

# MINING URBAN HEAT: INNOVATION IN DESIGN AND PLANNING OF CITIES

---

GRADUATE SCHOOL OF ARCHITECTURE, PRESERVATION AND PLANNING (GSAPP), COLUMBIA UNIVERSITY, NEW YORK CITY

**ANNA OURSLER** / M. ARCHITECTURE + MS. URBAN PLANNING

“We need to be much smarter in terms of building buildings and how we use energy, and as a consequence, we are going to save money for consumers and deal with issues like climate change that have an enormous economic and health impact on Americans as a whole”

“there’s a lot of low-hanging fruit”

**President Barack Obama, 30 April 2015**

**Remarks before signing the Energy Efficiency Improvement Act of 2015**

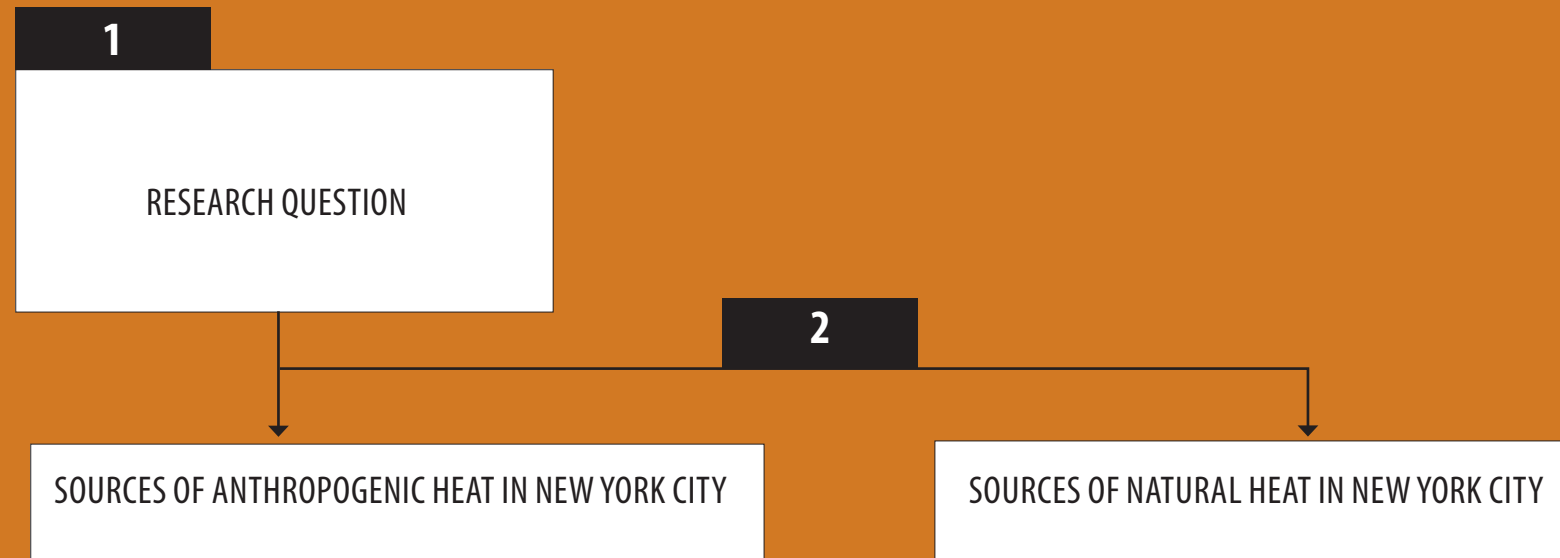
# TABLE OF CONTENTS

---

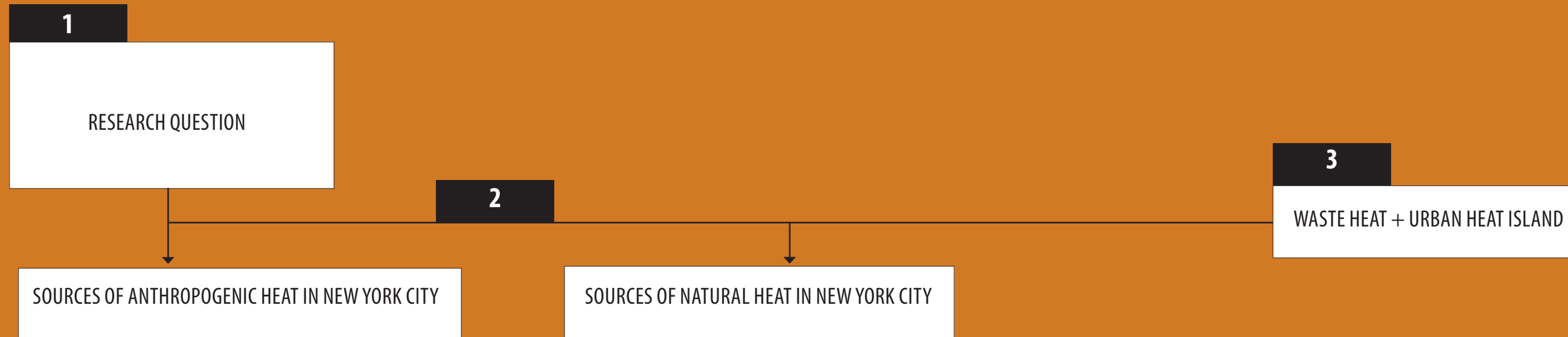
1

RESEARCH QUESTION

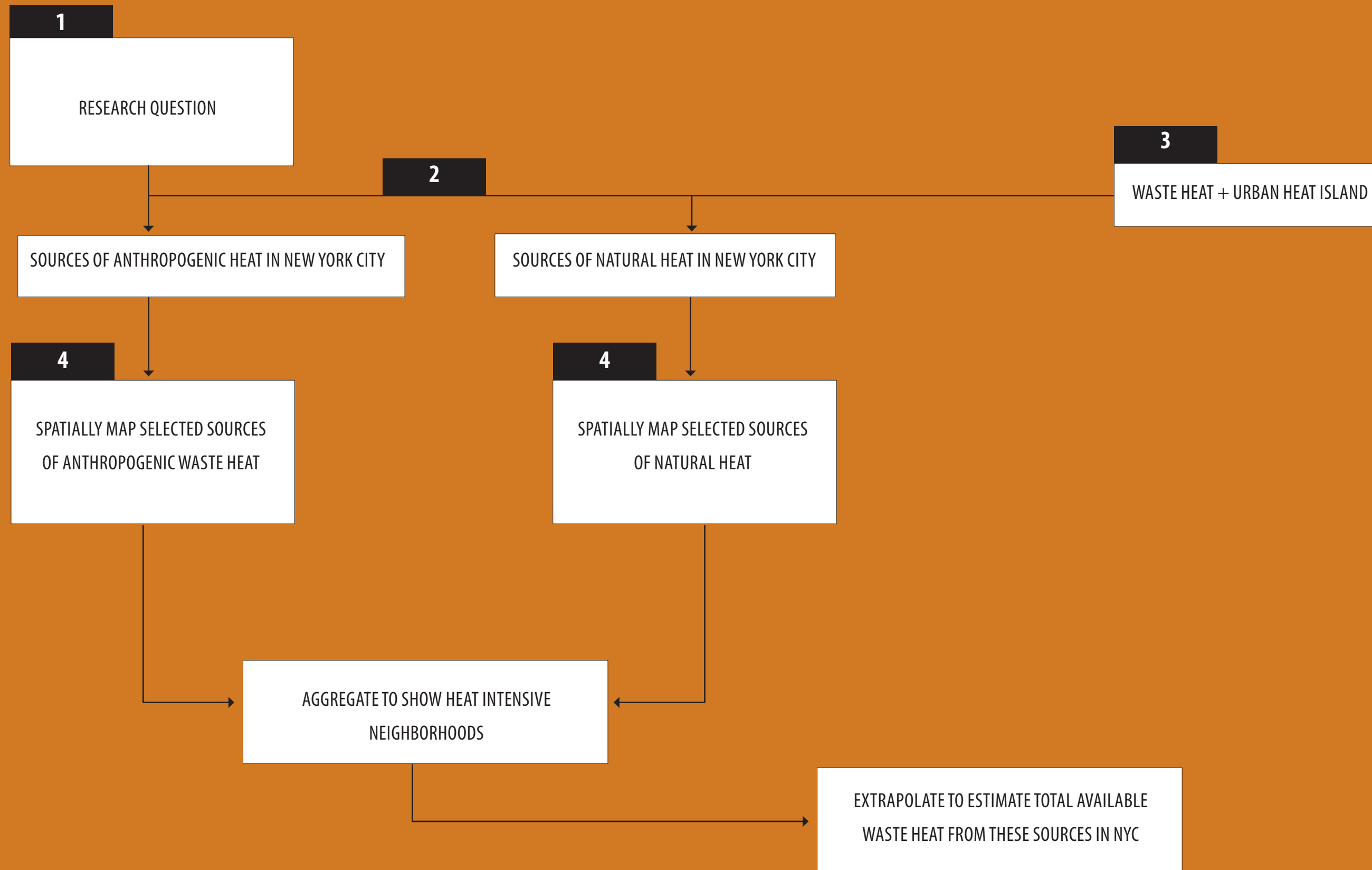
# TABLE OF CONTENTS



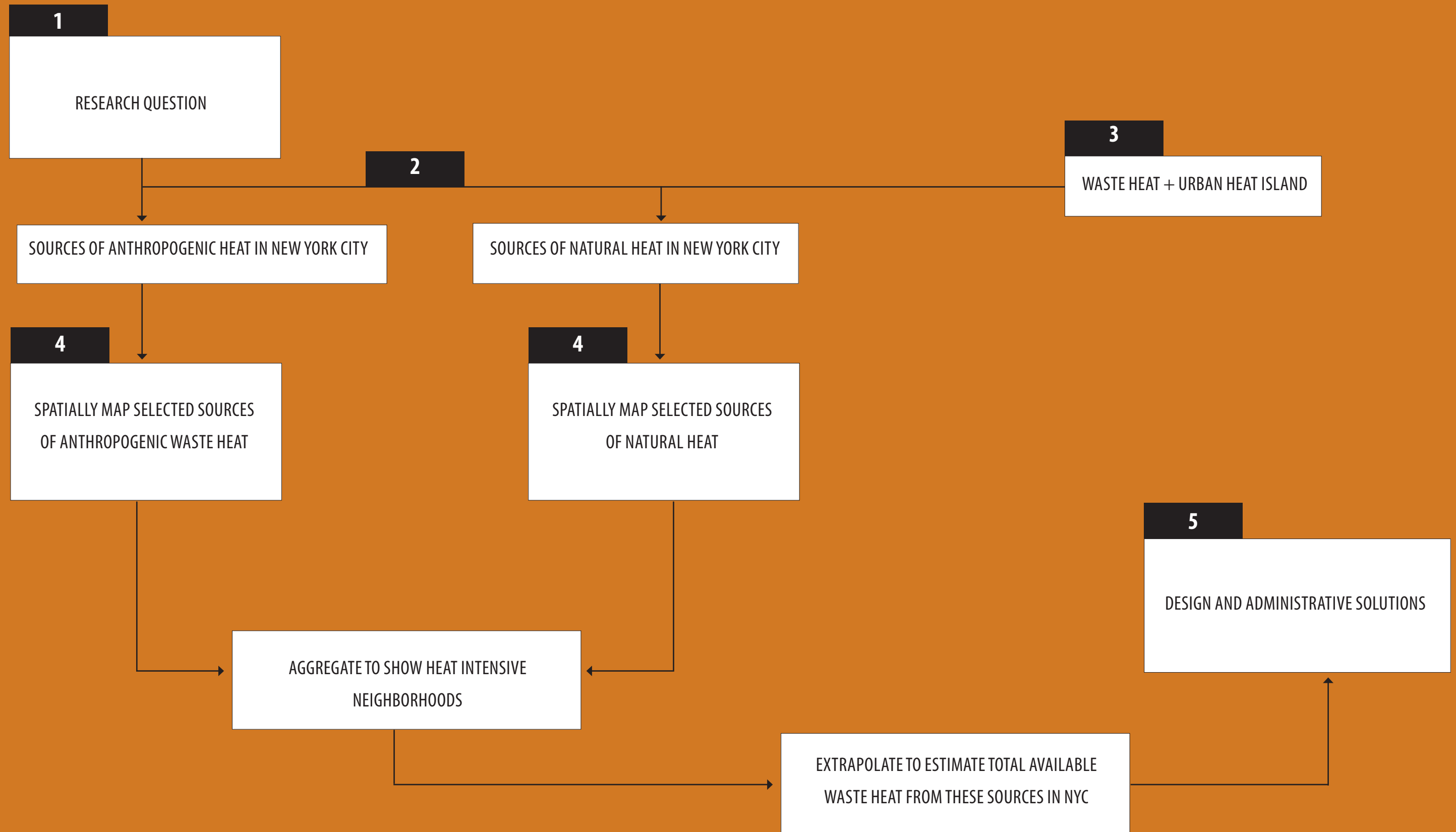
# TABLE OF CONTENTS



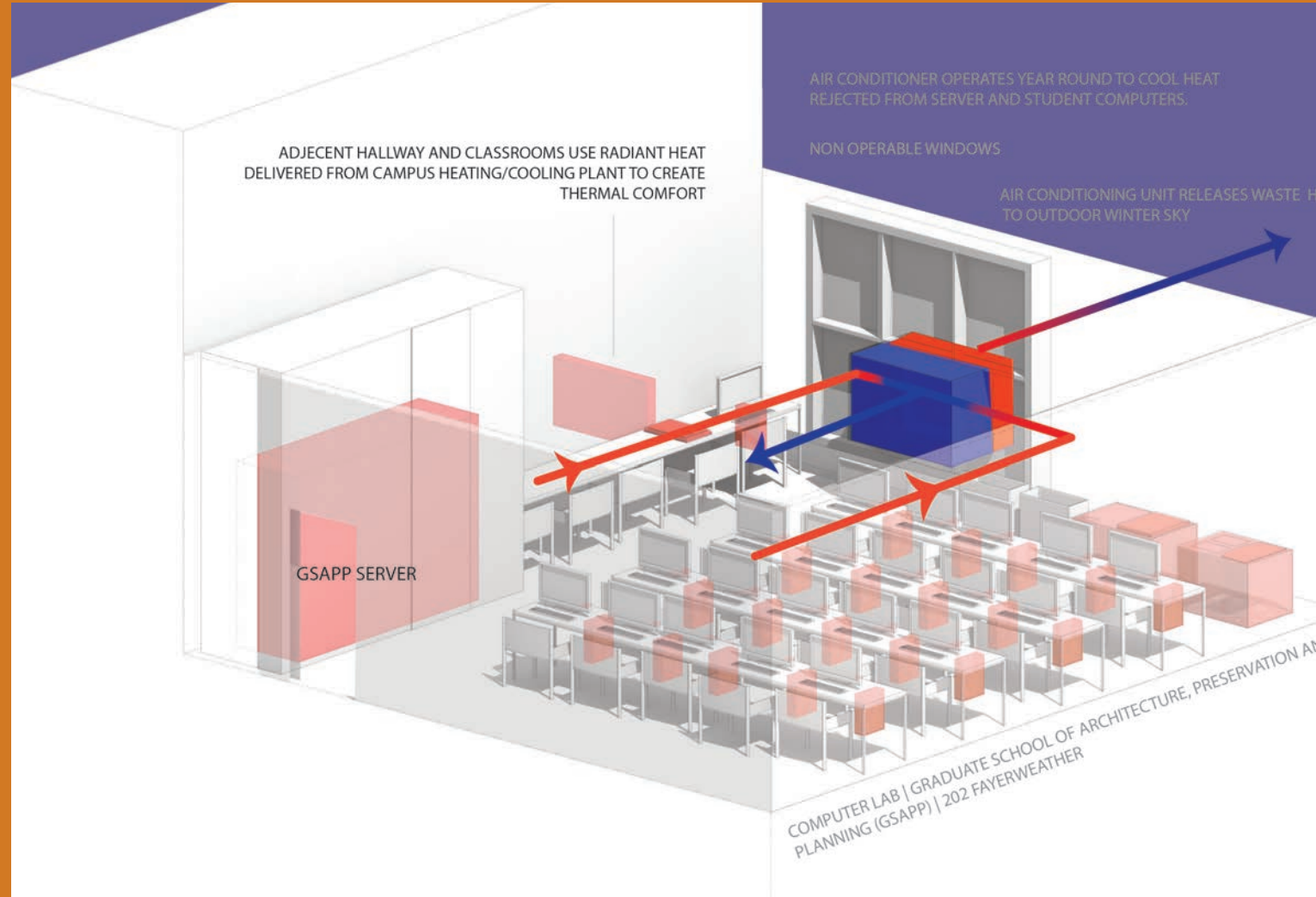
# TABLE OF CONTENTS



# TABLE OF CONTENTS



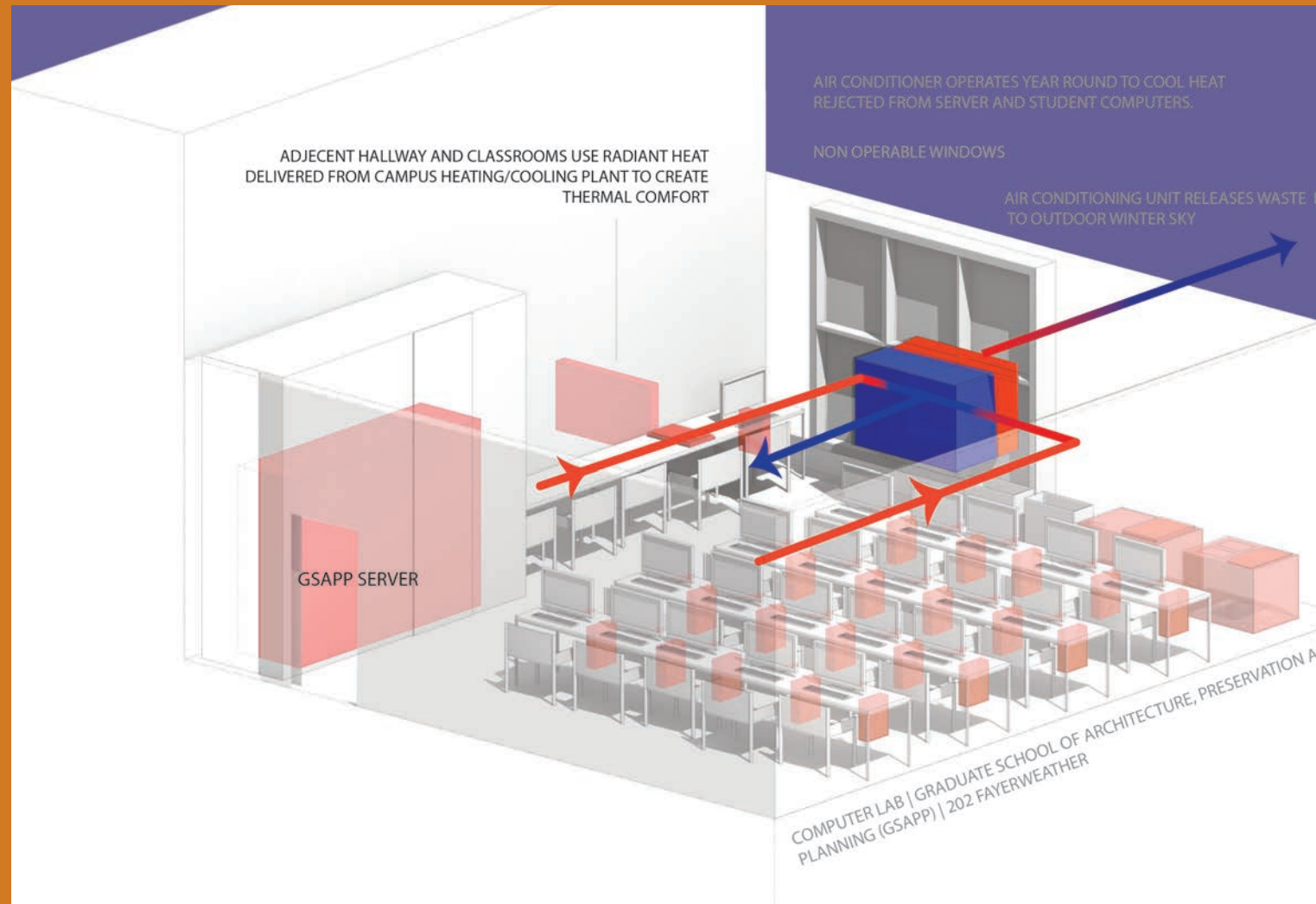
# RESEARCH QUESTION



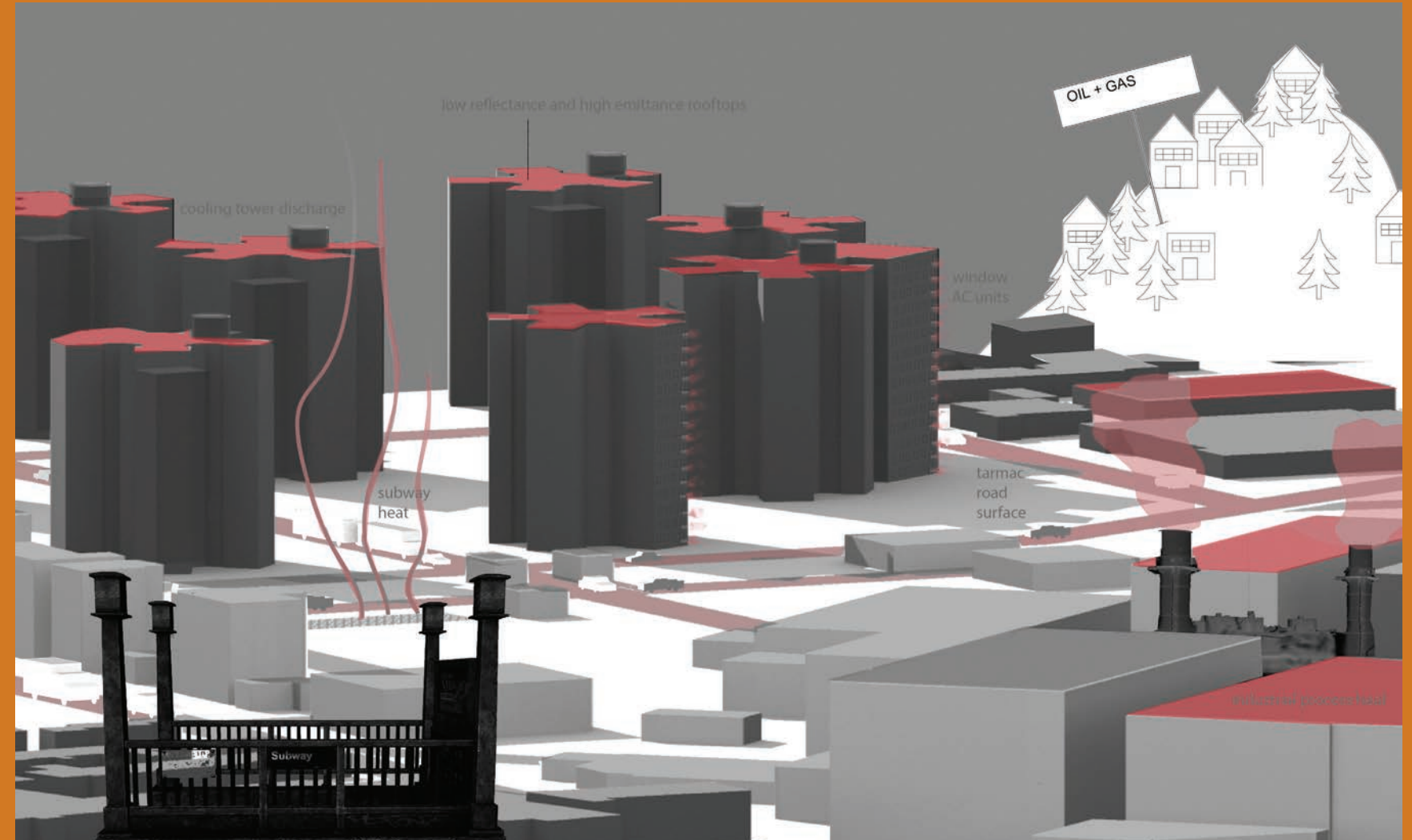
