Municipal Climate Adaptation in the Great Lakes Region:

Adaptation and Water, Wastewater and Stormwater:

Milwaukee
and the Milwaukee Metropolitan Sewerage District

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MMSD

Today's Talk…

- Brief MMSD Background
- Climate Change Context
- Adaptation

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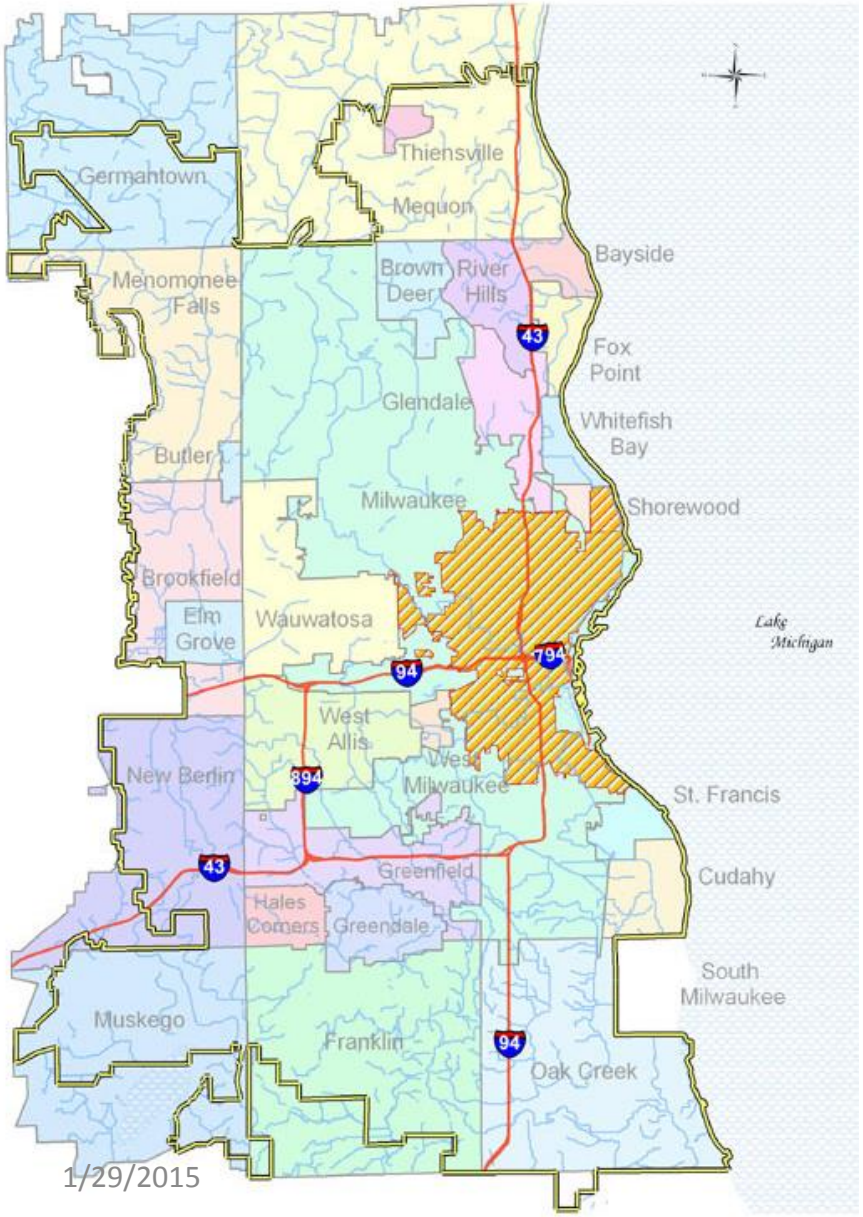
Milwaukee Metropolitan Sewerage District



We Serve:

- 1.1 Million Customers
- 28 Municipalities
- 411 Square Miles

Using Grey Infrastructure:

- Collector Sewers
- 2 Water Reclamation Facilities
- 521 MG Tunnel Storage

To Protect the Environment:

