

Climate science as decision- support for resilience: transdisciplinary approaches from local to global

JESSICA DATOR-BERCILLA

University of the Philippines in the Visayas

Coastal Cities at Risk Ph (Ateneo de Manila University, National Resilience Council, Manila
Observatory)

Asia Climate Change Consortium



ATNEO



OUR JOURNEY

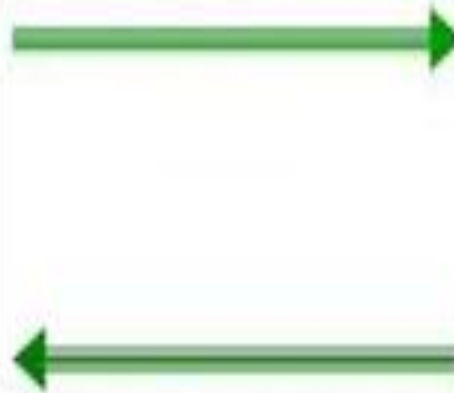
LOCAL



Research/
Scientific
Institutions

Bringing disaster science
to the service of
vulnerable communities

Communities
Vulnerable to
Disaster



Community participation
informs priorities of
disaster science



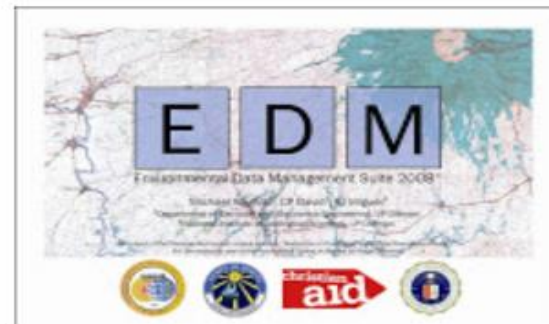
COPE Bicol *
COASTAL CORE
Sorsogon * Social
Action Center of the
Prelature of Infanta *
Marinduque Council
for Environmental
Concerns (MACEC)
* Mindoro Assistance
for Human
Advancement
through Linkages, Inc.
(MAHAL) * FORGE
Cebu * PhilNET-
Visayas * CERD-
Samar * Unlad
Kabayan * Muslim-
Christian Agency for
Advocacy, Relief, and
Development
(MuCAARD) * Social
Action Ministry of the
Prelature of Ipil



THE NETWORK OF HOME-BASED STATION VOLUNTEERS: Sends information to scientists via SMS



DEVELOPMENT OF A SOFTWARE (Satellite Image Picture Fetcher), SMS Data Manager, Text Alert Console



KNOWING THE RIVER, HOW THE WATER FLOWS, HOW IT DRAINS

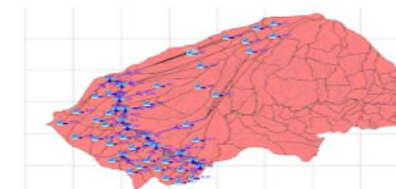
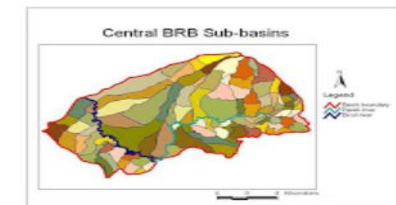
Installing water level measuring instruments in the Agos River



Measuring river depth, width, water height level



DEVELOPMENT OF MODELS: Basin and Channel Flow (Uses data from the community volunteers and other sources for analysis)



SIMULATION VS ACTUAL EVENT (Typhoon Dante)
During a simulation of the HEC-RAS analysis projected that at least 58mm of rainfall will lead to flooding in Central BRB. Typhoon Dante actually generated flooding in BRB with a minimum accumulated rainfall of 60mm.

SETTING UP THE TYPHOON and FLOODWATCH CENTER in NAGA COLLEGES FOUNDATION: Sample Alert Sends back information to communities at risk

Transdisciplinary Engagement Informing Policy Making for Resilience

Law on Disaster Risk Reduction and Management

S. No. 3086
H. No. 6985

Republic of the Philippines
Congress of the Philippines
Metro Manila

Fourteenth Congress
Third Regular Session

Begun and held in Metro Manila, on Monday, the twenty-seventh day of July, two thousand nine.

