

# ADAPTACION A CAMBIOS CLIMATICOS Y SUBIDA DEL NIVEL DEL MAR EN EL SUR DE LA FLORIDA, EE.UU



*Carlos Tamayo, M.Sc., LEED AP BD+C, ENV SP*



OUR VISION: THE ULTIMATE DESTINATION

**COMPañIA PREMIER DE  
INFRAESTRUCTURA  
TOTALMENTE INTEGRADA.**

OUR POSITIONING: A CLIENT-FOCUSED VALUE PROPOSITION

**EN SOCIEDAD CON AQUELLOS  
QUE PIENSAN SIN LIMITES.  
DISEÑAMOS, CONSTRUIMOS,  
FINANCIAMOS Y OPERAMOS  
SUEÑOS.**

OUR MISSION  
PROPELS US

**COMPLEX CHALLENGES  
COLLABORATIVE INNOVATION  
TRANSFORMATIONAL OUTCOMES**

OUR VALUES  
MAKE AMAZING HAPPEN

**ANTICIPATE, INSPIRE  
COLLABORATE, DREAM  
DELIVER, SAFEGUARD**

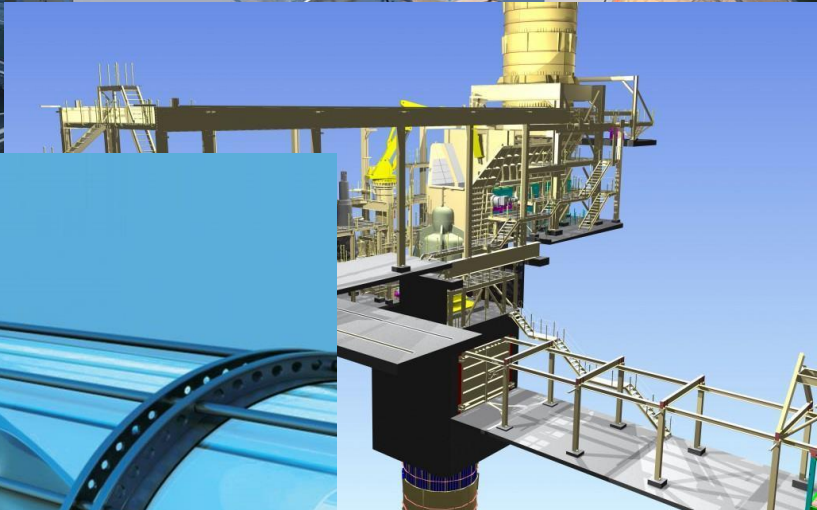
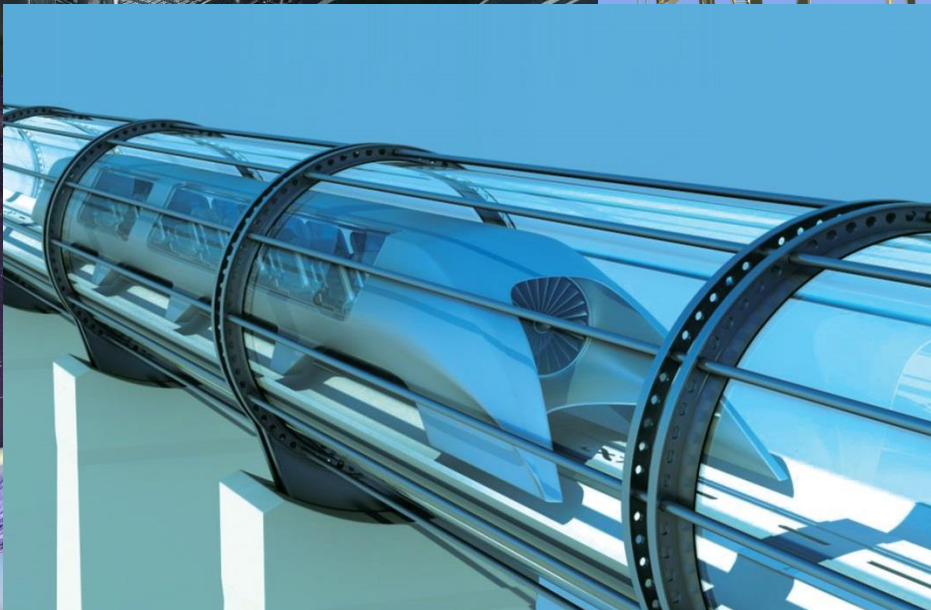
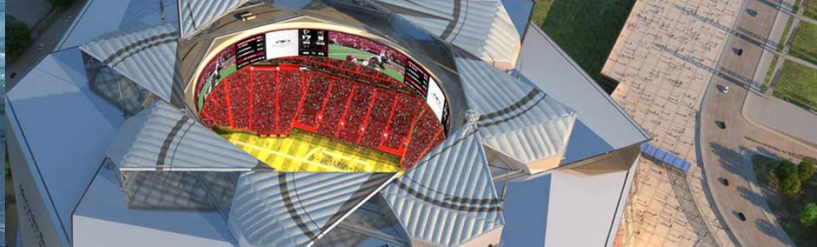
OUR PURPOSE  
INSPIRES US

