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CityLinks
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Legazpi and Fort Lauderdale Pilot Partnership Report: Technical Assistance Trip February 2015

USAID FROM THE AMERICAN PEOPLE

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Institute for Sustainable Communities
LAND O'LAKES, INC. International Development
ICLEI Local Governments for Sustainability USA
RUAF Foundation
APWA Your Comprehensive Public Works Resource
Shack / Slum Dwellers International (SDI)
UMC Urban Management Centre

Introduction

CityLinks™ is a program of the International City/County Management Association (ICMA) that allows city officials in developing and transitioning countries to draw on the resources of U.S. local governments to find sustainable solutions tailored to the real needs of their communities. CityLinks works to improve the capacity of cities to provide quality services to residents, create a better living space for the community, and sustain those improvements after the specific CityLinks project ends.

Made possible through a five-year agreement (2011-2016) with the U.S. Agency for International Development (USAID), the CityLinks program is implemented by ICMA and its partners with a focus on urban climate change mitigation and adaptation, food security, and water and sanitation access.

The CityLinks city-to-city exchange between Legazpi, Philippines and Fort Lauderdale, Florida is being executed through a pilot partnership between CityLinks and the Association of Southeast Asian Nations (ASEAN) Working Group on Environmentally Sustainable Cities (AWESG). The partnership was established in January, 2013 to help institute and strengthen technical support networks and capacity building among cities in the ASEAN region and between ASEAN and U.S. cities for integrated climate change adaptation planning at the local level.

The partnership began with a CityLinks Climate Leadership Academy (CLA) workshop focused on urban adaptation, which took place in August, 2013 in Jakarta, Indonesia. The CLA brought together representatives from eight cities from Cambodia, Indonesia, Lao PDR, Malaysia, Philippines, Thailand, and Vietnam to advance their climate adaptation efforts by sharing successes, challenges, lessons learned. As a result of the CLA, each city developed an action plan to advance their climate adaptation efforts based on what they learned at the workshop. Overall, the CLA was successful in advancing individual stakeholders and participating institutions' urban climate adaptation activities, and provided clear evidence that peer-learning can be a successful intervention in the ASEAN context.

As a follow up to the CLA, the CityLinks team distributed a survey to participating cities six months after the workshop in order to measure the success of their action plans and identify potential cities for participation in Phase II of the partnership—a city to city exchange with a partner U.S. city. Criteria for selection for Phase II included:

- Participation in the 2013 CLA in Jakarta;
- City's attentiveness to information requests;
- Level of commitment to self-identified goals and strategies presented in CLA action plans; and
- Alignment with the USAID Climate Change & Development strategy.

Based on the above criteria, the CityLinks team selected two cities for the exchange: Chiang Rai, Thailand, and Legazpi, Philippines. Each city demonstrated strong leadership on climate adaptation with clear capacity needs well suited to the city to city exchange program.

To select U.S. based cities for the exchange, CityLinks distributed an application to its network of municipal leaders in the United States. Applications were evaluated based on the following criteria:

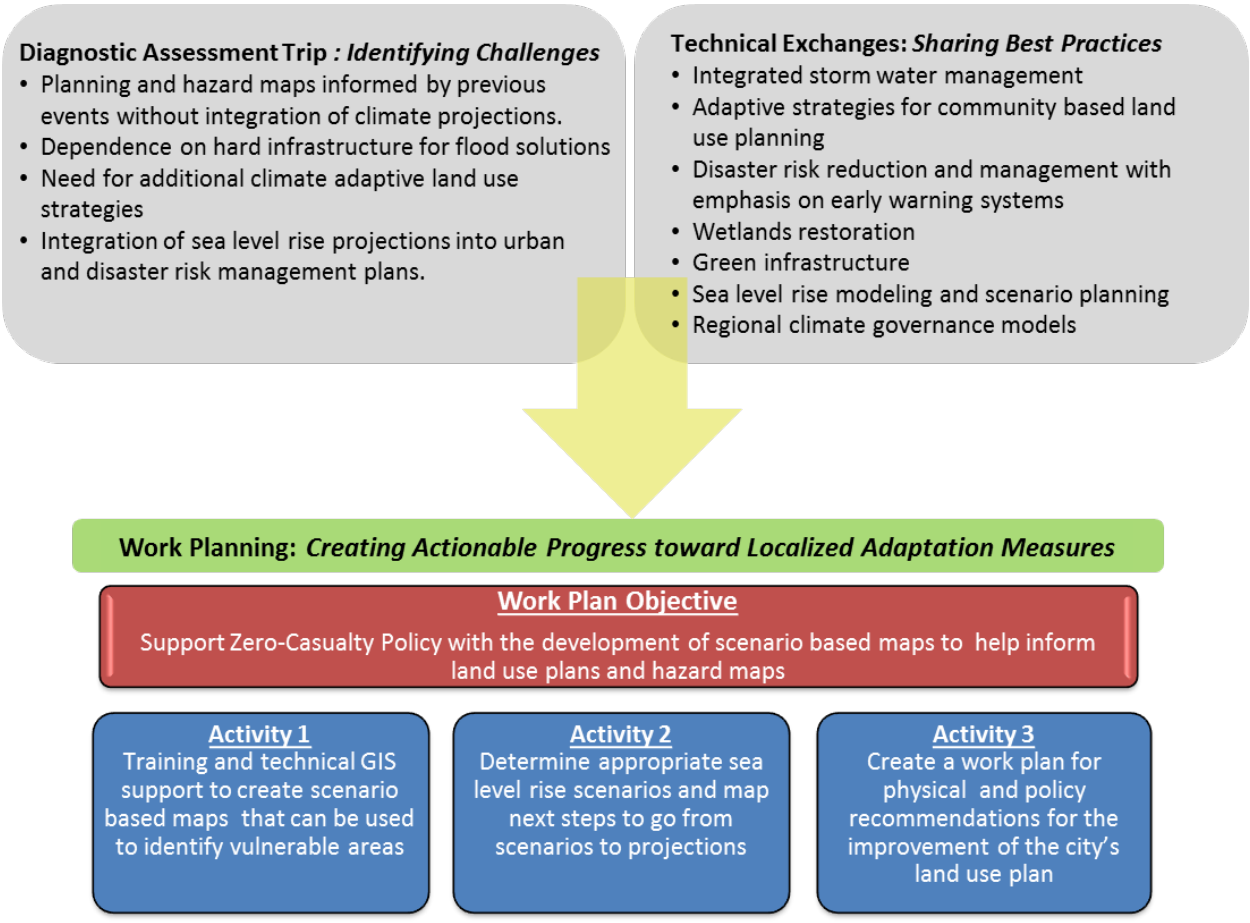
- Commitment from the city to participate in and host reciprocal technical exchanges;
- Population and geographic profile to create appropriate matches;

- Experience addressing climate change adaptation through the restoration of urban ecosystems (this might include sustainable resource management efforts, use of urban green spaces, storm water management systems, urban forestry etc.);
- Use/implementation of scientific models or other decision-making tools to inform policies related to climate change adaptation (This could include but is not limited to sea level rise projections, flood mapping, spatial planning tools, etc.);
- Effective community outreach practices that engage a range of stakeholders including but not limited to underserved populations; and
- Proven governance models that have successfully mainstreamed climate change adaptation across sectors.

CityLinks partnered Legazpi and Fort Lauderdale, Florida as the two cities shared similar climate challenges including flooding, sea level rise, hurricanes and typhoons, coastal erosion, and storm water management. Fort Lauderdale had also already begun to implement innovative approaches to mitigate the adverse effects of climate change. In particular, Fort Lauderdale had the results to demonstrate the positive economic impacts adaptation efforts had on the tourism industry and investments from private industry, a key interest of Legazpi.

Program Design

The partnership followed the CityLinks framework for pilot partnerships which included a diagnostic assessment trip, a trip to the US partner city to demonstrate best practices, innovations, and lessons learned, and a final technical assistance trip.



The design and execution of the work plan was a joint effort by Legazpi and Fort Lauderdale staff facilitated by the CityLinks team. To provide the technical assistance necessary to achieve these results, Jim Hetzel an Urban Planner, and David Rubin a GIS Analyst, from the City of Fort Lauderdale provided training to staff in Legazpi on how to integrate climate data into GIS planning as well as climate adaptive strategies and policies for Legazpi's comprehensive land use plan.