[REPUBLIC ACT NO. 10121]

AN ACT STRENGTHENING THE PHILIPPINE DISASTER RISK REDUCTION AND MANAGEMENT SYSTEM, PROVIDING FOR THE NATIONAL DISASTER RISK REDUCTION AND MANAGEMENT FRAMEWORK AND INSTITUTIONALIZING THE NATIONAL DISASTER RISK REDUCTION AND MANAGEMENT PLAN, APPROPRIATING FUNDS THEREFOR AND FOR OTHER PURPOSES

Be it enacted by the Senate and House of Representatives of the Philippines in Congress assembled:

SECTION 1. *Title.* – This Act shall be known as the “Philippine Disaster Risk Reduction and Management Act of 2010”.

Laws on Climate Change

S. No. 2811
H. No. 6235

Republic of the Philippines
Congress of the Philippines
Metro Manila
Fifteenth Congress
Second Regular Session

Begun and held in Metro Manila, on Monday, the twenty-seventh day of July, two thousand eleven.

[REPUBLIC ACT NO. 9729]

AN ACT MAINSTREAMING CLIMATE CHANGE INTO GOVERNMENT POLICY FORMULATIONS, ESTABLISHING THE FRAMEWORK, STRATEGY AND PROGRAM ON CLIMATE CHANGE, CREATING FOR USE PURPOSE THE CLIMATE CHANGE COMMISSION, AND FOR OTHER PURPOSES

Be it enacted by the Senate and House of Representatives of the Philippines in Congress assembled:

SECTION 1. *Title.* – This Act shall be known as the “Climate Change Act of 2009”.

S. No. 2811
H. No. 6235

Republic of the Philippines
Congress of the Philippines
Metro Manila
Fifteenth Congress
Second Regular Session

Begun and held in Metro Manila, on Monday, the twenty-fifth day of July, two thousand eleven.

[REPUBLIC ACT NO. 10174]

AN ACT ESTABLISHING THE PEOPLE'S SURVIVAL FUND TO PROVIDE LONG-TERM FINANCE STREAMS TO ENABLE THE GOVERNMENT TO EFFECTIVELY ADDRESS THE PROBLEM OF CLIMATE CHANGE, AMENDING FOR THE PURPOSE REPUBLIC ACT NO. 9729, OTHERWISE KNOWN AS THE “CLIMATE CHANGE ACT OF 2009”, AND FOR OTHER PURPOSES

Be it enacted by the Senate and House of Representatives of the Philippines in Congress assembled:

SECTION 1. Section 2 of Republic Act No. 9729, otherwise known as the “Climate Change Act of 2009”, is hereby amended to read as follows:

“SEC. 2. *Declaration of Policy.* – It is the policy of the State to afford full protection and the

Applying IPCC's SREX

Table 2. Mainstreaming and Integration of CCA and DRR in the Planning and Budgeting Process (informed by the Rationalized Planning System, JMC 2007-1, of the Republic of the Philippines)

Reality Check	Vision 10 year period	Strategic Direction (Roadmap to the Vision) 10 year period	Investment Programming (Programs, projects, activities)	Identifying funding sources	Major Final Output
<ul style="list-style-type: none"> Ecological profiling. Check Desinventar Database Review secondary data Consult local and national meteorological and scientific 	<ul style="list-style-type: none"> In the face of disaster and climate-related risks, what does the LGU aspire for the local population, local economy, natural environment, local 	<ul style="list-style-type: none"> Per sector Per year RA 10121, amended RA 9729, RA 7160 Considered strategies for current and future extreme 	<ul style="list-style-type: none"> Per sector, per year Clustered strategy, project/activity, annual estimated cost, timeline Cost: labor, supplies/materials, administrative overhead Create enabling programs, projects, activities that will help develop resilience by 	<ul style="list-style-type: none"> Per sector, per year Identify funding: General Fund or other sources Mode of procurement Where can the funding come from? IRA: General Fund Disaster Risk 	<ul style="list-style-type: none"> Per sector Performance indicator per project and activity Cost per project Do the indicators reflect what adaptive and coping capacities were developed? Do the indicators reflect