- Convey/Store/Reclaim Wastewater
- Manage Flooding
- Much More…

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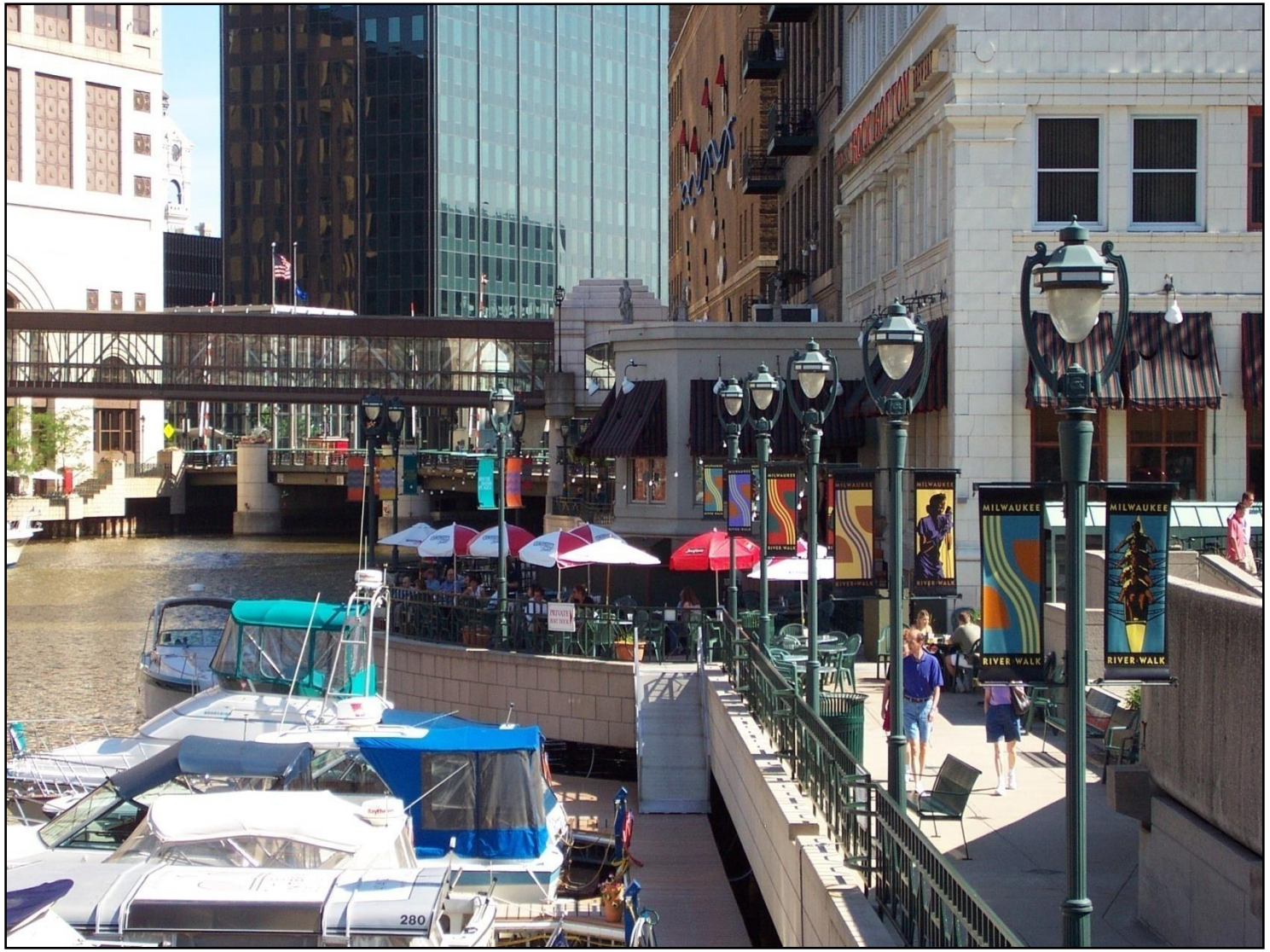
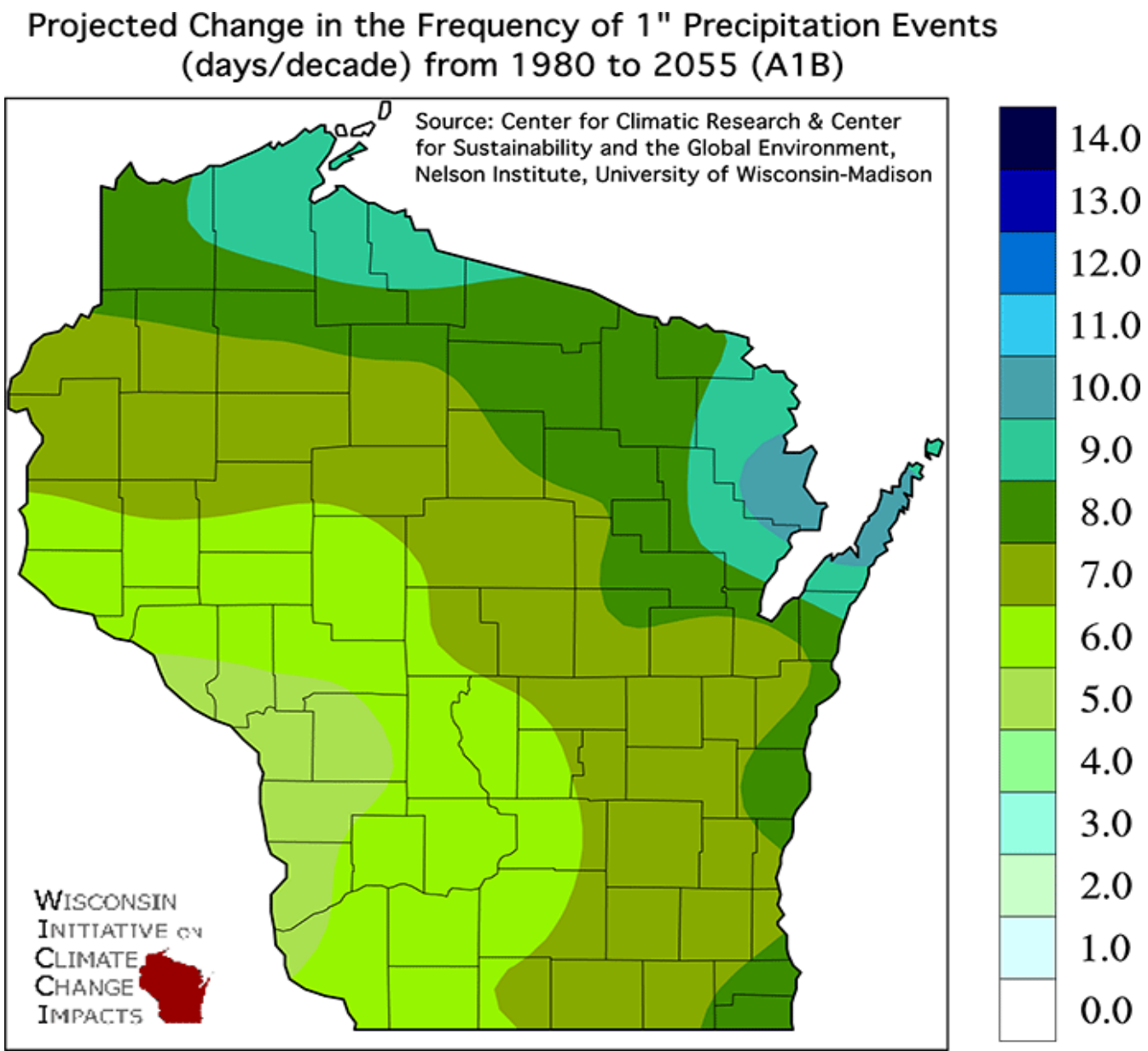
End Result!



