

This project aims to better define and evaluate social vulnerability during flooding events through the development and comparison of three methodologies. The first methodology, Hazard LULU, was developed to measure the social vulnerability aspects of the Hazardous materials using the Federal Emergency Management Association (FEMA) through a weighted overlay analysis at the census block level. In order to increase the granularity and specificity of this model, method two, the Flooding Vulnerability Index (FVI), built directly off Hazard LULU through the incorporation of additional social and environmental vulnerability indicators through a weighted overlay analysis at the building level. The last method, FVI + Accessibility, built directly off the FVI by adding measures of accessibility through both a service area analysis and a closest-facility network analysis before completing the final weighted overlay analysis at the building level. The findings of the three methods were then compared to the inundation area of 2013's Superstorm Sandy event.

What social and spatial metrics are best used to identify the communities who are most vulnerable during flooding events?

Where in Brooklyn are these communities located?

Methods & Results



1. Hazus Lite

The Hazus Lite SVI is constructed by demographic information from "Shelters Category Weights."

Variables Considered

- Income
- Ethnicity
 - Black
 - Hispanic
 - Native American
 - Asian
- Group Quarters
- Age
 - Under 18 and Over 64

2. Flooding Vulnerability Index (FVI)

From Harvard Life

- Income
- Ethnicity
 - Black
 - Hispanic
 - Native American
 - Asian
- Group Quarters

Modified from Hazus.

- Age
Modifying range to Under 16 and Over 75

New Demographics Proxys

- Single-Parent Households
- Live alone
- Speaks English "Less than very well"

Proximity Index

- Flood Plain & Elevation

Zooming in

The most impacted neighborhoods within Superstorm Sandy

A Redhook: This snapshot displays the acute vulnerability of Red Hook based on low elevation and coastal proximity, creating conditions for extreme flood inundation. Though NYCHA properties are highlighted by the white square, vulnerability extends to the general building stock.

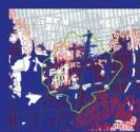
6 Sheepshead Bay: Using the NTA boundaries, this coastal community contains the highest count of vulnerable residential units in Brooklyn, where high vulnerability is categorized as a PVI in the 80th percentile.



How to make (an engaging) poster?



Every day resources and community
(Service area analysis 1/4 mile - 1/2 mile)



Service Area Analysis: The residential building outlined in green above has a 1/2 mile accessibility which we are considering a 15 minute walk, which is reduced by 81% when the 100 year floodplain polygon is incorporated as a barrier within the service area accessibility analysis. This statistic was calculated for every residential building in Brooklyn and was included as a layer within the weighted overlay analysis for the FVA Accessibility method.

Hospitals, Schools & Community Centers (Network analysis)



Network analysis: The above coding analysis shows the change in accessibility to hospitals from residential buildings. In this example, observed facility changes from one which is 10 years to one which is ~2.5 miles away (a decrease in distance). The same analysis was performed for schools and community centers and the percent change (stable) for both was included as a layer within the weighted overlay analysis for the PUL + Accessibility, rather

C **Contest**

Here we can see that the Sandy inundation extends beyond the flood plain affecting less vulnerable buildings. This shows our reliance on coastal and tidal flooding for our FvF and the need to incorporate inland flooding scenarios.



Ankita Singhvi
Glòria Serra Coch

May 7 2025

WHAT?

Some practical items:

- deadlines
- content
- evaluation

- **22.05.2025:** Submit poster to Moodle by **9:00am**
- **28.05.2025:** Presentations, whole group must be present
- **28.05.2025:** Do the critical evaluation individually of another poster
- **30.05.2025:** Submit critical evaluation

Guidelines updated!

General

[Collapse all](#)

The course will be given on campus (BS 170) every Wednesday's from 13:15-15:00, followed by an exercise session until 16:00 (BS 170).

Announcements

List of Groups

Template for data collection

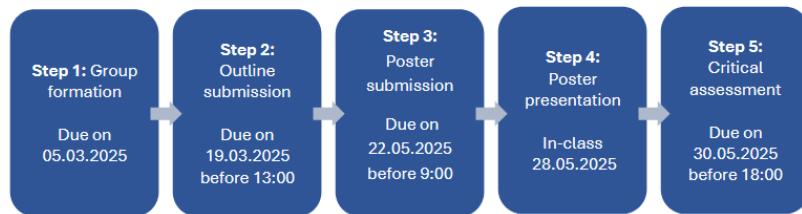
Guidelines for the Project

Guidelines for group project

Updated 07-05-2025

- The goal of the group project is to mobilize the concepts and tools presented during the lectures, and in the suggested reading.
- As a general rule, each group will be made of 4 students.
- Each group is expected to: (i) evaluate and compare the sustainability of 4 cities; and (ii) report the results of their assessment in the form of an oral presentation with an A0 poster.
- At the end of the project, students will be able to independently carry out a comparative sustainability assessment of cities and develop critical reflections on the theory and methodology introduced in the lectures.

Submission timeline



Step 1: Group formation

Form groups of four students and submit the group list on Moodle. Together, select four cities that share a common characteristic to ensure meaningful comparisons. For example, this could be a thematic focus on:

- Geographical factors (e.g., Swiss cities, Mediterranean cities)
- Economic factors (e.g., developing cities, post-industrial hubs, tourism-dependent cities, recession-hit cities)
- Social factors (e.g., cities with declining populations, commuter towns)

Step 2: Outline

Each group must submit a 2-page outline (excluding the bibliography) for review by supervisors. The outline should include:

1. Motivation of the study and RQ



WHO guideline: $\text{PM}_{2.5} < 5 \mu\text{g}/\text{m}^3$

Milan: $28.6 \mu\text{g}/\text{m}^3$

Cairo: $47.4 \mu\text{g}/\text{m}^3$

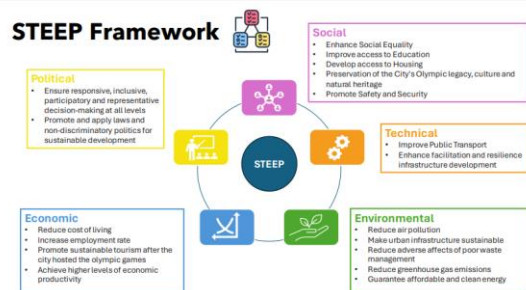
Lima: $25.6 \mu\text{g}/\text{m}^3$

New Delhi: $89.1 \mu\text{g}/\text{m}^3$



Which of London, Rio de Janeiro, Beijing, Sydney linked by their Summer Olympic experience is the most sustainable?

1. Motivation of the study and RQ
2. Definition of sustainability specific to your cities + graphic representation of your conceptual framework



	Social/cultural	Environmental	Economical	Political
Food supply	Access to food, diversity of the needs, sufficient production	Impact of the agriculture, the transportation and the distribution	Cost of production, infrastructure costs	Support to the agriculture
Inequalities	Different backgrounds		Distribution of the money	Regulations to support minorities
Security	Feel safe in the city, amount of crimes	Natural disaster	Infrastructure and security personal costs	Measures put in place, surveillance, police
Energy demand	Access to electricity	Electricity production from fossil energies	Electric infrastructures (bring electricity to the households)	Energy plan (renewable)
High Waste production	Waste in the streets, different habits	Recycling or burning	Cost of waste collection	Waste management
Education	Amount, geographic distribution and quality of schools		Cost of education	Increase of education quality, financial help
Traffic/mobility	Access to mobility, public transportation	Car Pollution, amount of cars	Cost of public transportation infrastructure	Lack of public transport, cyclic area
Health infrastructure	Access to hospitals		Hospital fees for poor people	Health insurance
Housing	Access to a living place, suburb	Material usage	High accommodation cost	Regulations for housing distribution
Water supply systems and wastewater	Usage of tap water	Wastewater, pollution of the rivers/lakes	Cost of infrastructure	Wastewater management
Pollution	Smog, air breathability	Industry/agricultural/traffic pollution	Costs for implementing solutions to reduce CO2 emissions	Regulations to reduce pollution problems

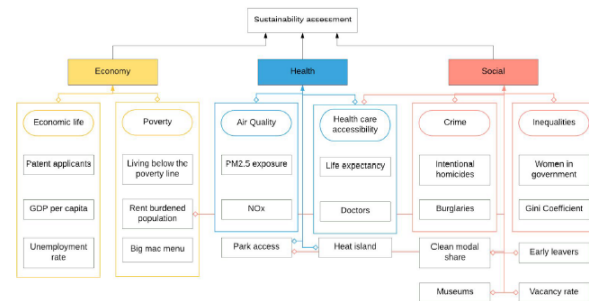
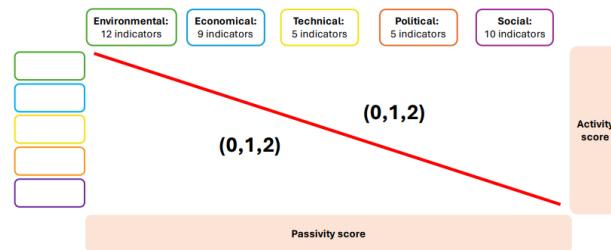
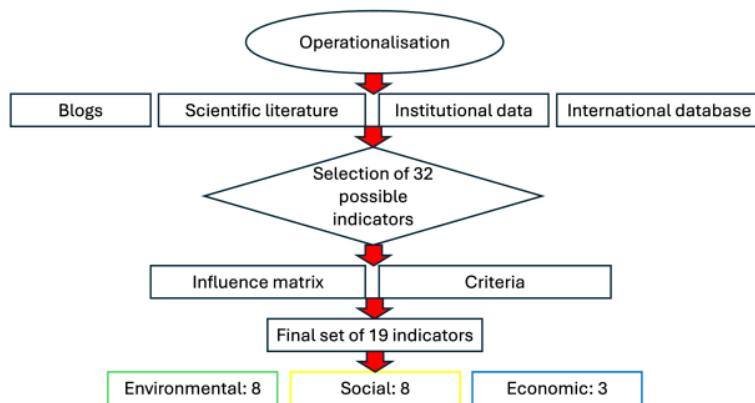


Figure 2: Conceptual Framework

Figure 5.2: Framework

1. Motivation of the study and RQ
2. Definition of sustainability specific to your cities + graphic representation of your conceptual framework
3. Methods and materials



Multi-criteria assessment - Weighting

		Weighting Decision Matrix (WDM)						
		social	environ	tech	poli	eco		
A	Person 1	0.2	0.3	0.2	0.15	0.15	1	Domains
	Person 2	0.3	0.25	0.25	0.1	0.1	1	
	Person 3	0.25	0.25	0.15	0.15	0.2	1	
	Person 4	0.3	0.25	0.2	0.15	0.1	1	
Group decision		0.2	0.25	0.2	0.1375	0.1375	1	X
	Env_1P	0.2	0.3	0.2	0.15	0.15	0.15	Indicators
	Soc_1P	0.3	0.25	0.25	0.1	0.1	0.25	
	Env_2P	0.25	0.25	0.15	0.15	0.1	0.15	
	Soc_2P	0.3	0.25	0.2	0.15	0.1	0.1	
	Env_3P	0.2	0.25	0.2	0.1375	0.1375	0.25	
	Soc_3P	0.3	0.25	0.2	0.1375	0.1375	0.1	
	Env_4P	0.2	0.25	0.2	0.1375	0.1375	0.1	
	Soc_4P	0.3	0.25	0.2	0.1375	0.1375	0.1	
	Env_5P	0.2	0.25	0.2	0.1375	0.1375	0.1	
	Soc_5P	0.3	0.25	0.2	0.1375	0.1375	0.1	
	Env_6P	0.2	0.25	0.2	0.1375	0.1375	0.1	
	Soc_6P	0.3	0.25	0.2	0.1375	0.1375	0.1	

1. Motivation of the study and RQ
2. Definition of sustainability specific to your cities + graphic representation of your conceptual framework
3. Methods and materials
4. Results

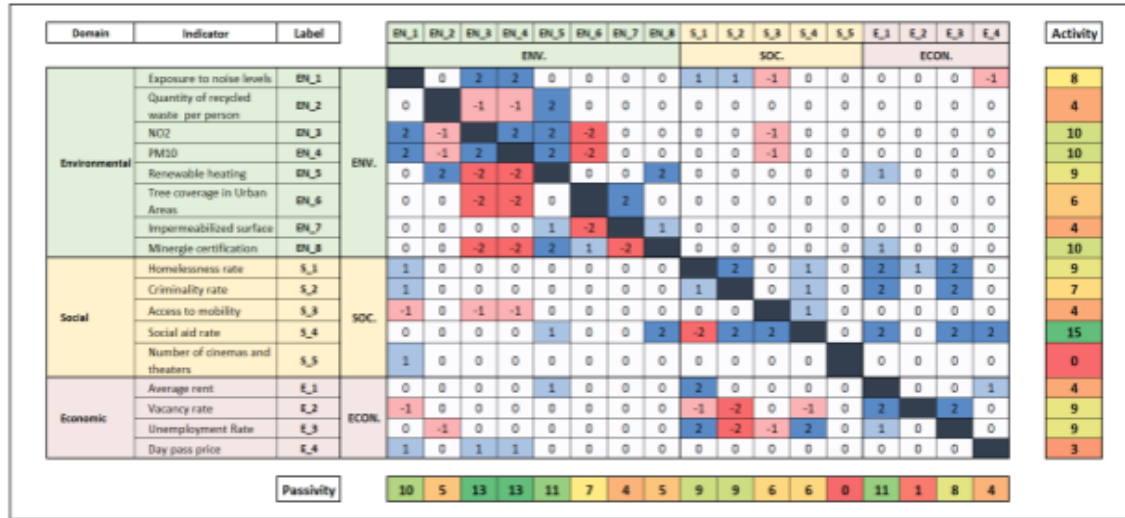
1. Motivation of the study and RQ
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3. Methods and materials
4. Results
 - a. Final indicators

Domains	Goals	Indicators label and Metrics	
ECONOMIC	Reduce Unemployment Rate	Unemployment Rate	%
	Improve access to public transportation	Day pass price	CHF
	Improve access to affordable housing	Average rent	CHF
	Reduce vacancy rate	Vacancy rate	%
	Reduce Air Pollution	NO2 and PM10	µg/m3
	Reduce Noise Pollution	Exposure to noise levels	dB
ENVIRONMENTAL	Improve Waste Management	Quantity of recycled waste per person	kg/capita
	Protect biodiversity	Tree coverage in Urban Areas	%
	Improve Water Management	Impermeabilized surface	%
	Enhance sustainable construction	Minergie certification	n
	Increase Renewable Energy Use	Renewable heating	%
	Ensure affordable public transportation	Public transport stops	n
SOCIAL	Ensure safety for everyone	Criminality rate	n/year
	Improve social cohesion	Homelessness rate	n
	Increase urban cultural attractiveness	Number of cinemas and theaters	n
	Reduce Poverty	Social aid rate	%

Code	Indicator Definition	Objective	Source	Years taken into account
Env 1.1	Annual mean level of fine particulate matter (PM2.5 or PM10)	↓	IQAir [13]	2023
Env 2.3	Percent of population that lives within 1km of a city-managed green space	↑	Landscape and Urban Planning[14]	2022
Env 3.3*	Amount of foodwaste	↓	UNEP [15]	2023 (London), 2022 (Rio), 2021 (Sydney), 2021 (Beijing)
Env 5.2	Renewable energy share in the total final energy consumption	↑	Worldbank [16]	2023
Eco 1.1*	Share of population that cannot afford a healthy diet	↓	OurWorldInData [17]	2021
Eco 1.2	Proportion of citizens' income that is attributed to necessities (housing, food, electricity, transport, etc.)	↓	OECD [18]	2020
Eco 2.1	Proportion of youth (aged 15-24 years) not in education, employment or training	↑	Statista [19], ILOSTAT (for Beijing) [20]	2022
Eco 3.1	Tourism direct GDP as a proportion of total GDP for 5 years directly after hosting the games	↑	SDG data (London) [21], GlobalEconomy (Rio, Sydney) [22], Environmental Science and Pollution Research (Beijing) [23]	2012-2017 (London), 2016-2020 (Rio), 2000-2005 (Sydney), 2008-2013 (Beijing)
Eco 3.3	Percentage difference of the unemployment rate during and 5 years after a city hosted the Olympic Games	↓	WorldBank [24]	2012-2017 (London), 2016-2020 (Rio), 2000-2005 (Sydney), 2008-2013 (Beijing)
Eco 4.1	GDP per capita	↑	WorldBank [25]	2022
Tech 1.3*	Number of buses by 1000 inhabitants	↑	OECD [26], China-Institute-org [27]	2021
Tech 2.1	Percent of repurposed facilities since used in the Olympics	↑	The Olympics studies centre [28]	2022
Pol 1.1	Average approval rate of local government	↑	OECD [29], Statista (Beijing) [30]	2019-2022 (London), 2019-2022 (Rio), 2019-2022 (Sydney), 2022 (Beijing)
Pol 1.2*	Country's score on global peace index	↓	Vision of Humanity [31]	2022
Pol 2.2*	Gender index	↓	OECD [32]	2019
Soc 1.1*	Income inequality measured by the Gini coefficient	↓	OECD (London, Sydney) [33], Statista (Rio) [34], Statista (Beijing) [35]	2022 (London), 2020 (Rio), 2022 (Sydney), 2022 (Beijing)
Soc 1.2	Proportion of people earning less than 50% of the median income	↓	OECD [36]	2021 (London), 2022 (Rio), 2018 (Sydney), 2020 (Beijing)
Soc 2.2	Percentage of residents aged 25-34 years with a higher education degree	↑	OECD [37], OECD (Beijing) [38]	2022
Soc 3.2	Percentage of population without a permanent residence (living in shams, informal settlements, inadequate housing)	↓	WorldPopulationReview [39]	2024
Soc 4.1	Citizen satisfaction with the hosting of the Olympic Games	↑	London School of Economics and Political Science (London) [40], The Guardian (Rio) [41], Elsevier Science (Sydney) [42], Pew Research Center (Beijing) [43]	2016 (London), 2016 (Rio), 2000 (Sydney), 2008 (Beijing)

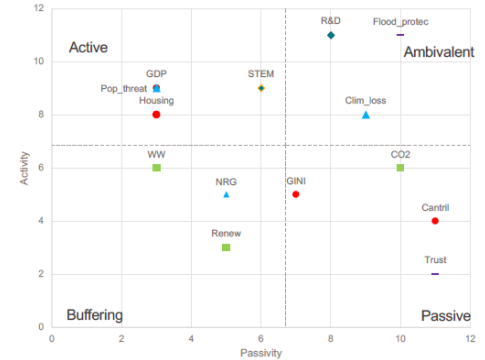
1. Motivation of the study and RQ
2. Definition of sustainability specific to your cities + graphic representation of your conceptual framework
3. Methods and materials
4. Results
 - a. Final indicators
 - b. (Influence matrix and) activity-passivity plot

Content - Influence matrix and activity-passivity plot

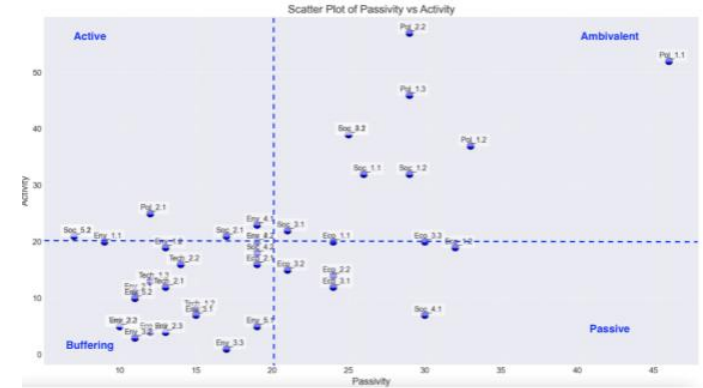
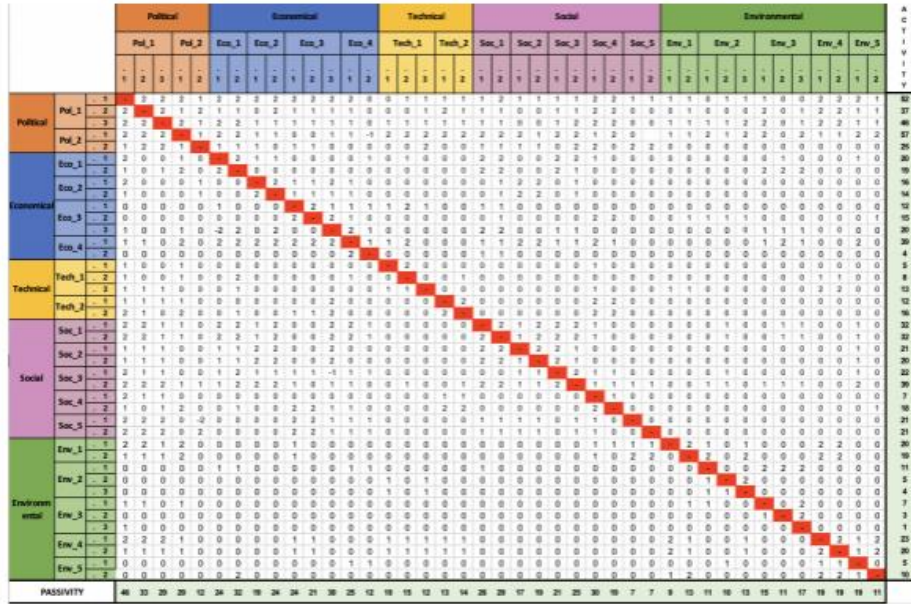


Indicators categories

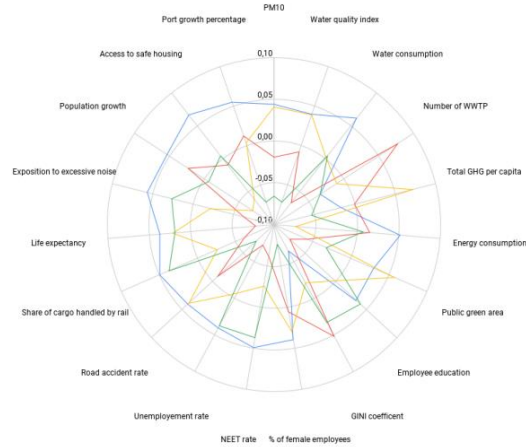
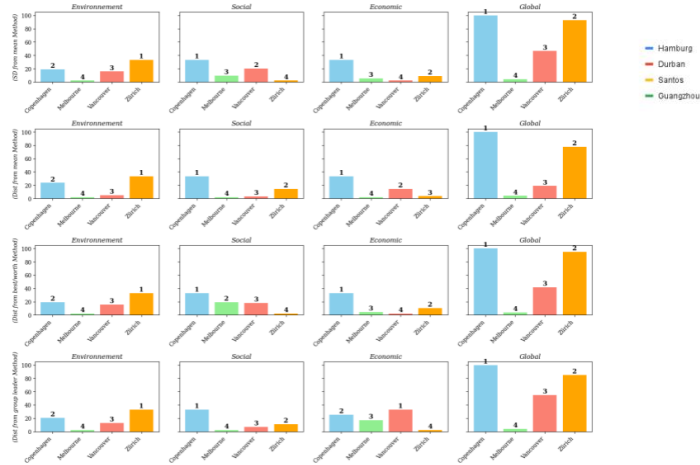
- Social
- ◆ Technological
- ▲ Economic
- Environmental
- Political



Content - Influence matrix and activity-passivity plot



1. Motivation of the study and RQ
2. Definition of sustainability specific to your cities + graphic representation of your conceptual framework
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4. Results
 - a. Final indicators
 - b. (Influence matrix and) activity-passivity plot
 - c. MCDA

