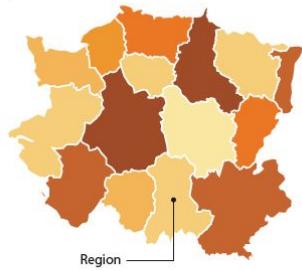
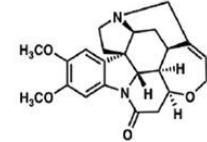
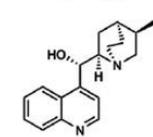
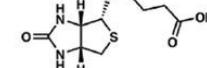
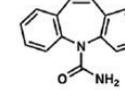


# Embracing the complexity of a city to predict dengue hotspots

Michelle Evans

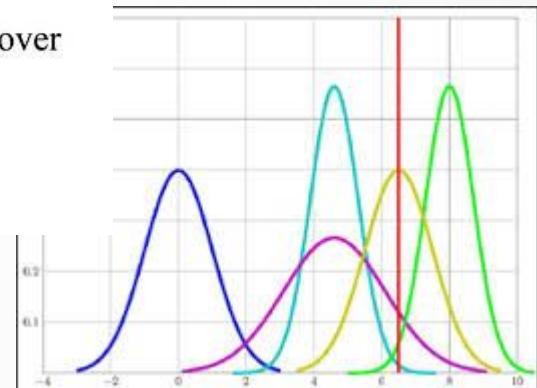




what is stronger  
than the human heart  
which shatters over and over  
and still lives

- rupi kaur

$$\int_0^{\infty} e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$$



# Myths surrounding knowledge production

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# Myths surrounding knowledge production

**Hierarchy of knowledge:** the supremacy of quantitative methods & data over qualitative methods and data

**Dichotomy of knowledge:** the incompatibility of quantitative/natural and qualitative/social sciences

**Completeness of knowledge:** one perspective is able to represent a whole truth

What happens if these myths are not  
challenged?

# What happens if these myths are not challenged?



Image: Mosquito Squad



Piped water

Mosquitoes  
Dengue incidence



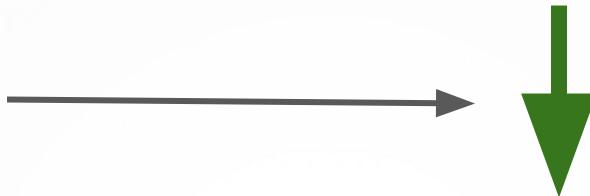
Piped water



Mosquitoes  
Dengue incidence



Piped water



Mosquitoes  
Dengue incidence



Piped water



Piped water



Mosquitoes  
Dengue incidence



Piped water



Mosquitoes  
Dengue incidence



Piped water



*Sembrando el futuro  
(trust in govt.)*



Mosquitoes  
Dengue incidence



Piped water



*Mala unión  
(no trust in govt.)*



Mosquitoes  
Dengue incidence

# Myths surrounding knowledge production

**Hierarchy of knowledge:** the existing hierarchy is an **incorrect relic** of the history of science

**Dichotomy of knowledge:** the proposed split between quantitative/natural and qualitative/social sciences is **false**

**Completeness of knowledge:** all knowledge is **partial**

# A hybrid approach

Three levels of hybrid practice:

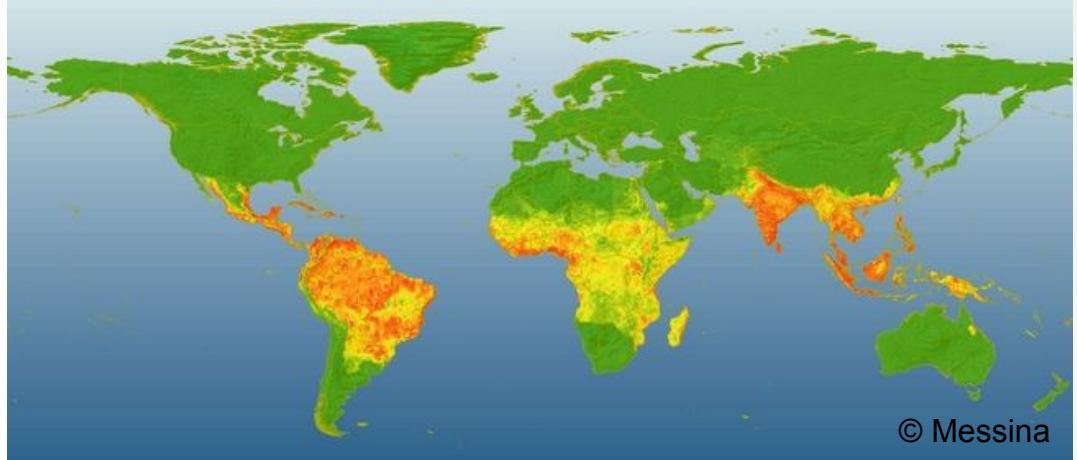
- 1) Use quantitative techniques to address topics conventionally under the realm of critical or social sciences
- 2) Use of quantitative techniques with qualitative knowledge and understanding
- 3) “True integration” of quantitative methods with critical social theory

