



Building a Resilient Business: Before, During, and After a Disaster

Entrepreneurs Support Practitioners

Module 2



Puerto Rico
Science, Technology
& Research Trust



Resiliency and
Business Innovation



Center for Resilient and
Sustainable Communities

Organized by the Puerto Rico Science, Technology & Research Trust

Sponsored by: U.S. Economic Development Administration

May 26, 2020 6:00pm-8:30pm

Linton Wells II, J.P. Auffret, Robert Rogers

*C-RASC consists of researchers from George Mason's Volgenau School of Engineering, the School of Business, the Schar School of Policy and Government, the Jimmy and Rosalyn Carter School of Peace and Conflict Resolution, the College of Science, and the College of Health and Human Services





Overview for Entrepreneurs Support Practitioners' Course: Helping Business Owners/Operators Get the Most from Their Course



Resiliency and
Business Innovation

Sponsored by: U.S. Economic Development Administration

Introductions



Lucy Crespo, CEO



Puerto Rico
Science, Technology
& Research Trust



Annie Mustafá Ramos



Resiliency and
Business Innovation

A program of the:



Puerto Rico
Science, Technology
& Research Trust



Gilberto Guevara



Puerto Rico
Science, Technology
& Research Trust



Gloria Viscasillas Aponte

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PA'LANTE**



Overview for Entrepreneurs Support Practitioners' Course: Helping Business Owners/Operators Get the Most from Their Course



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Course Outline

Module 1 Overview and Introduction (May 19)

- Overview for Entrepreneurs Support Practitioners: Helping Business Owners/Operators Get the Most from Their Course
- **Lesson 1**, Spring Forward from COVID-19

Module 2 Strategic Policy and Analysis Concepts (May 26)

- Strategy and Policy Aspects of Puerto Rican Resilience
- **Lesson 2**, Review Lesson 1 Exercises; Resilience Concepts; SWOT Analysis; Intro to Business Resilience Workbook; Hazard Analysis

Module 3 Business Analysis (June 2)

- **Lesson C**, Comparative Strategies for Resilience and Economic Development; Digital Puerto Rico; Micro-Manufacturing
- **Lessons 3 & 4**, Business Impact Analysis; Protection of People, Data, and Operations; Protection of Inventory, Equipment, and Buildings

Module 4 Integration and Wrap Up (June 9)

- **Lesson D**, From Personal Resilience to Business Resilience and Building a; Culture of Entrepreneurship; Engaging the Diaspora Caribbean Resilience Hub
- **Lessons 5 & 6**, Integrate Material from Lessons 3 & 4; Discuss “Adapt & Reposition;” “Pivot,” Finalize Resilience Plan; Discuss Lessons Learned and Best Practices from Resilience Plans; Address way ahead; Presentation of Badges

Agenda for Module 2

6:00 PM -7:10 PM Strategy and Policy Aspects of Puerto Rican Resilience

Puerto Rico, A Snapshot

External Forces

- Natural Disasters & Climate Change
- Age of Accelerations” and 4th Industrial Revolution

SWOT Analysis

Innovation and Entrepreneurship

Observations for Puerto Rico from Singapore

Post-virus “new un-normal”-- opportunities for Puerto Rico

7:10 PM-7:15 PM Break

7:15 PM -8:30 PM Lesson 2: Review Lesson 1 Exercises; Resilience Concepts; SWOT Analysis; Intro to Business Resilience Workbook; Hazard Analysis



Building a Resilient Business: Before, During, and After a Disaster

Strategy and Policy Aspects of Puerto Rican Resilience



Puerto Rico
Science, Technology
& Research Trust



Resiliency and
Business Innovation



Center for Resilient and
Sustainable Communities

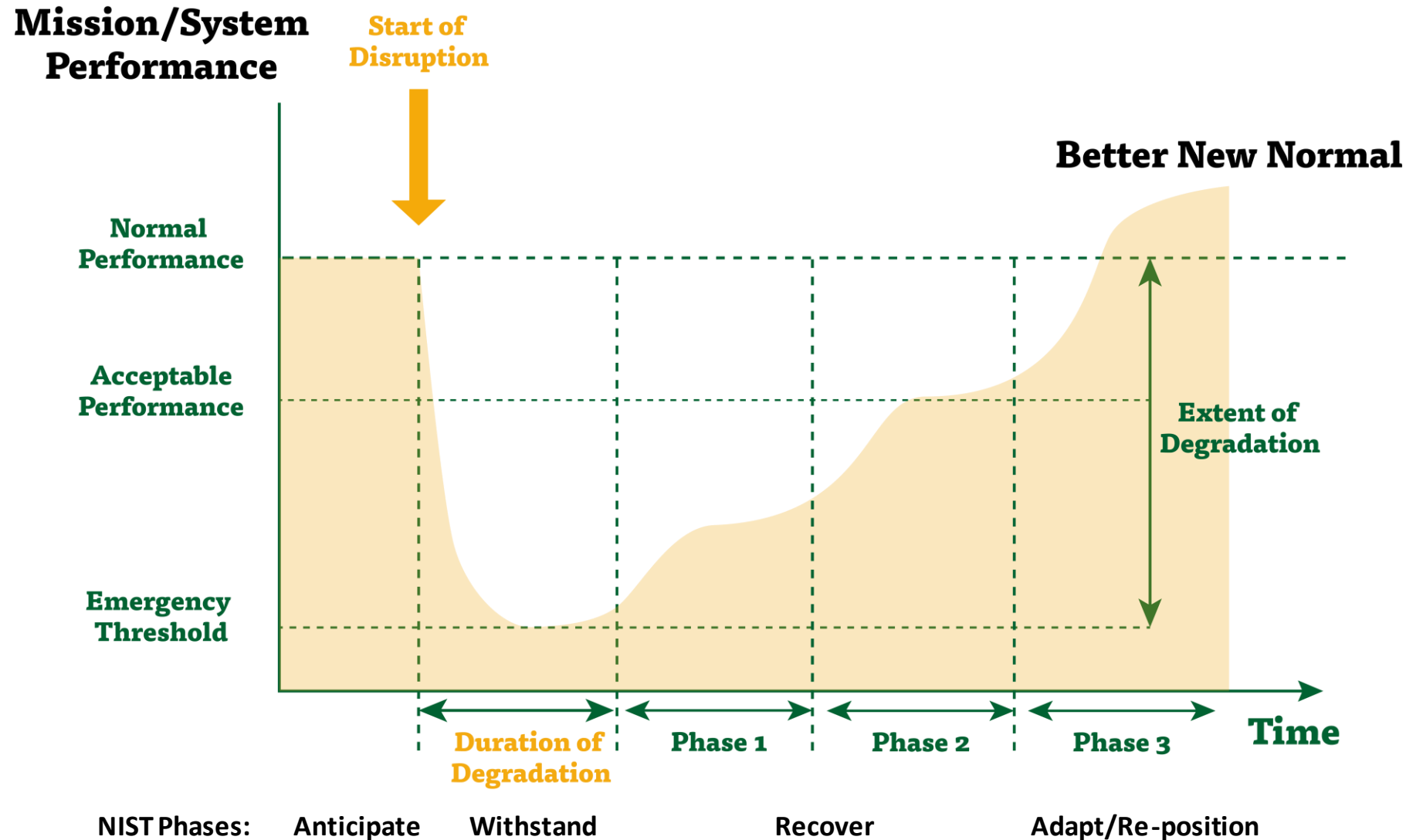
Organized by the Puerto Rico Science, Technology & Research Trust