**BUILT TO DELIVER A BETTER WORLD**

OUR TAGLINE  
IS A CALL TO ACTION

**IMAGINALO. REALIZADO.**





RANK	Company, Headquarters	500rank	REVENUES \$ millions	NO. OF EMPLOYEES
<b>CALIFORNIA 49 COMPANIES</b>				
1	APPLE Cupertino	4	229,234.0	123,000
2	MCKESSON San Francisco	6	198,533.0	64,500
3	CHEVRON San Ramon	13	134,533.0	51,900
4	ALPHABET Mountain View	22	110,855.0	80,110
5	WELLS FARGO San Francisco	26	97,741.0	262,700
6	INTEL Santa Clara	46	62,761.0	102,700
7	WALT DISNEY Burbank	55	55,137.0	199,000
8	HP Palo Alto	58	52,056.0	49,000
9	CISCO SYSTEMS San Jose	62	48,005.0	72,900
10	FACEBOOK Menlo Park	76	40,653.0	25,105
11	ORACLE Redwood City	82	37,728.0	138,000
12	HEWLETT PACKARD ENTERPRISE Palo Alto	107	28,871.0	66,000
13	GILEAD SCIENCES Foster City	116	26,107.0	10,000
14	AMGEN Thousand Oaks	130	22,849.0	20,800
15	QUALCOMM San Diego	133	22,291.0	33,800
16	MOLINA HEALTHCARE Long Beach	152	19,883.0	20,000
17	WESTERN DIGITAL San Jose	158	19,093.0	67,629
18	VISA San Francisco	161	18,358.0	15,000
19	AECOM Los Angeles	164	18,203.4	87,000
20	PG&E CORP. San Francisco	168	17,135.0	23,000
21	SYNNEX Fremont	169	17,045.7	113,600
22	GAP San Francisco	181	15,855.0	135,000
23	APPLIED MATERIALS Santa Clara	201	14,537.0	18,400
		207	14,209.6	80,000

# FASTEST-GROWING COMPANIES

## GROWTH IN PROFITS 1 YEAR

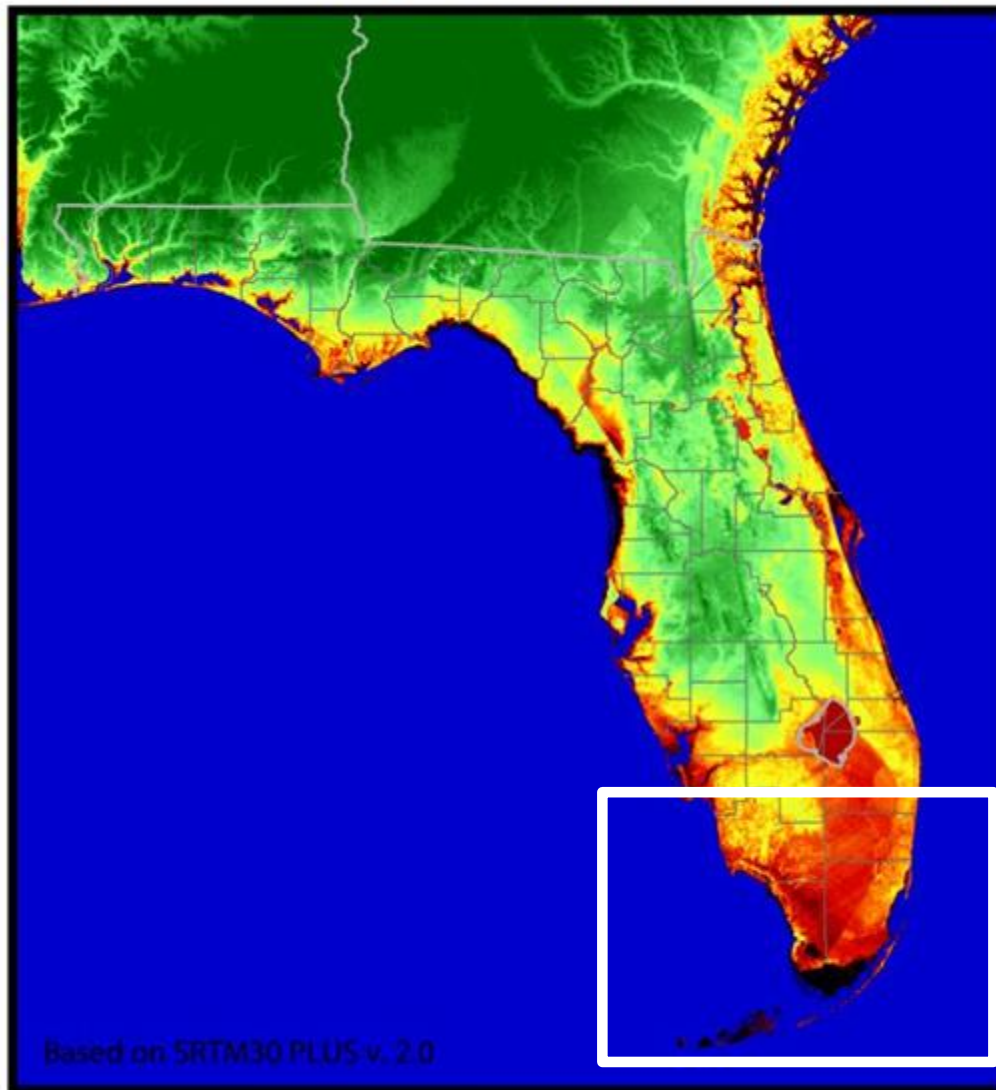
Rank	Company	500 revenues rank	2017 % growth in EPS
1	CHEMOURS	451	9,675.0
2	IQVIA HOLDINGS	304	673.7
3	ZIMMER BIOMET HOLDINGS	361	489.4
4	METLIFE	43	474.6
5	HD SUPPLY HOLDINGS	430	416.5
6	AIR PRODUCTS & CHEMICALS	345	372.3
7	XPO LOGISTICS	186	362.3
8	NEWELL BRANDS	196	350.4
9	ON SEMICONDUCTOR	492	339.5
10	HUMANA	56	313.0
11	CENTERPOINT ENERGY	308	313.0
12	BORGWARNER	301	278.2
13	SUPERVALU	180	268.2
14	HILTON WORLDWIDE HOLDINGS	324	266.7
15	AECOM	164	243.5
16	FIRST DATA	254	239.1

