

* Coastal Climate Change & Adaptation:

PART I - Practices & Lessons from South East Asia

Dan Lane, Director - IOI-Canada

Co-Director - C-Change (Canada)

Professor Emeritus, Telfer School of Management,
University of Ottawa

Professeur associé, Université Sainte-Anne



*Presentation to the 4th China- ASEAN Academy on Oceans
Law & Governance, NISCSS Haikou, Hainan*

PART 1 - Afternoon, November 13, 2018

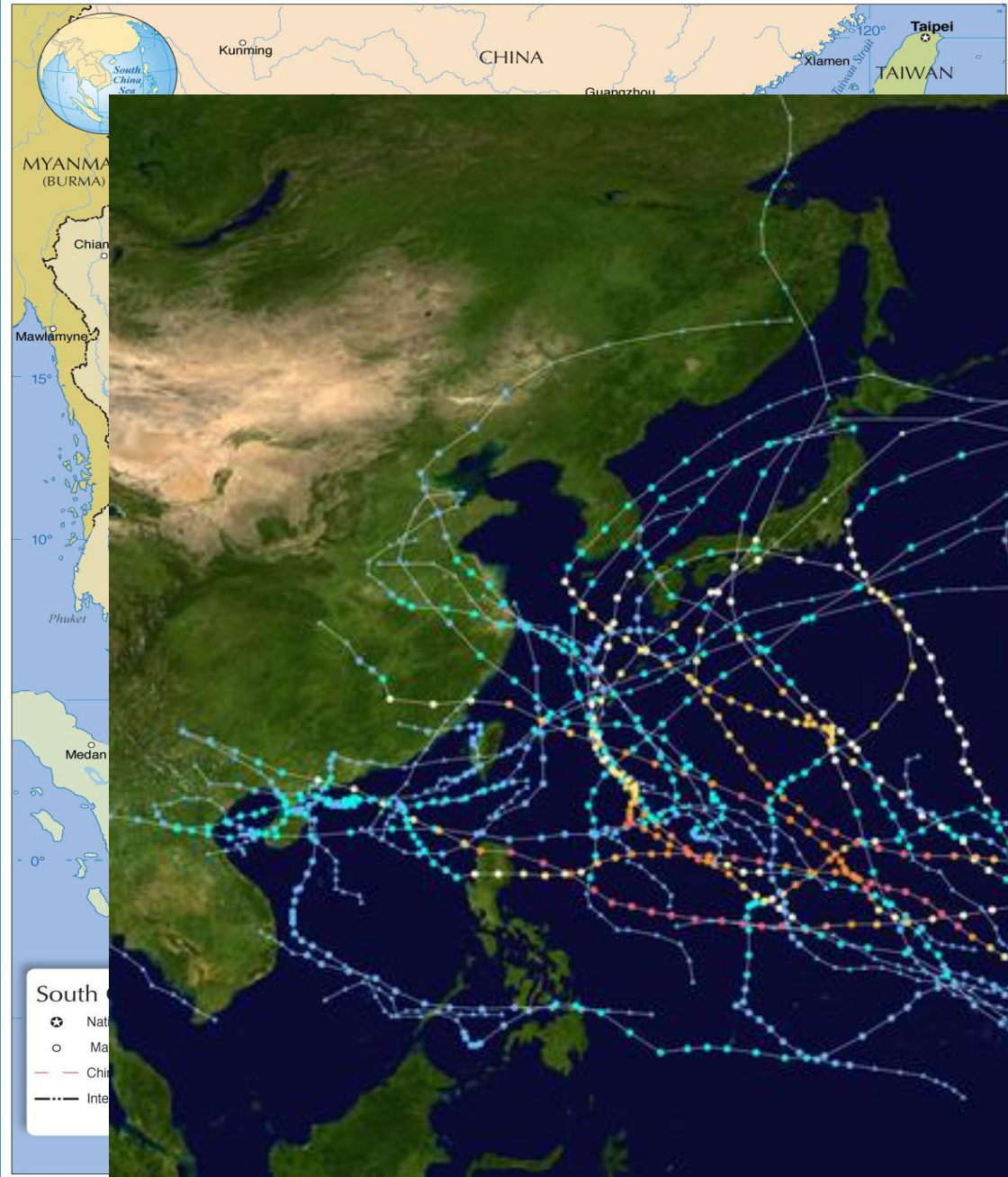




* IOI-Canada

- * 100 anniversary of Elizabeth Mann Borgese
- * Peace in The Ocean
- * The Ocean as a shared heritage for all humankind
- * The Ocean as a sustainable resource for all future generations
- * The Ocean as respected entity





South
Sea
Media
Moon
son

* Coastal Climate Change & Adaptation - Outline

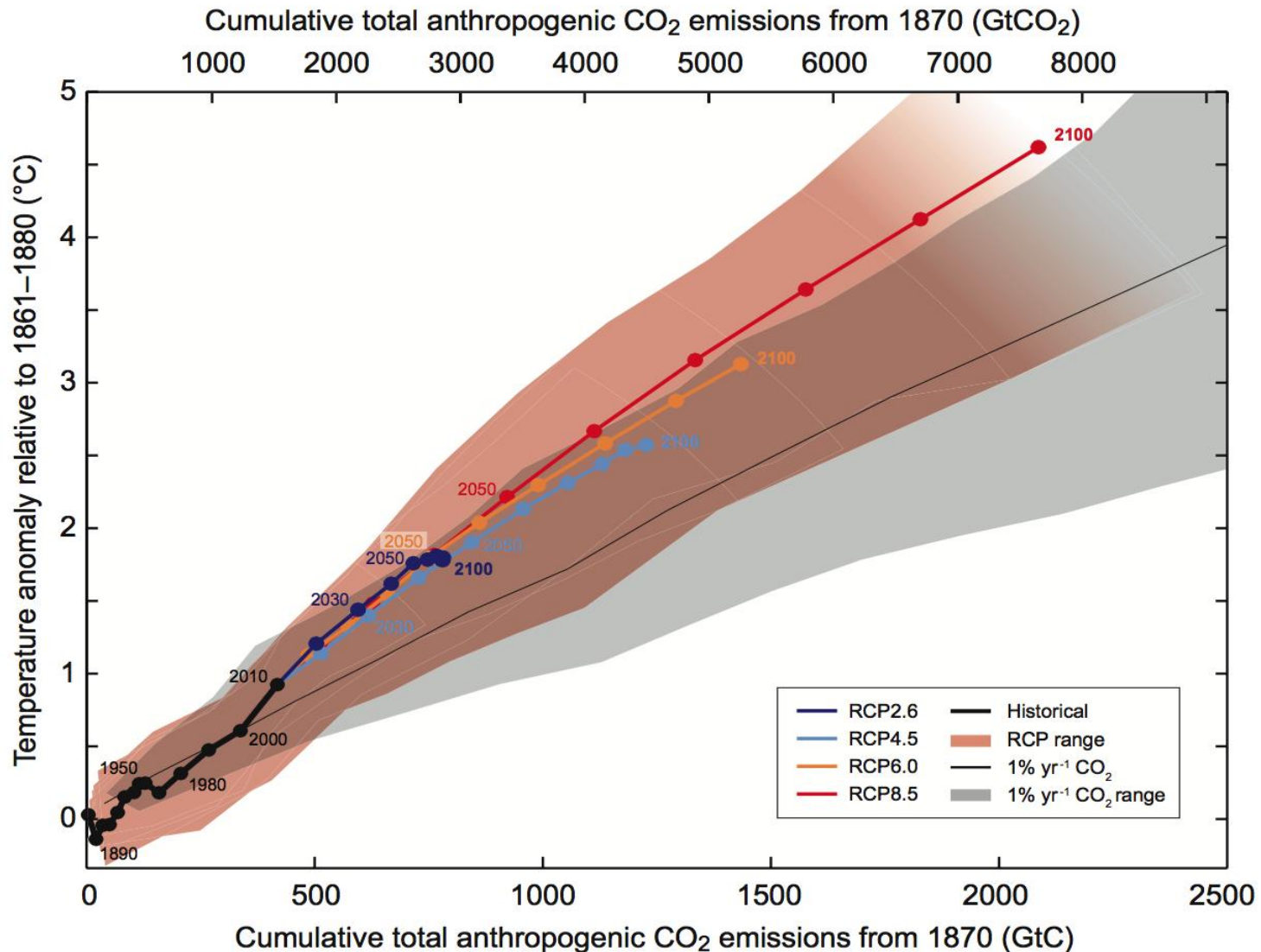
PART I - Morning

1. Introduction - Southeast Asia/China and Climate Change
2. Challenges for the 21st Century - Coastal Zones
3. Understanding Adaptation Needs - Profiling
4. Pillars of Sustainability - Reflecting Importance**

PART II

5. Vulnerability Assessment
6. Estimating Coastal Impacts
7. Adaptation Problem Solving and Strategy Options
8. Evaluating Decisions**
9. Climate Change Governance

* 1. Introduction



Source: IPCC, 2013: Summary for Policymakers. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Figure SPM 10, p.28
 Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

* UNFCCC COP21 (2015)- Paris Accord

- * To keep global temperatures "well below" 2.0C above pre-industrial times and "endeavour to limit" them even more, to 1.5C
- * To limit the amount of greenhouse gases emitted by human activity to the same levels that trees, soil and oceans can absorb naturally, beginning at some point between 2050 and 2100
- * To review each country's contribution to cutting emissions every five years so they scale up to the challenge
- * For rich countries to help poorer nations by providing "climate finance" to adapt to climate change and switch to renewable energy.

