

# Research on Tap: Coastal Cities, People, and Waterways

February 4, 2019

# Coastal Issues and Water

Tony Janetos

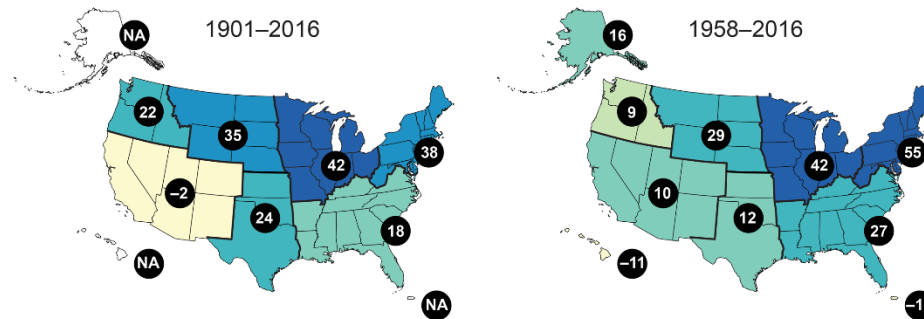
*Director, Pardee Center*  
*Chair, Dept. of Earth and Environment*



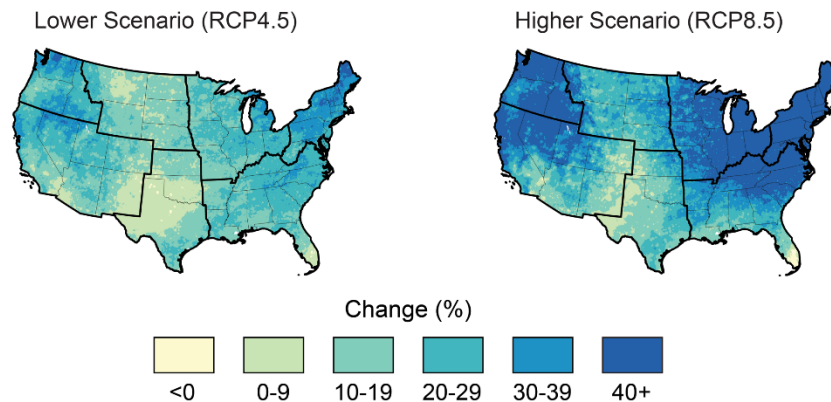
- Water and the hydrologic cycle are key issues in understanding future sustainability of cities, settlements and ecosystems
- We've asked a number of BU faculty working on water-related issues to do lightning presentations of their work
- Here's why this is so important to understand



Observed Change in Total Annual Precipitation  
Falling in the Heaviest 1% of Events



Projected Change in Total Annual Precipitation  
Falling in the Heaviest 1% of Events by Late 21st Century







# Climate-Related Disasters in Coastal Cities of Northern Java, Indonesia

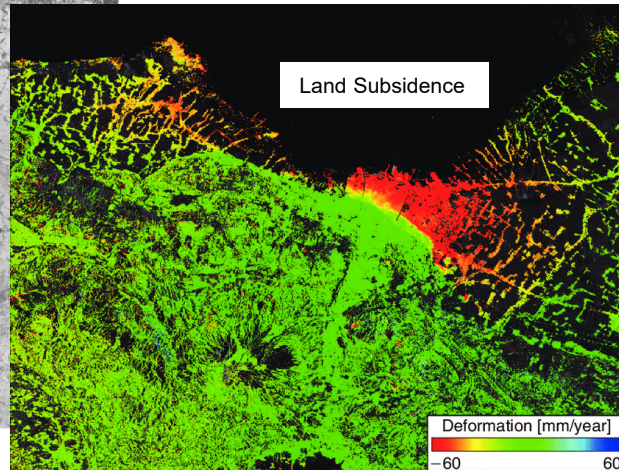
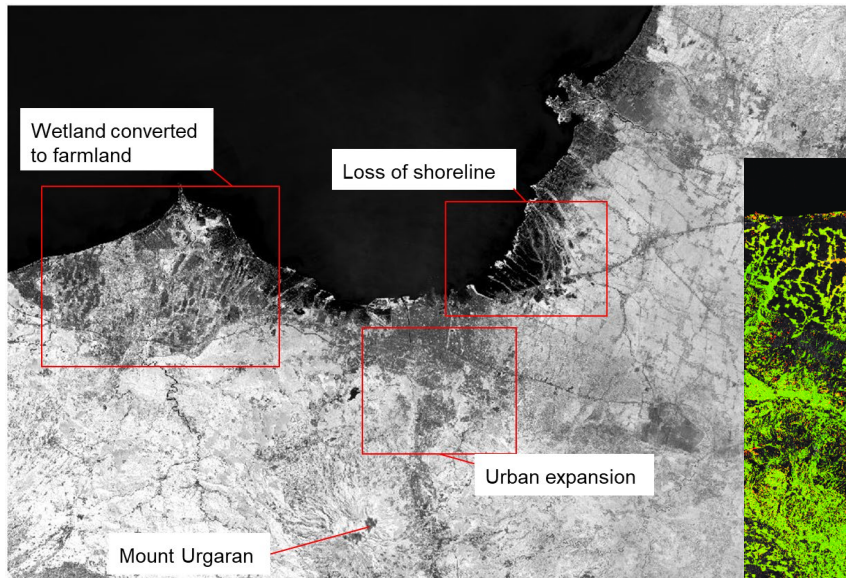
Magaly Koch

*Research Associate Professor  
Center for Remote Sensing, CAS*





- ❑ Semarang City faces land subsidence & sea level rise
- ❑ The impact is sever:
  - Loss of shoreline
  - Flooding and inundation
  - Economic growth drops
  - Health and sanitation conditions degrade
  - Land conversion
  - Water & soil salinization