# 17 ENGINEERING, CONSTRUCTION 7 COMPANIES

1	FLUOR	153	19,521	191	7	1	7	6	7
2	AECOM	164	18,203	339	3	2	6	8	4
3	JACOBS ENGINEERING GROUP	297	10,023	294	5	3	5	7	6
4	QUANTA SERVICES	316	9,466	315	4	3	3	8	5
5	PETER KIEWIT SONS'	339	8,678	371	1	4	2	12	3
6	EMCOR GROUP	368	7,688	227	6	3	4	14	2
7	MASTEC	428	6,607	347	2	5	1	24	1

**INUNDACIONES, SUBIDA DEL NIVEL DEL MAR  
Y CAMBIOS CLIMATICOS EN CIUDADES  
COSTERAS DEL SUR DE LA FLORIDA**

# RIESGOS ANTE EL NIVEL DEL MAR



## Cities Most Vulnerable to Coastal Flooding Today

Top 25 cities and their populations at risk (thousands) within FEMA's 100-year coastal floodplain

1.	New York	245	14.	Lauderhill, Fla.	66
2.	Miami	126	15.	Charleston, S.C.	64
3.	Pembroke Pines, Fla.	116	16.	Cape Coral, Fla.	59
4.	Coral Springs, Fla.	115	17.	Tamarac, Fla.	58
5.	Miramar, Fla.	93	18.	Margate, Fla.	50
6.	St. Petersburg, Fla.	88	19.	Tampa, Fla.	50
7.	Davie, Fla.	87	20.	Fountainebleau, Fla.	48
8.	Fort Lauderdale, Fla.	85	21.	Miami Gardens, Fla.	44
9.	Miami Beach, Fla.	85	22.	Country Club, Fla.	43
10.	Hialeah, Fla.	76	23.	Atlantic City, N.J.	37
11.	Sunrise, Fla.	74	24.	North Lauderdale, Fla.	37
12.	Pompano Beach, Fla.	73	25.	Kendale Lakes, Fla.	37
13.	Hollywood, Fla.	69			

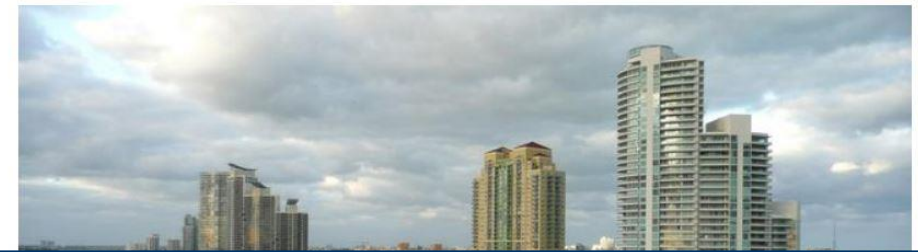
## These U.S. communities are most vulnerable to sea level rise

Florida alone accounts for 40% of the country's most at-risk homes.



MATT HICKMAN

June 20, 2018, 8:33 a.m.



## Cities Most Vulnerable to Coastal Flooding by 2050

Top 25 cities and their populations at risk (thousands) within FEMA's 100-year coastal floodplain as augmented by projected sea level rise

1.	New York	426	14.	Miami Beach has by far the greatest number of homes at risk of chronic flooding of any coastal community. By 2045, sea level rise could result in over \$6 billion in residential property value loss in the south Florida island city. (Photo: Brent Ozar/flickr)	
2.	Hialeah, Fla.	204	15.		
3.	Miami	154	16.	Norfolk, Va.	66
4.	Fort Lauderdale, Fla.	127	17.	Lauderhill, Fla.	66
5.	Pembroke Pines, Fla.	120	18.	Cape Coral, Fla.	66
6.	Coral Springs, Fla.	119	19.	Boston	62
7.	Miramar, Fla.	100	20.	Tamarac, Fla.	60
8.	St. Petersburg, Fla.	91	21.	Virginia Beach, Va.	58
9.	Davie, Fla.	90	22.	Tampa, Fla.	57
10.	Miami Beach, Fla.	87	23.	Fountainebleau, Fla.	56
11.	Charleston, S.C.	83	24.	Margate, Fla.	53
12.	Pompano Beach, Fla.	80	25.	Kendale Lakes, Fla.	51
13.	Sunrise, Fla.	79			



Miami Beach has by far the greatest number of homes at risk of chronic flooding of any coastal community. By 2045, sea level rise could result in over \$6 billion in residential property value loss in the south Florida island city. (Photo: Brent Ozar/flickr)

Fuente: <https://www.mnn.com/earth-matters/climate-weather/blogs/these-us-communities-are-most-vulnerable-sea-level-rise>