* South East Asia/China Experience

Boiling Point

One of the most vulnerable regions to climate change is witnessing the world's biggest jump in greenhouse gas emissions

Amit Prakash

The Blue Dragon, a small riverfront eatery in Hoi An, Vietnam, serves morsels of local trivia to tourists along with \$2 plates of crisp spring rolls and succulent noodles. On its damp-stained walls, the Blue Dragon's owner, Nam, marks the level of annual floods that submerge this popular UNESCO World Heritage town renowned for its bright-yellow-painted buildings.

Last November, days before presidents and prime ministers arrived in nearby Da Nang for a meeting of the Asia Pacific Economic Cooperation forum, the water level at the Blue Dragon rose to 1.6 meters (5.25 feet) when typhoon-driven rains lashed the city. Patrons scurried to safety as pots and pans floated by.

"Every time we get big rains or typhoons, it floods and everything shuts down for three to four days," says Nam, 65, who goes by one name. "Last year people had to escape in boats because the water was too high."

Typhoons and floods are becoming more intense and frequent as Vietnam and the rest of Southeast Asia bear the brunt of climate change. Long coastlines and heavily populated low-lying areas make the region of more than 640 million people one of the world's most vulnerable to weather extremes and rising sea levels associated with global warming. Governments are under pressure to act quickly or risk giving up improvements in living standards achieved through decades of export-driven growth.

Southeast Asia faces a dual challenge. It not only must adapt to climate change caused largely by greenhouse gases emitted over decades by advanced economies—and more recently by developing economies such as China and India—it also must alter development strategies that are increasingly contributing to global warming. The region's growing reliance on coal and oil, along with deforestation, are undermining national pledges to curb emissions and embrace cleaner energy sources.

Economic impact

Average temperatures in Southeast Asia have risen every decade since 1960. Vietnam, Myanmar, the Philippines, and Thailand are among 10 countries in the world most affected by climate change in the past 20 years, according to the Global Climate Risk Index compiled by Germanwatch, an environmental group. The World Bank counts Vietnam among five countries most likely to be affected by global warming in the future.

The economic impact could be devastating. The Asian Development Bank (ADB) estimates Southeast Asia could suffer bigger losses than most regions in the world. Unchecked, climate change could shave 11 percent off the region's GDP by the end of the century as it takes a toll on key sectors such as agriculture, tourism, and fishing—along with human health and labor productivity—the ADB estimated in a 2015 report. That's far more than its 2009 estimate of a 6.7 percent reduction.

22 FINANCE & DEVELOPMENT | September 2018



* IPCC Special Report Oct 2018

- * This report responds to the invitation for IPCC ‘... to provide a Special Report in 2018 on the impacts of global warming of 1.5° C above pre-industrial levels and related global greenhouse gas emission pathways’.
- * This Summary for Policy Makers (SPM) presents the key findings of the Special Report, based on the assessment of the available scientific, technical and socio-economic literature relevant to global warming of 1.5° C and for the comparison between global warming of 1.5° C and 2° C above preindustrial levels.

* IPCC Special Report Highlights

- * A1. Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate. (high confidence)
- * B1. Climate models project robust differences in regional climate characteristics between present-day and global warming of 1.5°C, and between 1.5°C and 2°C. These differences include increases in: mean temperature in most land and ocean regions (high confidence), hot extremes in most inhabited regions (high confidence), heavy precipitation in several regions (medium confidence), and the probability of drought and precipitation deficits in some regions (medium confidence).
- * B4. Limiting global warming to 1.5°C compared to 2°C is projected to reduce increases in ocean temperature as well as associated increases in ocean acidity and decreases in ocean oxygen levels (high confidence). Consequently, limiting global warming to 1.5°C is projected to reduce risks to marine biodiversity, fisheries, and ecosystems, and their functions and services to humans, as illustrated by recent changes to Arctic sea ice and warm water coral reef ecosystems (high confidence).

* CO2 Emitters (Source: CCPI/Wikipedia)

Country	Fossil fuel CO ₂ emissions (kt) in 2015 ^[8]	% Fossil fuel CO ₂ emissions by country	Emissions per capita (t) in 2015 ^[9]	Emissions (kg) per \$1,000 of GDP (2010 US\$) in 2014 ^[10]
<i>World</i>	36,061,710	100%	4.9	490.8
 China	10,641,789	29.51%	7.7	1235
 United States	5,172,336	14.34%	16.1	324.2
 European Union	3,469,671	9.62%	6.9	184.7
 India	2,454,968	6.81%	1.9	1051.5
 Russia	1,760,895	4.88%	12.3	999.4
 Japan	1,252,890	3.47%	9.9	205.2
 Germany	777,905	2.16%	9.6	197.4
International Shipping	642,024	1.78%	—	—
 Iran	633,750	1.76%	8.0	1344.4
 South Korea	617,285	1.71%	12.3	475.7
 Canada	555,401	1.54%	15.5	301
 Saudi Arabia	505,565	1.40%	16.0	921.9
 Indonesia	502,961	1.39%	2.0	492.7

* SEA (Source: ADB 2015)

- * From 1990 to 2010, carbon dioxide (CO₂) emissions in SEA have grown more rapidly than in any other region of the world. Five countries of Southeast Asia collectively account for 90% of regional greenhouse gas (GHG) emissions—Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam.
- * Potential regimes for regulating global GHG emissions through 2050:
 - ① business as usual (BAU);
 - ② fragmented national climate policies;
 - ③ a global climate stabilization agreement that is likely to keep warming below 3 °C, by limiting GHG concentrations to 650 parts per million (ppm) CO₂ equivalent by the end of the century (650 ppm scenario); and
 - ④ ambitious targets likely to avoid warming of more than 2 °C, by limiting GHG concentrations to 500 ppm CO₂ equivalent (500 ppm scenario).
- * SEA likely to sustain larger economic losses from climate change than most other areas in the world. The collective effect of impacts on agriculture, tourism, energy demand, labor productivity, catastrophic risks, health, and ecosystems—may be larger than previously estimated. Gross Domestic Product (GDP) is reduced by 11% in 2100 under the BAU emissions scenario
- * SEA has experienced rapid economic growth in recent years, and regional GHG emissions have rapidly increased, at nearly 5% per year over the last 2 decades. Deforestation and land use account for a majority of emissions.
- * Energy efficiency in most of Southeast Asia is improving more slowly than in other areas of developing Asia or the world as a whole, while coal and oil have been rapidly rising as sources of primary energy. Southeast Asia's per capita emissions are currently near the world average. Without explicit policies aimed at reducing future emissions, the region's GHG emissions are estimated to be at least 60% higher in 2050 than the actual value in 2010. Energy sector emissions are found to be 300% higher.

* ADB report- Key messages

- * Climate change is already evident in SEA (mean temperature increases between 0.14 and 0.20 C per decade since 1960). Without climate action, impacts will be much larger in the future.
- * Climate change poses substantial physical risks from increased river flooding, coastal inundation and sea level rise, increased water stress, and increased frequency of intense cyclones and storms.
- * Effects of unmitigated climate change lead to substantial economy-wide consequences and include:
 - ✓ reduced agricultural productivity
 - ✓ losses of labor productivity
 - ✓ reduced human health
 - ✓ increased energy and other resource demand
 - ✓ collapse of coastal ecosystems, and
 - ✓ loss of terrestrial forest cover and biodiversity.
- * To avoid these long-term risks, countries should help to lead the way in global climate action by transitioning toward low-carbon development.

