efficiency is typically considered the first focus of an energy management plan. Public entities can develop many different types of projects from public street lighting replacement to public building retrofits to water pump replacement. In addition, energy efficiency has a built-in repayment source in the cost savings. Public entities can pursue projects considered in a 1-2 year simple payback period, or through 5-7 year payback cycle or longer. In either approach, the funding source in energy efficiency projects is arguably present within the project.

When it comes to transportation, highways and bridge construction is not the objective but rather the development and implementation of mobility systems that are efficient and focused on reducing air quality criteria pollutants and greenhouse gases. The types of projects that might be eligible would be bus rapid transit systems, expedited border

[9] Data provided by David Munoz Andrade, State Energy Commissioner for the State of Baja California. Interview conducted on February 7, 2011.

crossings for heavy-duty diesel vehicles, vehicle idling reduction and truck electrification programs at border crossings, light rail, bus fleet conversion to compressed natural gas (CNG), or implementation of efficient traffic patterns such as "right-turn only", which reduces idling times and alleviates congestion. These projects, much like renewable energy, are complex and have many components that many times challenge the technical and managerial capacity of border communities.

Developed Projects

In spite of limited technical assistance resources, there have been several project successes from the energy and transportation sectors that are worth mentioning. These projects were developed specifically as public sector and public-private partnerships so they are stellar examples of what can be accomplished when adequate development resources are made available for a project. Table 2 lists existing successful projects.

Table 2: Projects in U.S.-Mexico Border Region

Project and Location	Description
State of Baja California Wind Energy (La Rumorosa, Baja Ca.)	Project completed in 2010. The state of Baja California built 10MW wind farm to generate electricity for its own power needs. Total cost is approximately $26 million.
Monterrey Landfill Gas-to-Energy (Monterrey, Nuevo Leon)	First phase was completed in 2004. Project is a public-private partnership between the State of Nuevo Leon and a private developer. Landfill gas is used to generate 7MW of electricity that is sold to the Municipality of Monterrey, Metrorey (commuter light rail), and Servicios Agua y Drenaje (state water utility). Total cost is approximately $12 million.
El Paso Citywide Energy Efficiency (El Paso, Texas)	Project completed in 2009. Project is a public-private partnership between the city and JCI, an energy services company (ESCO). Project entails installation of 6,600 LED traffic lights, retrofits of 53 public buildings, and installation of thermal solar at 7 indoor pools. Total cost is $15 million
San Luis Rio Colorado Port-of-Entry (San Luis Rio Colorado, Sonora)	Project completed in 2010, was **BECC certified and NADB financed.** Project is a public-private partnership under a long-term concession agreement. Project entails providing a new port-of-entry for expediting truck traffic out of downtown SLRC and providing truck anti-idling electrification stations for trucks waiting in line. Total cost is $15 million.
San Diego Solar Power (San Diego, California)	Project to be completed by 2013. City of San Diego is partnered with SunEdison to develop 5MW of solar energy located on city facilities under a 20-year power purchase agreement (PPA). 2.3MW has been completed as of year-end 2010. The two largest projects to date are a 945kW system at Otay Mesa Water Treatment Plant and a 1.1MW system at Alvarado WTP. Cost: N/A

These are a sampling of successful projects that are engaging greenhouse gas reduction in direct and innovative ways for the public sector. These projects are by no means a comprehensive list, only a representative effort, to describe what has been done across the border region. The key to these projects' success was that they had access to sufficient technical assistance resources and the entity carrying out the project had sufficient capacity to develop and manage the projects.

Green Job Creation

An additional yet very important component of establishing a larger number of clean and efficient energy and transportation projects is that there will be job creation in the public and public-private sphere. Projects in the focus sectors do create viable and sustainable jobs that provide many positive economic benefits to border communities. For example, it is estimated that for every $1 million invested in energy efficiency projects potentially 13 jobs are created (short-term/direct installation and longer-term/equipment production jobs).[10] Energy efficiency is one of the most logical and practical sectors to invest public sector funds for economic and environmental reasons.

A very compelling 2008 study of job creation in California, conducted by Dr. Roland Holst, suggests that increases in disposable income related to energy savings for a household can be responsible for the creation of jobs. His analysis indicated that about 1.5 million full-time equivalent jobs with a total payroll of $45 billion were generated from energy efficiency savings of $56 billion in the 34-year period from 1972-2006. This was contained to the State of California, but it demonstrates the correlation between energy savings in dollars and jobs created from the investment made in energy efficiency.[11]

In the clean energy sector, there are several studies that estimate the number of jobs created by different types of renewable energy, but each uses different assumptions and methodologies and results vary widely.[12] The most relevant focus for our purposes is on short-term jobs (e.g. construction) and on-going jobs (e.g. operations and maintenance) that are created. Additionally, it is important to define the term "job-years." One job-year (''full-time equivalent'' FTE job) is full time employment for one person for duration of 1 year. Many times, ''jobs'' and ''job-years'' are used interchangeably; however, referring to ''jobs'' created without duration can be misleading.[13] This definition is a more comprehensive effort to include a time value for the job created as well as the job.

[10] Copenhagen Climate Council, Green Jobs and the Clean Energy Economy, p. 15.
[11] Copenhagen Climate Council, Green Jobs and the Clean Energy Economy, p. 16.
[12] These studies are explained and critiqued in "Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US?" by Max Wei and Daniel M. Kammen (Energy and Resources Group, University of California Berkeley) and Shana Patadia (Haas School of Business, University of California Berkeley), November 14, 2009.
[13] Wei, Patadia and Kammen provide a lengthy explanation of their methodology and why "job-years" provides the best basis for comparison, as opposed to "jobs" which are distributed among direct, indirect and induced jobs. November 14, 2009.