Sponsored by: **U.S. Economic Development Administration**

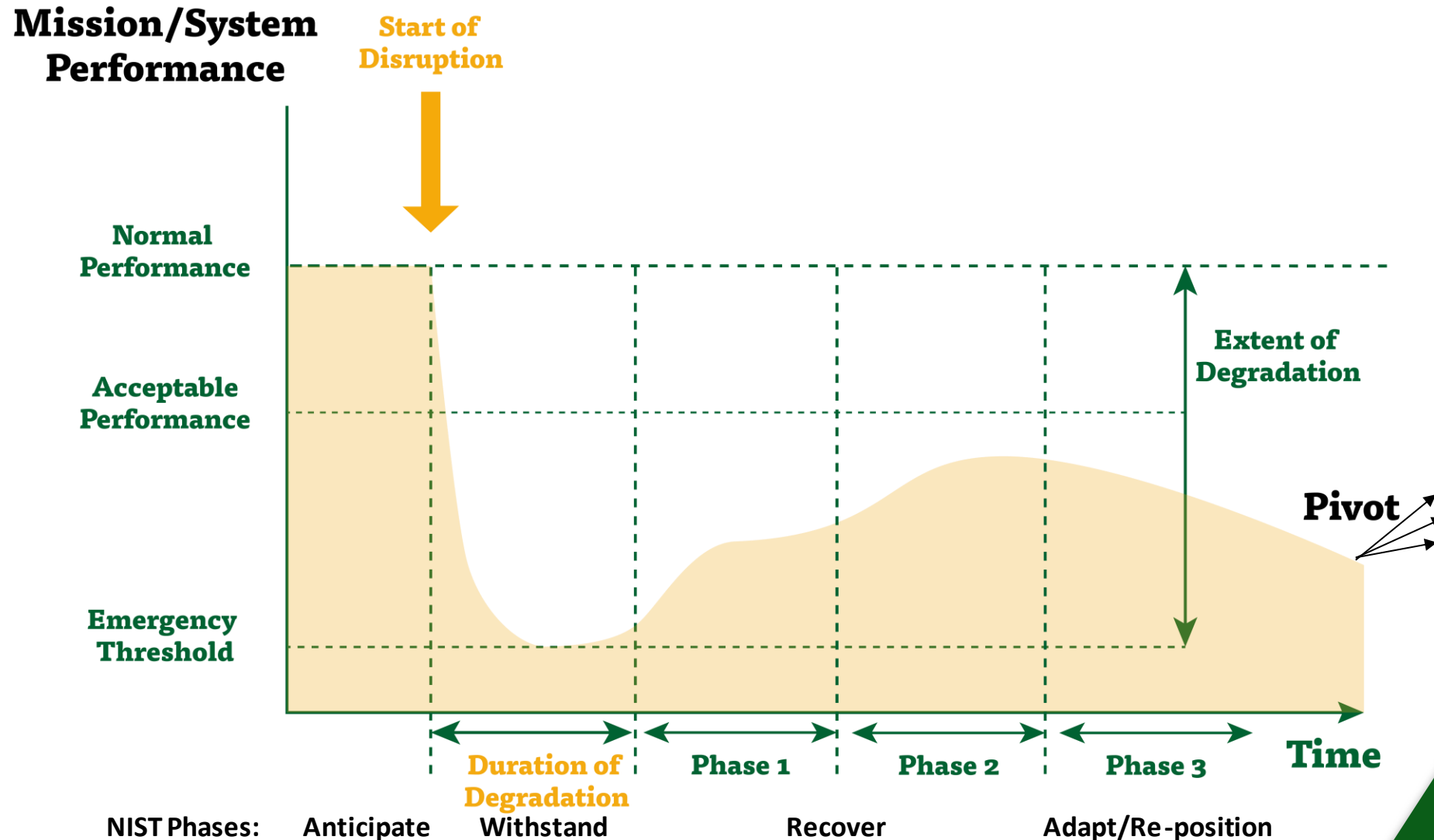
May 28, 2020, 6:00 PM- 7:10 PM

*C-RASC consists of researchers from George Mason's Volgenau School of Engineering, the School of Business, the Schar School of Policy and Government, the Jimmy and Rosalynn Carter School of Peace and Conflict Resolution, the College of Science, and the College of Health and Human Services

Resilience is NOT Just Bouncing Back. It's Being Prepared to Bounce Forward Better



Sometimes You Can't Bounce Forward Better When to Pivot?





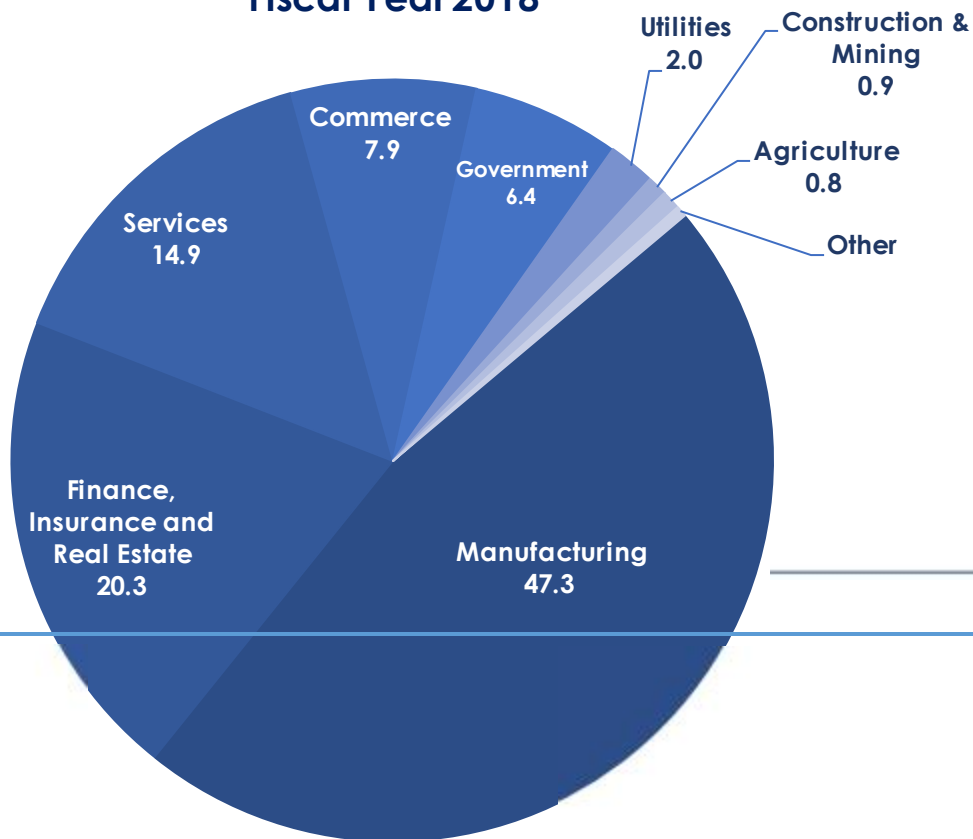
Puerto Rico: A Snapshot

Our Economy



$$\text{GDP} = \text{Personal consumption expenditure} + \text{Government consumption expenditure} + \text{Gross public* domestic investment} + \text{Gross private domestic investment} + (\text{Sales Exports} - \text{Purchases Imports})$$

Gross Domestic Product Share by
Main Economic Sector
Fiscal Year 2018



GNP \$68.0 billion
GDP \$101.1 billion
GDP Per Capita \$31,022
Exports Value \$60.6 billion
Imports Value \$46.5 billion

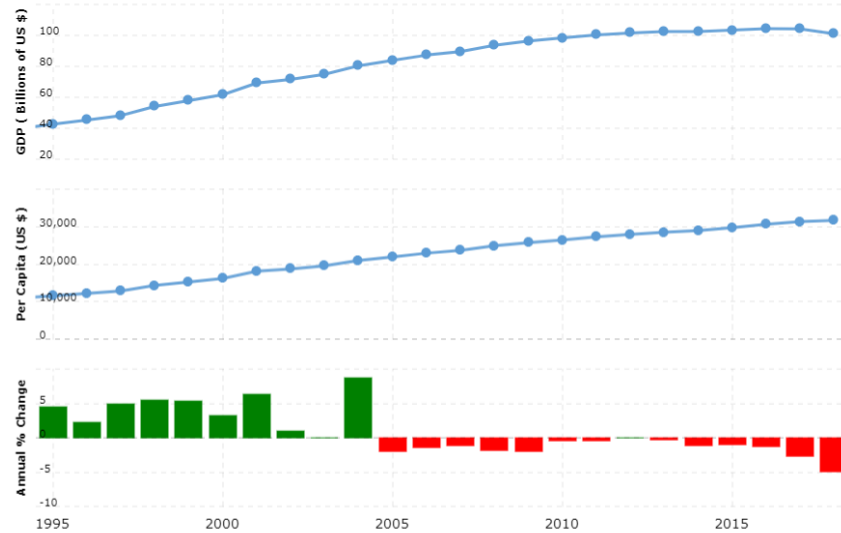
TOURISM: 2.0% of GDP and estimated to 7.4%* in 2018 as a total contribution to the Economy GDP (including wider effects from investment, the supply chain and induced income impacts).