**SOUTHEAST FLORIDA  
REGIONAL COMPACT  
CLIMATE  
CHANGE**



PIONEERED BY THE  
ROCKEFELLER FOUNDATION

100 RESILIENT CITIES



**FIU**  
**Sea Level  
Solutions Center**



Bloomberg  
Philanthropies

MAYORS  
CHALLENGE

MIAMI/MIAMI BEACH, FL : 2018 CHAMPION CITY

## Predicting and Responding to Rising Sea Levels



## How we are testing our idea



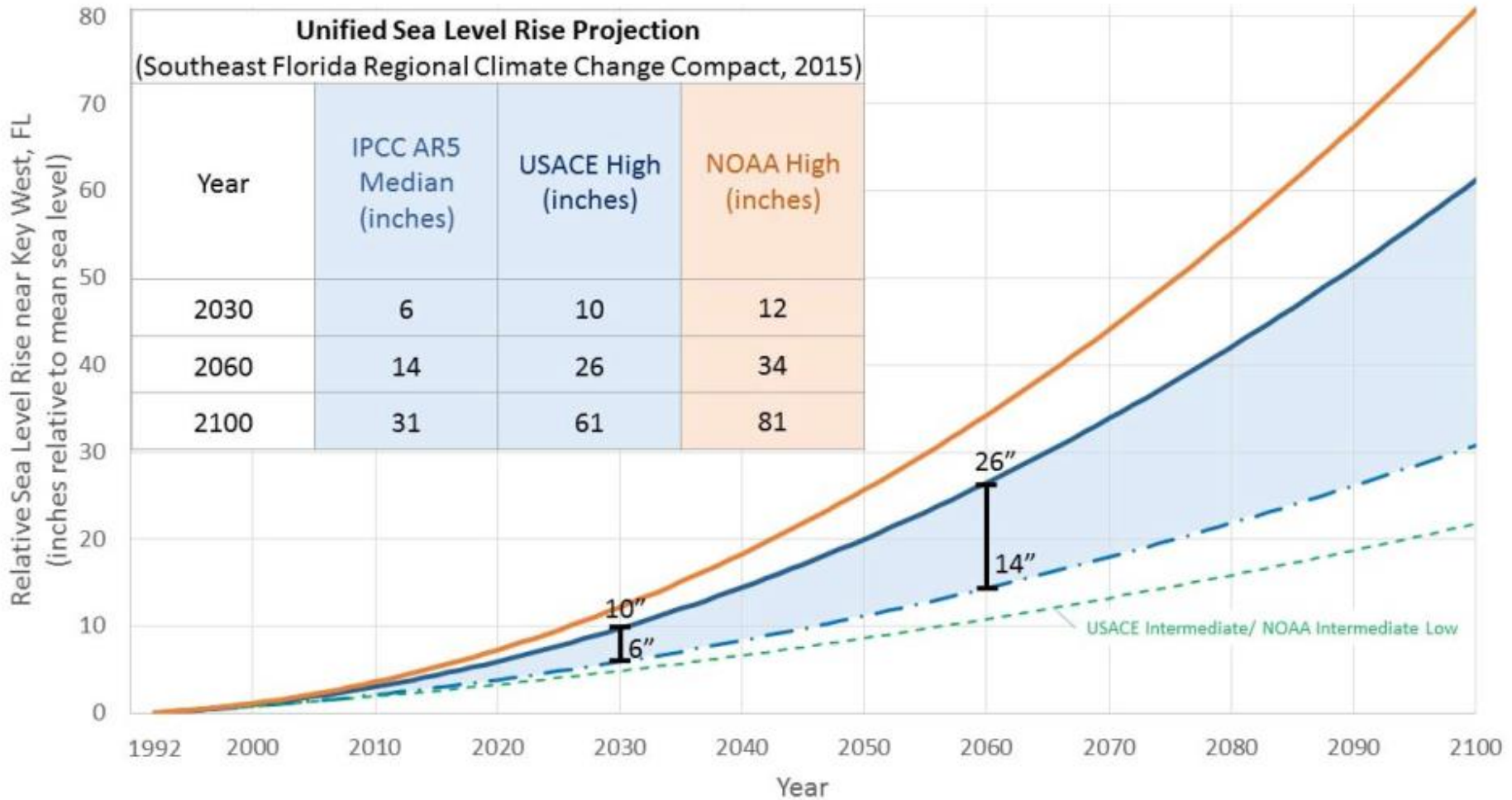
How will sea level rise affect your home? Miami is creating a tool that will show you

— Miami Herald

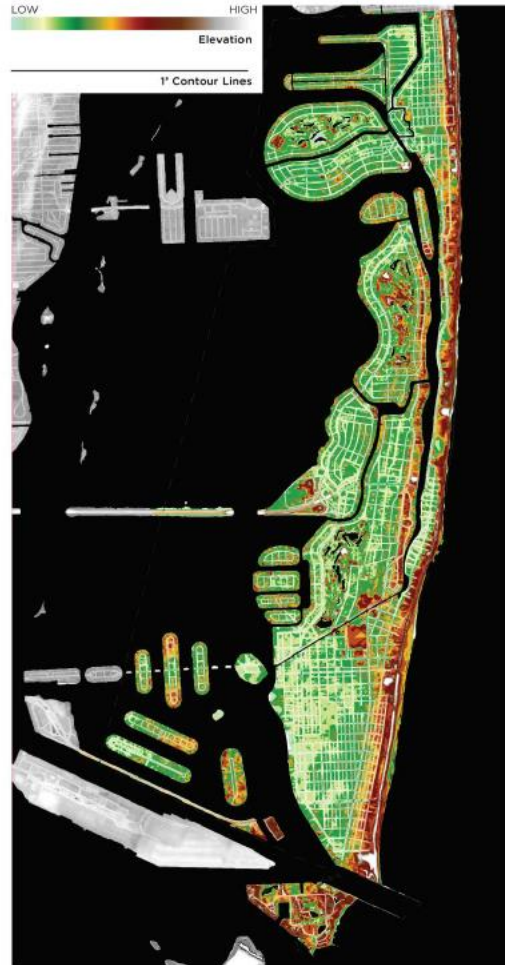
ARTICLE

# Proyección de Subida del Nivel del Mar (SNM)

- 2-2.5 pies de SNM en los próximos 50 años (2015 SE FL Regional Climate Compact)