Regional Climate Change Context: WICCI



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Climate Change: Data Speaks for Itself

Kinnickinnic River top 5 crests:

(1) 16.01 ft on 08/06/1986
(2) 13.29 ft on 06/08/**2008**
(3) 13.22 ft on 07/10/**2006**
(4) 13.20 ft on 07/15/**2010**
(5) 13.17 ft on 07/23/**2010**

MMSD's 2035 Vision and Strategic Objectives

Broad Strategic Objectives For:

1. **Integrated Watershed Management**

2. **Climate Change Mitigation/Adaptation with an Emphasis on Energy Efficiency**

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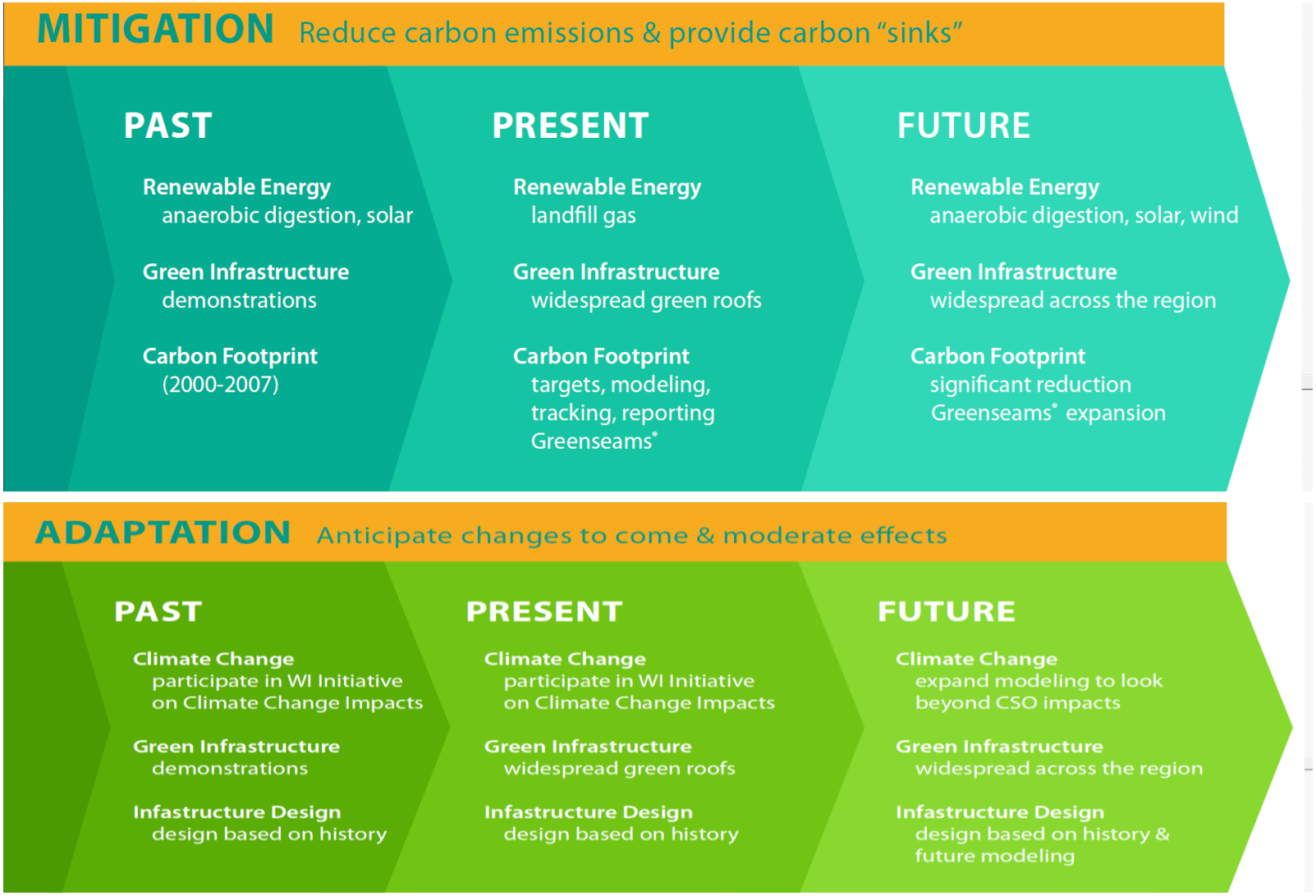
MMSD's Overall Climate Change Strategy



Climate Change Issues for MMSD

- More frequent large storms
- Longer drought periods in between storms
- More precipitation falling on frozen ground
- Others…

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MMSD Adaptation Solutions

- Flood management
- Green infrastructure to infiltrate, hold, evapotranspire
- Vulnerability analysis