*calculated by the World Travel & Tourism Council (WTC)

Contribution to Total MFG GDP FY 2018

36.3% Pharmaceutical Industry (includes Bio-Pharma)
22.0% Computer and Electronics
26.9% Basic Chemicals
5.4% Medical Devices
2.5% Beverages & Tobacco
2.5% Food
1.5% Electrical Equipment & Components
3.0% Others

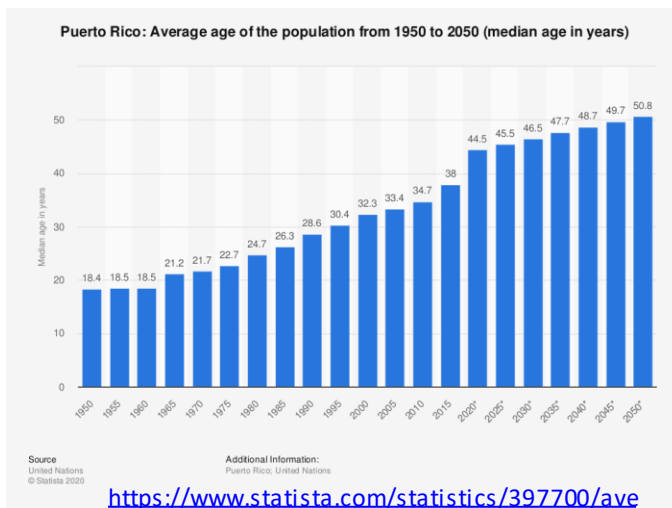
GDP, GDP p/c, Growth Rate



<https://www.macrotrends.net/countries/PRI/puerto-rico/gdp-gross-domestic-product> Puerto Rico GDP 1960-2020 Data Source: World Bank

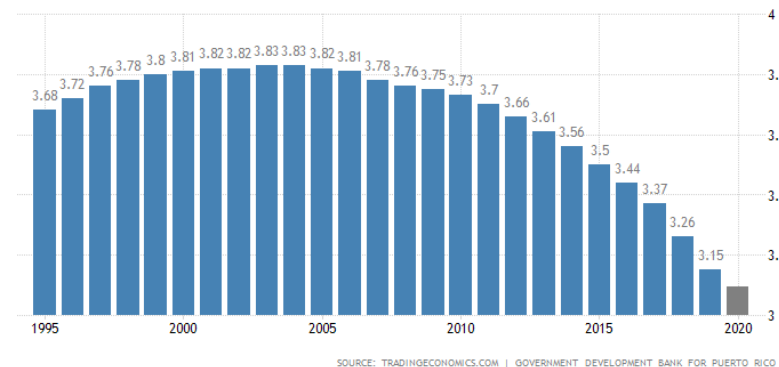
Trends 1995-2020

Population Avg Age



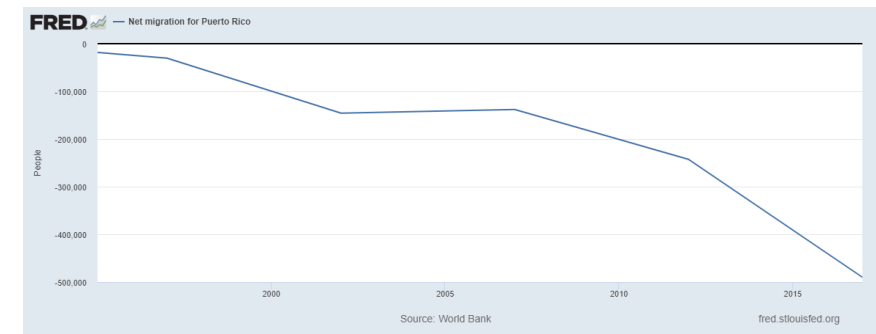
<https://www.statista.com/statistics/397700/average-age-of-the-population-in-puerto-rico/>

Population



<https://tradingeconomics.com/puerto-rico/population>

Net Migration



<https://fred.stlouisfed.org/series/SMPOPNETMPRI>



External Forces (1)