# Miami Beach: Programa de \$US500 Millones

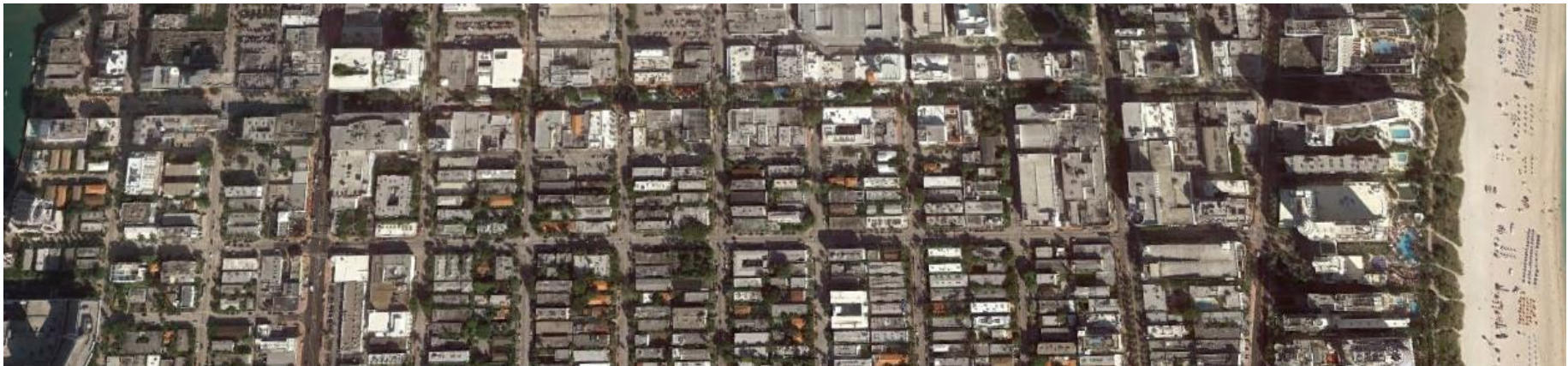


ELEVATION  
Miami Beach



HYDROLOGY  
Miami Beach

# TOPOGRAFIA



# IMPACTOS DE SNM



- Nivel freático elevado
- Mareas y marejadas más altas
- Aumento en inundaciones
- Reducción en efectividad del actual sistema de aguas pluviales
- Infraestructura Crítica
- Economía
- Turismo



# ADAPTACION Y RESILIENCIA

1. Implementación de Plan Maestro para Sistema de Aguas Pluviales:
  - Modelado numérico integrado
  - Elevación de vías publicas
  - Elevación de muros rompeolas
  - Elevacion infraestructura pública y privada
  - Retroadaptación del sistema pluvial
  - Actualización o reemplazo de utilidades
  - Infraestructura “verde”, “azul”
2. Construcción de edificios nuevos bajo estándares nuevos;
3. Incentivar y/o requerir medidas de adaptación en propiedad privada;
4. Integración de data, análisis predictivo y aplicación de redes neuronales, aprendizaje automático e inteligencia artificial.



# ADAPTACION Y RESILIENCIA

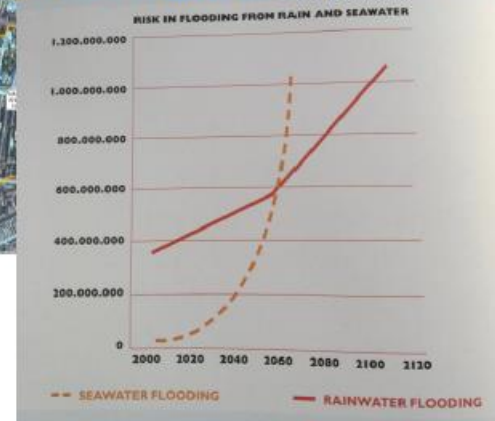
- ✓ Adoptar la Resolución de Alcaldes para endosar la promesa comprometida a reducir emisiones de gases de invernadero;
- ✓ Establecer ordenanzas de reciclaje para implementar programas “single-stream” ;
- ✓ Establecer ordenanzas para requerir estándares mínimos de construcción “verde” a través de LEED y/o la certificación de Living Building Challenge;
- ✓ Establecer ordenanzas para requerir estándares mínimos para infraestructura pública sostenible y resiliente a través de certificación ENVISION;
- ✓ Establecer ordenanza para promover la implementación de energías renovables y medidas de “Desarrollo de Bajo Impacto” (LID);
- ✓ Establecer ordenanzas para ajustar tarifas de utilidades del sistema pluvial;
- ✓ Establecer ordenanzas para adoptar estándares mínimos de “Elevación Base de Inundación” (BFE).