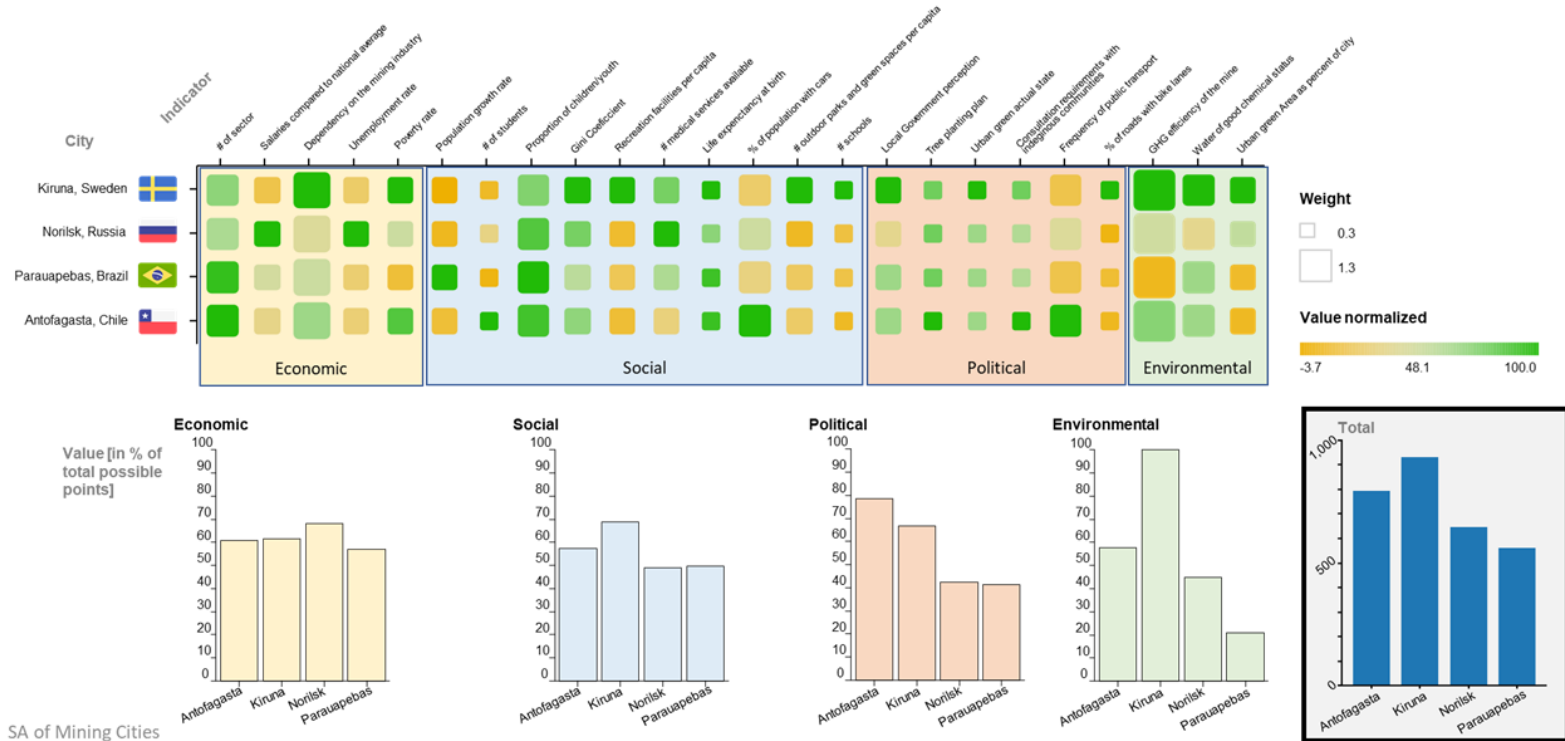


Standard Deviation from the Mean					
City	Basel	Geneva	Lausanne	Zürich	Best Options
Environmental	0.207	-0.335	0.016	0.112	Basel
Social	-0.337	-0.015	0.749	-0.398	Lausanne
Economic	-0.546	0.015	-0.693	1.223	Zürich
Sum	-0.675	-0.335	0.073	0.938	Zürich

Distance from the Mean					
City	Basel	Geneva	Lausanne	Zürich	Best Options
Environmental	108.7	80.7	101.7	109.0	Zürich - Basel
Social	81.3	110.8	118.9	89.0	Lausanne
Economic	87.0	103.3	81.0	128.6	Zürich
Sum	277.1	294.8	301.6	326.5	Zürich

Distance from the Best and Worst Performers					
City	Basel	Geneva	Lausanne	Zürich	Best Options
Environmental	476.2	294.3	421.9	453.9	Basel
Social	123.6	201.0	377.4	110.7	Lausanne
Economic	49.0	164.8	22.7	380.7	Zürich
Sum	648.8	660.1	822.0	945.4	Zürich - Lausanne

Distance from the Group Leader					
City	Basel	Geneva	Lausanne	Zürich	Best Options
Environmental	580.2	464.8	563.0	547.4	Basel
Social	297.1	372.7	417.2	309.4	Lausanne
Economic	245.0	299.5	235.3	379.2	Zürich
Sum	1122.3	1137.0	1215.4	1236.0	Zürich - Lausanne

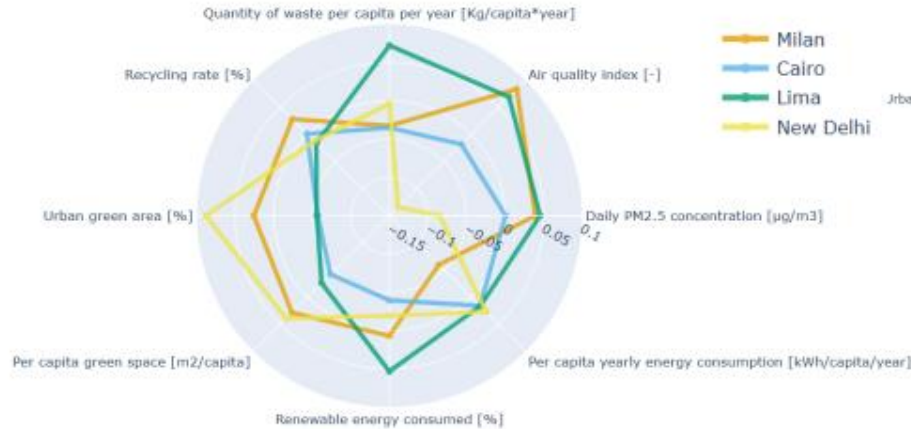
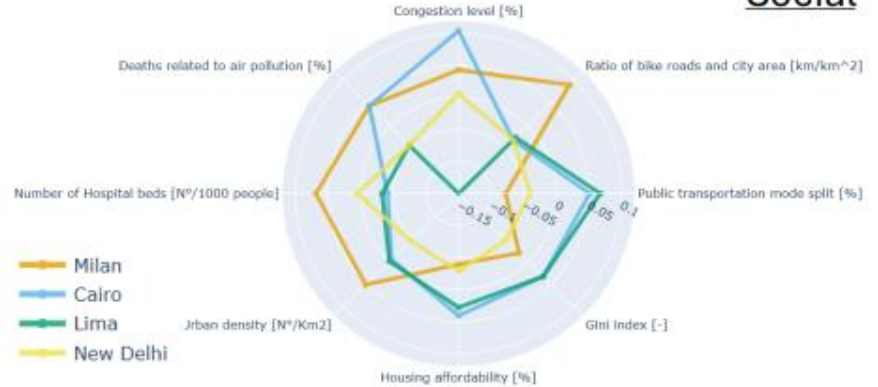


SA of Mining Cities

1. Motivation of the study and RQ
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4. Results
 - a. Final indicators
 - b. (Influence matrix and) activity-passivity plot
 - c. MCDA
5. Recommendations: Policies targeted to specific stakeholders to enhance sustainability

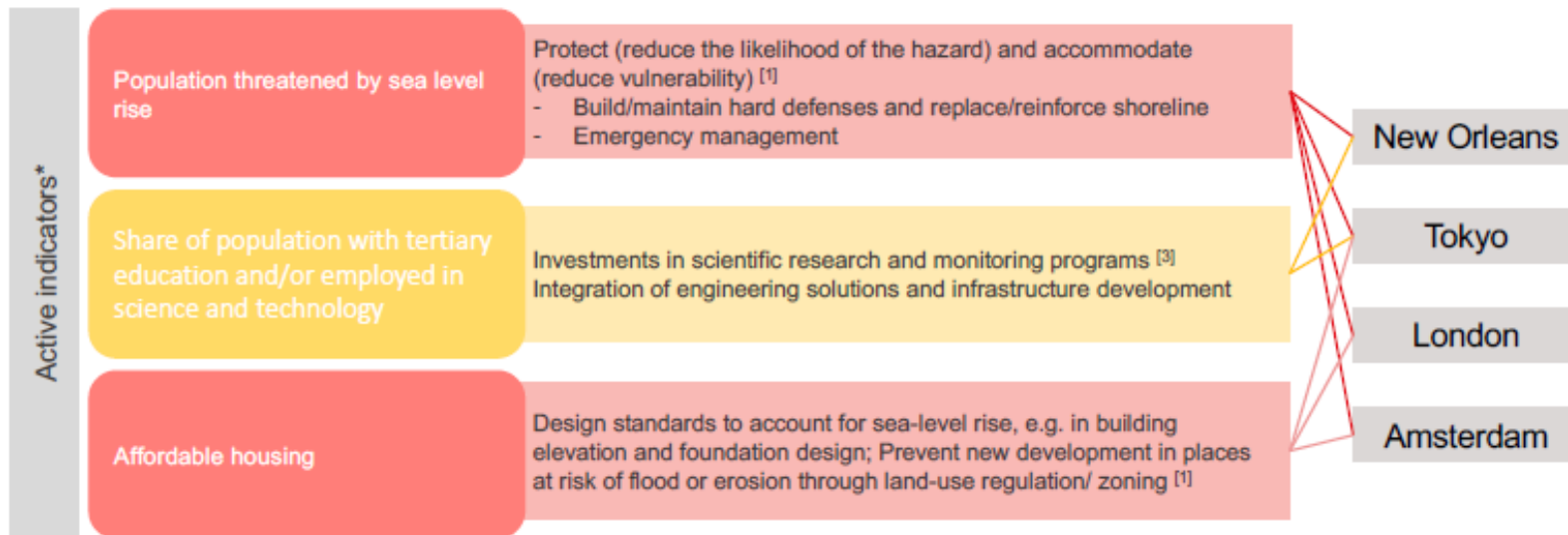
Milan

- Waste production
- Energy consumption
- Public transport split

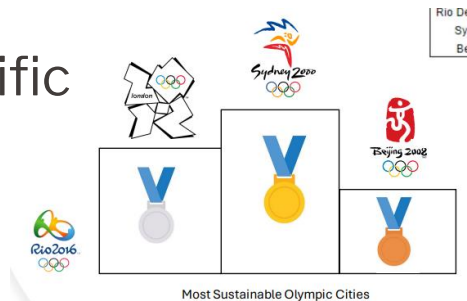
Environment**Social****Cairo**

- Bike roads
- Green areas
- Number of hospital beds

Content - Recommendations



1. Motivation of the study and RQ
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5. Recommendations: Policies targeted to specific stakeholders to enhance sustainability
6. Conclusions



- Exam - 60% of final grade
- Poster content - 20%
- Oral presentation - 10%
- Critical evaluation - 10%

WHY?

Why a poster?

The place of posters in scientific communication

- Posters are a staple of scientific communication
- Their useful characteristics are:
 - Succinct (one page)
 - Presents curated, key pieces of information
 - Understandable even without researcher to guide viewer through the content
 - Physical artefact (“in the real world”) allows a conversational starting point

HOW?

First things first,
working with your data

country	year	cases	population
Afghanistan	1999	745	19987071
Afghanistan	2000	2666	20095360
Brazil	1999	37737	172006362
Brazil	2000	80488	174504898
China	1999	212258	1272015272
China	2000	216766	128042583

variables

country	year	cases	population
Afghanistan	1999	745	19987071
Afghanistan	2000	2666	20095360
Brazil	1999	37737	172006362
Brazil	2000	80488	174504898
China	1999	212258	1272015272
China	2000	216766	128042583

observations

country	year	cases	population
Afghanistan	1999	745	19987071
Afghanistan	2000	2666	20095360
Brazil	1999	37737	172006362
Brazil	2000	80488	174504898
China	1999	212258	1272015272
China	2000	216766	128042583

values

1. Each variable must have its own column.
2. Each observation must have its own row.
3. Each value must have its own cell.

One reason data might not be tidy is because sometimes data entry doesn't make it easy.

country	year	cases
Afghanistan	1999	745
Afghanistan	2000	2666
Brazil	1999	37737
Brazil	2000	80488
China	1999	212258
China	2000	213766

country	1999	2000
Afghanistan	745	2666
Brazil	37737	80488
China	212258	213766

table4

country	year	key	value
Afghanistan	1999	cases	745
Afghanistan	1999	population	19987071
Afghanistan	2000	cases	2666
Afghanistan	2000	population	20595360
Brazil	1999	cases	37737
Brazil	1999	population	172006362
Brazil	2000	cases	80488
Brazil	2000	population	174504898
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country	year	cases	population
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Brazil	1999	37737	172006362
Brazil	2000	80488	174504898
China	1999	212258	1272915272
China	2000	213766	1280428583

table2

Domain	Goal	Indicator	Definition	units	value	aggregation	level	datatype	dataCategory	city	country	year	datasource	datasourceLink
Environemnt	Access to Clean Air for Everyone	Air quality index	A composite score of pm 2.5 and NO2	index	9	score	city	int	quantitative	Lausanne	Switzerland	2021	iqair	https://www.iqair.com/a/ir-quality-map
Environemnt	Access to Clean Air for Everyone	Air quality index	A composite score of pm 2.5 and NO3	index	61	score	city	int	quantitative	Paris	France	2021	iqair	https://www.iqair.com/a/ir-quality-map
Environemnt	Access to Clean Air for Everyone	Air quality index	A composite score of pm 2.5 and NO4	index	20	score	city	int	quantitative	Boston	United States	2021	iqair	https://www.iqair.com/a/ir-quality-map
Environemnt	Access to Clean Air for Everyone	Air quality index	A composite score of pm 2.5 and NO5	index	17	score	city	int	quantitative	Cambridge	United Kingdom	2021	iqair	https://www.iqair.com/a/ir-quality-map
Environemnt	Access to Clean Air for Everyone	total greenhouse gas emissions	Total amount of kilotonnes of Co2 emissions released	Kilotones of Co2 equivalent	500	sum	city	int	quantitative	Lausanne	Switzerland	2016	CDP	https://data.cdp.net/Emissions/2016-Citywide-Emissions-Map/iqbu-zjai
Environemnt	Access to Clean Air for Everyone	total greenhouse gas emissions	Total amount of kilotonnes of Co2 emissions released	Kilotones of Co2 equivalent	5196	sum	city	int	quantitative	Paris	France	2016	CDP	https://data.cdp.net/Emissions/2016-Citywide-Emissions-Map/iqbu-zjai
Environemnt	Access to Clean Air for Everyone	total greenhouse gas emissions	Total amount of kilotonnes of Co2 emissions released	Kilotones of Co2 equivalent	6066	sum	city	int	quantitative	Boston	United States	2016	CDP	https://data.cdp.net/Emissions/2016-Citywide-Emissions-Map/iqbu-zjai
Environemnt	Access to Clean Air for Everyone	total greenhouse gas emissions	Total amount of kilotonnes of Co2 emissions released	Kilotones of Co2 equivalent	6	sum	city	int	quantitative	Cambridge	United Kingdom	2020	Cambridge City Council	https://www.cambridge.gov.uk/media/10022/greenhouse-gas-report-2020-21.pdf

Column Dictionary

domain	The domain that indicator corresponds to
goal	the goal that you have set for sustainability
indicator	name of the indicator
definition	a description of how the indicator has been measured
value	value of the indicator
units	unit of the value
aggregation	the aggregation of the metric, i.e. sum, score, index, median, mean, etc...
level	the administrative boundary level of the data, i.e. city, region, country
datatype	the data type of the value for databases, i.e. int, float, character, boolean
data category	the category of data i.e. quantitative or qualitative, could be broken down(nominal, ordinal, etc.)
city	the city where value is for
country	the country where city is located
year	the year the value was measured
datasource	the data source provider
datasource link	the html or location of pdf for the data source

Environmental Sciences and Engineering (SIE) / SIE - Master

Sustainability assessment of urban systems

[Course](#) [Settings](#) [Participants](#) [Grades](#) [Reports](#) [More](#) ▾

▾ General

The course will be given on campus (BS 170) every Wednesday's from 13:15-15:00, followed by an exercise session until 16:00 (BS 170).



Announcements



List of Groups



Template for data collection



Guidelines for the Project

Download here and fill in
with your data, it should be
an appendix to your final
report submission!



Qualitative

vs.

Quantitative

Subjective

vs.

Objective

Qualitative

vs.

Quantitative

Data that describes
qualities or characteristics
i.e.: land use data

Data that can either be counted
or compared on a numeric scale
i.e. population density

Subjective

vs.

Objective

anecdotal information that
comes from opinions,
perceptions or experiences.
**i.e.: neighborhood
satisfaction**

actual information gathered through
observation or measurement that is
true regardless of the feelings or
opinions of the person presenting or
receiving the information.
i.e. green cover

HOW?

How to design a poster?

How to effectively use visualisations
to communicate

Check-list:

- Hierarchy
- Consistency
- Coherence
- Legibility

BACKGROUND

In the 1930s, the Home Owners' Loan Corporation (HOLC) created maps as part of its City Survey program to classify neighborhoods based on perceived level of lending risk. Color-coded boundaries drawn within a neighborhood revealed the following classifications: green for "best," blue for "still desirable," yellow for "definitely declining," and red for "hazardous." Though the maps were designed to assess risk in an effort to stabilize the housing market, they were adopted by the private market and federal appraisers, often against the advancement of those living in "redlined" areas.

This study aims to understand **how and to what extent a "methodology of assumption" impacts one's findings in spatial analysis**. Through examination of the HOLC maps and their impact on health infrastructure and investment, the results of two distinct methodologies are compared. Health infrastructure (HI) is defined as hospitals, hospital extensions, and health centers. The location examined is Brooklyn (BK), NY.

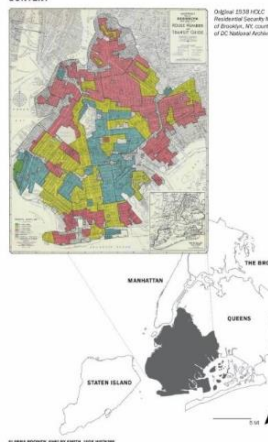
COMPARISON MATRIX

Comparisons between analyses can be made to other immediately adjacent analyses situated in the matrix.

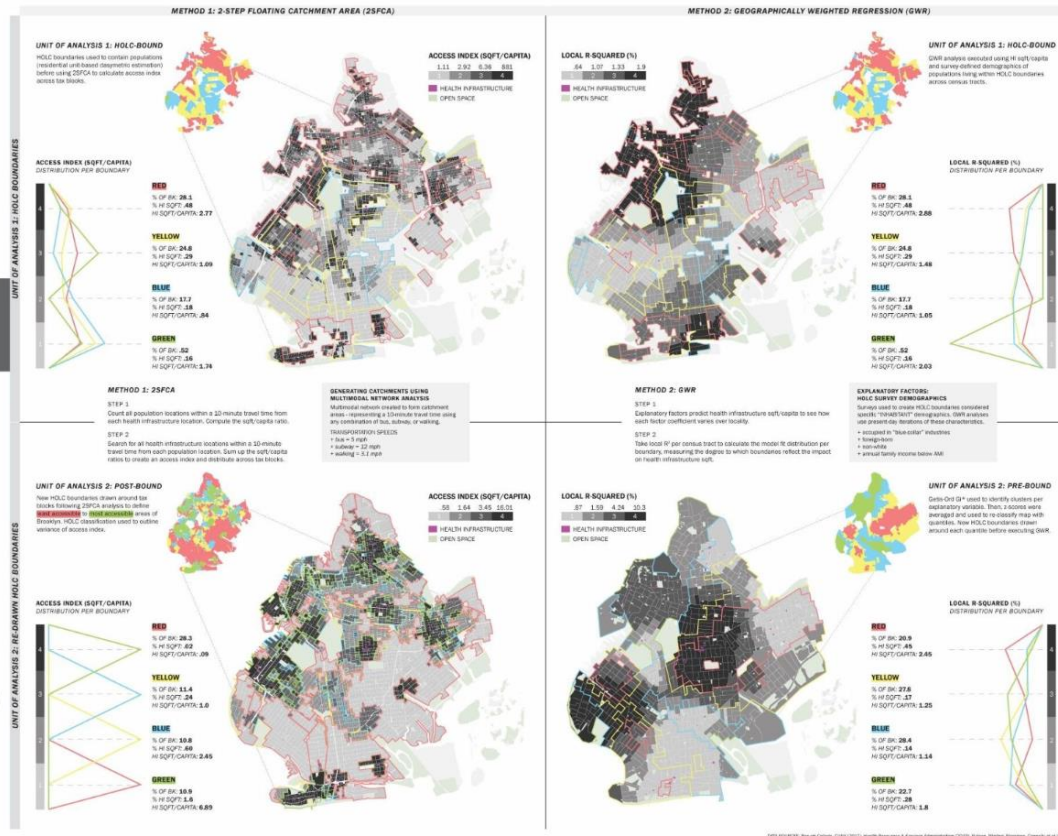
RESEARCH QUESTIONS

What are the analytical implications within a "methodology of assumption"?

CONTEXT



**Laboratory on
Human-
Environment
Relations in
Urban Systems**



Drawing neighborhood boundaries in Queens, NY

A.F. López Zamora | J. A. Romeo | G. Serra Coch | M. Uchida, *Advanced Spatial Analysis*, Spring 2018, MS UP, GSAPP, Columbia

1. APPROACH

How different definitions and methods can render diverse neighborhood boundaries and how well Neighborhood Tabulation Areas (NTAs) approximate those boundaries in Queens?



PEOPLE

a neighborhood is defined by the people living there

selected demographics of ACS 2016

Population Density
Age
Race
Education attainment
Income
Poverty Rate
Unemployment rate
Employment sector
Foreign born

METHOD 1. SIMILAR

where people are similar
clustering
grouping similar demographics

Cairns-Harabasz
Pseudo F-Statistic
(R^2 - 1) / (1 - R^2) * n

METHOD 2. DIVERSE

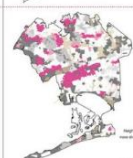
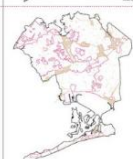
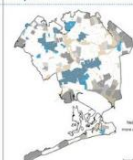
where people are diverse

land use dissimilarity index
multi-group Shannon entropy index
 $H = -\sum_{i=1}^n p_i \log(p_i)$

Iterative
Getis-Ord Gi* Hotspot

2. RESULTS

NTAs



number of Neighborhoods: 55

Mean Area: 1020 acres

Mean Perimeter: 4751.5 feet

mean PD: 50.11

mean FAR: 0.81

mean PD: 50.11

mean FAR: 0.81

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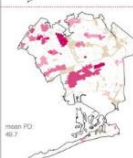
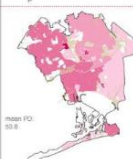
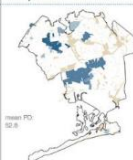
mean FAR: 0.81

mean PD: 50.11

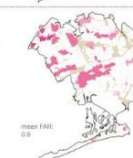
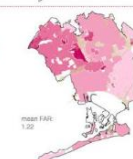
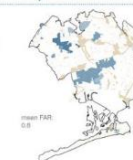
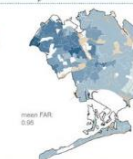
mean FAR: 0.81

3. COMPARE ACROSS

Population Density



Floor Area Ratio (FAR)



4. CONCLUSION

A neighborhood is an area of the city that

comprises people and place characteristics.

Although this separation has been useful to

analyze patterns across the methods, our final

neighborhoods map combines the 4 methods.

The boundaries were produced by departing from

the NTAs and modifying them when our methods

were pointing out an inconsistency.

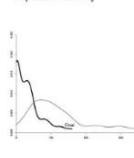
Then we classified the areas in:

(a) non-neighborhood

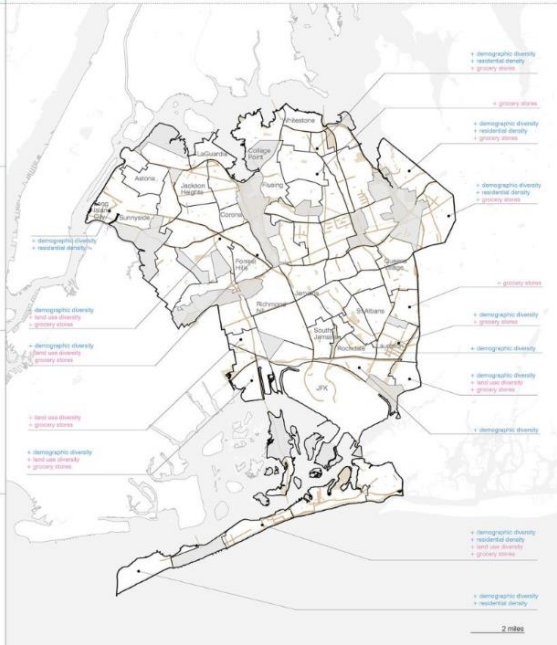
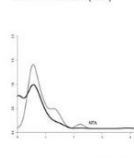
(b) potential neighborhood with improvements

(c) neighborhood

Population Density



Floor Area Ratio (FAR)



GOAL Shed light on the impact of neighborhood boundary definitions on urban systems analysis.

Compare three conceptualizations of neighborhoods: (i) functional, (ii) perceived, (iii) activity space...

