Systems Planning: a consilience approach to Planning urban areas

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I have been thinking over the last year about how to define Systems Planning and identifying elements that make up this idea of Systems Planning. I picture Systems Planning as a socioecological perspective of how cities can be understood or design. Using "Systems" as a method to connect ecological principles, urban planning principles, and laws of physics to understand and implement sustainable methods to manage and design cities.

A few years ago I read Consilience: The Unity of Knowledge by E.O. Wilson. This book helped me understand how important it is to develop models of the physical and psychological effects of design; using case studies to understand the reality of a space and the inputs required to maintain that reality. Then I developed elements to understand a complex human dominated ecosystem. The 16 elements below make up what I called "Systems Planning".

1. In Systems Planning a space is a human dominated ecosystem (urban areas, it is psychological driven by how we perceive our environment, our cultures, and our social norms (creativity, art, etc.)
2. It follows the laws of thermodynamics, especially the second law (entropy)
3. It is driven by natural resource availability
4. It is both a close and open system based on how a space is defined
5. It is a complex system that requires models to scratch the surface of its reality
6. It is an adaptable and resilient, seeing the importance of this for the system to last longer
7. It is driven by political norms or policy
8. It knows that it can never be perfect that is malleable to change
9. It sees other potentials of reality
10. It maximizes its energy potential, mostly solar, through the placement of structures in ideal locations based on location potential research or ecosystem research
11. It engineers a reality of oscillation and change
12. It cannot be a law or applicable to every environment, it depends on defined space
13. It requires the interaction of the natural world with the human world. That the system has environmental implications
14. It balances species ecosystems
15. It looks for a balance of bottom up (grassroots) and top down approach to planning and implementation
16. It has to develop a set of tools that have short term and long term approaches to planning and designing cities
17. It has energy focus zoning and focuses on multimodal transportation options
18. Transportation for a variety of natural and human dominated ecosystems
19. It uses ecological economics and biophysical economic principles to understand the economic implications of alternative solutions

I keep saying “it” like it is living or alive. The idea of “it” came from ideas of James Lovelock. James Lovelock wrote “Gaia: A new look at life on earth”, most people misunderstood his theory, thinking that the earth is a living thing. He did not mean it in those terms, but in Systems Planning a place can be thought as alive. It has an immune system that requires for humans to understand to maintain its health.

1. In Systems Planning a space is a human dominated ecosystem (urban areas, it is psychological driven by how we perceive our environment, our cultures, and our social norms (creativity, art, etc.)
   Cities are human dominated ecosystems. People used design to construct buildings and build transportation, commercial, and industrial infrastructure. How places are built has a psychological effect on how people perceived their world. A person visiting New York City may feel different about spaces than people who are residents of the city. A person that has always lived in a hut with trees has a different perspective on space usage then someone that has always lived in an apartment.

   For example, Public Housing was design for low income people. The way it was designed affected how people perceived their environment. Millbrook Houses, a NYCHA development in the South Bronx, is full of gated green spaces. Gated spaces send a negative subconscious message to residents of public housing. It says that this doesn’t belong to residents that live in those developments: that you should not take care of these spaces.

   Psychological effects of design

   Mental and psychological health of design

   Entertainment
   People spend too much time seating down and they are not interacting with people.

2. It follows the laws of thermodynamics, especially the second law (entropy)
   Archetypes
   How long does it take for a building to fall apart? Need to determine a unit of measurement to determine how long an archetype physically last in a system. This requires the need to know materials and the entropy of these materials. My conceptual research method is to study materials and develop a city model and quantify and qualify the energy content of it and see how long it falls apart.