In Figure 3, the columns represent data from the Electric Power Research Institute (EPRI), which is considered to be one of the standard sources of data for the electricity industry. The numbers shown are the job-years per average megawatt of power output (MWa). The blue portions are the job-years created in construction, installation, and manufacturing (CIM), and the red portions are job-years created in the power plant's operation, maintenance, and fuel processing. Unfortunately, there are no convenient formulas to convert "job-years" to "jobs".

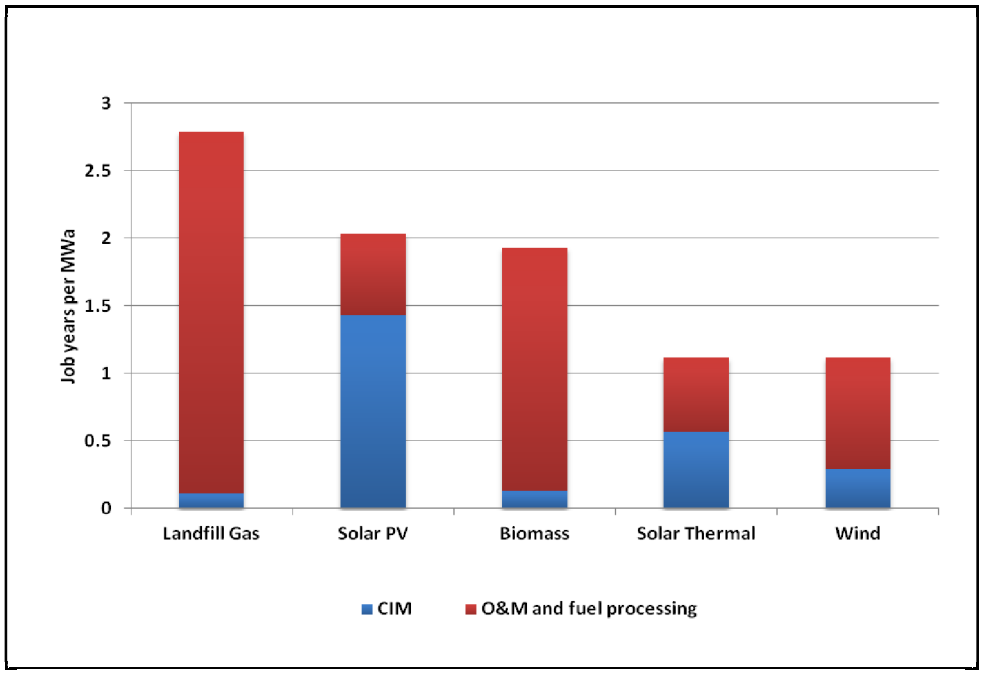

Figure 3: Jobs Created by Type Renewable Energy

Source: Electric Power Research Institute, 2001, as shown in report by Wei, Patadia, and Kammen

The trend demonstrated in Figure 3 is generally consistent with other reports on renewable energy job creation. Landfill gas and solar photovoltaic (PV) create the largest number of job-years per MWa. The primary difference is that landfill gas produces more long-term employment versus the short-term orientation of solar PV. Biomass and wind energy tend to have more long-term employment associated with those sectors. Clearly, the more long-term employment gains that can be realized by communities are preferable. However, whether the job-years associated are short-term or long-term, these five renewable energy sectors are the leading areas where the public sector could benefit in economic terms.

Transportation job creation that is focused on "public transit" tends to create jobs more directly linked to GHG reductions than jobs from new highway and bridge spending. It is estimated that spending on public transit versus highways and bridges creates 19% more jobs. Public transit covers bus and rail systems in general. According to research

done by the Economic Development Research Group, for every $1 billion spent on public transit there are 23,788 jobs created for capital expenses (production of buses and construction of facilities) and 41,140 jobs for operations spending (O&M for bus and rail systems).[14]

Additional tangential job creation comes from public transit investment. For example, it occurs along new bus rapid transit (BRT) routes since it spurs new economic development. That economic development comes in the form of new stores, restaurants, and multi-family housing along the new routes and the job creation related to these new commercial establishments. In addition, public transit provides a vital service in assisting many people without transportation access jobs at work sites all over a community, and in doing so through an environmentally beneficial (less GHG impact) and efficient manner (fewer vehicles on the road). [15]

The key point to emphasize when considering the opportunities of clean and efficient energy and transportation projects is that jobs are a powerful social benefit of the arrangement. The concept of green jobs is a new phenomenon in the U.S.-Mexico border region and they are part and parcel of sustainability efforts in the focus sectors. Many analysts would argue that the future of green jobs is not whether it will happen; it is rather how it happens and to what extent, and that it applies equally to the border region.

Border States Priority Projects

In developing this white paper, the most vital piece of work conducted was the interviews with U.S. and Mexico border state environmental, energy, and transportation officials. The information gained from these interviews provides a soft market analysis of project opportunities in the region. Also, and most importantly, the state governments helped with the outcomes of this white paper by conveying their perspectives and priorities, specifically related to clean and efficient energy and transportation. The following table lays out the priority projects by border state.

Table 3: Border States Priority Projects

State	Priority Projects
Baja California	• 77MW wind energy project for development/implementation in 2011-2012 • 21MW hydroelectric energy project for development/implementation in 2011-2012 • *Linea Verde* ("Green Line") 320 kilovolt power line dedicated to 100% renewable energy bi-national transmission from Baja California to California

[14] Center on Globalization and Competitiveness, Chapter 12 "Public Transit Buses", pp. 28-29.
[15] Center on Globalization and Competitiveness, Chapter 12 "Public Transit Buses", p. 28-29.