# ADAPTACION Y RESILIENCIA



Infraestructura “Azul/Verde”

Modelado Numérico Integrado





# ADAPTACION Y RESILIENCIA

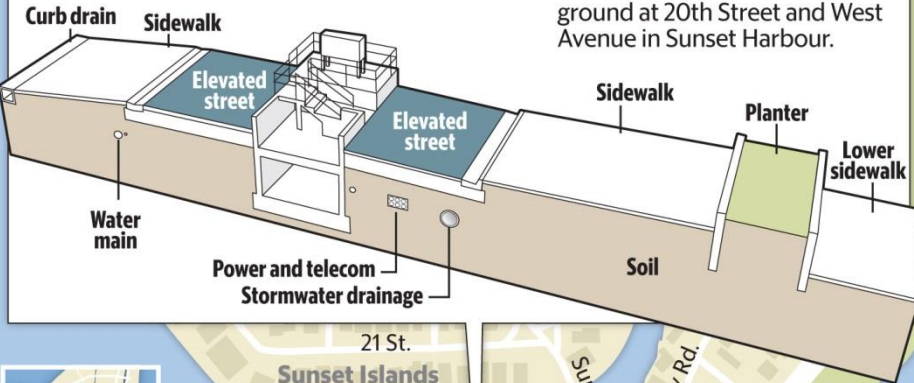
Construcción de estaciones de bombeo de mayor capacidad



# ADAPTACION Y RESILIENCIA

## 20th Street at pump station 3

The control panel for a pump station now rises out of the ground at 20th Street and West Avenue in Sunset Harbour.

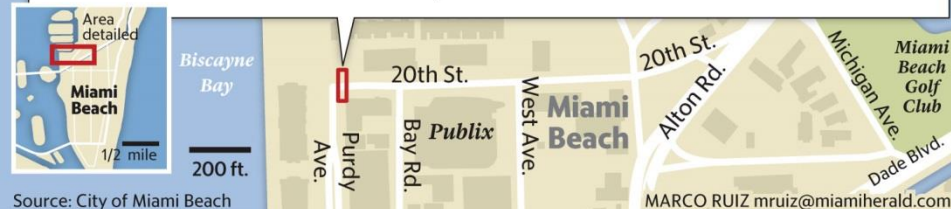
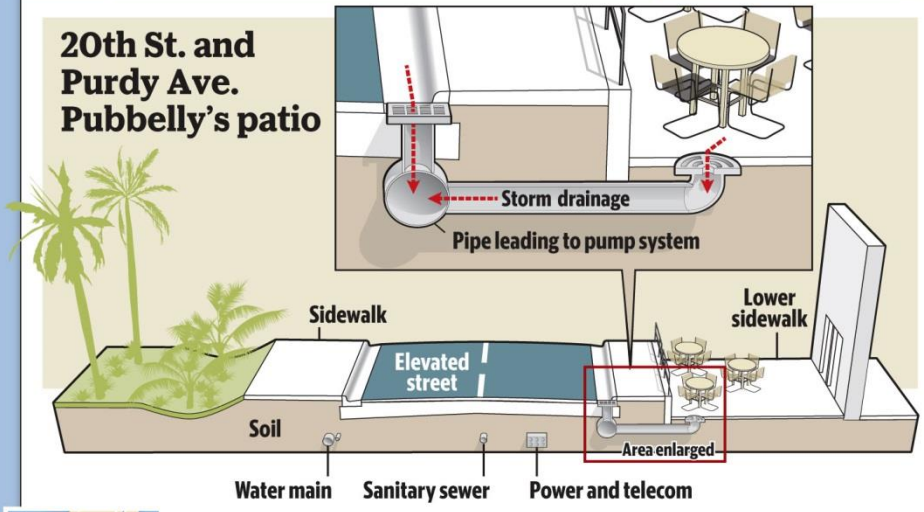


Source: City of Miami Beach

MARCO RUIZ mruiz@miamiherald.com

## Nuevas estaciones de bombeo y elevación de vías públicas

## 20th St. and Purdy Ave. Pubblelly's patio



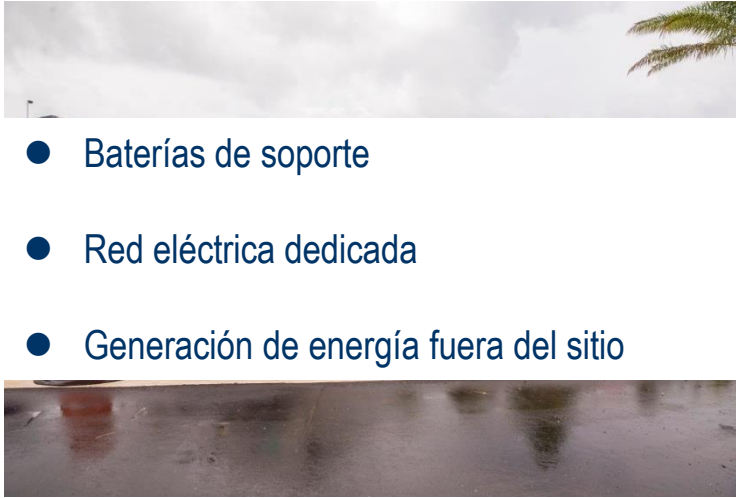
Source: City of Miami Beach

MARCO RUIZ mruiz@miamiherald.com

This rendering shows the elevated roadway at 20th Street and Purdy Avenue, in front of Pubblelly restaurant. To the right, the patio in front of Pubblelly is about two feet lower than the street. Floor drains down there feed into the same pipes that connect to the curb drains on the road, which routes water to the pump station.

