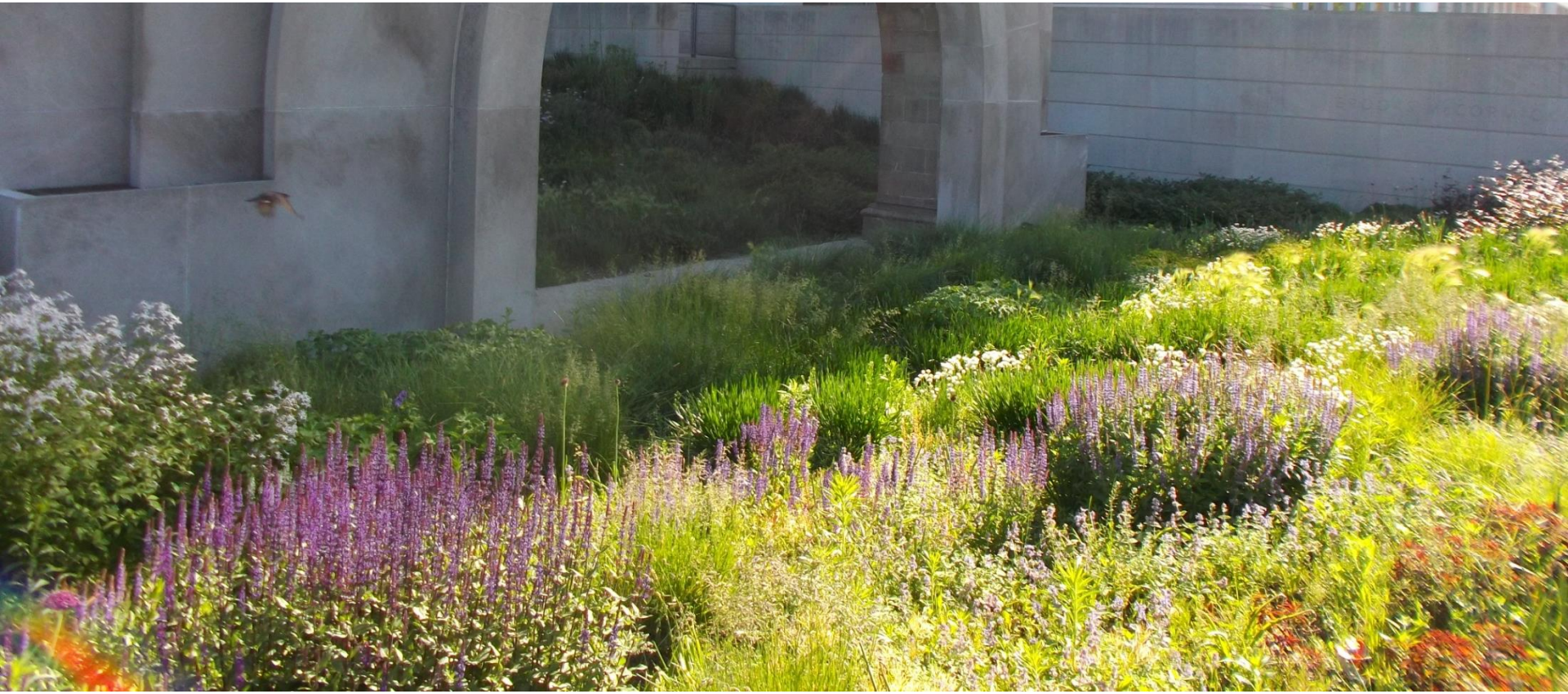
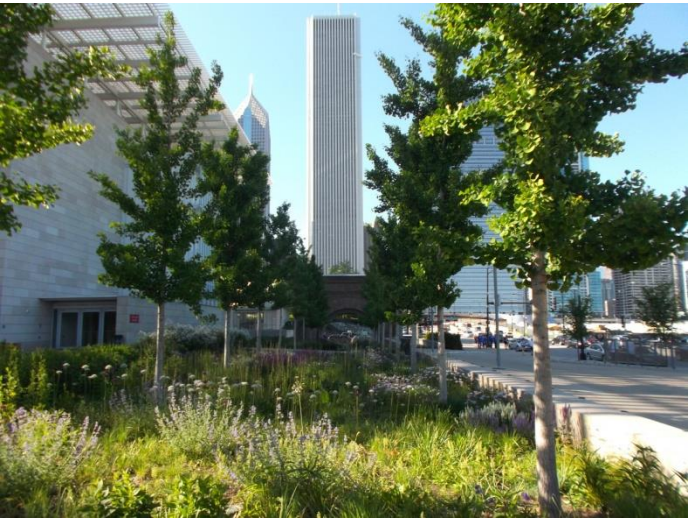
Green Infrastructure That Promotes Environmental and Human Health



Donying Li, Barbara Minsker, Sun Young Park, Ankit Rai, Art Schmidt, Bill Sullivan, and Pongsakorn Suppakittpaisarn

Green Stormwater Infrastructure (GI)