## ARCHITECTURAL SCALE



# RESEARCH QUESTION



ARCHITECTURAL SCALE



URBAN SCALE

# URBAN HEAT ISLAND MITIGATION EFFORTS IN NEW YORK CITY



## New York City regional Urban Heat Island studies:

1. "Reducing Urban Heat Islands: Compendium of Strategies, Cool Pavements." *The American Economic Review*, 1972, 777–95. Alchian, Armen A., and Harold Demsetz.
2. "Characterizing the Urban Heat Island in Current and Future Climates in New Jersey". *Global Environmental Change Part B: Environmental Hazards*, no. 1 (2005): 51–62. doi:10.1016/j.hazards.2004.12.001. Cynthia Rosenzweig, William D. Solecki.
3. "Reducing Urban Heat Islands: Compendium of Strategies", *Urban Heat Island Basics*, Climate Protection Partnership Division, U.S. Environmental Protection Agency Office of Atmospheric Programs, 2014.
4. "Evaluating the Impact of the Urban Heat Island on Public Health: Spatial and Social Determinants of Heat-Related Mortality in New York City," 2010. <http://academiccommons.columbia.edu/catalog/ac:148820>. Rosenthal, Joyce Klein.
5. "Green Roofs in the New York Metropolitan Region: Research Report". Columbia University Center for Climate Systems Research, 2006. <http://www.statisticstutors.com/articles/debrat-green-roofs.pdf>. Rosenzweig, Cynthia, Stuart R. Gaffin, and Lily Parshall.
6. "Canyon Geometry and the Nocturnal Urban Heat Island: Comparison of Scale Model and Field Observations." *Journal of Climatology* 1, no. 3 (1981): 237–54. Oke, Tim R.
7. "Potential impact of green roofs on the urban heat island effect." Solecki, W.D., Rosenzweig, C., Cox, J., Parshall, L. (2006). In Rosenzweig, C., S. Gaffin, and