Technology Drives the Ecological Modernization of Urban Environments

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Abstract

As humanity becomes more dependent on technology, we lose our connection with Nature. It is the natural world, which governs all things, but our constant exposure to what is called modern creates its own laws that resist the laws of nature. We are growing as a species, and at the same time, we are also growing worried of the results of our modern way of life due to patterns of increased climate change and unnatural phenomena. No longer can we keep resisting nature, we must learn to work with and understand it so that we may live in a symbiotic relationship with the Earth. Luckily for us, most of the populations will be clustered in urban settings, giving us the opportunity to redesign cities as ecologically modernized centers that nurture our ancient relationship with the earth that promotes the well being of all living things. With this move into urban settings, we will see a change in food production and would need to adapt to the verticality of a city. One can look at urban farming as a way to feed dense urban populations, it can also provide economic integrity and community oriented infrastructure. Such an explosion of radical infrastructure has never been seen since the industrial revolution, and studying such a time of economic progress might prove useful in the understanding of how to synthesize food production with industrialized methods that would be sufficient to feed an urban population. What is considered modern is unsustainable in our time, and what is considered sustainable is radical to most people in America, but we have driven ourselves to the point in which ecological modernization cannot be just a theory anymore. It must be applied to the framework of society and fused into the urban fabric to ensure a brighter future for all.

Introduction

Environmental awareness grows as the earth's population increases. By 2050 is predicted that we will have grown to more than 9 billion people. There are major concerns that the consequences of such growth are progressively negative. Most of the population will be clustered in urban settings, leaving behind unusable land for agriculture, all while requiring an abundance of resources that a city is unable to produce in our current time. This concern for our future wellbeing calls for a need for change, and gives us now the opportunity to rethink cities as being totally self-sufficient. Sustainable approaches regarding "the processes of production and consumption can be restructured on ecological terms through the institutionalization of ecological aims" (Mol, 1994).

Ecological Modernization (EM) is a theory that suggests that policies for economic development and environmental protection can be combined with synergistic effect. Rather than perceiving the goals of environmental protection to be a brake on development, EM promotes the application of stringent environmental policy as positive influence on economic efficiency and technological innovation (Gouldson, p.11-27, 1996). Given the current circumstances, we have an amazing opportunity shift our technological progression towards sustainable progression. Industrialization invoked massive changes in production and efficiency, so can this idea be used to change how production and consumption of food is realized in our current economic and environmental situation as it pertains to EM. This brings us to question what might sustainable urban agriculture look like? Or is it even possible given the severity of the situation. The book *Environmentalism and the Technologies of Tomorrow* by Robert Olson and David Rejeski builds upon the need to integrate new technologies with a new

governance and ways to achieve this, going into full detail the direction in which these new technologies will lead us, and the opportunities that they present within the corporate and political world. The book, although very detailed and thorough, acts more like a step-by-step process towards a sustainable society.

Looking back at the industrial revolution, we can identify that the technological innovations of mass production is what really made it such an explosion of economic wealth. By thinking critically of the application of mass production to agriculture for example, we can begin to see an outline of the direction that urban agriculture needs to take to be a plausible comparison to the current agro – food system in place today. But before we dive into detail about that, attention to current eco-industrial projects should be taken into consideration. We can get an overall sense of scale and understanding by researching such projects that have been thriving in urban environments and build upon their weak points to enhance the idea of a, for example, industrialized agro – food system within a city and how this idea could potentially accelerate ecological modernization. Additionally, new technologies such as Hydroponics have evolved from old methods that are being used in current projects will help us understand the importance of these technologies, as they pertain to, again the acceleration of ecological modernization.

