

# **Urban Resilience to Climate Change: Challenges and Initiatives for Philippine Urban Setting**

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# Outline of Talk

- Definitions and Elements of Building Urban Resilience
- Climate Change Design Parameters and Downscaling and Alternative Urban Resilience Measures, Strategies and Infrastructures (Not Discussed Anymore)
- Role of Sustainability Science and Transdisciplinary Approach in Building Urban Resilience
- Government Initiatives, Issues and Challenges in Building Urban Resilience
  - Climate Change Commission, Philippines
  - Department of Public Works and Highways, Philippines
- Conclusions

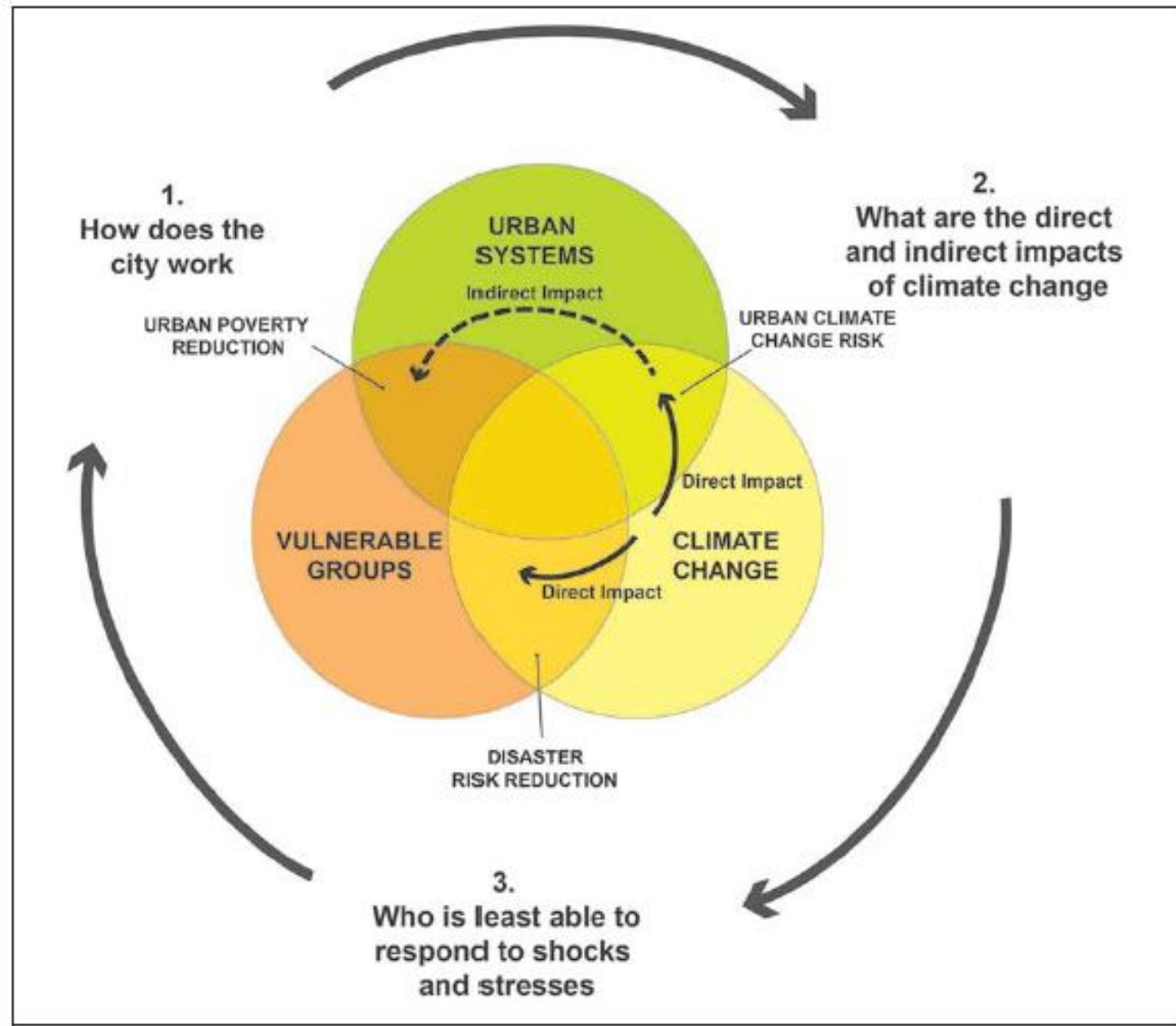
# Definition: Urban Resilience to Climate Change

- From ecosystem and socio-ecological system literature, resilience is defined as (ACCCRN, 2007)

“the ability to absorb disturbances, to be changed and then to re-organize and still have the same identity, that is, to retain the same basic structure and ways of functioning”
- In the context of climate change (ACCCRN, 2007)
  - Resilience is the capacity of an individual, community or institution to dynamically and effectively respond to shifting climate circumstances while continuing to function at an acceptable level.
  - The ability to resist or withstand impacts, as well as the ability to recover and re-organize in order to establish the necessary functionality to prevent catastrophic failure at a minimum and the ability to thrive at best.

