Ingestible Cities

This paper explores how an architect can begin to understand the complex systems operating in six Asian cities: Tokyo, Beijing, Bangkok, Hong Kong, Shanghai, and Seoul, and speculate on the relationships between air, water, smell, and sonic environment in unfamiliar cities.[1]

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BEIJING

Beijing is the center of Chinese government and culture and is the second largest city in the country, after Shanghai. Beijing has 11.5 million residents within 1,369 square kilometers[2] giving it a density of 8,500 people per square kilometer. Chinese culture does not require a large personal boundary and Chinese citizens often invade a westerner's circle of personal space with both their physical presence as well as their voices. Yelling, car horn honking, clearing of the throat, and spitting (on the street) are all common public activities. Beijing is not a clean city. Winter and spring sandstorms are a common occurrence. These help blow out pollution yet emissions are replaced by sand and dust particles from nearby. City infrastructure is irregular. City water is not potable and cannot be ingested without filtration or boiling. In the city's hutongs, traditional courtyard houses, no plumbing is provided in many individual residences except a water tap for boiling water. Cooking is done in the streets or alleyways between the small units. On each block there are many public toilets, spaced about evenly on both sides of the block, each with multiple squatter holes without a privacy partition.

The largest issue in Beijing is the air pollution, which can vary within a week from an Air Quality Index (AQI)[3] of 35 to an AQI of 350, as it did for me in March 2014. Air quality control measures are rather late to the game in Beijing. The air, of course, smells of smog and car emissions, as well as, charcoal from sidewalk cooking and dust that might have blown in from the west. Water in Beijing is two-thirds groundwater sourced and one-third surface sourced. A major holding reservoir is near the Summer Palace on the northwest side of the city. Water from the Yongding River no longer contributes to the city's water supply due to industrial and agricultural pollution.

SEOUL

The current population of Seoul is 10.4 million, though the Seoul Capital Area is the second largest metropolitan area in the world and has 25.6 million people.[4]

The city is just 605 square kilometers and has a density of 16,700 residents per square kilometer, making it one of the densest cities in the developed world. Air quality and water quality in Seoul are high. Air quality regulations in Seoul are more stringent than USEPA standards, require car emissions to meet Euro IV standards, and have fuels with reduced sulphur content. However, Seoul must deal with trans-boundary dust storms - or "yellow sand days" complete with higher mortality than regular days.[5] The subway system has 529 kilometers of track and 387 stations, making it, by most accounts, the largest metro system in the world.

TOKYO

Tokyo is a civilized city. It has had a modest increase in population[6] in the last twenty years and is a fairly stable city with approximately 13.2 million residents within 2,200 square kilometers giving it a density of 6,000 people per square kilometer.[7] For a city of 13 million, the metropolis operates efficiently and quietly. It is a place of quiet respect with no invasion of personal space in terms of physical, auditory or olfactory. No one speaks on the subway. Drivers do not honk car horns. Tokyo is a clean city. There is no trash on the city streets or sidewalks. Oddly there are also very few public trash cans. Personal hygiene is very high and makes it comfortable for a western visitor, complete with western style toilets and heated seats with bidets - Toto is a common brand. Public bathrooms are very accommodating with shelves and lots of space and privacy; even the bathrooms at subway stations are clean and safe. There is so little crime in Tokyo in general that you can leave a camera or bag unattended. Since the city has seen relatively steady growth for some time, and is a very wealthy city, money is spent on issues such as air and water quality. The air quality in the city has been managed well and the city smells of food including soy, vinegar, smoke from wood or charcoal cooking (and not smog). Tokyo citizens have had a high level of education since the city was named in 1868[8] and now enjoy an average life expectancy of 84. They also happen to be large consumers, per capita, of the world's resources.