* SEA (Source: FDB/IMF Sept 2018)

- * SEA dual challenge: (1) adapt to climate change caused by greenhouse gases emitted over decades by advanced economies and by developing economies such as China and India; and (2) alter development strategies that contribute to global warming, e.g., growing reliance on coal and oil, deforestation.
- * “New climate regime” by the end of the century when the coolest summer months would be warmer than the hottest summer months in the period from 1951 to 1980. Rice yields in Indonesia, the Philippines, Thailand, and Vietnam could drop by as much as 50 percent by 2100 from 1990 levels. Hotter weather is also pushing tropical diseases such as malaria and dengue fever northward to countries like Lao P.D.R.
- * Energy demand will grow as much as 66% by 2040. Coal alone will account for almost 40% of the increase as it overtakes cleaner-burning natural gas in the energy mix. Risk to the Paris Climate Agreement’s goal of limiting the average global temperature gain to 2C.
- * Erosion makes the area more vulnerable to storm surges and rising sea levels. The shoreline along Hoi An’s popular Cua Dai Beach receded by 150 meters in the years from 2004 to 2012. Floodwalls and sandbags are eyesores for vacationers.
- * 70% of Vietnam’s population lives along its 3,200-kilometer coastline and in the low-lying delta. Indonesia has one of the world’s longest coastlines at 54,700 kilometers. In the Philippines, which has 36,300 kilometers of coastline, 20 typhoons on average make landfall yearly, with increasing destructiveness. Cambodia, Lao P.D.R., and Thailand are also affected by storms and excessive rain, as well as by heat extremes that take a toll on agriculture and human health.

* China (CCPI Scorecard)

- * China is key. It is by far the world's biggest source of carbon emissions, producing more than one quarter of the global total and twice as much as the United States (second); India (third) emits half as much as the USA.
- * China's Paris Agreement commitment requires its CO₂ emissions to peak by 2030. Emissions declined between 2014 and 2016. However, 2017 saw coal use increase although it remained below its 2013 peak. Together with rising demand for oil and gas, CO₂ emissions in 2017 were above 2014 levels, the previous record high.
- * If the recent overall downward trend in China's coal use continues for the next few years, it is plausible that overall CO₂ emissions peaked in 2017. In this case, total Chinese GHG emissions would be likely to only show a very slight increase in the period between 2015-2030 and will essentially plateau at close to 12.0 GtCO₂e/year. If, however, coal consumption does not continue to decline, and instead stalls at today's levels, and no additional policies are introduced to limit other, non-CO₂-gases, China's total GHG emissions could continue to rise until at least 2030.
- * With current policies, China is on track to meet or exceed its 2030 Nationally Determined Contribution (NDC) under the Paris Agreement.
- * China's NDC "Highly insufficient," as it is not ambitious enough to limit warming to below 2°C, let alone limiting it to 1.5°C as required under the Paris Agreement, unless other countries make much deeper reductions and comparably greater effort.

* 2018 Typhoon Season in SEA

The 2018 Pacific typhoon season is an ongoing event in the annual cycle of tropical cyclone formation, in which tropical cyclones form in the western Pacific Ocean.

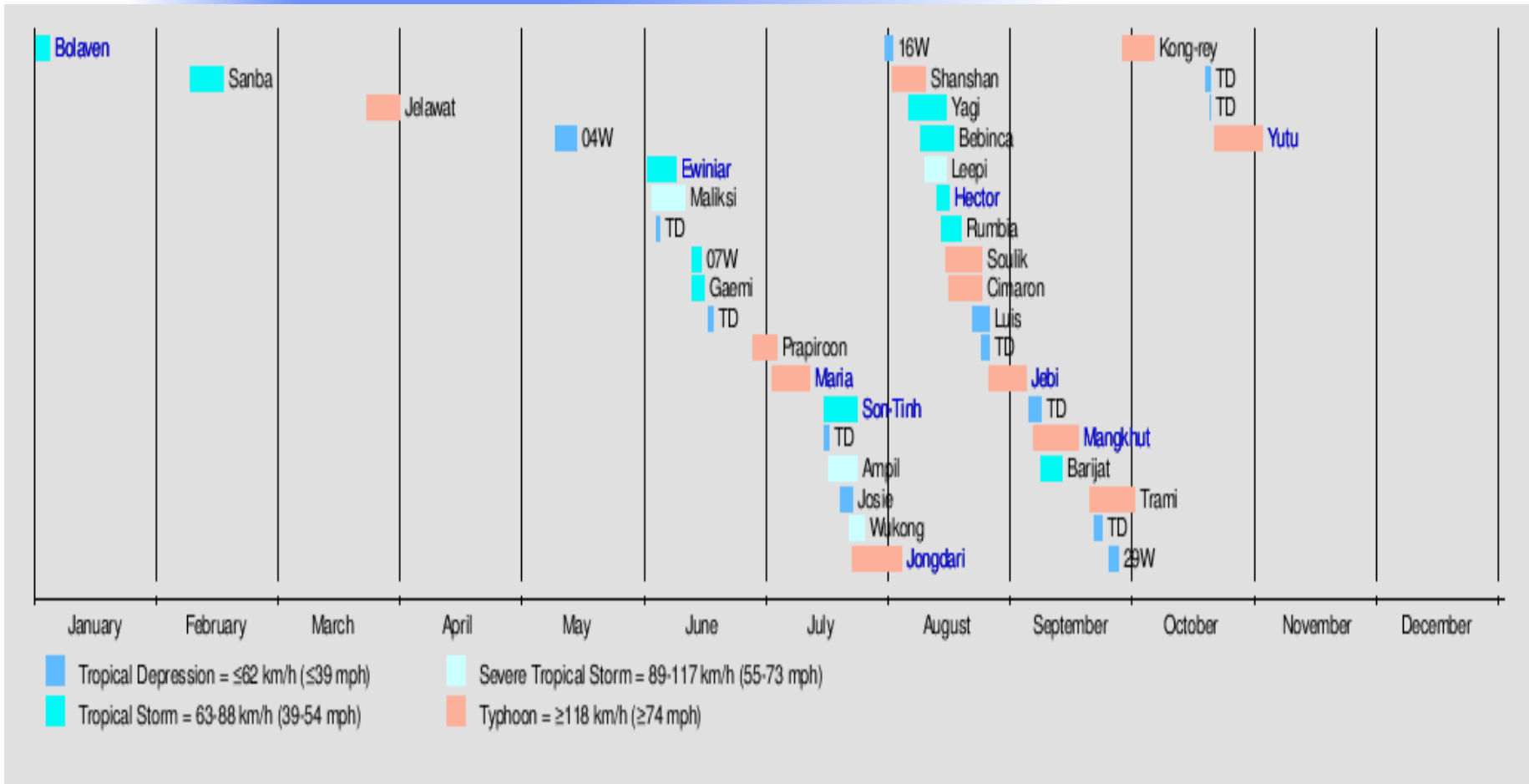
The season runs throughout 2018, though most tropical cyclones typically develop between May and October. The season's first named storm, *Bolaven*, developed on January 3.

The typhoon, *Jelawat*, reached typhoon status on March 29, and became the first super typhoon of the year on the next day.

(Wikipedia

https://en.wikipedia.org/wiki/2018_Pacific_typhoon_season#Typhoon_Cimaron)

* 2018 Pacific Typhoon Season



Source:
Wikipedia

Name	Dates active	Sustain wind speeds	Pressure (hPa)	Areas affected	Damage (USD)	Deaths
Maria (Gardo)	July 3 – 12	195 km/h (120 mph)	915	Mariana Islands, Ryukyu Islands, Taiwan, E China	\$490 m	2
Jongdari	July 23 – August 4	140 km/h (85 mph)	960	Japan, East China	>\$1.46 b	0
Mangkhut (Ompong)	September 6 – 17	205 km/h (125 mph)	905	Marshall Islands, Mariana Islands, Taiwan, Philippines, Hong Kong , Macau , South China, Vietnam	>\$2.52 b	>134
Kong-rey (Queenie)	September 28 – October 6	195 km/h (120 mph)	915	Caroline Islands, Mariana Islands, Japan, Taiwan, Korean Peninsula, Alaska	\$155 m	3
Yutu (Rosita)	October 21 – November 3	215 km/h (130 mph)	905	Caroline Islands, Mariana Islands, Philippines, South China, Taiwan	\$7.5 m	18

*The Changing Climate

- *Global evidence
- *Canada's natural resources government (



Canada

Climate Change Impacts and Adaptation

ASSESSMENT OF CANADA'S MARINE COASTS

-Natural Resources Canada document in development (2016)

1. Warming - air temperatures, land surface, oceans trend attributed to global warming due to increasing GHGs in the atmosphere
2. Increased frequency and severity of coastal storms - events of extreme precipitation, high winds and seasonal storms, storm surge aggravated by sea-level rise, extended periods of drought
3. More human development in coastal areas - higher pollution, GHG emissions, and maladaptation practices along the coastal zones.