<ul style="list-style-type: none"> Consult local and national meteorological and scientific institutions 	<p>local economy, natural environment, local leadership/ governance and the built environment?</p> <ul style="list-style-type: none"> Use multi-stakeholder, evidence-based visioning process by reflecting in climate and other hazard-informed risk assessment conducted Does the LGU need to 	<ul style="list-style-type: none"> Considered strategies for current and future extreme events and other climate-related hazards (ie increase in temperature, precipitation, frequency of typhoons, sea level rise, storm surges, wave heights) and geo-hazards Consider the ff.: Remove exposure of communities 	<ul style="list-style-type: none"> Create enabling programs, projects, activities that will help develop resilience by reducing risks to current and future climate and disaster-related hazards and help promote low carbon or GhG programs, projects, activities per sector Allow multi-stakeholder participation in the PPA design process Are these activities risk-reducing or risk-enhancing Do the activities help in reducing greenhouse gas emissions?
<ul style="list-style-type: none"> Integrated Climate Risk Analysis for Adaptation and Mitigation <ul style="list-style-type: none"> Use hazard maps, local climatology data, climate projections Scientific vulnerability assessments Crunch model to determin HxExV/C (hazards, exposure, vulnerability and adaptive capacity) GhG emission 		<ul style="list-style-type: none"> Validate data with and make available to stakeholders 	<ul style="list-style-type: none"> Will the activities encourage multi-stakeholder participation?



Collaborate

1. Partnerships are established with meteorological and scientific institutions that lead to improved information sharing and understanding
2. Barriers to integration - Both between relevant sectors and from local to national levels - are identified and actions taken to either reduce or remove them
3. Planning and implementation between existing and new partners across sectors and between levels takes place to improve integration across action points

Access

1. All relevant stakeholders are identified and actively engaged in developing and using climate scenarios to improved current and future policy and programming
2. Scientific and indigenous/local climate knowledge are triangulated and inform climate scenarios and risk reduction practice on an ongoing basis
3. Vulnerability and capacity assessments at community level reflects climate scenarios and identities resilience-building actions that are supported by policy, planning and programming

ACDM Joint Statement on the Occasion of the 4th Ministerial Conference for Disaster Risk Reduction Incheon, Republic of Korea, 25-28 October 2010

**ASEAN: At the Crossroads of Economic Advancement and
Increasing Disaster Vulnerability in a Changing Climate**

Climate-smart disaster risk reduction

In a changing climate regime, the ACDM recognises that a climate-smart approach to disaster risk reduction is urgently needed. Holistically tackling the impacts of climate change and risk of natural disasters is necessary, if ASEAN Member States are to attain the Millennium Development Goals (MDGs), alleviate poverty, and reduce vulnerability.



ପ୍ରାଚୀନ





CLIMATE CHANGE RISKS AND ACCESS TO SCIENTIFIC INFORMATION: KEY ASKS

THE AIM OF THIS SCIENTIFIC BRIEF IS TO BE ABLE TO PROVIDE INFORMATION TO CIVIL SOCIETY ORGANIZATIONS (CSOs) ON THE CURRENTLY AVAILABLE DOWNSCALED REPRESENTATIVE CONCENTRATION PATHWAYS OF COUNTRIES WHERE THE ASIA CLIMATE CHANGE CONSORTIUM (ACCC) PARTNERS WORK.

Potential actions that could diminish the threats posed by climate change to society and ecosystems include substantial reduction in greenhouse gas emissions as well as preparing for changes that are now unavoidable. The community of scientists has responsibilities to improve overall understanding of climate change and its impacts. Improvements will come from pursuing the research needed to understand climate change, working with stakeholders to identify relevant information, and conveying understanding clearly and accurately, both to decision makers and to the general public.

Specifically, the paper will:

1. Review and distill currently available RCPs in a form that CSOs will understand the projections and scenarios using RCPs per available climate variable for the near and far future
2. Based on sound science, advise on potential mitigation, adaptation, climate resilience options for decision support
3. Dialogue with ACCC members on the scientific brief so CSOs to help CSOs prepare an evidence-based policy brief that will inform the NDC preparation of respective countries and regional inter-governmental decisions