State	Priority Projects
Sonora	• Statewide public street lighting projects • Bus rapid transit (BRT) project in Hermosillo to cover three major routes within the city • Nogales waste-to-energy project
California	• Solar PV projects with smaller communities • Electric vehicle charging stations • CNG/propane-fuel switch for school bus fleets • Projects that improve regional mobility and land use planning as mandated by SB 375 intended to improve comprehensively the planning and design of transportation systems to reduce vehicular GHG emissions (CA Climate Plan) • Methane capture at municipal solid waste (MSW) facilities (CA Climate Plan) • High-level recycling and zero waste programs for MSW facilities (CA Climate Plan)
Arizona	• Municipal-level energy efficiency projects with public buildings, and water treatment plants • Transmission lines dedicated to renewable energy (solar and wind) to move from remote generation zones to populated centers • Community-level solar projects between 2-20MW size • Inter-community rail for Tucson to Nogales • Increase MSW recycling and waste reduction projects (AZ Climate Action Plan) • Purchase lower GHG emitting state vehicle fleet (AZ Climate Action Plan)
New Mexico	• Demand side energy management projects in public sector (NM Climate Action Plan) • Energy efficient building codes statewide (NM Climate Action Plan) • Solid waste recycling, source reduction, and composting programs per statewide mandate (NM Climate Action Plan) • Renewable energy transmission and storage projects (NM Climate Action Plan) • Low GHG emission vehicles for state agencies (NM Climate Plan) • Truck stop electrification and anti-idling systems (NM Climate Action Plan)
Chihuahua	• BRT projects in Chihuahua and Ciudad Juarez • Statewide program to develop solar-thermal for residential hot water • 1MW solar projects at the Chihuahua Technological University, the Ciudad Juarez Technological University, and the Chihuahua Technology Institute • Replacement of 700 water pumps at local water/wastewater utilities statewide

State	Priority Projects
Texas	• Community wind farms (10MW and less) for self-generation and merchant power sales • State lands for large-scale solar PV projects • CNG fleet fuel switch for school bus and public bus fleets
Tamaulipas	• 161MW wind energy project (Los Vergeles) to provide electricity for 43 municipios (statewide) for development and implementation in 2012-13 • Statewide vehicle emission testing programs
Coahuila	• Statewide network of "solar schools" that help educate and demonstrate energy efficiency and clean energy systems to students and the community • Statewide development of "green schools" that utilize the most up-to-date sustainability and green building techniques • Methane capture projects at dairies and cattle feedlots • Conservation and reforestation of urban tree populations • Large-scale public transit projects to reduce GHG emissions
Nuevo Leon	• BRT system for the Monterrey metropolitan area • Metrorey line expansion to connect up with "Linea 3" • Synchronized traffic lighting system for Monterrey (called "SINTRAM") • Landfill gas-to-energy projects with SIMEPRODE • Anaerobic digesters (biogas-to-energy) at wastewater treatment plants • Compact Fluorescent Light (CFL) replacement program for residential sector

What becomes abundantly clear after reviewing this list of projects is the level of activity being planned and anticipated by state governments and municipalities in the border region. The frustrating reality though for many of these state governments is that they do not have sufficient development funds to make these projects become reality. And in some cases, the technical assistance funding needs on the list are intended to help build capacity to sufficient levels so that projects can even be conceptualized and developed in a realistic manner.

This list is not all-inclusive of the border region public sector project opportunities; rather it is an indicative compilation of project opportunities that could be pursued in the near-term. The success rate of how many projects will be developed off this list is unknown, but the likelihood of success would be dramatically improved with the availability of technical assistance funds to develop projects in these sectors.

Energy Efficiency – The Greatest Potential

The project sector that has the greatest potential to reduce GHG's in the short term, create jobs, and facilitate projects with reasonable investment sizes and reasonable paybacks is energy efficiency. In fact, the greenhouse gas emission reduction cost curve established by McKinsey & Company, shows which variables provide the greatest potential abatement at the lowest cost under a reasonable set of assumptions. First among variables are energy efficiency measures such as insulation improvements, lighting systems, efficient air-conditioning units and fuel efficient commercial vehicles which all stand out as being feasible and at a negative cost to society.[16] In simplest terms, energy efficiency provides border-states the easiest and quickest positive impacts as it relates to reasonable investment amounts, GHG reduction, and job creation.

According to analysis and recommendations developed for this white paper by Green Hub Advisors, LLC (Green Hub) and ClimeCo Corporation (ClimeCo), the focus on the energy efficiency sector in border-states would yield the greatest near-term impact. This has been one of the primary recommendations based on a review of the six Mexican border-states GHG inventories that the BECC helped develop. The inventory analysis helped determine the most promising near-term opportunities for the public sector to target.

Based on this premise, from Green Hub and ClimeCo's professional experience, energy efficiency projects merit special mention for the following key reasons:

- Projects are quickly developed
- Low capital investment compared to larger power generation projects
- Quickest financial paybacks
- Solid return on investment
- Create 20%+ energy savings with most projects
- Quantifiable reductions in GHG emissions
- Broad market opportunities within the public sector (state government, municipalities, hospitals, education institutions, water utilities)
- Job creation is strong[17]

By emphasizing energy efficiency, it is not intended to diminish the role of renewable power generation and transportation projects. The intent is to prioritize energy efficiency in the earliest stages of any potential technical assistance program targeting

[16] "The Carbon Productivity Challenge: Curbing Climate Change and Sustaining Economic Growth", The McKinsey Global Institute, June 2008.

[17] Report from ClimeCo to Green Hub Advisors, LLC, as part of the analysis for the BECC white paper. See Attachment A.

GHG reductions, job creations, and solid investment targets. In simplest terms, you get the most for your money from numerous perspectives.

An illustration of a potential energy efficiency project could be one in Ciudad Juarez, Chihuahua. The city has a population of 1.32 million[18] and 95,122 public streetlights citywide.[19] With the replacement of all public streetlights using LED technology, under the assumption that the LED lighting systems are estimated to reduce the energy consumption for the municipality by 51% annually, the GHG reductions as a result of the energy savings are projected to be the equivalent of removing 9,047 vehicles per year. Additionally, beyond the energy savings, the municipality can expect financial savings through operation and maintenance efficiencies.

