# *Understanding Community iImpact through the study of Change Detection of Physical Attributes and Analysis of Human Narrative*

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**Vivaldi Rinaldi, New York University**
**Zhen Goh Cognitive Edge / New York University**
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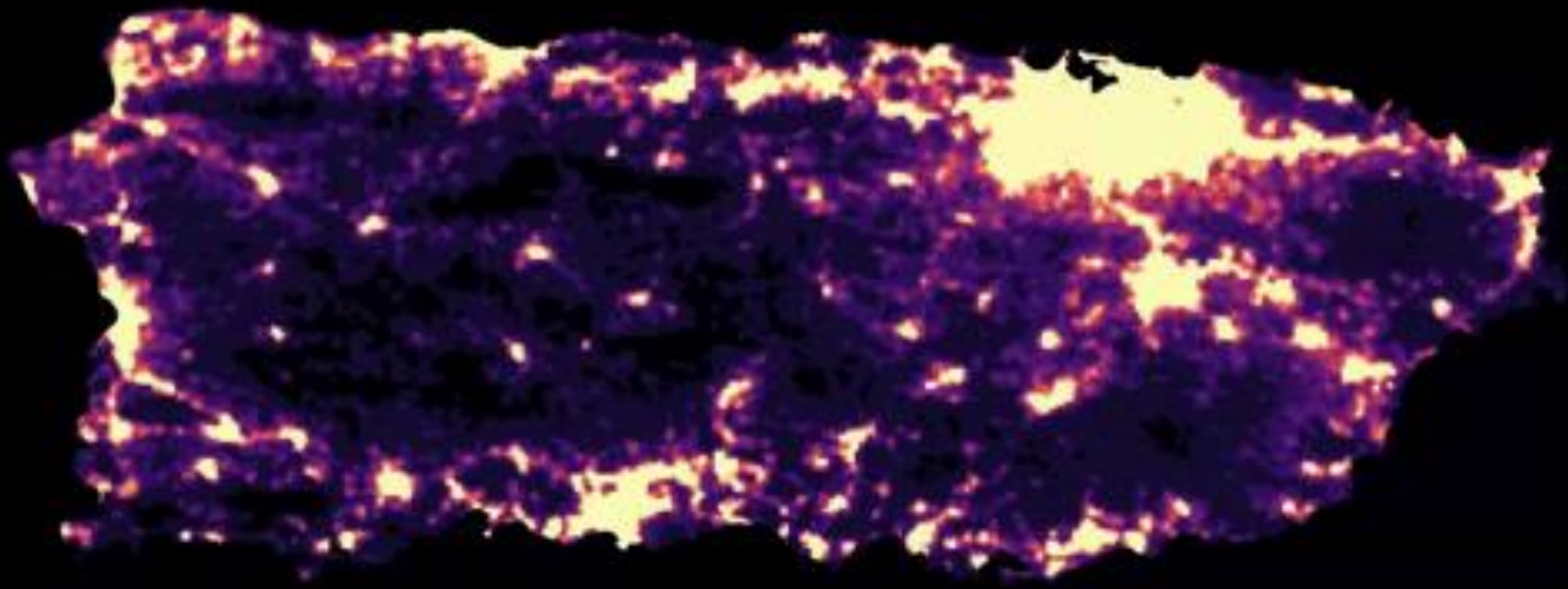
**Abbreviated Deck**

# Spatial Temporal Analysis of Nightlights as Surrogate to Trends in Power Delivery (Presented by Shams Azad)

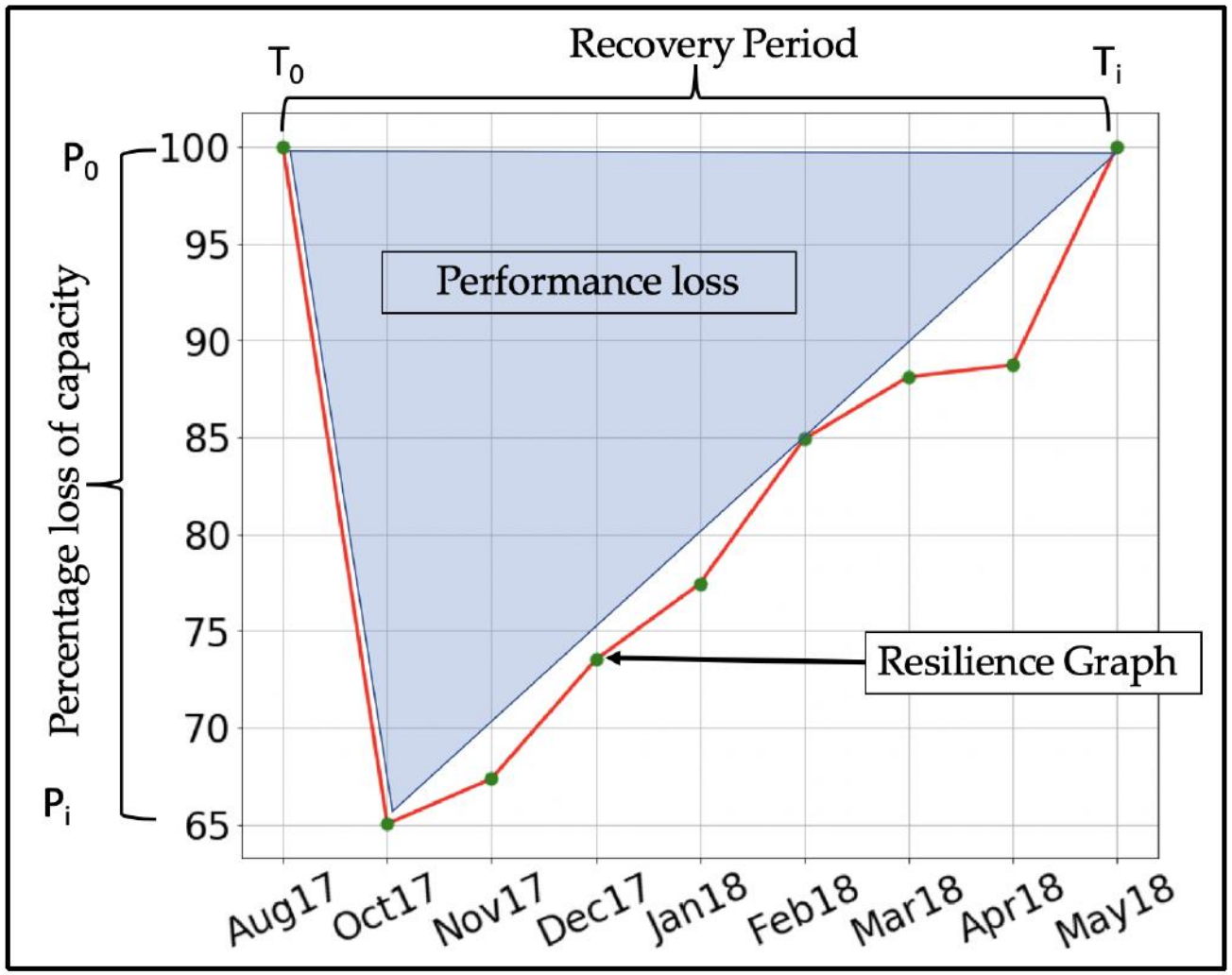
# Night Lights After Hurricane Maria: Patterns of Power Loss and Recovery on the Island of Puerto Rico