www.asiaclimatchangeconsortium.org ASIA CLIMATE CHANGE CONSORTIUM

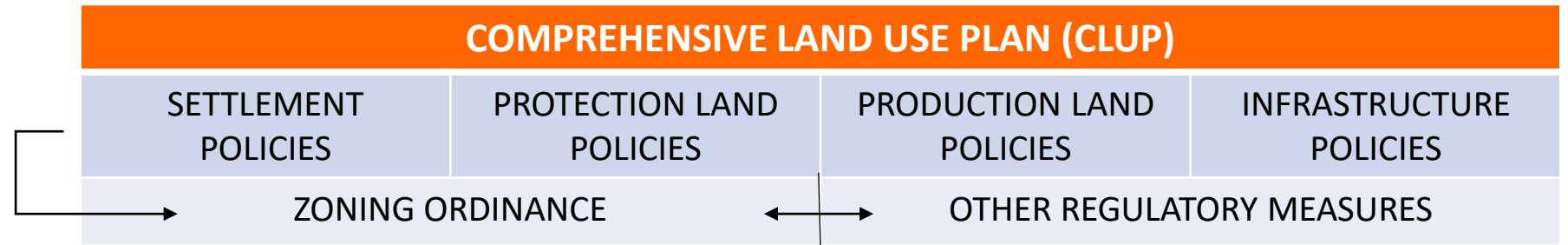
OBSERVED CHANGES AND TRENDS IN CLIMATE IN ASIA

The Intergovernmental Panel on Climate Change (IPCC) defines Asia as the land and territories of 51 countries/regions, as shown in Figure 2 below. Based on geographical position and coastal boundaries, it is divided into six sub-regions: Central Asia (5



So, where are we now in terms of using climate science as a decision support for resilience?

