

CRUNCH DESIGN RESEARCH

FOOD - WATER - ENERGY NEXUS
VOLUME 2 - **NET-ZERO HIGH-RISES**

Informazioni per il lettore

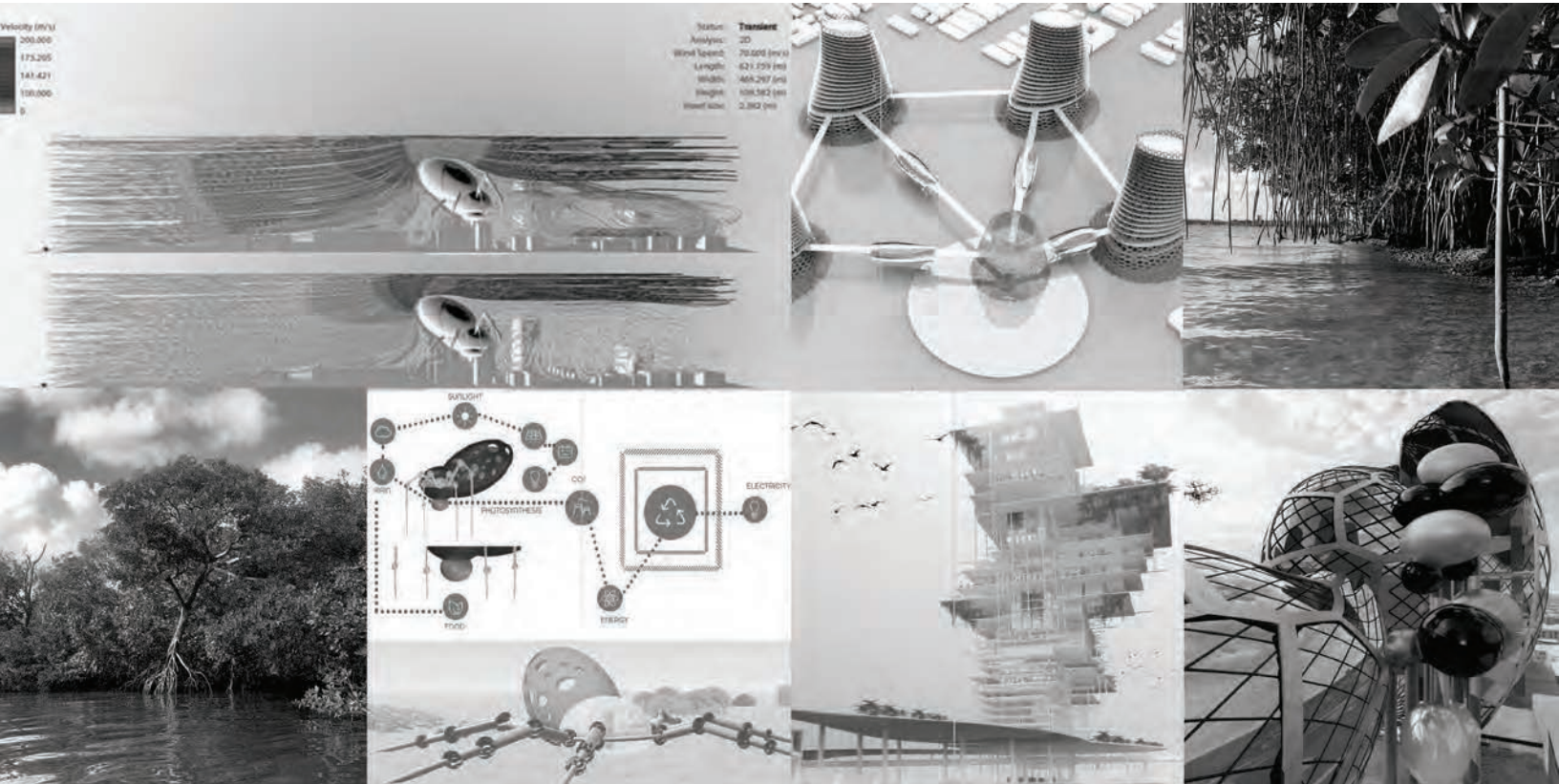
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FLORIDA INTERNATIONAL UNIVERSITY
MIAMI BEACH URBAN STUDIO | URBAN LIVING LAB