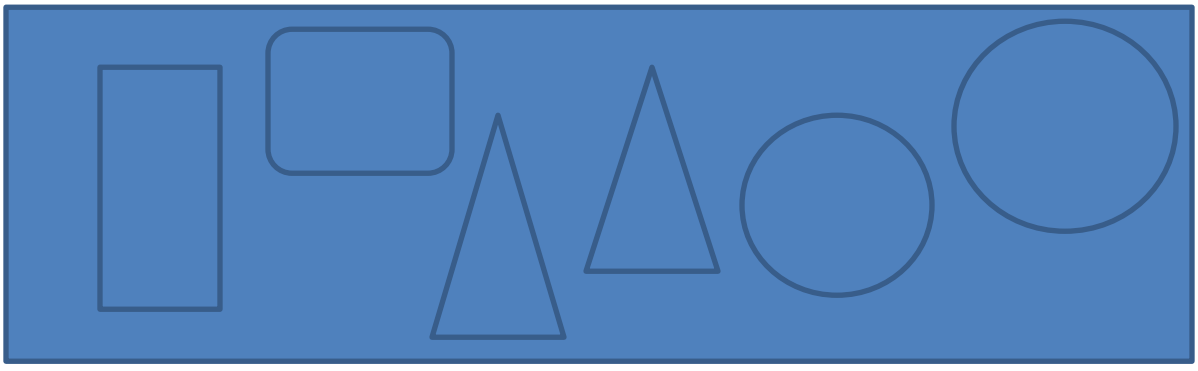


Figure 1. A conceptual city with a variety of archetypes

Energy potential of a selected environment

My idea is to define a space, for example an industrial community. Quantify the energy use of the space, from the energy use of industrial facility, to the energy use of non-industrial space. Non-industrial spaces include sidewalks, grass, asphalt, and other physical features of a space. Then ask what is the maximum energy potential or local energy generated in a space. Energy generated came come from heat produce by humans, sound waves from talking, water waves from industries near waterbodies, motion from walking, light and shadows from buildings and trees, and wind; meaning anything that we believe generates energy. We can quantify, but we also need to know energy quality using EROI or Energy Return on Investment, using the field of Systems Ecology to help with developing methods to gather this data. The energy use of a space based on current spatial usage

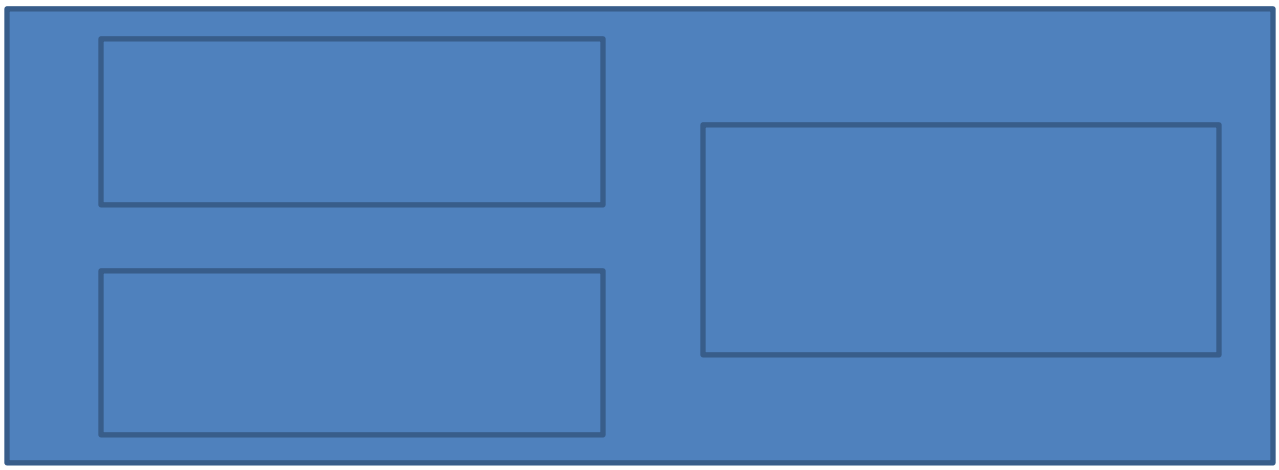


Figure 2: A conceptual design of an industrial facility

Need to define a spatial scale that is suitable for analysis. Then again the scale has to be large enough to be useful in implementation. Above is a conceptual picture of an industrial facility. Since reality is complex. This this area can be analyzed using the elements of systems planning. It may not cover all the elements, but it is an effective start to develop methods that can be applied in a larger or similar system. A variety of scales can be analyzed and see what is consistent with all of them. Then this data can be used to develop theories can be applied to a larger system.

Defined maximum energy of space or identify the spatial arrangement of structures to maximize the defined energy usage.

After the energy of a system is identified, then we need to analyze spatial arrangement of a space that maximizes the local energy potential. We have to use the grid less and maximize local energy or renewal energy sources. Have positive feedback loops that regenerate the grid use from local maximize energy, create an energy ecosystem. This requires a thorough

understanding of the laws of thermodynamics. So, researchers can understand how healthy the system is energy wise. It the system has high entropy then it requires more energy to maintain. If the system has low entropy and maximizes its local energy usage then it requires less non-renewable resources to maintain the system