1 Figure 1: Shanghai, April 2014.

SHANGHAI

Shanghai is the center of business for China and is the largest city in the country. Shanghai has 14.4 million residents within 3,497 square kilometers giving it a density of 4,100 people per square kilometer.[9] It is growing daily. Its shipping port is the largest in the world in terms of number of containers; the Port of Shanghai handles 29 million containers annually. International business is centered in Shanghai and it has the largest per capita disposable income in China at $6,483. Air quality and water quality are recent concerns for the city. About 80 percent of the water in Shanghai comes form the Huangpu River and 20 percent from the Yangtze River – both are polluted resulting in water with high levels of chlorine, bacteria, lead and other toxic metals. While the smell of jasmine can fill the air the urban environment is also filled with sounds of automobile honking, mopeds, wheels from bicycles and carts, hammers, and construction. The subway system in Shanghai stretches for 525.2 kilometers (270 miles) and is one of the largest in the world. Correspondingly, it has just 53 cars per 1000 residents.

HONG KONG

Hong Kong, with 7.1 million residents has about the same size population as Bangkok, however the city sits on 1,104 square kilometers and has a density of 6,400 people per square kilometer with areas of Hong Kong island having densiries of 20,000 people per square kilomteter or higher. Since 1997, when the control of Hong Kong was handed over from the British to the Chinese, the city is designated as a Special Administrative Region of the People's Republic of China, has its own governance, currency, and is not subject to Chinese visa or entry regulations. Hong Kong is the most international of the six cities and English signage and use makes is a very easy city to visit. Personal and plumbing hygiene is relatively high. Air quality and water quality are well monitored. Hong Kong has adopted Euro III emission standards since 2001, replaced diesel engines with liquid petroleum gas, and does a multitude of types of industry testing, which has resulted in cleaner air.[10] Hong Kong's water is in compliance with WHO 2011 guidelines with about 87 percent coming from the Dongjiang River and the rest coming from local catchments.[11] Sounds of honking car horns and the squeaking of wheels from the oldest running tram system are often masked by the constant sound of a jack hammer - required to break through the infrastructure encased in concrete. Smells of smoke, tea, bread, and dumplings fill the air.

BANGKOK

Bangkok, located in southern Thailand is that country's largest city and has 7.2 million residents within its 1,568 square kilometers and a density of 4,500 people per square kilometer.[12] In terms of hygiene and cleanliness, Bangkok fits somewhere in between Tokyo and Beijing. While the air quality in Bangkok is relatively high for a large city, the water is not considered potable by most residents and both surface water and ground water are contaminated from industry pollutants and septic system discharge.[13] Water[14] and traffic are the most critical health and environmental issues facing Bangkok. The water supply is tested and real time data is available on the web, showing water quality at various tap sites. The residents of Bangkok are, however, a bit more reserved than their Chinese neighbors, often bowing instead of pushing. Subway trips in Bangkok are a very pleasant experience, even during rush hour or political demonstrations. Sounds in the city include car honking from the notoriously stagnant yet polite traffic, as well as, music and chants. Smells in Bangkok include gasoline, urine, curry, and lime.

POPULATION

The populations of cities in Asia are exploding. These megacities – defined by some as being at least five million inhabitants while others set the bar at ten million inhabitants – are growing at an incredible rate, putting stress on infrastructure and urban systems that are often playing "catch up" as waves of land turn from rural landscapes to urban landscapes within a ten year period. Increases in population and city growth are directly interrelated. In fact, Edward Glaeser describes the relationship between new building and population growth as being "perfect' – meaning that for every one percent increase in housing stock there is an exact rise of population by that same amount.[15] If true, cities like Beijing, Shanghai, and even Xi'an - where thousands of square meters of new housing in the form of residential towers is currently under construction - should see a similar spike in population in the very near future. Population increases also increase demand on clean air and water, in addition to demands on the physical infrastructure of roads and mass transit rail lines.