...to understand potential data biases in sustainability, livability or well-being assessments that can, in turn, affect policy making and urban planning.

METHODOLOGY

1. LIT REVIEW

conceptualization of **neighborhood**:

- (i) functional
- (ii) perceived
- (iii) activity space

conceptualization of **urban system**:

- (i) People: socio-demographics
- (ii) Place: Built environment, Natural environment

2. DATA COLLECTION

Secondary sources:

- STIG data¹: open and limited access

Primary sources:

- Spatial Survey: Geneva 07-10.2021 x responses

3. BOUNDARY CREATION

similarity of urban form neighborhood design criteria

individually drawn

everyday destinations

4. COMPARISON

1. Selection of 1 representative functional neighborhood

2. Aggregation of urban system characteristics to equivalent perceived neighborhood and activity space

Notes: same type of neighborhood - different people

1. Size and compactness differences
2. Aggregated characteristics differences

Notes: between different types of neighborhoods

1. Size and compactness differences
2. Aggregated characteristics differences

TAKE-AWAYS

- **Interpersonal communication** including informal exchanges.
- The **quality of information** as well as its cohesiveness and effectiveness.
- Understanding **existing infrastructure**, conditions and their regional differences.
- A clear and flexible **regulation framework**.
- A straightforward **bundled business model**.
- **Involving and coordinating key actors**: energy utilities, energy technology providers, public entities, institutional investors, engineers.

FUNCTIONAL

This research compares three conceptualizations of neighborhoods: (i) functional neighborhoods, perceived. We take a geographical approach focusing on proximity effects and the role of spatial and social proximity relevant for the diffusion of innovations.

1. similar urban form characteristics

- density
- building type
- layout
- land use
- transport infrastructure (Deboise, 2005)

2. neighborhood design criteria

where do you live?

where do you shop?

where do you shop?

where do you shop?

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PERCEIVED

This research compares three conceptualizations of neighborhoods: (i) functional neighborhoods, perceived. We take a geographical approach focusing on proximity effects and the role of spatial and social proximity relevant for the diffusion of innovations.

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- building type
- layout
- land use
- transport infrastructure (Deboise, 2005)

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ACTIVITY SPACE

This research compares three conceptualizations of neighborhoods: (i) functional neighborhoods, perceived. We take a geographical approach focusing on proximity effects and the role of spatial and social proximity relevant for the diffusion of innovations.

1. similar urban form characteristics

- density
- building type
- layout
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Inter-COMPARISON

This research compares three conceptualizations of neighborhoods: (i) functional neighborhoods, perceived. We take a geographical approach focusing on proximity effects and the role of spatial and social proximity relevant for the diffusion of innovations.

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- density
- building type
- layout
- land use
- transport infrastructure (Deboise, 2005)

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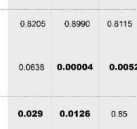
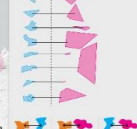
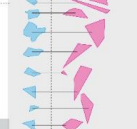
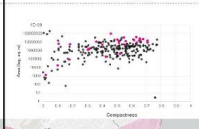
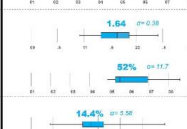
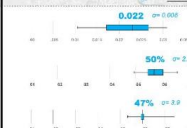
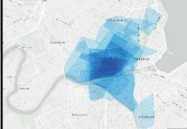
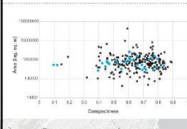
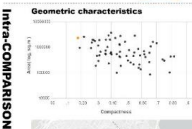
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where do you shop?

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Relevance

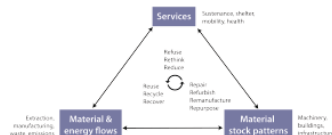
- Decent housing is a core sustainable development goal and a fundamental human right. It is currently not met for a quarter of the global population
- Construction sector is the world's largest consumer of raw materials, and 40% of global CO₂ emissions are attributed to housing and construction
- The challenge of providing decarbonised, decent housing differs per urbanisation context

Circular city ≠ Circular economy

- Circular economy proposes strategies to reduce resource use, reuse buildings, and recycle construction and demolition waste
- However, meeting housing needs within climate targets requires attention to more than material and energy stocks and flows
- A circular city must consider trade-offs in the configuration of stocks and flows in providing urban services

Theoretical basis: Stock-flow-service nexus

Resource flows combined with material stocks provide the urban services necessary for societal well-being (Haber et al., 2017).

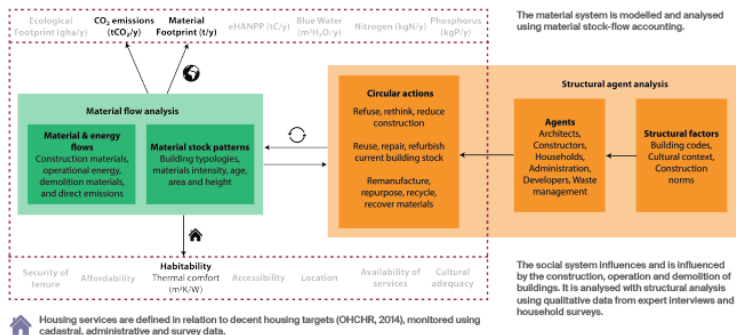


Social structures, actors and their actions restrict or enable strategies for managing material stocks and flows (Binder, 2007).



Methodological framework: Housing services in the urban circular economy

Planetary boundaries (O'Neill et al., 2018) are defined in relation to climate targets, monitored using biophysical indicators (i.e. carbon and material footprint) based on life cycle inventory data.



Next steps

- I will operationalise the framework for provision of decent housing services within climate targets for Geneva, Switzerland
- Housing services are defined as thermal habitability and planetary limits defined by climate targets (GHG emissions)
- System dynamics (right) allows the integration of housing stock-flow analysis, GHG emissions, and the circular actions that restrict or enable the meeting of targets
- Key contribution: Recentring urban circular economy around the objective of providing necessary urban services



Do's and don'ts

- Tell a story / narrative
- Minimum ink rule
- Keep text to a minimum
- Minimise mixing fonts
- Break text into readable blocks
- No bento boxes
- No huge title boxes
- Align!
- Diagrams are your friends
- Images can also be your friend
- Direct your audience

“Less is more”

*It is a visual mean of
communication*

Drawing neighborhood boundaries in Queens, NY

A.F. López Zamora | J. A. Romeo | G. Serra Coch | M. Uchida, *Advanced Spatial Analysis*, Spring 2018, MS UP, GSAPP, Columbia

1. APPROACH

How different definitions and methods can render diverse neighborhood boundaries and how well Neighborhood Tabulation Areas (NTAs) approximate those boundaries in Queens?



PEOPLE

a neighborhood is defined by the people living there

selected demographics of ACS 2016

Population Density
Age
Race
Education attainment
Income
Poverty Rate
Unemployment rate
Employment sector
Foreign born

METHOD 1. SIMILAR

where people are similar
clustering
grouping similar demographics

Cainelli-Harabasz
Pseudo F-Statistic
(R²=(n-1)/(n-k))

METHOD 2. DIVERSE

where people are diverse

land use dissimilarity index
multi-group Shannon entropy index
 $H' = -\sum_{i=1}^k \frac{1}{n} \log_2 \left(\frac{1}{n} \right)$

+ Iterative
Getis-Ord G^{*}i Hotspot

PLACE

a neighborhood is defined by its built environment characteristics

Land use PLUTO 2016
grocery stores
Reference USA
NYC DoITT

Land Use Data
Building Footprint Area
Building Footprint Width
Building Footprint Length
Building Height
Lot Area
Lot Width
Lot Length
Street Width
Street Length

METHOD 3. SIMILAR

where the built environment is similar
clustering
grouping similar built environment

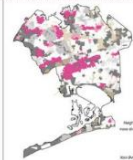
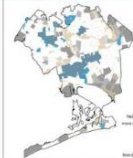
Cainelli-Harabasz
Pseudo F-Statistic
(R²=(n-1)/(n-k))

METHOD 4. DIVERSE

where land use is mixed + there are accessible grocery stores
1/4 mile service areas from residential lots
+ count of grocery stores
+ land use dissimilarity index
+ Iterative
Getis-Ord G^{*}i Hotspot

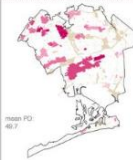
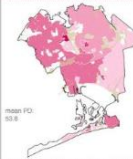
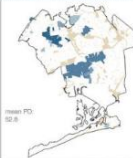
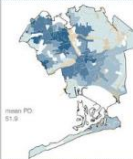
2. RESULTS

NTAs



3. COMPARE ACROSS

Population Density



Floor Area Ratio (FAR)



4. CONCLUSION

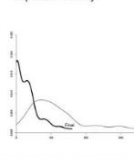
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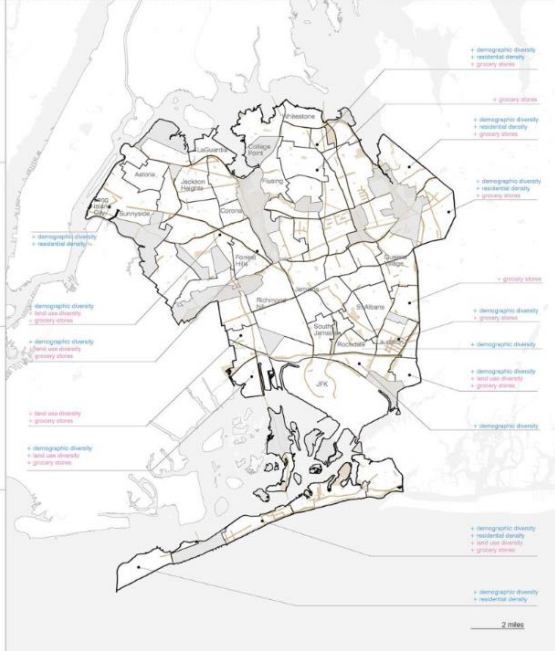
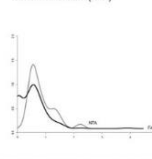
The boundaries were produced by departing from the NTAs and modifying them when our methods were pointing out an inconsistency. Then we classified the areas in:

- (a) non-neighborhood
- (b) potential neighborhood with improvements
- (c) neighborhood

Population Density



Floor Area Ratio (FAR)



SIGNAL OR NOISE? QOZ'S IN QUEENS

QUALIFIED OPPORTUNITY ZONE AFFECT ON
DEVELOPMENT ACTIVITY IN
QUEENS, NEW YORK
2015 TO 2018

NICK KUNZ & SUPRIMA BHELE

LEAN MEISTERLIN
ADVANCED SPATIAL ANALYSTS
COLUMBIA GSAPP
MAY 2019

MANHATTAN

Despite a significant increase in development activity in Queens, New York in 2018, Queens Qualified Opportunity Zone (QOZ) remained a cluster of low development activity. The cluster was not observed in 2015, but emerged in 2016 and 2017, suggesting a potential signal of development activity within the QOZ.

This study aimed to assess the impact of the QOZ on development activity within the spatial boundaries of the QOZ.

This was achieved by using the distance band by area density and a cluster analysis to assess the impact of the QOZ on development activity within the spatial boundaries of the QOZ.

Analysis of the data revealed an increase in development activity within the QOZ, but no significant difference in development activity between the QOZ and the surrounding area. The results suggest that the QOZ may be a signal of development activity, but not a source of development activity.

The analysis suggested that the introduction of the QOZ in 2015 did not have an immediate impact on development activity within the QOZ, but it did have a significant impact on development activity within the surrounding area.



MAP SOURCES: QOZ 2015-2018, BUREAU OF ECONOMIC ANALYSIS

DENSITY-BASED SPATIAL CLUSTERING IN APPLICATIONS WITH NOISE (DBSCAN)

DATA SOURCE:

Map data © OpenStreetMap contributors, Imagery © Mapbox, Map data © OpenStreetMap contributors, Imagery © Mapbox

Map data © OpenStreetMap contributors, Imagery © Mapbox, Map data © OpenStreetMap contributors, Imagery © Mapbox

Map data © OpenStreetMap contributors, Imagery © Mapbox, Map data © OpenStreetMap contributors, Imagery © Mapbox

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GOAL Shed light to the impact of neighborhood boundary definitions on urban systems analysis

Compare three conceptualizations of neighborhoods:
(i) **functional neighborhoods** (ii) **perceived neighborhoods** and (iii) **activity spaces**...

...to understand potential data biases in sustainability, health or well-being assessments that can, in turn, affect policy making and urban planning.

METHODOLOGY

1 LIT. REVIEW

conceptualization of **neighborhood**:

- (i) **functional**
- (ii) **perceived**
- (iii) **activity space**

conceptualization of **urban system**:

- (i) People: socio-demographics
- (ii) **Place**: Built environment, Natural environment

2 DATA COLLECTION

Secondary sources:

- SITG data¹: open and limited access

Primary sources:

- Spatial Survey: Geneva 07-10.2021
- x responses

3 BOUNDARY CREATION

sensibility of urban form neighborhood design criteria

- (i) **functional**
- (ii) **perceived**
- (iii) **activity space**

Individually drawn

- everyday situations

4 COMPARISON

Comparison

- 1. selection of 1 representative functional neighborhood
- 2. Aggregation of urban system characteristics to equivalent perceived neighborhood and activity space

Inter: same type of neighborhood - different people

- 1. Size and composition differences
- 2. Aggregated characteristics differences

Inter: between different types of neighborhoods

- 1. Size and composition differences
- 2. Aggregated characteristics differences

TAKE-AWAYS

Interpersonal communication including informal exchanges.

- The **quality of information** as well as its cohesiveness and effectiveness.
- Understanding **existing infrastructure**, conditions and their regional differences.
- A clear and **flexible regulation framework**.
- A **strategic and hunched business model**.
- **Intervening and coordinating key actors**: energy utilities, energy technology providers, public entities, institutional electronics, engineers

Inter: same type of neighborhood - different people

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Inter: between different types of neighborhoods

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- 1. Size and composition differences
- 2. Aggregated characteristics differences

1. INTRODUCTION

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- Geography of innovation diffusion
- Proximity dimensions

Demand

- Proximity effects
- Diffusion of innovation

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2. CASE-STUDY

3. METHODS

2 surveys

- Survey 1: Professionals in the sector
- Survey 2: Professionals in the sector

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- Survey 2: Professionals in the sector

Survey 1: Professionals in the sector

- Survey 2: Professionals in the sector

3. RESULTS

NETWORKS

Geographical

- The spatial, physical or temporal distance between actors, both in its absolute and relative meaning

Social

- The extent to which members of two organizations have friendly relationships

Institutional

- The extent to which two organizations operate under the same institutions

Cognitive

- The extent to which two organizations share the same knowledge base

Organisational

- The extent to which two organizations are affiliated

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4. NETWORKS

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5. TAKE-AWAYS

Geographical proximity is not enough to understand the whole picture, one needs to incorporate other dimensions.

- The lack of geographical proximity among professionals is compensated by other dimensions, i.e. social, cognitive and institutional proximity.

Social proximity is highest between adopters and their personal contacts, followed by adopter-professionals and adopters among personal contacts.

- The two indicators of social proximity, trust and frequency of interaction, are positively correlated.

Institutional proximity is relevant for all networks but mostly between adopters, followed by adopter-professionals and ending with professionals.

- Cognitive proximity matters between professionals and professional-adopters exchanges but less relevance for personal contacts

Organisational proximity seems relevant to generate new connections between professionals outside of their field and current collaborations.

- The authors of this poster bear sole responsibility of its conclusions and findings.

Contact: Glòria Serra-Coch | Herus, EPFL | gloria.serracoch@epfl.ch

- The authors of this poster bear sole responsibility of its conclusions and

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Crowded ER Waiting Rooms – Are Freestanding ERs The Way To Go?

Jesse Keats

INTRODUCTION

Overcrowding in the Emergency Room is a problem that strikes almost every hospital in the US. Overcrowding is not just a hospital issue. However, there are many intricate factors that play into why each ER is overcrowded. Overcrowding has resulted in migration that does not allow a hospital to deliver a patient treatment, poor staffing ratios, mass casualties, the need for emergency department, etc. Overcrowding can negatively impact patients by lengthening their stay in the hospital and even reducing their chances of survival (Mehra et al., 2006, p. 496).

To help alleviate the overcrowding problem, free standing ERs were introduced to help decrease the amount of patients in a hospital ER.

A free-standing ER can most simply be defined as an Emergency Department that is open 24/7, offering the same care as a hospital Emergency room but can not admit a patient because it is not connected to a hospital (Alexander J. Alexander, 2010, p. 327).

SIGNIFICANCE

In 2008, there were 123.5 million ER visits, in 2015 there were 136.9 million ER visits in the US alone. This was a 10.4% increase in 7 years. This number continues to grow (Yingying Xu, 2016).

In 2016, a study suggested that wait times in Texas hospital ERs had less than a 30 second difference in wait times compared to freestanding ERs (Yingying Xu, 2016).

In 2016 a study that compared academic free-standing ERs compared to hospital ERs suggested that there was less than a 7 minute wait difference (Dayton, 2016, p. 148).

18 Percent of all patients seen in the ER require some kind of specialist care (Aarons, 2018, p. 788).

POSITION STATEMENT

Free Standing ERs are not the answer to the problem of overcrowded ERs.

There are many factors that cause overcrowding in an ER.

The type of ER that treats patients is not the only factor in decreasing overcrowded ERs.

SUPPORT FOR POSITION

According to Alexander J. Alexander, who conducted a study on free standing ERs, suggested that the wait times in a free-standing ER compared to a Hospital ER are very similar.

A study that observed academic free-standing ERs compared to the national average ER wait time suggested that there was less than 2 minutes in wait time difference (Dayton, 2016, p. 137).

The problem of overcrowding is multifaceted. It is not a hospital problem. It is a short supply and limited hours of primary care doctors. ERs are federally mandated to treat every patient (Barash, 2012, p. 306).

IMPLICATIONS FOR PRACTICE

According to the previous studies, it can be understood that Free standing ERs are not the answer to overcrowded ERs. Multiple studies have suggested that the wait times at a freestanding ER and the wait times at a hospital ER are almost identical. This means that other options should be explored to reduce overcrowding in the emergency department.

In a study by Emily L. Aaronson, 18% of patients seen and discharged from the ER needed to be seen by a specialist. This results to a large amount of patients in an emergency room that need further treatment. Nurses could help reduce overcrowding by receiving training in specialty fields, having adequate nurses and physicians can help treat patients more quickly can in theory reduce overcrowding.

In 2014, The University of Kansas Medical Center (KUMC) in Kansas City hired BSN accredited nurses in the ER to act as a flow coordinator. This reduced the average length of stay of each patient by 40 minutes. The implementation of a nurse coordinator suggests that nurses in a leadership position to help manage the flow of patient care can greatly reduce the length of stay of each patient in the ER (Wood, 2014, p. 1).

CONCLUSION

After researching the idea of overcrowding in the ER compared to overcrowding in a free-standing ER, it can be concluded that there is not much of a difference when it comes to wait times. Both hospital ERs and free-standing ERs both struggle with the same types of problems. Both receive critically ill patients and must treat them regardless of what kind of illnesses the patients have. The whole idea of overcrowding is a much larger problem than the type of ER that is treating the patients. Nurses could help alleviate this when on ERs by specializing in different fields of expertise to help aid patients that need specialized care. The idea of a flow coordinator also has the potential to greatly reduce ER wait times. A nurse flow coordinator has the potential to direct people where they need to be. Nurses could also advocate for better staffing levels, prepare for disaster situations, and work as a team to help as many patients as possible. Nurses are also leaders in advocating for patients. Nurses are trained in prioritization and should practice their skills to best help to community.

REFERENCES

Aarons, 2018, p. 788.

Barash, 2012, p. 306.


Dayton, 2016, p. 137.

Dayton, 2016, p. 148.

McCarthy, et al. 2006, p. 496.

Wood, 2014, p. 1.

Yingying Xu, 2016.

PHOTOGRAPH PROVIDED FROM

 (Wikipedia: Freestanding emergency room)

Early Childhood Literacy Programs in Canada

Naomi Bala Boudreau & Doreen O'Reilly in partnership with Carol McDougall & Shanda Laflamme-Jones of Read to Me Nova Scotia Family Literacy Program & Vivian Howard of Dalhousie's School of Information Management

Background


More than 42% of Canadians do not have adequate literacy skills for succeeding in Canadian society (1). Early literacy programs provide important resources and services for children and families at a crucial time of development. Currently, Canada lacks a coherent approach and programs often operate in isolation despite common needs.

In partnership with Read to Me Nova Scotia Family Literacy Program this study sought to gain an understanding of early childhood literacy programs in Canada by identifying programs and gathering information on their operations, programming and challenges.

Methodology

A literature review and national survey were used to generate data and determine trends. The survey targeted programs that offer literacy resources and/or programming to families with children under the age of five. The online survey, available in English and French, was sent to over 200 programs across Canada. Fifty-eight were completed for a return rate of 28%.

Population Sample



Key findings

Target populations: Programs strive to meet the diverse needs of their communities, and must target multiple populations. Many also target families facing economic, social, geographical and educational barriers.

Program characteristics: Survey respondents connect with their communities through various means of contact.

Funding: Survey respondents indicated a range in funding sources. Only 9% of programs receive federal funding.

Resource sharing and collaboration: Despite diverse approaches to early literacy, 75% of respondents share resources with other programs. Many are interested in further sharing and other forms of collaboration.

Research: Research and evaluation strategies are measured program effectiveness and lessen the gap between what is known and what is practiced. Despite its importance, lack of time, resources, and expertise impacting respondents' ability to conduct and publish research.

Program goals

The goals of early literacy programs extend to the health of their entire communities. In addition to providing books and literacy resources many respondents connect families with local libraries, foster a culture and love of reading, and promote lifelong learning for children and their families.

Successes

Practitioners identified the following key indicators of their program's success:

- enthusiasm and positive responses from the families they serve
- development among families who regularly participate
- consistent attendance and program growth
- development of community partnerships
- working with hard to reach communities
- offering programming and resources for free
- able to secure funding and operate on little funding

Challenges

While programs face many challenges, three key challenges emerged from survey responses:

Funding: Funding underlies all aspects of early literacy programming. Repeatedly programs cited lack of reliable core funding as a barrier. Many noted that programs demand needed availability, and that they lack the funds to provide appropriate space, staff and quality resources.

Outreach: Challenges included engaging parents and communities, creating accessible programs, connecting with specific target populations and developing successful marketing strategies. Given the common perception of Canada as a literate nation, some programs have not with difficulty in advocating the value of early literacy and their programs, resulting in challenges securing community understanding and support.

Staffing: Challenges included recruiting, training and retaining staff to meet program demand, especially when positions were part-time, underpaid and insecure. Several programs rely heavily on certain staff or volunteers for their program's success. Other staffing challenges cited included:

- competing priorities
- flexibility and consistency among staff
- maintaining program momentum
- expanding to meet community needs
- fulfilling administrative requirements

Recommendations

From the survey and literature review came the following recommendations for moving forward:

1. **Funding:** Establish sustainable and flexible funding for early literacy programming.
2. **Staff training:** Provide opportunities for ongoing training for staff and volunteers to support and improve programming.
3. **Promotion and program materials:** Programing material should be inclusive and reflect the community served. Develop national best practices for program models and resources to enhance programs and facilitate resource sharing, training and evaluation.
4. **Network:** While many programs have developed relationships with local organizations, there is little communication between municipalities and across provinces. A network of practitioners is key to develop long-term, sustainable approaches to literacy. A national strategy that supports early literacy initiatives and the diverse needs of Canadians could help create opportunities for communication, collaboration and resource sharing.
5. **Research:** Practitioners have limited opportunities to participate in research. Community and university research partnerships can help support high-quality research that is relevant to front-line practitioners. Many areas of early childhood literacy and programming require further research. While areas like funding and resource sharing need investigation, it is crucial that methods for translating research into accessible models for practice are explored.

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ACCESSIBILITY TO MEDICAL FACILITIES IN NEW YORK CITY A CASE STUDY FOCUS ON GAS LEAK VULNERABLE BUILDINGS

ADVANCED SPATIAL ANALYSIS | 2018 SPRING
GAS EXPLOSION GROUP | BOYING LI, QIANTU XIANG, LITING ZHANG

BACKGROUND

Gas leak can cause serious disasters, especially in buildings where the gas pipelines are old and lack of construction. We learned from the East Harlem gas explosion that higher medical accessibility is very significant for saving lives.

As planners, we want to compare different spatial accessibility measures between the gas leak vulnerable buildings and medical facilities in Manhattan, and try to provide suggestions for gas leak regulations and future medical facility planning.