* 2. Coastal Climate Challenges

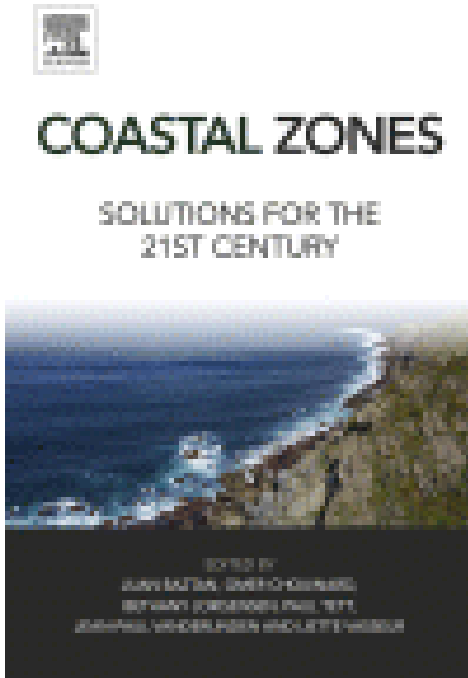
* Climate Challenges for the 21st Century



United Nations

Report of the United Nations Conference on Sustainable Development

**Rio de Janeiro, Brazil
20–22 June 2012**



Editors:
 Juan Baztan, Omer Chouinard,
 Bethany Jorgensen, Paul Tett,
 Jean-Paul Vanderlinden and
 Liette Vasseur
 ISBN: 978-0-12-802748-6

c0010 Managing Adaptation to Changing Climate in Coastal Zones

Daniel E. Lane¹, Colleen M. Clarke¹, John D. Clarke¹, Michelle Mycoo², Judith Gobin²

¹Telfer School of Management, University of Ottawa, Ottawa, ON, Canada; ²The University of the West Indies, St. Augustine Campus, Trinidad and Tobago

Chapter Outline

Introduction	1	Policy Challenges	6
The C-Change Project	2	Research Challenges	10
C-Change Communities and Partners	3	Solutions	13
Environmental, Policy, and Research Challenges	3	Conclusions	16
Environmental Challenges	6	Glossary	16
		Acknowledgments	16
		References	17

s0010 INTRODUCTION

p0015 Coastal zones are the most biologically and economically productive regions in the world. Over 40% of the world's population lives within 150km of the shore (United Nations Atlas of the Oceans, 2010), and that figure is growing. In Canada, approximately 38% of Canadians live within only 50km of one of three surrounding oceans—the Atlantic, Pacific, or Arctic Oceans—or one of the Great Lakes. In the Caribbean region, coastal populations in 28 independent territories and island states are generally clustered along thin bands of land in close proximity to the shore. An estimated 60% of the Caribbean's total population of approximately 40 million people lives within less than 100 km from the coast, and approximately 40% of the population resides within a mere 2 km of the coast.

p0020 These coastal zones, where land and water interact, are key landscapes when considering (1) the environmental challenges faced by human societies and (2)

Coastal Zones. <http://dx.doi.org/10.1016/B978-0-12-802748-6.00010-3>
 Copyright © 2015 Elsevier Inc. All rights reserved.

1

10010-BAZTAN-9780128027486

*Challenges for the 21st Century

Rio +20

1. Identify community priorities
2. Cede authority to local communities, municipalities
3. Measure, track, and exercise preparedness
4. Implement the precautionary approach and plan strategically
5. Build an education legacy

Laudato Si'

1. ...dialogue that includes everyone
2. We require a new and universal solidarity.
3. drawing on the results of the best scientific research available today (Chapter 1)
4. Article 186 and the Rio Declaration (1992)
5. change is impossible without motivation and a process of education (Article 15)



*** 3. Understanding
Adaptation Needs -
Profiling Coastal
Communities**

*Understanding Adaptation Needs

1. Profiling Coastal Communities
2. Assessing Coastal Vulnerabilities
3. Determining Relative Importance of Sustainability Pillars

Isle Madame (Source: Google Earth 2010)