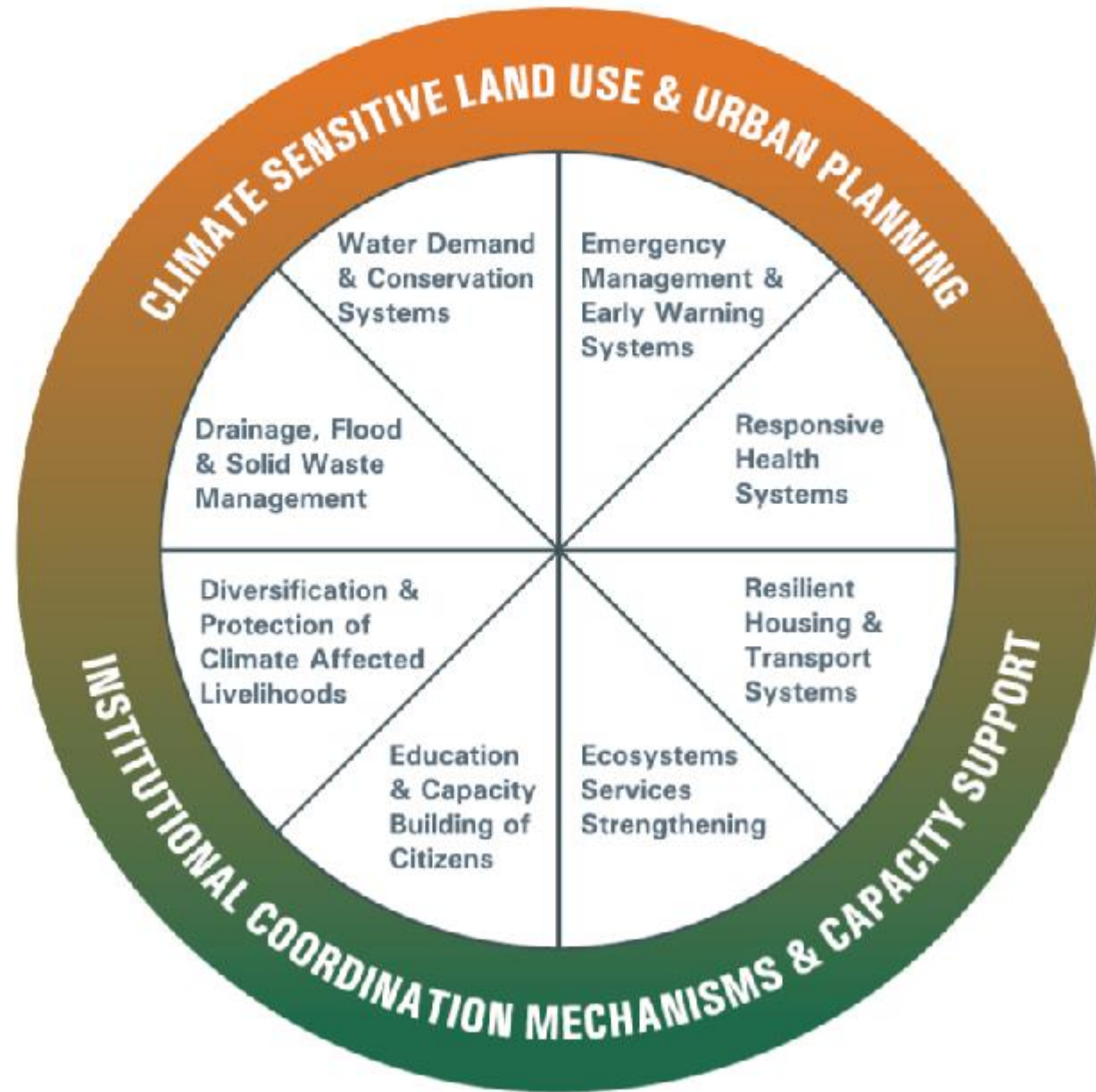
## Starting Point in Urban Resilience to Climate Change (from da Silva, Kernaghan and Luque, 2012):

Understanding vulnerability in the context of urbanization in the **urban system**, the **vulnerable groups** that are subjected to higher risks and exposures, and how the dynamics of **climate change** interact with both.