METHODS

1/5 Dasymetric Mapping Technique

2/5 Network-based minimum distance Accessibility Measures

3/5 Gravity-based Accessibility Measures

Inertia Power $\sum_{i=1}^n \frac{1}{d_i^{2.5}}$, $R^2 = 0.81$, $F(1, 13) = 13.18$
Exponential $\sum_{i=1}^n \frac{1}{d_i^{0.5}}$, $R^2 = 0.9023$, $F(1, 13) = 0.9045$, 0.0003
Gaussian $\sum_{i=1}^n \frac{1}{d_i^{0.5}}$, $R^2 = 0.9023$, $F(1, 13) = 0.9045$, 0.0003

4/5 Two Step Floating Catchment Area Accessibility Measures

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5/5 Enhanced Two Step Floating Catchment Area Accessibility Measures

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OUTCOMES

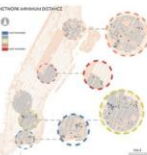
DASYMETRIC MAPPING



VULNERABLE BUILDINGS



MINIMUM DISTANCE



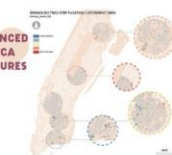
GRAVITY MEASURES



ZSFCA MEASURES



ENHANCED ZSFCA MEASURES



ANALYSIS

Methodology	Advantages	Disadvantages
Minimum Distance	Simple and easy to understand	Does not consider the size of the building
Gravity-based	Considers the size of the building	Does not consider the size of the building
ZSFCA	Considers the size of the building and the distance	Does not consider the size of the building
Enhanced ZSFCA	Considers the size of the building and the distance	Does not consider the size of the building

This study used different accessibility measures to analyze the distribution of the medical accessibility in specific situation. Based on the different accessibility measures, we found that the distance-based effect of the network-based and the gravity-based model are similar, which shows the possibility to use the gravity-based model as a replacement for the network-based model. However, the gravity-based model is more suitable to show the deviation of spatial accessibility in each area of the vulnerable buildings and the network-based model is more suitable to show the deviation of spatial accessibility in each area of the vulnerable buildings. Therefore, we believe the gravity-based model is more suitable to show the deviation of spatial accessibility in each area of the vulnerable buildings and the network-based model is more suitable to show the deviation of spatial accessibility in each area of the vulnerable buildings.



IN PIECES:

FOOD IS MORE FILLING WHEN PRE-CUT INTO PIECES

Aner Tal & Brian Wansink

CORNELL UNIVERSITY

ABSTRACT

To investigate if cutting a food into pieces has an effect on satiety, students were given a bagel that was either (1) whole, (2) cut into 4 pieces which were kept together, or (3) cut into 4 pieces which were spread out. A general linear model revealed that overall satiety was the highest when food was cut into pieces, but only when the pieces were kept together.

METHODS

- 43 college students
- Asked to finish a mini bagel with cream cheese
- Assigned to 1 of 3 conditions:



- Measured hunger, fullness, and satiety levels on 9-point likert scales

CONCLUSIONS

- Participants reported greater satiety when eating a food that was cut into several pieces, but only when those pieces remained close together.
- We suspect that cutting a food into several pieces increases satiety because it increases the number of units being eaten, hence increasing the psychological sense of satiety.
- However, if the food is spread out, therefore countering the positive effects of eating pieces.

OBJECTIVES

- Is food more filling when people receive it pre-cut into several pieces?
- Is it the space the pieces fill on the plate or the number of pieces that increase satiety?

RESULTS

OVERALL SATIETY



Created by: Patricia Natalie | 2015 Summer Intern | Food and Brand Lab | Cornell University

Funding provided by Food and Brand Lab

For more information, contact Aner Tal at at425@cornell.edu



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**PIGS IN SPACE:
EFFECT OF ZERO GRAVITY AND
AD LIBITUM FEEDING ON WEIGHT
GAIN IN CAVIA PORCELLUS**

Colin B. Purrington
6673 College Avenue, Swarthmore, PA 19081 USA

ABSTRACT:
One ignored benefit of space travel is a potential elimination of obesity, a chronic problem for a growing majority in many parts of the world. In theory, when an individual is in a condition of zero gravity, weight is eliminated. Indeed, in space one could conceivably follow ad libitum feeding and never even gain an gram, and the only side effect would be the need to upgrade one's stretchy pants ("exercise pants"). But because many diet schemes start as very good theories only to be found to be rather harmful, we tested our traditions with a long-term experiment in a colony of Guinea pigs (*Cavia porcellus*) maintained on the International Space Station. Individuals were housed separately and given unlimited amounts of high-calorie food pellets. Fresh fruits and vegetables were not available in space so were not offered. Every 30 days, each Guinea pig was weighed. After 5 years, we found that individuals, on average, weighed nothing. In addition to weighing nothing, no weight appeared to be gained over the duration of the protocol. If space continues to be gravity-free, and we believe that assumption is sound, we believe that sending the overweight — and those at risk for overweight — to space would be a lasting cure.

INTRODUCTION:
The current obesity epidemic started in the early 1960s with the invention and proliferation of elastane and related stretchy fibers, which released wearers from the rigid constraints of clothes and permitted monthly weight gain without the need to buy new outfits. Indeed, exercise today for hundreds of million people involve only the act of wearing stretchy pants in public, presumably because the constrictive pressure forces fat molecules to adopt a more compact tertiary structure (Xavier 1965).
Luckily, at the same time that fabrics became stretchy, the race to the moon between the United States and Russia yielded a useful fact: gravity in outer space is minimal to nonexistent. When gravity is zero, objects cease to have weight. Indeed, early astronauts and cosmonauts had to secure themselves to their ships with seat belts and sticky boots. The potential application to weight loss was noted immediately, but at the time travel to space was prohibitively expensive and thus the issue was not seriously pursued. Now, however, multiple companies are developing cheap extra-orbital travel options for normal consumers, and potential travelers are also creating news ways to pay for products and services that they cannot actually afford. Together, these factors open the possibility that moving to space could cure overweight syndrome quickly and permanently for a large number of humans.
We studied this potential by following weight gain in Guinea pigs, known on Earth as fond of ad libitum feeding. Guinea pigs were long envisioned to be the "Guinea pigs" of space research, too, so they seemed like the obvious choice. Studies on humans are of course desirable, but we feel this current study will be critical in acquiring the attention of granting agencies.

MATERIALS AND METHODS:
One hundred male and one hundred female Guinea pigs (*Cavia porcellus*) were transported to the International Space Laboratory in 2010. Each pig was housed separately and deprived of exercise wheels and fresh fruits and vegetables for 48 months. Each month, pigs were individually weighed by duct-taping them to an electronic balance sensitive to 0.0001 grams. Back on Earth, an identical cohort was similarly maintained and weighed. Data was analyzed by statistics.

RESULTS:
Mean weight of pigs in space was 0.0000 ± 0.0002 g. Some individuals weighed less than zero, some more, but these variations were due to reaction to the duct tape, we believe, which caused them to be alarmed push briefly against the force plate in the balance. Individuals on the Earth, the control cohort, gained about 240 g/month ($p = 0.0002$). Males and females gained a similar amount of weight on Earth (no main effect of sex), and size at any point during the study was related to starting size (which was used as a covariate in the ANCOVA). Both Earth and space pigs developed substantial dewlaps (double chins) and were lethargic at the conclusion of the study.

CONCLUSIONS:
Our view that weight and weight gain would be zero in space was confirmed. Although we have not replicated this experiment on larger animals or primates, we are confident that our result would be mirrored in other model organisms. We are currently in the process of obtaining necessary human trial permissions, and should have our planned experiment initiated within 80 years, pending expedited review by local and Federal IRBs.

ACKNOWLEDGEMENTS:
I am grateful for generous support from the National Research Foundation, Black Hole Diet Plans, and the High Fructose Sugar Association. Transport flights were funded by SPACE-EXES, the consortium of wives divorced from insanely wealthy space-flight startups. I am also grateful for comments on early drafts by Mariana Athletic Club, Corpus Christi, USA. Finally, sincere thanks to the Cuy Foundation for generously donating animal care after the conclusion of the study.

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GERRYMANDERING can be defined as the instance in which redistricting is used to manipulate boundaries and stack the deck in favor of a political party.

In today's post-truth political era, political representation is key. Yet extreme partisanship has led to all-time lows in political efficacy.

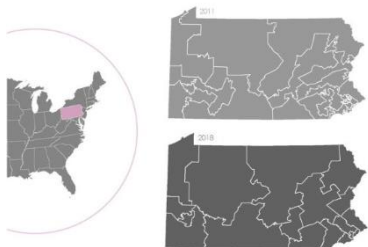
Single-member district plurality voting remains the status quo in American legislative elections, emphasizing the importance of geographically defined districts. How these districts are shaped to a large extent determines who can gain and maintain legislative power.

Pennsylvania's 2011 congressional map may be among the most obvious partisan gerrymanders in United States history. In January 2018, the Pennsylvania Supreme Court ruled that this 2011 congressional map "clearly, plainly, and palpably" violates the state constitution. *The Philadelphia Inquirer*, 2018.

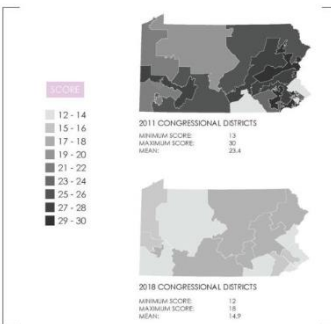
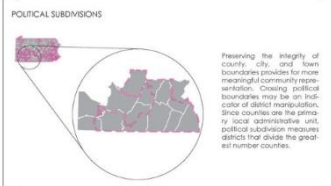
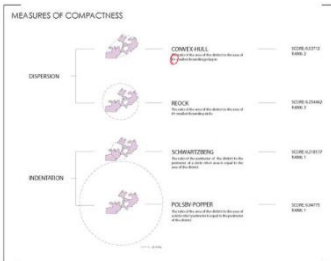


RESEARCH QUESTION To what extent are legal tests for gerrymandering consistent with a variety of statistical and spatial methods to detect gerrymandering?

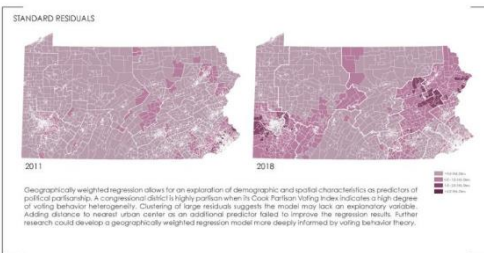
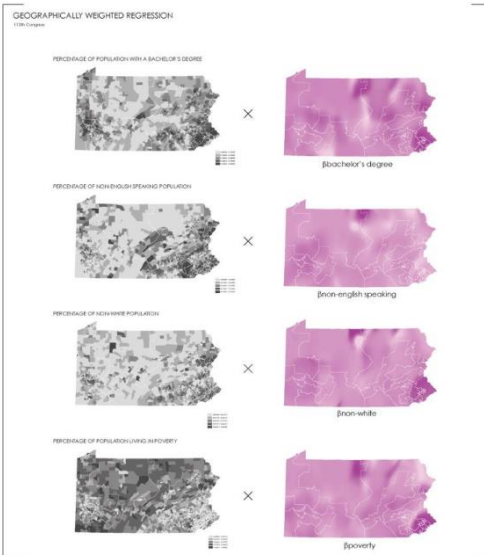
PENNSYLVANIA Congressional Maps



PHYSICAL INDICATORS OF GERRYMANDERING



SOCIAL INDICATORS OF GERRYMANDERING



ETHICS AND/OFF UNCERTAINTY: SPECULATIVE URBANISM AND THE RISE OF SYNTHETIC PEOPLE

Dare Brawley, Gayatri Kaula, Francis Yu

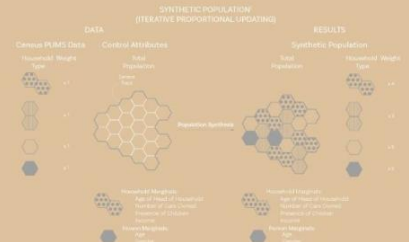
Abstract:

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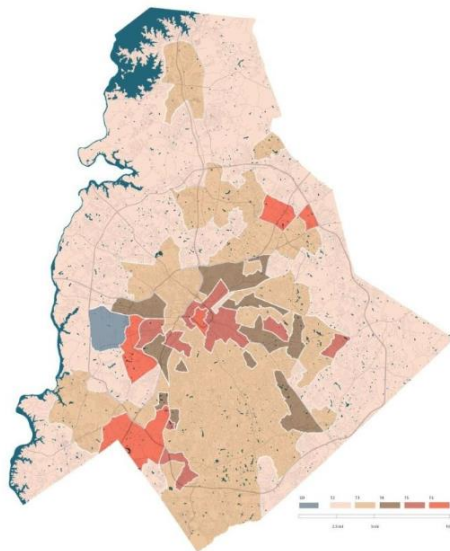
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- We use two methods to evaluate the goodness of fit and spatial variation.
 - We define zones according to the model of the New Urbanist transect. For each transect zone and for the city as a whole we assess whether each synthetic population model performs better in certain types of places over others using Total Absolute Error and Classification Error.
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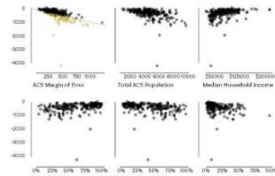
CASE STUDY CITY: CHARLOTTE, NORTH CAROLINA



Synthetic Population Error

$$\delta = T - E$$

where, T is the synthetic population estimate and E is the ACS population estimate



Total Absolute Error by Zone

$$TAE_i = \sum_{j=1}^n |T_j - E_j|$$

where, T_j is the synthetic population estimate and E_j is the ACS population estimate

Percentage Error by Zone

$$CE_i = \frac{TAE_i}{E_i}$$

where $TAE_i = \sum_{j=1}^n |T_j - E_j|$

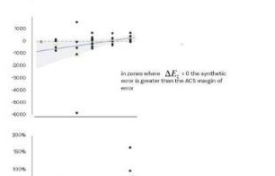
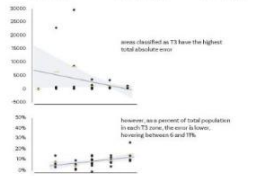
Difference Between Total Absolute Error and ACS Magnitude of Error

$$\Delta E_i = TAE_i - TAE_i$$

where $TAE_i = \sum_{j=1}^n |T_j - E_j|$

Percent Difference

$$\% \Delta E_i = \frac{\Delta E_i}{TAE_i}$$



β Land Area

In areas with high (■) standard residuals the explanatory variable is over predicting percentage error. In other words the percentage error is actually lower than the model predicts.

β Population Density

In areas with low (■) standard residuals the explanatory variable is under predicting percentage error. In these areas the percentage error is higher than the model predicts.

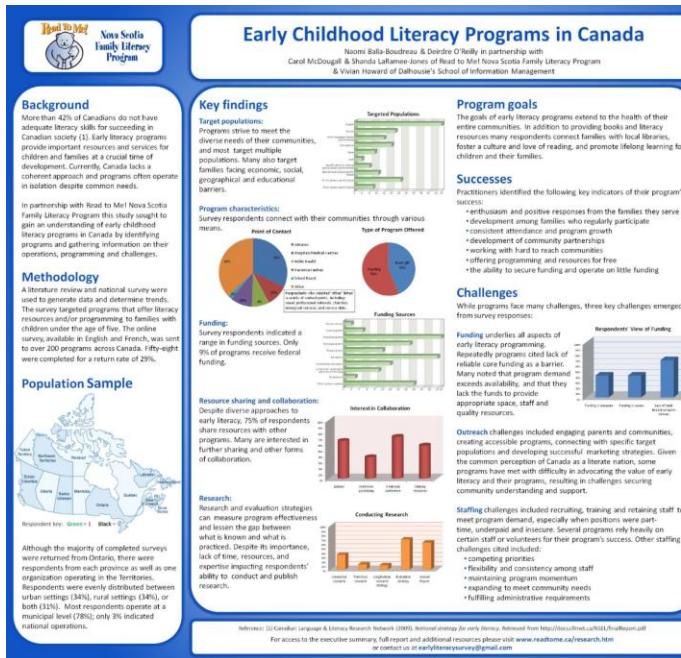
β Transect Zones

Geographically weighted regression allows for an exploration of demographic and spatial characteristics as predictors of absolute error. From our analysis we find that our chosen four explanatory variables are poor predictors of absolute error. Of note is the transect zone model, which remains most significant in both the global and local regression models.

This suggests a) the GWR method is limited in predicting goodness of fit of synthetic populations or b) further research is required to develop a geographically weighted model more deeply informed by spatial variation in synthetic modeling.

Independent Variable	ACS	r^2	Adjusted r^2	Partial Correlation
Population Density	-0.72 0.68	0.045	0.044	0.046
Built Density	-0.63 0.39	0.008	0.043	0.010
Land Area	-0.65 0.68	0.031	0.044	0.062
T-zone	-0.78 0.04	0.029	0.075	0.064

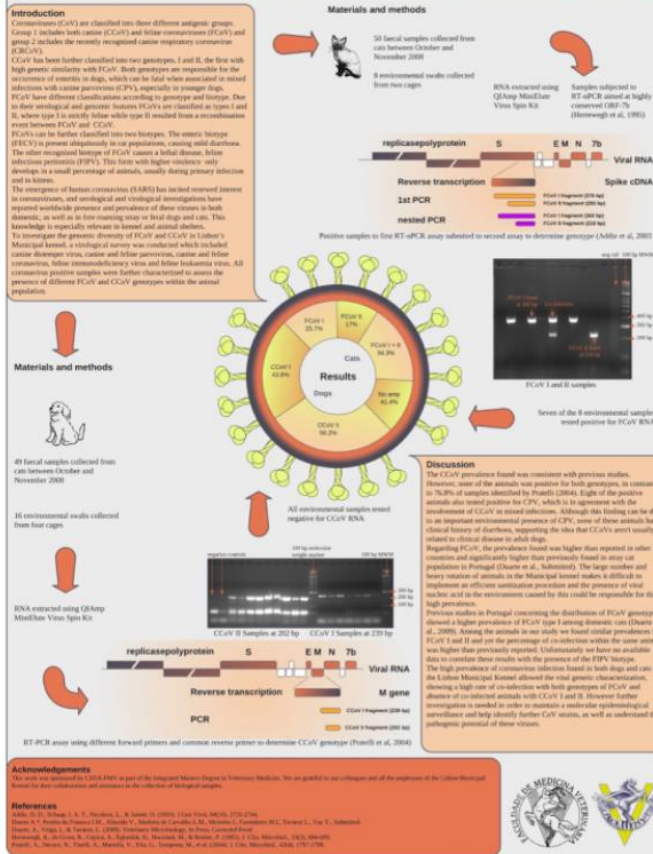
- No bento boxes
- No huge title boxes



Notes: [1] Canadian Language & Literacy Research Network (2005). National strategy for early literacy. Retrieved from <http://www.ccllrc.ca/ccllrc/FullReport.pdf>
For access to the executive summary, full report and additional resources please visit www.readtogether.ca/research.htm or contact us at earlyliteracy@readtogether.ca

Genetic characterisation of coronaviruses in shelter dogs and cats in Lisbon

Ricardo C. Rosado (rosado@med.ulisboa.pt), Ana Duarte, Sílvia Baptista, Fátima Gouveia, Ana Inês, Leontina Fereira, Luis Teófilo
CIBSA, Faculty of Veterinary Medicine, Universidade Técnica de Lisboa, 1600-019, Lisboa, Portugal, CIBSA Municipal de Lisboa



ETHICS AND/OF UNCERTAINTY: SPECULATIVE URBANISM AND THE RISE OF SYNTHETIC PEOPLE

Dare Brawley, Gayatri Kavrila, Francis Yu

Abstract:

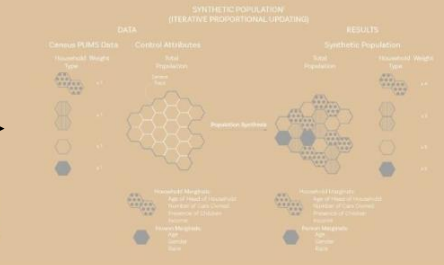
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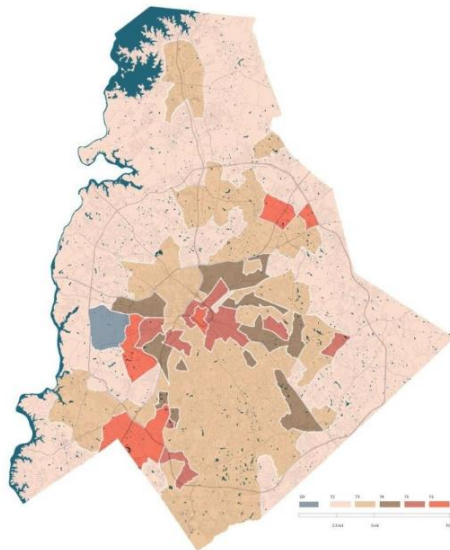
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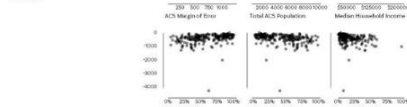
CASE STUDY CITY: CHARLOTTE, NORTH CAROLINA



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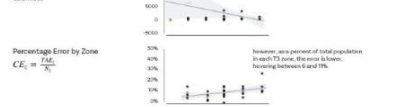
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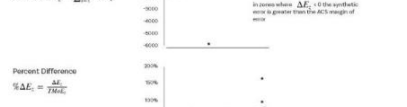
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Percentage Error by Zone

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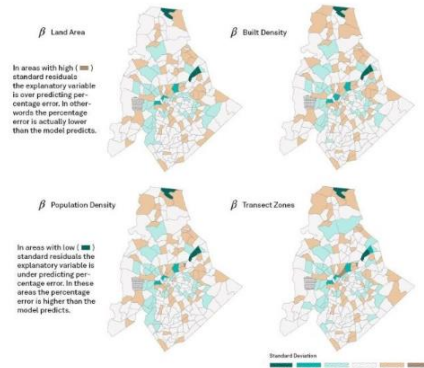
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the LIBERTY BELL: cracked & packed



GERRYMANDERING can be defined as the instance in which redistricting is used to manipulate boundaries and stack the deck in favor of a political party.

In today's post-truth political era, political representation is key. Yet extreme partisanship has led to all-time lows in political efficacy.

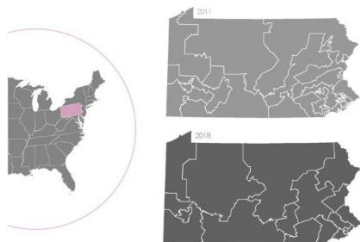
Single-member district plurality voting remains the status quo in American legislative elections, emphasizing the importance of geographically defined districts. How these districts are shaped to a large extent determines who can gain and maintain legislative power.

Pennsylvania's 2011 congressional map may be among the most obvious partisan gerrymanders in United States history. In January 2018, the Pennsylvania Supreme Court ruled that this 2011 congressional map "clearly, plainly, and palpably" violates the state constitution. The Philadelphia Inquirer, 2018

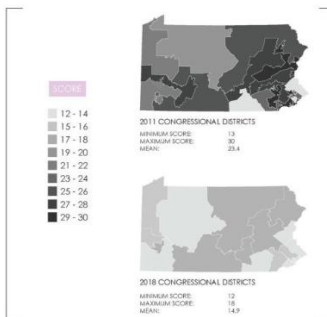
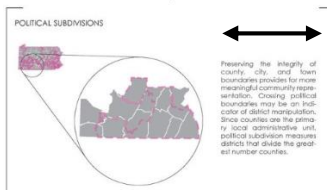
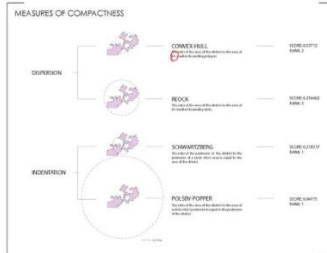


RESEARCH QUESTION To what extent are legal tests for gerrymandering consistent with a variety of statistical and spatial methods to detect gerrymandering?