# Coastal Geomorphology

Sergio Fagherazzi

*Professor  
Earth and Environment, CAS*



GLOBAL WARMING



EARTH SURFACE  
DYNAMICS



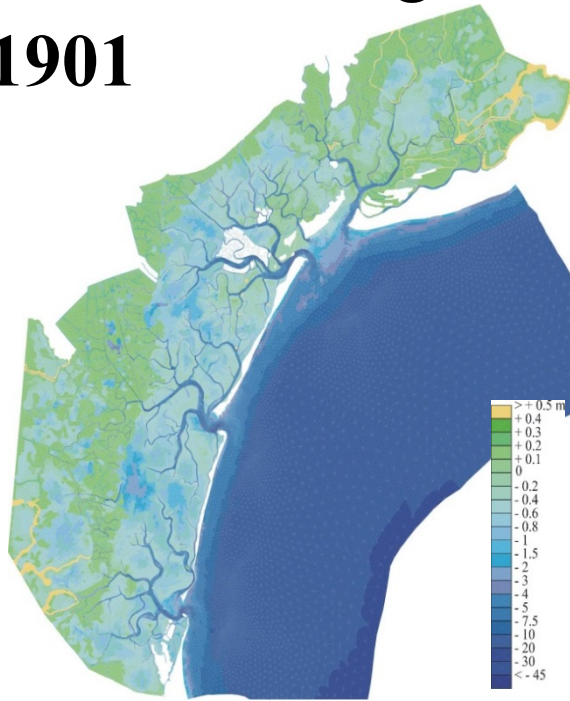
Ecosystems



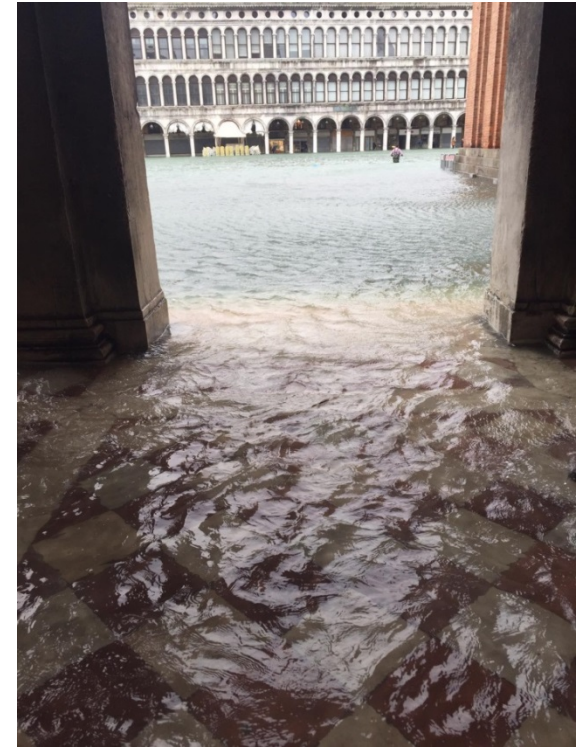
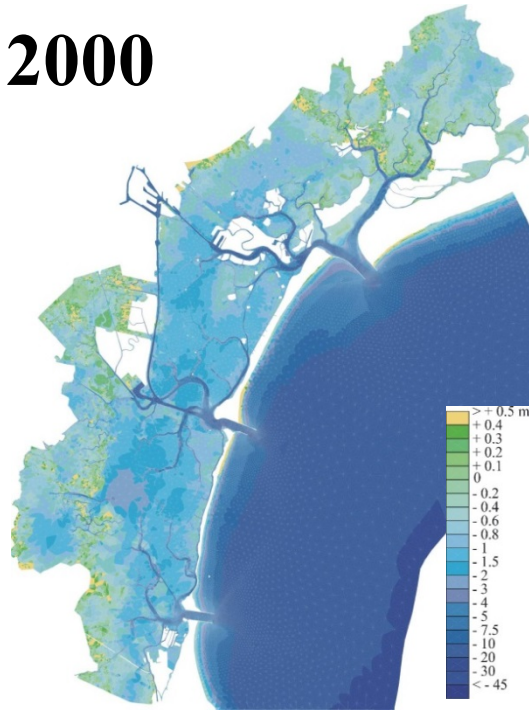
Humans

# Venice Lagoon Italy

1901

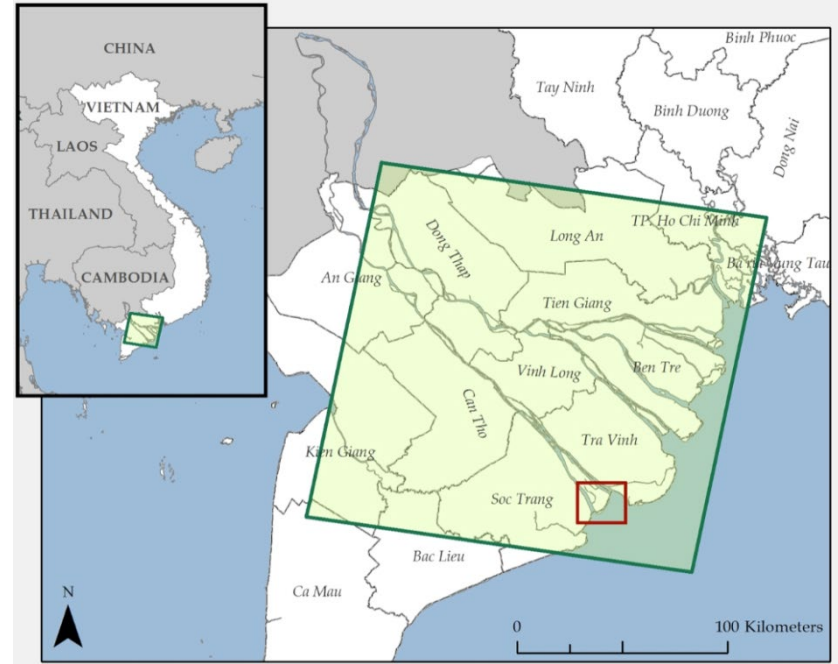


2000

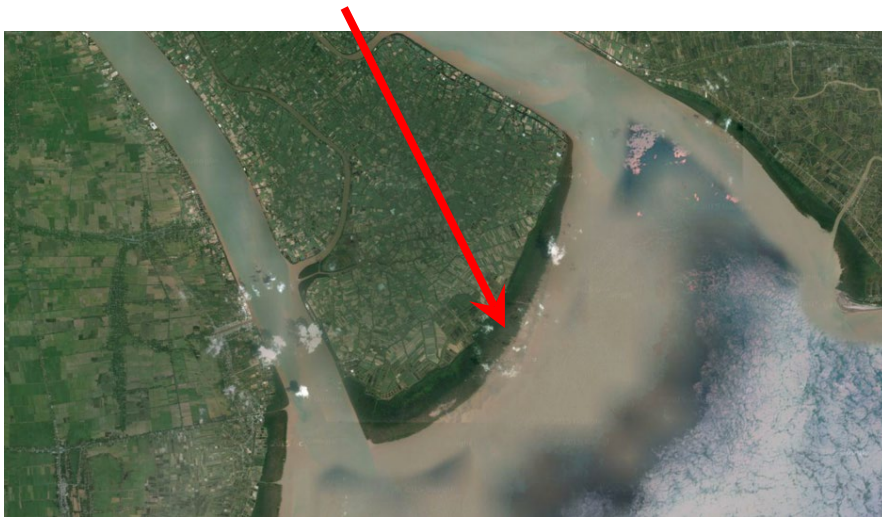




# Mekong Delta



## Mangrove Fringe Forest in Cù Lao Dung



# Geomorphology is critical



After Jeffrey  
Howe



# Urban Ecology of the Upper Nile: Fish and the City

James C. McCann

*Professor and Chair, Department of History*  
*Associate Director for Development, African Studies Center*  
*Faculty Fellow, Pardee Center*







Local knowledge:  
Lakeside daily market and *Labeobarbus* catch (May 2016)











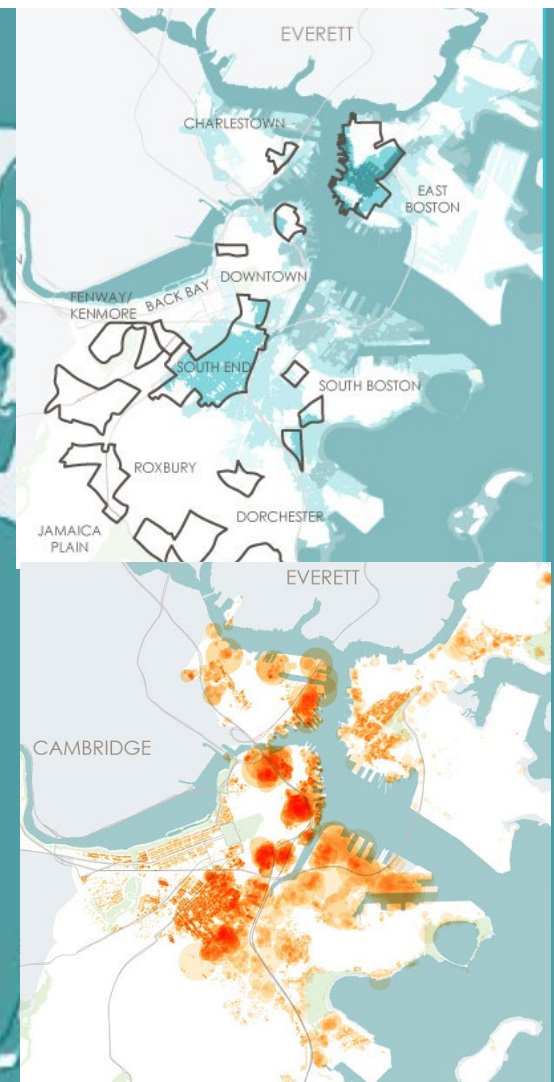
“We don’t know who discovered water, but it wasn’t a fish”  
Marshall McLuhan, 1966