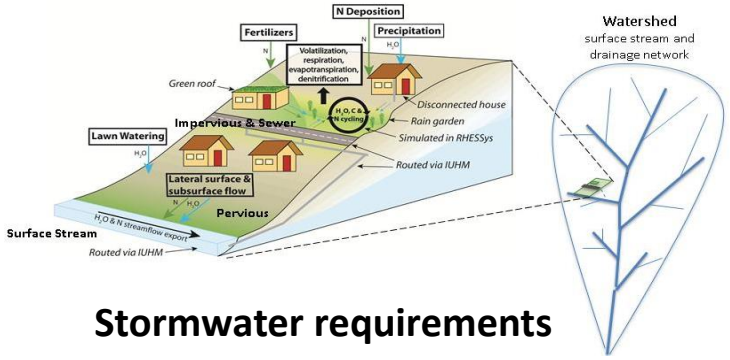


Research Motivation

How can urban green infrastructure design promote ecosystem and human health along with stormwater management?

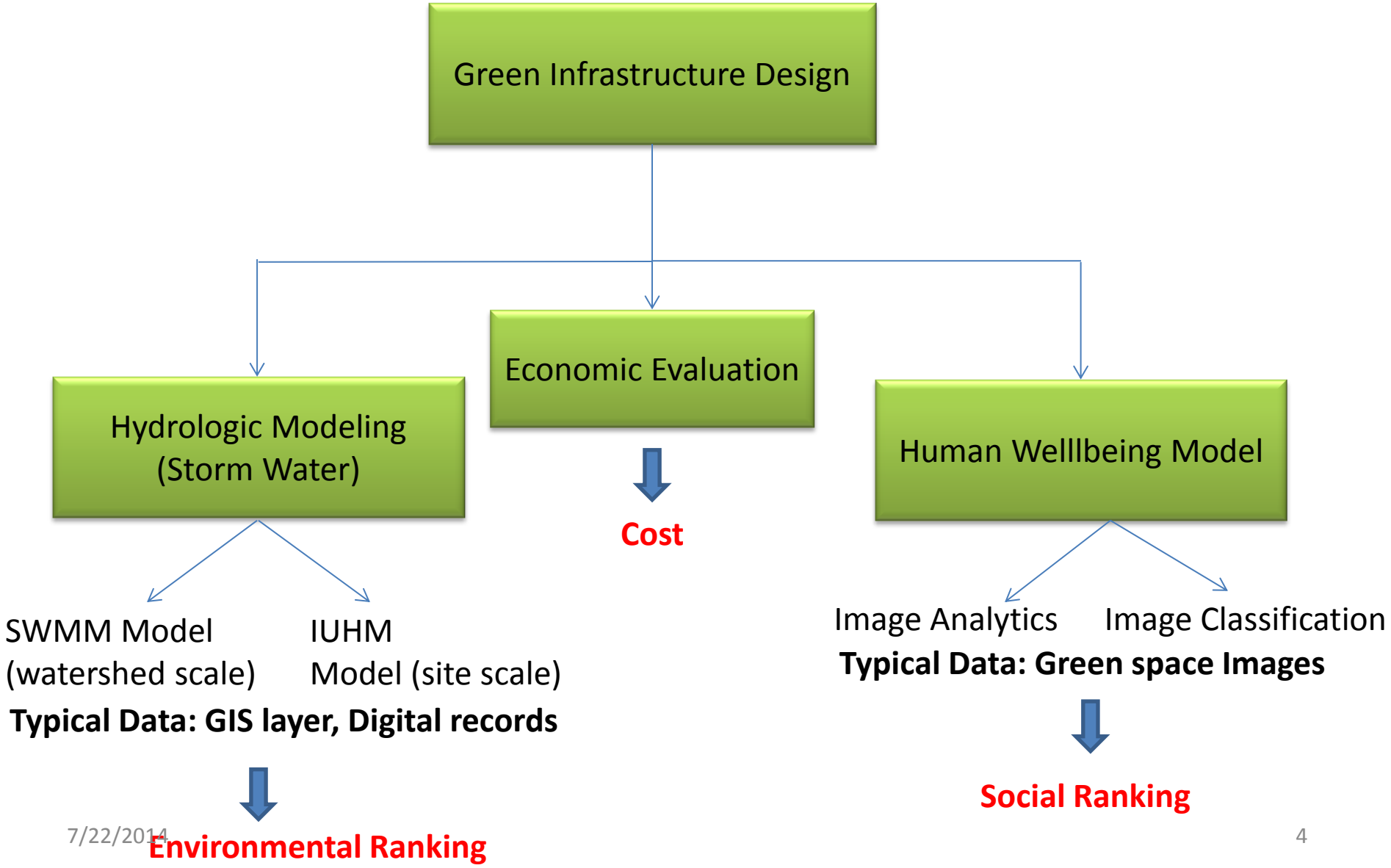
Green Infrastructure

Stakeholders



Stormwater requirements

GI Design Methodology



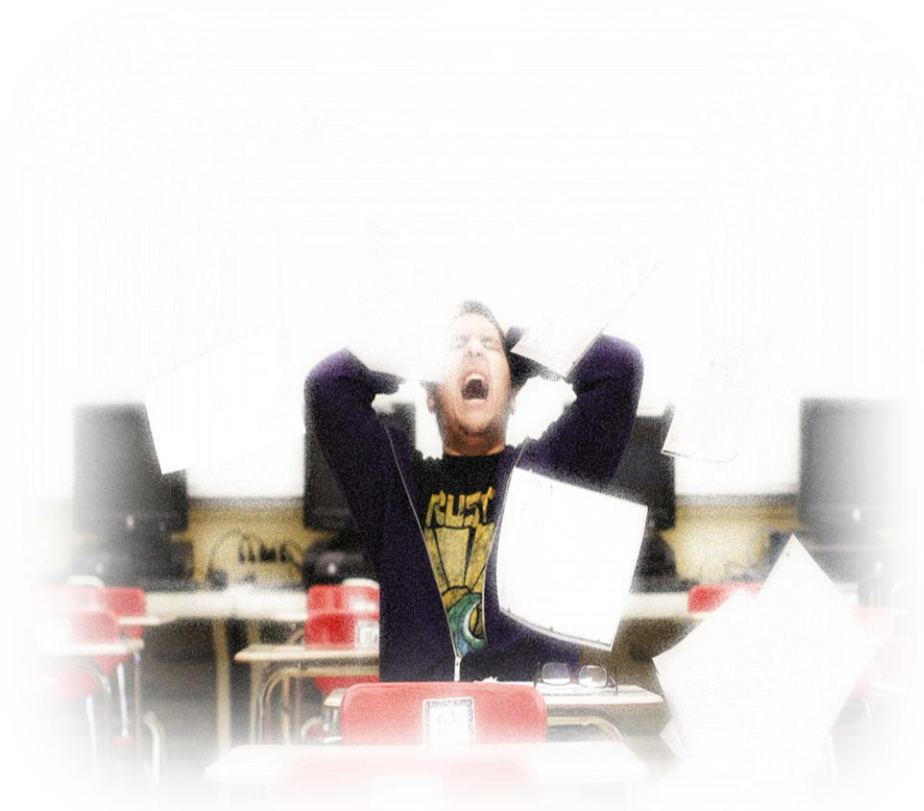
Research Questions

- What types of, and designs for, GI do people prefer?
- What is the relationship between accessibility to green space and psychological well-being?
- How can we best predict GI impacts to enable improved design?
- How does spatial scale affect GI predictions and what models are most accurate at each scale?