Shams Azad
PhD student, New York University

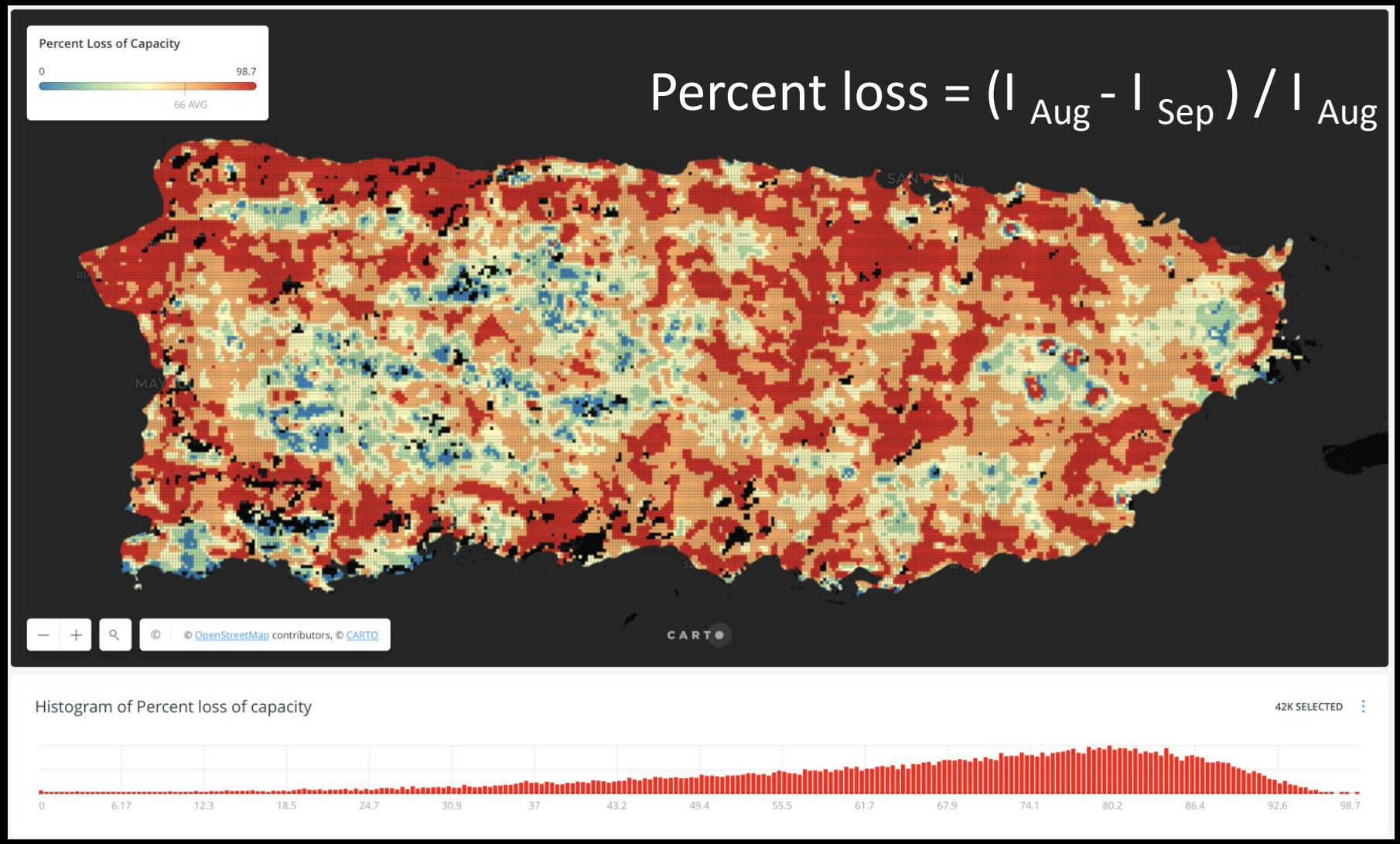
Global coverage
Daily Night light data



# QUANTIFYING PERFORMANCE LOSS
considering nine months after Hurricane Maria at 500 meter resolution



# PERCENT LOSS IN CAPACITY



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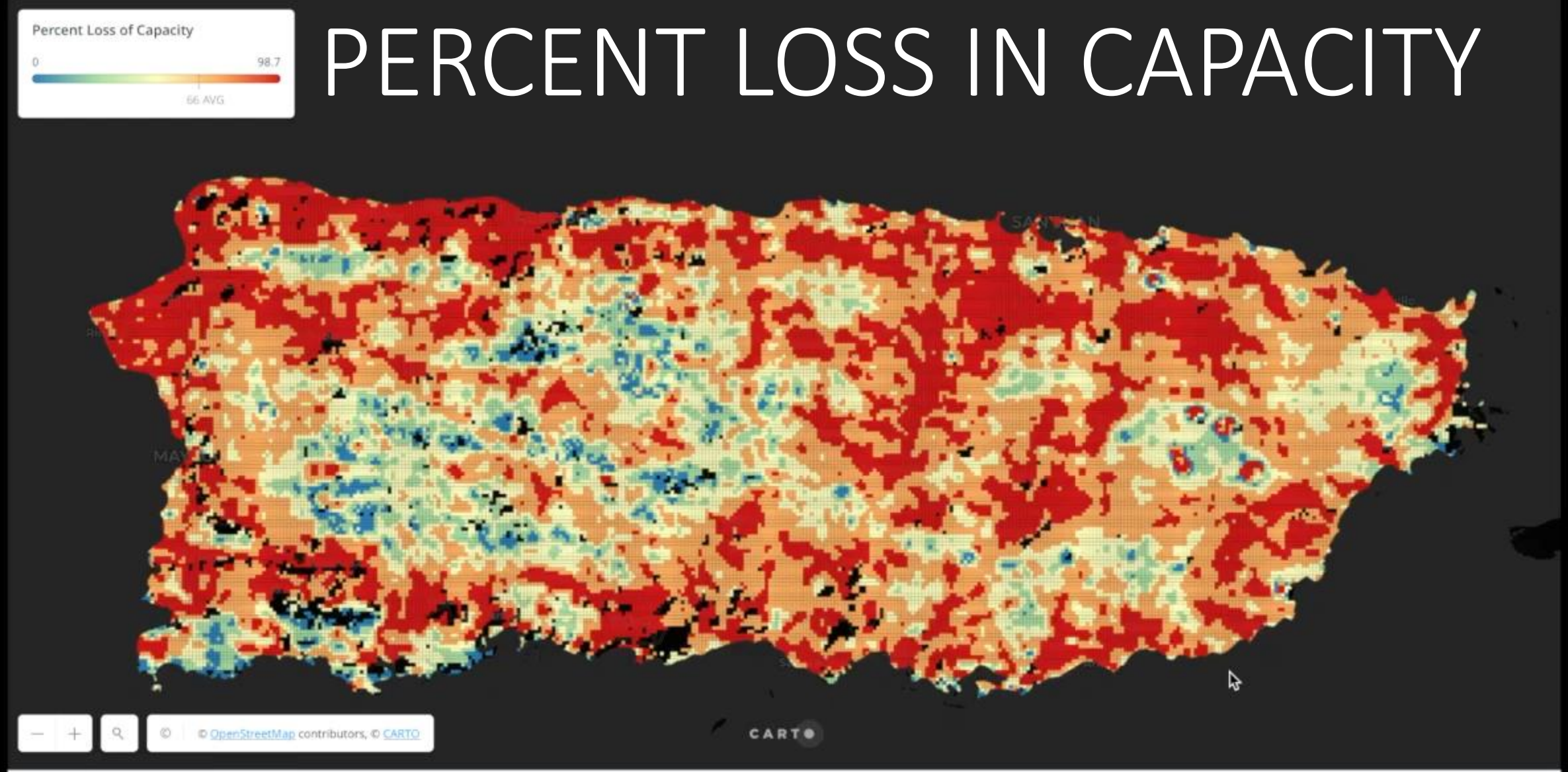