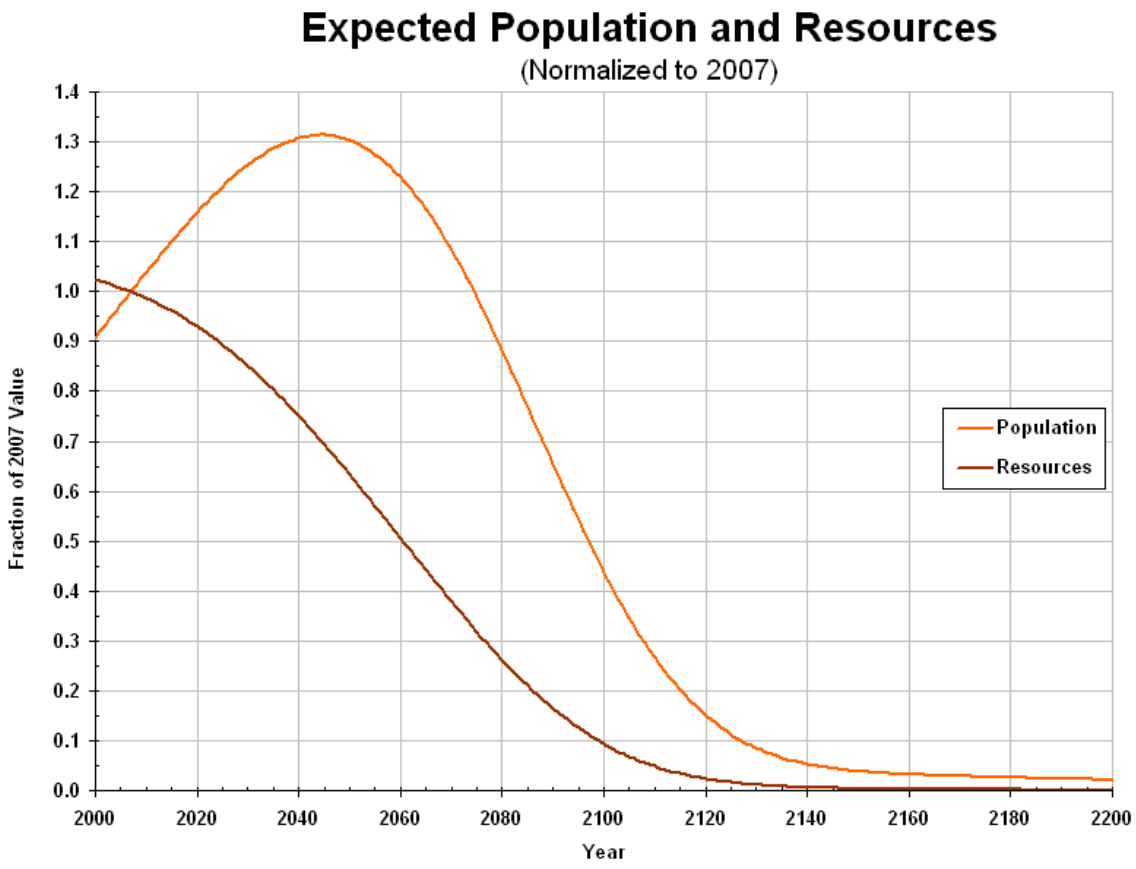
A peek into industrialized methods for efficiency through selected articles and understandings such as *Robotics and automation in the food industry* will provide key concepts that will evolve the discussion of urban agriculture towards industrialization of the food industry and connect the ideas previously noted about EM. Additionally, the push back towards a city "community" in the growing future and how technology can become its drive will be studied as well as exploring the effects that ecological

modernization will have at a condensed point such as a city. With the idea of community based infrastructure comes the need to re-design the traditional idea of a city. This could be made possible by the acceleration of new technology and the joining of corporate – governmental bodies, but more importantly, the population must be aware of and understand the benefits of a move towards agro-industrial food production. Providing incentives for change that synthesize within the political realm, business world, economical fabric and ecological system of the earth will provide the concrete evidence that can prove the merit of ecological modernization, when compared to the current economic structure.