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Flood Management: Lincoln Creek

- Concrete removal to naturalize channel
- Minimized floodplain
- Habitat enhancement

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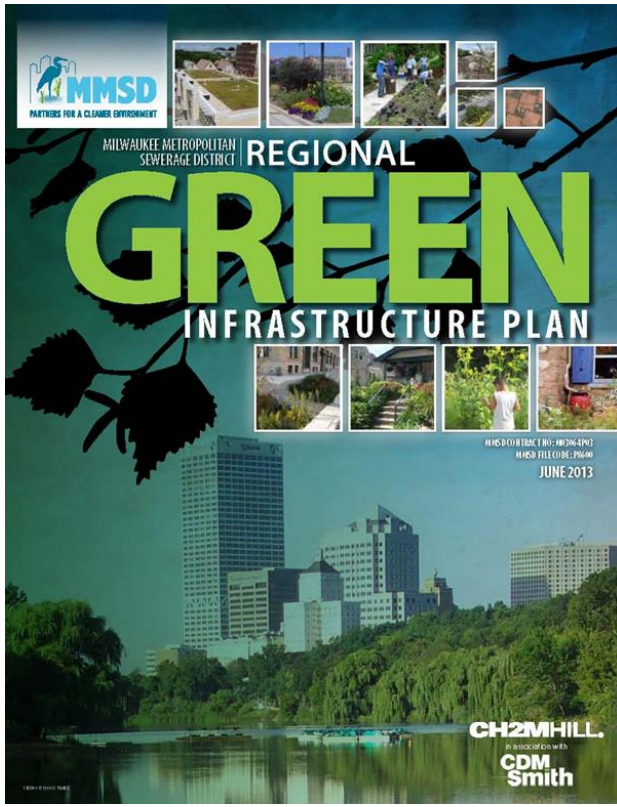
MMSD's Plan: What's So Groundbreaking?

- 0.5" of rainfall on imperviousness = 740 MG!
- Emphasizes combined & separate sewer service areas
- Supports private property inflow & infiltration
- Promotes turf grass with soil amendments
- Assumes we support but don't directly build



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Milwaukee's Refresh and GI Baseline Inventory (GIBI) Reports

- Recommends an annual 10% volume increase
- Current implementation: 8 MG
- Additional designed/funded: 19.5 MG
- Report is an inventory only, does not establish GI targets

MMSD's On-Going Programs

Climate Change Vulnerability Analysis

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Identify High, Medium and Low Risks, Then…

Adapt:

- Take no-regrets actions, like:
  - Maximize onsite-generated power for ISS pumps
  - Consider sewer lining materials resistant to H2S
  - Maximize implementation of GI practices

- Take actions to address climate change

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For Instance…

- Falling lake levels dry foundation piles

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Next Steps (besides GI)

- Monitor floodplains
- Evaluate feasibility of modifications
  - MIS pump stations, change to gravity sewers
  - Retrofit electronic equipment with ventilation
  - Replace WRF equipment to reduce costs
- Develop vector management plan
- Review rain data for changes in volumes and frequency