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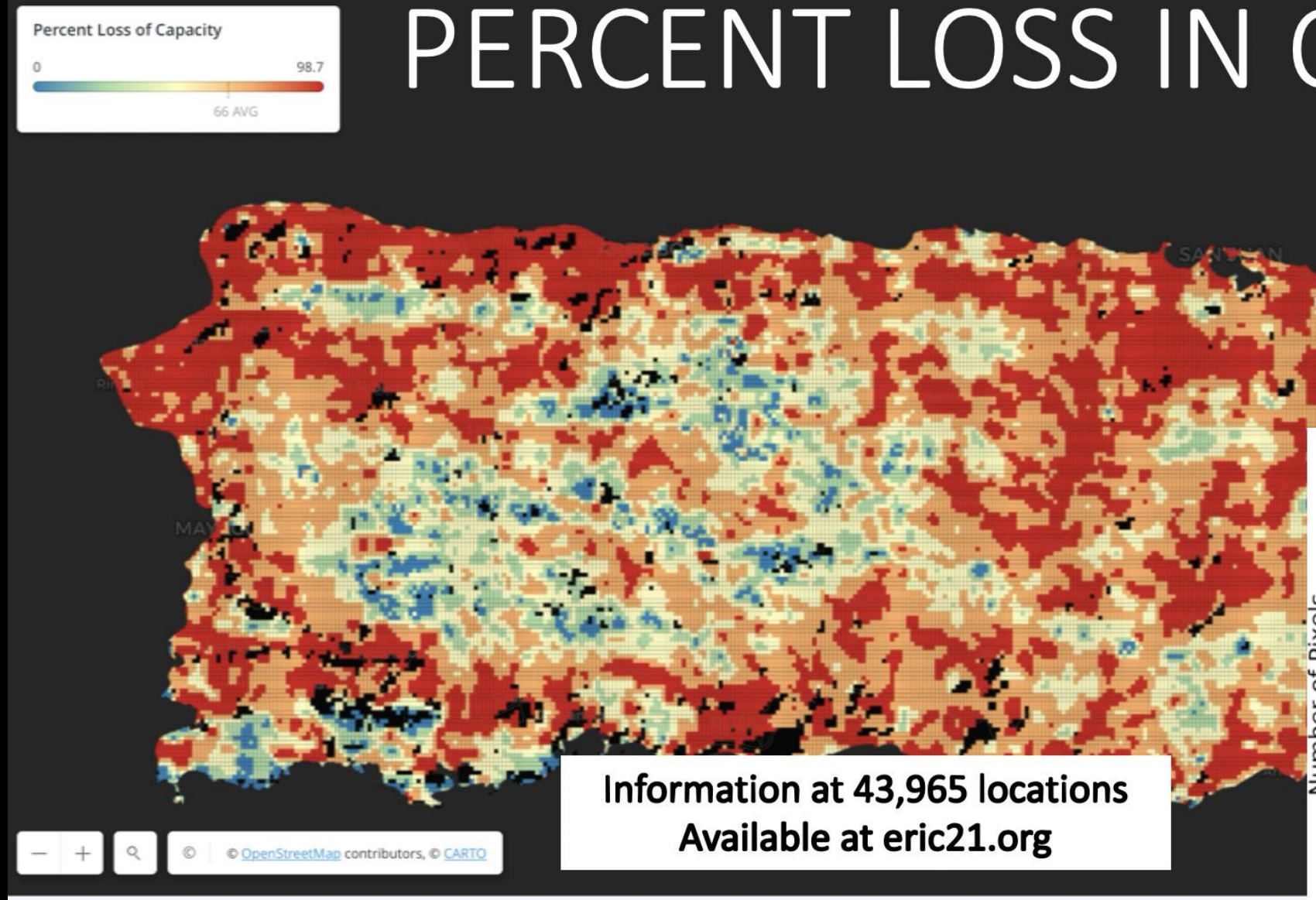