CRUNCH DESIGN RESEARCH
FOOD - WATER - ENERGY NEXUS
VOLUME 2 - **NET-ZERO HIGH-RISES**

Nuova serie di architettura
FRANCOANGELI

THOMAS SPIEGELHALTER

Editing Graduate Assistants: Yi Gong, Rebecca Quesnel, Chelsea Guimaraes and Paula Castell
Final typesetting and edit: Darren Ockert
<http://crunch.fiu.edu/about/team/>

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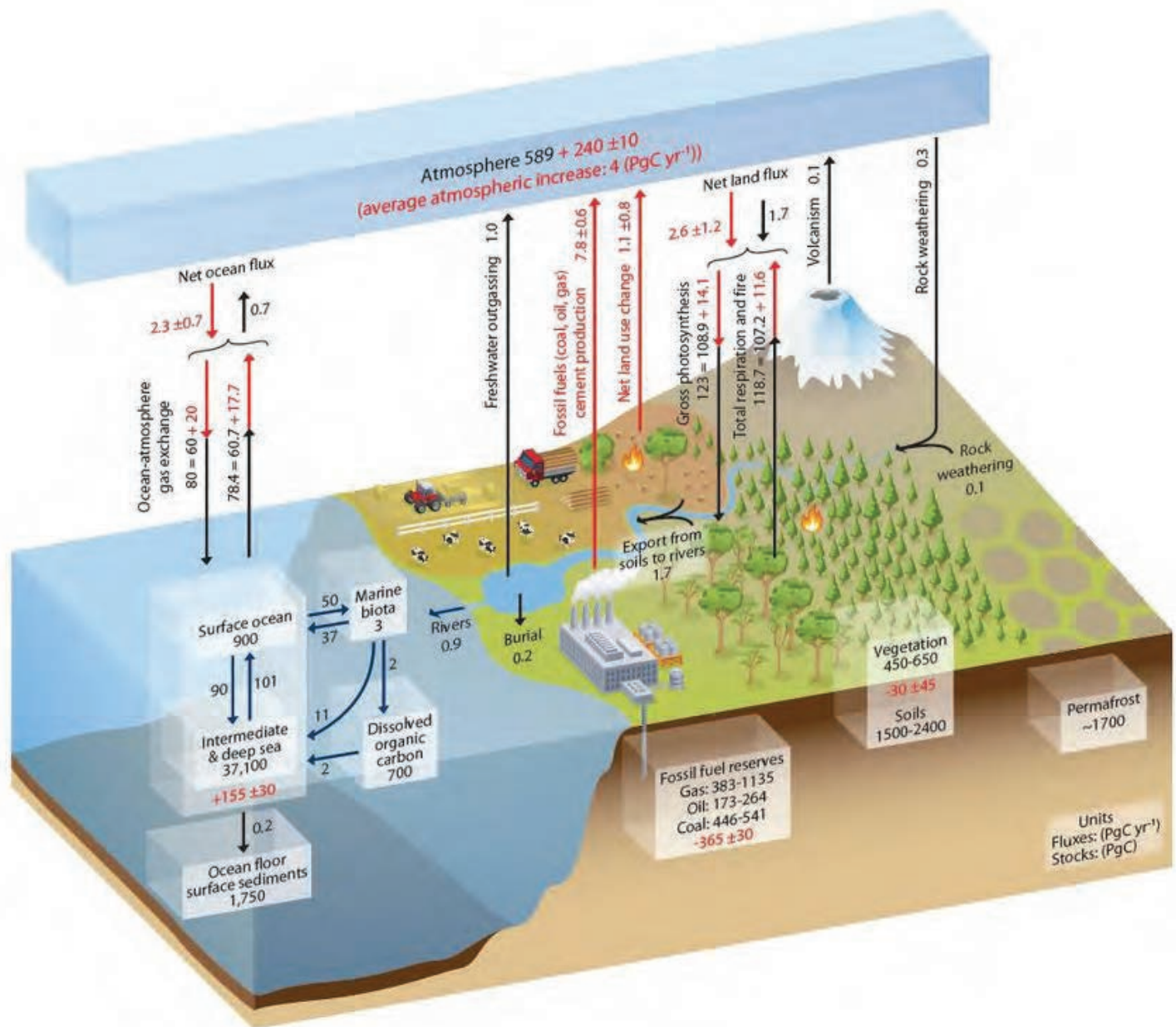
INTRODUCTION		
BY THOMAS SPIEGELHALTER	9	
CRUNCH FOOD NEXUS		
BY JAMES BRASIL	26	
NEO FUNCTIONALISM AND CLIMATE DESIGN		
BY CHRISTIANO LEPRATTI	27	
HOPE CRUNCH DESIGN RESEARCH FOREWORD		
BY VERA MARTINEZ	28	
SITE CONDITIONS 2019	32	
SEA LEVEL RISE 2019	33	
SOUTH FLORIDA'S FATE 2019	34	
SITE CROSS SECTION 2019	36	
TIDAL CITY DECIPHERING THE DATUMS	38	
PROJECT OVERVIEWS	40	
DESIGN 9 STUDIO ARC 5362 SPRING 2019		
NOW IS THE MOMENT TO RE . ACT	43	
BY JORGE L. MILLA & MARIANA AGUILAR		
HOUSE OF REFUGEE	52	
BY MIGUEL RODRIGUEZ & SARAH SASSEN		
A HUMAN RENAISSANCE	63	
BY JAVIER PEREZ & JUAN MORENO		
NEW COLONY	70	
BY SOUFIANE BENBRAHIM		
SEA LEVEL THRIVE	81	
BY DARREN OCKERT		
ECO DESIGN	101	
BY NEIL MAYORGA		
DESIGN 7 & 8 STUDIO ARC 5340-5343 FALL 2019		
SPIDERSTILTSVILLE		113
BY PILAR NEREYDA MARTE & LIUDMYLA STASIV		
THE ROOTING NICHE		120
BY KATHERINE RENDON		
GROWING DESIGN		127
BY JOSEPH LEPORE, MICHAEL TORRES & YULYA MURSULI SOTO		
SYMBIOTIC SWARM		137
BY CHRISTOPHER CHANEZ		
ABOVE THE REEF		145
BY HANNAH RUTHERFORD & NESTOR MIRANDA		
SYMBIOTIC DESIGN		155
BY JORGE CUBAS & MARIELYS DELGADO		
DESIGN 8 & 10 STUDIO FALL 2018		
ENTWINE TOWERS		171
BY JORGE VASQUEZ, PHILLIP PRETELL & WENDY VINCENT		
GREEN SOURCE		185
BY PAULA CASTEL & ALEXA MOLKO		
UNIVERSITY OF GENOA 2016/2017 MASTER THESIS		
LIFE WITH WATER		197
BY FENG XU, UMBERTO GROSSO		
DESIGN 9 STUDIO ARC 5362 SPRING 2019		
URBAN SYMBIOSIS		208
BY ALEX NUNEZ & JAVIER JIMENEZ		
DESALINATION ISLANDS		212
BY ANDREA LANZ & MARTHA MORALES		
MIAMI CENTRAL PARK		216
BY LAKEISHA STEVANNA MASON		
CENTER OF REUSABLE ENERGY		222
BY ALEXA MOLKO & AIDA DIAZ		
FOOD NEXUS 2100		224
BY HANAN MAJID & ANDREA ORTIZ		