A public street lighting project is a fairly straightforward and relatively feasible project for most municipalities to implement. The analysis to determine the project's feasibility is focused on selecting the appropriate technology, the cost savings achieved per technology, and the desired simple payback for a project based on the project savings. The community needs to match its annualized energy dollar savings to the cost of the project, including the cost of financing. In most cases, the dollars savings will provide a built-in repayment source within the useful life of the technology to pay off the project costs and cost of capital, if project debt is utilized.

Other types of public sector energy efficiency projects that are typically solid investments will be in water/wastewater utilities for water pumping and processing systems, a gradual replacement of vehicle fleets by more fuel-efficient ones, and public building retrofits of insulation, lighting, heating/ventilation/air conditioning, and boilers. These types of projects many times can be facilitated under similar public-private partnerships with energy service companies (ESCOs) where the capital investment in the facility is conducted by the ESCO. The costs savings to the public entity generated over a period of time are the repayment source to the ESCO, and this is facilitated through a performance contract or a private concession agreement. In addition to cost savings, the GHG reductions are crucial to these projects.

For example, the BECC in collaboration with the World Bank conducted a water utility benchmarking analysis of thirteen large utilities in the Mexico border region.[20] The data collected and analyzed focused on various indicators, but the relevant ones to this example were total cost of energy, total kilowatt-hours of usage, and tons of GHG produced from energy consumption. At a 30% reduction of tons of GHG's for the thirteen utilities, 3,989 tons would be reduced at a dollar savings of approximately $11.4 M in energy costs. These GHG reductions and energy savings would be accomplished through pump replacements, motor retrofits, process equipment upgrades, and energy management systems installation. This benchmarking study provides an insight to what

[18] Censo de Población y Vivienda 2010 INEGI.
[19] Instituto Municipal de Investigación y Planeación de Ciudad Juárez, Chihuahua.
[20] See Attachment G – "Major Mexican Water Utilities Energy Consumption and Potential GHG Reductions along the Border" data table

can be accomplished based on real world data and energy efficiency improvements at border water utilities.

Another instance of a GHG reduction measure is truck stop electrification (TSE) and anti-idling (AI). Along border ports of entry, congestion and idling wastes fuel and money, and produces greenhouse gases and other pollutants. TSE/AI areas encourage drivers to turn off their engines and avoid idling while their internal systems are connected to an energy source to provide air conditioning, heating and other uses. It provides a range of benefits including reducing costs due to fuel savings, reducing emissions, and providing amenities and rest for drivers by connecting to onsite systems along truck stops. For example, a typical US trailer idles between 1800 and 2400 hours per year, burning approximately one gallon of diesel per hour, incurs maintenance costs, and emits particulate matter, and green house gases such as carbon dioxide (CO2) and nitrous oxide (NOx).

At a 90 minute wait for 3000 trucks average crossings per day, the average at Otay Mesa in the Baja California - California border, for 250 days per year, shows that approximately $3.4 M in diesel fuel is burned and costs about $800,000 in operation and maintenance for a total cost to truck owners of $4.2 M annually. Idling during this same period produces over 11,000 tons of CO_2, 4 tons of PM, and 152 tons of NOx.

Assuming drivers will cut idling time by 75% through an TSE/AI strategy, they can save over $3 million dollars per year, and reduce almost 8,500 tons of CO_2 emissions, 3 tons of PM, and 114 tons of NOx.[21]

A Programmatic Energy Efficiency Project

A compelling energy efficiency project that could be developed by the public sector is a large-scale compact fluorescent light (CFL) replacement program, especially in Mexico. The project could be targeted to the residential sector. The municipality could partner with a private company that develops carbon emission reduction projects and that would finance the residential sector CFL replacement program. The private company funds the CFL replacement program and seeks its repayment on investment through the aggregation of the carbon savings that will be provided by the reduced energy consumption from the CFL's.

Hypothetically speaking, the private company will sign an agreement with the municipality that requires the municipality to be the project facilitator. The program will hand out 500,000 CFL's for residential use only. The municipality will guarantee delivery of the CFL's for free to residents in the community through an organized replacement program, and will guarantee change-out of one incandescent light bulb as part of the replacement transaction per CFL provided.

[21] Truck Stop Electrification and Anti-Idling as a Diesel Emissions Reduction Strategy at U.S-Mexico Ports of Entry. Prepared for the U.S. Environmental Protection Agency. Ross and Associates Environmental Consulting, April 2009.

The municipality will be paid a fee for its services; local residents will have lower energy costs; greenhouse gas reductions on a community-wide scale are facilitated; and, private capital funded the entire transaction and seeks its return not out of the residents' or municipality's pockets but from the sale of carbon credits. This type of project has a certified methodology under the Clean Development Mechanism (CDM), which is the program that allows for carbon reduction projects and carbon credits in Mexico. CFL replacement programs are a very viable and scalable mechanisms that can lead to significant carbon reductions, energy cost savings, and financial savings when conducted on a larger scale.

It should be noted, however, that there is a sense of urgency to get these projects underway if BECC or the public sector chose to participate. Unless the CDM is extended, only projects registered before December 31, 2012 will be eligible for the issuance of certified emission reductions (CERs). Prices in the voluntary carbon credit markets have been relatively low recently, and the Climate Action Reserve (CAR) is not yet working on a similar protocol so that market avenue is limited.

According to the ENERGY STAR's CFL energy savings calculator, the replacement of 500,000 60-watt incandescent light bulbs with an equivalent number of 15-watt CFL's will save 225,000,000 kilowatt-hours. The basic assumptions are $.14 cents per kilowatt-hour for the average energy cost and an average usage of 5-hours daily. A typical 60-watt incandescent bulb costs $.60 cents per bulb, and a 15-watt CFL costs $3.40 per bulb. The number can easily be tailored to any location's actual cost elements. The estimated results of this programmatic approach are summarized below in Table 4.