## Critical action areas in urban climate change resilience (Brown, Dayal & del Rio, 2012)

Inside the circle are action areas that cities must consider to strengthen their ability to anticipate, prepare for and respond to the sudden and slow onset impacts of climate change **under the umbrella (outer circle)** of climate sensitive land use and urban planning as well as institutional coordination mechanisms and capacity support.



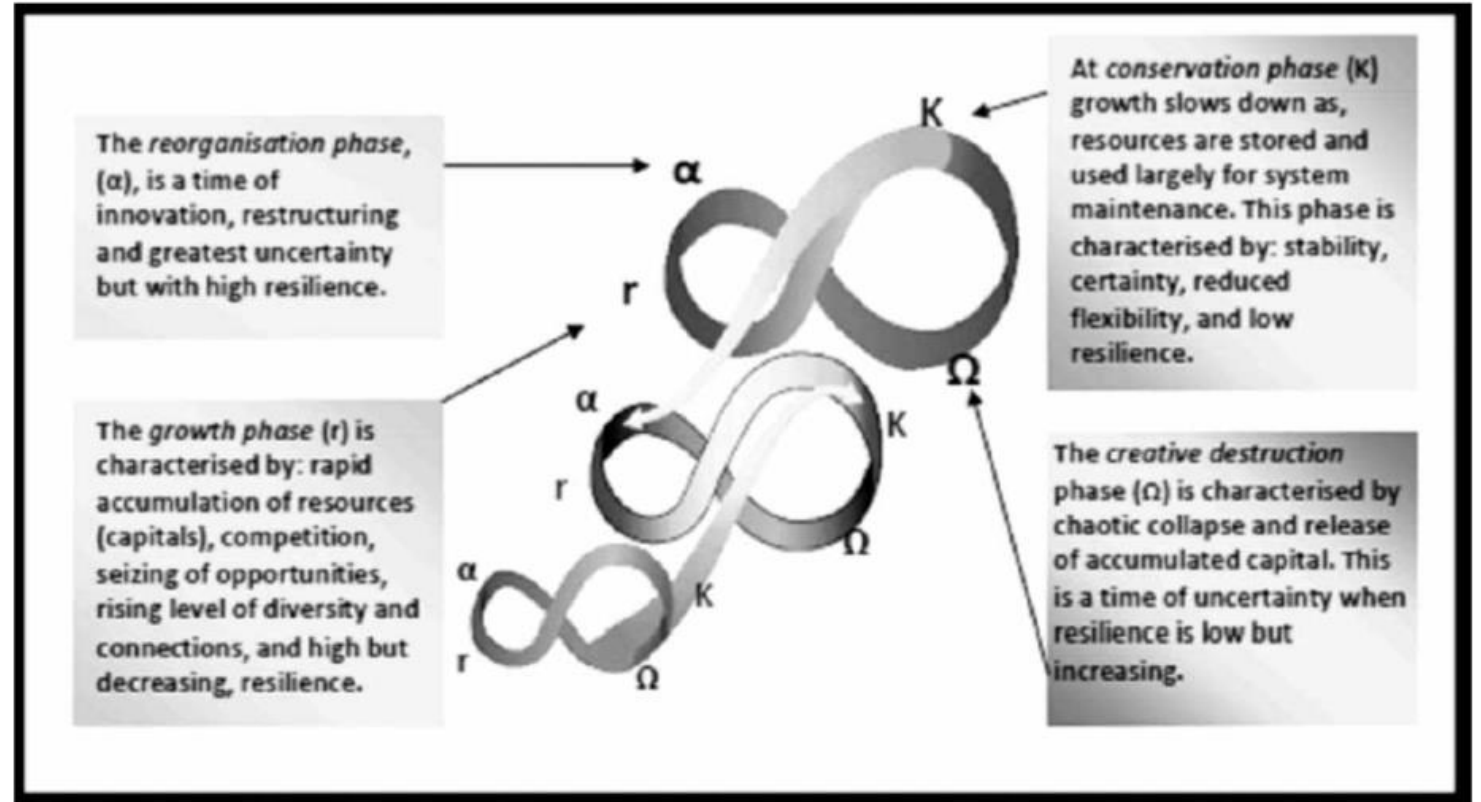
# Holling's Panarchy model of resilience and adaptive change (from Davoudi, et al, 2016)

Two loops:

- First loop of the cycle relates to emergence, development and stabilization of the system structure and functions.
- Second loop relates to their eventual rigidification and decline, and at the same time opening up of new and unpredictable possibilities.