MORE DETAILS ON RESEARCH CONTEXT

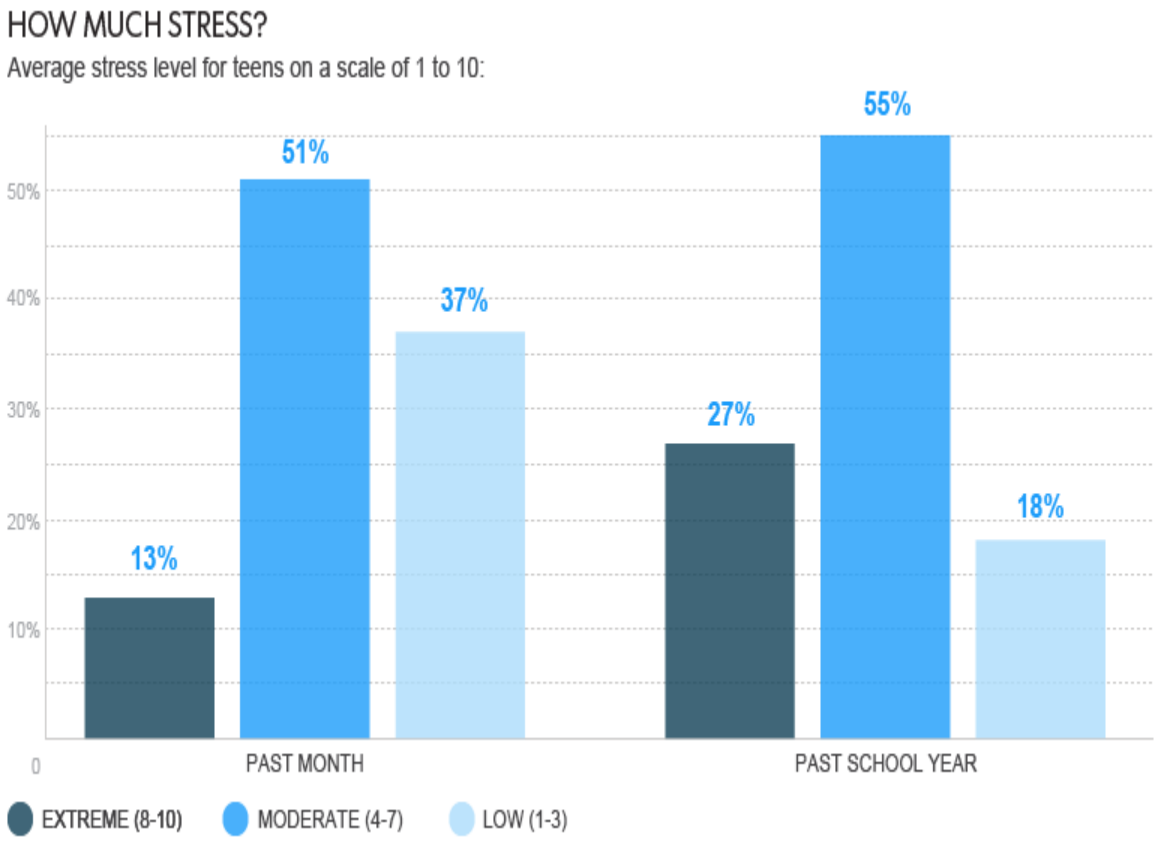
Research context

High School Stress



Research context

High School Stress

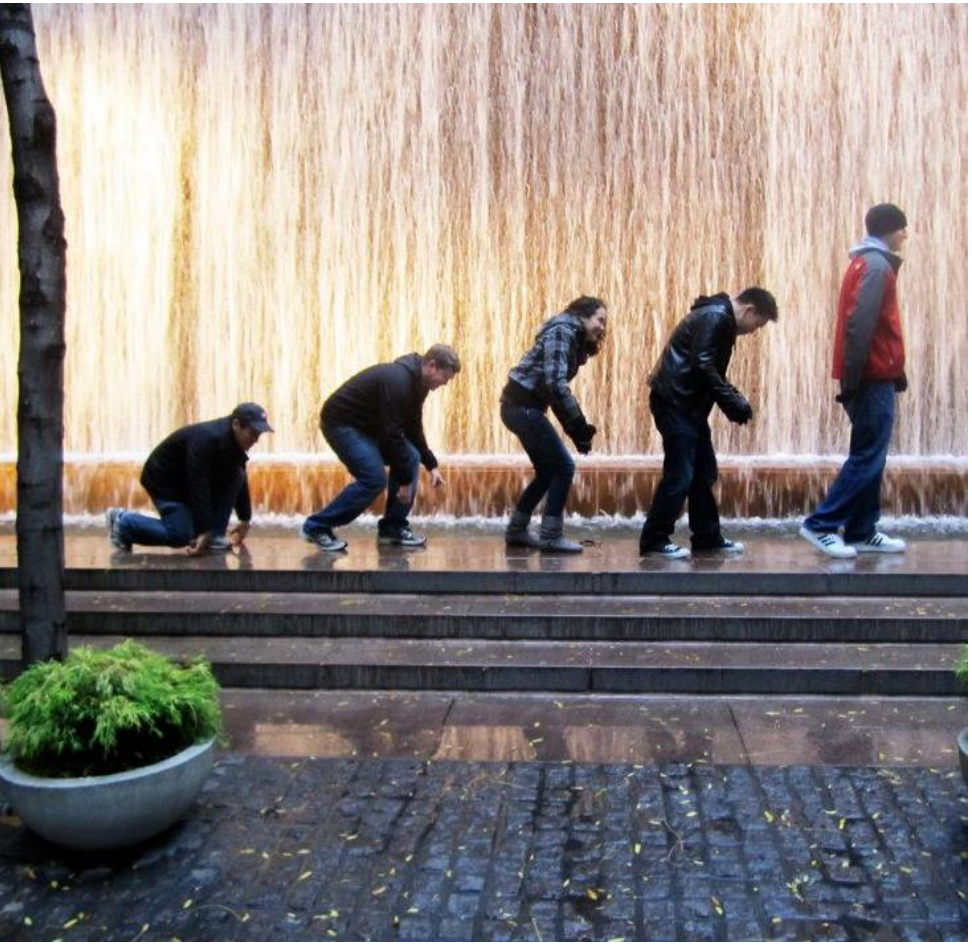


Online survey of 1,018 U.S. teens (ages 13-17) and by Harris Interactive for the American Psychological Association, August

Research context

NATURE AS A PRESCRIPTION FOR STRESS AND MENTAL FATIGUE

What we don’t know

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Predicting GI Preferences With Image & Text Mining