Image © 2008 GeoEye

© 2008 Tele Atlas

Image NASA

Image © 2008 TerraMetrics

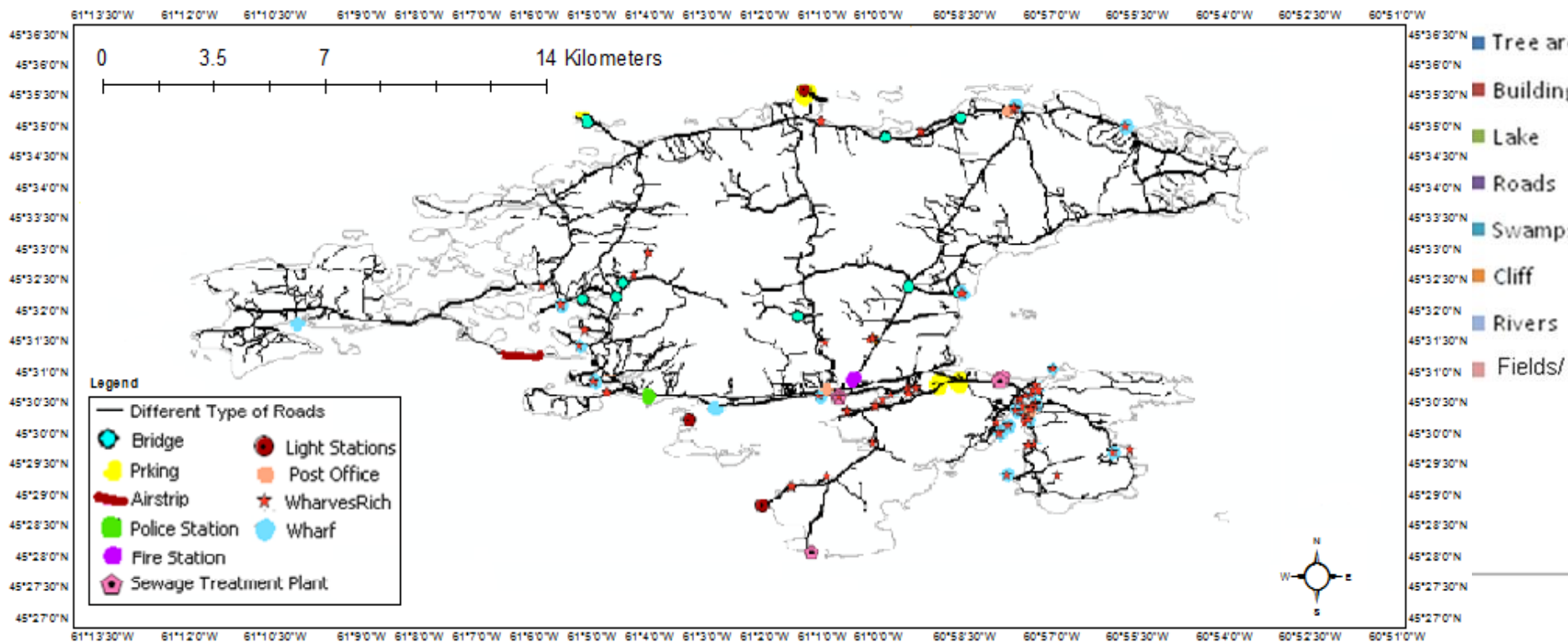
elev 133 ft

* Profiling - Examples

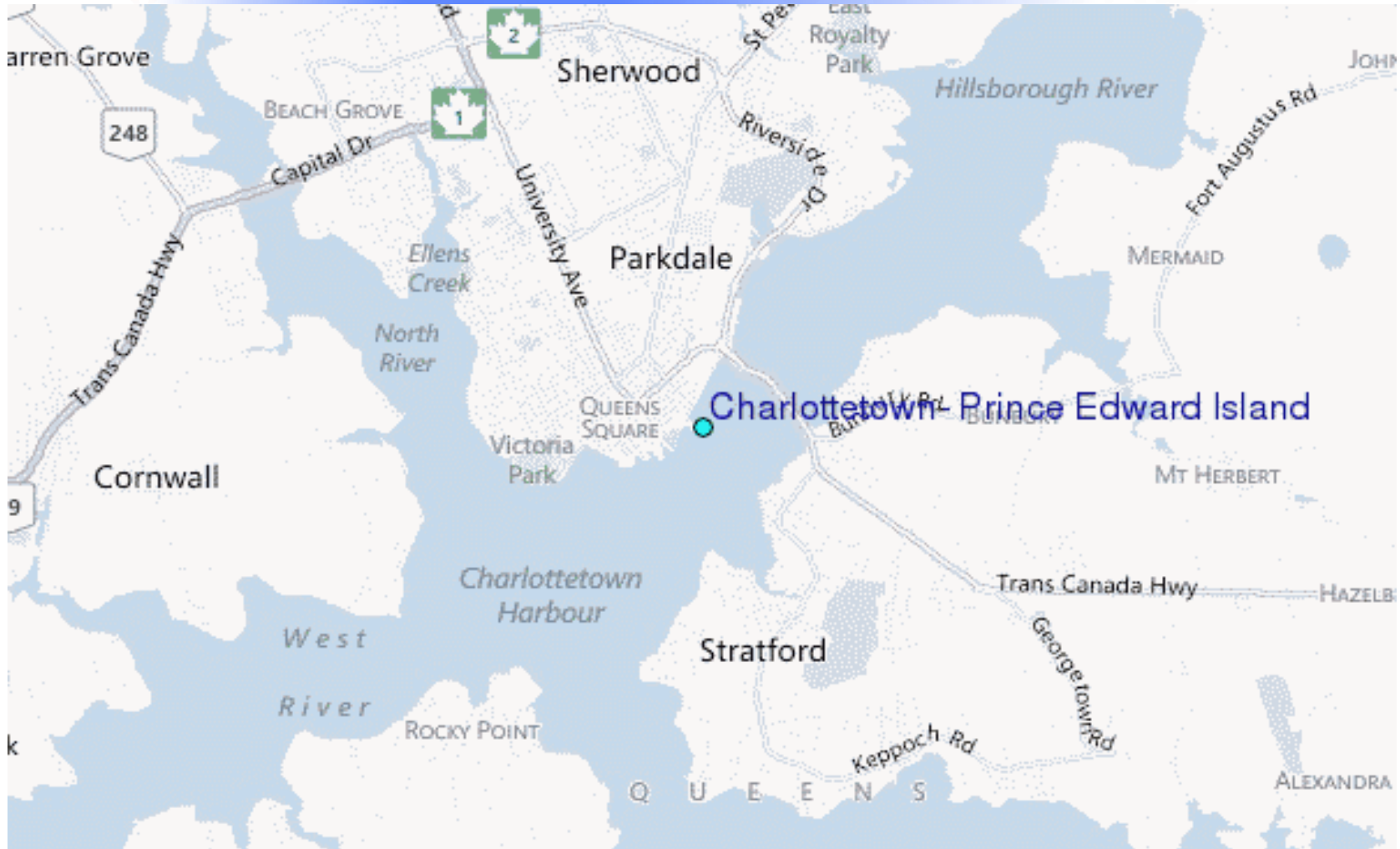


Hydrology, Land Use & Land Cover Distribution

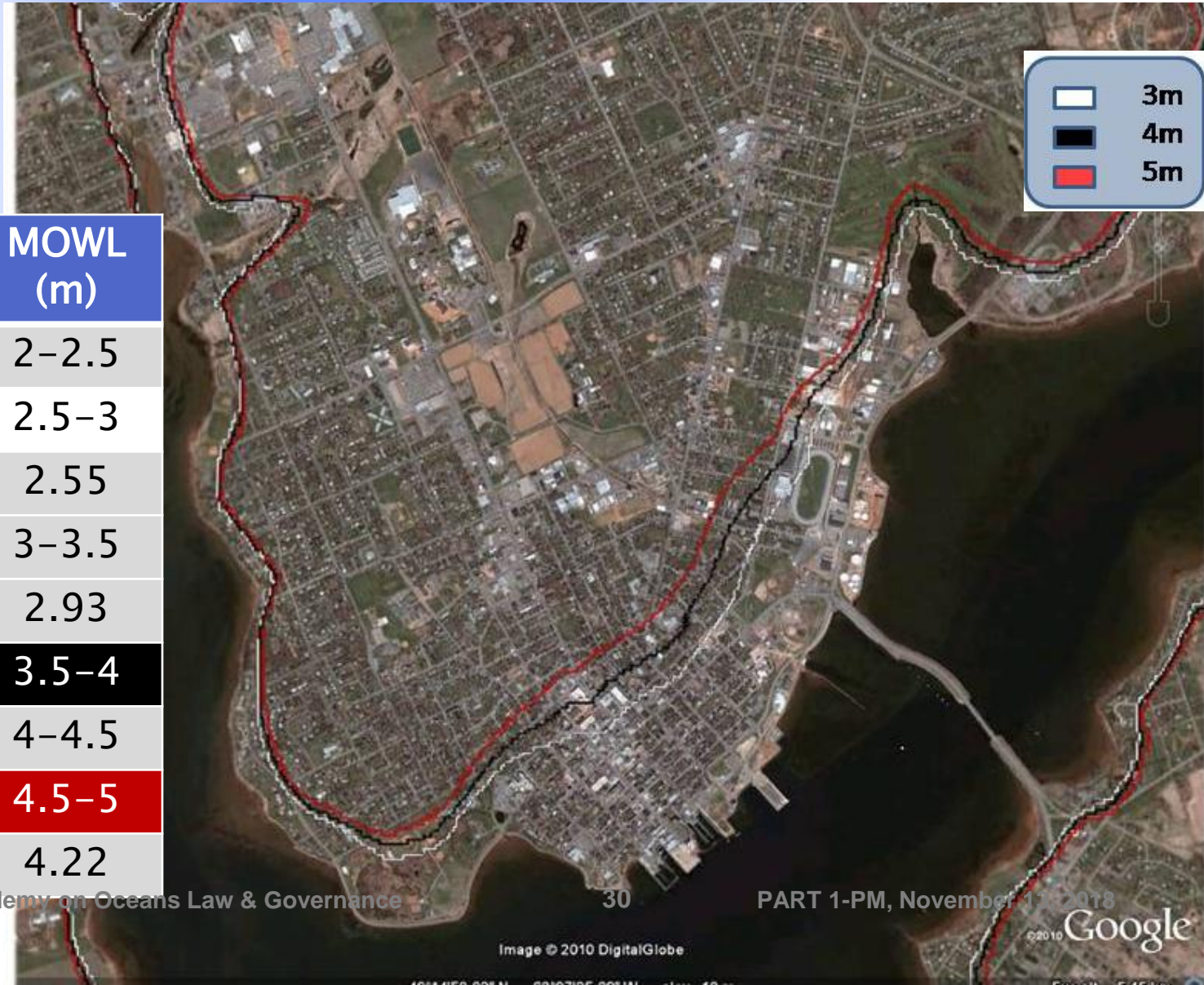
Fields/Beaches



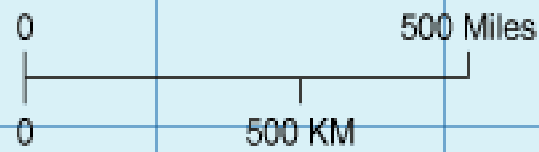
* City of Charlottetown



* Charlottetown Spatial/GIS Model



Scenario	MOWL (m)
I	2-2.5
II	2.5-3
NN1962	2.55
III	3-3.5
Juan	2.93
IV	3.5-4
V	4-4.5
VI	4.5-5
NN2000	4.22



Parallel scale
at 20 degrees N 0 degrees E

20 degrees N

Gulf of Mexico

Atlantic Ocean

Pacific Ocean

Merida
Campeche
Chetumal

Belize
Belmopan

Guatemala
Tegucigalpa
San Salvador

Managua
San Jose
Panama

Costa Rica
Panama
Medellin

Nassau
THE BAHAMAS

Havana
CUBA

George Town
CAYMAN ISLANDS

Kingston
JAMAICA

Port-au-Prince
HAITI/DOMINICAN REPUBLIC

Santo Domingo
PUERTO RICO

San Juan

VIRGIN ISLANDS (U.S. & UK.)

St. Thomas
St. John
St. Croix
St. Martin
St. Eustatius
St. Nevis
St. Kitts
St. Barthelemy
St. Kitts and Nevis
St. Vincent and the Grenadines
St. Lucia
St. Kitts and Nevis
St. Vincent and the Grenadines
St. Lucia