# Is 50 Years Enough to Prepare Boston for the Rising Seas?

Bruce T. Anderson

*Professor and Associate Chair  
Earth and Environment, College of Arts and Sciences*



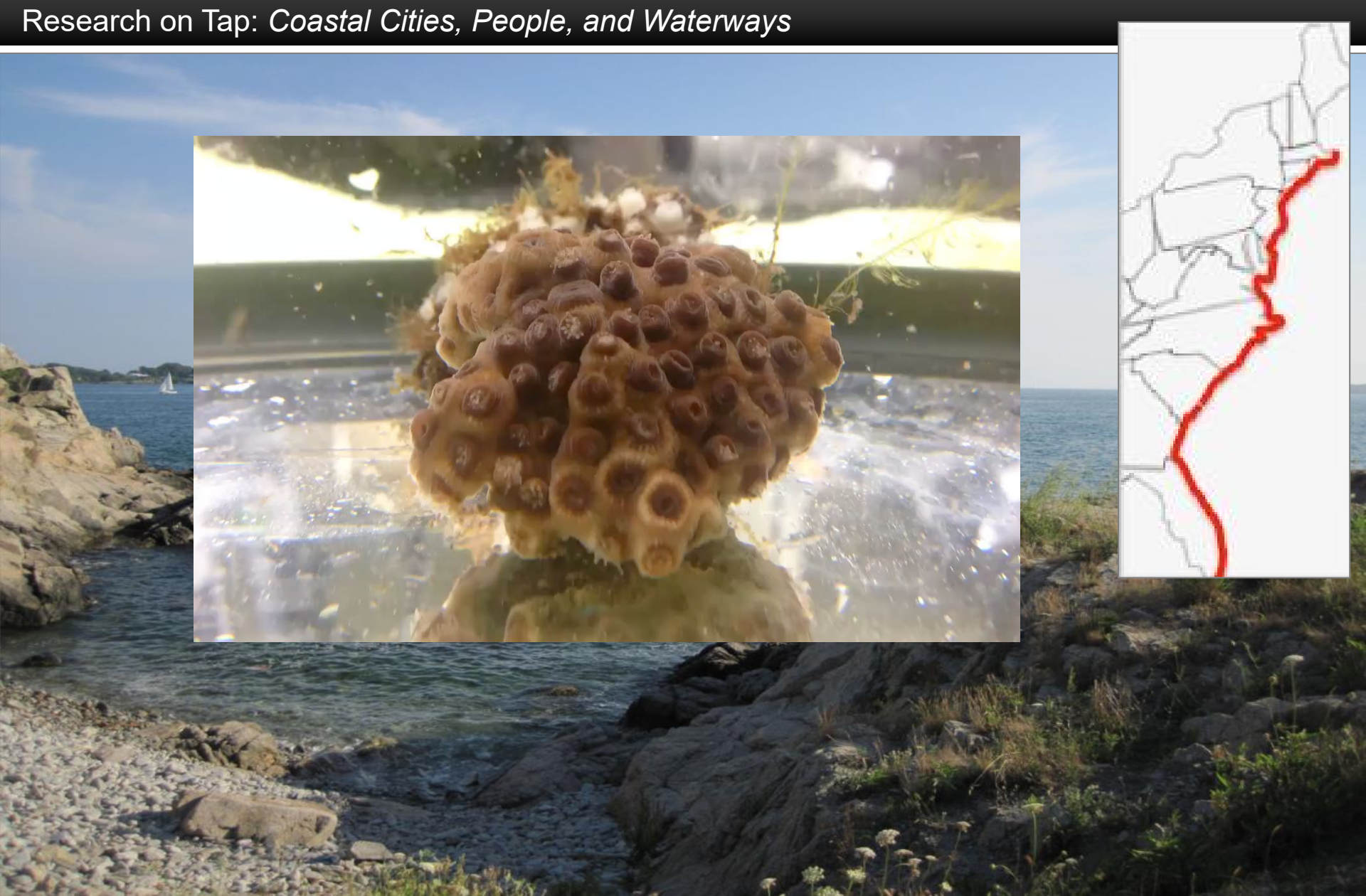


**Monthly: \$130M, >10,000pop**      **Decadal: \$1B, >75,000pop**

# Hidden Problems in Secret Corals: Microplastic Pollution in an Urban, Coastal, Temperate Coral

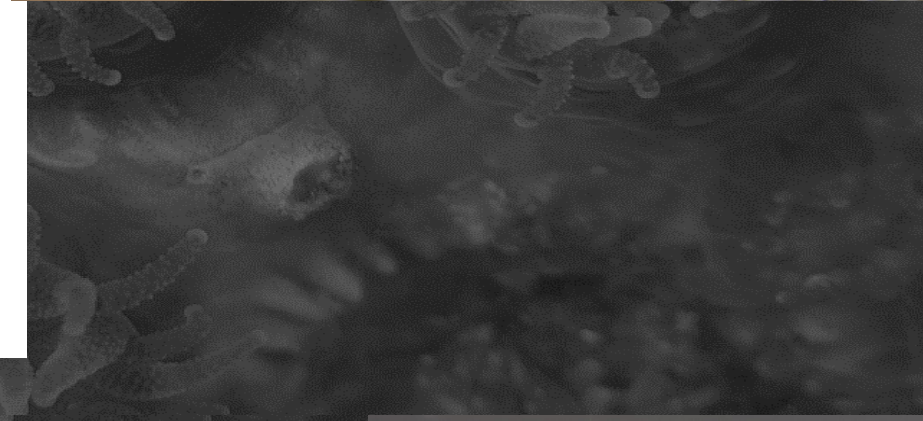
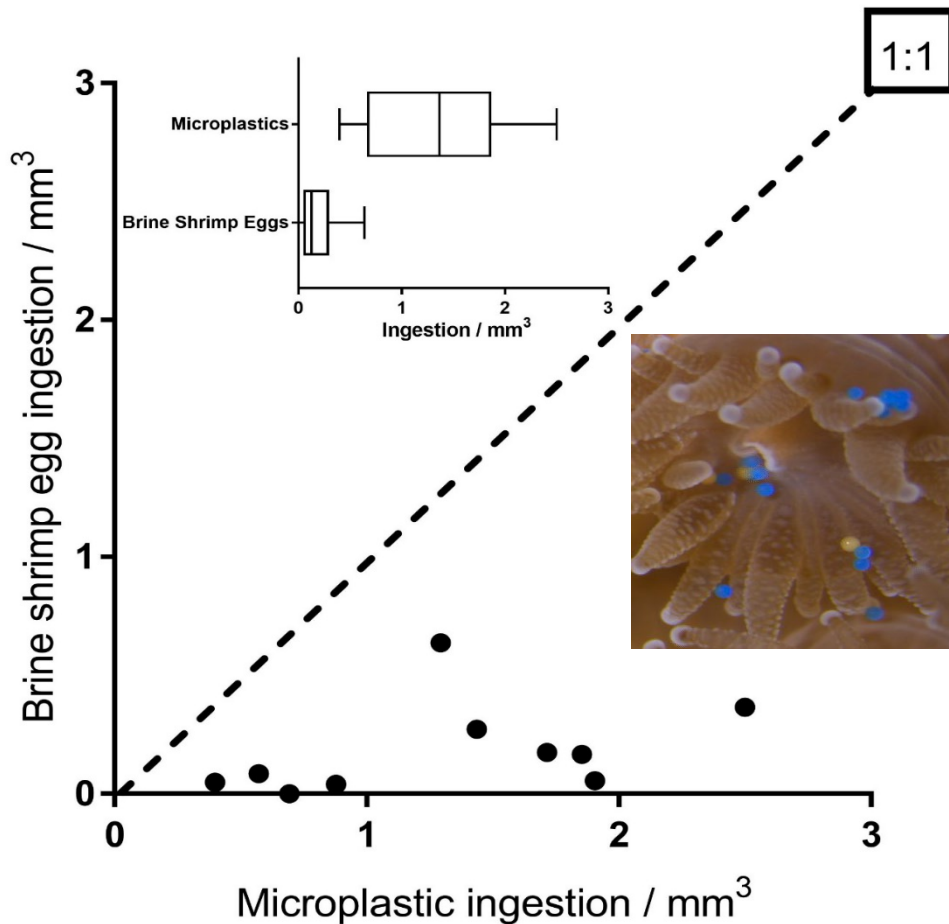
Dr. Randi Rotjan