(a) A low preference setting

(b) A high preference setting

Human Preference & Health Prediction Framework

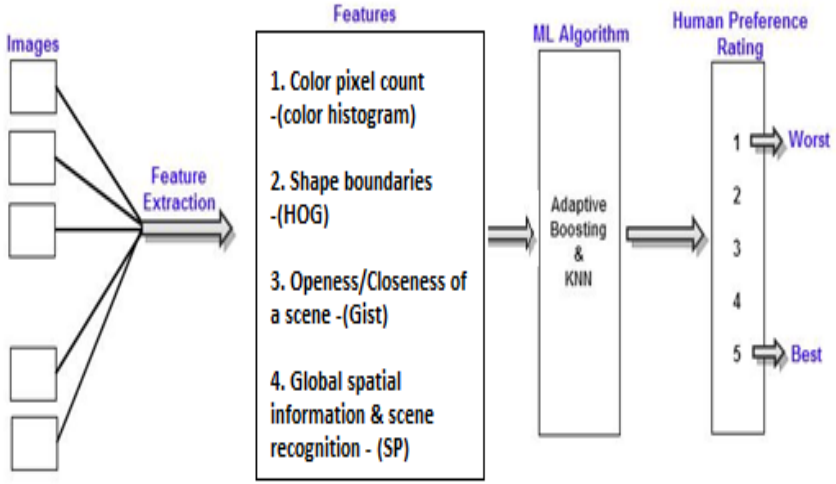


Figure 1: Stages involve in human preference model

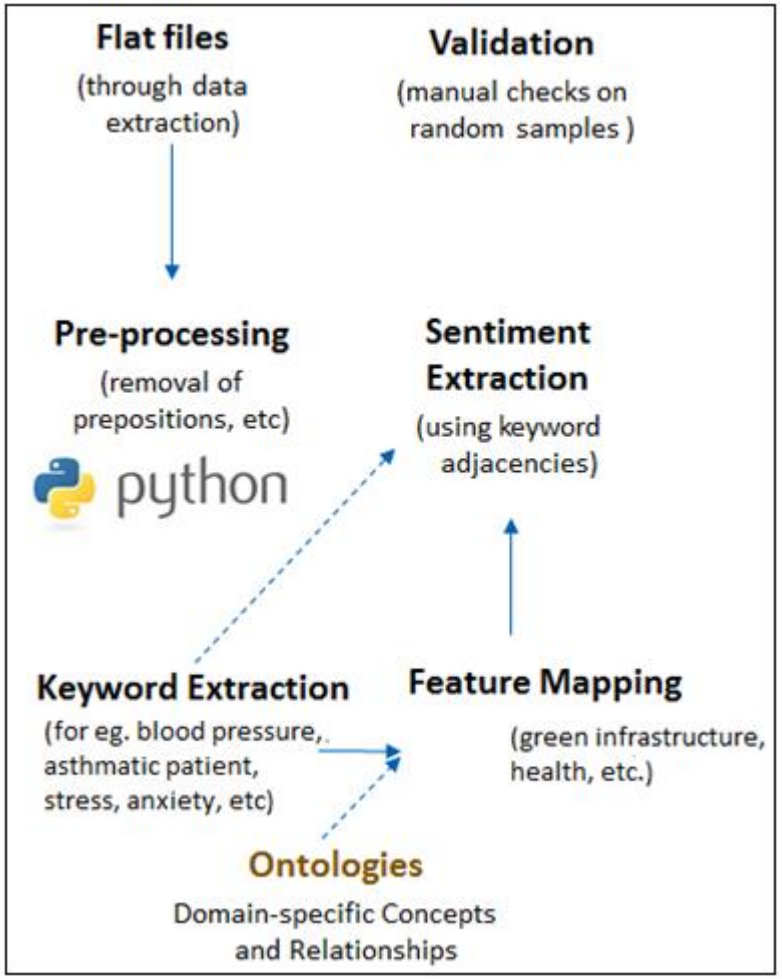
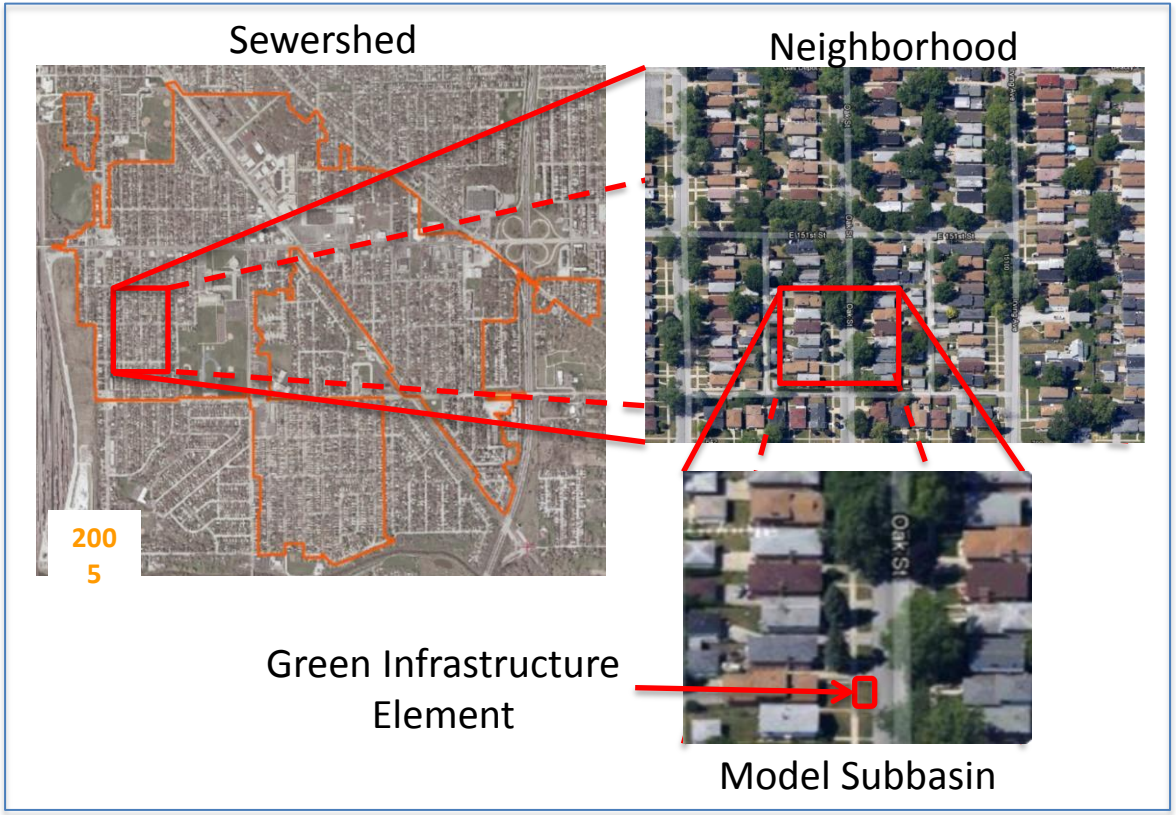