Technical Assistance Outcomes

Hetzel and Rubin reviewed the city's land use plans and current GIS capabilities to the extent possible before departing for Legazpi. During the week in Legazpi they worked closely with planning and GIS staff at the local and provincial level. Legazpi will update their comprehensive land use plan this year which made the timing of the partnership all the more critical.

Partnership Results

Creation of land use planning tool that provides different types of adaptation strategies for land use purposes including protection, accommodation, retreat, and avoidance.

Key technical staff at the city and provincial level trained in the policies and programs that address climate impacts in key land use areas.

Provided city land use planning staff with data requirements and steps to take to begin scenario mapping for sea level rise.

Increase in capacity of city, provincial, and regional representatives to adapt to climate change and understand long term impacts of climate change.

Lessons learned through the partnership shared with municipalities throughout the Philippines and the ASEAN region.

Adaptive Land Use Policies and Strategies

Jim Hetzel worked closely with the staff to evaluate the elements of Legazpi's current comprehensive land use plan in an effort to see if there were areas that could be more responsive to the city's future climate challenges. To evaluate the land use plan Hetzel introduced the following adaptive strategies:

- **Protection** - Protection strategies involve "hard" and "soft" structurally defensive measures to mitigate the impacts of rising seas, such as shoreline armoring or beach renourishment, in order to decrease vulnerability yet allow structures and infrastructure in the area to remain unaltered. Protection strategies may be targeted for areas of a community that are location-dependent and cannot be significantly changed structurally (i.e., downtown centers, areas of historical significance, water-dependent uses, etc.).

- **Accommodation** - Accommodation strategies do not act as a barrier, but rather alter the design through measures such as elevation or storm water improvements, to allow the structure or infrastructure system to stay in place. Adaptation measures that may not prevent flooding or inundation of the property but do protect the structure. Accommodation strategies may be suitable for location-dependent structures that could be

changed to accommodate water, without compromising the use (i.e., bridge elevation, residential home elevation, downtown storm water improvements, etc.).

- **Retreat** - Retreat strategies involve the actual removal of existing development and possible relocation to other areas and the prevention of future development in these high risk areas. Retreat options usually involve the acquisition of vulnerable land for public ownership, but may also include other strategies such as transfer of development rights, purchase of development rights, rolling easements, conservation easements, etc.

- **Avoidance:** Strategies that involve ensuring development does not take place in areas subject to coastal hazards associated with sea level rise or where the risk is low at present but will increase over time.

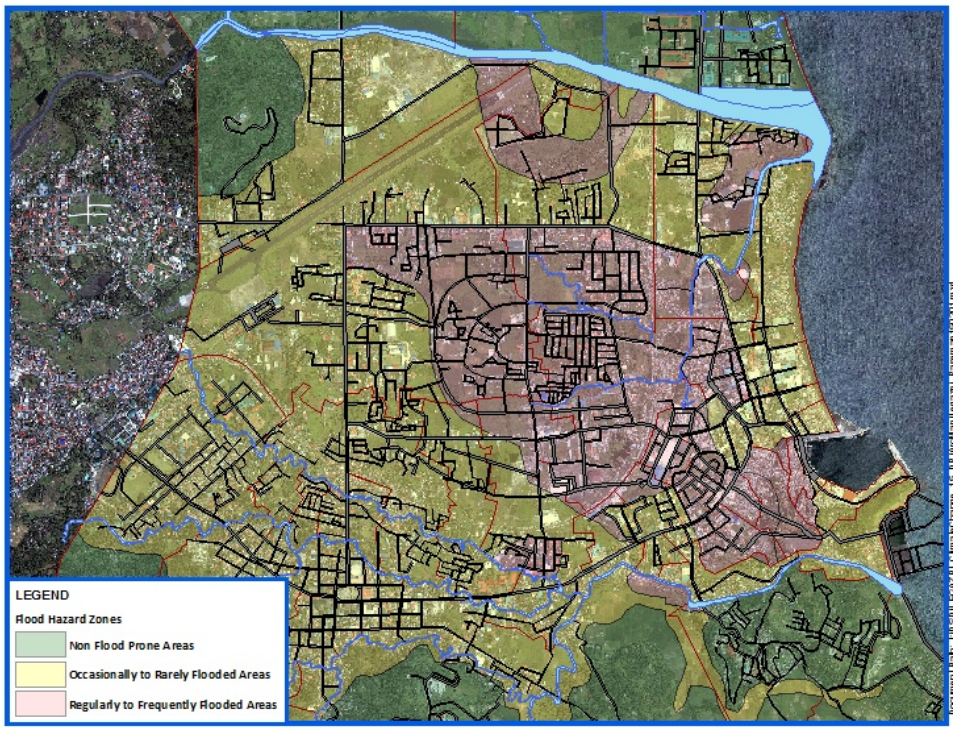
The team worked together to look at each land use in the plan and assess the climate impacts, policy implications, the adaptation strategy outlined above, and the potential design or program strategies to support the adaptive strategy. From there, the team brainstormed how these ideas could be implemented. Recognizing that data at the local level isn't easily accessible or available, the team assessed what strategies required immediate implementation, long term implementation, or a combination of the two options. Strategies were then categorized into three options:

- **Option1: Immediate Implementation -** Based on historical data, hypothetical scenarios, and professional knowledge and expertise on anticipated impacts from climate change (e.g. sea level rise). Progressive approach taking innovative measures to address impacts from climate change. Utilize local authority, to the greatest extent possible. Potentially, Legazpi can become a leader in the Philippines on addressing these concerns and impacts.
- **Option 2: Intermediate/Long Term Implementation -** Based on gathering additional data and developing vulnerability scenarios. Take step-by-step approach with adopting few strategies at a time when data becomes available. Utilize local authority, to the greatest extent possible. Potentially, Legazpi can become a leader in the Philippines addressing these concerns and impacts.
- **Option 3: Combination -**A combination of Option 1 and Option 2.

These discussions were organized around a Microsoft Excel-based matrix that the city can continue to use for communicating amongst themselves and higher level decision-makers to justify amendments to their current plan. The city stated that they planned to use this tool to perform a comprehensive assessment of their current policy and determine what amendments should be made and in what time frame. This tool will be shared with interested parties and will be available to cities who are intending to take a more climate adaptive approach to land use planning.

GIS Analysis and Recommendations

Legazpi City has been working to expand their staff capacity in GIS over the last several years. They understand the value GIS brings across service delivery sectors and the important ways in which it can support decision making. However, their current software package and available data are not capable of creating detailed sea level rise (SLR) scenarios, let alone sea level rise projections. Staff is currently using GIS Manifold software that is populated with satellite images from 2008-2010. The layers are in two different projections (Universal Transverse Mercator and Philippines Zone IV). The existing layers do not take into account climate change and sea level rise projections. Although the data was incomplete and the software posed challenges, the team was able to use current data from Legazpi to determine areas susceptible to flooding.



Legazpi City Flood Hazard Map

Coastal Change and Sea Level Rise Analysis

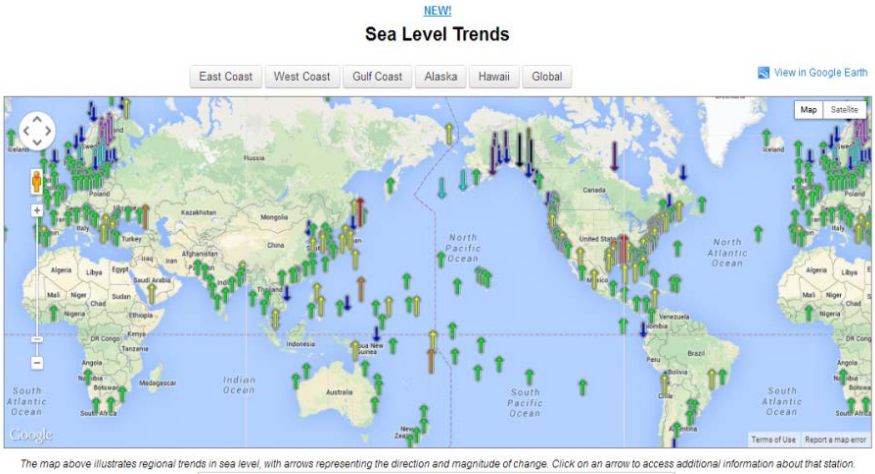
To demonstrate how to run preliminary coastal change and sea level rise analysis, David Rubin used the existing satellite images and tidal station data from 2008-2010 to show potential coastal change.

