

Transforming an Energy Grid One Scale at a Time

Jonathan Marvel

FAIA

President

Resilient Power Puerto Rico



RESILIENCE BUILDING ACROSS PUERTO RICO



INDEX

1.

PUERTO RICO IN
CONTEXT

2.

ARCHITECTURE
AS SOCIAL
ENTREPRENEURSHIP

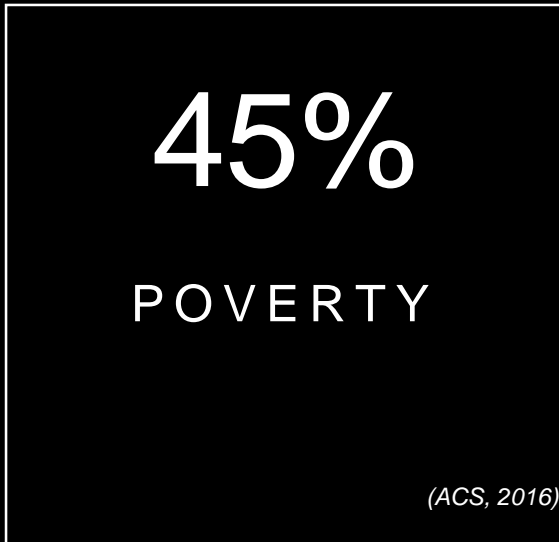
3.

PERVASIVE
ALTRUISM / SHELTER
IN PLACE

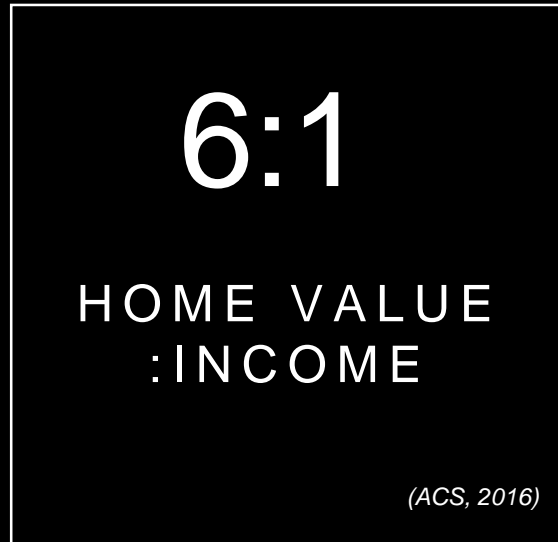
1.

PUERTO RICO IN
CONTEXT

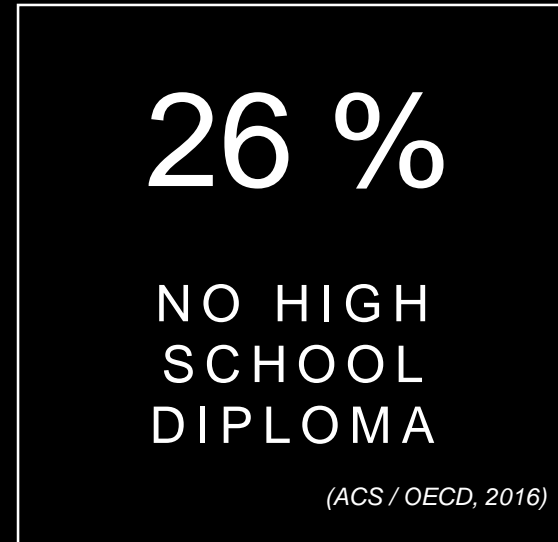
C O N T E X T
PUERTO RICO IN NUMBERS



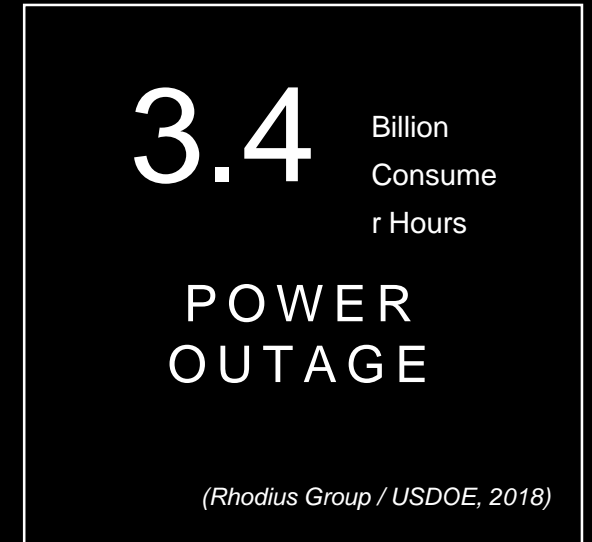
*Puerto Rico's poverty rate is 3
X that of the US.*