Natural Disasters & Climate Change

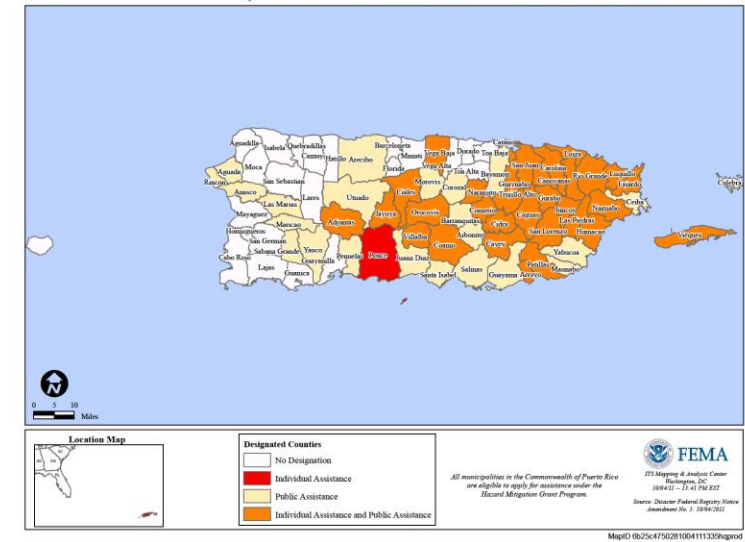
Natural Disasters 2004-2020

FEMA-1552-DR, Puerto Rico
Disaster Declaration as of 10/19/2004

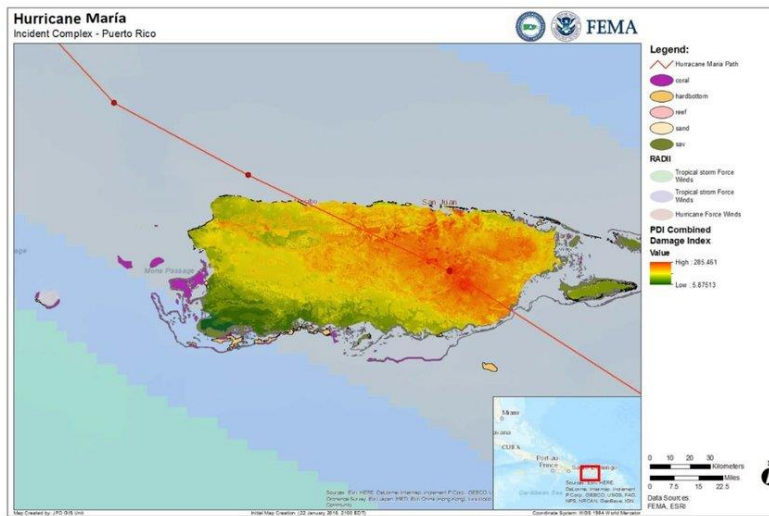


Tropical Storm Jeanne Sep 2004

FEMA-4017-DR, Puerto Rico Disaster Declaration as of 10/04/2011

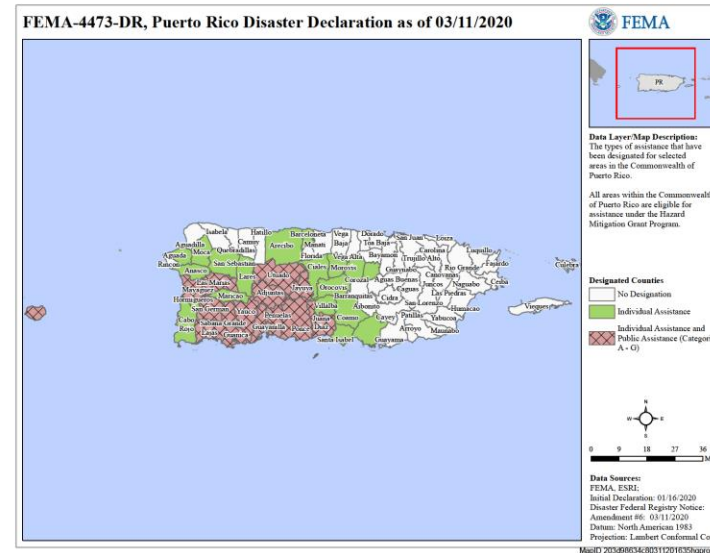


Hurricane Irene Aug 2011



Hurricane Maria Sep 2017

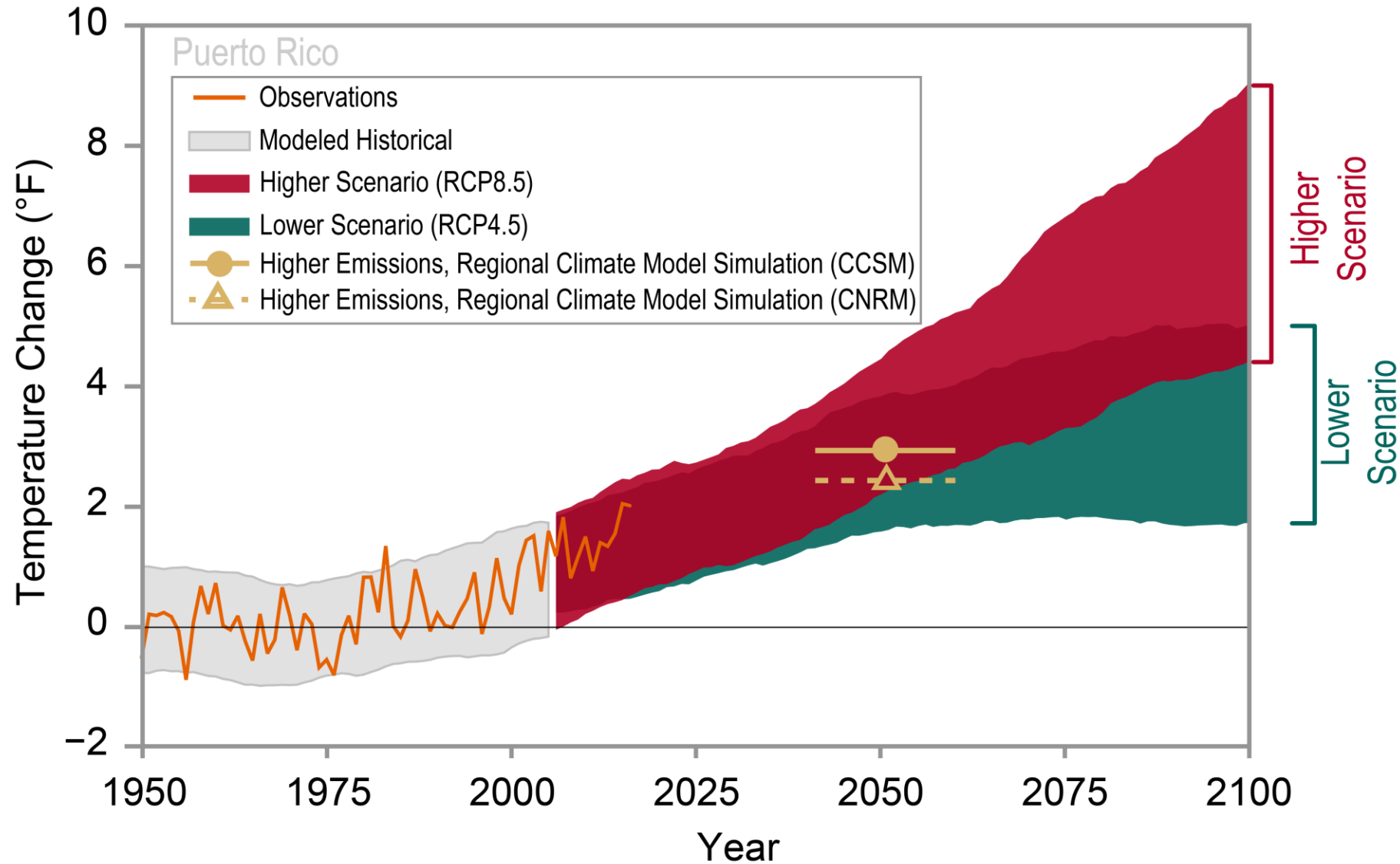
FEMA-4473-DR, Puerto Rico Disaster Declaration as of 03/11/2020



Earthquakes, as of Mar 2020

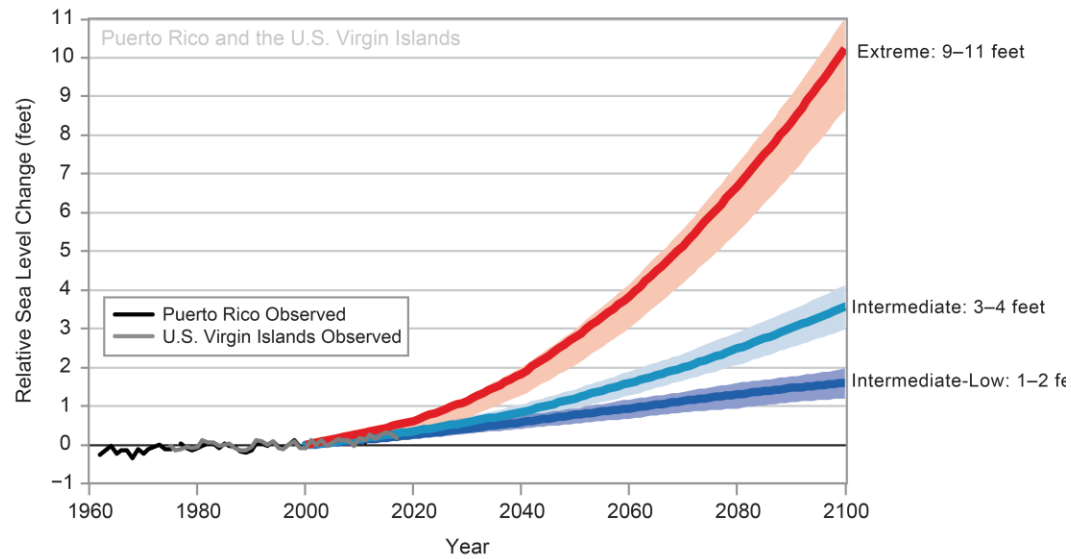
May 26, 2020

Temperature Change 1950-2100

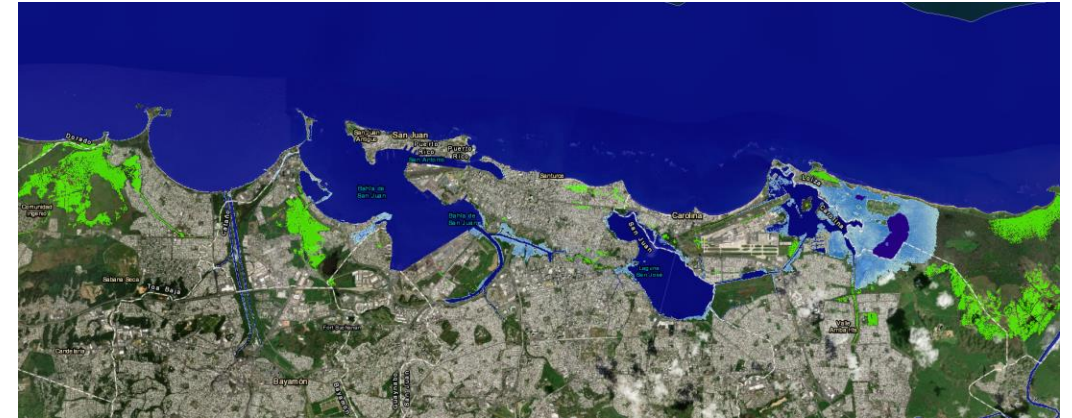


Global Models Predict 1.5° to 4° F by 2050

Effects of Sea Level Rise



Sea Level Rise Predictions 2000-2100



San Juan, 1 foot



San Juan, 3 feet



San Juan, high tide flooding

Sea Level Rise Projections for Puerto Rico by 2050: 0.8 feet, 1.2 feet, 2.8 feet
Under Intermediate-Low, Intermediate, and Extreme Scenarios