Table 4: Summary of Benefits for 500,000 CFL Replacement Program[22]

Concept	**Result**
Total investment for 500,000 CFLs	$1,700,000
Life cycle savings (energy and avoided maintenance)	$43,674,651
Life cycle energy saved	225,000,000 kilowatt-hours
Simple payback (based on energy savings alone)	0.2 years
Life cycle C02 reductions	173,250 tons
Simple payback (based on sale of carbon credits at $17 per ton under CDM)	0.6 years
CO2 reduction equivalence (cars removed from the road for one year)	28,726 cars
C02 reduction equivalence (acres of forest)	35,271 acres

[22] ENERGY STAR Program CFL Life Cycle Cost Estimated Worksheet. ENERGY STAR is administered by the U.S. Environmental Protection Agency and the U.S. Department of Energy. Worksheet used for Table 4 is attached (Attachment B) to the white paper. The attached worksheet can be adapted to any municipality's expected savings based on local assumptions.

The estimates from Table 4 are quite impressive. This is a hypothetical example based on the assumptions provide above, but the assumptions are based on real world pricing and data. The benefits summary is an indication of what can be achieved in a CFL replacement program.

Another potential household energy savings measure that could be accomplished is based on the information provided by the *Guide Book on Methods for the Use of Energy and Water Saving Technologies in Public Housing in Mexico*, developed by the National Autonomous University of Mexico (UNAM) and the *Instituto Nacional de Ecologia*. The cities of Tijuana, Mexicali, and Ciudad Juarez were selected to be the case studies for the guidebook. They were selected due to their population size, their socioeconomic relevance within their respective states and border region, and their location within the 300-kilometer geographic zone covered by BECC. These cities would provide an idea of the extent of the savings per household with the installation of the fourteen devices presented in the UNAM/INE guide.[23] The devices range from natural gas instant water heater, solar water heater, CFL's, PV solar, orientation/layout of the house, and water conservation technologies.

The projected household savings that would be achieved, if the fourteen devices were installed, would be $1,576 annually, which is almost equal to 20% of the annual income of these households, which is $8,025.04.[24] How would these devices be funded is clearly the challenge, but the cost savings and improvement to the percentage of household income is noteworthy. No matter the mechanism for conducting these types of projects, it is a key recommendation of this white paper that energy efficiency should be a priority sector for any technical assistance program.

Resources Fuel Opportunities

The BECC was created in 1995 as part of a bi-national effort to provide improved environmental infrastructure and living conditions for millions of border residents. Under that mandate, the BECC has provided over $34 million worth of technical assistance funding specifically targeted for water and wastewater project development through the U.S. EPA-funded Project Development Assistance Program (PDAP). Those funds have flowed into 203 projects in 132 communities along the border region. The PDAP has assisted many communities develop viable projects that otherwise would not have ever moved beyond a concept at the local water utility.

The central argument of this white paper is that similar results will occur over time, as they did with water projects, in the clean and efficient energy and transportation sectors along the border, if resources are targeted on these types of projects for public entities. There will be increased capacity built around energy and GHG management from municipalities. Projects will be developed and ultimately built which will provide

[23] Attachment H – List of Fourteen Energy Conservation Household Devices from the UNAM-INE guidebook.

[24] Average border household income levels were calculated by BECC in 2008 based on national census data developed by the National Statistic, Geographic, and Information Institute (INEGI) in Mexico. Included in Attachment H.

GHG emission reductions, increased job creation, and proliferation of social benefits to participating communities. That cannot happen though without a serious and dedicated effort to focus technical assistance resources on these project sectors, which will in turn fuel project opportunities.

SECTION 4: BECC – THE BORDER TECHNICAL ASSISTANCE PROVIDER [25]

Since 1995, the BECC has demonstrated a very strong capacity to manage technical assistance programs for capacity building and project development. They have administered millions of dollars in technical assistance funds for hundreds of projects across the border region. Two of the most noteworthy technical assistance programs that BECC has been entrusted with by the U.S. EPA are: Border 2012 Program (2005) and the Project Develop Assistance Program (1997).

Border 2012

In 2005, EPA requested that BECC assist in administering the Border 2012 program. Since 2006 when the first program funds were provided for environmental projects, the BECC has distributed over $10 M in funds and managed over 183 projects, of which 95 are complete and 71 in progress.

BECC provides logistical support for the work groups, assists in identifying priority areas for grant funding, reviews requests for proposals, assists in project selection and project management, and ensures quality of deliverables and compliance with work plans. BECC's participation in the program has been instrumental in solidifying bi-national collaboration in the development of projects, which have provided tangible results and basic scientific information on environmental and human health conditions along the border.

Project Development Assistance Program (PDAP)

As mentioned in Section 3, the BECC has distributed approximately $34.5 million through the PDAP into 203 water, wastewater collection, and wastewater treatment projects.

Of the 203 projects, approximately 72% (146) have been implemented or are under development resulting in 85% of PDAP funds ($29.4M) invested in these projects. This demonstrates a successful management of the program. Approximately $19.5M in PDAP funding has led to BECC certified projects and has leveraged $1.2B in funds from programs and institutions such as the Border Environmental Infrastructure Fund (BEIF), NADB Loans, USDA, CONAGUA and state and municipal programs. This provides a ratio is $1dollar of PDAP to about $61 dollars of construction funding for certified projects,

[25] Statistics compiled by the Border Environment Cooperation Commission (BECC). December 2010

further demonstrating the successful financial management of the technical assistance program.

In addition, $7M in PDAP funding has led to the implementation of projects through other agencies, of which the final construction costs are to be determined. This would increase the leveraging effect of PDAP.