*Median home values = \$118K
1/2 of the population's
incomes <\$19K*



*> ¼ of Puerto Ricans over 25
years old lack a HSD*



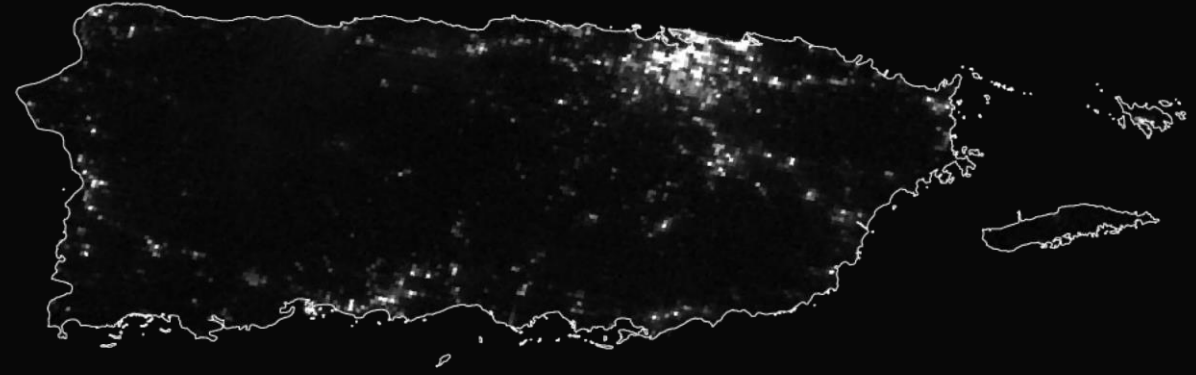
*María's was the 2nd longest in
the World and 4.4 times that of
Superstorm Sandy.*

C O N T E X T

PUERTO RICO'S POWER GRID



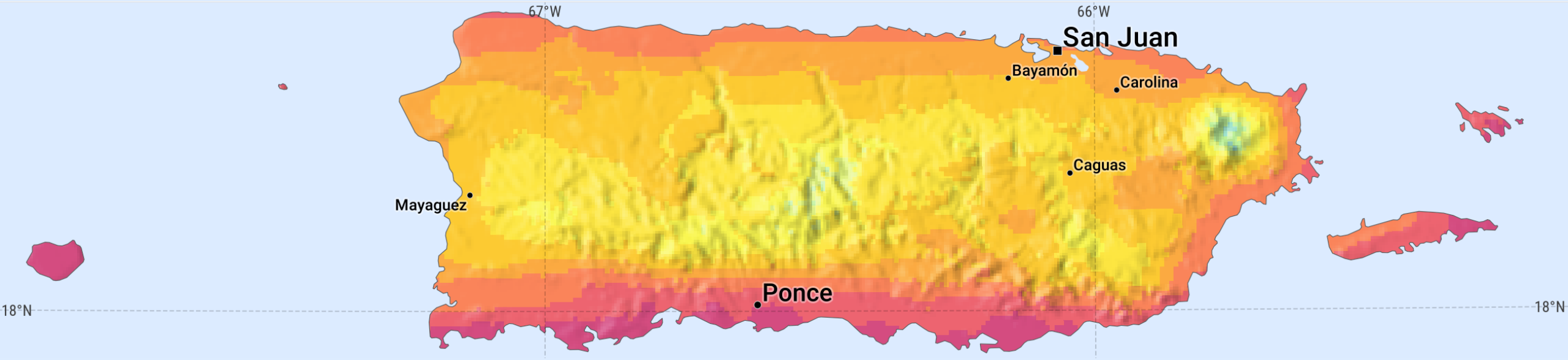
BEFORE HURRICANE MARIA



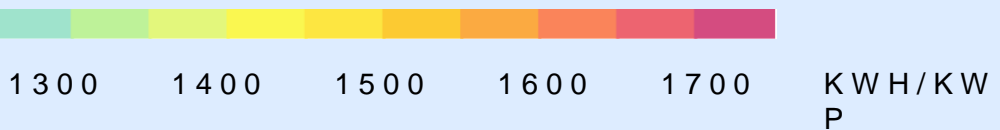
AFTER HURRICANE MARIA

C O N T E X T

PHOTOVOLTAIC POWER POTENTIAL



AVERAGE ANNUAL SUM OF PVOUT, 1999-2016



C O N T E X T

NATURAL MANMADE DISASTERS (2017)



JOSE

KATIA

MARÍA

C O N T E X T

NATURAL MANMADE DISASTERS (2018)