# A hybrid approach

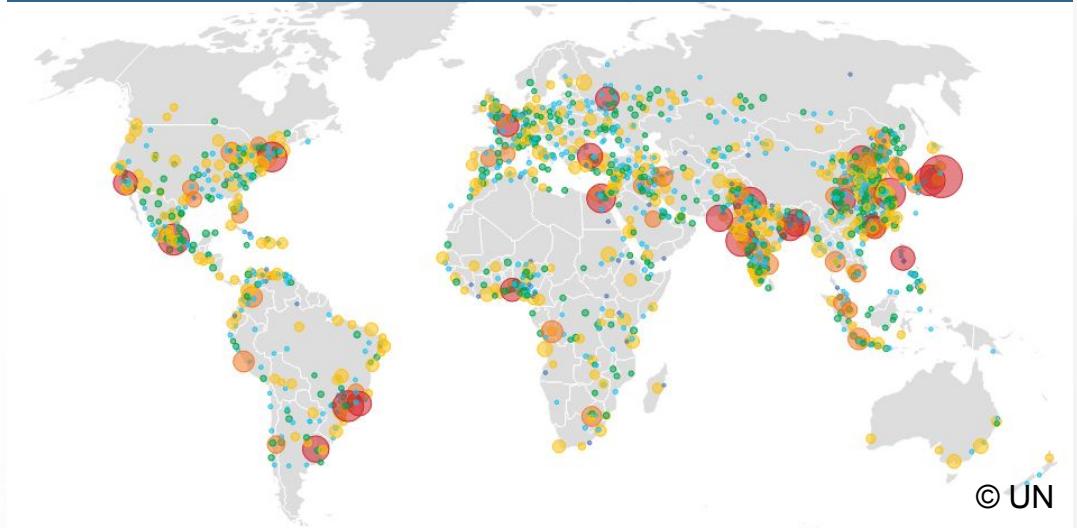
Three levels

- 1) Use quantitative methods to understand the research problem
  - 2) Use of qualitative methods to gain a deeper understanding
  - 3) “True integration” of quantitative methods with critical social theory
- Dengue is an ideal system to implement a level 3 hybrid approach
- ally under
- e and

# Global risk of dengue



# Global urbanization patterns



# Dengue-carrying mosquitoes are city dwellers



Mosquito-borne disease traditionally falls under the realm of medical doctors and epidemiologists