*Research Assistant Professor  
Biology, CAS*





# In a direct comparison, microplastics are preferred



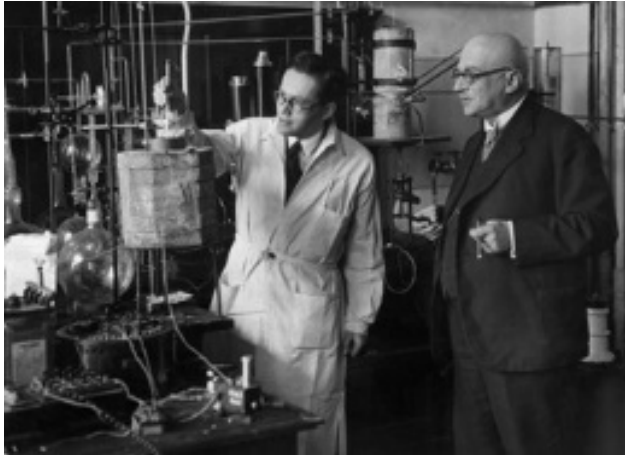
# Can We Make Fresh Air from Pond Scum ?

Linda H. Doerr

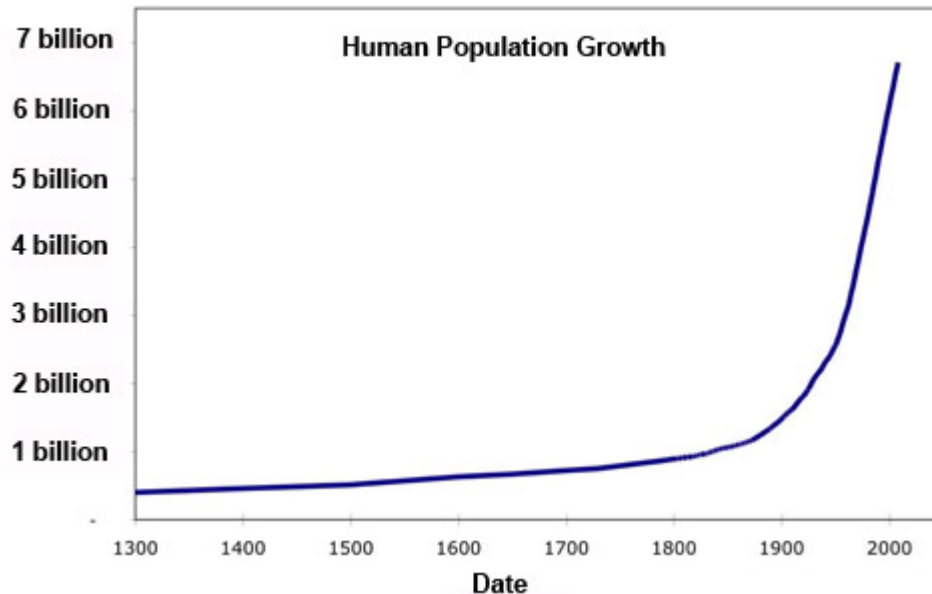
*Associate Professor  
Chemistry Department, CAS*