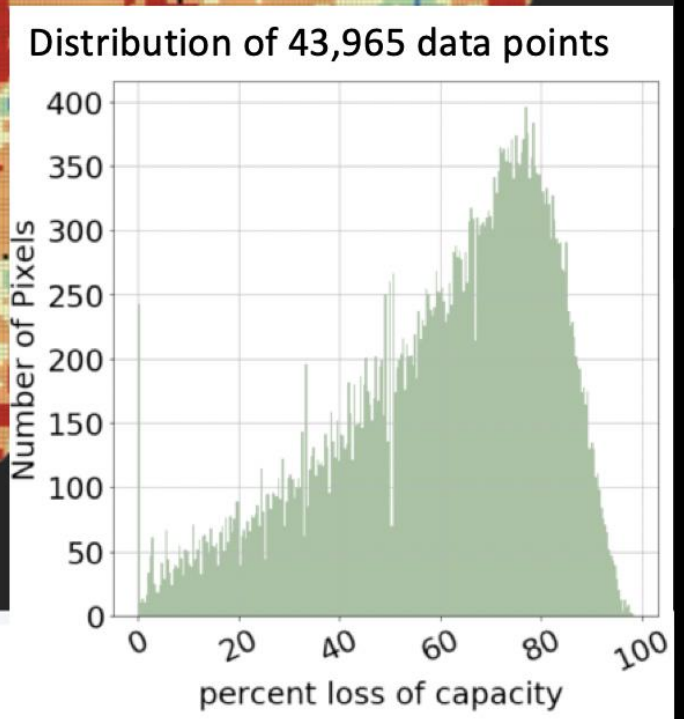
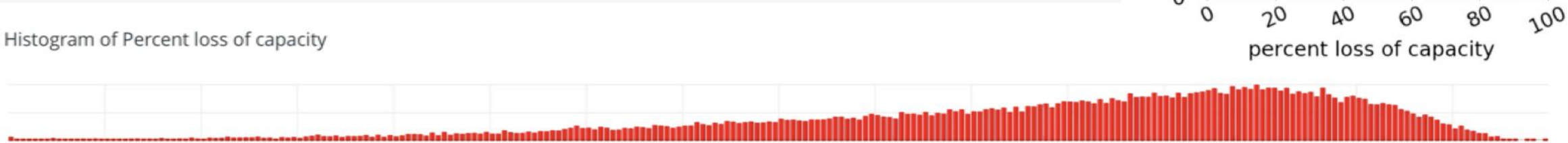
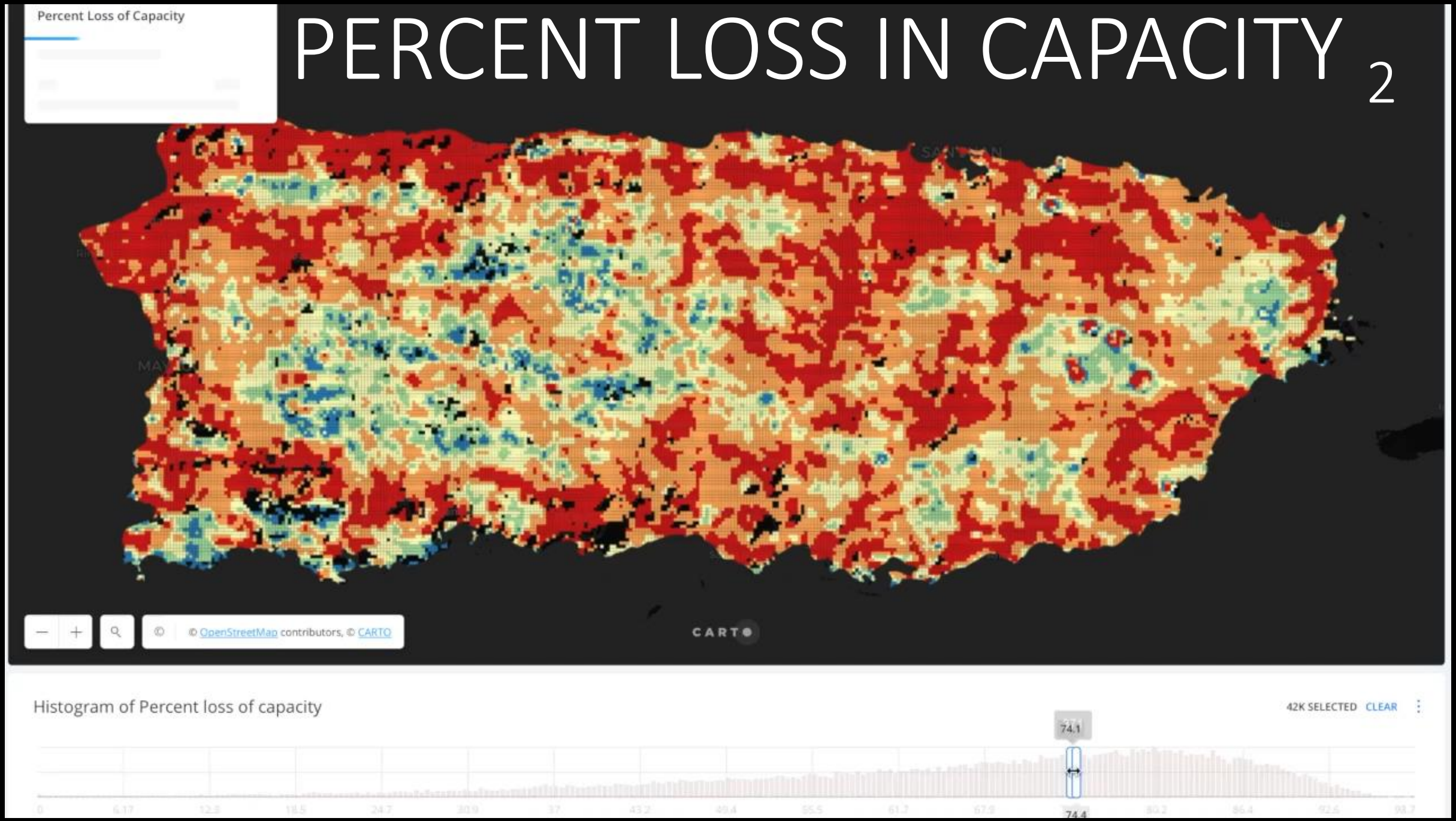