SECTION 5: TECHNICAL ASSISTANCE – THE MAIN SOLUTION

A Technical Assistance for the Border Region

The BECC has worked a considerable amount on projects in its "core" sectors of water, wastewater, and solid waste for over 15 years. The technical assistance programs that have been utilized by the BECC have been effective and successful in creating projects for the NADB to finance and, most importantly, have contributed to dramatic improvements in the quality of life in the U.S.-Mexico border region. However, the next generation of public sector infrastructure activity will require a new type of technical assistance focused on impacting air quality and climate change tied to energy efficiency, clean energy and transportation.

A technical assistance program for clean and efficient energy and transportation project development and related capacity building could have the following outcomes:

1. Border communities would have access to targeted resources in grants and technical expertise in these sectors.
2. The BECC's role would provide for a high degree for success given its track record and management of environmental programs.
3. Border communities would see their capacity to plan, develop, and manage clean energy and transportation projects improve.
4. Clean energy and transportation infrastructure projects tied to the public sector would begin to be implemented more frequently.

Border States' Priority Technical Assistance Needs

As part of the interview process with the border state government environmental and energy agencies, they were queried about what they considered priority technical assistance needs in their state. Their responses track similarly to the priority projects in that they show a clear and ample need for technical assistance in the focus sectors.

Some states are more ambitious with their goals, and other states are more focused on a few priority sectors but, on the whole, they are either focused on project development or capacity building. In the following table, the priority technical assistance needs of the states are reported.

Table 5: Border State Priority Technical Assistance Needs

State	Priority Technical Assistance Needs
Sonora	• Statewide energy assessment (savings and generation) at wastewater treatment plants • Energy audits of public street lighting
Baja California	• Feasibility and market analysis study on *Linea Verde* • Statewide energy assessment (savings and generation) at wastewater treatment plants • Assistance designing financial tools for funding large-scale residential solar PV projects • Energy audits of public facilities and public street lighting
California	• Capacity building funds to: o Help border communities with implementation and management of voluntary and mandatory programs (i.e. SB 375) – law mandating Metropolitan Planning Organizations (MPO), the regional transportation planning entity, to develop GHG reductions plan for all vehicles in the state o Community-level GHG inventories and action plans
Arizona	• Energy audits for municipalities • Capacity building for municipalities in developing energy projects: o Project development process o Technical issues o Business and regulatory negotiation issues o Financial analysis
New Mexico	• Energy audits for municipalities • Fund demand side management plans for public sector entities
Chihuahua	• Statewide solar and wind energy site assessments • Statewide energy audit of water pumps at treatment systems
Texas	• Energy audits and opportunity assessments for municipal operations
Tamaulipas	• Energy audits for municipal operation
Nuevo Leon	• Statewide energy assessment (savings and generation) at wastewater treatment plants • Statewide solar and wind energy site assessments • Statewide assessment of waste-to-energy generation potential from MSW operations • Statewide assessment of animal waste-to-energy generation capacity • Energy audits for public buildings, public street lights, and water pumps

A revealing factor from these interviews is that energy efficiency is a priority technical assistance need for every state. This confirms a key recommendation of this white paper, which is to focus resources on energy efficiency for project development and capacity building. By not focusing considerable resources on energy efficiency from the inception of the technical assistance program, there is a high likelihood that there will not be significant or tangible benefits tied to the expenditure of funds in the near-term. Energy efficiency technical assistance studies can be completed and projects can be implemented in reasonably short time periods compared to power generation and transportation projects.

Border Community Perspectives on GHG Reduction Efforts

In 2010, Arizona State University (ASU) coordinated a survey of U.S. and Mexican border municipalities related to their perspectives on GHGs and climate change. The outcomes of the research provide helpful clarification about the local-level priorities related to GHG reduction, reflected in Table 6 below.

The survey yielded several priority areas where participating municipalities were most active in GHG reduction efforts. Also, these efforts would include technical assistance studies and project development to project implementation.

In total forty-five (45) municipalities with more than 10,000 residents were surveyed, twenty-seven (27) from Mexico and eighteen (18) from the U.S. Officials from eleven (11) Mexican municipios and eighteen (18) U.S. counties responded for a 64% response rate.

The leading areas of activity were as follows:

1) Solid waste recycling and waste minimization programs,
2) Promotion of water conservation/recycling programs,
3) Protection of open and natural spaces,
4) Retrofit of municipal facilities with energy efficient and environmentally sustainable products,
5) Generation of renewable power from existing municipal facilities,
6) Use of higher efficiency energy systems in buildings and facilities,
7) Public transportation,
8) Promotion of transit-oriented/mixed-use developments, and
9) Use of alternative-fuel, hybrid-gas/electric, or all-electric vehicles for municipal vehicle fleets.[26]

[26] "The Response of U.S.-Mexico Border Cities to Climate Change: Current Practices and Urgent Needs" Arizona State University, pp. 10-11.

Table 6: Border Community Perspectives

Programs/Actions	responses	%
Promotion of solid waste recycling and waste minimization programs	22	75.9
Promotion of water saving and water resources protection (e.g., water recycling)	19	65.5
Protection of open and natural spaces	19	65.5
Retrofit of municipal buildings with energy efficient, healthy, and environmentally sustainable components	16	55.2
Generation of renewable power from existing city facilities (e.g., landfills)	16	55.2
Use of more energy-efficient technologies in public buildings and facilities	12	41.4
Promotion of public transportation, car sharing, or biking/walking to work or school	10	34.5
Promotion of transit-oriented or mixed-use development	10	34.5
Purchase of alternative-fuel, hybrid-gas/electric, or all-electric vehicles	9	31.0
Use of alternative fuels or hybrid-electronic technology to run municipal fleets	6	20.7

Much of the municipal GHG/climate change activity for both sides of the border focuses on waste management, water conservation, open space protection, and energy efficiency. One significant general difference between the two sides is that U.S. counties tend to focus on mitigation-oriented projects while Mexican municipalities prioritize adaptation-related projects.[27] This is important to consider in the development of a border technical assistance program because mitigation projects are a priority while many capacity building studies could fall under adaptation. As has been highlighted already, both types of studies have value to GHG reduction efforts.