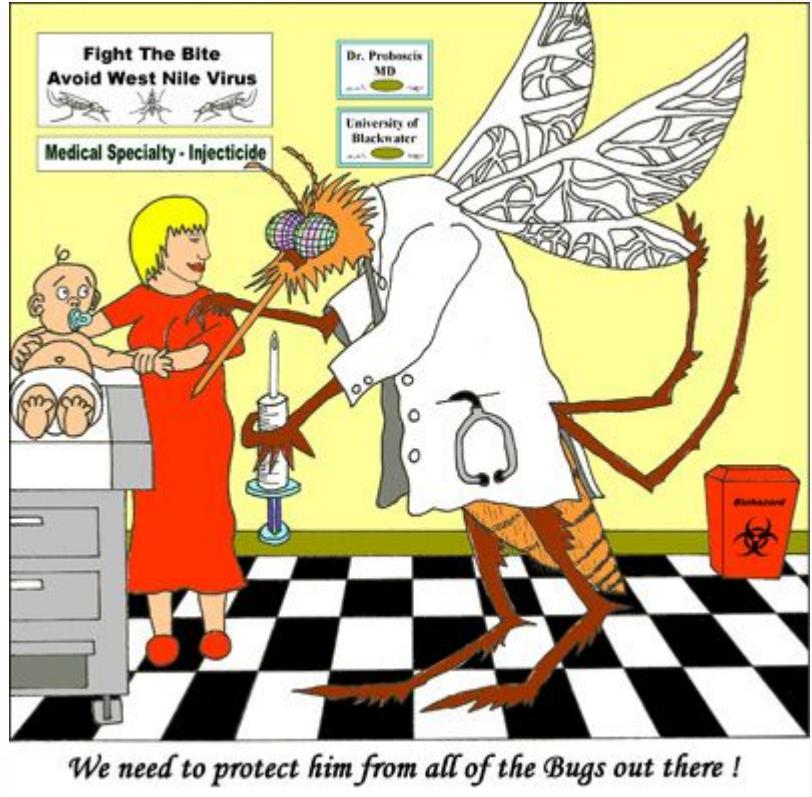


Image: Rebecca Carley

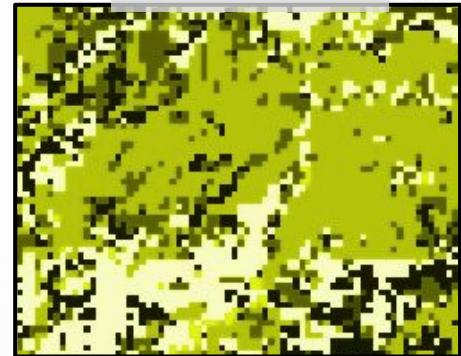
# What might an epidemiological approach miss?

Epidemiology is the study of the **distribution** and **determinants** of health-related states or events in specified populations

# What might an epidemiological approach miss?

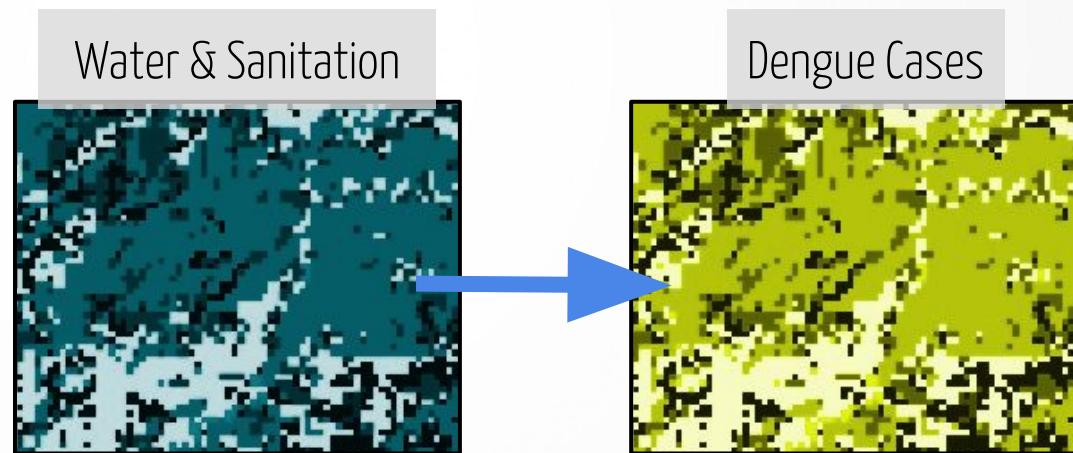
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Dengue Cases