**Information at 43,965 locations**
**Available at eric21.org**

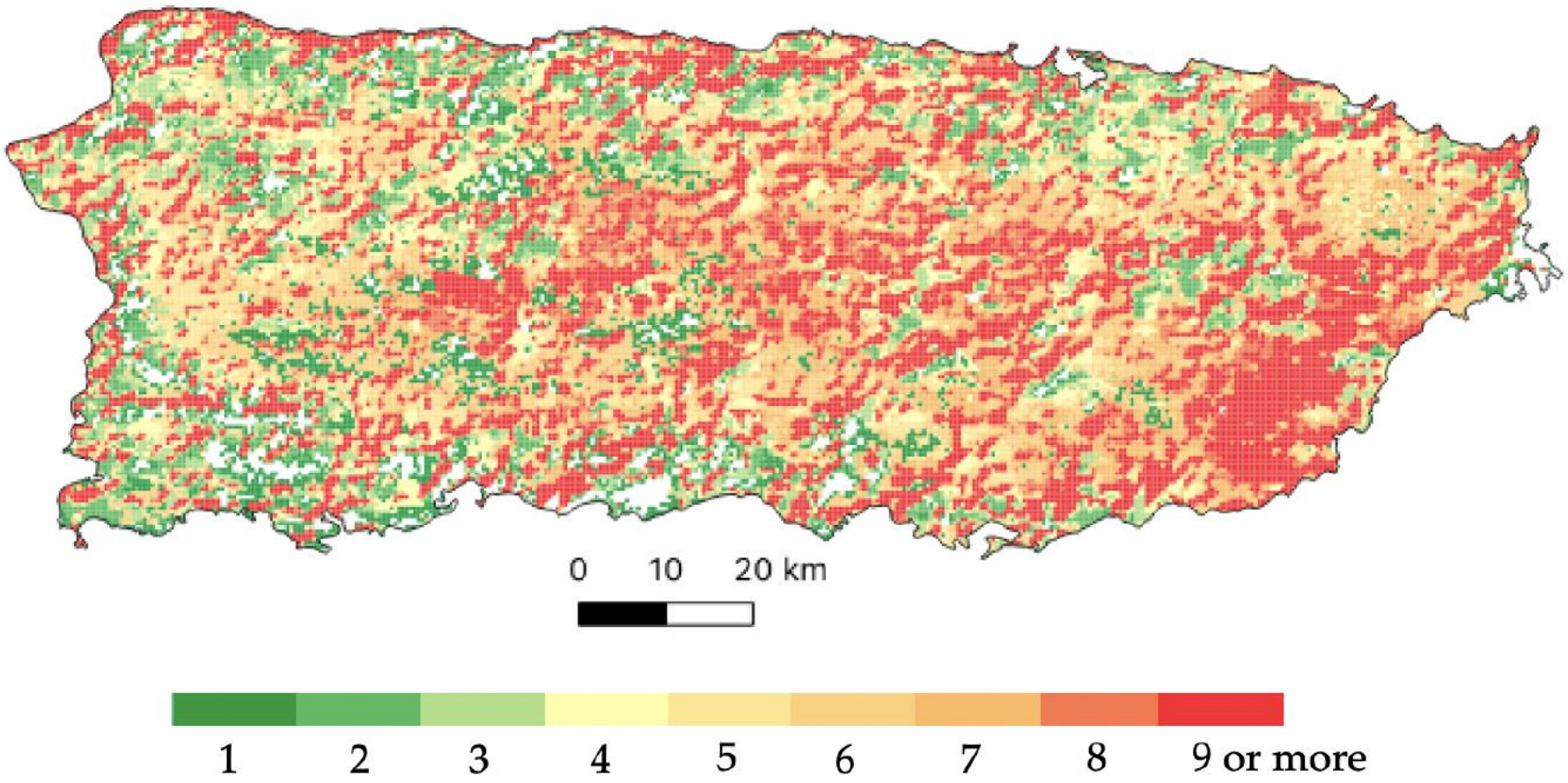


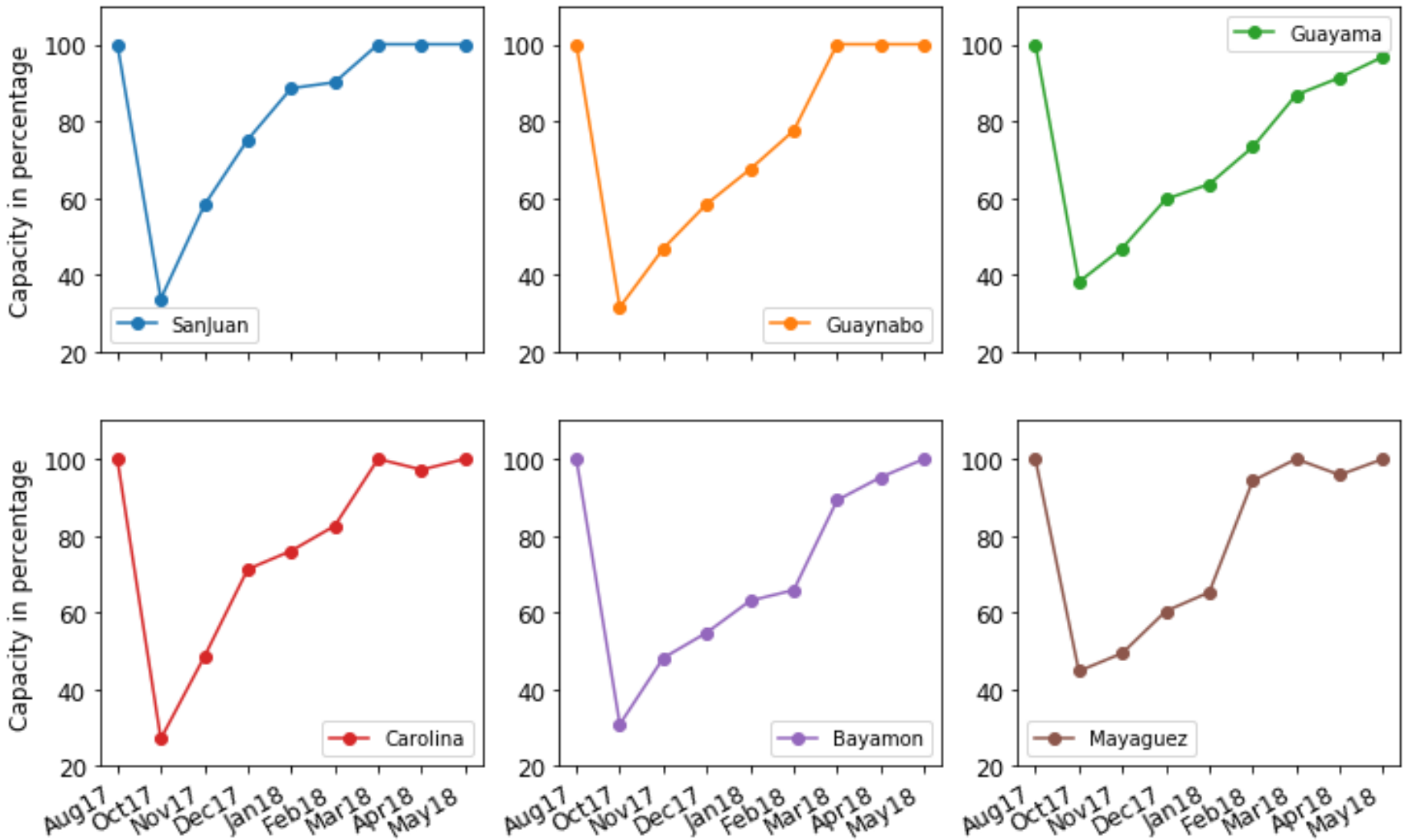
# PERCENT LOSS IN CAPACITY $_2$



# Recovery: months spent to reach 80% of capacity

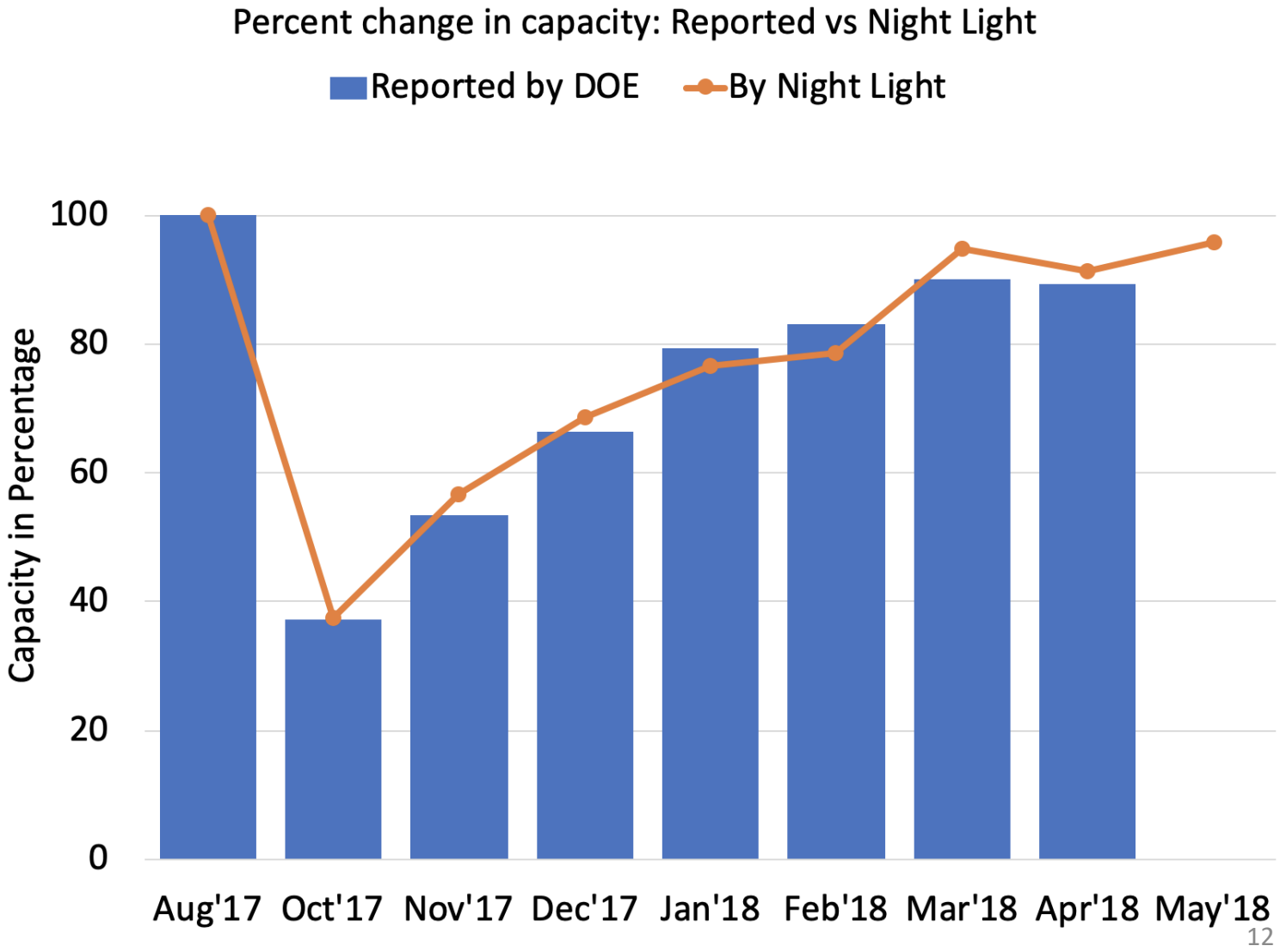


# Resilience for major municipalities



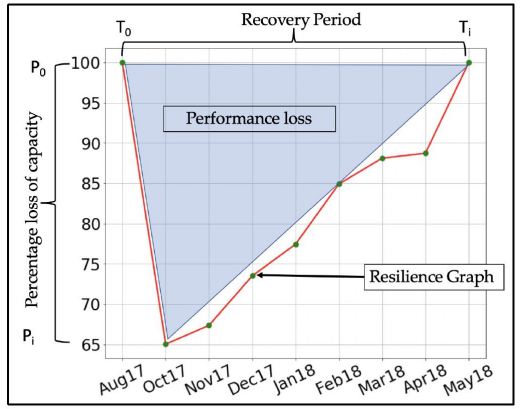
# Comparison of Night Light data (mean of 500m X 500m) with aggregated (island wide) power capacity reported by PREPA

500 meter resolution data
This gives us the opportunity to carryout spatial and temporal analysis of  population impact



# Impact on people

people-days without power =