Kingston
Bequia
St. George's
Port of Spain
Grand'Riviere

VENEZUELA

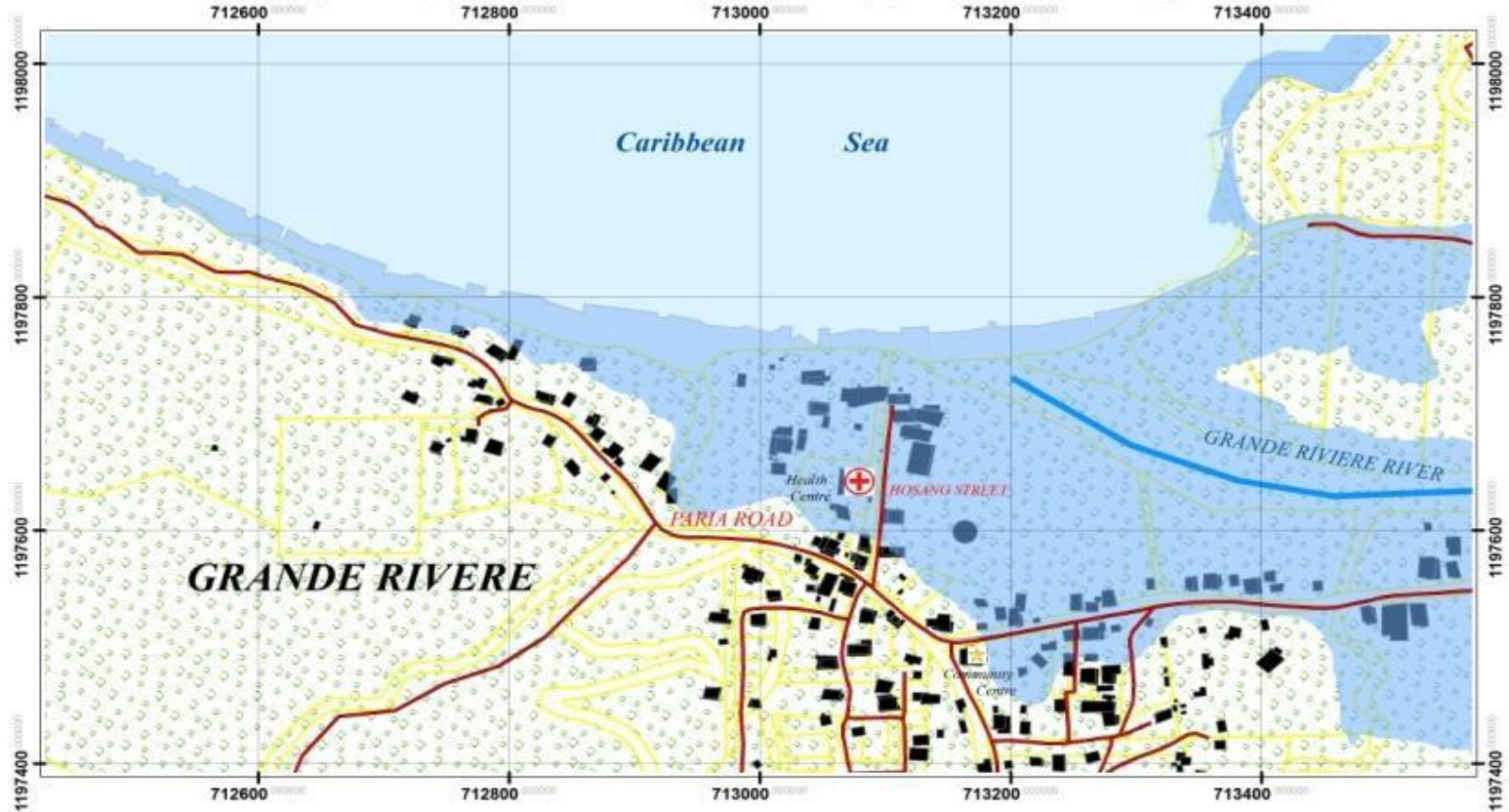
COLOMBIA

Georgetown
GUYANA

* Grande Riviere, NE T&T - Leatherback turtle tracks (March 22, 2010)



MAP OF GRANDE RIVIERE SHOWING 7m RISE IN SEA LEVEL



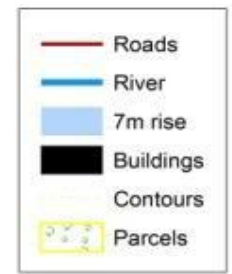
Data collected by Surveying and Existing Topographic Data
 Data process in ArcGIS 9.3 & Map created in ArcGIS 9.3

Projection: UTM Zone 20N
 Datum: WGS84
 Vertical Datum: Mean Sea Level

1:5,000

Prediction of 50m was derived from the M.E.T office in the U.K Government

Produced on 3rd April 2010 by Amit Seeram



Profiling Communities

1. Community preferences
 - * Ecological, economic, social, cultural
2. Recognition of assets
 - * Natural, industrial, demographic, cultural
3. History of storm events and impacts
 - * Hurricanes, high wind and snow/rain events
4. Sources of community vulnerability

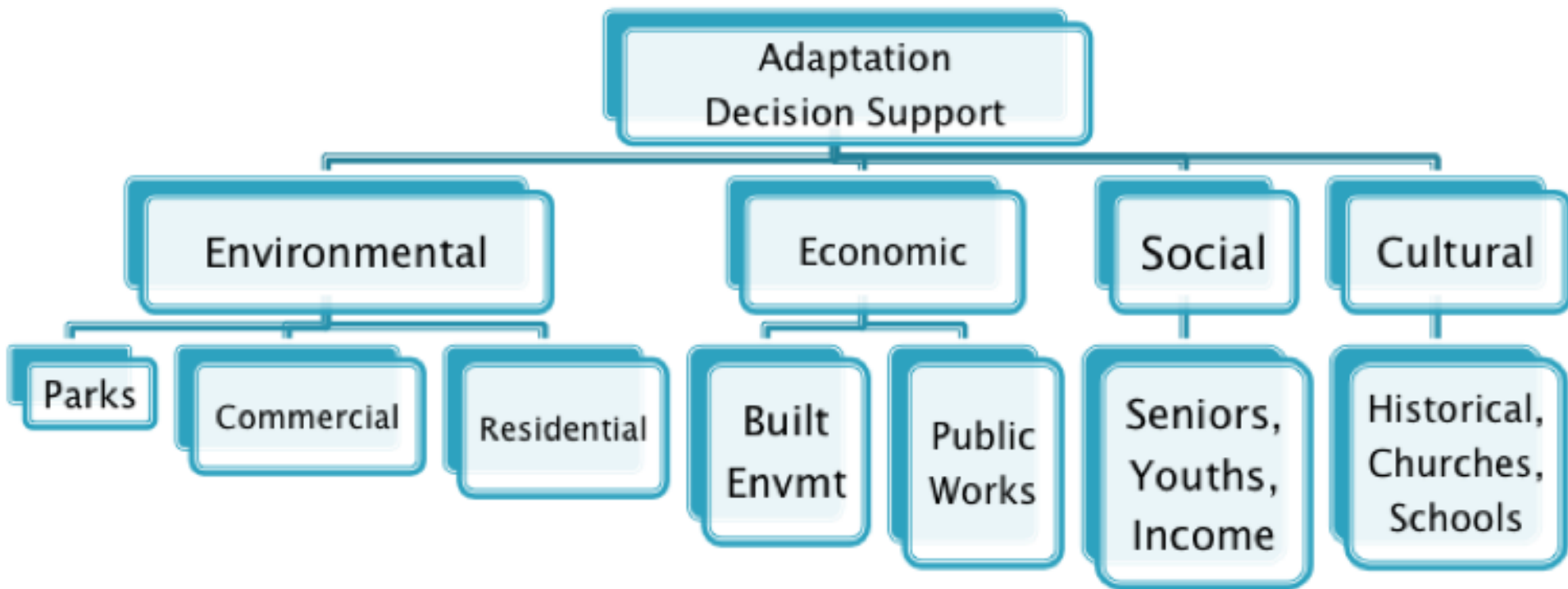


* 4. Pillars of Sustainability

* Community Profile - 4 Pillars of Sustainability (ICSPs)

	Dimension	Sub-categories
1	Environmental	Topography, Land and Marine Use, Natural Resources, Climate
2	Economic	Employment, Industry, Property, Occupation, Revenues, Earnings, Public Works, Built Environment
3	Social	Population, Health, Education, Communications, Community Dynamics, Governance
4	Cultural	Places, Groups, Events, Language

* Coastal Community Adaptation Problem Hierarchy



* How to compare the relative importance of problem elements?

- * Pairwise comparison exercise
- * Example: Community Profile Dimensions - Environmental, Economic, Social and Cultural

	Economic	Social	Cultural
Environmental	Value1	Value2	Value3
Economic	-	Value4	Value5
Social	-	-	Value6

* MCDM Worksheets

(1)

		Pairwise Scores										
		1	2	3	4	5	6	7	8	9		
Row											(2) Calculated Cells Ratio	
1	Environmental	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	Economic	<input type="text"/>
2	Environmental	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	Social	<input type="text"/>
3	Environmental	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	Cultural	<input type="text"/>
4	Economic	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	Social	<input type="text"/>
5	Economic	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	Cultural	<input type="text"/>
6	Social	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	Cultural	<input type="text"/>

(2) Go back to row 1 and calculate the cells ratio for each row 1-6.

(3) Fill in the table below that summarizes the overall weights for all the pillars.