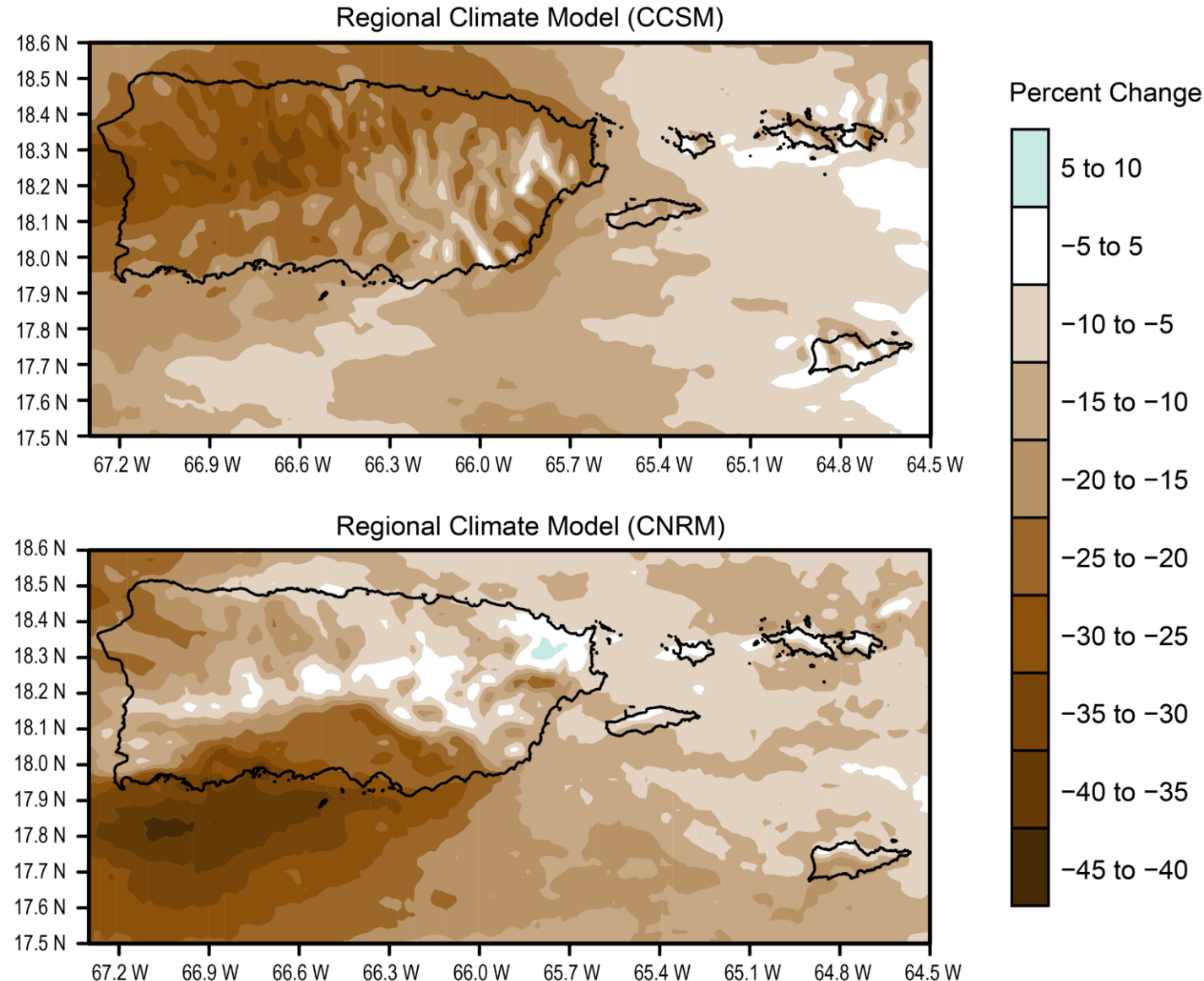
Drop in Precipitation Forecast

Major reservoirs in Puerto Rico could enter permanent supply deficit as early as 2025 under a higher emissions scenario and by 2040 under a lower emissions scenario

Also longer dry seasons and shorter, but wetter wet seasons

Recommendations:

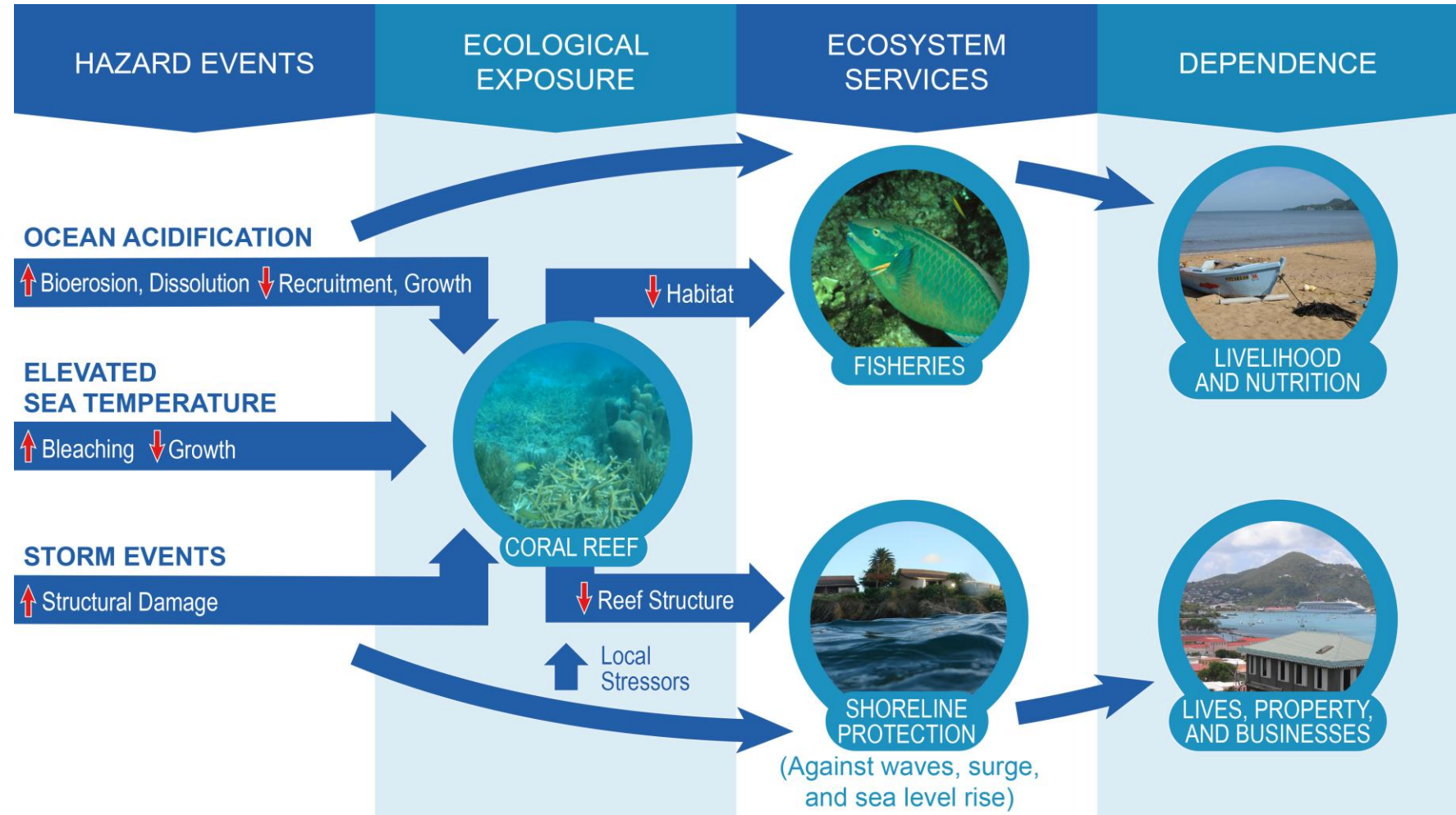
- Fresh water harvesting
- Increase agricultural water use efficiency