A key conclusion of the ASU report was regarding the need for greater cross-border collaboration within a policy, research, and project framework.[28] Border communities do not currently have a technical assistance program targeting the focus sectors nor do they have a bi-national organization to assist the policy planning needed to support GHG reduction projects, whether they are adaption or mitigation. A very viable option for both assignments (technical assistance program and planning organization) is the BECC. In fact, the BECC was one of the co-authors on the ASU report, and this reinforces the argument that the BECC is a solid logical candidate for this type of role.

[27] "The Response of U.S.-Mexico Border Cities to Climate Change: Current Practices and Urgent Needs" p. 14.
[28] "The Response of U.S.-Mexico Border Cities to Climate Change: Current Practices and Urgent Needs" p. 15

Analysis of Mexico State GHG Inventories – Technical Assistance Priorities

The GHG Inventories that have been completed for the six Mexican border-states provide a very helpful insight to the technical assistance needs of the region. Those needs are based on the main sectors creating the largest GHG emissions. Green Hub and ClimeCo have analyzed the GHG inventories and developed additional recommendations for sectors that could utilize specific technical assistance funds from the proposed technical assistance program. Although the GHG inventories identify areas of private and public sector activity, the priority technical assistance needs defined in this section will focus primarily on the *public sector* sphere of activity and influence.

Additionally, it is important to emphasize that the CDM process and its methodologies are only eligible until the end of 2012. The CAR has specific protocols for landfill gas, livestock waste management, and forestry projects, which are currently not affected by the uncertainties surrounding CDM's future. As the transition away from CDM goes into effect, it is expected that Climate Reserve Tonnes (CRT) prices under the CAR will firm up providing an alternative to the CDM beyond 2012. The following table defines some of the key areas or types of technical assistance.

Table 7: Mexican State GHG Inventory Technical Assistance Recommendations[29]

Project Sector	Technical Assistance Recommendations
State and City level GHG Action Plans	Capacity building through training and GHG action plan development for state governments and municipalities
Demand-side energy efficiency	Capacity building for communities, specifically: community awareness programs about energy efficiency and develop guidelines for energy efficiency retrofits and new construction standards
Demand-side energy efficiency	Analyze market segments for programmatic methodology under Clean Development Mechanism (CDM), specifically for a compact fluorescent lights (CFL) replacement program in residential and commercial sectors
Production-side efficiency	Facilitate a statewide program targeting industrial facilities to identify waste heat recovery project opportunities
Production-side efficiency	Assist state government fund site-specific surveys for waste heat recovery projects at industrial facilities
Renewable energy generation	Capacity building to assist state and local governments understand and leverage the provisions of the 2008 Renewable Energy Development and Financing for Energy Transition Law" (LAERFTE) for self-generation projects in Mexico.

[29] Clime Co. report to Green Hub Advisors for the BECC white paper. See Attachment A.

Project Sector	Technical Assistance Recommendations
Renewable energy generation	Perform project-specific feasibility studies with state and local governments
Transportation energy use	Improve traffic patterns to reduce GHG-intensity of mass transit through project feasibility studies and capacity building by educating on best practices from other cities
Transportation energy use	Feasibility studies for implementing CDM methodology on bus fleet fuel switch projects (diesel to compressed natural gas)
Transportation energy use	Develop vehicle emission testing programs
Agriculture	Facilitate analysis of animal waste management systems at poultry, swine, and cattle operations, and assist in developing anaerobic digester projects to address sub-par waste management operations – use existing CDM or CAR methodology
Waste management	Evaluate landfills for projects targeting methane mitigation and power generation – CDM or CAR methodology
Waste management	Evaluate wastewater operations for projects targeting methane mitigation and power generation
Training for financial management capacity building	Provide training to public sector entities on how to access, apply, and obtain financing from funding sources

The recommended technical assistance needs in Table 7 are both for project development and capacity building. There is not an overarching public policy to reduce the GHG footprint. However, the recommendations are part of an overall strategy to mitigate GHG emissions directly through projects, build capacity in the community so GHG reductions and adaption will be implemented over time, and influence industry to implement GHG reduction projects either through policy initiatives or direct technical assistance. Based on the data developed in the GHG inventories, this mixed approach to targeted technical assistance for specific sectors will hopefully lead to viable projects in the near-term and stronger capacity to develop and implement projects mid to longer-term.

Leveraging and Partnering – Stretching Technical Assistance Funds

U.S. Projects – As it relates to projects in U.S. federal agencies, the highest profile source of funding is the U.S. Department of Energy (DOE). As a result of the investment from Energy Efficiency and Conservation Block Grant Program (EECBG), the U.S. side of the border region received project-funding allocations totaling at approximately $47 million.[30] This funding was a targeted, one-time round as part of the American Recovery

[30] Statistics reported from the EEBCG website at: http://www1.eere.energy.gov/wip/eecbg.html

and Reinvestment Act (ARRA). DOE is the only U.S. border wide funding agency that focuses on clean and efficient energy, especially for the public sector.

DOE has a program called the **"Technical Assistance Program"** (TAP). The TAP provides technical assistance in the areas of: 1) Energy efficiency and renewable energy, 2) Program design and implementation, 3) Financing, 4) Performance contracting for energy efficiency, and 5) State and local capacity building. The DOE has over 200 technical experts available to assist communities in the above areas. This program is well respected and can provide helpful benefits to U.S. border communities.[31]

Another U.S. government funding program is with **U.S. Department of Agriculture (USDA)**, which is called the **High Energy Cost Grant Program**. This program provides financial assistance for the improvement of energy generation, transmission, and distribution facilities servicing eligible rural communities with home energy costs that are over 275 percent of the national average. Grants under this program may be used for the acquisition, construction, installation, repair, replacement, or improvement of energy generation, transmission, or distribution facilities in communities with extremely high-energy costs. On-grid and off-grid renewable energy projects, energy efficiency, and energy conservation projects are eligible.[32]

The BECC could target this program for eligible rural communities along the U.S. side of the border. The BECC would use the technical assistance funds for the project development and USDA funds for the grant component of the project implementation. NADB loan funding would complement the required financing.