This implies that:

- as systems mature, their resilience reduces and they become “an accident waiting to happen” , and
- when systems collapse, “a window of opportunity” opens up for alternative systems configuration.



Holling uses the “omega” symbol for the creative destruction phase to denote the end phase, but one which is rapidly followed by an alpha phase of reorganization and renewal.

The omega phase is, therefore, the time of greatest uncertainty yet high resilience; a time for innovation and transformation; a time when a crisis can be turned into an opportunity.

## **Furthermore on Panarchy Model of adaptive cycle (Gunnerson and Holling, 2000 and Gunderson and Holling, 2002)**

Adaptive cycle presents a number of paradoxes:

- persistence versus change
- flexible versus efficient
- resilient versus transformational
- connected versus adaptable

These contradictions are resolved with the idea of “panarchy” as opposed to hierarchy such that:

- Firstly, the phases are not necessarily sequential or fixed
- Secondly, systems function not in a single cycle, but rather in a series of nested adaptive cycles that operate and interact.

## Urban climate change resilience planning (from Brown, Dayal & del Rio, 2012)

Resilience planning is the process of bringing together technical, scientific, and local knowledge into decision making processes.

Resilience planning builds on iterative, inclusive, and integrated processes to reduce the uncertainty and complexity of rapid urban growth and climate change.

Engages multiple stakeholders using an adaptive cycle of action and reflection progressively builds capacity and understanding over time.

Visioning and scenario planning for planning for urban and climatic uncertainty and to plan and prioritize actions.



Resilience planning involves development of a strategy that documents the cumulative understanding of current and future vulnerability, and identifies strategies and actions to build resilience over time.



# Qualities of Resilience and Resilient Systems (from Arup, 2012)

## Reflective

- People and institutions systematically learn from experience, with an adaptive planning mindset that accepts unpredictable outcomes

## Robust

- A robust system anticipates system failures and makes provisions to maximize predictability and safety.

## Redundant

- Redundancy is to deliberately plan capacity so that if one component of the system fails, other pathways or substitutable components can meet essential functional needs.

## Flexible

- Flexibility is the ability to change, evolve and adopt in response to changing conditions.

## Resourceful

- Resourcefulness is to respond quickly to extreme events, modifying organizations or procedures as needed.



## Inclusive

- An inclusive approach is consultation and engagement of stakeholders and communities, particularly those who are vulnerable.

## Integrated

- Integration requires ongoing feedback system for collection of information and response.

# Building Urban Resilience in the Context of Sustainability Science Vs Traditional Science

<i>Elements</i>	<i>Traditional Science (TS)</i>	<i>Sustainability Science (SS)</i>	<i>Difference TS vs SS</i>	<i>Urban Resilience with SS</i>
<i>Aim of Study</i>	To understand everything and manage individuals	To understand everything and manage their relations	Separate Disciplines vs Transdisciplinary	Understand and manage together infrastructural, institutional, economic and social resilience (i.e., avoid whole system to suffer by improving only part of it)
<i>Mode of Change</i>	Unchangeable (deduced from existence)	Slow change	Stable vs Unstable	Urbanization changes with climate, land use, social, political and economic changes at micro/macro levels
<i>Truth Verification</i>	Experiments in laboratory	Evolution in reality	Certain (historicist) vs Uncertain (evolutionary)	Include computer simulations (4d lens) over so many years to account for uncertainties and dynamic changes
<i>Result of Research</i>	Knowledge for understanding	Knowledge for action	Analysis vs Synthesis	Resilience planning is iterative, inclusive and integrative to reduce the uncertainty and complexity of urban growth and climate change
<i>Expected Outcome</i>	Prosperity of human beings	Sustainability of the earth	Prosperity vs Sustainability	Not a single outcome but series of outcomes and actions building upon each other, enhanced and progressed over time as people and institutions learn from past experiences and decisions

Columns 1-4 Adapted from Prof. H. Yoshikawa, (*Sustainability Science for Action*, 2009)

# Transdisciplinary Approach in Building Urban Resilience

- Building urban resilience in an urban setting like Metro Manila is a complex process due to the interaction, dynamics and uncertainties of:

<b><i>physical system</i></b>	<b><i>social system</i></b>	<b><i>human system</i></b>
<ul style="list-style-type: none"><li>• global and local climate and variabilities</li><li>• land use changes</li><li>• changes in urban configuration and dimension</li></ul>	<ul style="list-style-type: none"><li>• economic objectives</li><li>• societal needs</li><li>• political ambitions</li><li>• inadequate investment</li></ul>	<ul style="list-style-type: none"><li>• individual lifestyles and behaviors</li><li>• culture of disaster</li><li>• informal settlements</li><li>• improper garbage disposal</li></ul>