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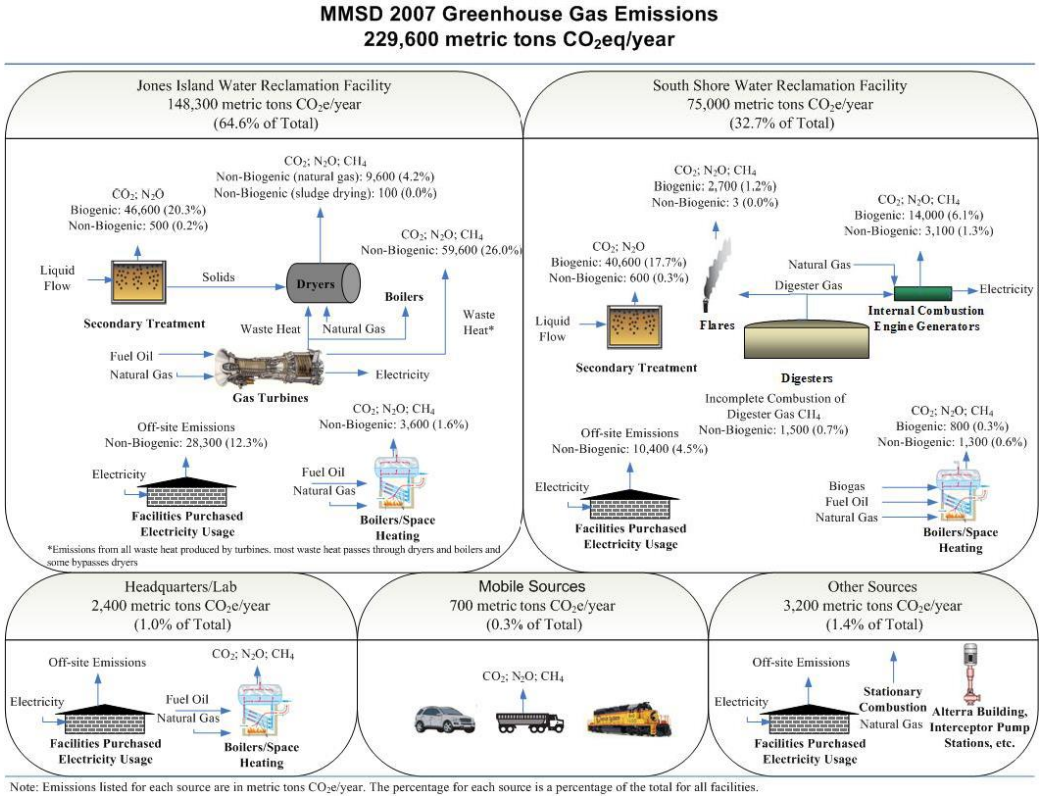
MMSD Mitigation (besides adaptation)

- Renewable energy/ energy conservation
- GI to sequester carbon
- Carbon footprint



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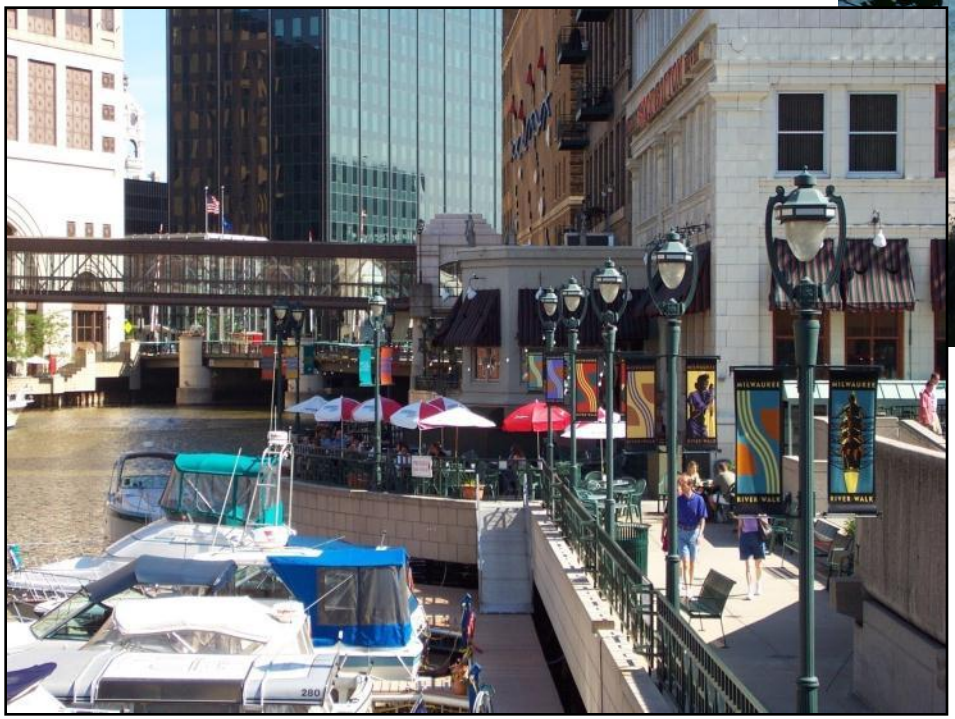

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