The following procedure was used to determine possible change and effects to the region:

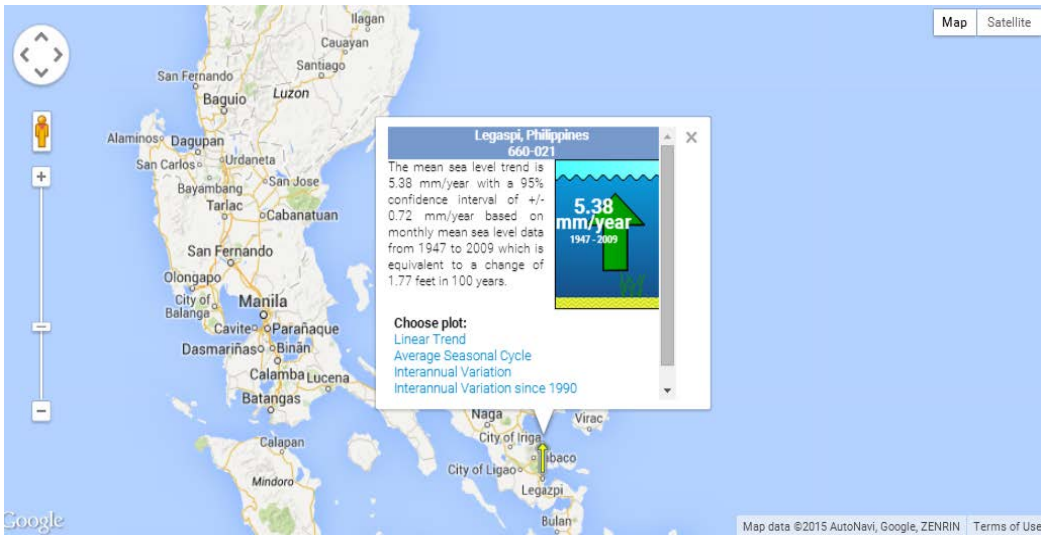
1. Identified the High Water Line (HWL) or Wet Line (WL) in the aerial (2008 -2010).

2. Digitized the HWL / Wet Line with ESRI ArcMap.

3. Acquired SLR data from the Legazpi Tidal Station Data(http://tidesandcurrents.noaa.gov/sltrends/sltrends.html)



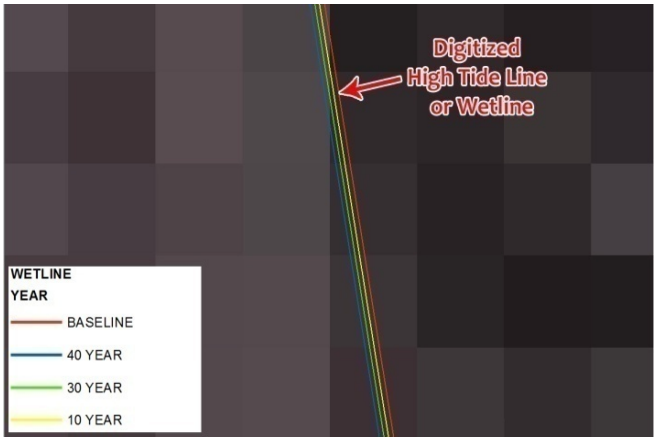
4. Using the Tidal Station calculations that the mean SLR trend is 5.38 millimeters/year, calculated a linear change for 10, 20 and 30 years



Number of years * 5.38 mm per yr/ 10 = Total SLR cm

- 10 yrs. = 5.38 cm
- 20 yrs. = 10.76 cm
- 30 yrs. = 16.14 cm
- 40 yrs. = 21.52 cm

5. Using ESRI ArcMap, represented SLR change by adding Polylines to the appropriate distance from the MHW Line.



Staff were given this demonstration as an example of how to run coastal change scenarios, however in order to more accurately determine how sea level rise will impact flood zones, accurate elevation data (X,Y,Z) will need to be gathered. Additionally the city will need the tidal and seawall elevation to analyze the integrity of their current sea wall based on future sea level rise and storm surge projections.