- Thus, building urban resilience encompass the various disciplines from physical sciences, socio-economics, political science, to cultural and behavioral sciences.
- According to van Kerkhoff (2013), transdisciplinary approach :

*“transcends disciplinary pre-conceptions, but is capable of understanding and synthesizing across a range of disciplinary and nondisciplinary ideas and theories”*

- **Main features of transdisciplinary approach**

<ul style="list-style-type: none"> <li>❑ <b>stakeholder engagement and collaboration</b> involving academics, professionals, government units, non-government organizations, communities and individuals</li> </ul>
<ul style="list-style-type: none"> <li>❑ <b>iterative process</b> of project development in consultation with stakeholder</li> </ul>
<ul style="list-style-type: none"> <li>❑ <b>work collectively</b> from problem identification, then knowledge generation to development of sustainable solutions and final project implementation</li> </ul>
<ul style="list-style-type: none"> <li>❑ <b>decisions are made on panarchical basis (in contrast to hierarchical)</b> of (i) satisfying physical laws and constraints, (ii) sustainable ecological solution, (iii) sound economic basis, and finally (iv) socially justifiable and (v) politically acceptable solutions</li> </ul>

- **Transdisciplinary approach as contrasted to other approaches:**

<p><b><i>Monodisciplinary</i></b></p> <ul style="list-style-type: none"> <li>• reactive</li> <li>• isolated approach by individual experts</li> </ul>	<p><b><i>Multidisciplinary</i></b></p> <ul style="list-style-type: none"> <li>• proactive</li> <li>• additive approach bringing together a wide range of experts</li> </ul>	<p><b><i>Interdisciplinary</i></b></p> <ul style="list-style-type: none"> <li>• integrative</li> <li>• experts and stakeholders solve a problem by parts then integrate</li> </ul>	<p><b><i>Transdisciplinary</i></b></p> <ul style="list-style-type: none"> <li>• interactive and holistic</li> <li>• experts and stakeholders solve problem as a whole through interaction of parts</li> </ul>
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## **Major government initiatives including issues and challenges in building urban resilience**

- Climate Change Commission (CCC)
- Department of Public Works and Highways (DPWH)

# Ecotown Pilot Projects: Climate Change Commission (1)

Project Name	Scope	Partner	Milestones	
<b>ADB TA: 8111</b> Climate Resilience and Green Growth in the Upper Marikina Riverbasin Protected Landscape	Antipolo Baras Rodriguez San Mateo Tanay	Asia Development Bank (ADB)	<ul style="list-style-type: none"> <li>- Baseline Information and GHG (Inventory)</li> <li>- Green Growth Road Map</li> <li>- Benefit Cost Analysis</li> <li>- Multi-Criteria Variate Analysis</li> <li>- Vulnerability Assessment</li> <li>- Sectoral Reports</li> </ul>	<ul style="list-style-type: none"> <li>- ENRA and GIS Mapping</li> <li>- Envi. And Economic Valuation, and PES Training</li> <li>- Pilot Demonstration Projects (On-going)</li> <li>- Final Report</li> </ul>
<b>ADB TA: 8493</b> Climate Resilience and Green Growth in Critical Watersheds	Lower Marikina (3) -Marikina, Quezon City, Cainta  Camarines Sur (3) -Naga, San Fernando, Milaor  Davao Oriental (3) -Baganga, Cateel, Boston	Asia Development Bank (ADB) and Japan Fund for Poverty Reduction (JFPR)	<ul style="list-style-type: none"> <li>- Baseline Information Report</li> <li>- Study Tour in Japan</li> <li>- GHG Training - 3 Watersheds</li> <li>- VA and Gender Sensitivity Training</li> <li>- Baseline Calculation Methods Training</li> <li>- ENRA and PES Training Workshop</li> <li>- GHG Inventory Report</li> </ul>	<ul style="list-style-type: none"> <li>- Dedicated website for the demonstration</li> <li>- Conduct of ADB-IGES Workshop</li> <li>- Participatory Action Planning workshop</li> <li>- Cost Benefit Analysis Workshop and reports</li> <li>- Development of LCCAPs</li> </ul>
<b>Climate Resilience and Green Growth (CRGG)</b>	San Vicente, Palawan	Global Green Growth Institute (GGGI)	<ul style="list-style-type: none"> <li>- Ecotown demonstration results used in Tourism Master Plan</li> <li>- Project development Assistance (ON-GOING)</li> </ul>	<ul style="list-style-type: none"> <li>- Scale up to the Province of Palawan and Oriental Mindoro ( Ecotown Scale-Up)</li> </ul>
<b>Ecotown Scale-Up: CRGGG at the Provincial Level</b>	Prov. Of Palawan (23) Prov. Of Oriental Mindoro (14)	Global Green Growth Institute (GGGI)	<ul style="list-style-type: none"> <li>- General CRGG Framework developed and finalized</li> <li>- Deliverables for Component 1 (Institutional Mechanism, M&amp;E, Communication Mechanism) are completed</li> <li>- Provincial Project Team established</li> </ul>	<ul style="list-style-type: none"> <li>- General CRGG Framework developed and finalized</li> <li>- Validation workshop for the draft CRGG methodology framework</li> <li>- Conduct of LCCAP and PSF Training Workshop</li> </ul>