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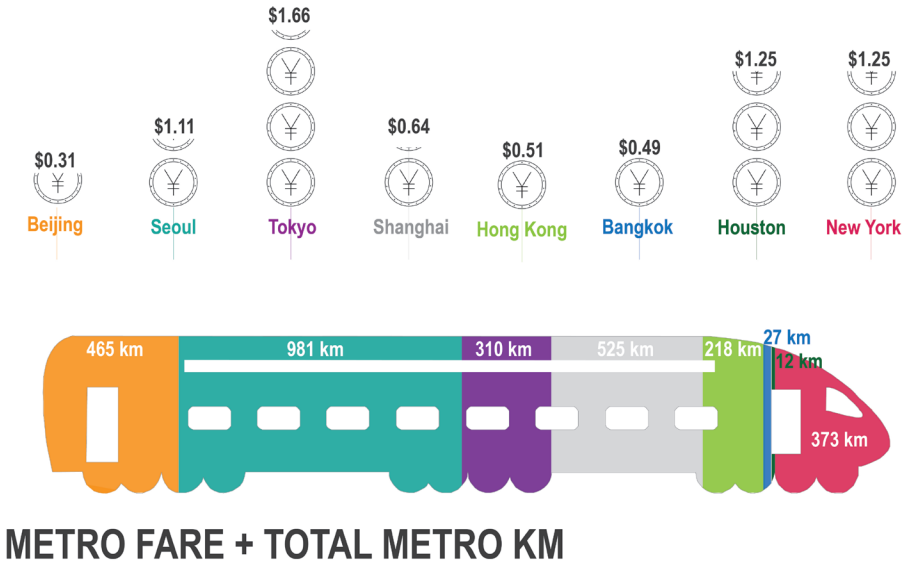
AIR

Air pollution in many Asian cities regularly exceeds World Health Organization guidelines.[16] Air quality is directly related to the date in which air quality measurements and controls were put into place. Cities, such as Tokyo, with long-standing – since 1968 - air quality monitoring, currently have consistently better air quality than more newly developed (and newly regulated) cities. There are also regional air quality agreements, such as the ASEAN Agreement on Transboundary Haze Pollution, signed in 2002 by Malaysia, the Philippines, Singapore, and Thailand, which recognizes the national and international cooperation required to mitigate urban pollution in cities.

Total global fossil-fuel carbon emissions for 2009 are estimated at 9,000 million metric tons of carbon.[17] In 2012 it is estimated that China has had a 71 percent increase in its global CO2 emissions and contributed 27 percent to the global fossil fuel based emissions.[18] Urban air pollution is caused mainly by "the use

Figure 2: Population, density, air quality.

of fossil fuels in transport, power generation, industry and domestic sectors."[19] Economic growth typically requires an increase in energy consumption. The Environmental Kuznets Curve[20] describes the relationship between improving economies and environmental degradation. As economies develop air quality decreases until a certain level of wealth is introduced that allows for technology and regulation to help meet health guidelines.



3

In China, where 65 percent of the electric power comes from coal, and "no photography" and "no smoking"[21] signs are merely "suggestions"; air quality is beginning to be addressed. Recent "bad air days" have led to promises of new regulations. The recently released World Health Organizations (WHO) report claims seven million premature deaths in 2012 are due to air pollution exposure confirming air pollution as the "world's largest single environmental health risk."[22] The report states that 40 percent of both ischaemic heart disease and strokes are due to outdoor air pollution while indoor air pollution deaths are 34 percent stroke, 26 percent ischaemic heart disease, and 22 percent COPD. WHO guideline values for particulate matter with a diameter of 2.5 micrometers or smaller (PM2.5) are 25 or less for a 24-hour period and most developed cities are well above that limit. While there are many different standards, often air quality is measured by an Air Quality Index (AQI) that measures ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen. An equation then generates an AQI number and a color coded system is used to distinguish between good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy, and hazardous (at the 300 AQI level).

In Beijing about 30 percent of the pollution comes from neighboring areas, such as Hebei, and 70 percent is from local sources where vehicles contribute 30 percent, coal combustion 22 percent, industrial production 18 percent, dust 14 percent, and the rest from other sources such as cooking and paint fumes. Beijing's minister of the Environmental Protection Bureau promised to implement a low emission zone in the inner city, change the energy use for taxis and buses, change

Figure 3: Subway systems.