Although a preliminary analysis was possible using the existing data, updating the available data would allow for a more comprehensive understanding of the coastal change and SLR impact. In addition to the procedure outlined above, the Digital Shoreline Analysis System (DSAS), which is an extension to be used with ESRI ArcMap, is a useful tool for tracking coastline changes.

In addition to the data requirements for the coastal change work, the city will need to take several further steps to gather more data and upgrade software. While national level agencies support many of these efforts, it was clear that requesting data and understanding the current inventory of data at a national level is a monumental challenge for local governments in the Philippines. To begin accurately calculating coastal change, the city will have to begin to take the following steps:

Aerial Photographs

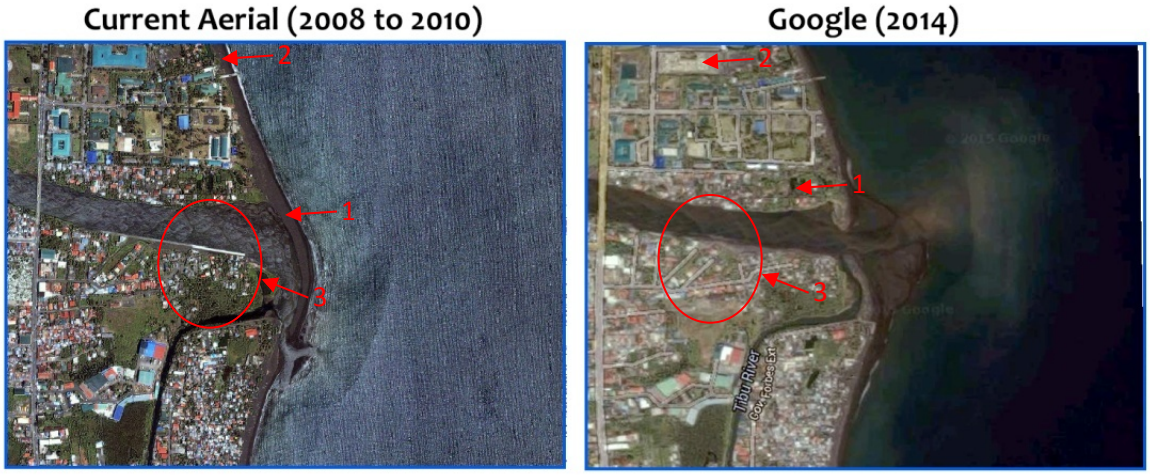
As the landscape changes naturally and/or though economic growth of the city, planners, engineers and city officials will need to see how the region has changed. Ideally, aerials should be flown yearly, although this can be costly. To cut costs, the city could team with neighboring cities and have the region flown at the same time. Drones are also beginning to be widely used for aerial photography. This is a lower cost way to capture aerial photography.

Having access to current and historical aerial photographs will help decision makers better understand the impacts of adaptive infrastructure measures. David Rubin demonstrated this using the recent jetty construction.

Example: If there were aerials before and after the new jetty was constructed, one would be able to see the effects on the coastline over time.

Comparing the current image the city uses (2008 -2010) to the 2014 Google aerial, several observations can be made:

1. The river mouth has opened up and is releasing a plume of sand and mud into the bay.
2. The beach near the dock in the north of the river has eroded.
3. The *Tibu River* has closed off due to changes at the mouth of Main River.



The Google Maps aerial was taken during 2014, no exact date is provided.

Data Management and Software Requirements

David Rubin strongly recommended that the city upgrade to ESRI ArcMap which has become an international standard. However even with the program they have there are additional steps the city can take to enhance their data management to better utilize GIS for planning purposes.

Layer Management

The city needs to use one projection either **UTM** or **Philippines_Zone_IV**. The staff should contact the National Mapping and Resource information Authority and follow the same standards.

- The city needs to re-project all layers and define the projection within the layer. When the city switches to ESRI ArcMap, a layer that is projected will automatically re-project to the Data Frames coordinate system, even if it has been created in another coordinate system.
- While staff assumed that the Contour Data was in Philippines_Zone_IV, it turned out to be in an unknown projection and could not be re-projected to the proper coordinate system. Rubin is continuing to work on trying to re-project the layer and will be in contact with the GIS staff if successful.