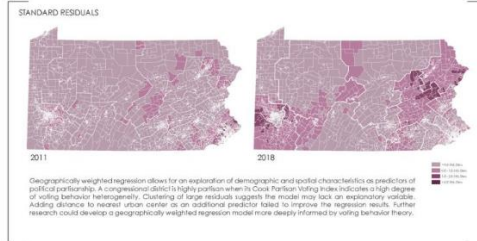
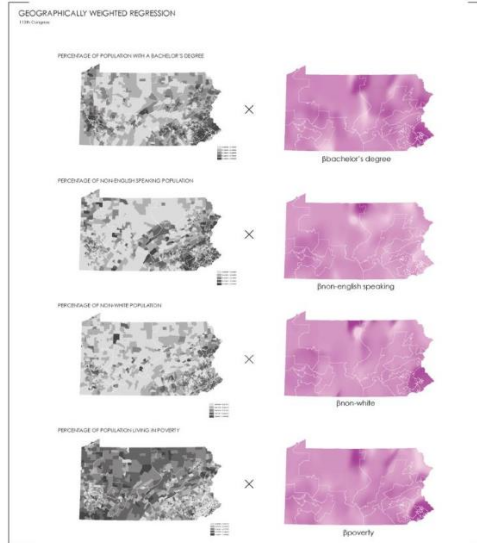
PENNSYLVANIA Congressional Maps



PHYSICAL INDICATORS OF GERRYMANDERING



SOCIAL INDICATORS OF GERRYMANDERING






PIGS IN SPACE: EFFECT OF ZERO GRAVITY AND AD LIBITUM FEEDING ON WEIGHT GAIN IN CAVIA PORCELLUS



ABSTRACT:
One ignored benefit of space travel is a potential elimination of obesity, a chronic problem for a growing majority in many parts of the world. In theory, when an individual is in a condition of zero gravity, weight is eliminated. Indeed, in space one could conceivably follow ad libitum feeding and never even gain an gram, and the only side effect would be the need to upgrade one's stretchy pants ("exercise pants"). But because many diet schemes start as very good theories only to be found to be rather harmful, we tested our predictions with a long-term experiment, in a colony of Guinea pigs (*Cavia porcellus*) maintained on the International Space Station. Individuals were housed separately and given unlimited amounts of high-calorie food pellets. Fresh fruits and vegetables were not available in space so were not offered. Every 30 days, each Guinea pig was weighed. After 5 years, we found that individuals, on average, weighed nothing. In addition to weighing nothing, no weight appeared to be gained over the duration of the protocol. If space continues to be gravity-free, and we believe that assumption is sound, we believe that sending the overweight — and those at risk for overweight — to space would be a lasting cure.

Colin B. Purrington
6673 College Avenue, Swarthmore, PA 19081 USA

MATERIALS AND METHODS:
One hundred male and one hundred female Guinea pigs (*Cavia porcellus*) were transported to the International Space Laboratory in 2010. Each pig was housed separately and deprived of exercise wheels and fresh fruits and vegetables for 48 months. Each month, pigs were individually weighed by duct-taping them to an electronic balance sensitive to 0.0001 grams. Back on Earth, an identical cohort was similarly maintained and weighed. Data was analyzed by statistics.

INTRODUCTION:
The current obesity epidemic started in the early 1960s with the invention and proliferation of elastane and related stretchy fibers, which released wearers from the rigid constraints of clothes and permitted monthly weight gain without the need to buy new outfits. Indeed, exercise today for hundreds of million people involve only the act of wearing stretchy pants in public, presumably because the constrictive pressure forces fat molecules to adopt a more compact tertiary structure (Xavier 1965).
Luckily, at the same time that fabrics became stretchy, the race to the moon between the United States and Russia yielded a useful fact: gravity in outer space is minimal to nonexistent. When gravity is zero, objects cease to have weight. Indeed, early astronauts and cosmonauts had to secure themselves to their ships with seat belts and sticky boots. The potential application to weight loss was noted immediately, but at the time travel to space was prohibitively expensive and thus the issue was not seriously pursued. Now, however, multiple companies are developing cheap extra-orbital travel options for normal consumers, and potential travelers are also creating news ways to pay for products and services that they cannot actually afford. Together, these factors open the possibility that moving to space could cure overweight syndrome quickly and permanently for a large number of humans.
We studied this potential by following weight gain in Guinea pigs, known on Earth as fond of ad libitum feeding. Guinea pigs were long envisioned to be the "Guinea pigs" of space research, too, so they seemed like the obvious choice. Studies on humans are of course desirable, but we feel this current study will be critical in acquiring the attention of granting agencies.



RESULTS:
Mean weight of pigs in space was 0.0000 ± 0.0002 g. Some individuals weighed less than zero, some more, but these variations were due to reaction to the duct tape, we believe, which caused them to be alarmed push briefly against the force plate in the balance. Individuals on the Earth, the control cohort, gained about 240 g/month ($p = 0.0002$). Males and females gained a similar amount of weight on Earth (no main effect of sex), and size at any point during the study was related to starting size (which was used as a covariate in the ANCOVA). Both Earth and space pigs developed substantial dewlaps (double chins) and were lethargic at the conclusion of the study.



CONCLUSIONS:
Our view that weight and weight gain would be zero in space was confirmed. Although we have not replicated this experiment on larger animals or primates, we are confident that our result would be mirrored in other model organisms. We are currently in the process of obtaining necessary human trial permissions, and should have our planned experiment initiated within 80 years, pending expedited review by local and Federal IRBs.


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LITERATURE CITED:
NASA. 1982. Project STS-XX: Guinea Pigs. Leaked internal memo.
Sekulic, S.R., D. D. Lukac, and N. M. Naumovic. 2005. The Fetus Cannot Exercise Like An Astronaut: Gravity Loading Is Necessary For The Physiological Development During Second Half Of Pregnancy. Medical Hypotheses. 64:221-228
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SPACEEXES

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Drawing neighborhood boundaries in Queens, NY

A.F. López Zamora | J. A. Romeo | G. Serra Coch | M. Uchida, Advanced Spatial Analysis, Spring 2018, MS UP, GSAPP, Columbia

1. APPROACH

How different definitions and methods can render diverse neighborhood boundaries and how well Neighborhood Tabulation Areas (NTAs) approximate those boundaries in Queens?



PEOPLE

a neighborhood is defined by the people living there

selected demographics of ACS 2016

Population Density
Age
Race
Education attainment
Income
Poverty Rate
Unemployment rate
Employment sector
Foreign born

METHOD 1. SIMILAR

where people are similar
clustering
grouping similar demographics

Cainelli-Harabasz
Pseudo F-Statistic
(R²=(n-1)/(1-R²))=n

METHOD 2. DIVERSE

where people are diverse

land use dissimilarity index
multi-group Shannon entropy index
 $H' = -\sum_{i=1}^n (P_i \log_2 P_i)$

+ Iterative
Getis-Ord Gi* Hotspot

PLACE

a neighborhood is defined by its built environment characteristics

Land use PLUTO 2016
grocery stores
Reference USA
NYC DoITT

Land Use Data
Building Footprint Area
Building Footprint Width
Building Footprint Length
Building Height
Lot Area
Lot Width
Lot Length
Street Width
Street Length

METHOD 3. SIMILAR

where the built environment is similar
clustering
grouping similar built environment

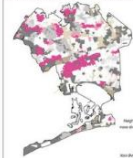
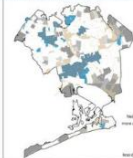
Cainelli-Harabasz
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(R²=(n-1)/(1-R²))=n

METHOD 4. DIVERSE

where land use is mixed + there are accessible grocery stores
1/4 mile service areas from residential lots
+ count of grocery stores
+ land use dissimilarity index
+ Iterative
Getis-Ord Gi* Hotspot

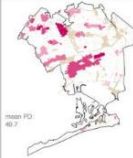
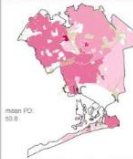
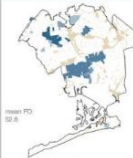
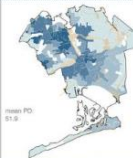
2. RESULTS

NTAs

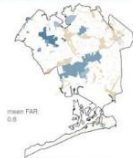
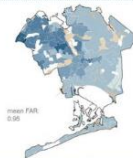


3. COMPARE ACROSS

Population Density



Floor Area Ratio (FAR)



4. CONCLUSION

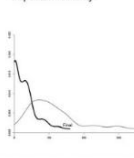
A neighborhood is an area of the city that comprises people and place characteristics.

Although this separation has been useful to analyze patterns across the methods, our final neighborhood map combines the 4 methods.

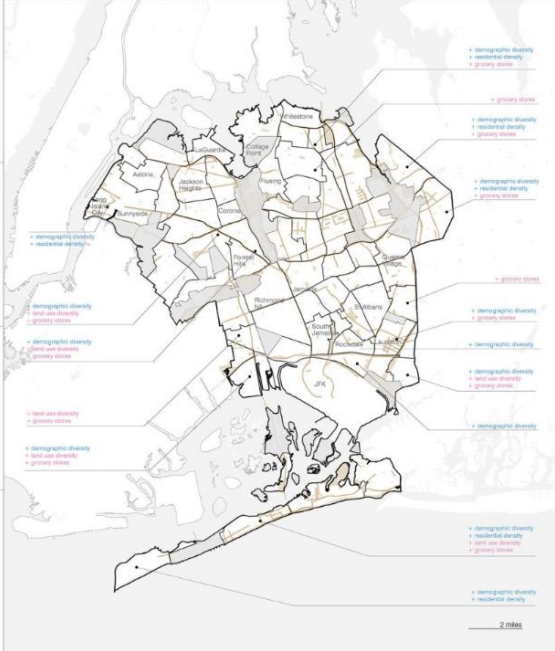
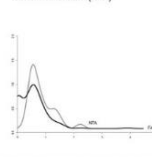
The boundaries were produced by departing from the NTAs and modifying them when our methods were pointing out an inconsistency. Then we classified the areas in:

- (a) non-neighborhood
- (b) potential neighborhood with improvements
- (c) neighborhood

Population Density



Floor Area Ratio (FAR)



Measuring & Mapping Social Vulnerability in Flooding Events

This project aims to better define and evaluate social vulnerability during flooding events through the development and comparison of three methodologies. The first methodology, Hazus Lite, was developed to measure the social vulnerability aspects of the Hazus model used by the Federal Emergency Management Association (FEMA) through a weighted overlay analysis at the census block level. In order to increase the granularity and specificity of this model, method two, the Flooding Vulnerability Index (FVI), built directly off Hazus Lite through the incorporation of additional social and environmental vulnerability. Method three, a weighted overlay analysis at the building level. The last method, FVI + Accessibility, built directly off the FVI by adding measures of accessibility through both a service area analysis and a closing facility network analysis before computing the final weighted overlay analysis at the building level. The findings of the three methods were then compared to the inundation area of 2012's Superstorm Sandy.

Methods & Results

1. Hazus Lite

The Hazus Lite DV is constructed by designating information from "Shelter Category Weights."

Variables Considered

- Income
- Ethnicity
- Sex
- Race
- Group Quarters
- Age

Weight 10 and Over 65

2. Flooding Vulnerability Index (FVI)

From Hazus Lite

- Income
- Ethnicity
- Sex
- Race
- Group Quarters

Added from Hazus

- Age

Weighting range to Under 10 and Over 75

Other Demographics Factors

- Single Parent Households
- Low income
- Spoken English "Less than very well"

Vulnerability Index

- Flood Plan & Elevation

Area: 1000 sq ft

Area: 1000 sq ft

Area: 1000 sq ft

Area: 1000 sq ft

Area: 1000 sq ft

Area: 1000 sq ft

Area: 1000 sq ft

Area: 1000 sq ft

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Area: 1000 sq ft

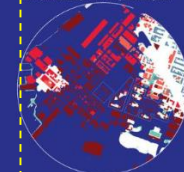
Area: 1000 sq ft

Area: 1000 sq ft

Zooming In The most impacted neighborhoods within Superstorm Sandy

A. Hudson

This map displays the acute vulnerability of that area based on the elevation and coastal proximity, making conditions for intense flood inundation. Though FEMA properties are highlighted by the pink square, vulnerability extends to the ground building stock.



B. Sheepshead Bay

Using the FEMA inundation, this coastal community contains the highest percent of vulnerable assets that will be flooded, where high vulnerability is represented as a FVI in the 800 percentile.



C. Flatlands

It is not just the FEMA inundation extent that is the most critical factor in determining vulnerability. The extent and intensity of flood inundation for the FVI and the need to incorporate flood evacuation routes.



What social and spatial metrics are best used to identify the communities who are most vulnerable during flooding events?

Where in Brooklyn are these communities located?

Manhattan

Queens

FVI + Accessibility
in Superstorm Sandy



1 MILE

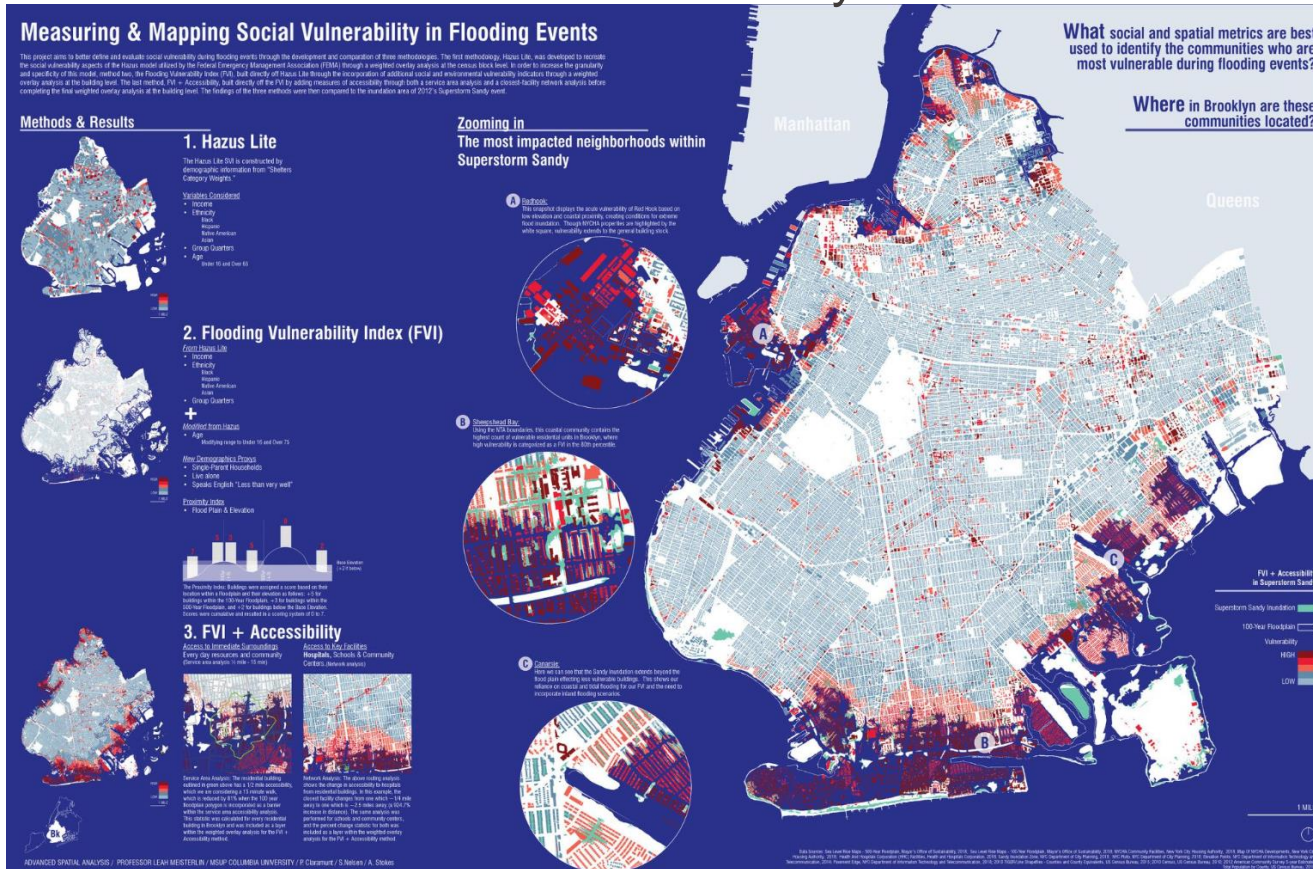
1 MILE

1 MILE

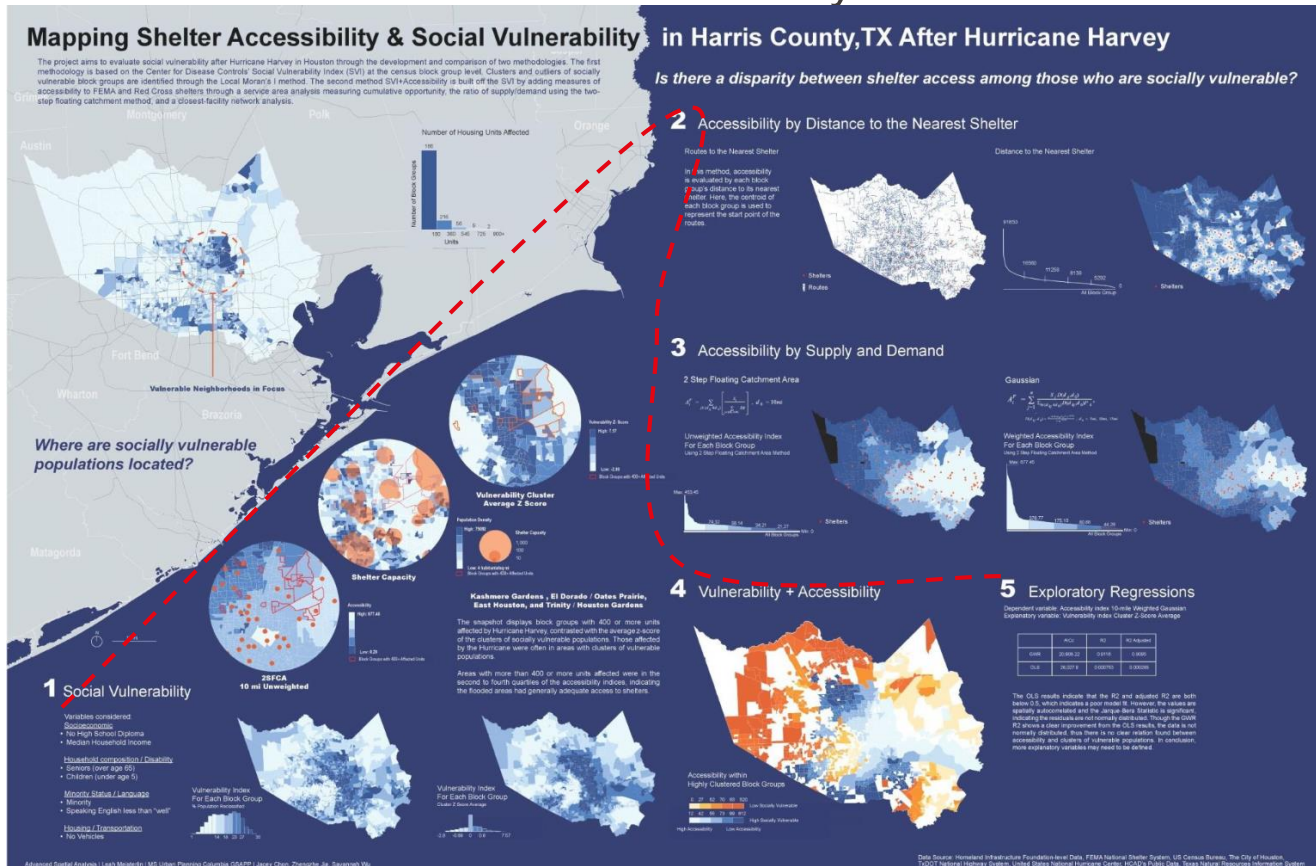
1 MILE

1 MILE

- Diagrams are your friends
- Images can also be your friend
- Direct your audience

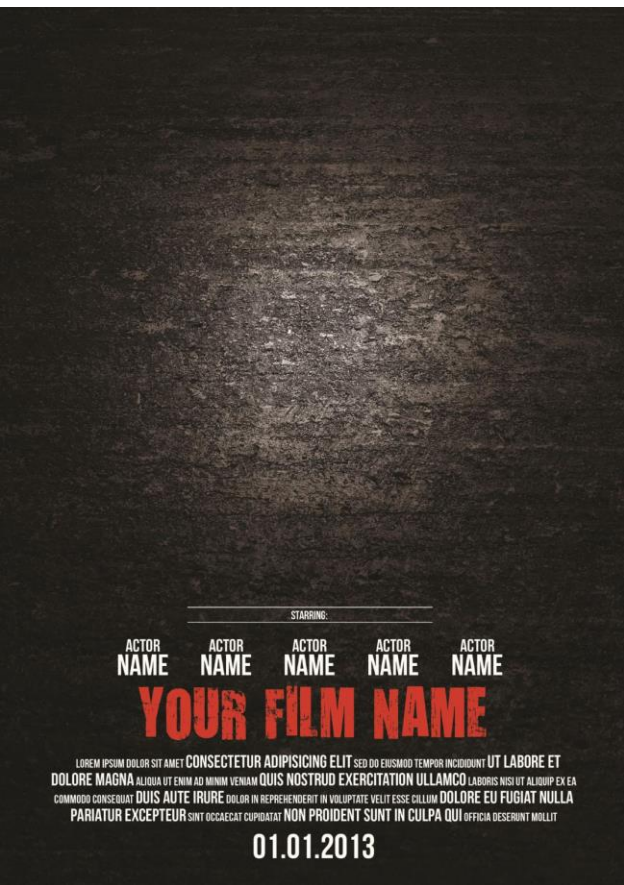


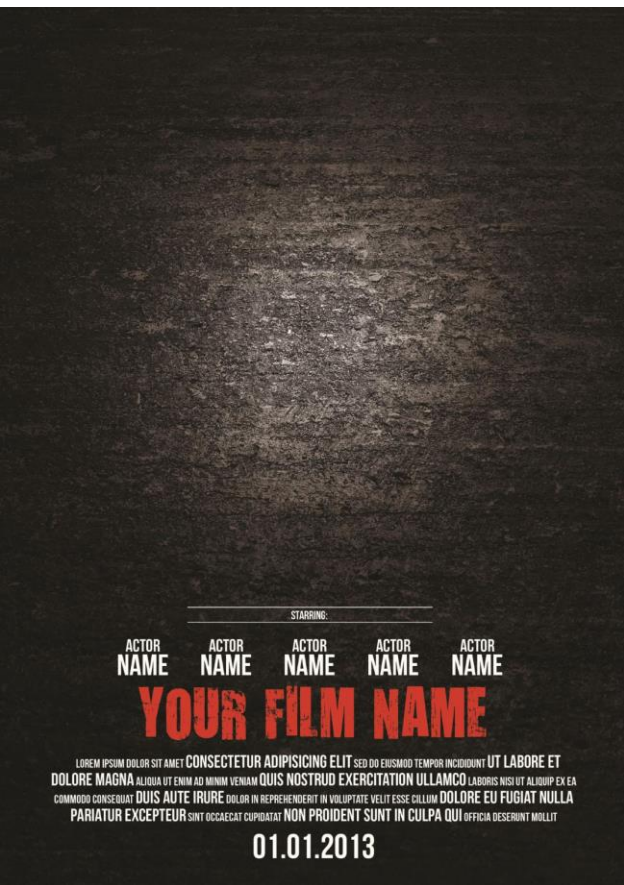
- Diagrams are your friends
- Images can also be your friend
- Direct your audience



Composition rules

- Weight to the bottom
- Western reading: top to bottom, left to right
- Colors have (and should have) meaning
- Golden ratio
- Proportions $\frac{1}{2}$, $\frac{1}{3}$... *“a quien modula dios le ayuda”*
- Matrix vs. Follie systems





ETHICS AND/OR UNCERTAINTY: SPECULATIVE URBANISM AND THE RISE OF SYNTHETIC PEOPLE

Dare Brawley, Gayatri Kewla, Francis Yu

Abstract:

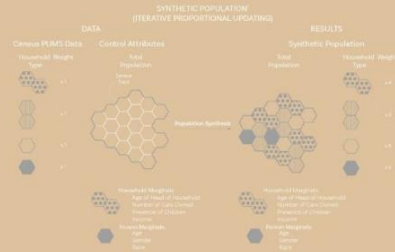
This research takes up synthetic populations to discuss the ethics of uncertainty in data-driven urban processes. Urban-tech tells us that better data is a replacement for more robust democracy, that urban issues are solved through more computation, not more deliberation, and that data can increasingly substitute for political representation. In the face of these ever louder claims for calculable urban futures we examine the hopes underlying synthetic populations → fictitious but statistically representative urban populace. This paper uses GIS-based methods to investigate whether synthetic populations evenly represent the cities and citizens they claim to describe. It asks whether mathematical sophistication here obscures an underlying uncertainty and, in turn, speculates on the stakes of this uncertainty for the creation of a just city.

Synthetic populations describe a fictitious but statistically representative urban populace. Materially, it is a dataset comprised of individual-level statistics calculated from aggregate data.