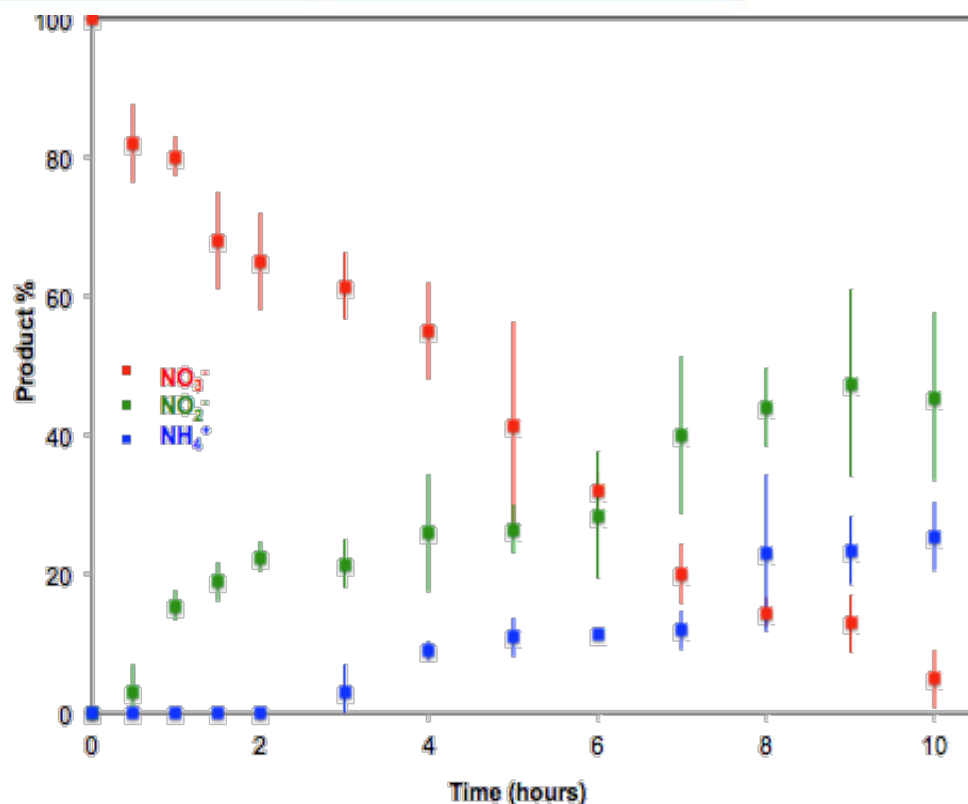
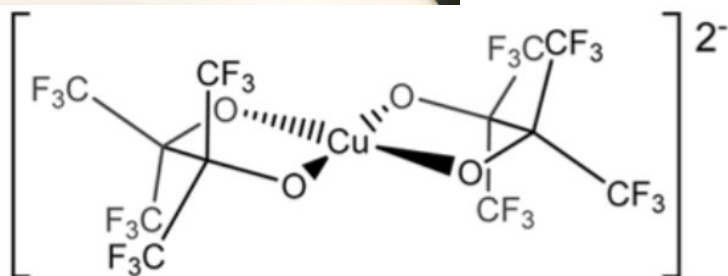
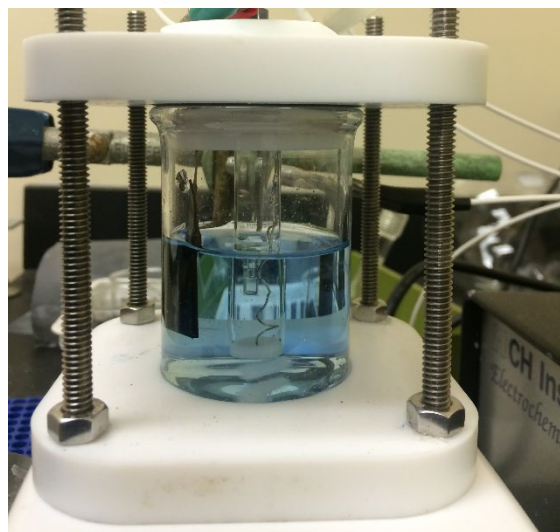
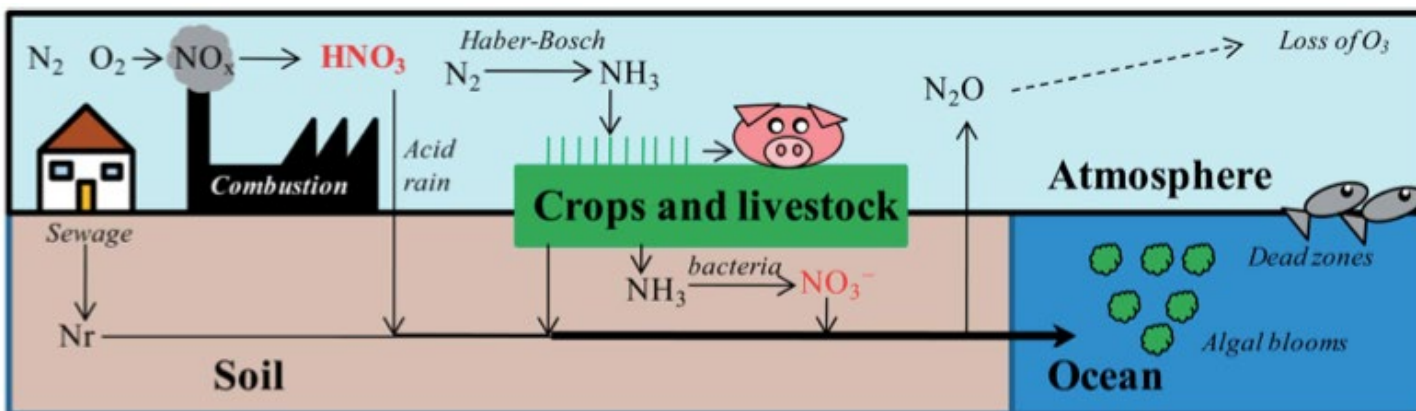


# Bread ( $\text{NH}_3$ ) from Air ( $\text{N}_2$ ) !



Fritz Haber and Carl Bosch (1909-10)





# The Mighty Merrimack: Toilet and Tap

Wendy Heiger-Bernays, PhD

Clinical Professor of Environmental Health  
Department of Environmental Health SPH





## Wastewater Treatment

Toilets  
Sinks  
Industries

Per & Polyfluorinated  
(PFAS)

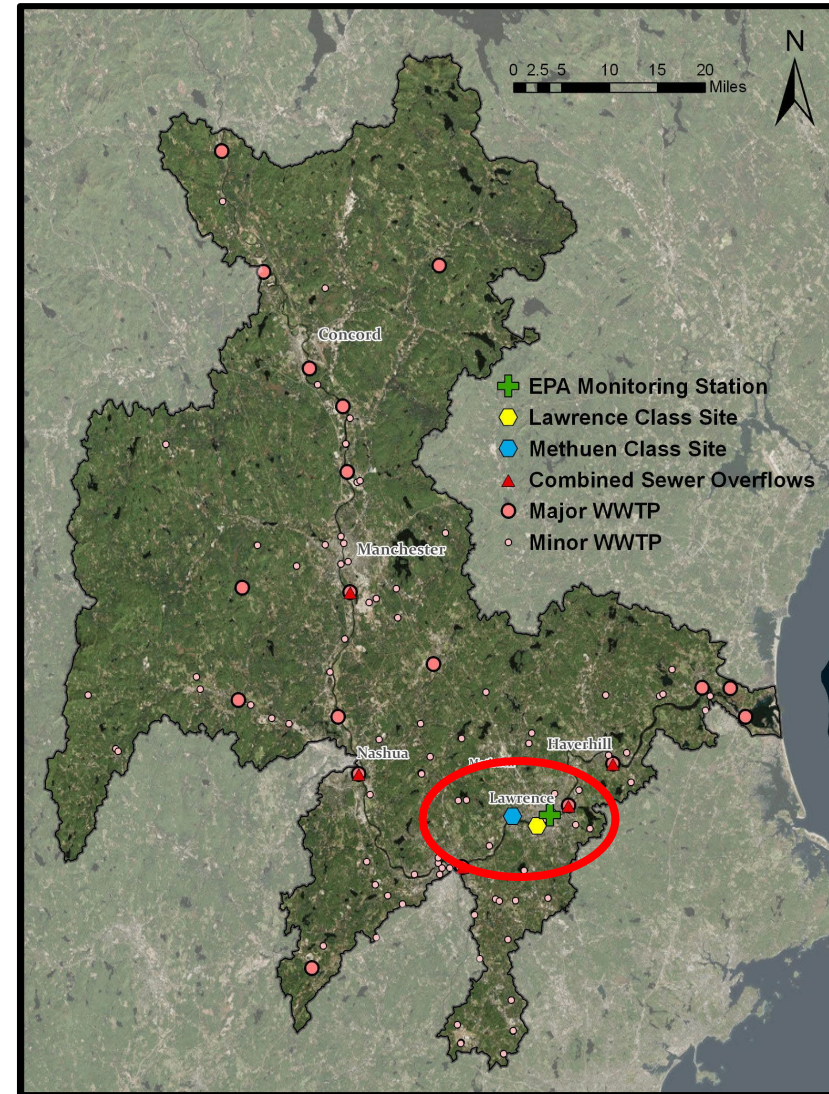
Pharmaceuticals

Nanoparticles  
Microplastics



## Drinking Water Treatment

Tap Water



Merrimack River Watershed

## Who Lives in Lawrence & What is their Health Status?

POPULATION (census)	79,337
INCOME (Median Household)	\$36,754
POVERTY (Individuals)	26%
SNAP (Households)	44%
EDUCATION (High School, +25 years)	67%