Climate Change Impacts on Coral Reef Ecosystems and Societal Implications

Future impacts on island economies due to:

- changes in key fisheries
- declines in natural shoreline protection
- loss of tourism



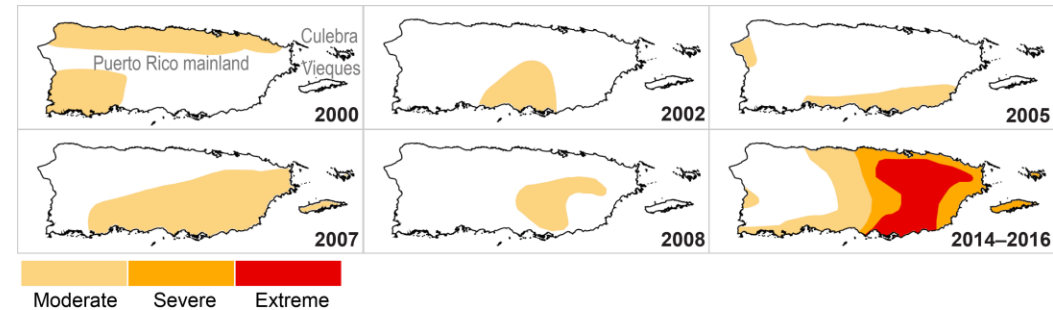
Future Climate Change Relevant to Regional Risks

Global climate model predictions uncertain, but they suggest:

- Increased frequency of strong hurricanes (Categories 4 and 5) in Atlantic Basin, including Caribbean.³³
- Increase in both drought intensity and frequency for Puerto Rico due to increases in both average and extreme temperatures and decreases in precipitation.⁷

Resilience capacity can be increased through:

- Better data collection of extreme events, and cost analysis
- Application of new technologies
- Collaborative action
 - With other Caribbean countries, e.g. via
 - Caribbean Community Climate Change Centre (5C) in Belize
 - Caribbean Institute for Metrology and Hydrology (CIMH)
 - With US Federal agencies, academics, and climate experts





External Forces (2)

**Age of Accelerations and
the 4th Industrial Revolution**

Age of Accelerations

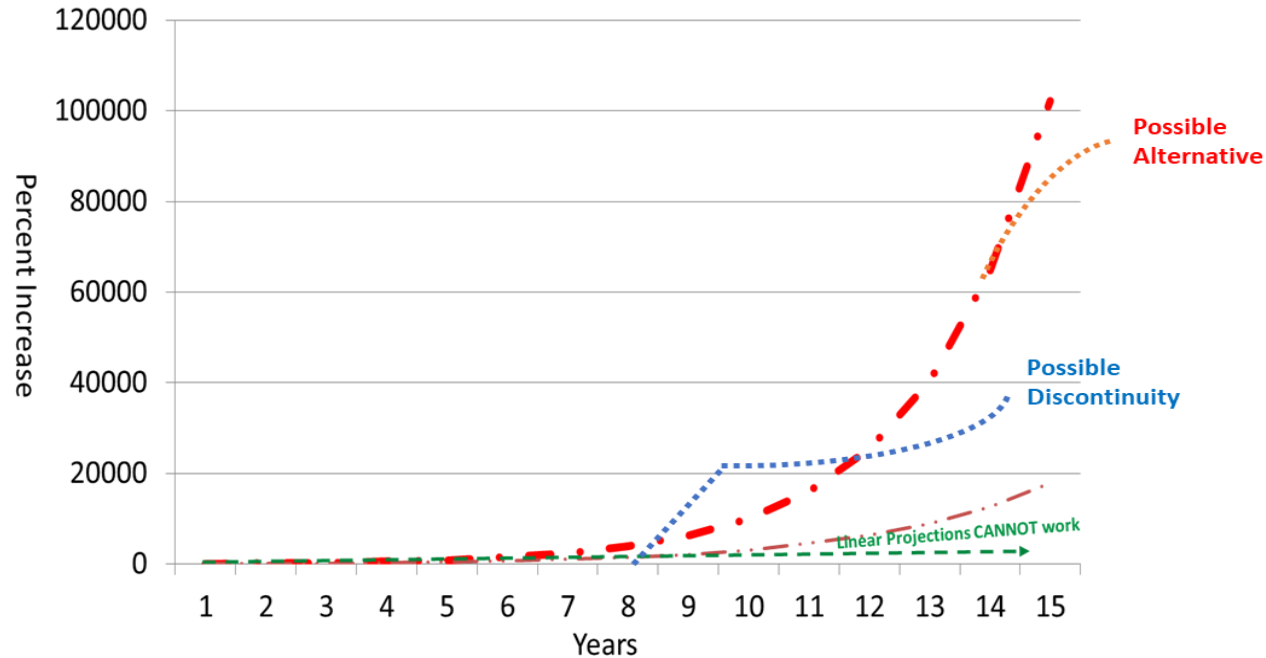
Thomas L. Friedman



- Accelerating political, social, economic changes
 - Climate change and pandemics cross borders
 - Pace of tech change
 - Globalization vs. de-globalization
- From interconnected to interdependent
- Deep impacts on people
- Left-right political divisions no longer meaningful
- How to design socio-political-economic governance for Fused, Fast and Deep world?

Velocity of Tech Change

Growth in Computing Power per Unit Cost



Capability doubles every 18 months — · — · — Capability doubles every 24 months — · · · —

If a factor, e.g. computing power/unit cost, doubles every 18 mo, 5-yr increase is 900%, 10-yr is 10,000%, 15-yr is ~100,000%

Biotech even faster, robotics ubiquitous, nano poised breakout, energy impacts are global

- Think BRINE (bio-robo-info-nano-energy) + Additive Manufacturing & AI
- Interactions complicate things
- Linear projections CAN'T work

Fourth Industrial Revolution



Dr. Klaus Schwab, WEF

- Accelerating tech change
- Interconnected technical & social impacts
- Rising geopolitical risk and changing markets

Four Industrial Revolutions

1780s

1870s

1969

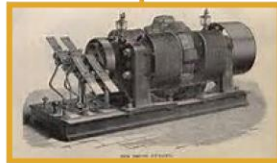
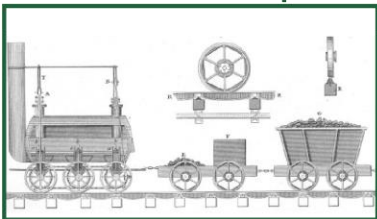
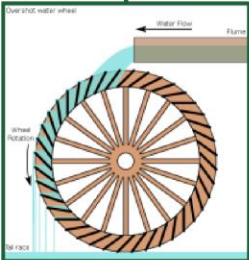
JUST BEGINNING

1ST INDUSTRIAL REVOLUTION

2ND INDUSTRIAL REVOLUTION

3RD INDUSTRIAL REVOLUTION

4TH INDUSTRIAL REVOLUTION



fuse technologies
"blur lines between
physical, digital
and biological
spheres"

Source: Klaus Schwab, "The Fourth Industrial Revolution: what it means, how to respond," 14 January 2016
<http://www.weforum.org/agenda/2016/01/>, accessed February 16, 2016

Converging 4th IR Trends (1)

Trends **can't be controlled by governments, only influenced**

4th IR will affect business, government, and people

- Now governing by “**systems of public policy and decision-making [that] evolved alongside 2nd IR**”

Challenges of misinformation & disinformation



Converging 4th IR Trends (2)

Trends support:

- **Empowerment** of individuals and non-state actors
 - **More people part of conversations about their future**

Profound impact on people

- Change “**not only what we do, but also who we are**”
- Privacy issues vs. biotech and AI revolutions
 - **Pushing back thresholds of life span, health, cognition, and capabilities**
 - **will redefine moral and ethical boundaries**