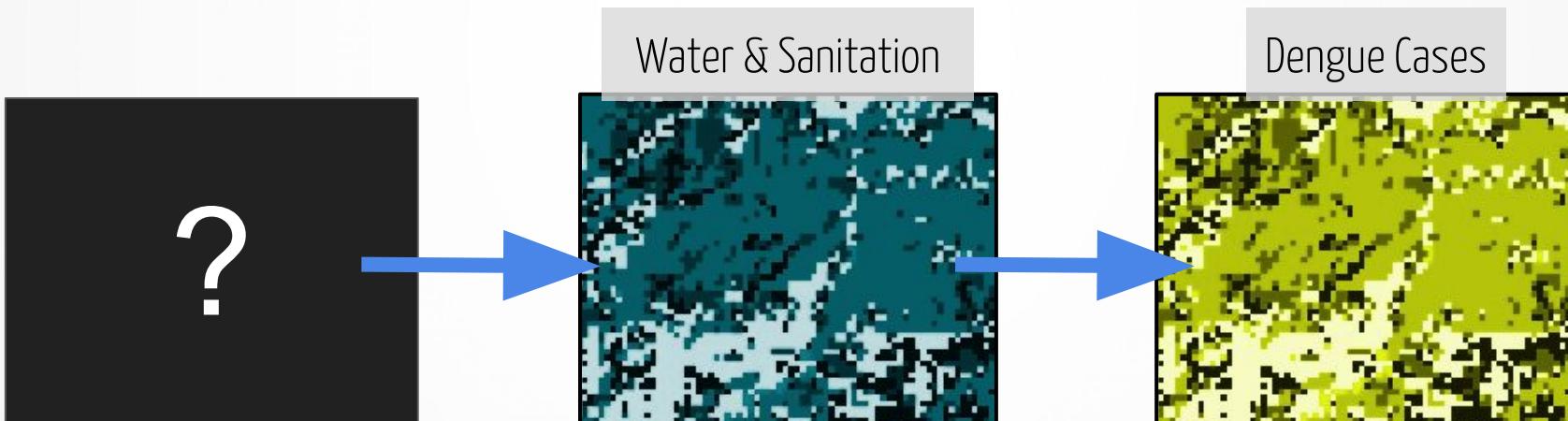
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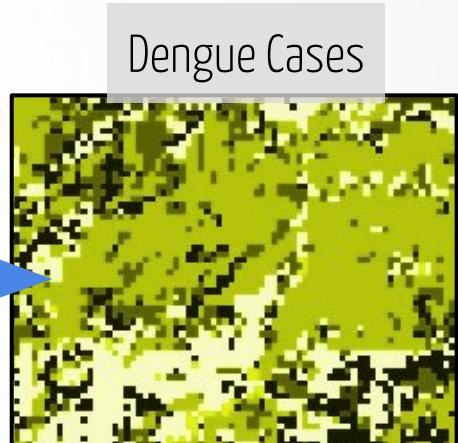
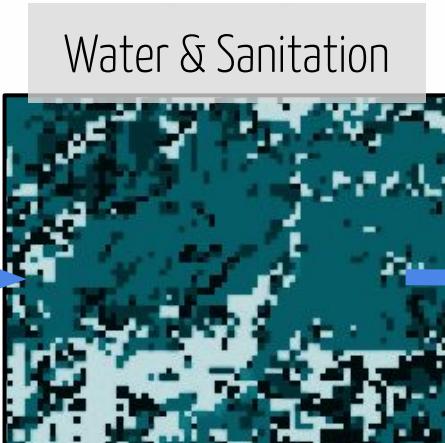
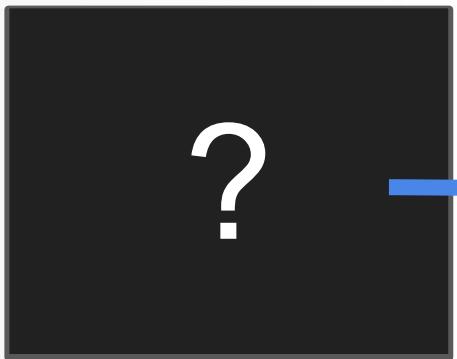
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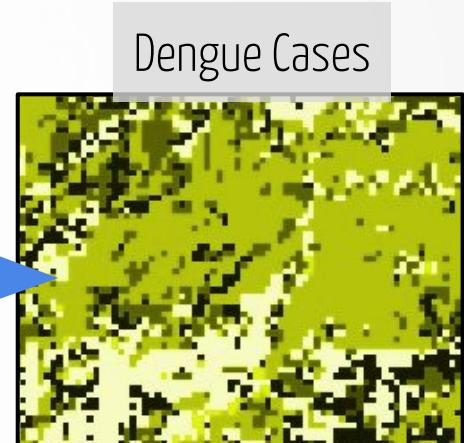
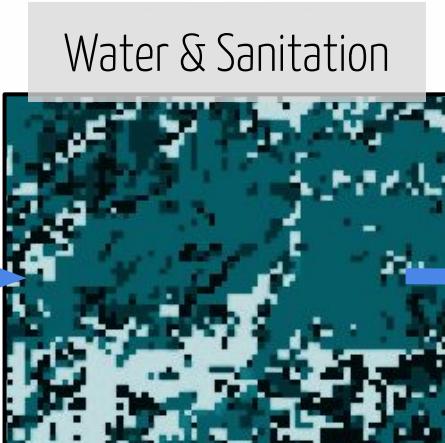
# Enter political ecology...