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GLOBAL CARBON BUDGET



OBTAINED FROM IPCC, 2013: 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.)]. CAMBRIDGE UNIVERSITY PRESS, CAMBRIDGE, UNITED KINGDOM AND NEW YORK, NY, USA, 1535 PP

INTRODUCTION



BY THOMAS SPIEGELHALTER

ENGINEER, ARCHITECT, CRUNCH PRINCIPAL INVESTIGATOR, FIU PROFESSOR

Greater Miami and the Islands are one of the most climate-vulnerable regions on planet Earth. In the coming decades, the low-lying areas of Miami are set to be swallowed by sea-level rise combined with increased yearly threats of hurricanes, king tides, tropical storm surges and heatwaves. Multiple lineups of powers — municipal, state, federal, and private — debate, strategize, borrow and spend billions to defend the region and its environments with incremental adaptation strategies that do not look at more extended periods until 2100. Not far away from Miami, the strongest Hurricane named Dorian on record hit the Bahamas, wreaking massive devastation on the islands and loss of life with maximum sustained winds of 297 km/h. The storm surge topped 7 meters above normal tide levels in September 2019. For Miami 2,5 to 3 meters of sea-level rise by 2100 is possible and catastrophic with storm surges up to 7 to 10 meters. Inundations of this magnitude would physically displace some 800,000 to 1.000.000 residents of Miami-Dade County and surrender a large portion of the urban settlements uninhabitable if the decision-makers continue and do not raise the infrastructures and buildings accordingly to the predicted future sea and storm surge levels. Besides, most of the infrastructure in Miami is over 80 years old. Out of control runoffs, contaminants and thousands of leaking septic tanks pollute and spill yearly millions of gallons sewage into the bay. On top of all of this, the porous limestone rocks its residents live and work on every day means there is no stopping of sea-level rise, changing ocean currents, storm surges and the intrusion of saltwater and contaminants into the drinking water aquifers.