## Ecotown Pilot Projects: Climate Change Commission (2)

Project Name	Scope	Milestones	
<b>Ecotown demonstration in Batanes</b> <i>(with additional support from USAid)</i>	-Basco -Ivana -Mahatao -Sabtang -Uyugan	- Socio-Economic Assessment (USAID) - GIS Maps (USAID)	
<b>Ecotown demonstration in Surigao Del Norte</b> <i>(with additional support from GIZ and GGGI)</i>	-Del Carmen -Pilar -San Benito -San Isidro	-Local Subsidy (LS) -CASS (Funded by CCC) -Low Carbon Dev't Pathway Study	-GIS - NRA (USAID) -VA Study and Adaptation Measures (GGGI)
<b>Ecotown demonstration in the Province of Bohol</b>	-Balilihan -Antequera -Catigbian -Cortes -Maribojoc	Module Training: 1) Introduction to Climate Change and VA/NRA Concepts 2) Climate Change Early Action and Adaptation Workshop	- Presentation and validation workshop of the results of the VA/NRA - FGD/KIIs conducted
<b>Ecotown demonstration in the Province of Romblon</b>	-San Fernando -Cajidiocan -Magdiwang -Romblon -Odiongan	- VA and NRA Inception Reports - NRA Scoping Report - NRA Draft Report (for integration of comments)	
<b>Ecotown demonstration in the Province of Eastern Samar</b>	-Borongan -Can Avid -Llorente -Guiuan	- VA report - Training Program Climate Smart Planning and Implementation integrated into final VA report	- Prioritized Adaptation and Mitigation Measures integrated into final VA report

# Other Projects and Programs: Climate Change Commission (1)

Project Name	Scope	Partner	Outputs/Milestones
<b>ReBuild</b>	Cagayan Riverbasin (2) Jalaur Riverbasin (3)	UNDP and NZAP	-Synergy in activities and maximize outputs of PCTP; -Implementation of the ClimEx.db; -Partnership with UP-Diliman and PAGASA for flood-inundation hazard maps and climate change projections for the flood modelling; -Development of VAA Framework
<b>Scaling-up Risk Transfer Mechanisms for Climate change Vulnerable Agriculture-based Communities in Mindanao (WIBI Mindanao)</b>	Cagayan de Oro Iligan Compostela Valley Davao Oriental	UNDP and PCIC	-Community-based DRRM capacity enhancement
<b>GMMA Ready: Component 5</b>	Metro Manila Bulacan Cavite Rizal Laguna	Australian Government - DFAT	-Establishing a knowledge management system, including a vigorous Community of Practice on Disaster/Climate Risk Management.
<b>PhilCCAP: Component 1</b>		World Bank (WB)	-The Enhanced Climate-Smart Farmers' Field School Manual; -The Weather Index-Based Crop Insurance (for drought and excessive rainfall indices); -The Enhanced Operations Manual of the National Irrigation Administration (climate-proofing irrigations systems and other agricultural facilities); -Climate-Smart Decision Support System for rice and corn farmers developed by the International Rice Research Institute (IRRI); -The online climate knowledge management system created by the - Climate Change Commission, and the climate simulations produced by PAGASA.