Figure 2: Unstructured text mining for human health prediction

Modeling Hydrologic Performance of GI

Incorporating numerical models at different scales

Scale for Design/Plan



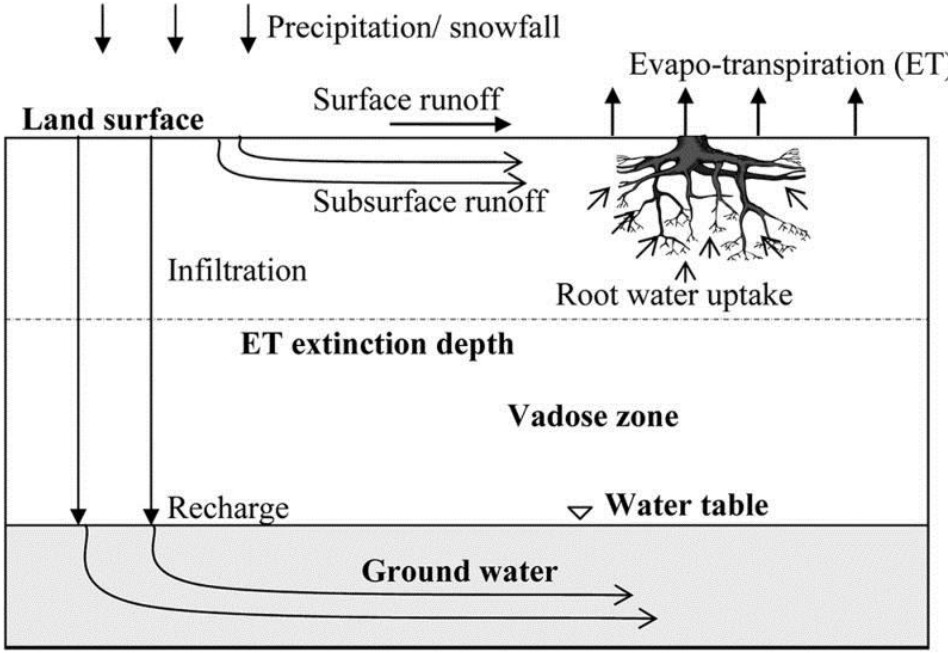
Scale for Human Health

Scale for Modeling GI

Figure 1. Different scales for each purposes

Modeling Hydrologic Performance of GI

- **Examine how GI affects vertically complex systems**



RHESSYS

HYDRUS1D

Figure 2. Water flows in drainage system

Butler and Davies (2004)

Modeling Performance of GI

- Incorporation of numerical models considering different scales

Model	Scale
HYDRUS1D / RHESSYS	Site
IUHM	Catchment / Sewershed
SWMM5 / INFOWORKS	Collection system