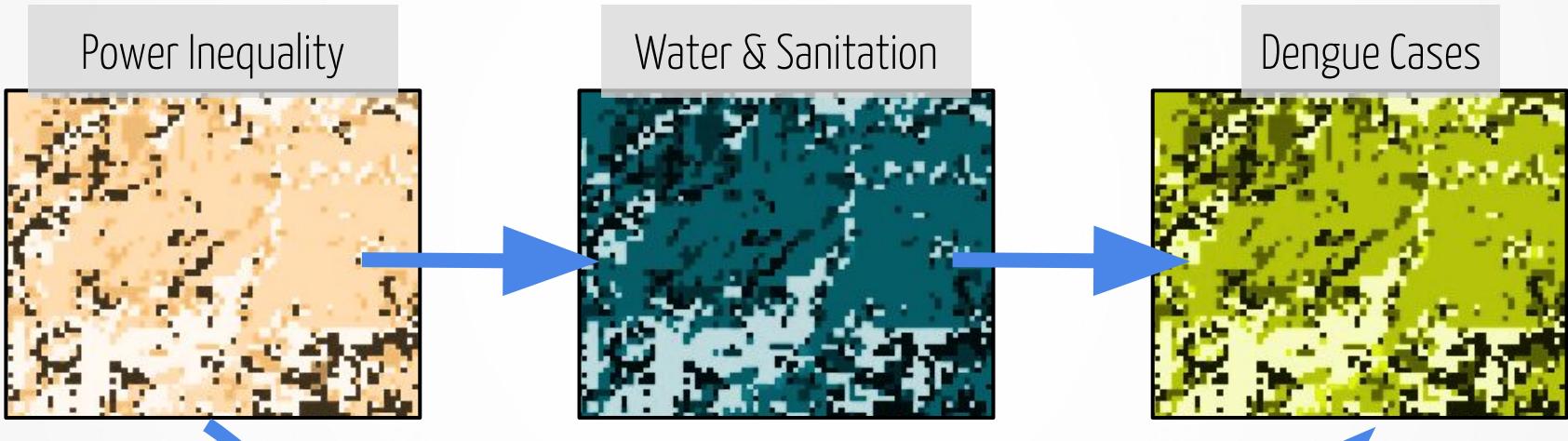
## The tenets of political ecology

1. The nature/society duality is false
2. Urbanization happens within existing social and power structures
3. Following 2, urbanization can reproduce and reinforce existing inequalities through the unequal distribution of environmental amenities



Social relations  
Political relations  
Cultural relations





# Water crisis: Is Bengaluru heading for Day Zero?

TNN | Feb 13, 2018, 05.53 AM IST

**INDIA'S SILICON VALLEY IS DYING OF THIRST.  
YOUR CITY MAY BE NEXT**



The Morning News

**BREAKING NEWS | B'LURU BRACES FOR WATER CRISIS  
B'LURU TO FACE WATER CRISIS IN MAY**

B'lore sucking itself dry

1 High Court and Cubbon Park have the highest amount of ground water recharge

Peripheral areas have least amount of recharge

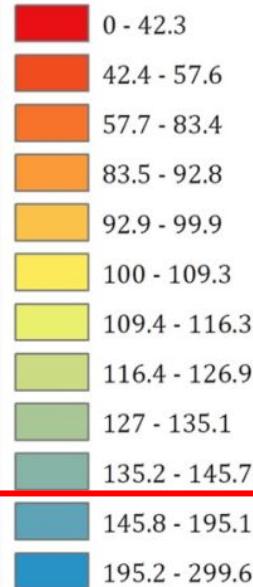
Ground water level (in metres) of city's different parts as recorded by Mines and Geology Dept in 2011