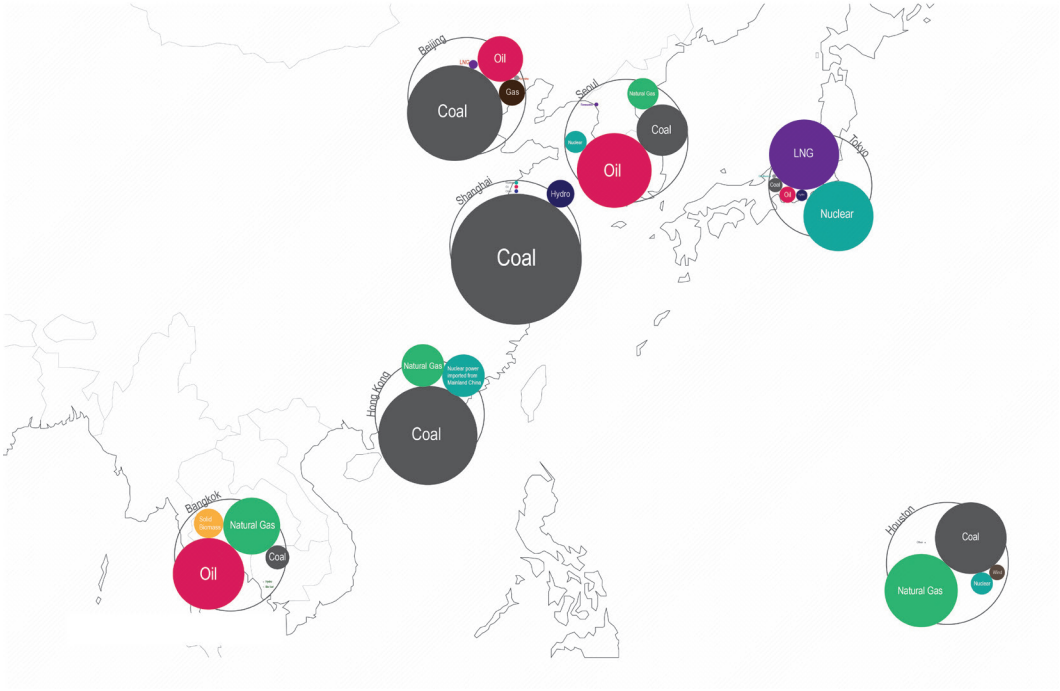


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Figure 4: Total energy consumption.

four coal-burning thermal power plants to gas by 2016, and implement stricter emissions standards and fees for industry.

China is certainly growing and consuming more resources as is grows. Yet, as pointed out by many others, China also has the ability to develop in a more sustainable way due to its scale. It is building more public transportation, high-speed trains, and solar panels than any other country. Once it sets it mind on it, China could implement clean air and water regulations that truly change the world and the country's impact on the rest of the world.

WATER

Assuring citizens of appropriate quantity and quality of drinking and bathing water is important for all cities. Climate change and worldwide population growth have led to global water stress. Water is needed for energy, agriculture, economic development, hygiene, as well as for daily drinking. As industry and energy needs of cities grow water sources become more polluted. Cities such as Shanghai are moving taps further and further from the city in order to find acceptable water due to increased pollution. Even cities such as Hong Kong, with relatively high water quality, remind citizens that building owners are also responsible for water quality due to maintenance of piping systems.

It is much harder to determine what constitutes "healthy" – or even "potable" – water than it is to determine air quality. Water is typically located in an aquifer, lake, or river; its specificity of location contrasts with air that moves and shifts from one municipality or country to another, requiring negotiation and collaboration between governments and regulating agencies. Water, by its very nature, is more territorial. Because water flows in streams and is therefore more easily controlled, it is also more subject to local control and definition. In the United States, the Safe Water Drinking Act and the Environmental Protection Agency (EPA) regulate water quality. The EPA standards govern water quality - yet each of the fifty states has its own water quality authority and standards that vary from