Benefits & Opportunities for Puerto Rico

Accelerating, converging technologies

- Increased overall productivity
 - Automation beneficial to aging, declining workforce
- Physical, digital, biological worlds play to Puerto Rico's strengths
- Gaming industry now much larger than movies

Also accelerate de-globalization of supply chains*

- Local production of manufacturing and services
 - But, reduced labor costs through robots/co-bots--reshoring
- Installed new energy production is now dominated by local sources -- solar, wind, hydro, and fracked natural gas.
- Explosion of productivity in urban and indoor agriculture

*TX Hammes, "3-D Printing Will Disrupt the World in Ways We Can Barely Imagine,"
<http://warontherocks.com/2015/12/3-d-printing-will-disrupt-the-world-in-ways-we-can-barely-imagine/>

Stresses for Puerto Rico

- Potential job loss
 - McKinsey (MGI) 2017 study:
 - **“about 60% of all occupations have at least 30% of constituent activities that could be automated.”** [with present tech]
 - Need human-machine teaming
 - **Service jobs particularly vulnerable** to automation
- Increase in migration pressures
- In many places high potential for **domestic unrest, scapegoat-finding, radical nationalism and protectionism**
- **Potential balkanization of Internet**



Threats to existing security structures

- **Likely center of gravity of future conflicts: resilience of populations of engaged nations**
 - Can challenge social compacts



SWOT Analysis for Puerto Rico

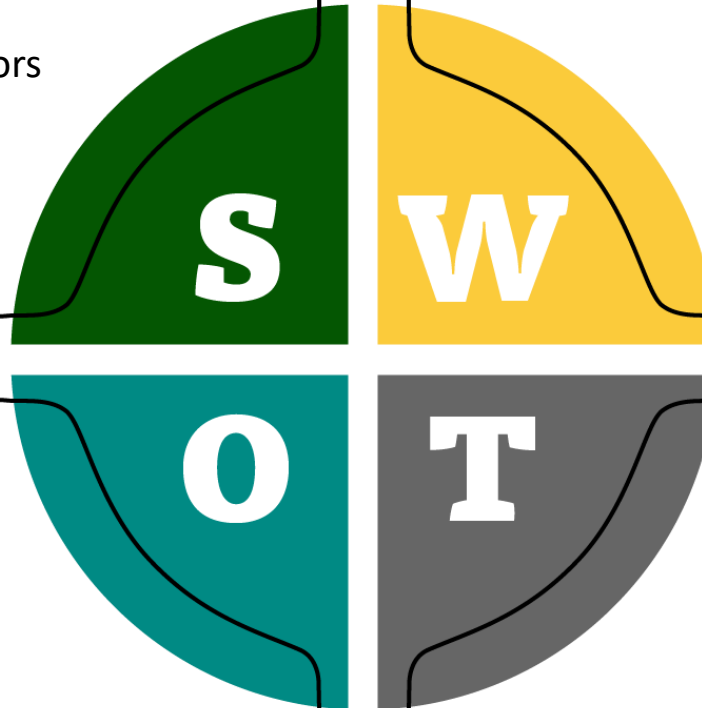
In the new post-virus “un-normal”

STRENGTHS

- Things your company does well
- Qualities separating you from competitors
- Internal resources: HR, morale, etc
- Tangible assets: IP, patents, etc.

WEAKNESSES

- Things your company lacks
- Things competitors do better
- Unclear selling proposition
- Resource limitations



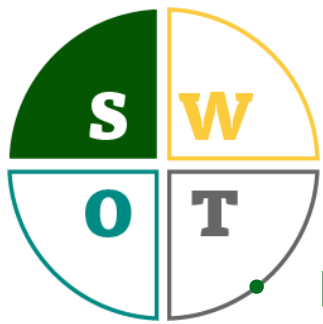
- Under-served markets
- Areas with few competitors
- Press/media coverage
- Emergency need for your products/svcs

OPPORTUNITIES

- Emerging competitors
- Negative press/media coverage
- Changing customer attitudes
- Changing regulatory environment

THREATS

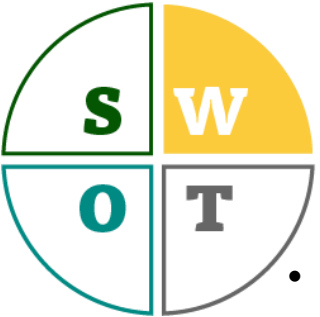
Contribute Inputs to Business Owner/Operators' Resilience Plans



STRENGTHS

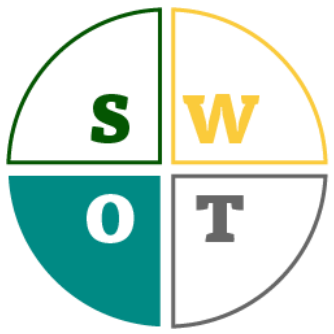
Inherent assets

- Diverse activities: History, architecture, culture, cuisine, rainforest, beaches
- Location
- **Qualities separating you from competitors**
 - U.S. jurisdiction, goods “Made in U.S.A.”
 - U.S. accounting and licensing processes
 - No U.S. passport needed
 - Strategic sectors: (1) Adv Manufacturing, (2) IT, (3) Services for export, (4) agro industries, (5) ocean economy, (6) bio economy, (7) logistics, (8) visitors’ economy
- **Internal resources**
 - Bi-lingual, educated workforce
 - Strong higher education system
- **Tangible assets**
 - Manufacturing base in pharma, computers & electronics, chemicals, medical devices
- **Lower tax rates**



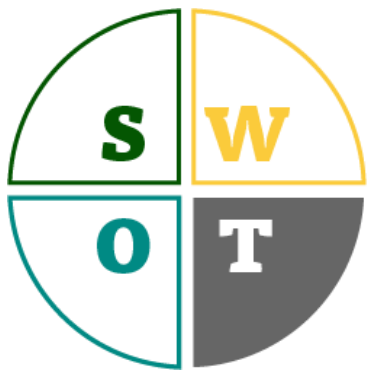
WEAKNESSES

- Power, comms & other infrastructures are unstable and vulnerable
- Many small businesses can't shift to remote ops
- Extended brain drain
- Unstable politics—"long term" is 4 years
 - Strategic plans not being executed
- Unpredictable regulatory environment
- Regulatory rules and taxes increase production & shipping costs
 - Bureaucracy
- Resource limitations—debt burden and financial controls
 - Uncertain flow of recovery funds
 - Good governance will be essential
 - No room to squander funds



OPPORTUNITIES

- Entering new markets via bi-lateral or multi-lateral agreements
- Manufacturing in pharma, computers & electronics, medical devices
- Closed environment agriculture – also, NO WINTER
- De-globalization of supply chains
- Local production of energy
- Opportunities for remote work
 - Bring back, or leverage, diaspora
 - Stable power, comms and internet are key
- Trans-generational opportunities



THREATS

- **Recurring, diverse natural disasters**
 - **Weak critical infrastructures**
 - **Inconsistent preparations—focus of this course**
- **Emerging competitors—varies by sector**
- **Contradictory press/media coverage—need to tell story better**
- **Continuing brain drain, population loss**
- **Global economy restructuring post-COVID-19:**
 - **Will industries like tourism and hospitality recover? Where or where not?**
 - **Availability of reconstruction funds**