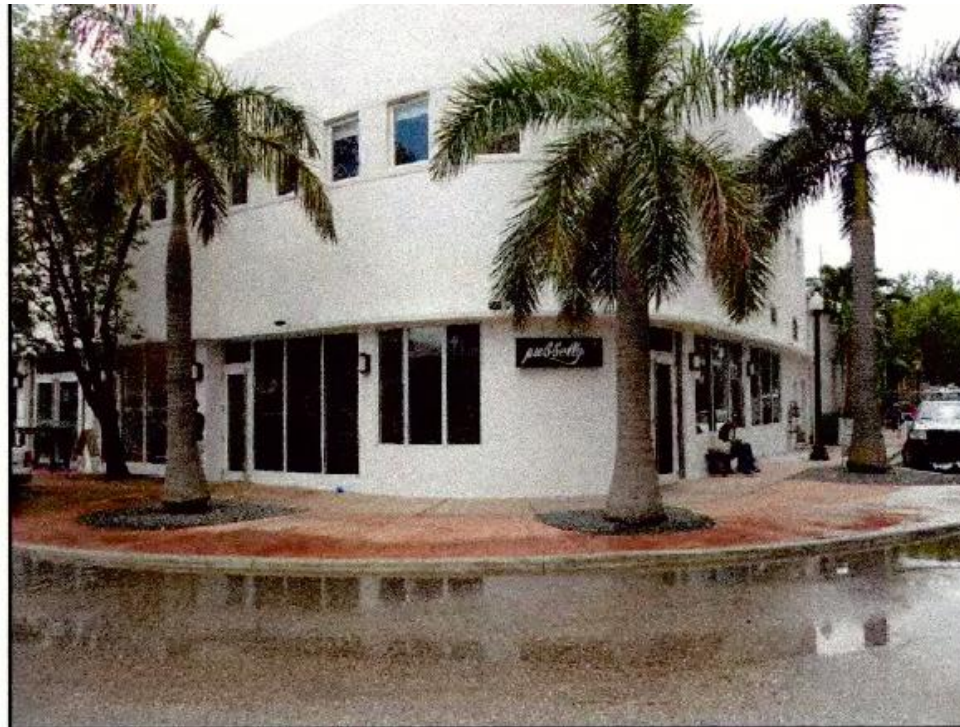
# ADAPTACION Y RESILIENCIA

- Baterías de soporte
- Red eléctrica dedicada
- Generación de energía fuera del sitio



# ADAPTACION Y RESILIENCIA

Antes



Después



# ADAPTACION Y RESILIENCIA

“Orillas Vivientes”



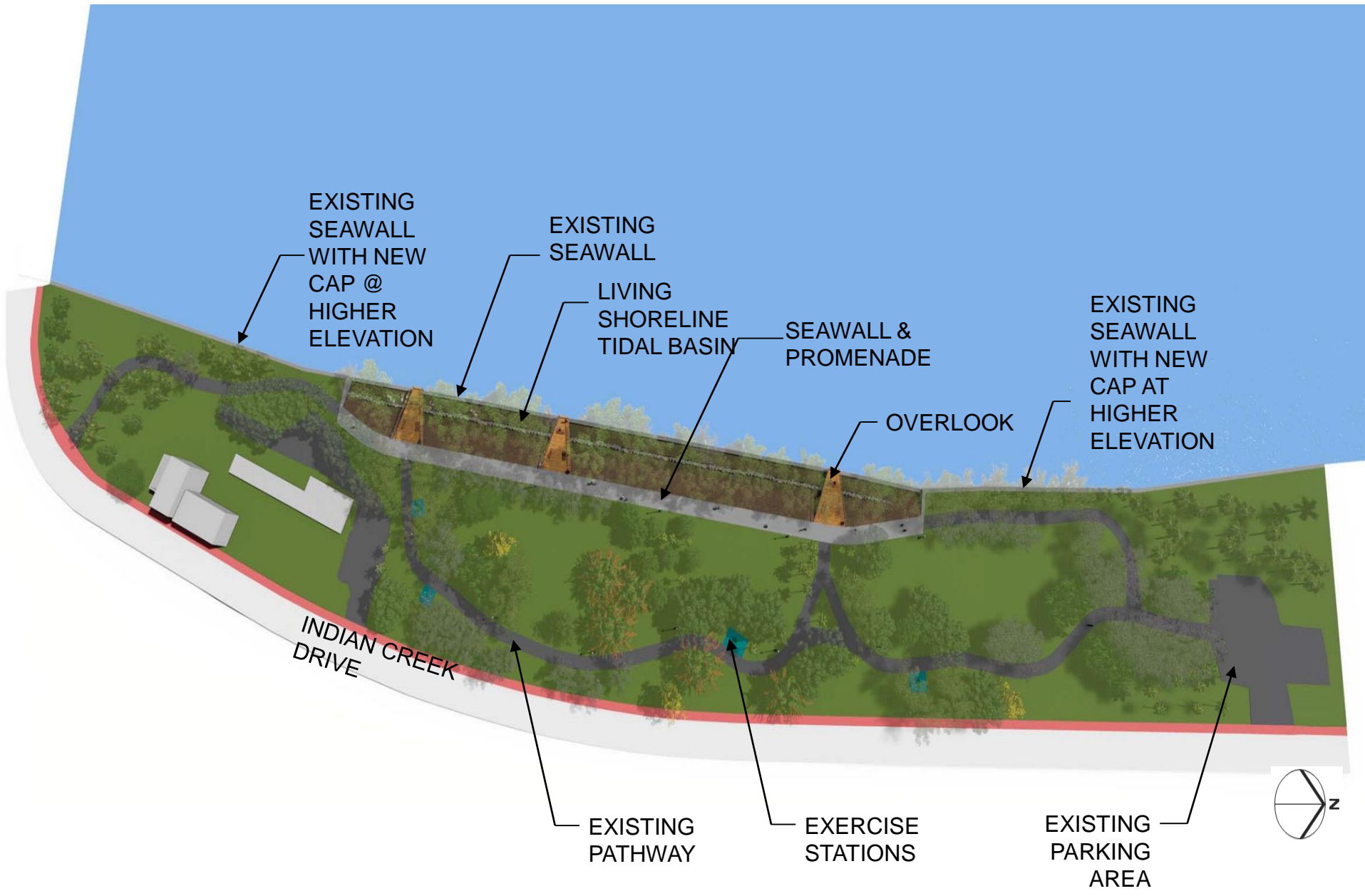
- Estabilización de orillas
- Protección de zonas intermareales
- Mejoramiento de calidad del agua
- Creación de habitats