L. Parshall, Eds., *Green Roofs in the New York Metropolitan Region*. Columbia University Center for Climate Systems Research and NASA Goddard Institute for Space Studies. New York, NY.
8. "Mitigation of uhi in Urban New Jersey". *Environmental Hazards* 6, no. 39–40 (2005). Solecki, William.
9. "Assessing potential public health impacts of changing climate and land uses: the New York Climate and Health Project. In *Regional Climate Change and Variability: Impacts and Responses*", edited by M. Ruth, K. Dohaghy, and P. Kirshen. Edward Elgar, Northampton, MA. Kinney, P. et all. (2006).



# SOURCES OF ANTHROPOGENIC WASTE HEAT IN NEW YORK CITY

---

## **BUILDING HEATING, VENTILATION AND COOLING SYSTEM**

WATER TREATMENT PLANTS

## **OTHER BUILDING MECHANICAL SYSTEMS (NON-HVAC)**

ELECTRIC POWER GENERATION STATIONS AND SUBSTATIONS

DOMESTIC HOT WATER

SUB-SURFACE TRANSPORTATION

GROUND LEVEL TRANSPORTATION

## **INDUSTRIAL PROCESS HEAT**

# SOURCES OF NATURAL HEAT IN NEW YORK CITY

---

HEAT STORED IN WATER BODIES

HEAT STORED IN SOIL AND ROCK

**DIRECT SOLAR RADIATION**