Innovation and Entrepreneurship

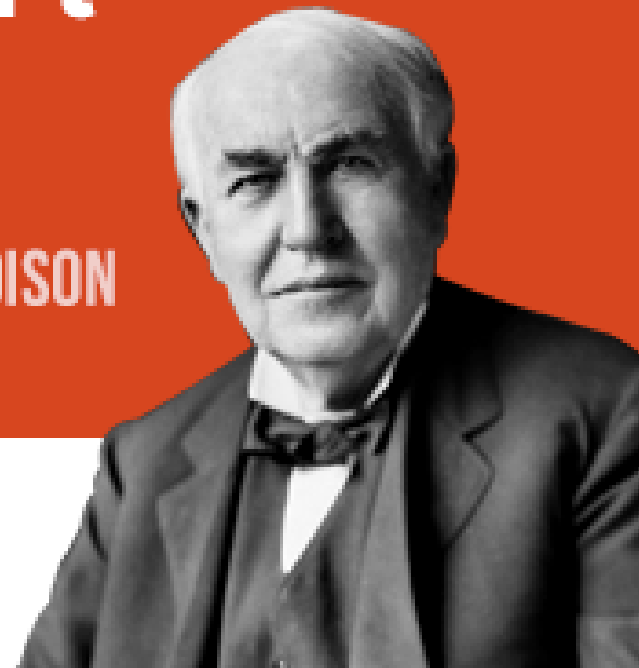


**"We have run out of money,
now we've got to think."**

—Sir Ernest Rutherford

**“I have not failed.
I’ve just found
10,000 ways
that won’t
work.”**

- THOMAS A. EDISON



Due.com

First
Atttempt at
Iterative
Learning

Observations for Puerto Rico from Singapore



Area: 5,328 mi²

Population: 3.194 million



Area: 278.6 mi²

Population: 5.639 million

2018 visit

- Execute 20-to-30-year strategic plans; by a highly effective, non-corrupt government; in a stable political environment

Peter Ho lectures: Of elephants in the room that are black*

- **Foresight**
 - Develop a mindset to deal with unexpected--systematically
 - Black Swans, Black Elephants, Pink Flamingos
- **Whole-of-Society Approach**
- **Need to be able to challenge official views**
- **Avoid blame-seeking culture**
- **Even small city-states can influence, shape, and even create, not just markets, but also their own operating environment**



Overcoming Obstacles

- **Joplin, Mo reconstruction model—bottom up, cultural resilience**
- **Understanding Federal Funding—and the coming drought of it**
- **Countering mis-information/dis-information**
- **“Managed retreat” from climate change**
- **Co-creation of services (public-private)**



Post-virus “new un-normal” opportunities for Puerto Rico

- Digital Puerto Rico—Estonia, Denmark, Singapore
 - Smart & Connected Communities
 - A “science of cities”
 - Cyber Resilience
- Apply the tools of complexity science to current problems
- Biotech revival/health care
- Micro-manufacturing
- Attract diaspora
- Solidify production roles within U.S. as supply chains re-shore
- Caribbean Resilience Hub

Questions Very Welcome

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Back-Up

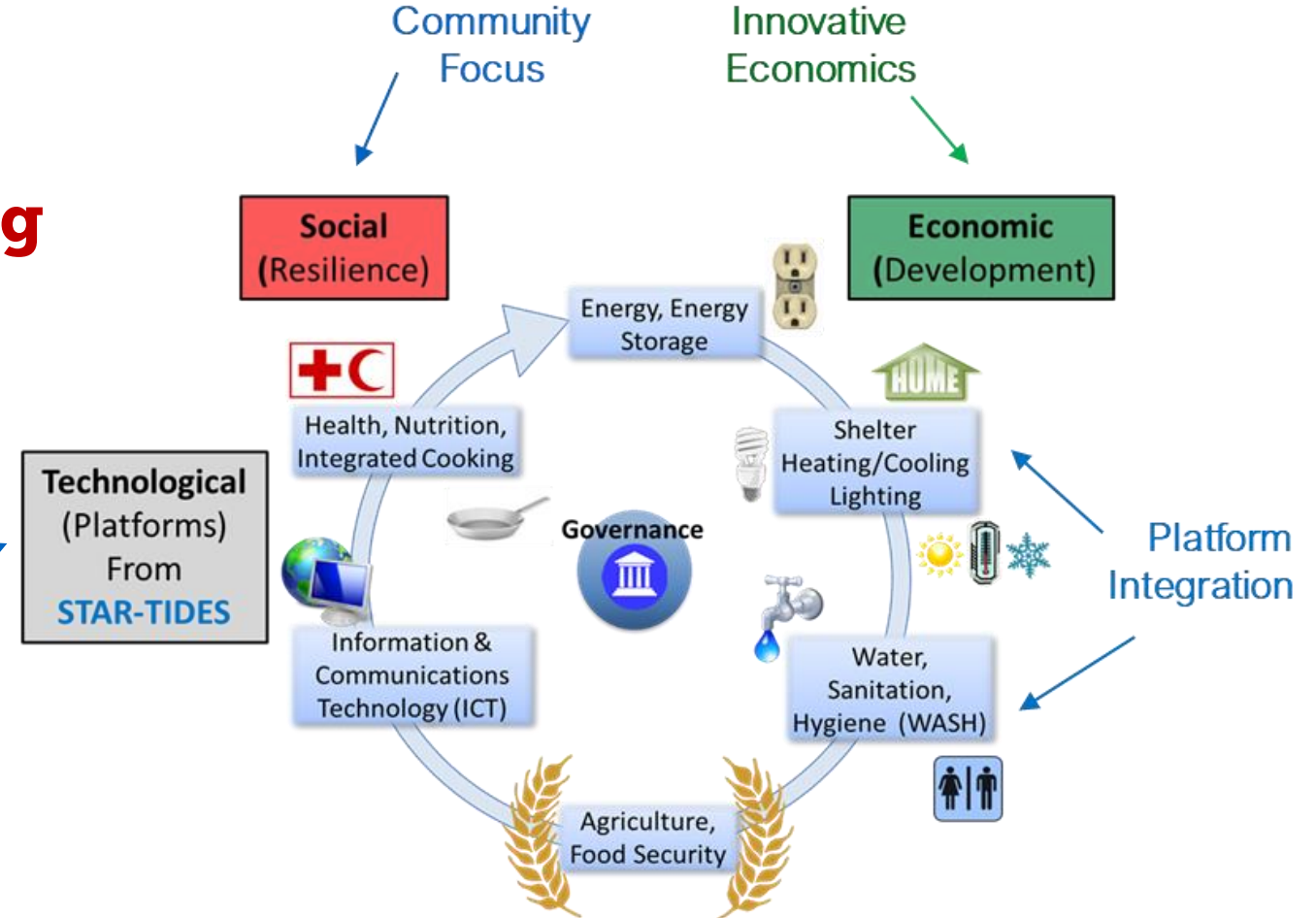
Listening, Learning Lasting

Knowledge Sharing

via STAR-TIDES network



Trans-Disciplinary Research and Teaching are Key



Keys to Success: Narrative; Systems Thinking; Shared Knowledge; Resources; Education; Logistics; Digital Enabling Technologies

Stability/Security ↔ Sustainability

Roles of Stakeholders

- **Private vs public**
 - Public sector being paid, but in lockdown many services aren't delivered
 - Actual unemployment in private sector (809% of workforce) may exceed 509%
- **What should roles be for govt, private sector, and academia in building sustainable resilience in Puerto Rico?**
- **What are strengths/weaknesses of Small/Medium-sized businesses?**

Collaboration and Tools for Cross-Country Capacity Building and Decision-Making

The **Caribbean Climate Online Risk and Adaptation tool (CCORAL)** is a planning tool that can help countries make climate-resilient decisions and take actions in response to a changing climate.

(<http://www.caribbeanclimate.bz/caribbean-climate-chage-tools/tools/>)

The **Caribbean Catastrophe Risk Insurance Facility** is the world's first index-based parametric insurance mechanism. It is a partnership of 17 Caribbean countries and the World Bank. (<https://www.ccrif.org/>)

The **Caribbean Challenge Initiative** was launched in 2008, with support of The Nature Conservancy. Puerto Rico and the USVI later joined participating governments committed to conserving at least 20% of their nearshore marine and coastal environments by 2020 and to ensuring that these areas are managed through a long-term finance structure.

(<http://caribbeanchallengeinitiative.org/>)

Iterative Approaches

- **Interdependencies often are complex (or “wicked”) problems**
 - Problem will change as fixes are applied
 - Iterative solutions
- **Document going-in assumptions and articulate them**
- **Sked review**
 - Get straight feedback
 - If plan is converging to desired outcome, continue
 - If not, review assumptions and adjust
- **Recognize leadership challenges, up and down chain**
 - **MUST** get buy-in up front from bosses and your team
 - Changes based on assessments are strengths, not weakness
- **Form complex, adaptive coalitions with outside organizations**



Mission/System Performance