ENDNOTES

1. Investigating issues, even data driven issues like population, are subjective. Any understanding of a city, especially this one, will be individual and clouded by the multitude of choices regarding what data and information to use.
2. http://worldpopulationreview.com/world-cities/beijing-population/.
3. Air Quality Indexes are converted from measurements of particulates that are 2.5 micrometers in diameter (PM 2.5). The U.S. Embassy has an air quality monitor to measure PM 2.5 particulates as an indication of the air quality on the Embassy compound located in Chaoyang district. The World Health Organization (WHO) recommends an AQI of no more than 25 for a 24-hour exposure.
4. http://worldpopulationreview.com/world-cities/seoul-population/, http://worldpopulationreview.com/world-cities/seoul-population/.
5. Schwela, Dieter and Gary Haq, Cornie Huizenga, Wha-Jin Han, Herbert Fabian, May Ajero. *Urban Air Pollution in Asian Cities: Status, Challenges and Management*. Sterling, VA: Earthsan, 2006, pg 149.
6. I tried to cross-reference as much data as possible. I focused on the population within a city rather than the metropolitan area. The boundaries of many, especially fast growing cities, are a bit blurry.
7. http://www.metro.tokyo.jp/ENGLISH/PROFILE/overview03.htm.
8. Glaeser, Edward. *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier.* New York: Penguin, 2011. Pg 224-226.
9. http://www.worldpopulationstatistics.com/shanghai-population-2013/.

one municipality to another. In China, the Ministry of Environmental Protection[26] sets water quality standards, and, internationally the WHO sets water quality standards for countries without such standards.

Water can have color (though it should be clear!), odor, turbidity due to suspended particles such as silt or clay, pH somewhere between 6 and 9, and other elements that can be measured such as chlorine, salinity, oxygen, metals, and other contaminants. With today's technology there is no limit to the number of type and size of contaminants that can be found in water supplies, yet technologies and government control vary with location, adding to many different definitions of "drinkable".[27] The same molecules of water, in a sample, can be determined as "potable" by one jurisdiction, but when it changes location; it can no longer be "potable" due to varying regulations. Years ago Ivory soap ran an advertisement claiming it was "99 and 44/100 percent pure" – which is the same "pureness" as raw sewage[28]. Increases in technology increase how high we can count but does not necessarily increase the quality of our water supply.

SENSORIAL CITY

Each of the above topics of air and water also influence the sensory experience of the city as characterized by its sounds and smells. Western designers tend to prioritize the sense of sight over the other senses of touch, taste, smell, and hearing. We need to strengthen our skills in both understanding and manipulating more than what a city or a building looks like. J.J. Gibson described our five senses as being "active detecting systems"[29] rather than merely ways we passively receive information. Gibson describes these as systems rather than senses: visual, auditory, taste-smell, basic-orienting, haptic and argues that each system contributes to our understanding of the world (and the built environment). New interest in sensory environments and sensory urbanism[30] has led to an expanded understanding of non-visual clues in our environments at multiple scales. Ray Lucas and Gordon Mair, both active participants in the sensory urbanism "movement" note that our senses are constantly "mediating the relationship between mind and body, idea and object, self and environment".[31] While it may be easier to document and compare the air and water[32] we ingest in cities we are also deeply influenced by the food, smells and sounds of a city. Smells and sounds, like the air we must breathe, are also items we cannot individually control. Joy Monic Malnar and Frank Vodvarka developed a "sensory slider" as a way to note the visual, sound, odor, haptic, and orientational environment at multiple addresses in Chicago, Illinois.[33] This device could become one way we subjectively measure and document the multitude of information we receive from the physical world around us.

SOUNDS

Sounds permeate an urban environment and only physical boundary or distance can reduce the transmission of sound waves. Sound can act both as a unifier (we all just heard that) and as a way to define different environments and spaces. The surface materials and spatial geometry determine how sounds travels through space. Richard Neutra wrote about the importance of sounds in understanding our built environment. "Like light, sounds will bring into bright relief architectural bodies and spaces and leave portions of them in shade."[34] Sounds of a city are an important part of the urban imprint and physical experience. One can document the sounds inside buildings[35] and there are several sound studies of cities – most with an interactive element that allow the general public to contribute. For New Yorkers, nysoundmap, attaches sound files to a map. Sound Around You,