Under the three year umbrella of CRUNCH (Climate Resilient Urban Nexus CHOICES), and the Food-Water-Energy Nexus research, this Second Volume looks at designing adaptive, resilient, biology-inspired, off-the-grid and carbon-positive green-blue infrastructures, self-growing coastal barrier islands and buildings on a timeline from 2019 to 2100. These systems and structures act as dynamic self-powered hybrids that are floating, sitting in, out, or under the water with the ability to be completely self-sufficient. Volume 2 features experimental scenarios of selected design approaches each envisioning and testing self-sustaining, adaptive, and resilient green-blue infrastructures with living shorelines, buildings and neighbourhoods, all benchmarked against 100% carbon-neutrality and the Food- Water-Energy nexus. All research designs are based on approximately 80-year scenarios in which modeling by NOAA, NASA, and reinsurance companies placed much of the Miami Beaches and parts of the low-lying areas of South Miami existing infrastructures and properties underwater. The studies include strategies to identify disruptive technologies and dynamically changing cultural identities, anticipate future potentials, and mitigate the issues as mentioned above through generative design strategies and AI-assisted planning transformations in the specific social, cultural, and ecological context of Miami Beach and the City of South Miami.



MIAMI
CRUNCH
The Food-Water-Energy Nexus

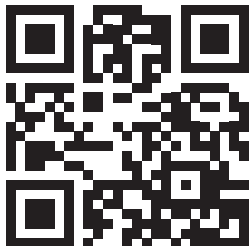
CRUNCH

Climate Resilient Urban Nexus Choices
for carbon neutral city scenarios

LEARN MORE

EXPLORE

VISIT THE WEBSITE

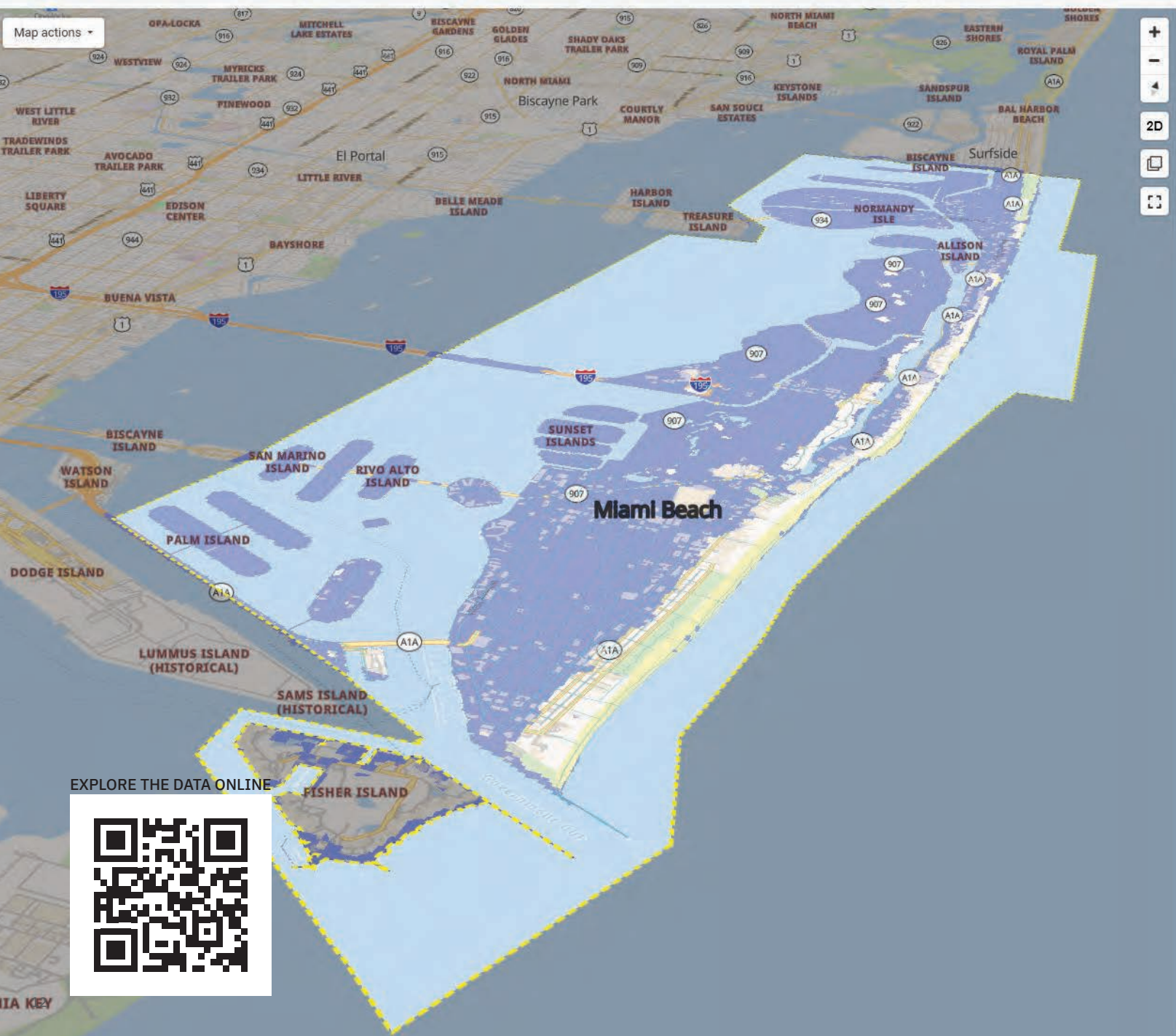


CRUNCH is a multi-disciplinary project with an international consortium of project partners and cities addressing all three sectors of food, water and energy through the integrative FWE-Nexus approach. It aims to support local decision and policy makers, practitioners and civil society organizations by translating the key findings of a deep review of literature, knowledge and research evidence on the FWE-Nexus into the design of Urban Living Labs (ULL). The Miami proposal aims to create a carbon-neutral, data driven planning and scenario tool for integrated decision making using the Urban Living Lab (ULL) approach; identifying a data and mapping

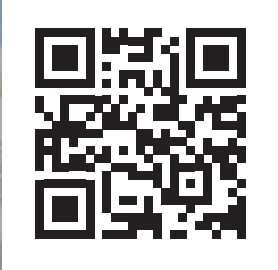


baseline for the city's needs, developing the tool and framework, testing and analyzing the data-driven models using different carbon-neutral and resilient scenarios from now to 2100.

Working across scales, policy questions, and by employing urban planning and design methods, the research focuses on working with communities and municipalities across four cities to enable the conceptualization and visualization of Urban Living Lab (ULL) focused on FEW-Nexus projects. The research aims to bring together design development, implementation and assessment of ULL's within the creation of the support tool and assessment framework.