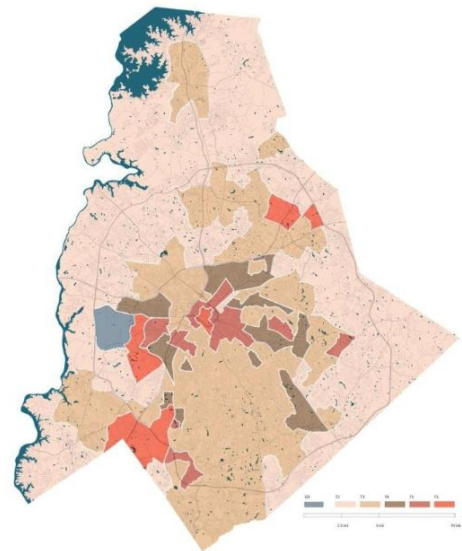
Q: To what extent can we rely on behavioral models produced by synthetic populations for planning and policy-making? What kinds of urban areas are such models best at synthesizing? (i.e. is the goodness of fit of such models evenly spatially distributed, and if not which places are best approximated?)

We use two methods to evaluate the goodness of fit and spatial variation.

1. We define zones according to the model of the New Urbanist transect. For each transect zone and for the city as a whole we assess whether each synthetic population model performs better in certain types of places over others using Total Absolute Error and Classification Error.
2. We perform geographically weighted regressions to assess the relationship between percent error and population density, built density, land area, and transect zones to see how synthetic populations differ from ACS aggregates in representing demographic and spatial characteristics.



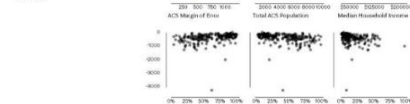
CASE STUDY CITY: CHARLOTTE, NORTH CAROLINA



Synthetic Population Error

$$\delta = T_i - E_i$$

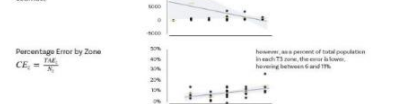
where T_i is the synthetic population estimate and E_i is the ACS population estimate.



Total Absolute Error by Zone

$$TAE_i = \sum_{j=1}^n |T_j - E_j|$$

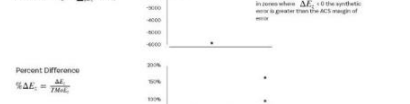
where T_j is the synthetic population estimate and E_j is the ACS population estimate.



Percentage Error by Zone

$$CE_i = \frac{TAE_i}{T_i}$$

where T_i is the synthetic population estimate and E_i is the ACS population estimate.



Difference Between Total Absolute Error and ACS Margin of Error

$$\Delta E_i = TAE_i - MoE_i$$

where TAE_i is the synthetic population estimate and E_i is the ACS population estimate.



In some areas synthetic error is between 50% and 100% greater than the ACS margin of error.

Land Area

In areas with high (■) standard residuals the explanatory variable is over predicting percentage error. In other words the percentage error is actually lower than the model predicts.

Population Density

In areas with low (■) standard residuals the explanatory variable is under predicting percentage error. In these areas the percentage error is higher than the model predicts.

Built Density

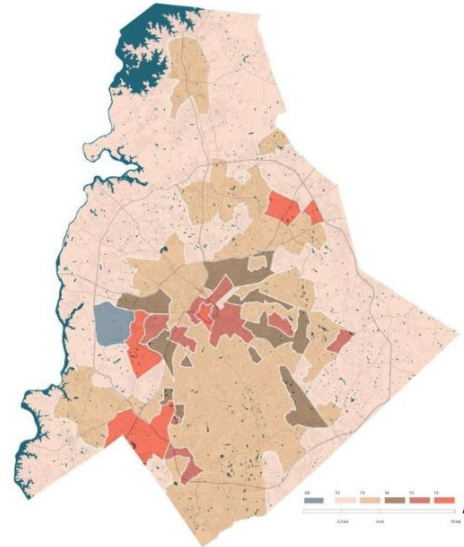
Transect Zones

Geographically weighted regression allows for an exploration of demographic and spatial characteristics as predictors of absolute error. From our analysis we find that our chosen four explanatory variables are poor predictors of absolute error. Of note is the transect zone model, which remains most significant in both the global and local regression models.

This suggests a) the GWR method is limited in predicting goodness of fit of synthetic populations or b) further research is required to develop a geographically weighted model more deeply informed by spatial variation in synthetic modeling.

Independent Variable	ACE	r ²	Adjusted r ²	Standard
Population Density	-872.148	0.165	0.064	0.965
Built Density	-569.299	0.106	0.043	1.010
Land Area	-565.968	0.131	0.044	0.982
T-zone	-578.004	0.129	0.075	0.984

CASE STUDY CITY:
CHARLOTTE, NORTH CAROLINA



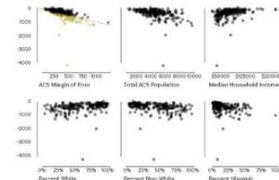
Synthetic Population Error
 $\delta = T - E$
where T is the synthetic
population estimate and E
is the ACS population
estimate.

Total Absolute Error by Zone
 $TAE_i = \sum_{j=1}^n |T_{ij} - E_{ij}|$
where T_{ij} is the synthetic
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is the ACS population
estimate.

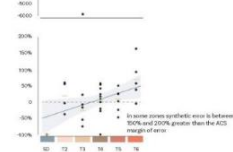
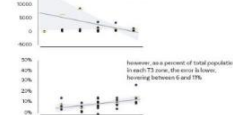
Percentage Error by Zone
 $CE_i = \frac{TAE_i}{E_i}$

Difference Between Total
Absolute Error and
ACS Margin of Error
 $\Delta E_i = TAE_i - MAE_i$
where $TAE_i = \sum_{j=1}^n |T_{ij} - E_{ij}|$

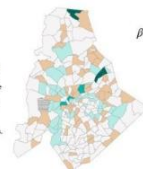
Percent Difference
 $\% \Delta E_i = \frac{\Delta E_i}{MAE_i}$



areas classified as T3 have the highest
total absolute error

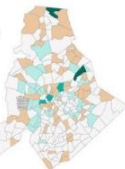


β Land Area

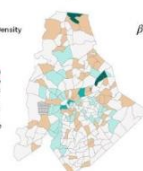


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β Built Density



β Population Density



In areas with low (■) standard residuals the explanatory variable is under predicting percentage error. In these areas the percentage error is higher than the model predicts.

β Transit Zones



Standard Deviation
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

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This suggests a) the GWR method is limited in predicting goodness of fit of synthetic populations or b) further research is required to develop a geographically weighted model more deeply informed by spatial variation in synthetic modelling.

Independent Variable	AICc	r ²	Adjusted r ²	Residual Sum of Squares
Population Density	-572.148	0.048	0.044	0.968
Built Density	-569.299	0.006	0.043	1.010
Land Area	-565.968	0.031	0.044	0.982
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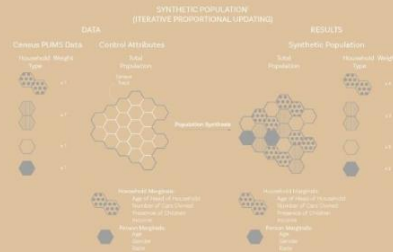
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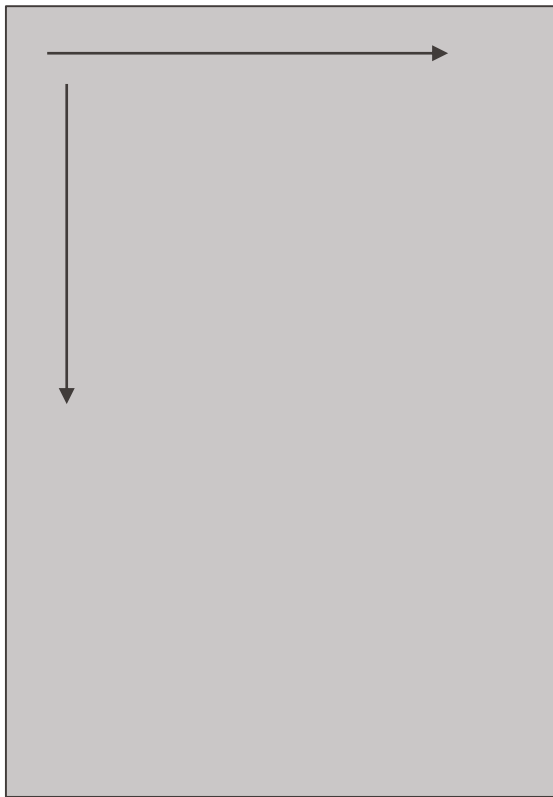
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Aim

To generate evidence to inform decision-making when designing buildings in Switzerland

- Considering possible **future climate conditions**
- Maximizing the time of year when mechanical heating or cooling is not required, called the **free-running period**
- Compare the thermal effect of whether static or mobile devices

Methodology

1 SIMULATION OF THE FUTURE CLIMATE

The future weather file is generated according to the RCP4.5* scenario from the International Panel on Climate Change (IPCC) for 2050 and 2070. The climate is simulated with the software Meteorom 8.

2 EVALUATION OF THE ENERGY DEMAND OF BOTH SCENARIOS

The energy demand is simulated for both scenarios (static and adaptable) and for the **current climate, 2050 (RCP4.5)** and **2070 (RCP4.5)**. The Energy Plus engine is used for the energy simulations.

*RCP scenarios are based on the best available science and understanding of the climate system, and are subject to change as more information becomes available.

Results

Current and simulated climate results:

Current climate
Avg. temp.: 10.7 °C
Avg. humidity: 70.5%
Avg. horiz. rad.: 298.5 W/m²

Climate 2050 (RCP4.5)
Avg. temp.: 12.3 °C
Avg. humidity: 70.6%
Avg. horiz. rad.: 298.5 W/m²

Climate 2070 (RCP4.5)
Avg. temp.: 12.8 °C
Avg. humidity: 70.8%
Avg. horiz. rad.: 298.5 W/m²

* Simulated in Meteorom 8, a free software developed by the University of Barcelona, based on the Energy Plus engine, and the International Panel on Climate Change (IPCC) scenarios.

Conclusion

These results suggest that **movable passive strategies could be a suitable approach to adapt buildings to future climate conditions** in Switzerland, which would provide larger periods of free-running conditions, lower energy demand, and lower costs.

Case study



Their position cannot be changed
They always develop the same function
Users cannot operate them

Static scenario



SCHEDULE OF STRATEGIES

Permanent

Movable insulation

Solar shading

Night ventilation

Winter

Day

Night

Summer

Day

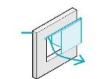
Night

Case study



They can be moved or changed
They can be activated or deactivated
Allow users to adapt to changing conditions

Adaptable scenario



Case study

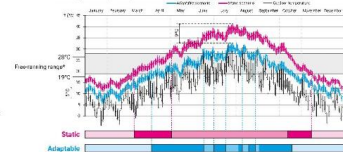
We propose to analyze this building as it was built according to regulations and design strategies in a warmer climate than in Switzerland, and add to it whether static or mobile devices



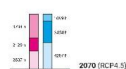
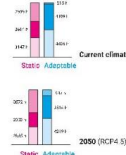
2050 (RCP4.5): Temperature of the Static and Adaptable scenarios



2070 (RCP4.5): Temperature of the Static and Adaptable scenarios



Yearly hours in and out the free-running range:



Static Adaptable

Outcome

- Regulations could include the role of mobile devices on energy performance of buildings.
- Building designers could provide buildings with mobile devices to ensure their resilience to climate change.
- Training programs could include the relevance of mobile devices when targeting different groups of people: regulators, designers, and users.

Static devices

- Better performance in winter
- 4-5 °C warmer in winter
- Free running 25% of the year

Mobile devices

- Better performance in summer
- 9 °C cooler in summer
- Free running 40% of the year (+100h of free running)

Mobile devices are essential for building's resilience to climate change.

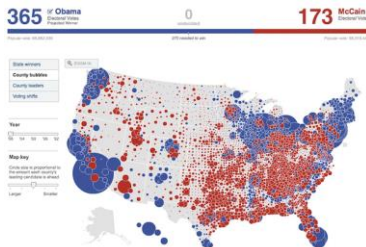
Colors have meaning

UNCONSCIOUS ASSOCIATIONS OF COLORS

	RED	ENERGY PASSION URGENCY
	ORANGE	FRIENDLINESS WARMTH CONFIDENCE
	YELLOW	HAPPINESS OPTIMISM WARMTH
	GREEN	NATURE GROWTH STABILITY
	BLUE	TRUST CALM INTELLIGENCE



Colors have meaning



After Hard-Fought Campaign, Results Start to Trickle In

LIVE COVERAGE Polls Close in Virginia, First of Battleground States

As votes are tallied, news reporters around the country are providing live updates, analysis and results throughout the night.

7:25 P.M. Outlets: A Portrait of Virginia Voters

7:23 P.M. Votes: State of the Art

7:18 P.M. Outlets: Government Trying to Do Too Much

7:08 P.M. Voter Portrait: Athens, Ohio

7:03 P.M. Outlets: A Clear Look at Times

7:00 P.M. A Polling Place Party

MORE UPDATES



Background states are called by New York Times editors. Others are by The Associated Press.

THE OPINION PAGES

CAMPAIGN STORIES

Barack Obama's Campaign

We now expect

conflict over voting rights.

'Sex Politics, the 1880s

By JONATHAN STONE

We're in an unusual period of

our political history.

Some on the left

- Broad: Framing

- Editorial: The debate

- Taking Note: Problems at the

Polls

- Score for Debate: What if

Voting Started at 13?

- Up-At: Conservatives

MORE IN OPINION

- Breaker: The Heart Grows

Reactor

- News: Mayor Bloomberg's

Blind Spot



Mr. Warner lost the southwest, which he won by large margins in 2008.

KENTUCKY

TENNESSEE

NORTH CAROLINA

Loudoun County, which voted for President Obama both times, turned red.

Winchester

Alexandria

Fredricksburg

Charlottesville

Richmond

Lynchburg

Roanoke

Norfolk

Virginia Beach

Danville

11 DAVID EGGERS reviews Jonathan

Miles' new novel, 'West Ne'

12 J.A. LEGAL AFFAIRS New books by

Dunblow, Power and Graham

17 THE LUMINARIES Eleanor Catton's

Man Booker Prize-winning novel

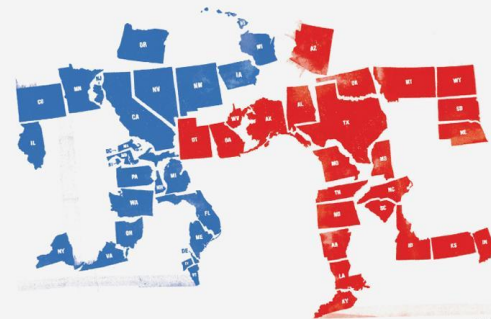
19 SPECIAL CHILDREN'S BOOKS ISSUE

'The Blue Illustrated Books of 2013'

The New York Times

NOVEMBER 11, 2013

Book Review



War of Umbrage

By Michael Kinsley

sears of how pandemonium broke out

in the 2012 presidential election

choosing the gap as 'V' all the more

persuasive, and you do save these

characters, if you're short on space.

O.K., but how about 'suspense'? Or

'suspenseful'? Or 'suspenseful'? Or

'suspenseful'? Make sure to have a

the dictionary nearby when you read 'Doubt'

Down, Mark Halperin and John Heilemann's

There's nothing wrong with fancy words if they

help to define your meaning. In the hands of

Halperin and Heilemann, though, they have the

quintessential effect. Being florid is a form of

horror, 'frenzied' sounds like a philosophy

of life or type of pain.

There is actually no word in the sense the au-

thors describe as 'frenzied.' It's just their way

of saying 'frenzied.'

CONTINUED ON PAGE 2

AVAILABLE NOW

Game Change 2012

By Mark Halperin and John Heilemann

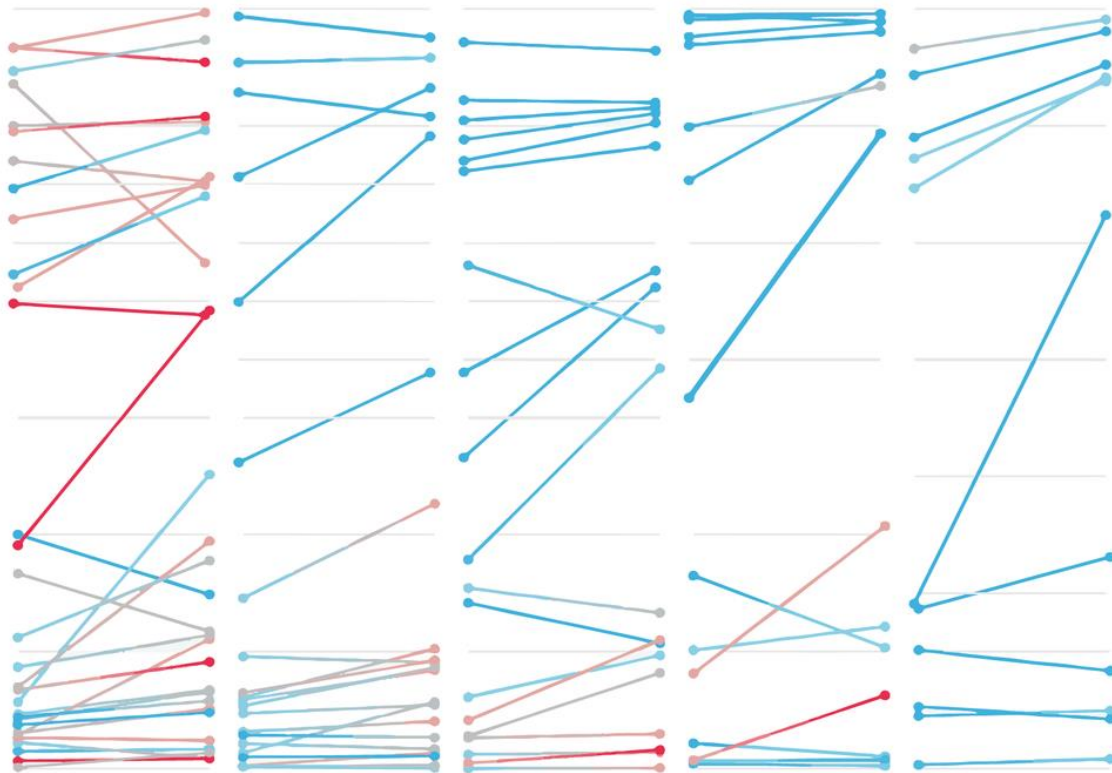
Illustrations by David Lauryl

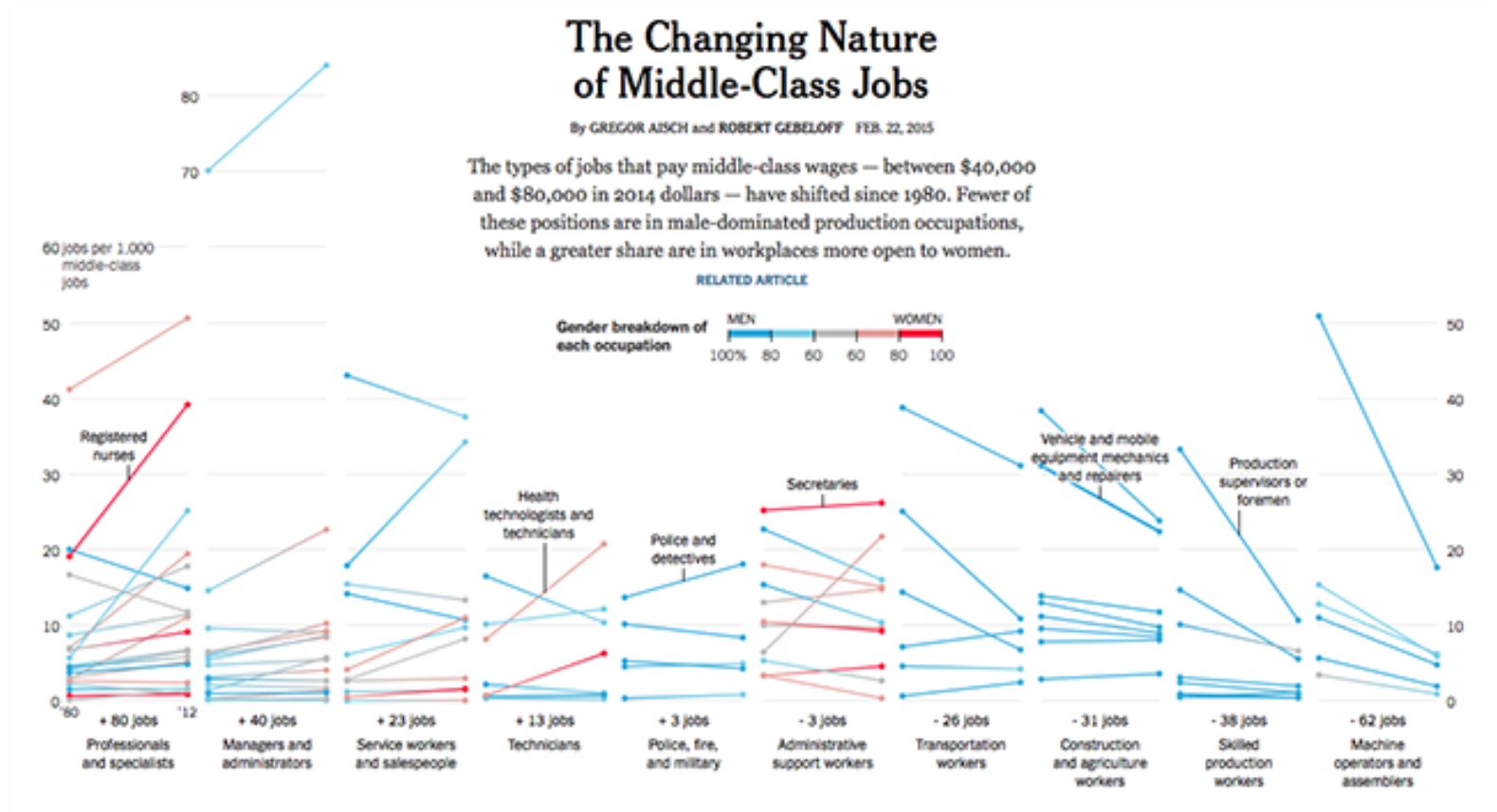
Random House, \$20.95

Penguin Press, \$20.95

CONTINUED ON PAGE 2

Colors have meaning





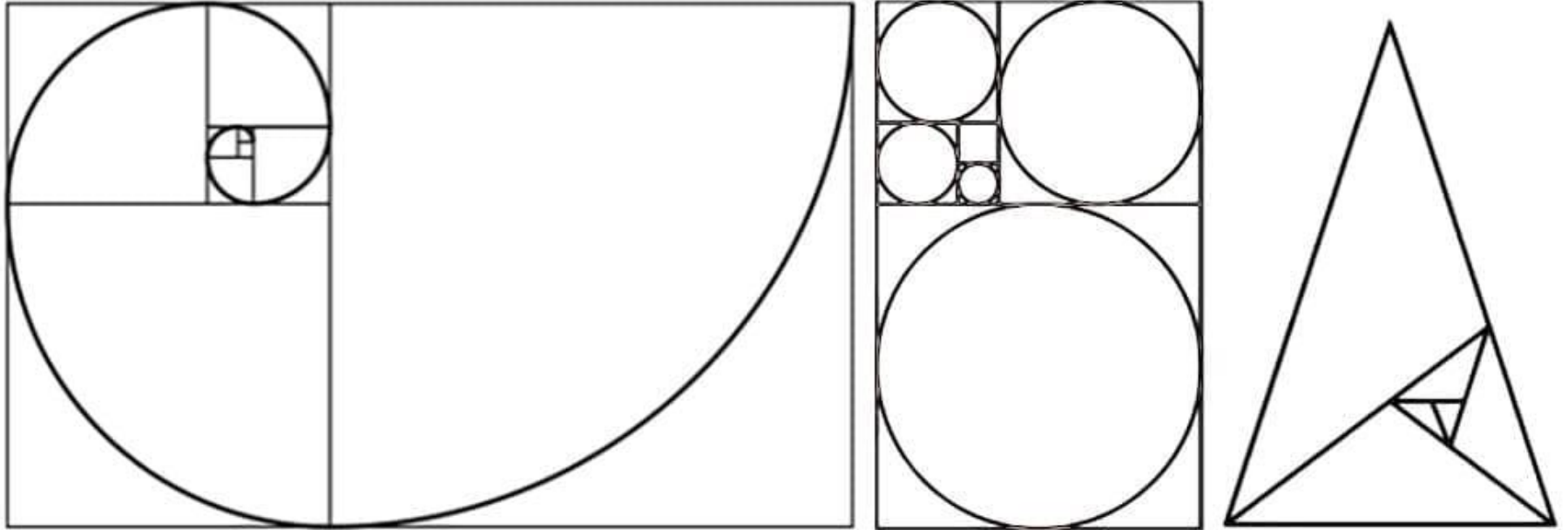
<https://www.nytimes.com/interactive/2015/02/23/business/economy/the-changing-nature-of-middle-class-jobs.html>