10. Schwela, pg 114-118.
11. http://www.wsd.gov.hk/en/water_resources/water_quality/water_quality_monitoring_data/index.html.
12. http://www.city-data.com/world-cities/Bangkok-People.html.
13. http://dds.bangkok.go.th/wqm/English/water%20quality.html.
14. Live monitoring of Bangkok's water quality can be found here: http://wqconline.mwa.co.th/wqc/OverviewMap.aspx?uiculture=en-US.
15. Glaeser, pg 151.
16. Schwela, pg 1.
17. http://cdiac.ornl.gov/trends/emis/glo.html.
18. http://www.globalcarbonproject.org/carbonbudget/13/hl-full.htm.
19. Schwela, pg 1.
20. David Stern, from Rensslelaer Polytechnic Institute, describes, in 2003, the Environmental Kuznets Curve as a hypothesized relationship between various indicators of environmental degradation and income per capita. In the early stages of economic growth degradation and pollution increase, but beyond some level of income per capita (which will vary for different indicators) the trend reverses, so that at high-income levels economic growth leads to environmental improvement. This implies that the environmental impact indicator is an inverted U-shaped function of income per capita. The EKC is named for Kuznets (1955) who hypothesized income inequality first rises and then falls as economic development proceeds.
21. In China 47 percent of the male population and 2 percent of the female population smoke. http://who.int/tobacco/surveillance/policy/country_profile/chn.pdf?ua=1.
22. World Health Organization. March 25, 2014. Geneva. http://www.who.int/mediacentre/news/releases/2014/air-pollution/en/ Ischaemic heart disease is heart disease caused by reduced blood supply to the heart.
23. http://www.zhb.gov.cn/zhxx/hjyw/201404/t20140416_270592.htm Translated by Clean Air Asia: http://cleanairinitiative.org.
24. William McDonough, Thomas Friedman, Alan Pasternack.
25. Campanella, Thomas. *The Concrete Dragon: China's Urban Revolution and What it Means for the Rest of the World*. New York; Princeton Architectural Press, 2008. pg 298 – 290.
26. http://english.mep.gov.cn/.
27. Changes in technology have led the Unites States to have different definitions of potable as well. Very recent technology only allowed detection in units of parts per thousand, now we can quantify parts per billion. The sample can be the same and is no "dirtier" yet the technology now gives us different numbers. When a "number" represents "dirt" or a contaminant the general public in the Unites States prefers "clean".
28. The difference between 99 44/100 percent and 100 percent is 0.56 percent. Typically elements suspended in water are measured in parts per million. If a liquid has 0.56 percent contaminants that equals 5600 parts (per million). Raw sewage is typically 700 -1200 parts per million (total solids) – this includes suspended and dissolved solids.
29. Kent Bloomer and Charles Moore. *Body Memory, and Architecture.* New Haven: Yale University Press, 1977, pg 33.

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Figure 5: Sounds + smells.

Sounds Cities , and Sound Localities are three current projects that document global urban sounds. One of the Sound Localities project, called Listen.HK, creates a symphony of sound from Hong Kong. There are even two specific sites for Seoul that track and document the sound of the city: the Seoul Sound Map and Seoul Sounds. Each of these contributes to our understanding of individual urban environments and adds a new set of tools to a designer's tool-belt.– most with an interactive element that allow the general public to contribute.

In Tokyo most subway stations have a unique chime to let passengers know the doors are about to close. The Takadanobaba station chime is the theme song from the anime cartoon Atom Boy. The Ebisu station chime is from the jingle of an old Sapporo beer commercial; Sapporo headquarters used to be near the station. These individual sounds help orient citizens and reinforce particular characteristics of specific neighborhoods within the larger city.