Staff is not currently creating metadata. Metadata provides users with background information and context behind the data that is inputted into the GIS database. Proper metadata is critical to GIS so that both back end and front end users have an understanding of where the data came from.

Without these references the knowledge of the data stays with a limited number of people making the maps difficult to manipulate and verify. ESRI ArcMap allows the user to create metadata within ArcCatalog (part of ArcMap). The data inputted can be as simple as who created the data and its date.

The table below shows what layers the city currently has available in their GIS database and recommendations for additional layers.

Layers Available in GIS database	Recommended Layers
Tax Map (Parcel boundary): As of 02/01/2015, the city only has 60% of the tax boundary data. Need to prioritize completion.	**Emergency Management Site (Points)**: Locations of Police, Fire, Hospitals &Evacuation Centers.
Contour - Needs to be updated to match the aerials. The landscape has changed in the past 5 years.	**Schools, Churches & Recreation Centers (Points)**
Roads -Width of roads - Need to merge polygons to create one polygon -Need to create Centerline with Street Names	**Utilities** (for internal use, unless a contractor requests the data during a construction project).
Waterways - River & Creeks -Width of waterways- Need to merge polygon to create one polygon -Need to create a centerline with river and creek names	**Zoning (Polygon):** Commercial, Retail, Hotel, Residential, Night Clubs Locations

The base data in these layers will have cross functional uses that can help inform emergency evacuation routes, population census to inform vulnerable residents, crime analysis, and revenue generation. There was strong interest across sectors in the city staff to utilize GIS more effectively. Expansion of software would allow for more comprehensive mapping techniques that could be utilized across sectors.

<u>Data Management</u>

Access to data and layers developed by engineering and survey companies hired by the national government for nationally funded infrastructure projects would also help the city staff better manage their data. Previous infrastructure projects along the coast would have developed Computer Aided Design (CAD) drawings, elevation data, and potentially aerial photography of the region. Aerial photographs and CAD drawings can easily be imported in the ESRI ArcMap.

Due to the short term nature of a pilot program, CityLinks did not delve deeply into the governance challenges that seem to keep national data out of reach for local governments. That being said, over the course of the pilot, it was clear that data developed at the national level was difficult to attain, and that local governments aren't fully aware of the data that could be made available to them. Closer cooperation with national ministries, universities, and private sector firms implementing

infrastructure projects will be critical to the data gathering and management needed to inform more climate adaptive planning.

Cross-cutting Recommendations and Lessons Learned

Having a robust data management system and a vehicle such as Arc Map to act as a visualization tool have become critical components of informed, data-driven decision making. These tools are even more important in light of climate change and the impacts it will have on developing and urbanizing economies. While the experience in Legazpi is unique, the challenges they face planning for a booming population and a quickly developing economy are relevant to other local governments in developing and decentralizing countries.

The pilot partnership in Legazpi demonstrates the balancing act local governments must do as they attempt to prepare for climate change without all of the data they need to make fully informed decisions. Building the capacity of planning staff to understand local climate projections and the potential adaptation interventions will help them begin to thoughtfully plan and prepare in the absence of perfect data. While the recommendations here are not revolutionary, they reinforce what many working in climate resilient development already know. While they were developed for Legazpi, we hope that they will be useful to other cities.

1. ***Cities must begin to integrate climate projections into hazard maps to better understand future threats instead of relying on historical data.***

2. ***Access and dissemination of data is critical to local governments' ability to make informed decisions across sectors to ensure climate resilient development.***

3. ***Building capacity at the local level in geospatial reasoning and analysis enhances better service delivery across sectors and easily allows climate data to be integrated into planning.***

4. ***Building relationships through city-to-city partnerships is key for long term knowledge sharing creating catalysts for change between partnered cities.***

These lessons and others will be expanded upon after the final monitoring and evaluation activities can take place. For more information on this partnership and others implemented by ICMA through CityLinks please visit the CityLinks website and the Notes from CityLinks blog, follow us on Twitter at @ICMACityLinks, like us on Facebook, and join the climate change discussion in the Climate Preparedness, Adaptation, and Resilience group on the Knowledge Network. Visit the ICMA International site for additional information about ICMA's global projects.

Access to the decision support tool for adaptive planning developed in during this partnership can be requested by emailing the CityLinks team citylinks@icma.org.