## Other Projects and Programs: Climate Change Commission (2)

Project Name	Scope	Partner	Outputs/Milestones
<b>Project Climate Twin Phoenix</b>	Cities of Cagayan de Oro, Iligan, Tacloban; provinces of Compostela Valley, Davao Oriental, Leyte, Samar, and Eastern Samar; municipalities of Opol, New Bataan, Boston, Abuyog, Mayorga, MacArthur, Dulag, Tolosa, Tanauan, Palo, Basey, Marabut, Lawaan, and Balangiga)	UNDP	<ul style="list-style-type: none"> <li>-Development of the ClimEx.db software;</li> <li>-Supplemental Guidelines;</li> <li>-Climate-adjusted Flood hazard Maps;</li> <li>-Climate Change and Risk Information System Planning (CRISP);</li> <li>-Expanded to: PCTP - RAPID</li> </ul>
<b>Low Emission Capacity Building Programme - Philippine Project (LECB PHL Project)</b>		The European Union, Governments of Germany and Australia (Donor) United Nations Development Programme-Country Office (Exec Agency)	<ol style="list-style-type: none"> <li>1. Provide support to CCC in NDC activities by assisting in the institutionalization and development of an NDC framework/roadmap</li> <li>2. Assist CCC in establishing an enabling environment that will engage private/business sector to adopt climate change measures through the following activities:               <ol style="list-style-type: none"> <li>a. Dev't of Private Sector Low Emission Development Strategy (LEDS) RoadMap</li> <li>b. Dev't of the Government Recognition/Awards System</li> <li>c. Dev't of GHG Reporting Inventory and Management Protocol/platform for the private sector</li> </ol> </li> <li>3. Continue to build the capacity of the public sector to develop policies and monitor the implementation of climate change measures spearheaded by the Government through the following activities:               <ol style="list-style-type: none"> <li>a. Finalization of the PGHGIMRS Ref. Manual</li> <li>b. Assist in the planning/consultation on GHG inventory (as national exercise) to determine the readiness of NGAs/focal agencies</li> <li>c. Dev't of the NICCDIES</li> <li>d. Dev't MRV Roadmap for NAMAs and LEDS</li> <li>e. Dev't of NCCCM Framework/goal</li> <li>f. Assessment of the capacity of the public sector to develop policies and monitor the implementation of climate change measures</li> <li>g. Dev't of a Climate Change Capacity Building for National Agencies</li> </ol> </li> <li>4. Develop promotion materials and knowledge products</li> </ol>

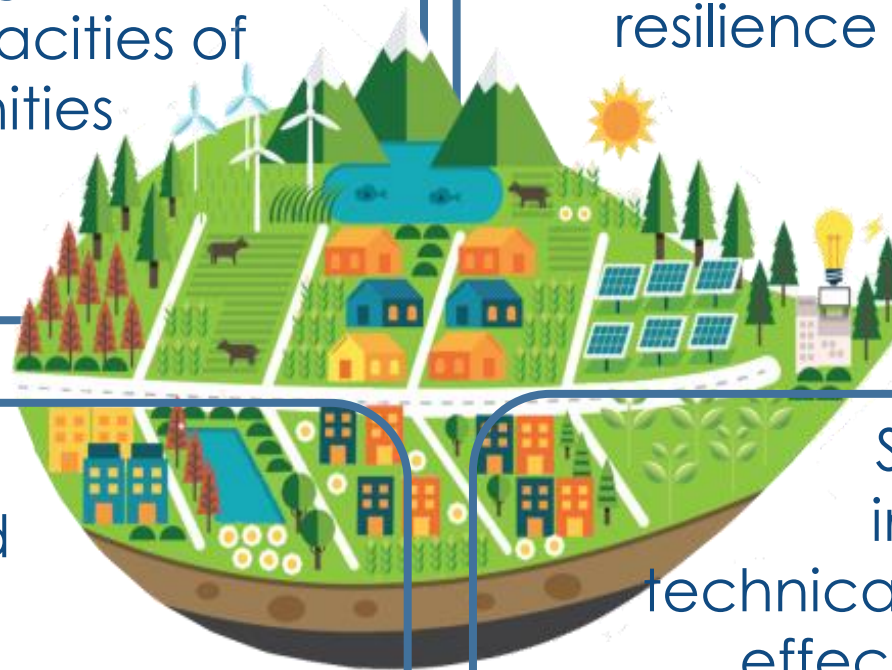
# CORE (Communities for Resilience) : Climate Change Commission (1)

Build knowledge and adaptive capacities of local communities

Upgrade disaster risk resilience of vulnerable communities

Optimize mitigation and adaptation opportunities for sustainable development

Strengthen LGU institutional and technical capacities for effective integration into local development plans.