**Long-Term
Framework Plan**



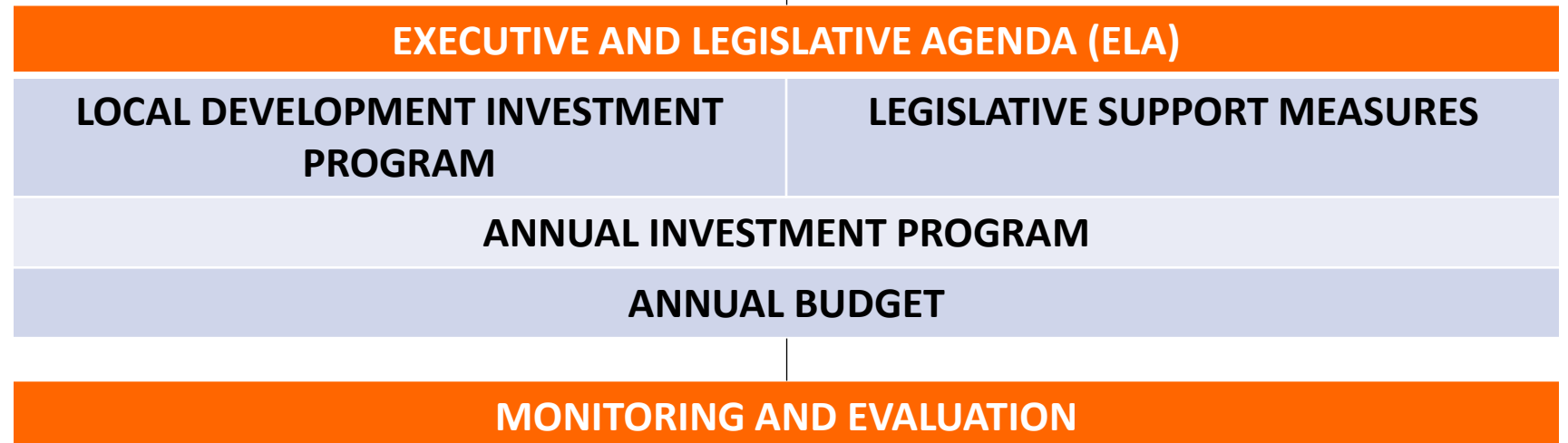
**Multi-year, Multi-
sector Plan**



Derivative Plans

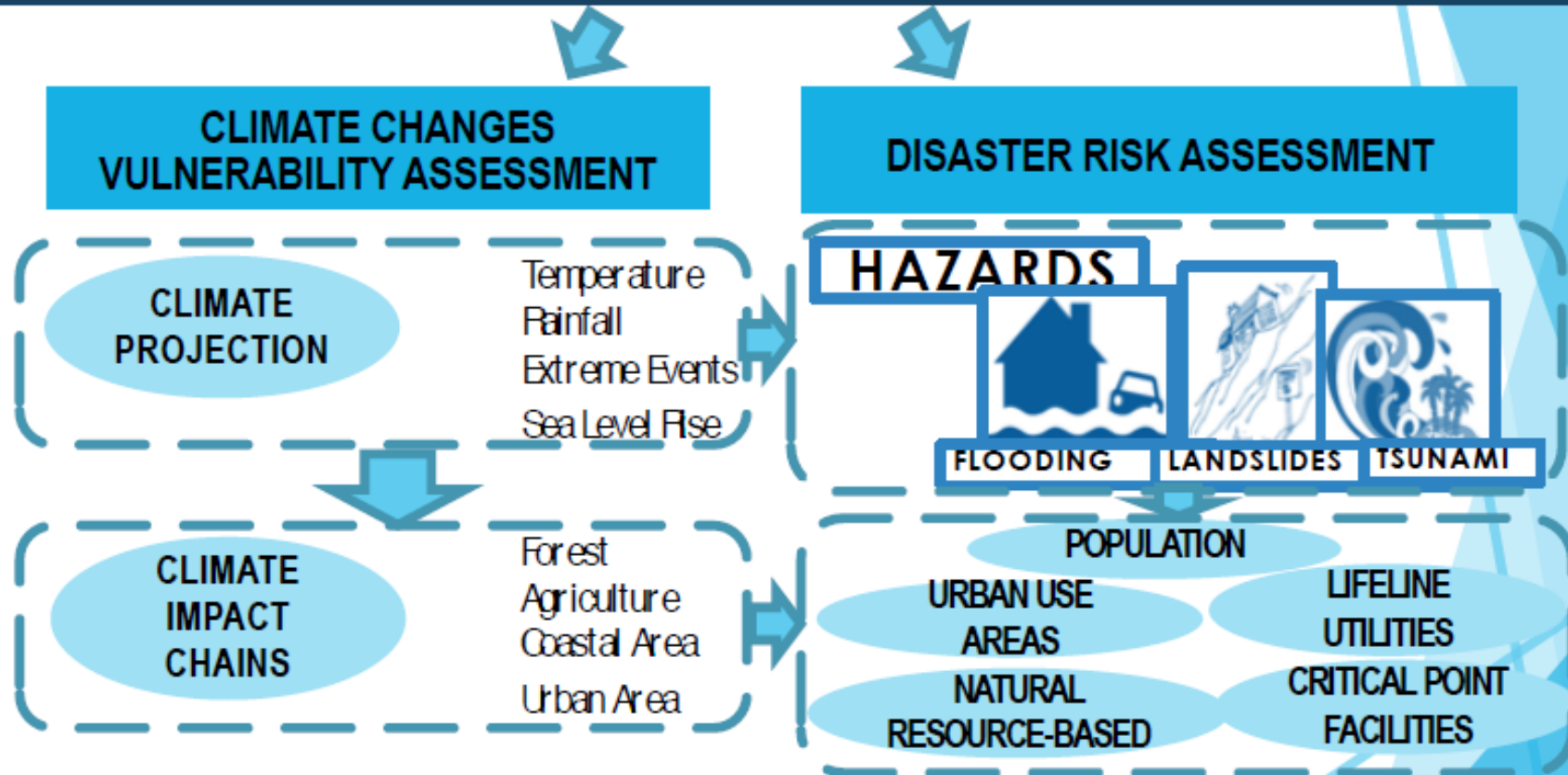


Term-based Plan



MONITORING AND EVALUATION

Climate and Disaster Risk Assessment





Understanding the Process



Social Sciences and Humanities Research Council of Canada

Conseil de recherches en sciences humaines du Canada

Canada

Climate and Disaster Risk Assessment: Iloilo City

(for the CLUP)

February 2020

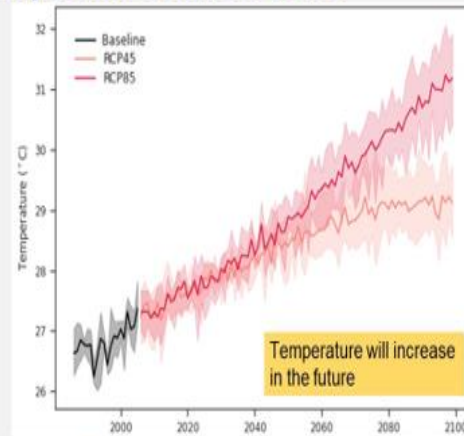


Acknowledgements

This transdisciplinary action research was carried out under the Coastal Cities at Risk in the Philippines: Investing in Climate and Resilience Project, with the aid of a grant from the International Development Resource Centre (IDRC), Canada, and implemented by the Ateneo de Manila University (ADMU), in collaboration with the Manila Observatory (MO), Ateneo Innovation Center (AIC), the National Resilience Council (NRC), University of the Philippines – Visayas (UPV), and the City Government of Iloilo.