(3)

	Environmental	Economic	Social	Cultural
1 Environmental	1			
2 Economic	-	1		
3 Social	-	-	1	
4 Cultural	-	-	-	1

* MCDM Worksheet Worked Example

(1)

		Pairwise Scores									(2) Calculated Cells Ratio			
		1	2	3	4	5	6	7	8	9	Row	Col	Ratio	
Row														
1	Environmental	██████████									Economic	5	4	1.25
2	Environmental	██████████								Social	4	5	0.8	
3	Environmental	██████████								Cultural	5	4	1.25	
4	Economic	██████████								Social	6	3	2	
5	Economic	██████████								Cultural	6	3	2	
6	Social	██████████							Cultural	4	5	0.8		

(2) Go back to row 1 and calculate the cells ratio for each row 1-6.

(3) Fill in the table below that summarizes the overall weights for all the pillars.

(3) Matrix

	Environmental	Economic	Social	Cultural
1 Environmental	1	1.25	0.80	1.25
2 Economic	0.80	1	2.00	2.00
3 Social	1.25	0.5	1	0.80
4 Cultural	0.80	0.5	1.25	1



*** Participants'
Preferences/Profiling
Exercise**

* China-ASEAN Academy 1 (January 2016)

China-ASEAN Academy on Ocean Law and Governance
NISCSS, Haikou, Hainan, China

January 24-31, 201

Thursday, January 28

Climate Change Adaptation (Lane, IOI-Canada)

Multicriteria Problem Solving Session - Participant Feedback Pillar Importance Inputs

Name:	All 40 China-ASEAN participants (12 empty)
Country:	All nations - China-ASEAN

Pairwise Comparison Exercise

(1)

Pairwise Scores

	1	2	3	4	5	6	7	8	9	
Row										
1 Environmental					.57					Economic
2 Environmental					.93					Social
3 Environmental						1/4				Cultural
4 Economic					.27					Social
5 Economic					.34					Cultural
6 Social					.70					Cultural

* 1st China-ASEAN Academy Results (January 2016)

AHP Community Profile Dimensions Results

Inconsistency Measure*

0.0011

*This indicator should not exceed 0.10 for reliable rational results.

Pillar Ratings

Normalized

Idealized

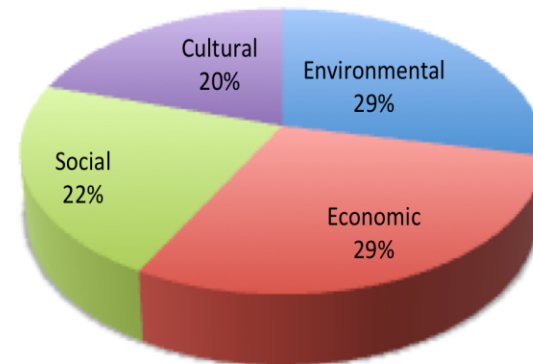
Environmental
Economic
Social
Cultural

0.28378
0.29357
0.22073
0.20191

0.96665
1
0.75189
0.68776

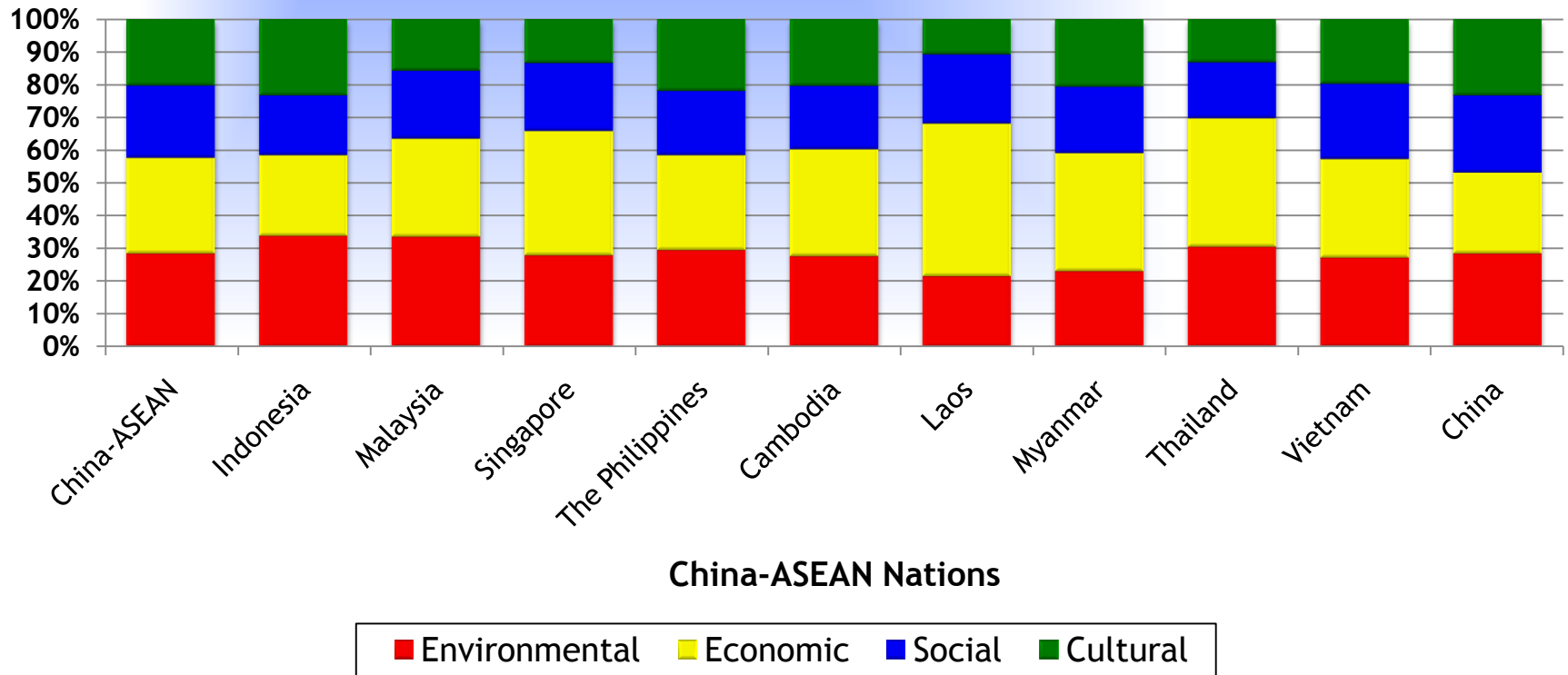
Total 1

All Participants Normalized Community Profile Sustainability Pillar Ratings



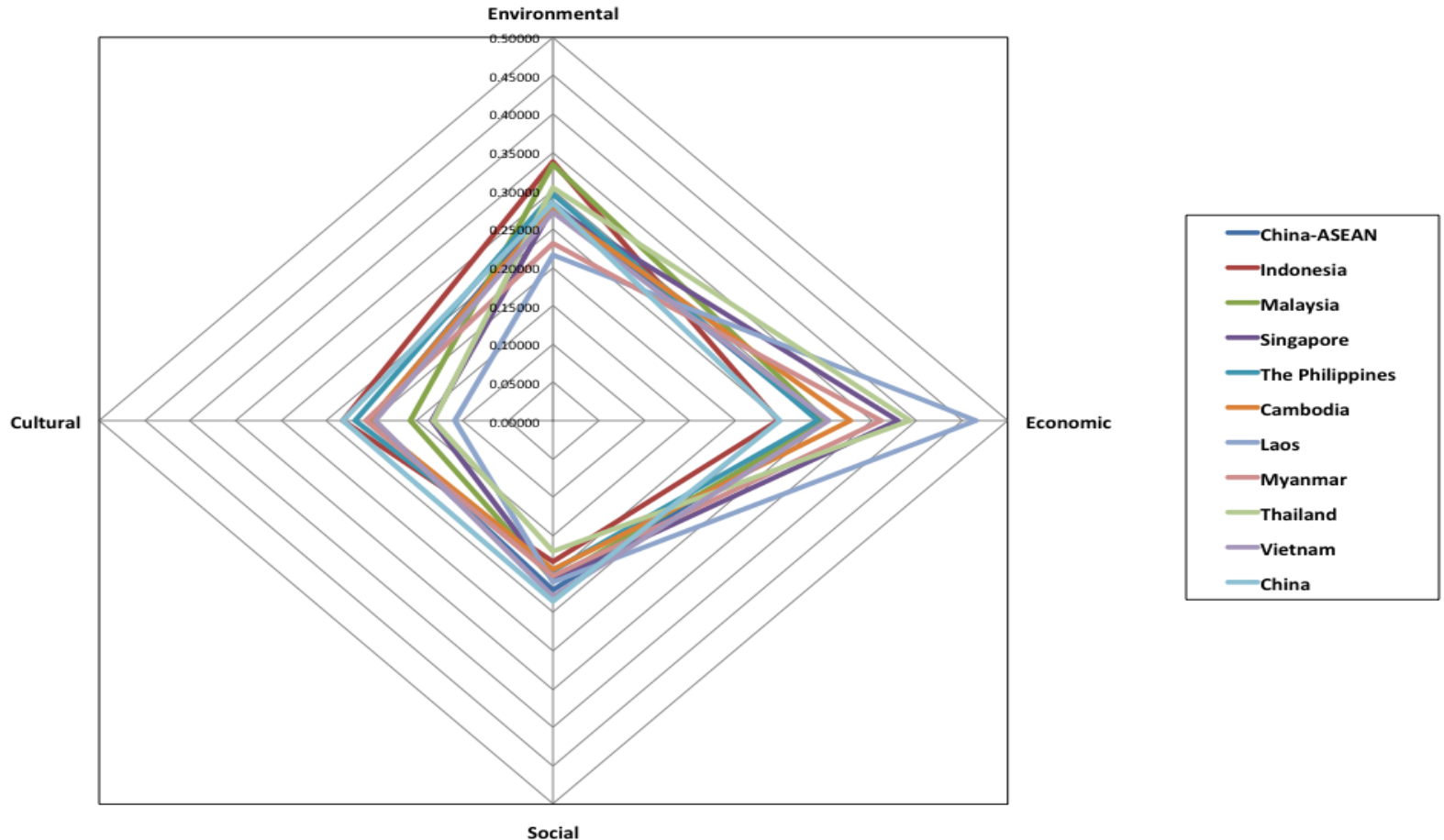
* China-ASEAN Academy 1 (January 2016)