# CORE (Communities for Resilience) : Climate Change Commission (2)



## Wave 1: CORE Convergence Forum

Awareness raising on:

- A. Climate change and disaster risk reduction strategy
- B. Methodology and tools

## Wave 2: Training of Trainers (TOT)

Training of partner SUCs and agencies:

- A. Module and manual development
  - NRA, V/RA, ENRA, GIS, Project Dev't, Financial Literacy, GHG



## Wave 3: Training of LGUs

Training of target LGUs:

- A. Trainers will train LGUs using the developed modules
- B. Target LGUs for 2016-2017: 18 Major River Basins

# CORE (Communities for Resilience): Status and Progress

- ✓ Wave 1: CORE Convergence Forum
  - Tagum-Libuganon Riverbasin
  - Davao, CDO, Buayan and Tagaloan RB
  - Wahig-Inabanga RB
  - Panay and Jalaur RB
  - Abra RB: UPCOMING
  
- ✓ Wave 2: Training of Trainers (TOT)
  - Modules and Manuals: NRA, VRA, FLT, GIS, PD and ENRA
  - MOA: 32 SUCs
  - TOT
    - First batch: Sept. 11 to Sept. 16
    - Second batch: Sept. 25 to Sept. 30
    - Third batch: Oct. 2 to Oct. 7

## **CORE (Communities for Resilience) Project: Gaps and Challenges**

- Political landscape and dynamics
- Frequency of changes in leadership (i.e. term of office)
- Lack of coordination and collaboration among national government agencies (NGAs)
- Interpretation of mandates and expected responsibilities

# Urban Resilience Infrastructure Strategies and Programs: Department of Public Works and Highways (1)

- Formulation of river basin flood mitigation master plans to flexibly cope with the potential impacts of future climate changes:
  - structural measures resilient to climate change
  - measures not to cause any casualties, even in the event exceeding the design flood
  - Strengthen non-structural measures for climate change
  - Strengthen monitoring system for rainfall intensities, river water level, tidal levels and other hydrological factors related to the climate changes
- Promotion of Rainwater Harvesting
  - Retarding basins or ponds for flood control
  - Rainwater collector systems in public school buildings for water supply and flood control
- Construction of Evacuation Centers

# Urban Resilience Infrastructure Strategies and Programs: Department of Public Works and Highways (2)

## Upgrades on design standards

- Design flood level of 50-year return period for principal and/or major rivers, which have drainage area of 40km<sup>2</sup> and above;
- Design flood level of 25-year return period for small rivers, which have the drainage area below 40km<sup>2</sup>;
- Design Guidelines, Criteria and Standards of 2015 provides for an increase of 10 % in rainfall to cover climate change impacts;
- Structural design standard for public buildings required the increase of wind speed from 200 kph to 250 kph in Zone II (along the middle part of the country traversing north to south)
- For evacuation shelter cum school building the following are provided: a) If possible, it shall not be located in a flood prone area; b) In case it is prone to flooding, the structure's finish ground flood should be 0.5 meter above the highest flood level

# **Needs and Challenges in Building Urban Resilience: Department of Public Works and Highways**

- Assessment of climate change impacts in local areas (river basins)
- Strengthening capacity for climate change impact studies
- Establishment of good data/information management system for hydrological data and basin information
- Good governance (solid waste management, encroachment in waterways, watershed use)
- Land use zoning (land conversion, rapid urbanization, etc)
- Increasing protection of vulnerable communities and properties under threat of water hazards
- Increasing public awareness and cooperation



# Conclusions

- Building urban resilience to climate change is a complex problem and definitely non-deterministic, dynamic and uncertain due climate, ecosystem and land use changes and uncertainty including economic, social and political changes.
- Thus, understanding and planning for urban resilience encompasses spatio-temporal variations of physical, economic, social and political factors and that building urban resilience covers infrastructural, institutional, economic and social resilience.
- In view of this, building urban resilience can no longer be based on traditional science but rather based on sustainability science and that transdisciplinary approach is required which utilizes scientific tools (physical, social, economic, behavioral sciences) and engages stakeholders (academics, professionals, government, civil society) to solve problems through an iterative process of collaborative learning, research and consensus building.

## ...conclusions

- In Philippine urban setting, there are several major government initiatives towards building climate change resilience. However, there are equally pressing issues and challenges in this effort.
- Questions and challenges (especially to our government)
  - How serious and to what extent do we really engage stakeholders?
  - How far are we in employing science-based decision support systems in planning and implementing urban resilience measures and strategies?
  - Can we really employ panarchical model of building urban resilience recognizing the evolutionary nature of climate change, land use change including socio-economic and political changes?
  - In the context of sustainable development, can we conduct urban resilience planning over time horizons over 100 to 150 years (to cover 4 to 5 generations) which requires sophisticated visioning and scenario setting and impact assessments by 4-d computer simulations?