Bengaluru's Water Woes: Demand-Supply Gap Rising

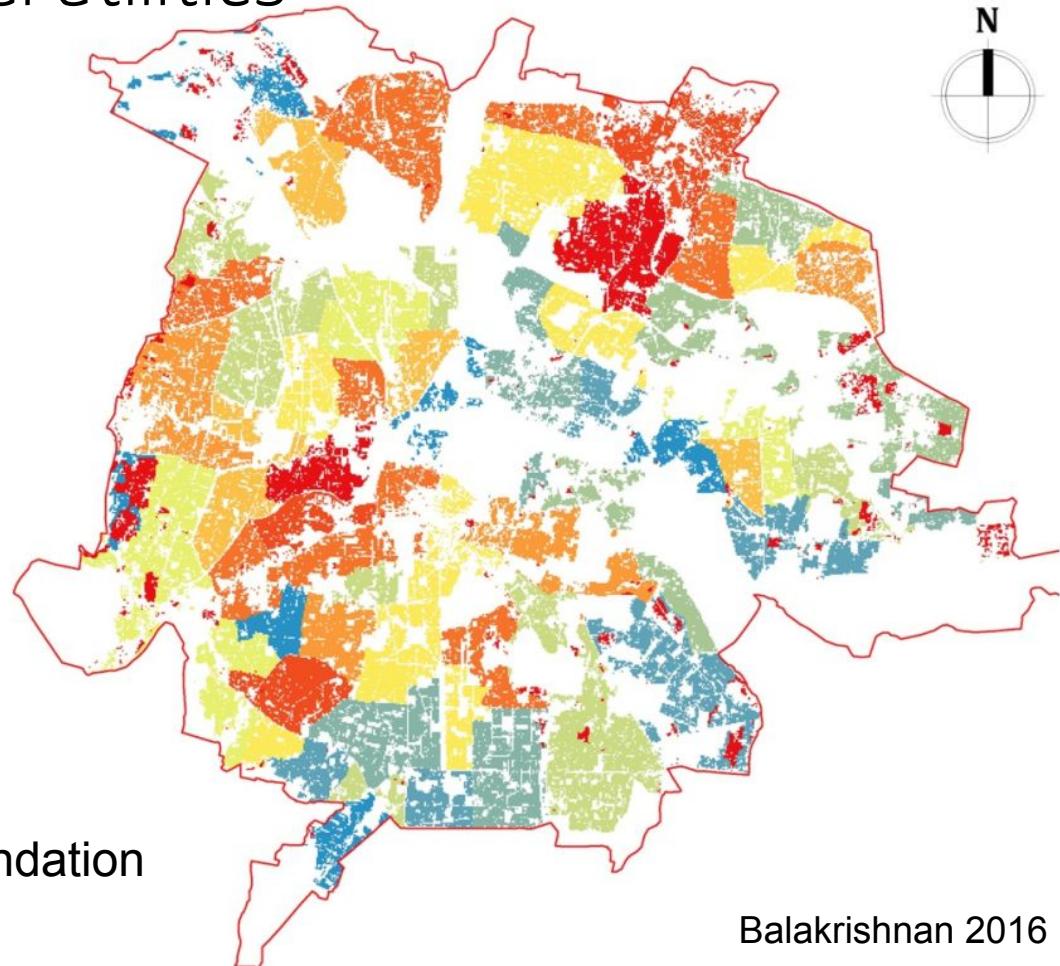


# Water supplied by municipal utilities

**Water availability**  
(liters per capita per day)  
Quantile classification



Above WHO recommendation  
of 150 lpcd



# Differing water ‘compensation practices’



# Water use as an 'everyday' practice

- Water compensation practices happen within a residential association or household
- Not everyone has access to all water compensation practices
  - *Who* has access to *which* depends on an individual's identity
- Individual compensation practices are missed by a macro-political ecology approach that focuses on class



© Soni, Bangalore Mirror

# Stories of water compensation

Semi-structured interviews

Sketch mapping

- Stories about how and why households choose their water compensation practices
- Spatial patterns of water bodies and mosquito habitat mapped by participants and researchers
- Use of grounded visualization to iteratively analyze maps and narratives

# Patterns of mosquito abundance

Sketch mapping

Mosquito surveys

- Sketch mapping of areas where people experience high exposure to mosquitoes
- Survey of household water bodies for immature mosquitoes
- Survey of adult mosquito abundances
- Comparison of spatial patterns



MY  
DISSERTATION

IS THIS 'TRUE INTEGRATION'?

# A hybrid approach

Three levels of hybrid practice:

- 1) Use quantitative techniques to address topics conventionally under the realm of critical or social sciences
- 2) Use of quantitative techniques with qualitative knowledge and understanding
- 3) “True integration” of quantitative methods with critical social theory

- 1 ) Political ecology approach is concerned with how individuals' identities limit or enable water compensation practices
- 2) Use of qualitative data (narratives, sketched maps) from conventionally 'non-expert' sources to create maps of water compensation practices
- 3) Based in social theory, but still unnecessarily reducing qualitative data down to numbers and maps

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# How do we achieve ‘true integration’?

- Practice self-reflection to be aware of bias
- Engage theory and methodologies, not just methods and analysis
- Critique the knowledge hierarchy & dichotomy
- Use multiple perspectives
- Challenge the myths of knowledge production through research

# Thank you!



UNIVERSITY OF  
**GEORGIA**  
Odum School of Ecology



UNIVERSITY OF  
**GEORGIA**  
Graduate School



**Committee members:** John Drake, Rico Holdo, Courtney Murdock, Jenn Rice, Jerry Shannon

# Questions?