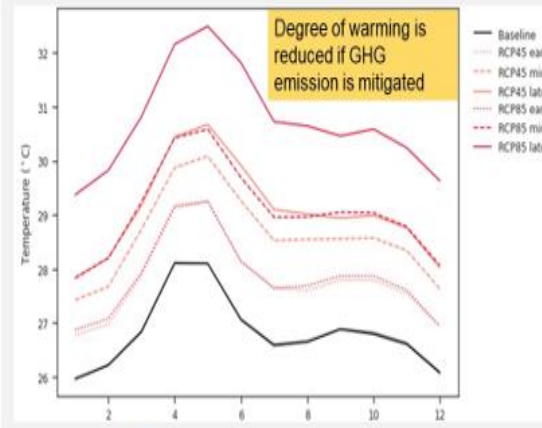
This report was prepared by Ma. Laurice Jamero, Gay Defiesta, Franco Anthony Agudo, Alan Moscoso, Leah Araneta, Emilio Gozo, Marion Dimain, Magn Dela Paz, Donna Magno, Jessica Dator-Bercilla. The authors would also like to thank Emma Porio, May Celine Vicente, Faye Cruz, Dolly Zoluaga, Keith Camena, Sonia Cadornigara for sharing their insights.

Temperature: Annual trend



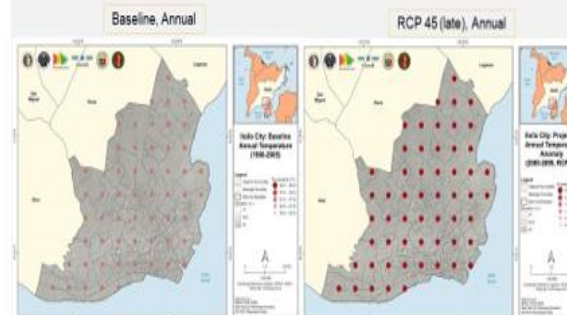
Average temperature is projected to significantly increase in Iloilo City but the temperature increase can be addressed by mitigation actions. There is projected uniform increase in temperature across the City of Iloilo with the temperature increase most felt in the summer in the months of March, April, and May and even on rainy season of June, July, and August.

Temperature: Monthly profile



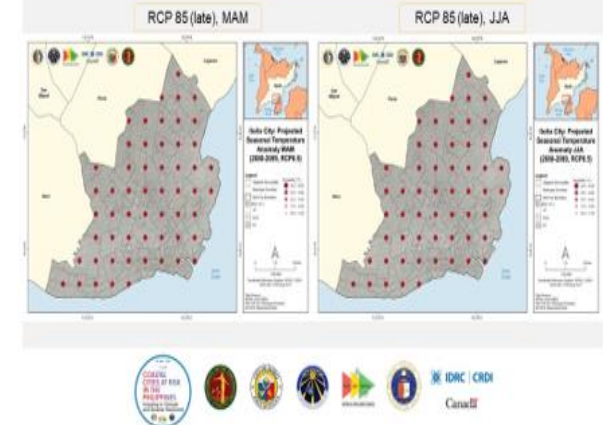
Temperature

Uniform increase in temperature over Iloilo City



Temperature

Temperature increase will be felt in summer (MAM), and even in rainy season (JJA)



In the summer of 2019, Iloilo Province declared a state of calamity due to the El Niño-induced water crisis in the area. As early as 2015, Iloilo City has foreseen such challenge when it declared a "state of imminent water crisis." Unfortunately, climate analyses show that drought events are projected to further increase in the future.

Drought can lower agricultural productivity especially within cropland areas, putting the city's economy and food security at risk (FAO, 2017). Prolonged drought may also cause the water in Tigun River (Maasin) to drop to critical levels, and groundwater wells to dry up.

Currently, many households in Iloilo City rely on groundwater wells for potable water to be used for cooking (Figure 5) and even drinking (Figure 6).