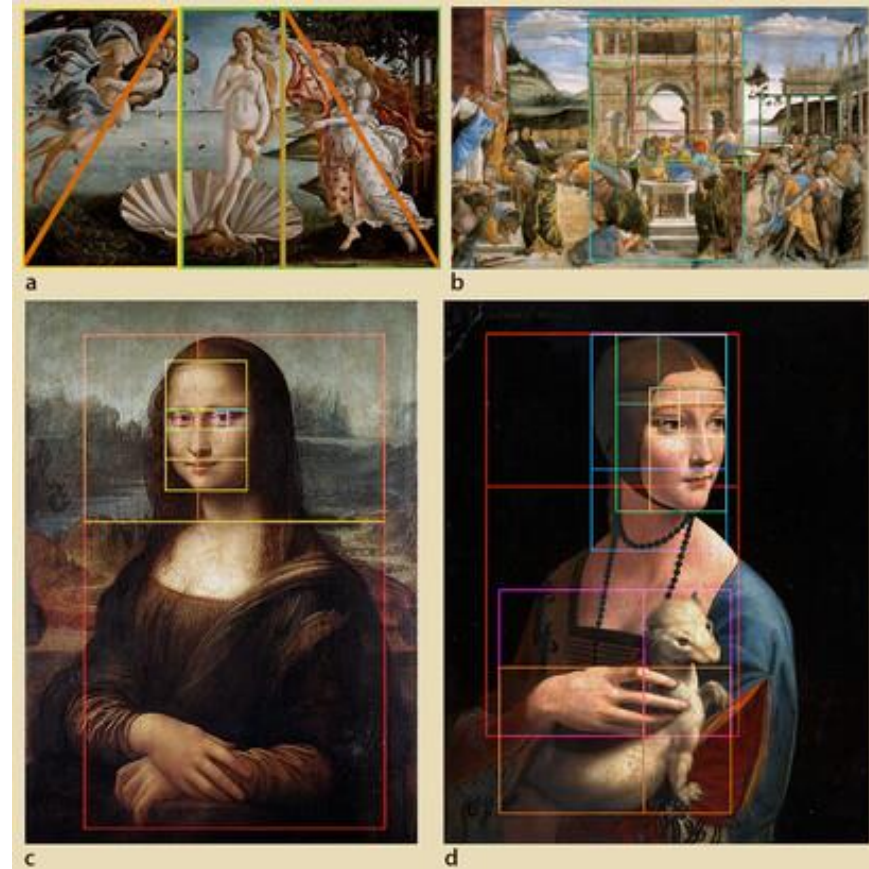
A Western / American	1 Anger	19 Desire
B Japanese	2 Art / Creativity	20 Earthy
C Hindu	3 Authority	21 Energy
D Native American	4 Bad Luck	22 Erotic
E Chinese	5 Balance	23 Eternity
F Asian	6 Beauty	24 Evil
G Eastern European	7 Calm	25 Excitement
H Arab	8 Celebration	26 Family
I African	9 Children	27 Femininity
J South American	10 Cold	28 Fertility
	11 Compassion	29 Flamboyance
	12 Courage	30 Freedom
	13 Cowardice	31 Friendly
	14 Cruelty	32 Fun
	15 Danger	33 God
	16 Death	34 Gods
	17 Decadence	35 Good Luck
	18 Deceit	36 Gratitude

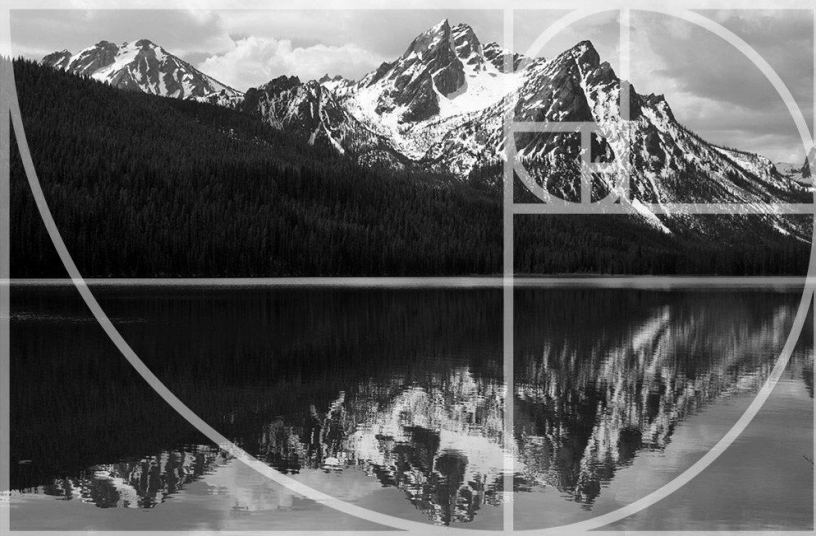
37 Growth	55 Luxury	73 Royalty
38 Happiness	56 Marriage	74 Self-cultivation
39 Healing	57 Modesty	75 Strength
40 Healthy	58 Money	76 Style
41 Heat	59 Mourning	77 Success
42 Heaven	60 Mystery	78 Trouble
43 Holiness	61 Nature	79 Truth
44 Illness	62 Passion	80 Trust
45 Insight	63 Peace	81 Unhappiness
46 Intelligence	64 Penance	82 Virtue
47 Intuition	65 Power	83 Warmth
48 Religion	66 Personal power	84 Wisdom
49 Jealousy	67 Purity	
50 Joy	68 Radicalism	
51 Learning	69 Rational	
52 Life	70 Reliable	
53 Love	71 Repels Evil	
54 Loyalty	72 Respect	

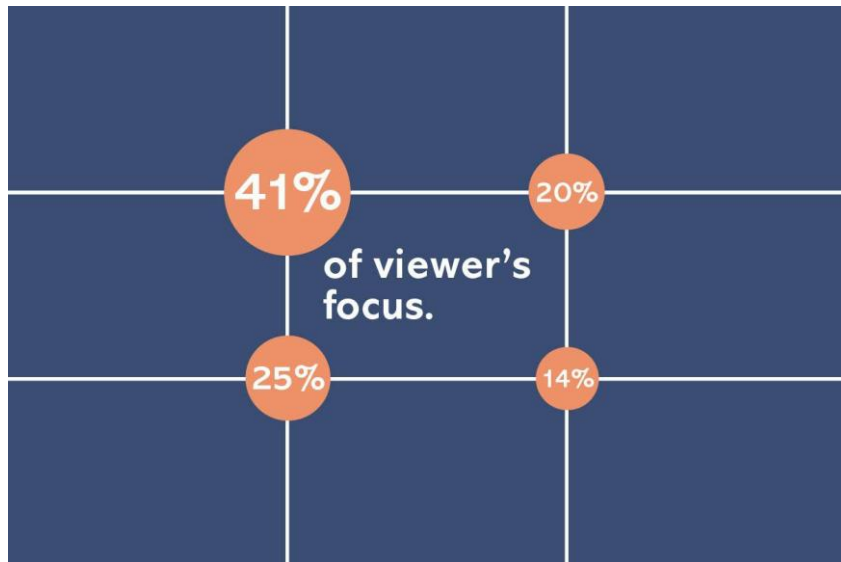
■ Yellow ■ Grey
■ Gold ■ Silver

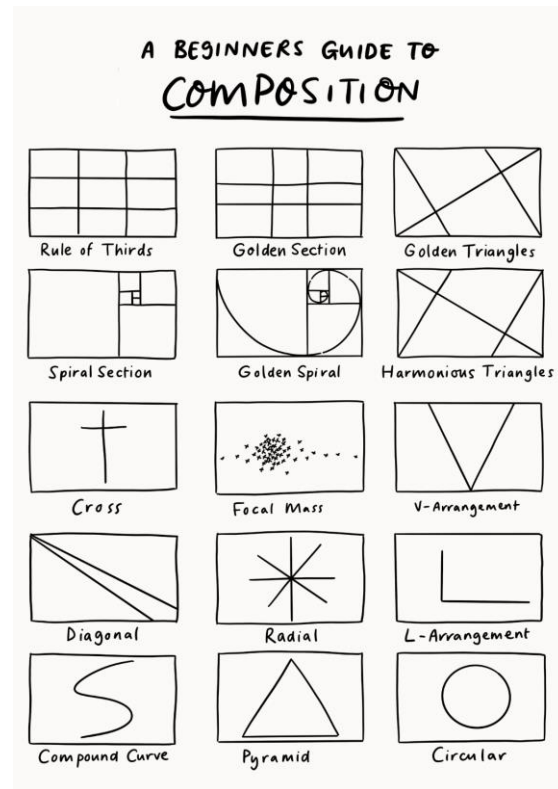
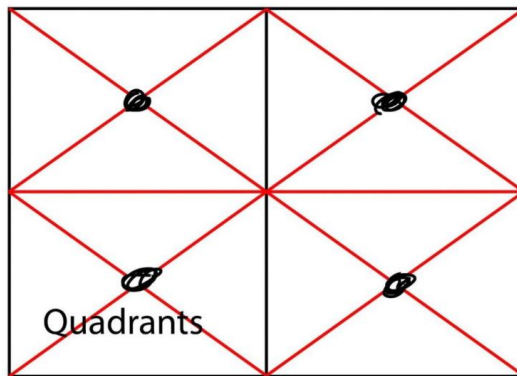
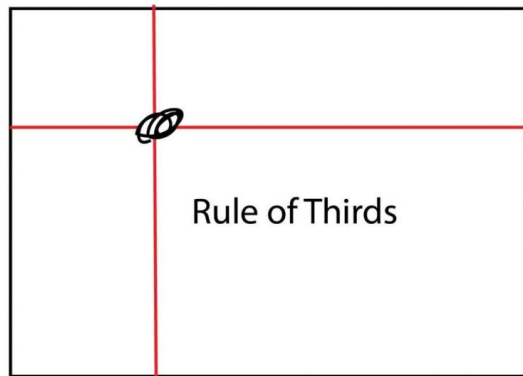
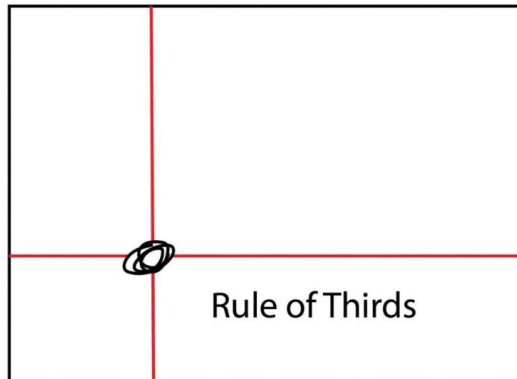
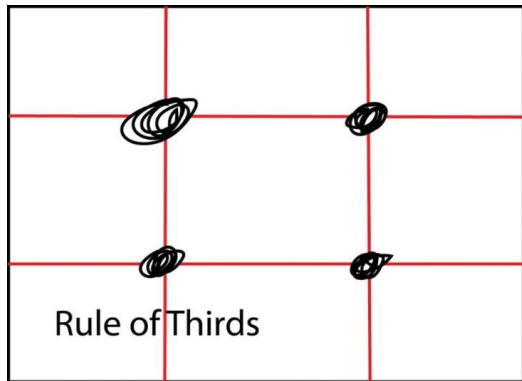


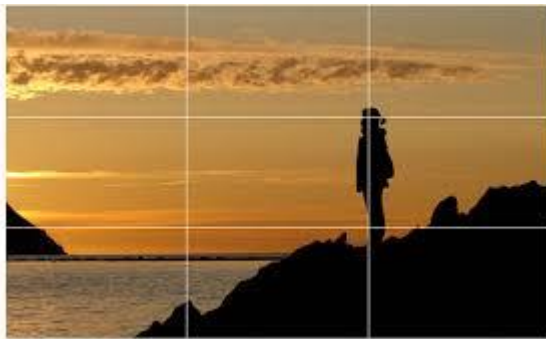






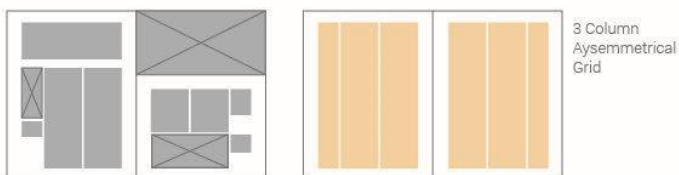
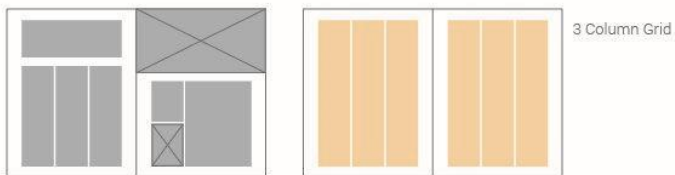
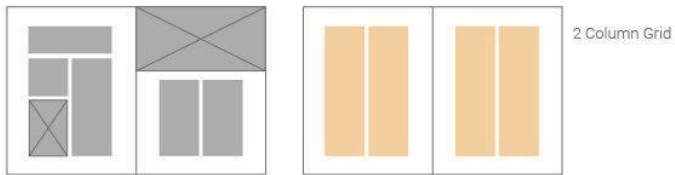






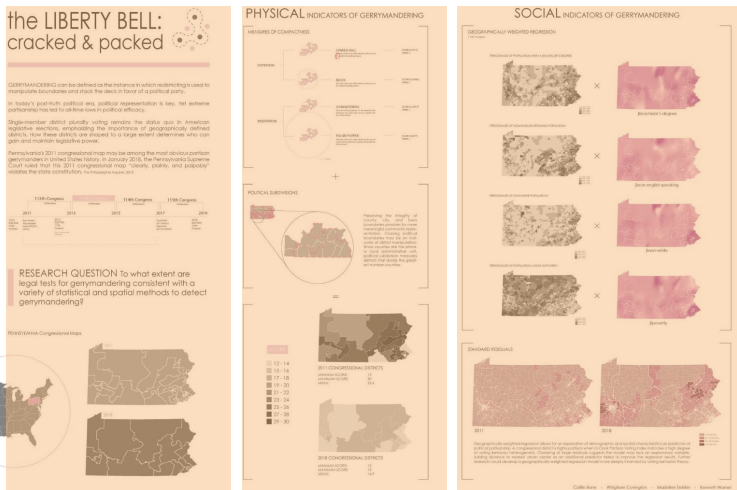
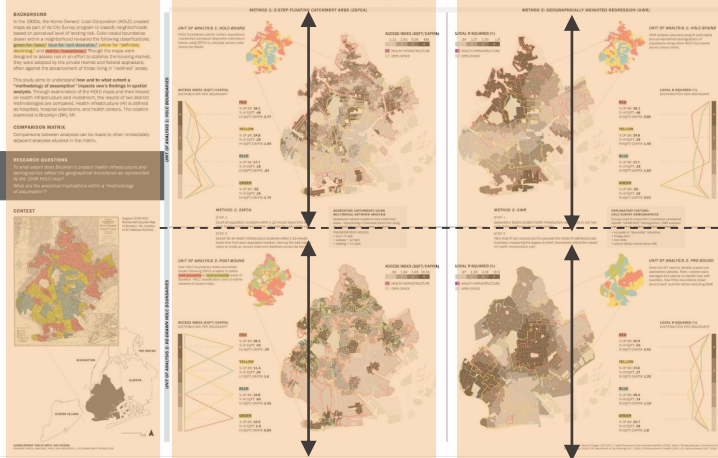
Other ratios

Page Layout Grids



ACCESSIBILITY & ASSUMPTION

Examining methodological assumptions and the impact of H3C security map boundaries (1938) on health infrastructure in Brooklyn, NY (2019)



Drawing neighborhood boundaries in Queens, NY

A.F. López Zamora | J. A. Romeo | G. Serra Coch | M. Uchida, Advanced Spatial Analysis, Spring 2018, MS UP GSAPP, Columbia

1. APPROACH

How different definitions and methods can render diverse neighborhood boundaries and how well Neighborhood Tabulation Areas (NTAs) approximate those boundaries in Queens?

PEOPLE

a neighborhood is defined by the people living there

selected demographics of ACS 2016

Population Density
Age
Race
Education attainment
Income
Poverty Rate
Unemployment rate
Employment sector
Foreign born

METHOD 1. SIMILAR

where people are similar
clustering
grouping similar demographics

Cairns-Hartbeez
Pseudo F-Statistic
(R² from 0.1 to 0.9)

METHOD 2. DIVERSE

where people are diverse

land use dissimilarity index
multigroup Shannon entropy index
 $H = -\sum_{i=1}^n p_i \log_2 p_i$

+ Iterative
Getis-Ord Gi* Hotspot

PLACE

a neighborhood is defined by its built environment characteristics

Land use PLUTO 2016
grocery stores
Reference USA
NYC DoITT

Land Use Data
Building Footprint Area
Building Footprint Width
Building Footprint Length
Building Height
Lot Area
Lot Width
Lot Length
Street Width
Street Length

METHOD 3. SIMILAR

where the built environment is similar
clustering
grouping similar built environment

Cairns-Hartbeez
Pseudo F-Statistic
(R² from 0.1 to 0.9)

METHOD 4. DIVERSE

where land use is mixed + there are accessible grocery stores

1/4 mile service areas from residential lots
+ count of grocery stores
+ land use dissimilarity index
+ Iterative
Getis-Ord Gi* Hotspot

2. RESULTS

NTAs



number of Neighborhoods: 95
Mean Area: 1000 acres
Mean Population: 47000

mean FCI: 0.11

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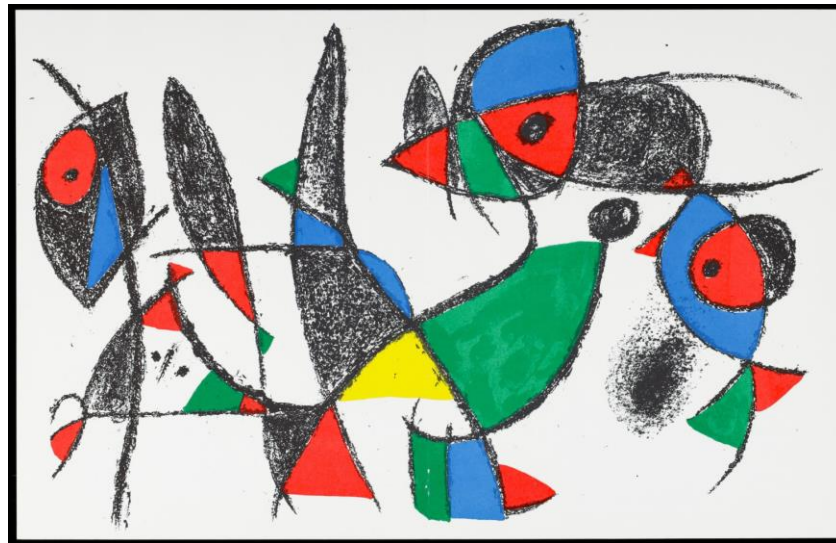
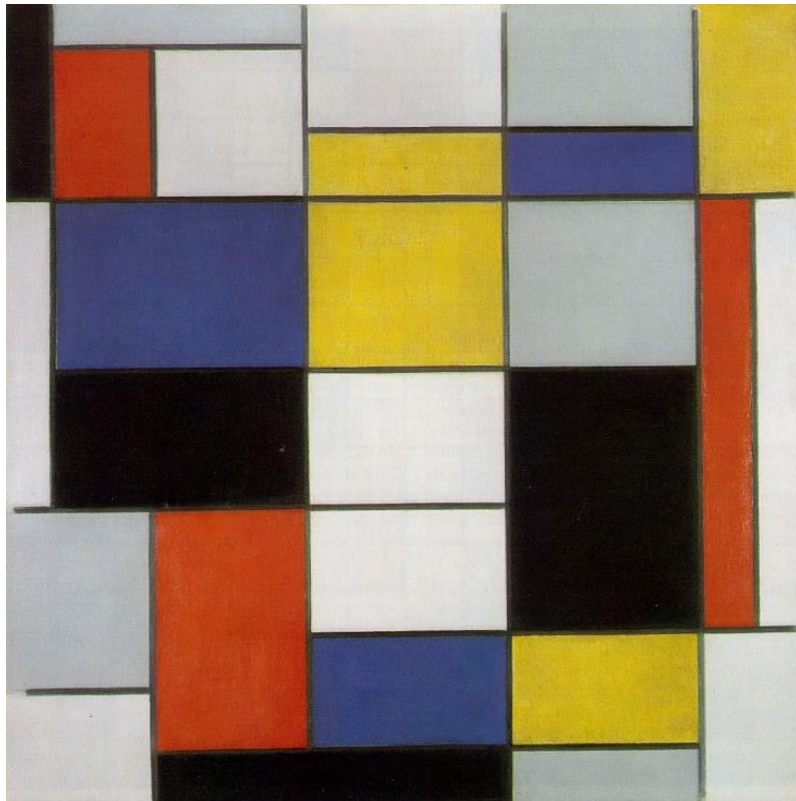
mean FCI: 0.11

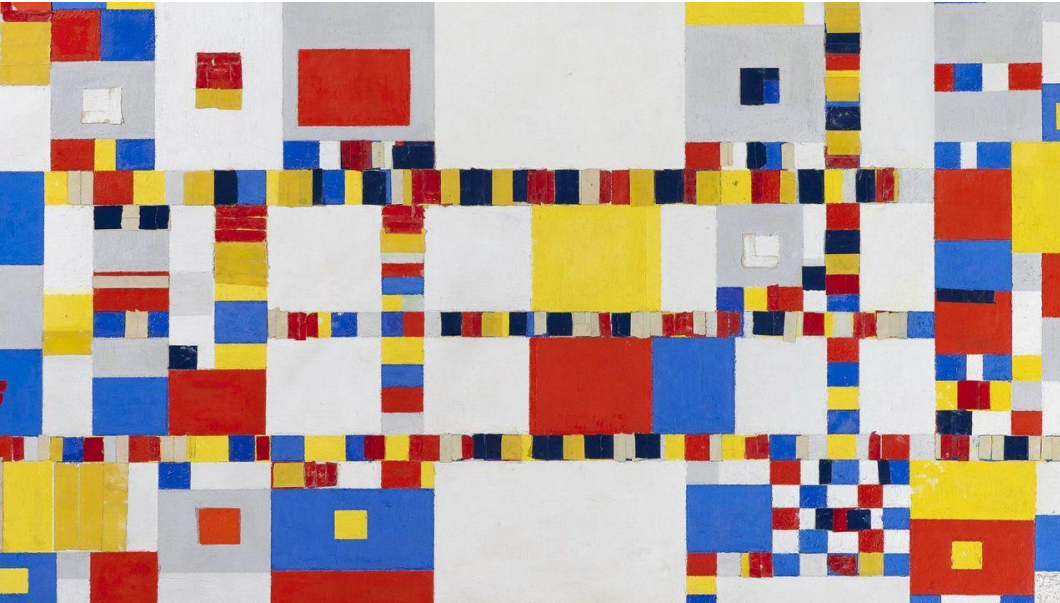
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mean FCI: 0.11

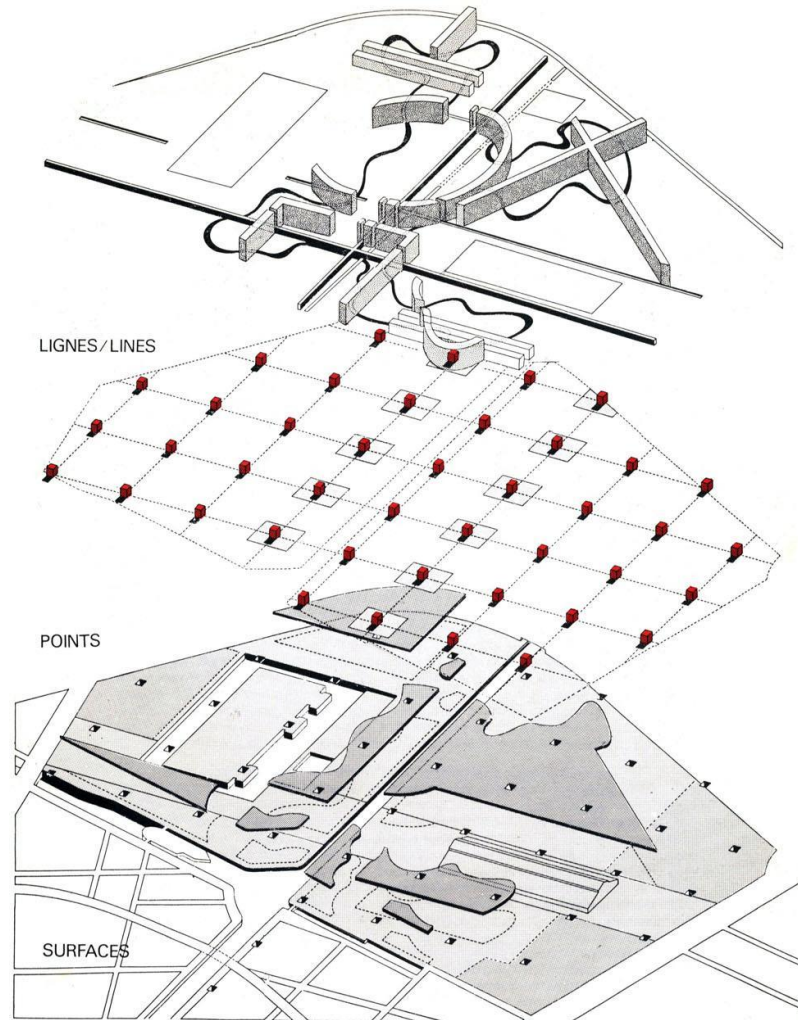
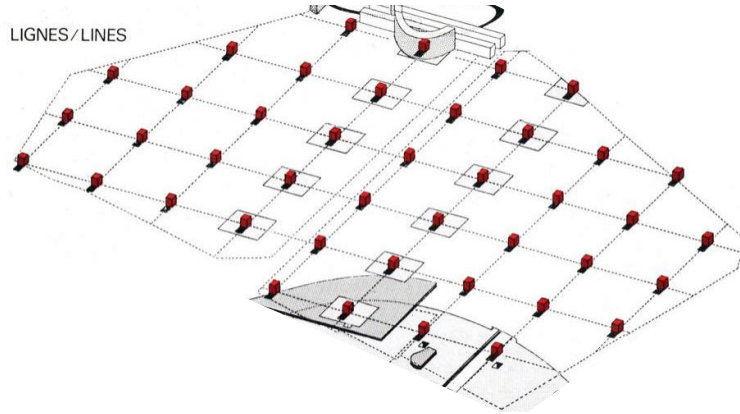
mean FAR: 0.01

mean FCI: 0.11





Matrix vs. Folie



THE SUPERIMPOSITION OF THE THREE SYSTEMS (POINTS, LINES, SURFACES) CREATES THE PARK AS IT GENERATES A SERIES OF CALCULATED TENSIONS WHICH REINFORCE THE DYNAMISM OF THE PLACE. EACH OF THE THREE SYSTEMS DISPLAYS ITS OWN LOGIC AND INDEPENDENCE

In your poster you will have:

- Materials and method
- Domain-goal conceptual framework
- Activity-passivity plot
- Multicriteria assessment
- Results of your sustainability assessment

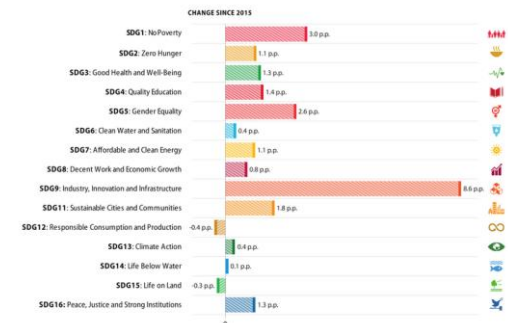
How will you present these elements?