EXPLORE THE DATA ONLINE

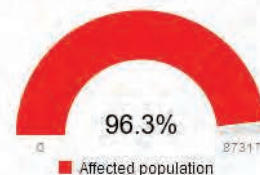


DEMOGRAPHY

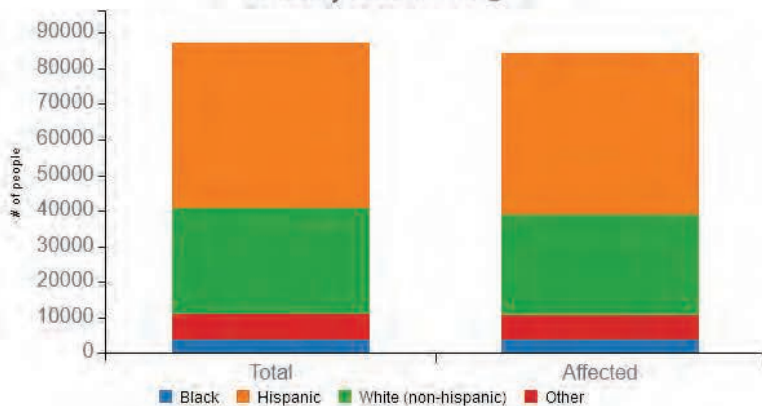
Total population ⓘ

87,317

Affected population ⓘ



Ethnicity breakdown ⓘ



PROPERTY

Total property value ⓘ

\$48.6B

Affected property ⓘ

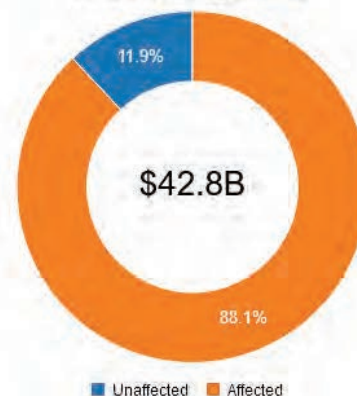




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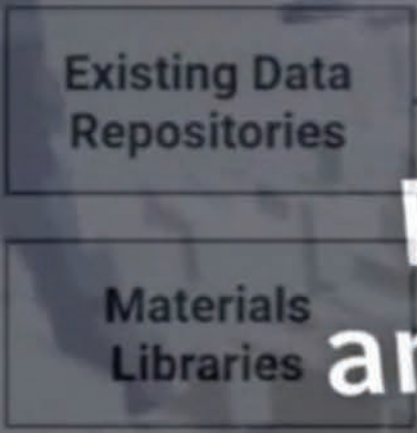
MIAMI + GREATER ISLANDS nD-PLATFORM FOR INTEGRATED DESIGN SOLUTIONS AND GREEN

- GIS DATA**
- Zoning
 - Land Use/Land Cover
 - Population Density
 - Parcel Footprints
 - Geophysical Properties
 - Building Density/Heights