# Solutions!!!

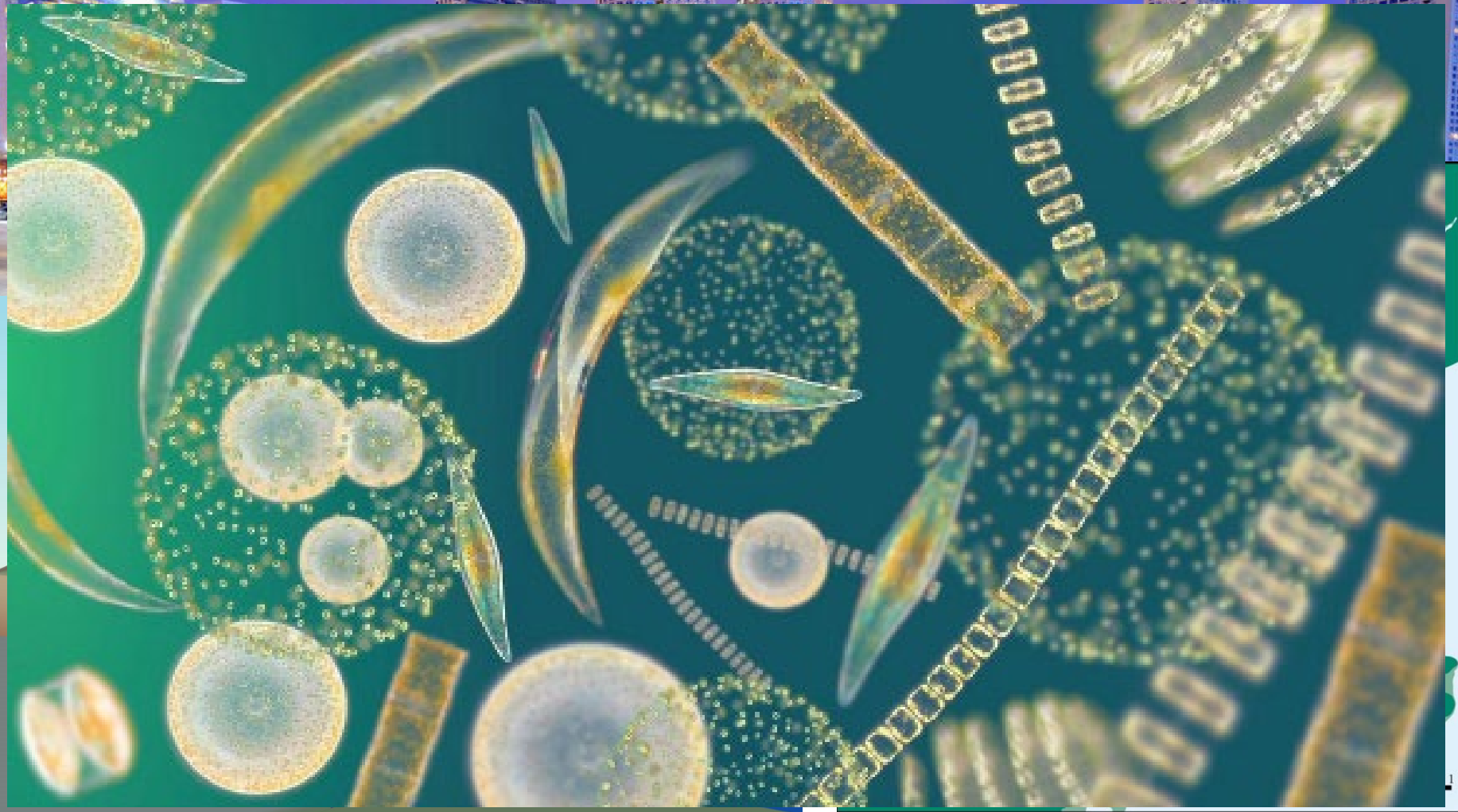
EH750 Fall 2018, L. Orlando and B. Haley  
Merrimack River Watershed Council

# Vertical composition of historic urban land-use impacts contemporary watershed silica export

Wally Fulweiler  
w/ Dr. Tim Maguire\*

*\*now a postdoctoral associate at the Great Lakes Research Institute*

*Associate Professor  
Department of Earth and Environment  
Department of Biology  
CAS*









**Land Use and Livelihood  
Change on the Rio  
Cauaburis**

**Julie M.  
Klinger, PhD**

*Assistant Professor,  
Frederick S. Pardee School  
of Global Studies  
Co-Director, Land Use and  
Livelihoods Initiative  
Global Development Policy  
Center*



Upper Rio Negro, Photo by Author, 2018



USGS Earth Explorer.



Walking past an old gold mine, Photo by student research assistants Avery Hall and Natalia Tanko, 2018



Rio Cauaburis, Principle source of food and drinking water, downstream from mines. Photo by Tinko, 2017





Franciano and Orlandinho



Luciana and Acrizio (in purple)



Robermar

Yanomami mapping and  
data-collection training  
expedition, supported by  
Environmental Ministry,  
2016

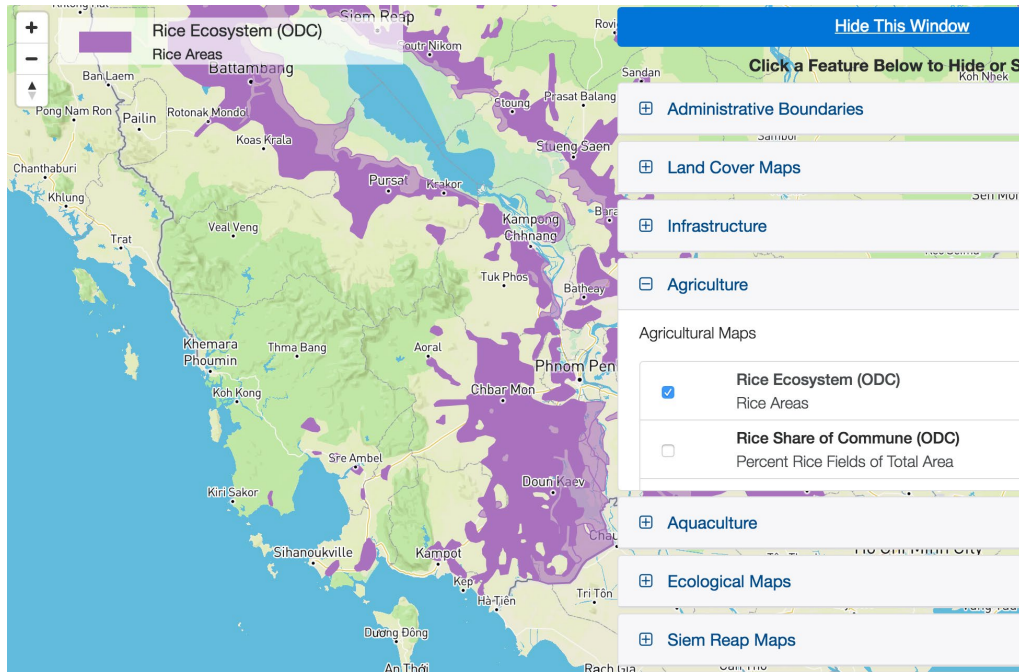
# Scenario Modeling & Spatial Decision Tools

Suchi Gopal

*Professor, Earth & Environment, CAS*



<http://45.55.215.153/midas/#>



**Suchi Gopal, Les Kaufman,  
Josh Pitts & Roel Boumans.**

Team conducted over 10 stakeholder  
workshops in Cambodia 2016-2019.

Over 150 participants from fisheries,  
Forestry, conservation, policy makers &  
NGOs participated in the workshops.