- Couple with human preference and health to assess design tradeoffs

- Translate visualizations of GI into model input parameters

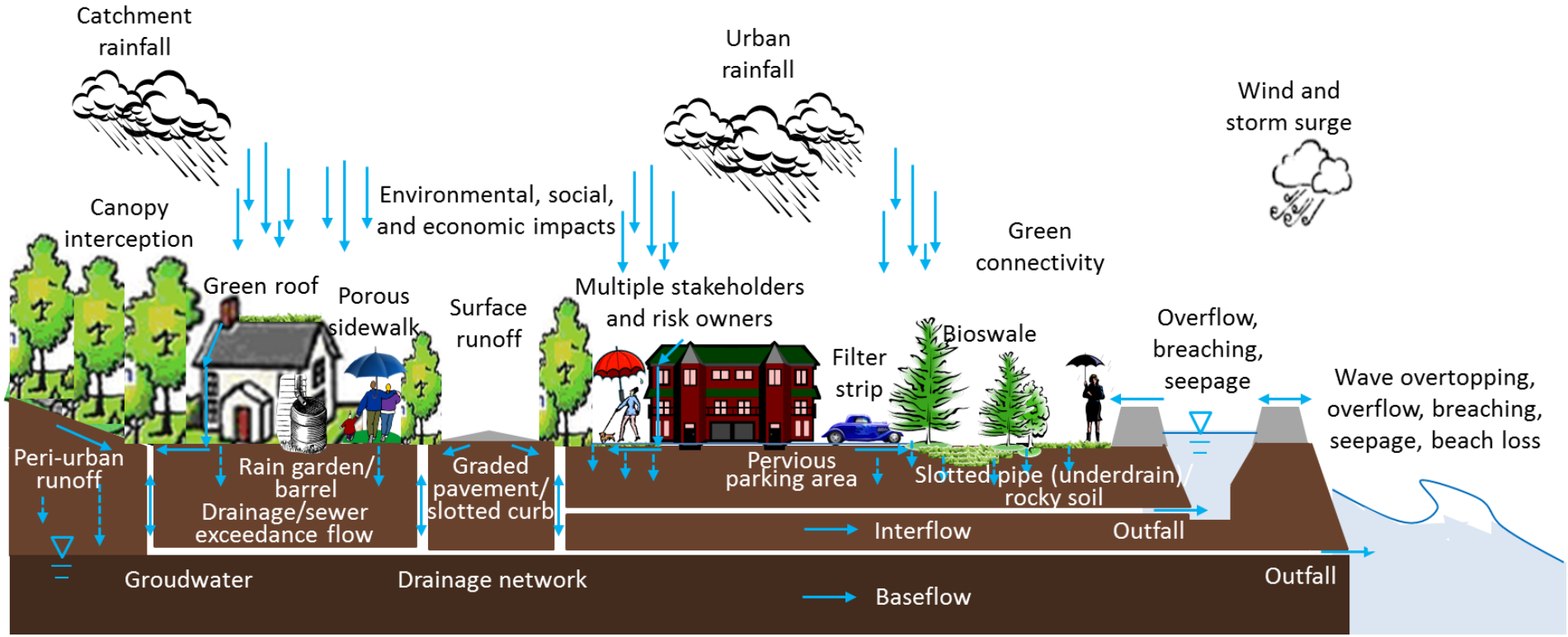
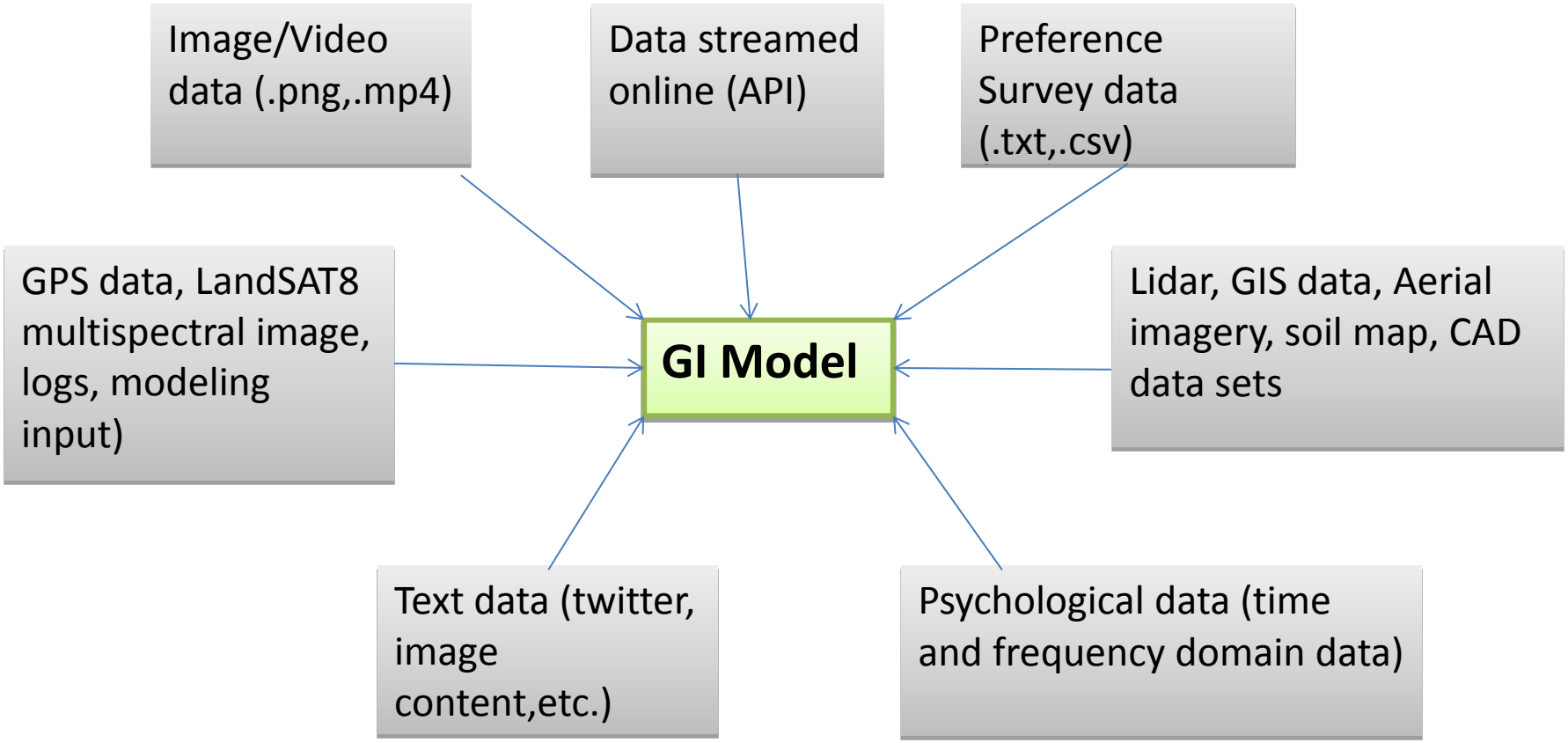