Mexico Projects – For projects in Mexico, the range of options is broader and complex. Also, it is very important to highlight that for BECC to engage any other multi-lateral development institution, it should be a coordinated effort with NADB. The primary reason is that there must an alignment of goals to not only leverage technical assistance funding for BECC projects, but also coordinate the funding priorities of the other financing sources with NADB's financing capabilities and goals.

The primary sources for leveraging additional funding to the benefit of BECC projects reside at the World Bank (WB) and the Inter-American Development Bank (IDB). These institutions have focused tremendous effort and funding to target climate change projects and programs. Some of the leading programs that might have potential for partnerships with the BECC are listed below.

1) **Clean Technology Fund (CTF) from the World Bank** – The CTF is facilitated through the host country (Mexico) and relevant regional development banks (IDB). It is a new fund that provides concessional finance to deploy low-carbon technologies through regional development banks. The opportunities for

[31] DOE Technical Assistance Program (TAP) website at: http://www.tac.eecleanenergy.org
[32] USDA program website at: http://www.rurdev.usda.gov/UEP_Grant_Program.html

assistance and financing are identified through a "clean technology investment plan." In the case of Mexico, their CTF investment plan is focused on energy efficiency, renewable energy, and urban transportation, primarily bus rapid transit programs.[33]

The recommendation is for BECC to work with NADB to approach the IDB and the Mexican Federal government to develop a specific "clean technology investment plan" for the border region. The CTF funds could be leveraged against the funds planted in the BECC technical assistance program for sharing project development costs and NADB funds for co-financing. This is an ambitious effort, but it is the type of effort where accessing expertise, experience, and funding that exist at other MDB's can provide an amplified benefit to the Mexican border region.

2) **Financial Mechanisms for Sustainability (FinMech) from the International Finance Corporation (IFC), World Bank Group** – This entity is a group within IFC's Environment and Social Development Department that manages a pool of donor funds with the aim of catalyzing private sector investments that benefit the environment. FinMech is a private sector lending entity that targets projects in energy efficiency and renewable energy.

   FinMech is a potential source of technical assistance funding and project financing for public-private partnerships in the energy sector. A similar joint approach by BECC and NADB to FinMech to propose a strategic initiative for projects in the border region is the recommendation. This program will create more challenges to BECC and NADB since the two institutions have not worked as extensively with the private sector, but they do have some limited experience with public-private partnerships in the wastewater treatment and transportation sectors.[34]

3) **Fondo Mexicano de Carbono (FOMECAR)** – This program was developed under the auspices of BANCOMEXT. FOMECAR is a non-profit trust fund that provides technical assistance and financial support for CDM project development in Mexico. This program is more focused on the carbon emission reductions market as a result of clean and efficient energy and transportation projects. However, the value is immense to the BECC and NADB.

   FOMECAR will provide technical assistance funding in developing the requisite studies and documentation to meet the CDM certification requirements. Additionally, FOMECAR will assist in brokering the "certified emission reductions" (CERs) on the international market through its relationships with

[33] "Investing in Sustainable Energy Futures – Multilateral Development Banks' Investments in Energy Policy" from the World Resources Institute, 2010: pp.11-22.
[34] Financial Mechanisms for Sustainability (FinMech) at the International Finance Corporation (IFC), World Bank Group website at: http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/fly_FinancialMechanisms/$FILE/FinMech+Flyer.pdf

carbon funds and large-scale CERs purchasers. Currently, BECC or NADB does not provide this type of service despite their being a viable market for CERs trading and related financing.

Additionally, FOMECAR will work with the German KfW Development Bank (KfW), the European Investment Bank (EIB), and the Japan Bank for International Cooperation (JBIC) to provide long-term financing for the projects. FOMECAR is a unique institution that BECC and NADB should more aggressively explore and work with to implement a joint project for development and financing.

4) **U.S. Agency for International Development (USAID): Low Emissions Development Strategy (LEDS)** – This program will provide targeted technical assistance for LEDS development and implementation. As defined by USAID, "LEDS is a strategic framework that articulates concrete actions, policies, programs and implementation plans to advance economic growth, improve environmental management, and meet development objectives."[35] **This program is not a project implementation funding program.**

USAID will work with a partner country, including key in-country stakeholders, to respond to the region's unique needs and priorities through targeted technical assistance. Those efforts can include: working with both government and civil society partners to strengthen in-country human and institutional capacity; working to provide tools and approaches to assist with LEDS management and implementation**;** and, identifying key policies, programs and financing sources that will promote climate-resilient economies and lead to lower-emission futures in key sectors and areas of the economy through projects.

USAID/Mexico has announced a new program entitled the "Mexico Low Emissions Development" (MLED) Program, which will serve as the cornerstone of its Global Climate Change (GCC) initiative. MLED will support Mexican efforts to develop and implement a LEDS and strengthen systems for Monitoring, Reporting and Verification (MRV) of emissions across all emitting sectors of the economy. Also, this LEDS program will promote the adoption of clean energy technologies and best practices through the development of energy policies, financing mechanisms, and strengthening of institutional and technical capacity in Mexico.

[35] U.S. AID Fact Sheet "Enhancing Capacity for Low Emission Development Strategies" at the website: http://www.usaid.gov/our_work/environment/climate/docs/ECLED_factsheet_24nov2010.pdf