Designing MIDAS/MIMES Models



**MacArthur  
Foundation**

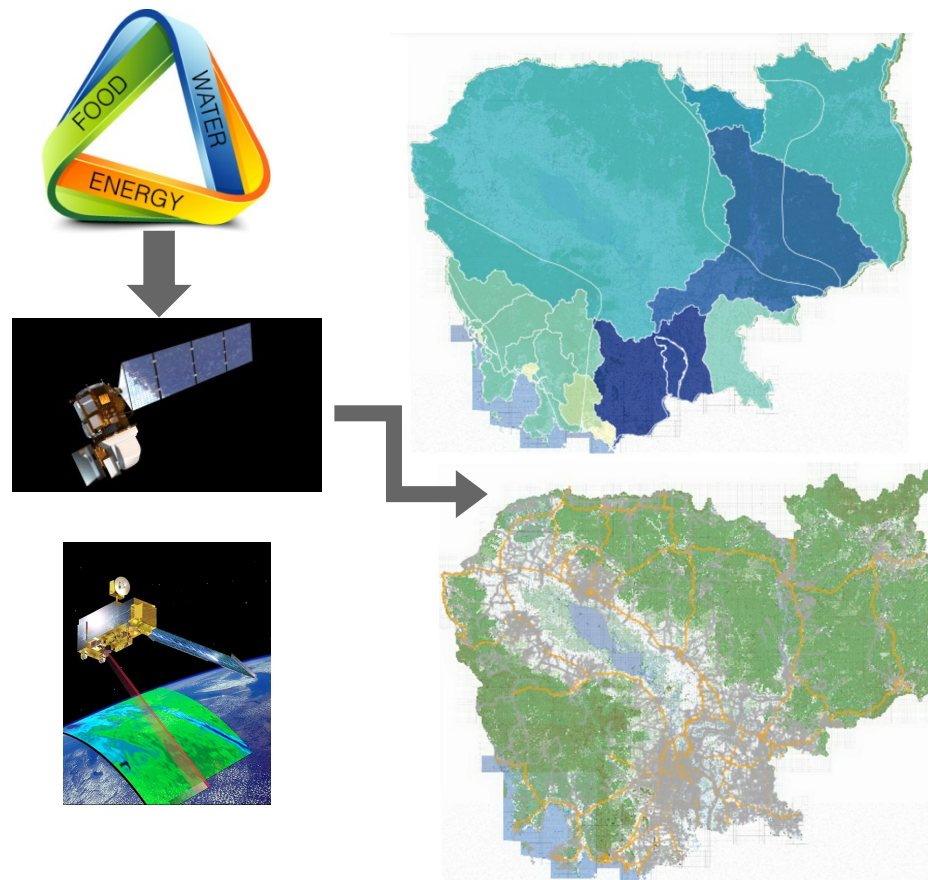
**BU** The Frederick S. Pardee Center for the Study of the Longer-Range Future

**Boston University** Office of the Vice President and Associate Provost for Research



# Coupled Human and Natural Systems Framework

1. Develop and apply computational methodologies, e.g. *improved algorithms* to integrate different types of data (scales, sensors, types), understand system flows, & interactions;
2. Create models to understand the *coupled human-natural system*;
3. Translate findings into a user-friendly *decision tool* that supports cyber-human-natural system resource management.
4. Crowd source knowledge and support collaborative DM)



# The **Pearl River Delta** in China: A Unique Natural and Human Ecosystem in **History**

**Prof. Eugenio Menegon**

**Department of History & Pardee Center,  
Boston University**

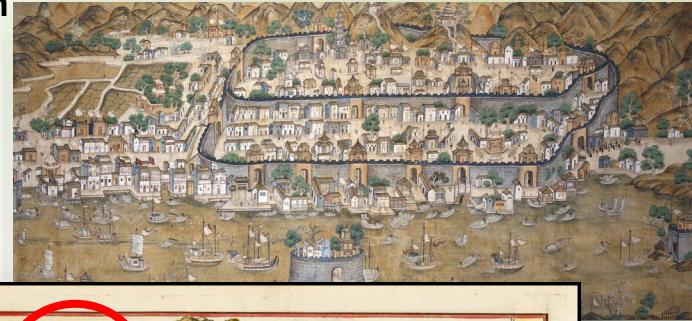
Research on Tap : Coastal Cities, People, and Waterways

February 4, 2019, 4-6 pm

Boston University



Canton



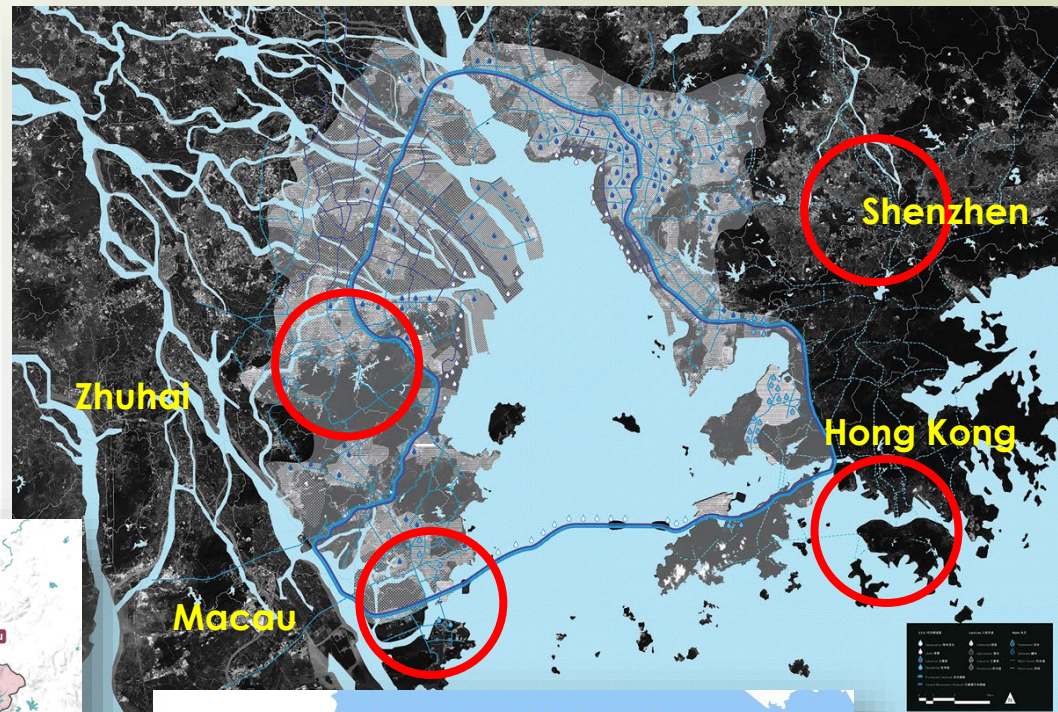
Canton  
(Guangzhou)

Foreign  
'Factories'