SMELLS

Smells and odors are influenced and controlled by physical boundaries but can also be swept away by invisible air currents. In their book, Invisible Architecture, Anna Barbara and Anthony Perliss, write about the importance of smell in experiencing cityscapes. "It is true that cities have odors, and not in the sense of metropolitan-type smells or pollution, but in the proper sense of an olfactory essence, of an identity that at times only a few are able to recognize: there are cities that smell of curry, port cities smelling of brine mixed with rust, cities that smell musty and stale, or those pervaded by the acrid odor of burned wiring."[43] Interest in olfactory landscapes, or "smellscapes", focuses on smell perceptions of urban environments and how those are communicated.[44] Jason Logan mapped a smell map of New York that describes both pleasant and unpleasant smells.[45]

30. Sensory environments are different than "multi-sensory environments" - small spaces in which a client's various senses are carefully modulated as part of a treatment or therapy plan - a very interesting idea but not what I am referring to. A recent symposium, held at the University of Strathclyde, titled "Sensory Urbanism", hosted presenters from multiple disciplines discussing the sensory perception of urban design. http://www.sensorystudies.org/about/ Richard Neutra wrote about the sense of smell in architecture in the 1950s. Richard Sennett writes about "sensory deprivation" in modern environments, Juhani Pallasmaa argues for the intelligence residing on our nonocular senses, and Peter Zumthor shows us all how that can be done at the building scale. For instance, the "electronic nose" developed by Cyranose Sciences, Pasadena, CA, the maps of the disrepair of sidewalks in New York City, or maps of the best Halloween decorations in a neighborhood are all documentation of our fascination with mapping a more ephemeral condition (http://www.thisamericanlife.org/radio-archives/episode/110/mapping).

31. Ray Lucas & Gordon Mair. *Sensory Urbanism Proceedings* 2008.

32. Food in in each city adds to the smells, tastes, and sounds of each city. For example, the street venders in Bangkok cook, on open-air grills, a variety of meat and seafood combined with vegetables, seasoned with garlic, ginger and chilies, lime juice, lemon grass, fresh coriander, basil, galangal root (Siamese ginger), tamarind juice, ground peanuts and coconut milk – all aromatic that combine with the sound of sizzling and thermal heat waves adding to the crowded street life. Eating in Thailand, typically a communal activity with dishes placed in the center of the table to be shared, often includes rice. Rice is becoming a concern for Asian diets as studies have shown that rice is "custom-built to pull a number of metals from the soil", adding to the unintentional ingestion of contaminants. Even typical utensils add to the sound in the city; Thai food is eaten with a spoon in the right hand and a fork in the left hand ; chopsticks are used only for noodle dishes.

Many other sensory artists and designers, showcased at a recent seminar, the Headspace 2010 event held at Parsons School of Design in 2010[46], design with a great understanding of the impact of smell. Ayse Birsel sees smell as a threshold and a way to understand the boundary of a space; she notes that you smell a scent immediately yet once you are in that space it disappears. There are many others who are engaged with smell at the urban scale.

My colleague EunSook Kwon, director of the Industrial Design program at the University of Houston, designed the scent of Seoul for the Seoul Design Olympiad 2008 when she was the Director General of the event. Her area of research includes synaesthesia – the study of how color and other modalities create meaning. She investigated both the scent of the nation and scent of the city and worked with perfumers to create a scent that has an undertone of pine, pine, in the Korean culture, represents, life and is associated with the color white. She has also worked to imbed scent in polymers.

Graphic designer, Kate McLean, balances memory, emotion and olfactory place making.[47] McLean creates "smell maps" of cities in order to make visible what is ephemeral. Her maps document the location, strength, and range of smells she encounters in her research trips. Her maps of Paris include the smell of cheese, wine, rain, and Yves Saint Laurent perfume. With 24,000 breathes each day we have multiple opportunities to understand our environment. McLean even likes the smell of sewers; she finds the smell is "evidence of life."[48]

Architect Toshiko Mori acknowledges that there are different attitudes towards scent in different cities. For instance, the Japanese are not interested in scent; for them floral arrangements are about form, not the flower. She recalls what Paris smells like, her first smell of Tokyo, and "the stench" or whiffs of New York that "welcome her home" and seeks to heighten that experience. Mori describes scents as being both immortal and temporary. The close circuit between sense of smell and memory in the brain creates space that works with the sense of time. Rapid, simultaneous associations are made among different unrelated memories that make life appear to "collapse on itself."