3. It is driven by natural resource availability

   Human footprint

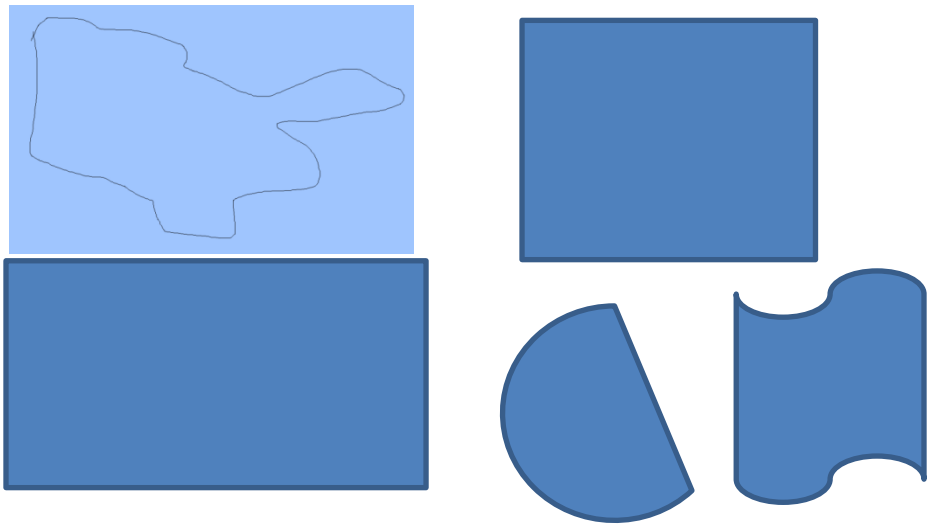
   Most of our resources come from external natural resources. Our cities add external pressures to natural environment. What is the time needed for environments to recover so the system can help us while we help it to be healthy. A need of healthy natural systems with architecture that maximizes its local energy use requires less energy input over time and less non-renewable resources to maintain the system. The system has to be flexible, sort of like the brain, flexible enough to create new thought.

   Fields that will create the knowledge needed to create a human dominated ecosystem
   Ecology, biology, physics, chemistry, sociology, cultural anthropology, engineering, mimicking life to get enough information about what is a resilient ecosystem
   Need to define sustainability in the context of Systems Planning. Need to know the implication of this idea on economic concepts. Need to introduce biophysical economics to have a broad understanding on natural resource use. Not everything in nature can be quantified. How can someone quantify a resilient ecosystem based on many living things? We can just understand its quality and use what we can quantify to properly use the natural resources needed for our cities to survive.
   This type of thinking may take too long; so need to create small scale models that can be applicable know, while researching ways to improve the macro system. Cannot have chaos of information, it needs to have flow to it.

4. It is both a close and open system based on how a space is defined

   <u>Spatial Arrangement</u>

   If they look the same will they be boring. If it is diverse will their minds be entertained? Which spatial arrangement maximizes energy use? What is the economic implications of spatial structure?
   What is the transportation suitable for this spatial arrangement? How can we maximze the energy of a system when the system is already in place?



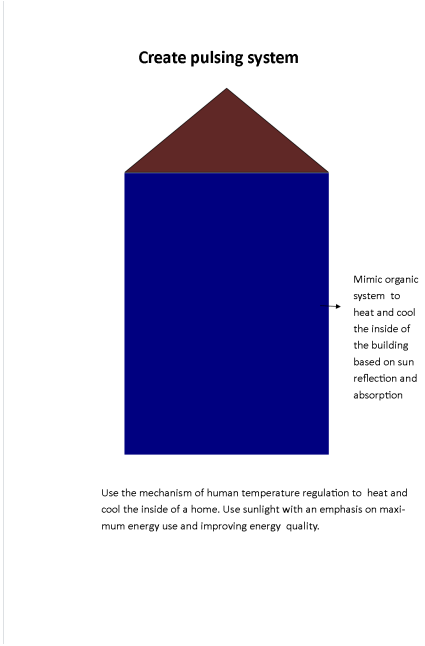
5. It is a complex system that requires models to scratch the surface of its reality

Generic Architecture Design

Need a generic structure with diverse uses in a space to increase resiliency and adaptability. Most architecture in the South Bronx is for single use, it is either for commercial, residential, industrial use. When these structures are no longer suitable for its current use or face economic pressures they are torn down and something new is built. A generic structure can maximize local energy and can adapt to a variety of issues, except for Industrial uses. Industrial uses require remediation due to its potential of having contaminants.

6. It is an adaptable and resilient, seeing the importance of this for the system to last longer
   Spatial randomness
   Which randomness maximizes the use of local energy?

   Create pulsing system
   A pulsing system is adaptive to change; it is like the immune system of a person. We need it to handle the changes of the environment. This comes from principles stated in the theory of natural selection.