China-ASEAN Nationals Comparison of Participants' Average Weights by Pillar



*China-ASEAN Academy 1 (January 2016)

Radar Graph of China-ASEAN Nationals Participants' Average Weights by Pillar

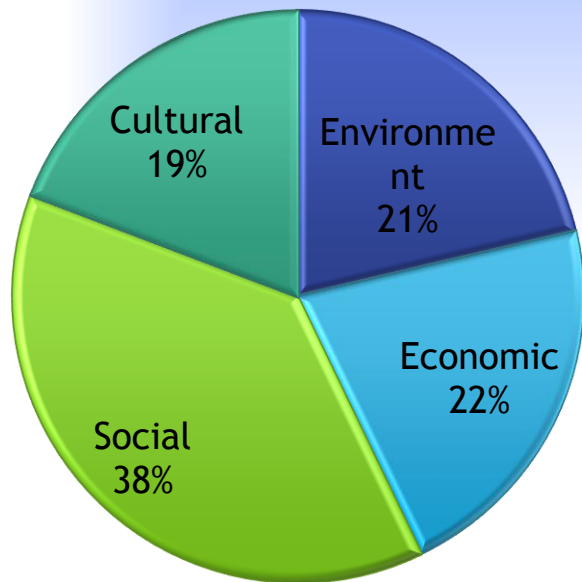


*Priorities & Multi-Participants

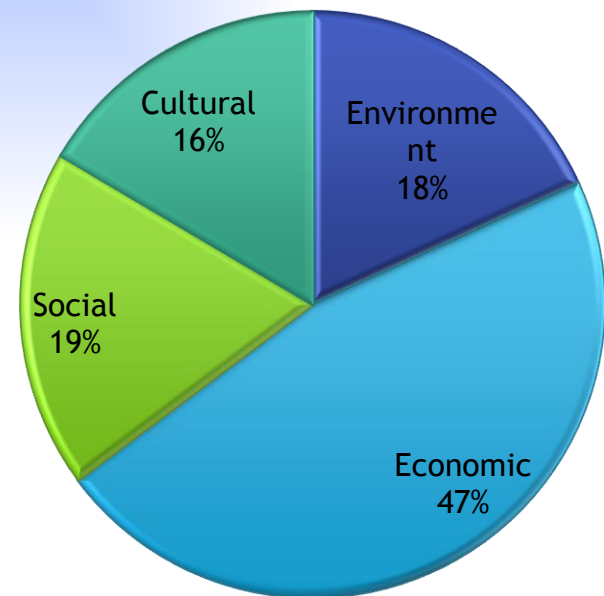
1. Community: representatives of the community at large
2. Local Government: representatives of local (municipal) government
3. Business/Industry: community industries
4. Professional: professionals providing service to the community, e.g., lawyers, doctors, nurses, engineers, etc.

*Participants

Local Government



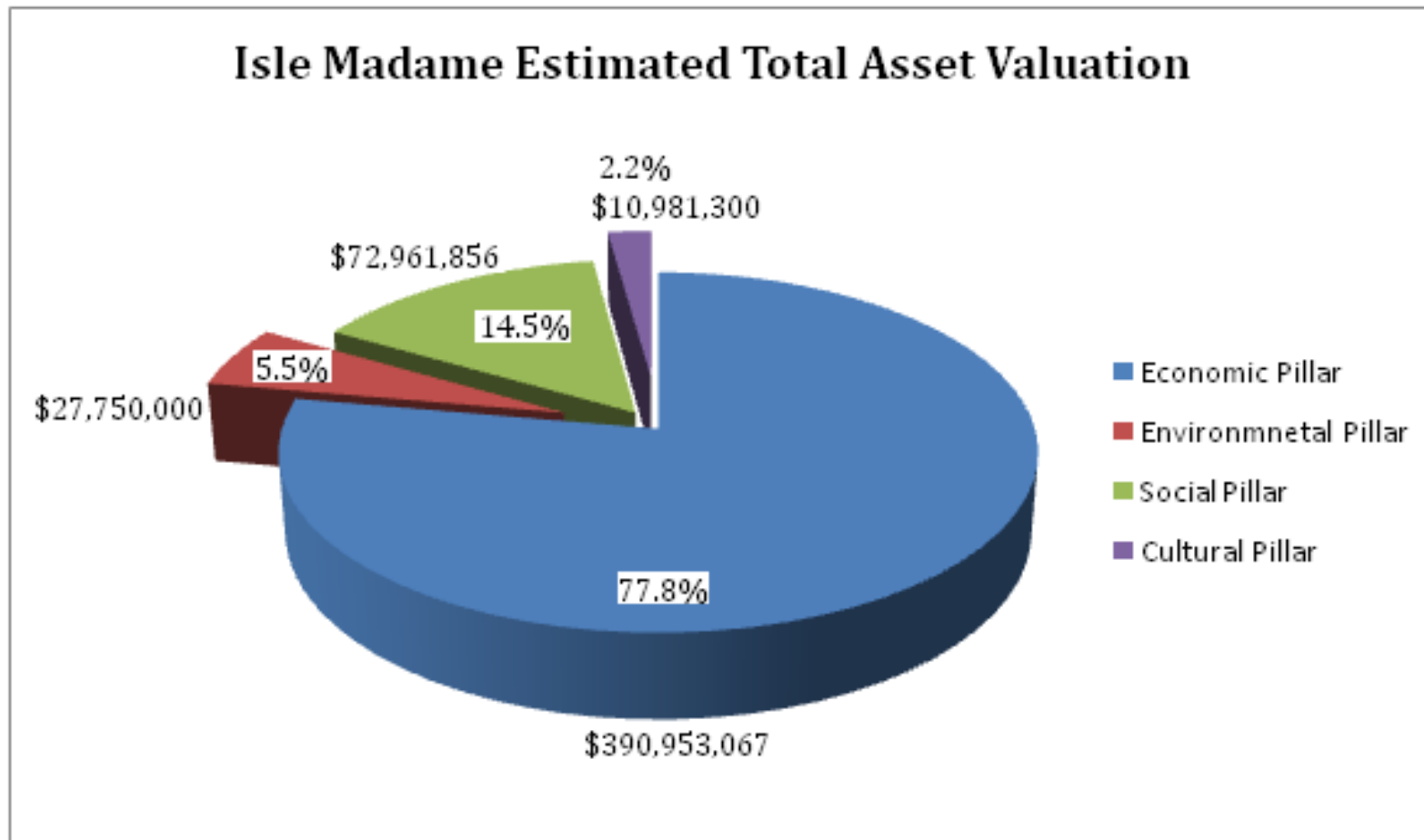
Business/Industry





*Coffee Break

* Isle Madame Asset (Pakdel 2011)



*Tools

1. Geographical Information Systems - (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data.
 - * ArcGIS - Esri Mapping Systems
2. System dynamics - a computer-aided approach to policy analysis and design. It applies to dynamic problems arising in complex social, managerial, economic, or ecological systems – literally any dynamic systems characterized by interdependence, mutual interaction, information feedback, and circular causality.
 - * STELLA - ISEE Systems
 - * Vensim (Open source, free download)
3. MCDM - MultiCriteria Decision Making - Problems characterized by multiple stakeholders, community participants, many and conflicting criteria (environmental, economic, social)
 - * AHP - the Analytic Hierarchy Process (Saaty)