Florence



Potential
disturbance
#2



Isaac



Helene



C O N T E X T

NATURAL MANMADE DISASTERS (2018 HURRICANE MICHAEL)





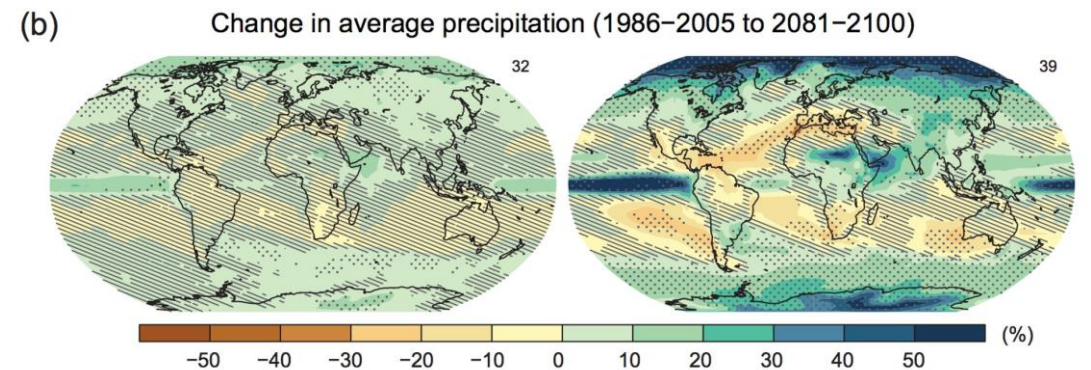
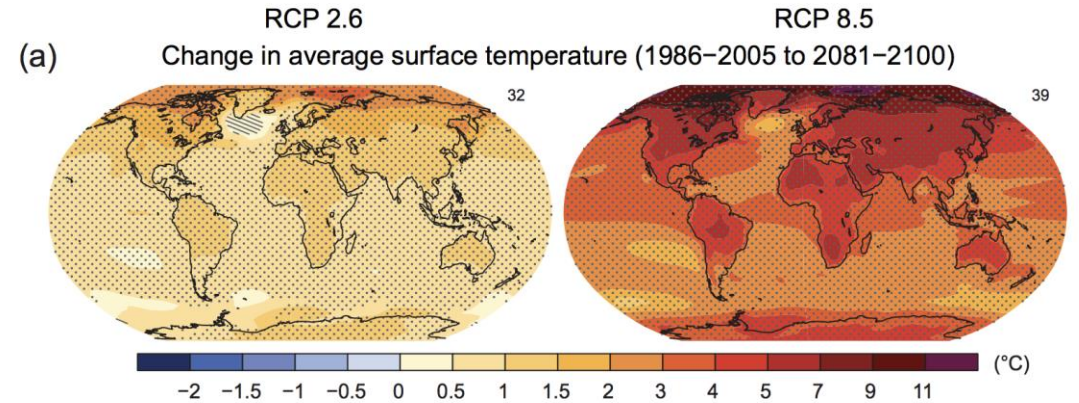
C O N T E X T

CLIMATE CHANGE REPORT



GLOBAL WARMING OF 1.5 °C

an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty

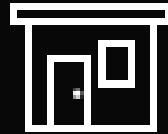


C O N T E X T

CLIMATE IS HAPPENING HOW DO WE ADAPT?



ENERGY



HOUSING



COMMUNITY



2.

**ARCHITECTURE
AS SOCIAL
ENTREPRENEURSHIP**

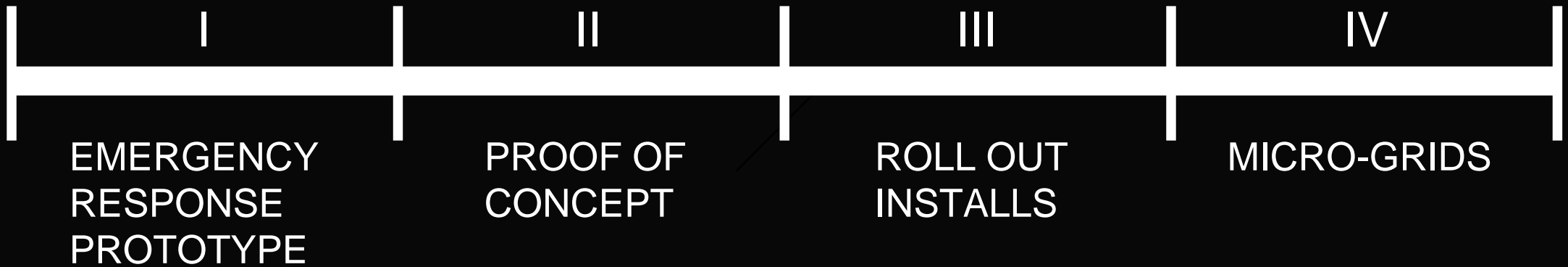
(ENERGY)

S O C I A L E N T R E P R E N E U R S H I P

RESILIENT POWER PUERTO RICO (RPPR)

2017

2017



S O C I A L E N T R E P R E N E U R S H I P

RPPR'S SCALES OF IMPACT

1.5 KW

EMERGENCY
RESPONSE

Emergency Kits for
small Critical Loads.