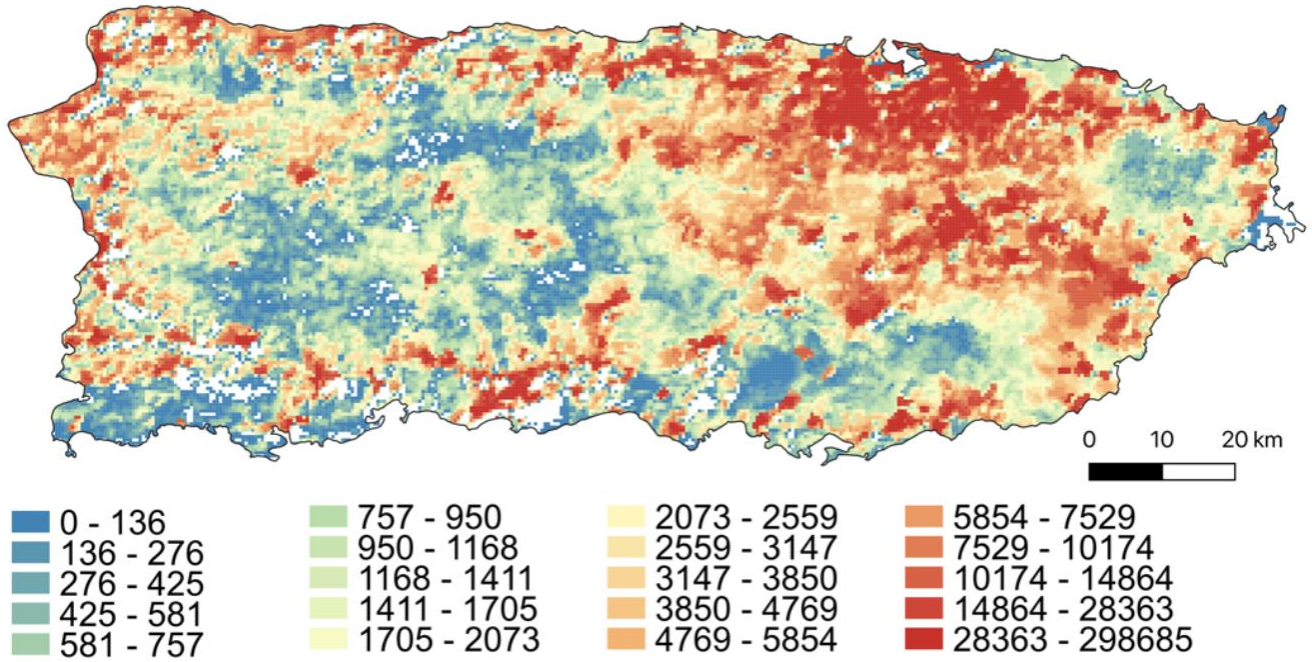



X Number of people

(Obtained from census block group)

Total people day without power for Hurricane Maria **270 million (people days)**.

For island with 3 million population this is equivalent to **3 months** without power for the entire island



# Thank You

# Mapping Changes to Physical Attributes using High Resolution Photogrametery (Presented by Vivaldi Rinaldi)

# Three Data streams for 2D or 3D Change Detection

**Satellite Imagery: Entire island coverage , Maxar,**

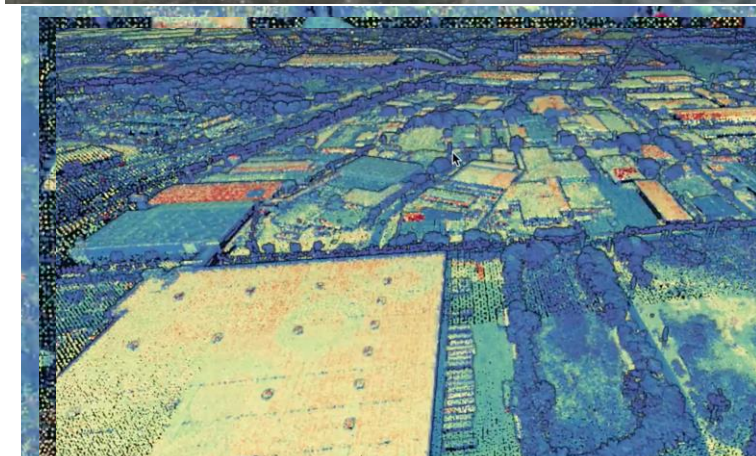
- 2 meter resolution (WorldView 2 and GeoEye)
- Pre and Post Coverage (RGB)