   Development of internal and external system of architecture structures using Thermodynamics

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    Zoning- new ways of thinking about zoning

    Zoning based on energy potential of local sites. So it will be zones of potential, the more likely to have more maximum energy, then their needs to be an investment in that system. The selection of land uses will be based on land uses that maximize energy use. We need to think of longevity not pretty uses that do not last long. Zoning looks piecemeal and doesn't focus on maximizing local energy use; it has a high entropy result. Lets not think of using ten kw of electricity for ten years, think 10 kw for 30 years.

    NYC has one of the oldest subway systems in the world. The system is slowly deteriorating. The political and economic forces have kept it from being improved on. Today, most of the problems have been band aid and the subway system shows what happens when a systems approaches high entropy.

    Roads, only cars

    No roads, just a variety of transportation options

18. Transportation for a variety of natural and human dominated ecosystems.

    Layers of transportation use, bottom, natural ecosystem, top man made transportation. The system work working side by side to create healthy places.

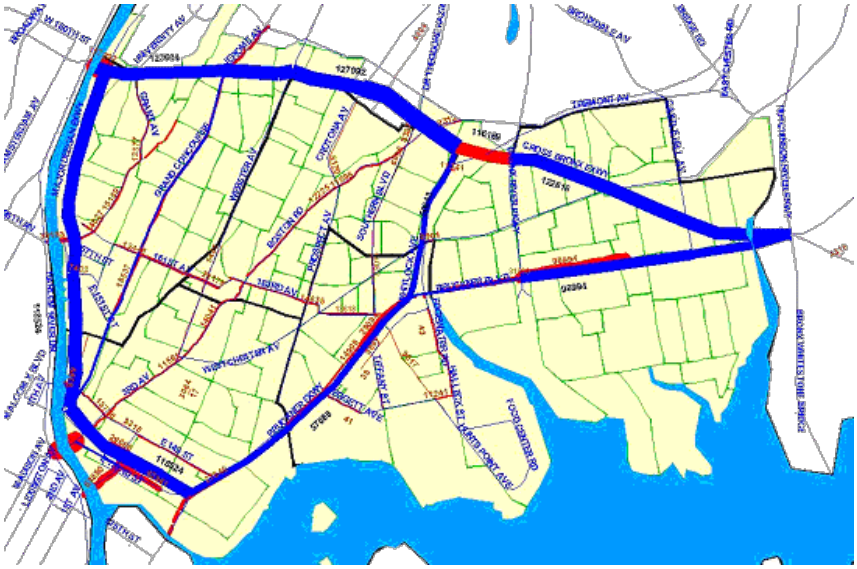
    Claustrophobic-cannot be around people, if I have only one transportation option will I put pressure on people. Need transportation for emergencies, for many people, single groups, and single person. Need transportation for a variety of species

A city will never be a utopia, because a utopia cannot exist. It is like saying that it will be a perfect system. It will never be perfect. Just like natural selection, natural selection never leads to perfection; a species is just given enough to survive.

20. It uses ecological economics and biophysical economic principles to understand the economic implications of alternative solutions

Sample case study

I grew up in the South Bronx and I have seen the deterioration of neighborhoods do to design and social issues. Robert Moses destroyed the South Bronx neighborhood by creating an Island of pollution. If you look at a highway map of the Bronx, you will see a circle of highways that make up the South Bronx. The South Bronx has the cross Bronx expressway and the Major Deegan Expressway. I've walked around some of these structures and observed the environmental and social effects it had on the South Bronx Community.



Another archetype observation is the redundancy of NYCHA structures.

All I saw was redundant recreation uses and box looking buildings. It looked beautiful on paper, but it had social, environmental, and economic consequences on the Bronx Community.

Selected industrial facilities in the South Bronx

1. Map the spatial arrangement of buildings and identify materials use for architecture structures

2. Use thermodynamic principles to determine how much energy and what kind of energy this spatial boundary uses
3. Determine the different degrees of degradation
    a. Entropy of cement
    b. Entropy of Asphalt roads
    c. Entropy of building structures
    d. others
4. Develop model of the system to determine how its entropy can be reduced
5. Develop models and define units to determine the maximum local energy that can be used in this system (water is around, so there is energy from wave motion)
    a. Water wave motion
    b. Wind
    c. Sunlight
    d. Ground motion
    e. Walking motion
    f. Tree motion
6. Need to determine the most healthy in can be based on these conditions
    a. Energy loops that maintain the health of the system
7. Learn the psychological effects of people that live and work on this system
8. Need to know how much pollution is generated and determine the sources of pollution
9. Determine a list of subsystems

Understand the current system and use models that maximize the energy use of the system or develop models of current human dominated ecosystems and models for alternative human dominated ecosystems.