Figure 3. Schematic features of an integrated urban drainage system

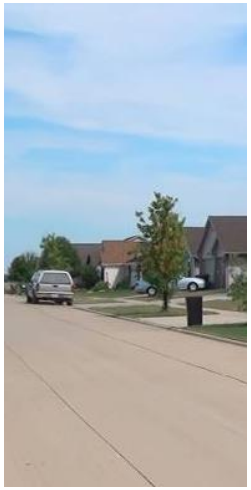
RAW DATA

Data Types (Unstructured/Un-curated data)



TOOLS

Brown Dog Tool: Text Content Analyst



- Open narrative questionnaire

- More complicated text- mining approach

Brown Dog Tool: Text Content Analyst

41.88° N, 87.62° W; Chicago, IL

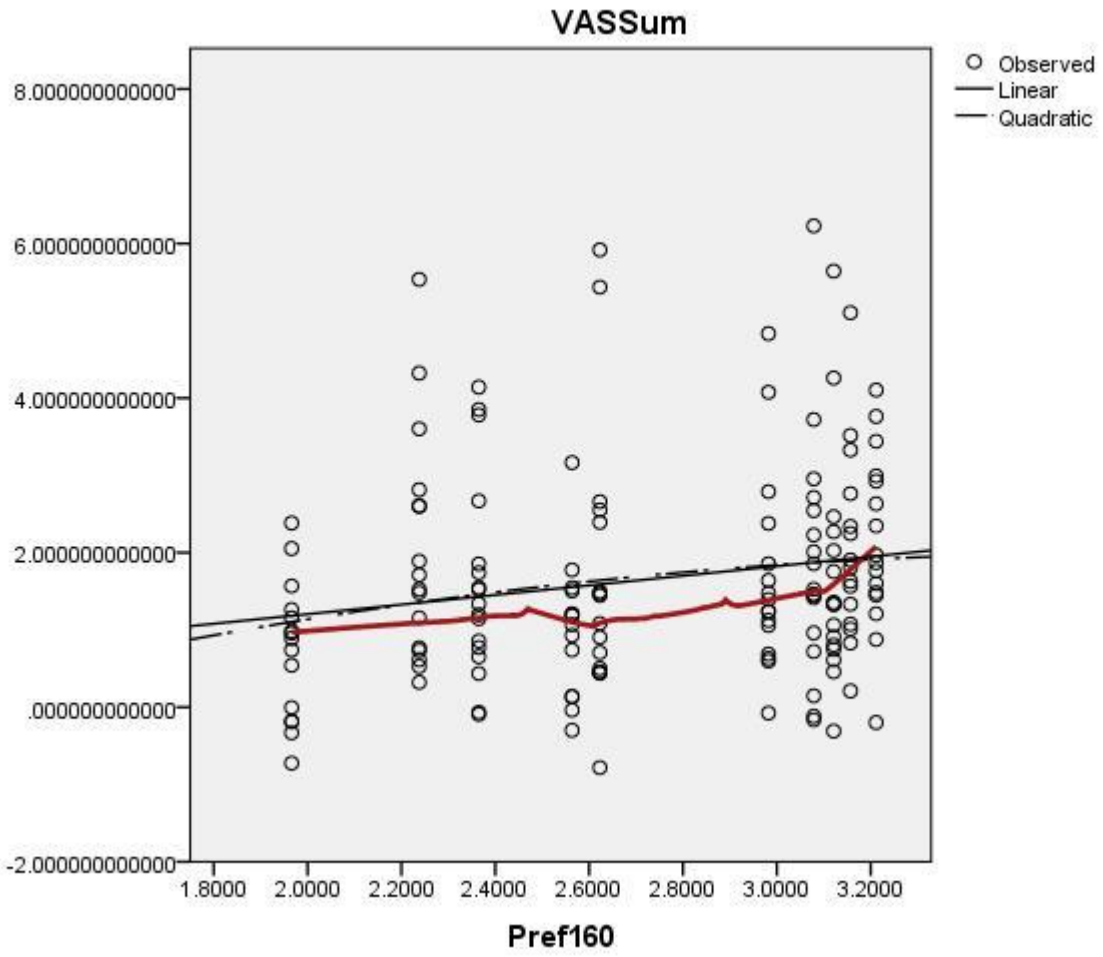
I love this tree. This is so beautiful

41.88° N, 87.62° W; Chicago, IL

Rain garden at my kid's school. What a mess!

- Analyze tones in qualitative contents

Brown Dog Tool: Statistics



- Currently using SPSS functions

- Browndog can create more user-friendly results and interpretation

Brown Dog Tool: Questionnaire Generator

How much do you like this landscape?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

- Generate questionnaires with randomized item
- Equal distribution of expected preference scores

Other Tools

- Cleaning and classifying GPS points & tracks
- Classifying raw satellite & aerial imagery into tree canopy cover map
- Translating individual GPS tracks and urban tree canopy
- Determination of model parameters
- Translation of raw watershed data into descriptions of the required elements discretized at multiple scales
- Translating GI visualization into georeferenced model parameters