**Aerial Imagery: Entire Island Coverage,**

- 15 cm resolution (Overlapping Orthophoto)
- Post Maria Coverage (RGB and NIR)

**Aerial LIDAR: Entire Island Coverage,**

- 10 cm resolution (point cloude)
- Pre Maria available, Post Maria (upcoming)

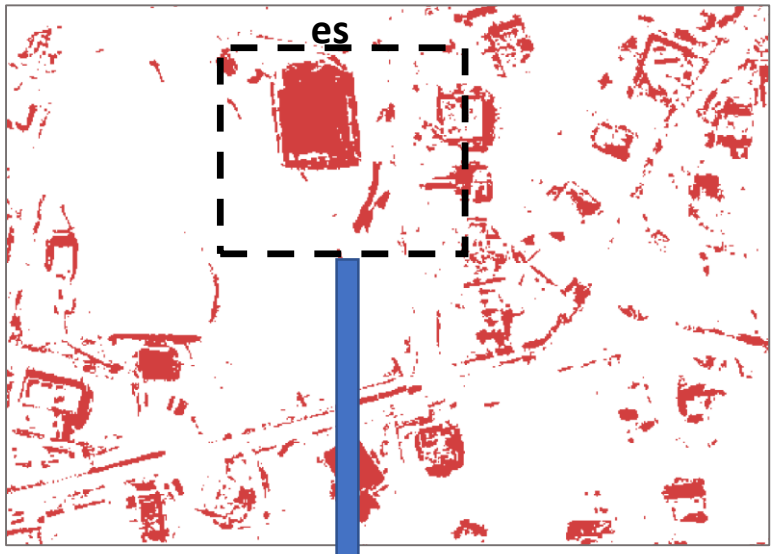


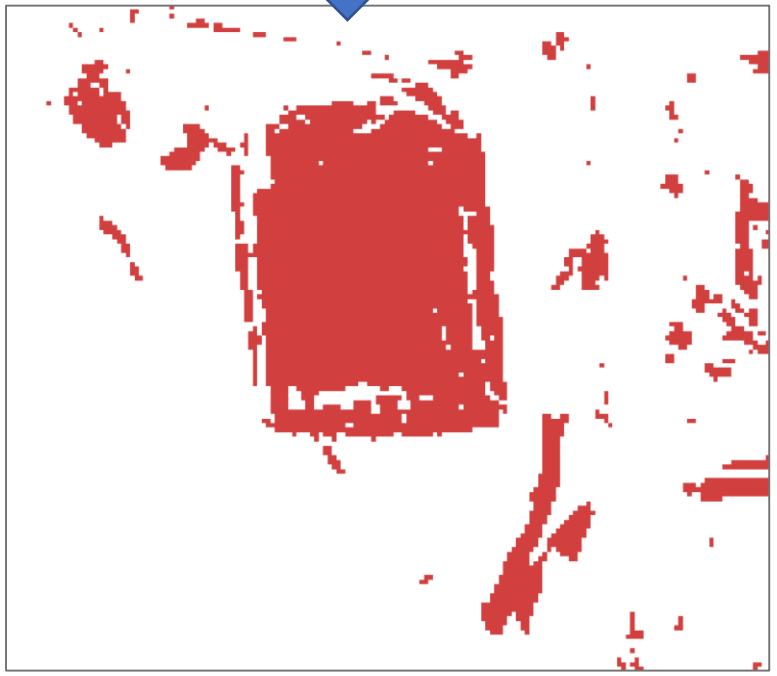
*By Vivaldi Rinaldi, New York University*