MODEL-BASED
ALTERNATIVE FUTURES



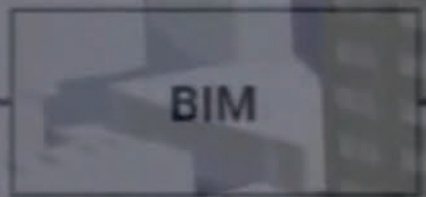
WORLD DATA



GIS DATA & VECTOR DATA

Sustainable
Initiative

PARIS2015
COP21-CMP11



nD SCENES

AI & MACHIN

Build a physical and analytical BIM model

- Infrastructures
- Vegetation

- Sefara
- Dynamic
- Grassho
- Python

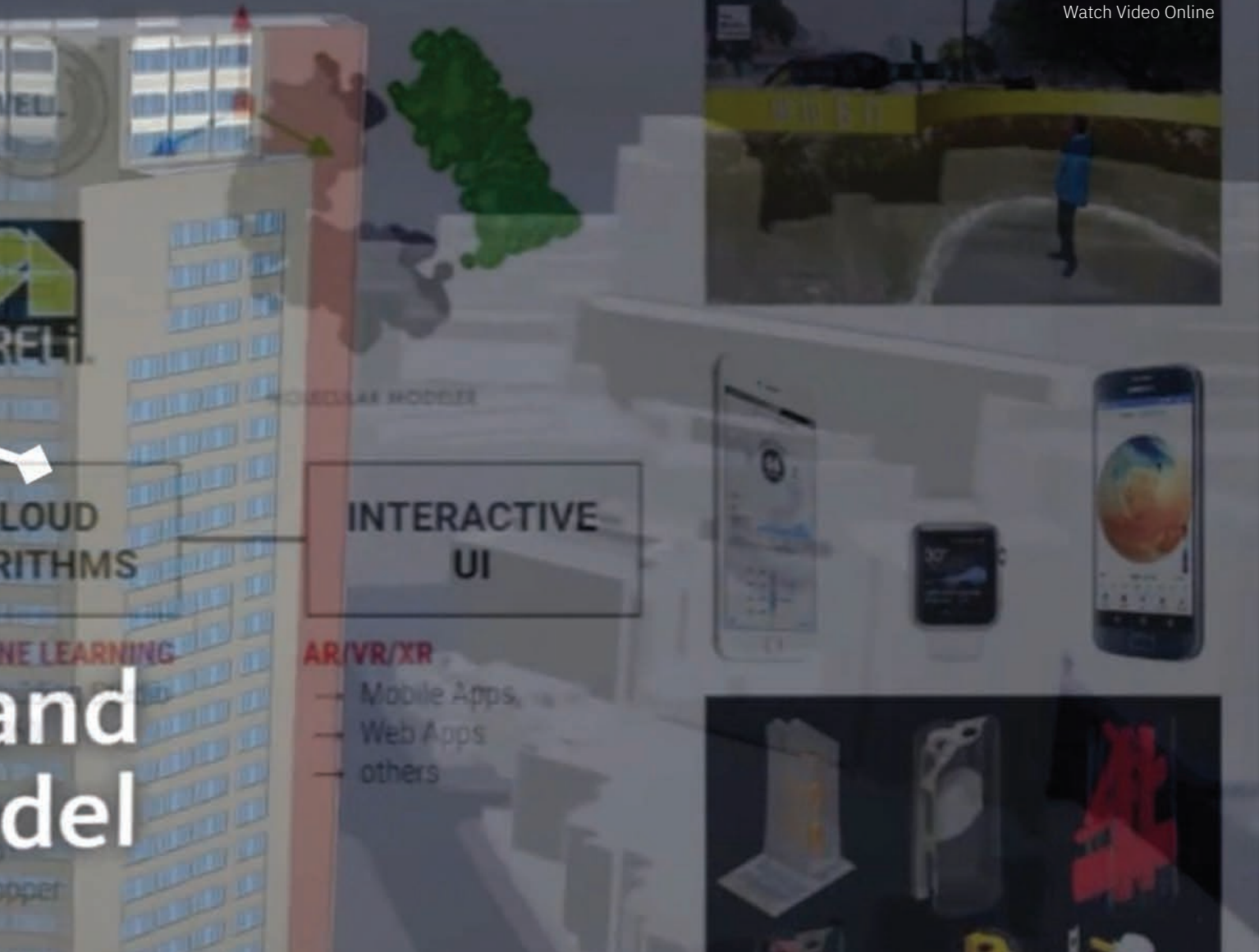
LAND STUDY AREA

D CARBON-NEUTRAL NEXUS

N-BLUE INFRASTRUCTURES



Watch Video Online



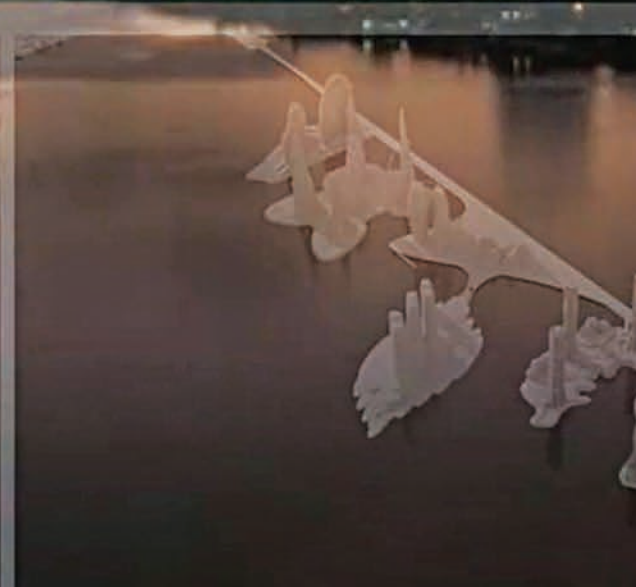
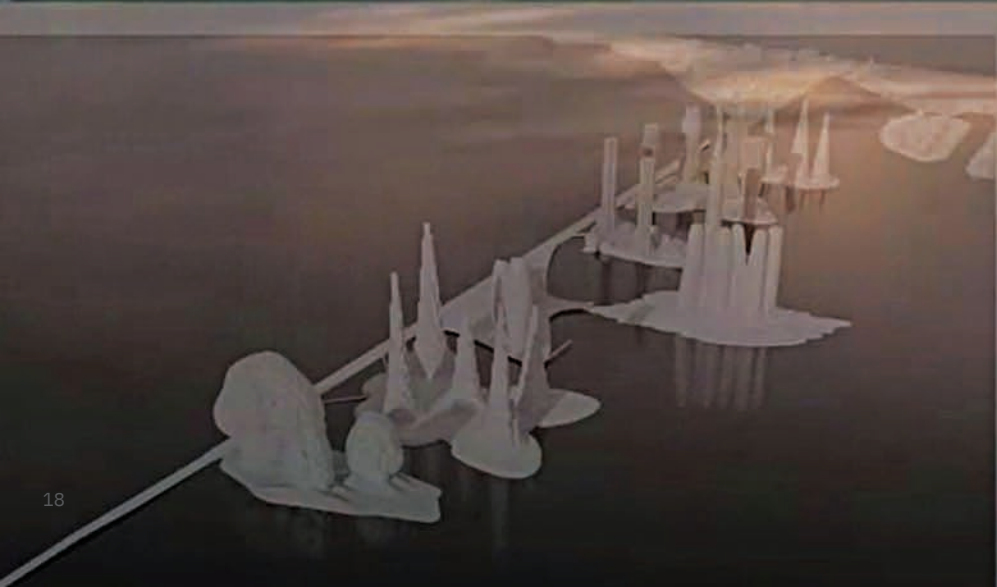
CLOUD
RITHMS