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Data
visualization
makes
information
accessible

Figure 2.7 | Progress in the world for each SDG since 2015 in percentage points



Note: Population-weighted averages. Insufficient data for SDG 10 (Reduced Inequalities) and SDG 17 (Partnerships for the Goals). Time series data for SDG 12 (Responsible Consumption and Production) is only based on the indicator 'Electronic waste (kg/capita).'

Source: Authors' analysis

For each figure, think about:

- Purpose (**the why**)
- Content (**the what**)
- Structure (**the how**)
- Formatting (**everything else**)

Example: Hybrid conceptual framework

- Purpose (the why) ☐ Present definition of sustainability relevant to this assessment
- Content (the what) ☐ Show the relationship between the chosen goals and domains
- Structure (the how) ☐ ?
- Formatting (everything else) ☐ Contrasting colours, easy to understand labels, legible font size etc.

Examples

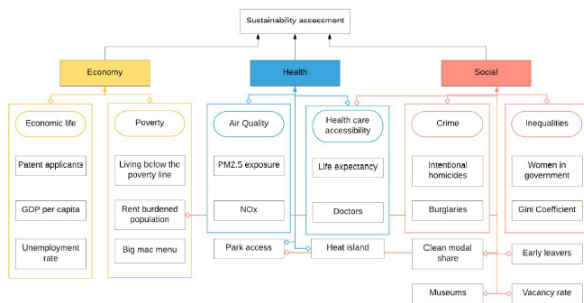


Figure 2: Conceptual Framework

	Social/cultural	Environmental	Economical	Political
Food supply	Access to food, diversity of the needs, sufficient production	Impact of the agriculture, the transportation and the distribution	Cost of production, infrastructure costs	Support to the agriculture
Inequalities	Different backgrounds		Distribution of the money	Regulations to support minorities
Security	Feel safe in the city, amount of crimes	Natural disaster	Infrastructure and security personnel costs	Measures put in place, surveillance, police
Energy demand	Access to electricity	Electricity production from fossil energies	Electric infrastructures (bring electricity to the households)	Energy plan (renewable)
High Waste production	Waste in the streets, different habits	Recycling or burning	Cost of waste collection	Waste management
Education	Amount, geographic distribution and quality of schools		Cost of education	Increase of education quality, financial help
Traffic/mobility	Access to mobility, public transportation	Car Pollution, amount of cars	Cost of public transportation infrastructure	Lack of public transport, cyclic area
Health infrastructure	Access to hospitals		Hospital fees for poor people	Health insurance
Housing	Access to a living place, suburb	Material usage	High accommodation cost	Regulations for housing distribution
Water supply system and wastewater	Usage of tap water	Wastewater, pollution of the rivers/lakes	Cost of infrastructure	Wastewater management
Pollution	Smog, air breathability	Industry/agriculture/traffic/ pollution	Costs for implementing solutions to reduce CO2 emissions	Regulations to reduce pollution problems

Figure 5.2: Framework

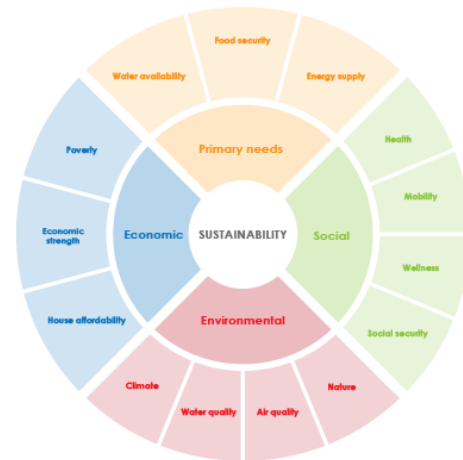


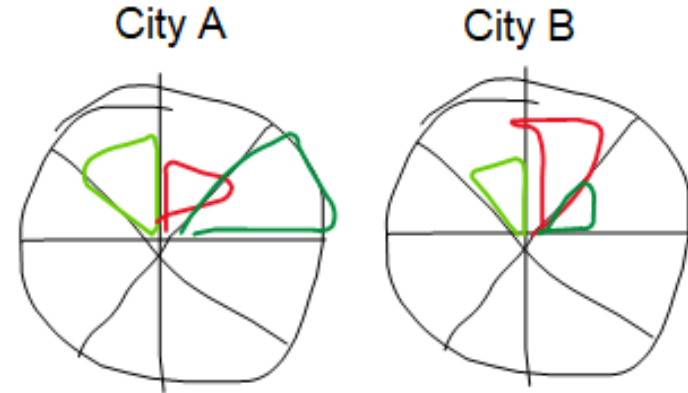
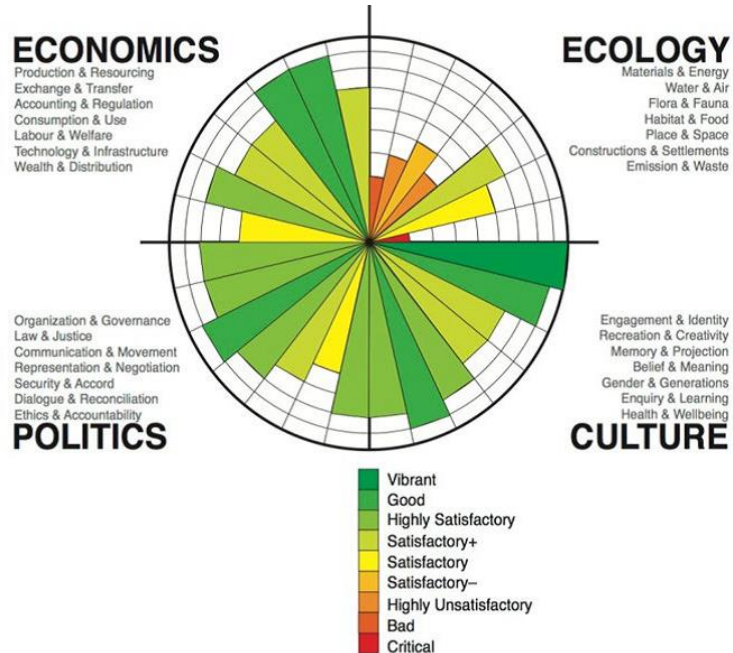
Figure 2: Scheme - Sustainability Conceptual Framework



Example: Result of your SA

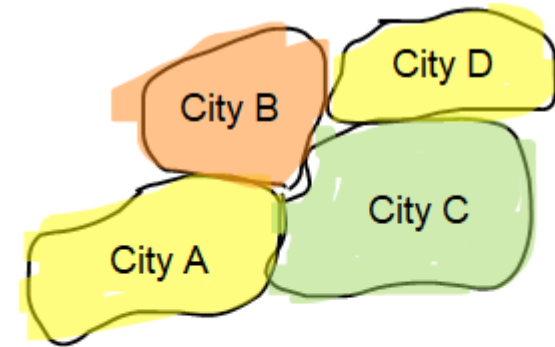
- Purpose (the why) ☐ Illustrating which of the selected cities (A, B, C and D) is the most sustainable
- Content (the what) ☐ Comparison of the sustainability score of four cities (per domain? per goal? per indicator? per city?)
- Structure (the how) ☐ ?
- Formatting (everything else) ☐ ?

Examples



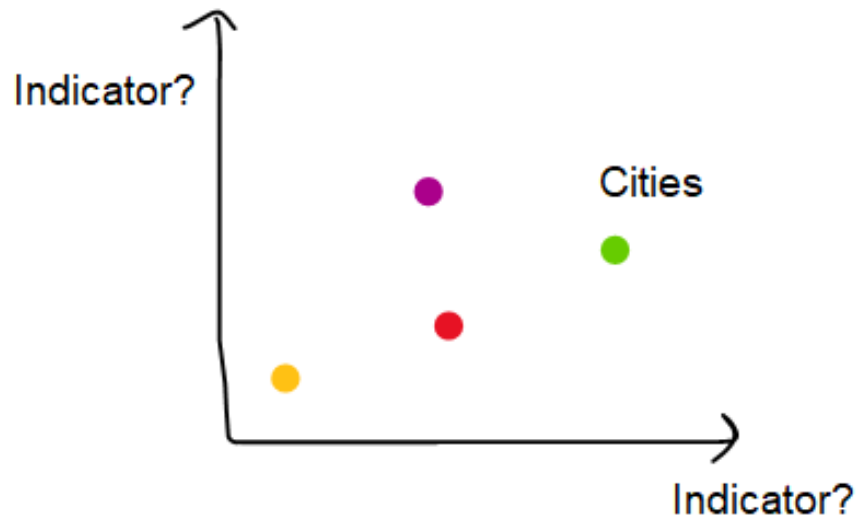
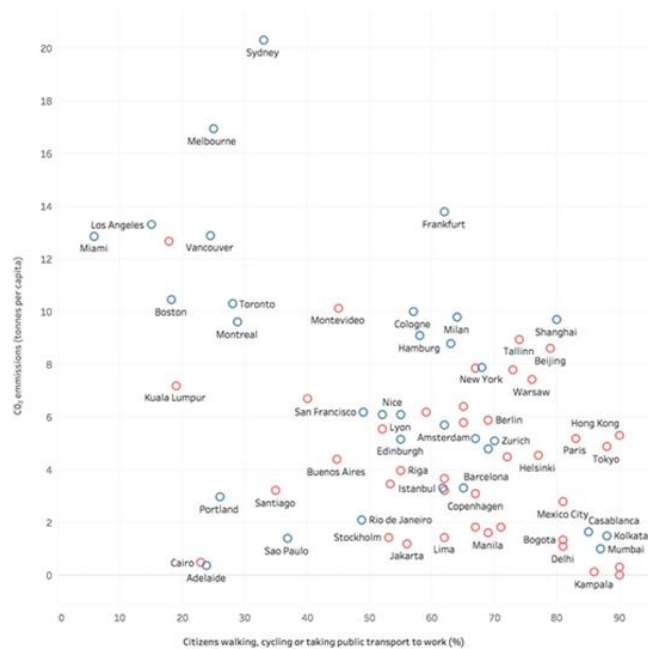
Domains?
Goals?

Examples

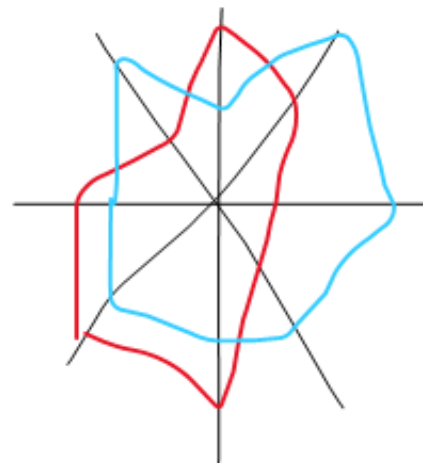
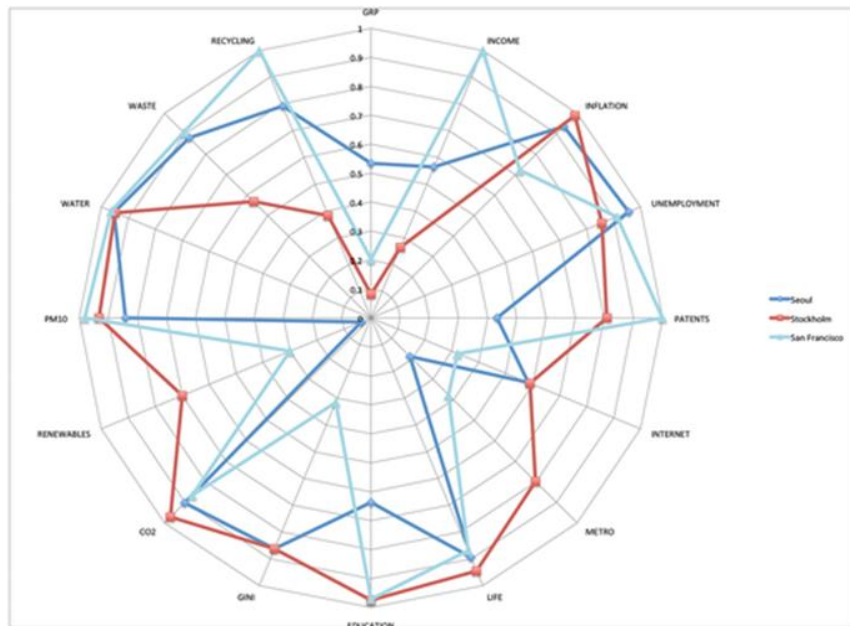


Total sustainability score?
Domains?
Goals?
Indicators?

Examples



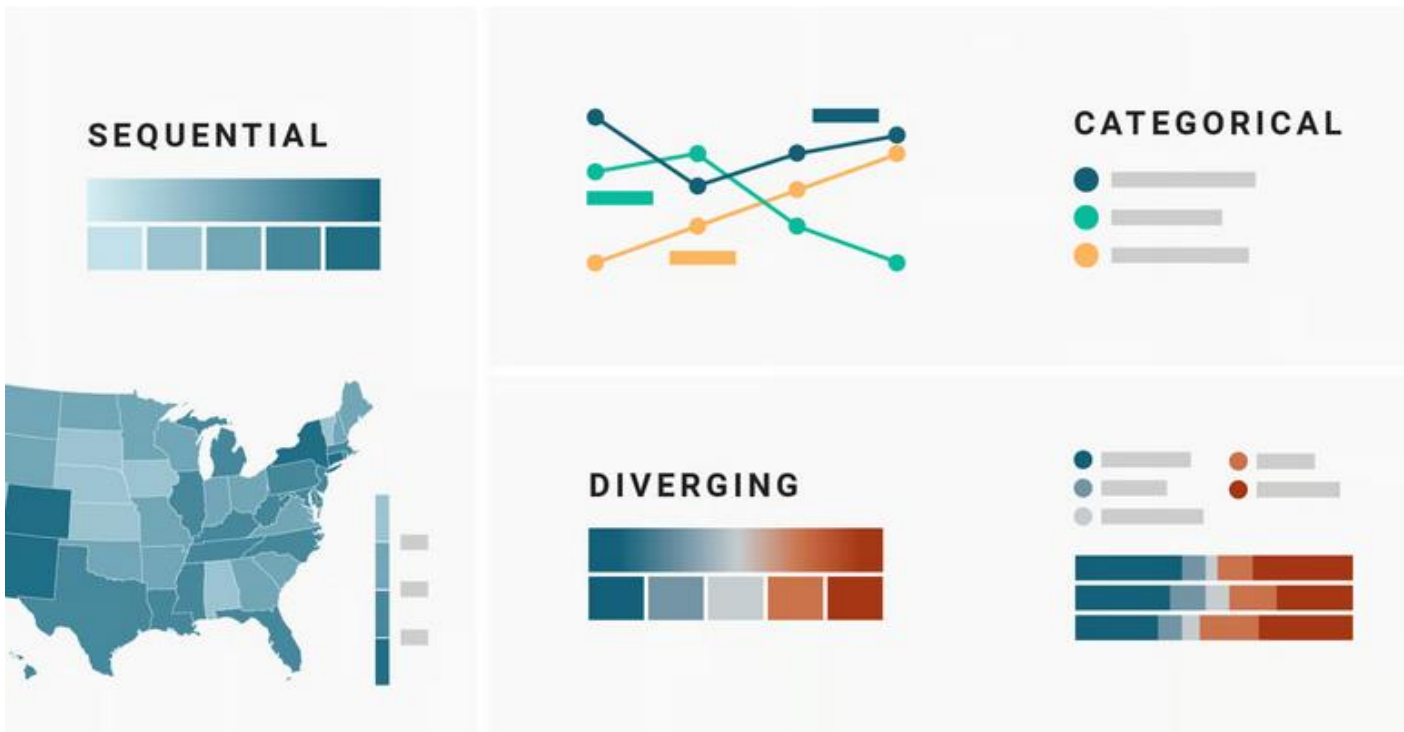
Examples



Domains?
Goals?
Sensitivity analyses?

How to choose your colors?

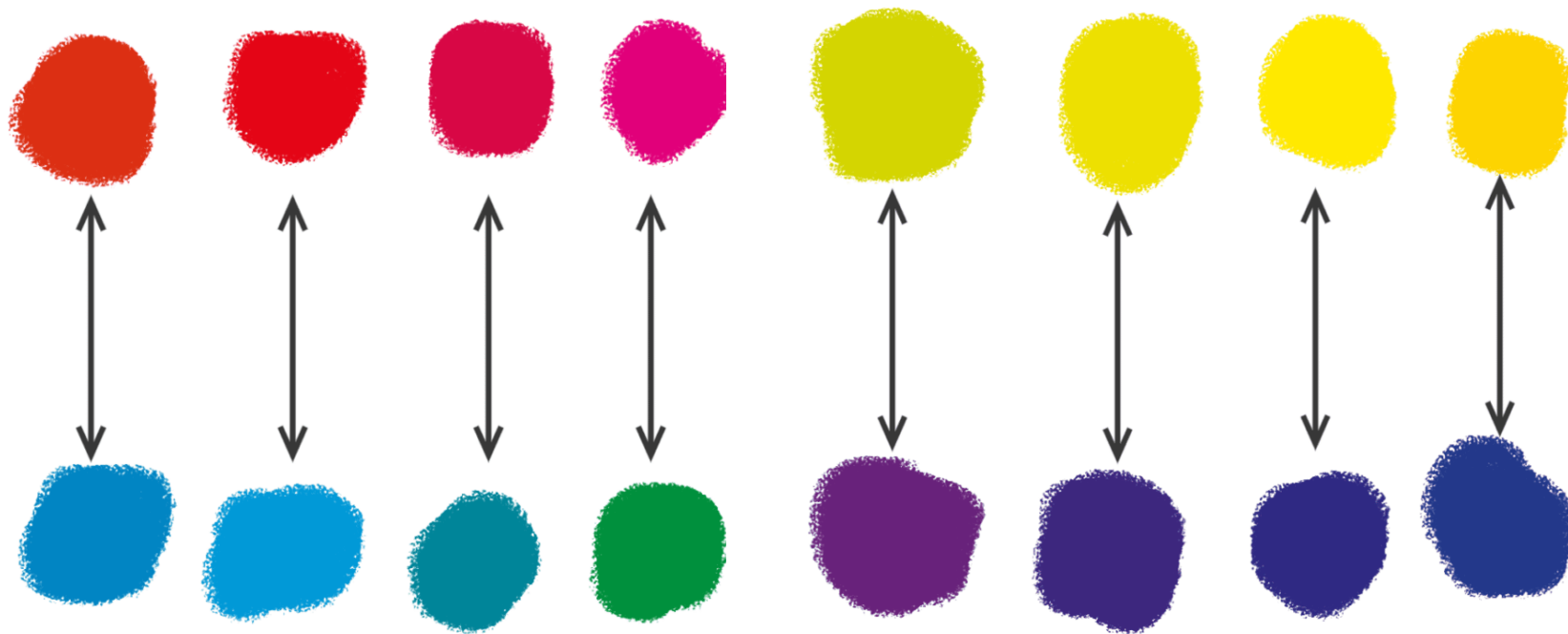
color schemes



<https://www.datawrapper.de/blog/which-color-scale-to-use-in-data-vis>
<https://www.datawrapper.de/blog/quantitative-vs-qualitative-color-scales>

How to choose your colors?

Complementary colors



Remember:

- First decide the storyline of your report
- Then decide which paragraphs need a figure to strengthen the point
- Each figure should tell one story
- Use clear language, avoid acronyms
- Remove visual clutter
- Title, caption, labels the axis and units in every diagram

Resources / tools

- **Excel:** https://policyviz.com/wp-content/uploads/woocommerce_uploads/2017/07/A-Guide-to-Advanced-Data-Visualization-in-Excel-2016-Final.pdf
- **Python libraries:** Matplotlib, Seaborn, Plotly
- **R packages:** ggplot
- **Online:**
 - <https://rawgraphs.io/>
 - <https://www.storytellingwithdata.com/chart-guide>
 - <https://material.io/design/communication/data-visualization.html>
 - <https://datavizcatalogue.com/>
 - <https://datavizproject.com/>
 - <https://www.informationisbeautifulawards.com/news/118-the-nyt-s-best-data-visualizations-of-the-yea>

Next week (14.05.2024)

Sustainability assessment in practise:

- **Engage with stakeholders who utilize SA related tools!**
- **Understand their role in the political agenda!**
- **Share their experiences regarding their potential impact!**

(Participation in this session is important, as it will also contribute to the exam)

The lecture will be structured as an interactive session in two steps to facilitate exchanges:

- Step 1: A 10-minute presentation by the guest speaker.
- Step 2: A question-and-answer session for discussion.



Please add your questions to Menti (1-3 per group):

<https://www.menti.com/al9iqgh5wios>

Our invited guests:

- **Albert Mérino-Saum** is a jurist and economist, and a former EPFL researcher, specialized in ecological economics and sustainability. He currently serves as a scientific advisor at the Directorate of Sustainability and Climate for the Canton of Geneva.
- **Alexandre Bosshard** is a board member of the Department for Industrial Services and Technical Office of the City of Pully. As the coordinator of this department, he has led several smart city projects focusing on big data, mobility, e-government, and open source, in collaboration with industry partners such as Swisscom, academia including EPFL, international organizations like ITU, and other cities. He is also responsible for implementing the United for Smart and Sustainable Cities (U4SSC) initiative developed by ITU and UNECE in the City of Pully.
- **Denis Bochatay** is an environmental engineer from EPFL who currently works as a Project Manager in the Climate Unit for the City of Lausanne. He has extensive experience in assisting businesses and public entities in measuring and understanding their environmental footprint.



Please add your questions to
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Before 14.05.2025

Take ten minutes now:

- Brainstorm three questions pertinent to your project for which the policymakers next week can give you advice.
- Submit them here:
<https://www.menti.com/al9iqgh5wios>
- **Rest of the session:** work further on your project