# ADAPTACION Y RESILIENCIA

## Infraestructuras Verdes

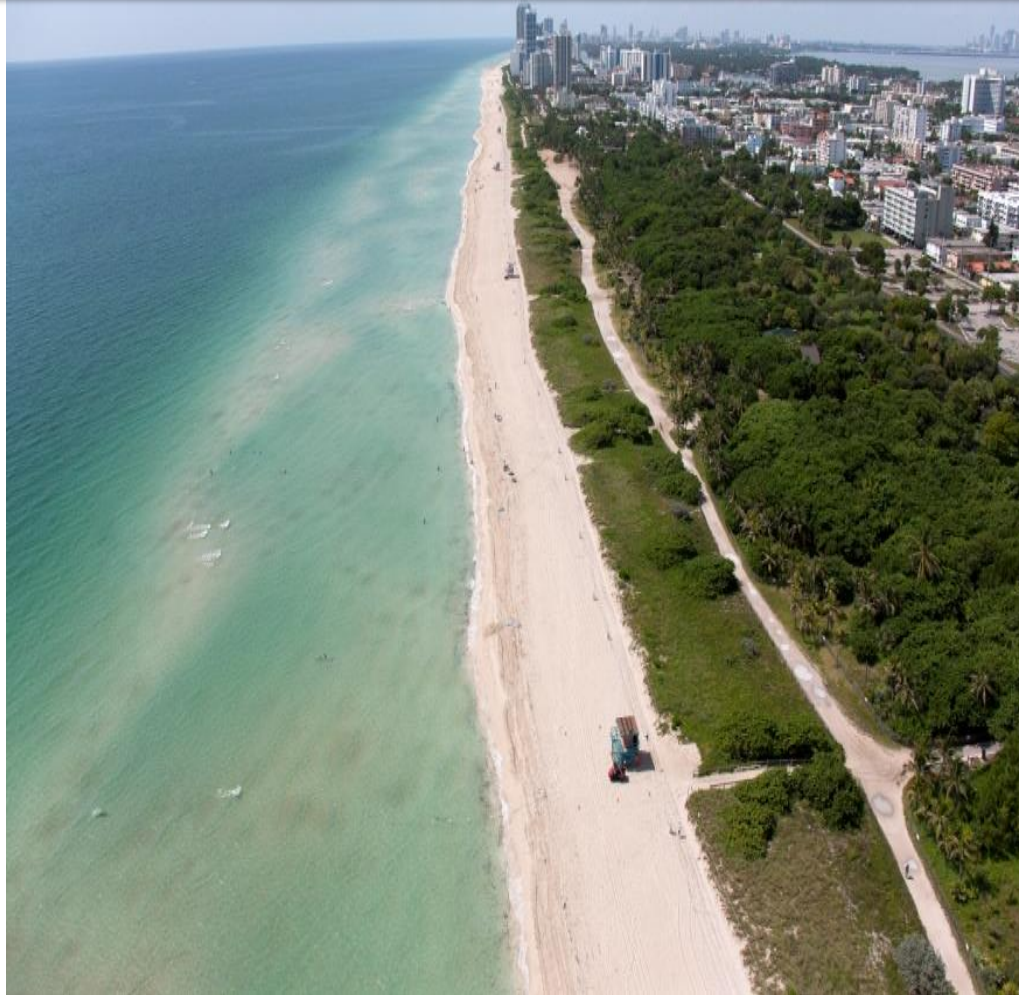


# ADAPTACION Y RESILIENCIA



# ADAPTACION Y RESILIENCIA

Construyendo la barrera costera









## That Sinking Feeling

Most nations think other issues are more pressing, but climate change takes center stage in these five.

### Chile: 30 percent

Chileans say climate change is the most important global issue for leaders to solve first. “**mega-inundación**” that began in 2010 has coincided with the warmest decade on record in central Chile, where about 80 percent of the country lives, [according to a study](#) published in the international academic journal Sustainability.

The Laguna de Aculeo, once a popular outdoor vacation destination, has almost entirely dried up, [NPR reported](#) in July, depriving locals of business and disrupting their daily lives. Meanwhile, Chile's glaciers are melting, and in 2017, the country experienced the worst **incendios forestales** in its history, leaving more than 2,300 square miles scorched.

Pushed in part by these severe weather events, Chile has become a leader in **energías limpias** with scores of wind farms and solar fields scattered across the country. During the past decade, the number of **energías renovables** projects grew exponentially, according to the [International Renewable Energy Agency](#).

"The goal is that by 2040, Chile has a **100% energías limpias y renovables** electricity grid and **100% sistema eléctrico de transporte público**," President-elect Sebastian Piñera said at a [September campaign rally](#).



" In God we trust.  
Everyone else, bring data."

— *Michael Bloomberg*

*"En Dios confiamos. Todos los demás, traigan data"*

An aerial photograph of a coastal city, likely Miami, showing a river on the left, a bridge, and numerous high-rise buildings along the coast. The ocean is visible on the right side of the image.

# GRACIAS!

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**AECOM**