Furthermore, given that many households in Iloilo City still rely on tubed or dug wells for cooking and drinking, special attention must be paid to preventing flood waters from contaminating the environment through increased sewage input. In the long-term, the city must work towards increasing these households' water access from Level 1 to Level 3 (Figure 4). Contamination of dug wells during flooding and lack of access to water in

Volume I

**Iloilo City Comprehensive Land Use Plan
(CLUP) 2021-2029**

Final Draft



February 2021

Local Development Council of Iloilo City

Climate and Disaster Preparedness and Resilience (per Development Planning recommendations defined in the CDRA Compilation Report)

1. Change in Temperature

- a. Adoption of green architecture, use of cool roofs and pavements to reduce Urban Heat Island
- b. Establish or increase areas of vegetated land through open spaces, pocket gardens, planting in curb, green roofs and walls or urban greening
- c. Provide risk insurance for farmers that may be affected by drought
- d. Promote low emission development
- e. Enact local policies for the mitigation of drought and its resulting other risks like water shortage (e.g., water conservation, regulated groundwater extraction, etc.)
- f. Plan and implement mitigating measures at the household and barangay levels (e.g., communal cisterns for emergency water supply, water deliveries by the city government, etc.
- g. Green city plazas, esplanade, walk ways
- h. Protect remaining and/or restore Iloilo City's wetlands to increase urban water bodies
- i. Secure air tunnels in urban design and in the review and approval of infrastructure
- j. Use of solar photo-voltaic (PV) canopies in parking lots;
- k. Eliminate or reduce urban canyons that do not enable emission of radiation to nighttime sky
- l. Enhance water recharge potential during rainy season by using pavement materials that are permeable

2. Change in Precipitation

- a. Consider construction of rainwater harvesting facilities at the household level or community scale to take advantage of increased rainfall
- b. Flood mitigating measures should be in place (e.g., disaster preparedness through evacuation, construction of evacuation centers, etc.)
- c. In case of lack of rainfall affecting water source, alternative water sources for domestic and commercial consumptions should be developed.
- d. Consider storm water cisterns at district plazas and other public open spaces for water storage
- e. Increase the number of below-road lineal detention tanks for storm water and study the possibility of its treatment for domestic water use

3. Extreme Events and Sea Level Rise

- a. Consider construction of rainwater harvesting facilities at the household level or community scale to take advantage of increased rainfall as potential water source in the long term.
- b. In case of lack of rainfall affecting water source, alternative water sources for domestic and commercial consumptions should be developed. Other planning activities such as Water Demand Management (WDM) and Non-Revenue Water (NRW) planning should be done.
- c. Flood mitigating measures should be in place (e.g., disaster preparedness through evacuation, construction of evacuation centers, etc.).
- d. Promote the application of tropical architecture designs and green technologies for houses and buildings
- e. Consider city-wide installation of below-road storm water detention tanks
- f. Implement a comprehensive urban drainage improvement program
- g. Plan and implement storm water cisterns at district plazas and other public open spaces
- h. Consider the construction of seawalls along critical coastal areas that can also serve as a road or a lineal park
- i. Implement greening projects along critical coastlines to act as buffers

4. Flooding

- a. Various flood mitigating measures should be in place (e.g., disaster preparedness through evacuation, construction of evacuation centers, etc.).
- b. In areas most exposed to flood, evacuation centers should be located outside the barangay. These evacuation centers should also be large enough to accommodate the estimated number of evacuees (based on the experience from Typhoon Frank).
- c. Further development (e.g., settlement areas or commercial activities) in identified flood prone areas particularly those in the high to very high flood susceptibility (as shown on the map) must have proper risk mitigation measures in place.
- d. The concept of Flood Protection Elevation should be sustained and the Zoning Ordinance's provision on its application should be carefully enforced at the Flood Overlay Zone
- e. An early warning system managed with the Iloilo Provincial Government should be sustained with adequate logistics and fund support

Next steps?

Getting climate science into the risk assessments for coastal and marine ecosystems



Essential Climate Variables



<https://gcos.wmo.int/en/essential-climate-variables>

Essential Ocean Variables



The Global Ocean Observing System, Essential Ocean Variables,
https://www.goosocean.org/index.php?option=com_content&view=article&id=14&Itemid=14

Why?

For Resilience

IPCC, SREX

- The ability of a system and its component parts to **anticipate, absorb, accommodate, or recover** from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.

UNISDR, 2017

- The ability of a system, community or society exposed to hazards to **resist, absorb, accommodate, adapt to, transform and recover** from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.

IPCC, AR5

- The **capacity of social, economic and environmental systems to cope** with a hazardous event or trend or disturbance, **responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.** {WGII, III