Macau







# What's Coming in Through Urban Rainwater?

Pamela Templer<sup>1</sup> & Lucy Hutyra<sup>2</sup>

*<sup>1</sup>Professor, Department of Biology, CAS*

*<sup>2</sup>Associate Professor, Department of Earth & Environment, CAS*



# Urban Biogeochemistry

## EPA forcing towns to clean up Charles River

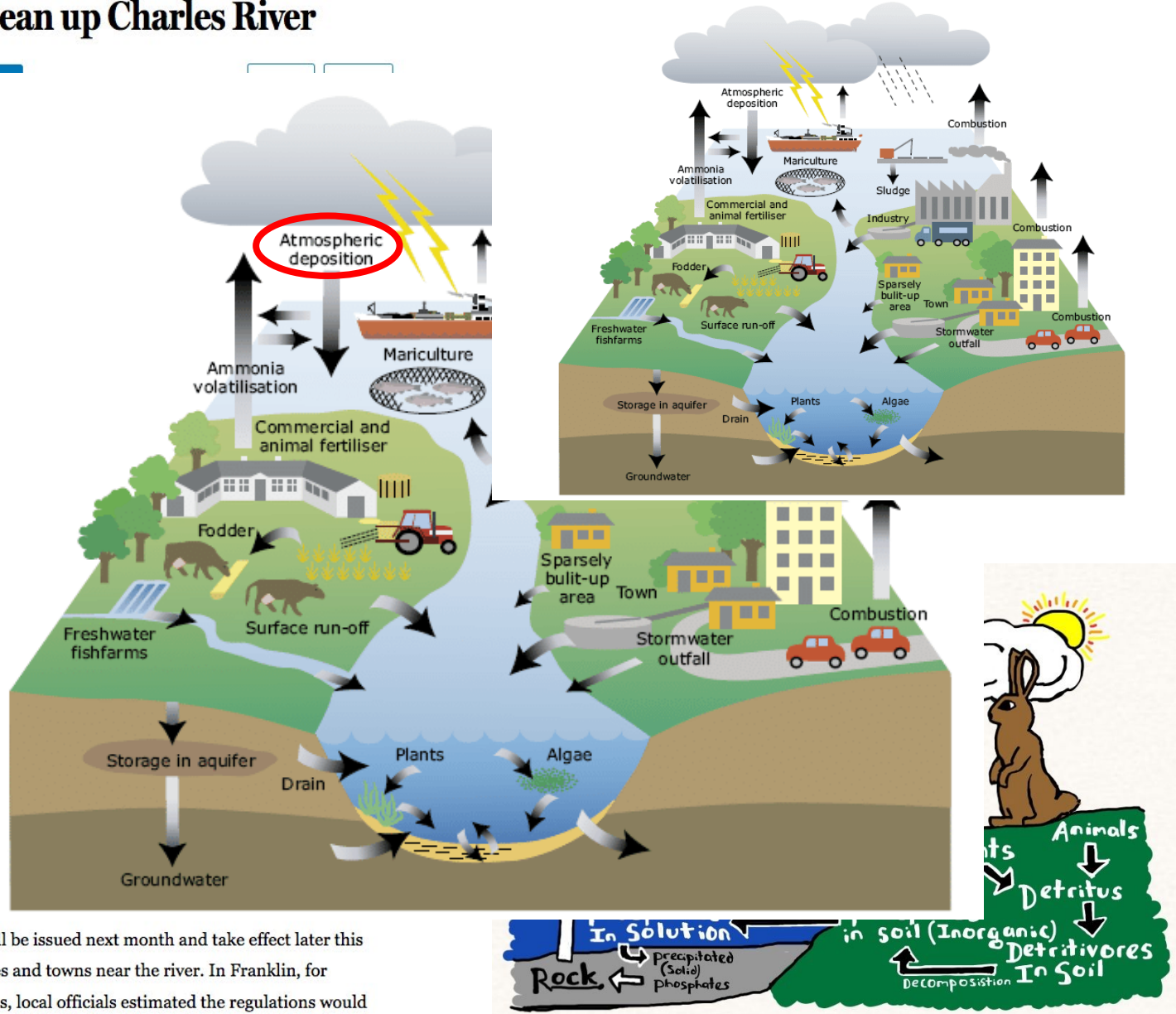


From left, interns Richard Treanor and Be scientist, test water from Willow Pond in I

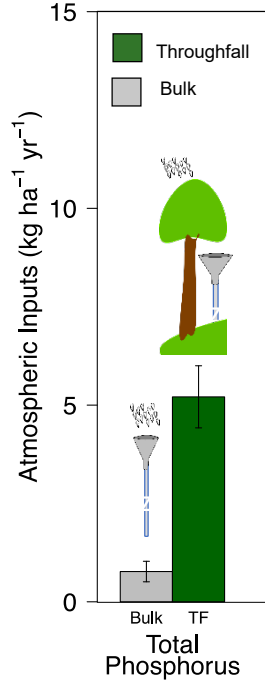
By [David Abel](#) | GLOBE STAFF |

Nearly every summer over the pe  
contaminated runoff, have coate  
poised to issue sweeping regulati  
municipalities tens of millions of



The regulations, which federal officials say will be issued next month and take effect later this  
year, have sparked a range of concerns in cities and towns near the river. In Franklin, for  
example, where the river runs for several miles, local officials estimated the regulations would  
cost households an average of \$300 a year, and at least \$62 million over 20 years, to do things  
like capture and treat more water.

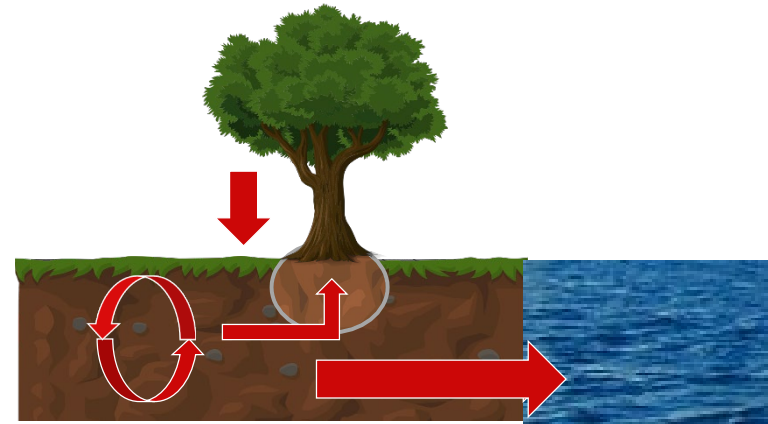
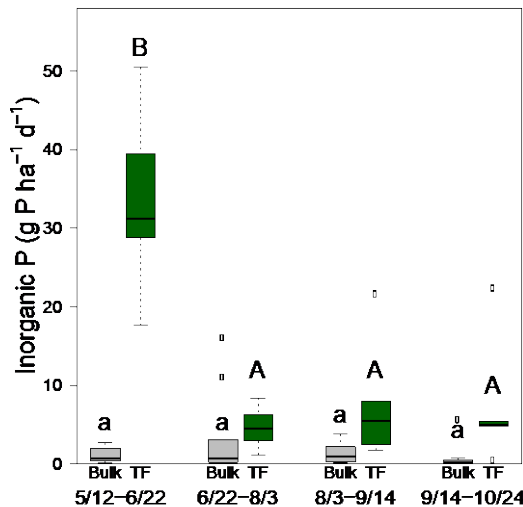


# Urban Sources of Phosphorus?



Boston canopy cover 25.5%, 1/4 of canopy is above pavement

 = canopy cover above soil  
 = canopy cover above pavement



So what? This is an amount equivalent to 23% of inorganic P in sewage effluent!



# Upcoming Research on Taps

For more details: [bu.edu/research/researchontap](https://bu.edu/research/researchontap)

## **Coastal Cities, People, and Waterways**

Monday, February 4, 2019 | 4-6 pm

## **The American City: Promoting Inclusion or Sowing Division?**

Wednesday, February 27, 2019 | 4-6 pm

## **High Tech and High Touch: Digital Innovations from BU's Mobile and Electronic Health-ARC**

Wednesday, March 20, 2019 | 4-6 pm

## **Mechanobiology: How Force and Stretch Shape Life**

Tuesday, April 2, 2019 | 4-6 pm