5 KW

COMMUNITY
CENTERS

Energy hubs for the
community.

10 KW +

MICROGRID

Robust energy
systems for
institutional facilities.

S O C I A L E N T R E P R E N E U R S H I P

1.5 KW EMERGENCY REPOSE SYSTEMS



S O C I A L E N T R E P R E N E U R S H I P

PLAYITA (1.5 KW)



An aerial photograph of a densely packed urban neighborhood, likely a slum or informal settlement. The buildings are closely packed together, with many featuring bright blue roofs. The streets are narrow and winding, with some vehicles visible. The overall scene depicts a high-density, low-income urban environment.

S O C I A L E N T R E P R E N E U R S H I P
5KW COMMUNITY CENTER SYSTEMS

S O C I A L E N T R E P R E N E U R S H I P

PILOT PROJECT: CAÑO MARTÍN PEÑA (5KW)



Buena Vista Santurce
Arte & Cultura

BUENA VISTA
CENTRO DE USOS
MÚLTIPLES

S O C I A L E N T R E P R E N E U R S H I P

CAÑO MARTIN PEÑA (5KW INSTALLATIONS)



SANTURCE

CENTRO BUENA
VISTA



HATO REY

CENTRO LAS
MONJAS



SAN JUAN

HIJOS DE DON
BOSCO



SAN JUAN

G-8
HEADQUARTERS

S O C I A L E N T R E P R E N E U R S H I P

COMMUNITY CENTER INSTALLATIONS (5KW)



● Emergency Response

● Community Resilience

● Funded

S O C I A L E N T R E P R E N E U R S H I P

COMMUNITY CENTER INSTALLATIONS (5KW)



Maunabo

ATMAR



Maunabo

COMITÉ PRO
DESAROLLO



Naguabo

DAGUAO



SALINAS

EL COQUI



S O C I A L E N T R E P R E N E U R S H I P

10KW+ MICRO-GRIDS (RMI PARTNERSHIP)

“A robust, diverse and inclusive renewable energy sector, where the tools and resources for the development of renewable energy micro grids are available for the benefit of communities across Puerto Rico.”





M I C R O G R I D S
D E C R E A S I N G S E N S I T I V I T Y

CONTINUED OPERATIONS OF SOCIAL INFRASTRUCTURE WITH POWER REDUNDANCIES

M I C R O G R I D S
REDUCING EXPOSURE



INDEPENDENCE FROM THE CENTRALIZED FOSSIL-FUEL POWER GRID

STRENGTHENING ADAPTIVE CAPACITY

A photograph showing several workers in high-visibility vests and safety gear installing large solar panels on a rooftop. The scene is set against a bright blue sky with scattered white clouds. In the background, there are residential buildings, including a pink one and a grey one, and a utility pole with power lines. The workers are focused on their task, with one worker in the foreground wearing blue safety glasses and another in the background wearing a hoodie and jeans. The overall atmosphere is one of active reconstruction and sustainable energy development.

LOCAL CONTROL OF RESOURCES TO RECOVER & REBUILD

3.

**PERVASIVE
ALTRUISM /
SHELTER IN PLACE**

(HOUSING + COMMUNITY)



S H E L T E R I N P L A C E

RESILIENT AFFORDABLE HOUSING





S H E L T E R I N P L A C E
RESILIENT COMMUNITY



SHELTER IN PLACE
CARIBBEAN CLIMATE CITY





S H E L T E R I N P L A C E

A RESILIENT CITY FOR THE FUTURE CARIBBEAN BASIN



FLORIDA

The Bahamas

Cuba

Turks and Caicos Islands

Cayman Islands

Haiti

Dominican Republic

Jamaica

Puerto Rico

British Virgin Islands

Antigua and Barbuda

Montserrat

Dominica

St Lucia

Barbados

Grenada

Trinidad and Tobago

Gulf of Mexico

YUCATAN

QUINTANA ROO

QUINTANA ROO

Belize

Honduras

El Salvador

Nicaragua

Costa Rica

Panama

Aruba

Curaçao

Google