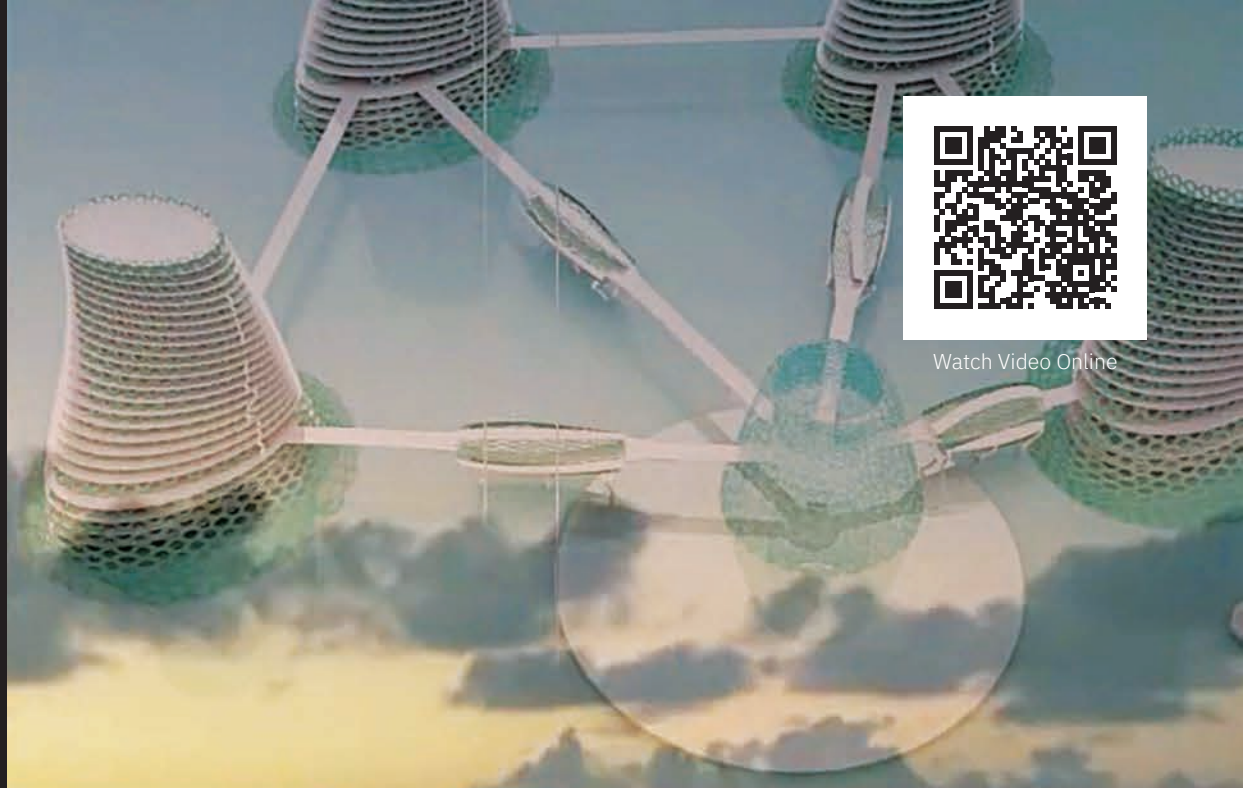
NE LEARNING

and
del

INTERACTIVE
UI

- AR/VR/XR
- Mobile Apps,
 - Web Apps
 - others





Watch Video Online