Sissel Tolaas, a chemist and perfumer, is very serious about scents. She has developed a new language for smell, called Nasalo. She wants designers to be able to have a language to describe scents as accurately as they now describe color and move beyond our current system of "good" or "bad" when describing our olfactory environment. In addition to curating a library of over 7000 unique scents, Tolaas has spent ten years documenting 200 neighborhoods in Mexico City in order to provide citizens a new way to navigate their city, created an "invisible map" of Berlin, and is now working on city guides for Louis Vuitton.

These issues of air, water, sound, and smell can add up to a more complete reading of an urban environment and give designers more tools with which to work. Mapping cities in unique ways gives us an alternate way to think of cities; while they may be as physical as brick and mortar, cities are also evolving and ephemeral, as shown by many investigations, such as MIT's Media Lab Social Computing Group's maps of coffee shops in cities[49], and leading architects to ingest a more complete understanding of cities.

33. Malnar, Joy Monice and Frank Vodvarka. *Sensory Design.* Minneapolis, MN: University of Minnesota Press, 2004.

34. Neutra, Richard. *Survival Through Design.* New York: Oxford University Press, 1969. Pg 139.

35. http://soundscape.iath.virginia.edu/display/index_p.html.

36. The website, started in 2006, is no longer fully functioning. Much of the analyses and mapping of soundscapes have been done in North America but also e.g. in Sweden. In the US, the New York Society for Acoustic Ecology has been very active, developing projects that focus on the sounds of the urban environment and hosting lectures and concerts that encourage public dialogue concerning sound in cities. The New York Soundmap at Soundseeker.org allows the public to upload their own sounds that simultaneously get marked on an online map. In Sweden earlier this year, Gothenburg introduced a new research program called Sonorus. The Division of Applied Acoustics at Chalmers is coordinating this European project, training "urban sound planners" to reverse the negative trend of a deteriorating acoustic environment in urban areas. "The soundscape is determined as early as at the drawing board" — Wolfgang Kropp (Applied Acoustics, Chalmers University of Technology). For fun check out these sounds, El Michael depicting Detroit: https://www.youtube.com/watch?v=MvBRGNNZ8kM in Sounding Out the City.

37. Charlie Mydlarz at the at the University of Salford's Audio and Acoustic Engineering Centre, http://www.soundaroundyou.com.

38. Soundscities project by Stanza, an international artist, http://www.soundcities.com, http://www.soundcities.com/?map=1.

39. Sound Localities is a project that explores the experience of sound in the city through field recordings to "produce a wider dialogue in a transcultural space with and through sound as it flows through many complex social and cultural spaces."

40. https://soundcloud.com/soundlocalities/hk-diary.

41. http://som.saii.or.kr/campaign.

42. http://seoulsounds.wordpress.com/about/.

43. Barbara, Anna and Anthony Perliss. *Invisible Architecture: Experiencing Places through the Sense of Smell.* Milan: Skira Editore, 2006. Pg 125.

44. A recently published book, *Urban Smellscapes*, by Victoria Henshaw, presents a variety of way designers can manipulate smells and with it emissions: manipulating airflow, pedestrianism, trees and planting, parks, and green-spaces, waterways, and traffic stopping points.

45. http://www.nytimes.com/interactive/2009/08/29/opinion/20090829-smell-map-feature.html?_r=0.

46. Videos of the speaker presentations are fascinating and available on YouTube: https://www.youtube.com/watch?v=0XJnOEpMUok, https://www.youtube.com/watch?v=nc4iV1Za4y8, https://www.youtube.com/watch?v=qABlji4e28Q, https://www.youtube.com/watch?v=1vu-LOL01bY, https://www.youtube.com/watch?v=Tf10_0uAmbs.

47. http://www.ediblegeography.com/talking-nose/.

48. *NPI The World Broadcast, May 13, 2014. http://www.pri.org/stories/2014-05-13graphic-designer-makes-smell-maps-cities-around-world.*

49. *http://youarehere.cc/w/coffeeshops/seattle#/description.*