Pre Maria, WorldView2, ~28° off Nadir

Post, Aerial Imagery

Chang
es



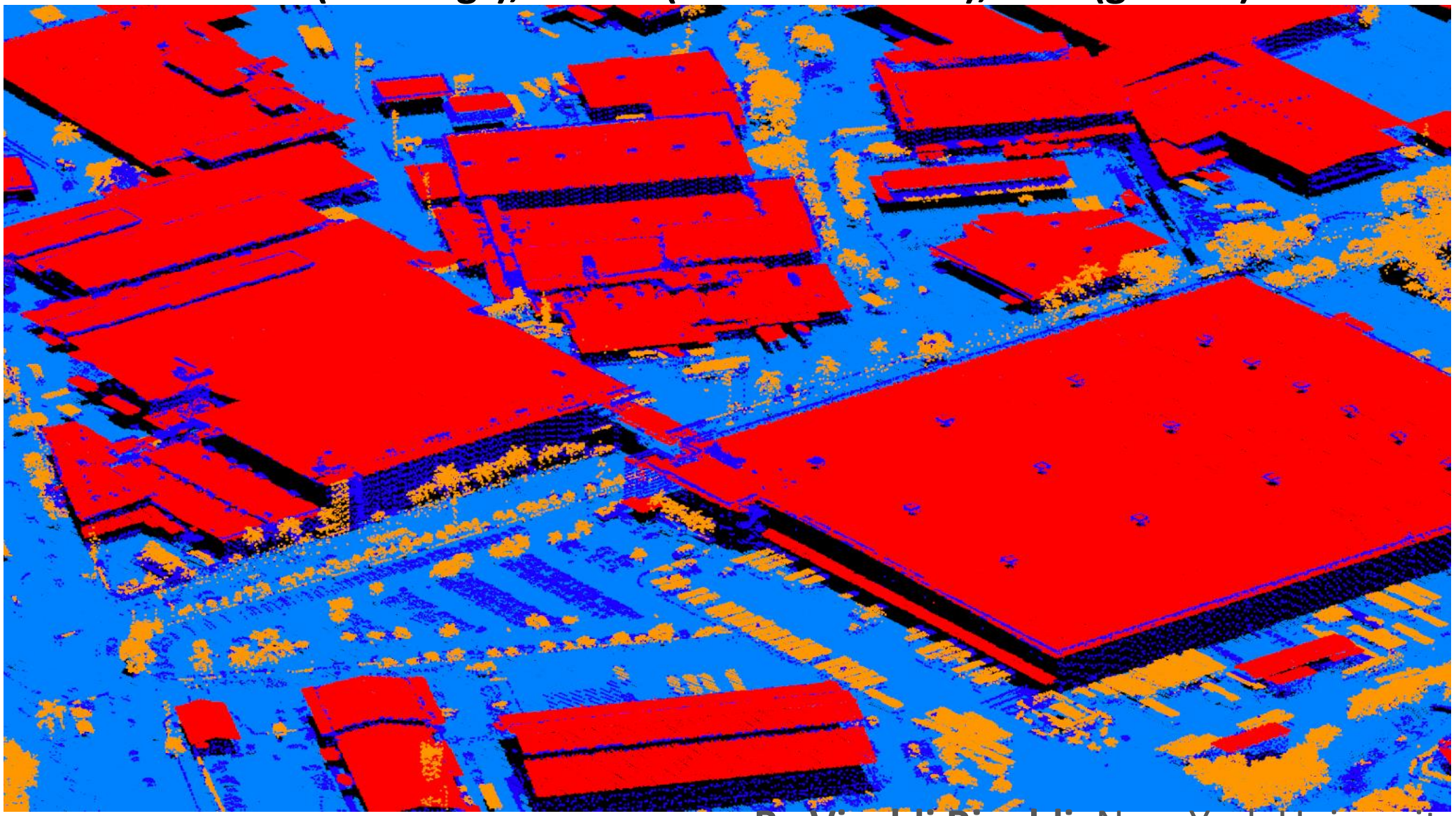


# Island wide Mapping

# (Physical and natural when used without building mask)

**By Vivaldi Rinaldi**,
New York University

**Island wide LiDAR coverage Pre Maria (post maria upcoming)**
**Red (buildings), Yellow (trees and other), blue (ground)**



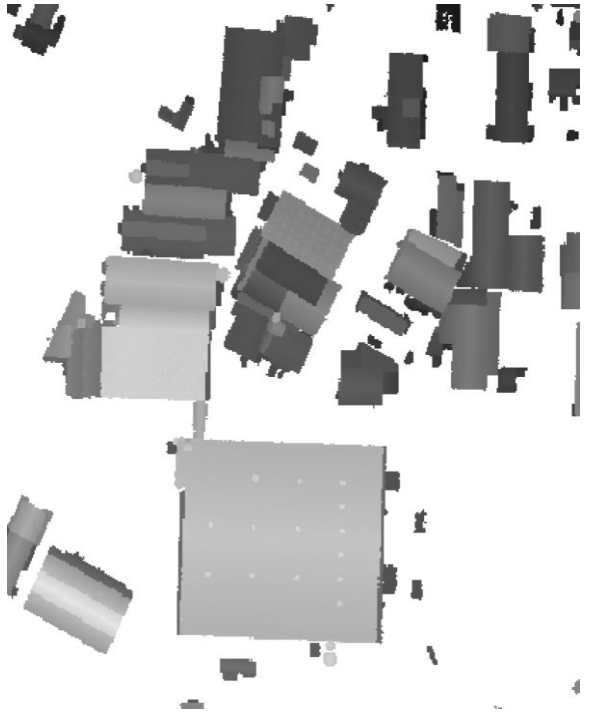
**By Vivaldi Rinaldi**, New York University

# Separation of constructed versus Natural using LIDAR data

Before Maria

After Maria

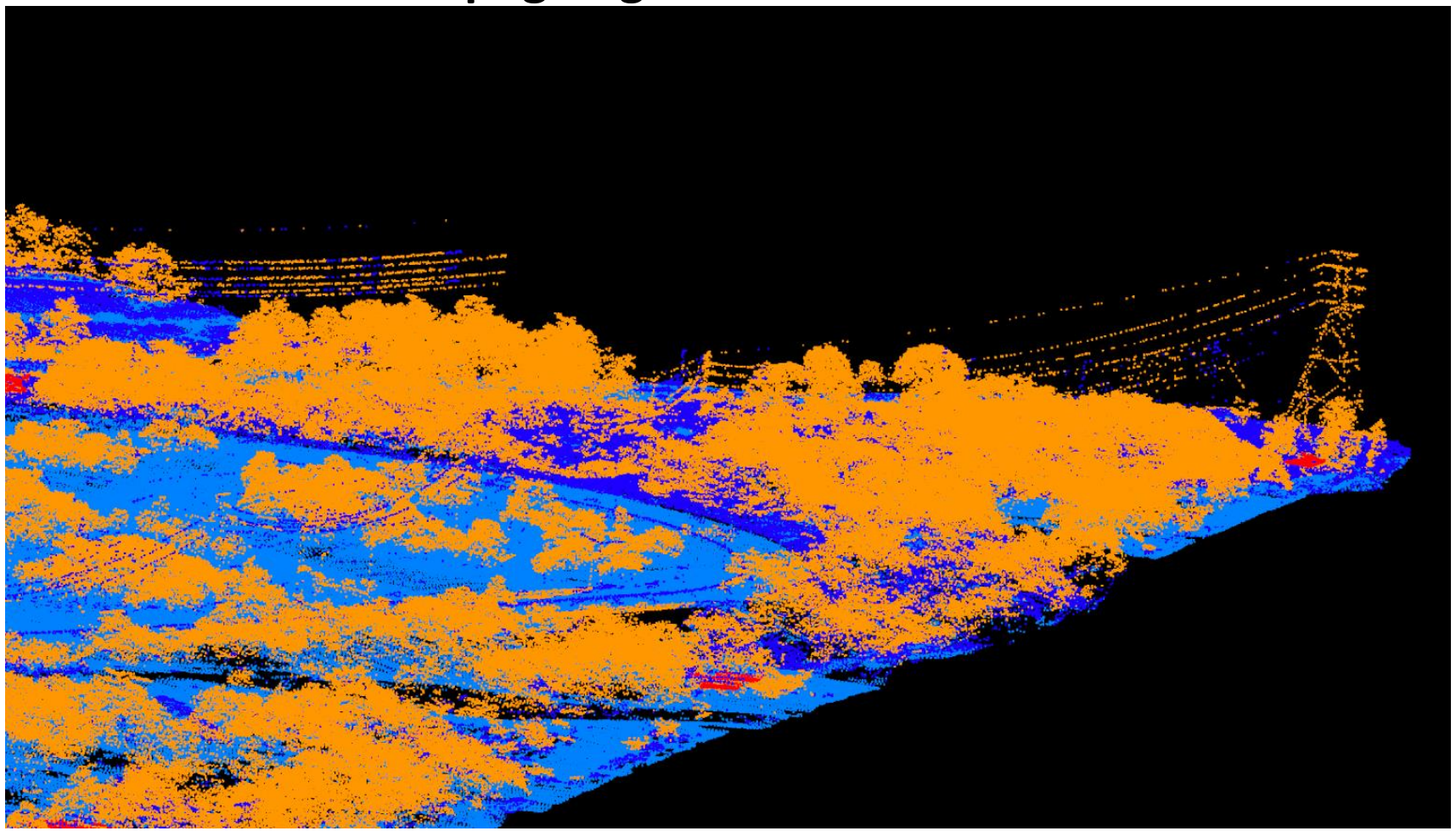
Change



LIDAR Elevation map (building mask) not yet applied to image)

By **Vivaldi Rinaldi**, New York University

**LiDAR point cloud for vegetation work pngoing for classification of**



**By Vivaldi Rinaldi**, New York University

# 3D Reconstruction of Digital Surface Model (DSM) using Post Maria Hight Resolution (15cm) Aerial imary Imagery Maria

**By Vivaldi Rinaldi**, New York University

# Thank You