A Need for Change

As we all know, or should know, the earth's population is growing, and by 2050 we will have grown to more than 9 billion people. With this global growth comes the need for change, on a global scale. It is often argued that change will either happen through governments, corporations that run the largest trade networks or the billions of people already living on the planet. No single group has the power to change the socio-economic structure of the planet, and because of this, we must all work together to manifest the change in our cities on ecological terms, and with this change how production and consumption of food is realized in our current economic and environmental situation as it pertains to EM. If such a task were to be left to a single organization, the results would be sub-par and wouldn't be as effective or responsive to the global needs. Resource depletion is also another current problem, and with the induction of billions more people to come in the future, resource conservation is not a

viable solution. As seen in the chart below, the expected population increase will not be able to keep up with the amount of resources.



It is obvious that the current system will not be able to maintain population increase, but in a time of heavy technological progression, we look back to a similar era of progress. History repeats itself, so by understanding the connections between eras of major change, we can avoid the mistakes made by previous generations. “We sit at the doorsteps of multiple revolutions in production, information and communications, logistics, and the interaction of new technologies such as nano and biotechnology. We have another chance to properly perceive these changes, integrate environmental

concerns into our decision-making, head off potentially serious environmental damages, and shape emerging technologies for both economic success and the health of the planet. However, the stakes are high, the tempo is fast, and the systems we are trying to influence are enormously complex in comparison to their earlier counterparts." (Robert Olsen and David Rejeski, p.11) This being said, the need for change should be very obvious to most of us by now, but sadly it is brushed under carpet like most global issues. Maybe we need to change the flow of information to everyone that shares the planet first?

Industrialization as a Precedent

Industrialization represents progress that can be understood and compared to our current era. Yes, there are other ways to represent major change and progress, but I chose industrialization because it is directly connected to being the cause of most of the issues we face today. "The production and processing of food are increasingly concentrated (fewer owners and larger operations), automated, and fast paced, which has implications for public health. Among the major problems: These phenomena are due, in part, to production and processing methods that emphasize economic efficiency but do not give sufficient priority to public health or the environment (Horrigan, Lawrence, p 451, 2002). For example, if a major environmental organization had risen during the time of the industrial revolution to pressure government and manufacturer's to create sustainable policy's for production and recycling of waste, the world would be in a much better place, but of course, we missed that opportunity and must work backward to move forward. The importance of technology in that era and our current era is inseparable. In

our current struggle, I believe that technology, being the biggest influence in the progression of our society, can be used to transition us into ecological modernization.

Industrialization represents a time of fast-paced technological progression that immersed American infrastructure, culture, and politics into a new idea of a "throw away" society. We have seen the ugly progression of this type of society evolve into something more sinister, enveloping the political and entirety of the economic framework of the world. All the interworking realms of the world are so independent on production of goods and GDP, that they have shifted in favor of remaining stagnant or even unable to change at most times. Since the emergence of the industrial revolution was a pivotal era in human progression, special attention and emphasis must be put into how it has halted sustainable progression and cradle to cradle design, which, like many sustainable theories, can be achieved through technological progression.

New Technologies

The success of industrialization is prevalent in the new technology that increased production through efficiency. This rapid increase in production allowed the economy to expand, which allowed for the United States to grow at a rate in which no one could anticipate. Our rapid growth was never explicitly connected to the ecological boundaries of the earth in the near future, and was never truly understood at the time. Now, after growth has simmered down a bit, we are seeing the effects of rapid expansion in our environment. New technology and strategies conceived from bright, motivated and concerned minds are the answer to the problems we now face and their applications in urban settings are extremely important given the prediction of major population moves

towards these urban settings. Providing power for the people living in cities, through the fabric of the city, can be realized through the use of sustainable technology such as solar panels. Being mass-produced, solar panels will become cheaper and will slowly begin to take over the surface of buildings, making them independent sources of their own power. Additionally, green roofs that act as a thermal insulation layer of the roof, offering biodiversity within the city and perform, as a natural water harvesting system will increase buildings independence.

Technologies such as this can be realized through industrialized production, which makes them a direct competitor to the current grid-interdependence that a city has. The incentives for change that sustainable technology offers needs to be kept at the scale of a city to be a viable solution for anything. Imagine moving all the agricultural land allocated to produce for a city, into the city itself to make it self-sustaining. The only way

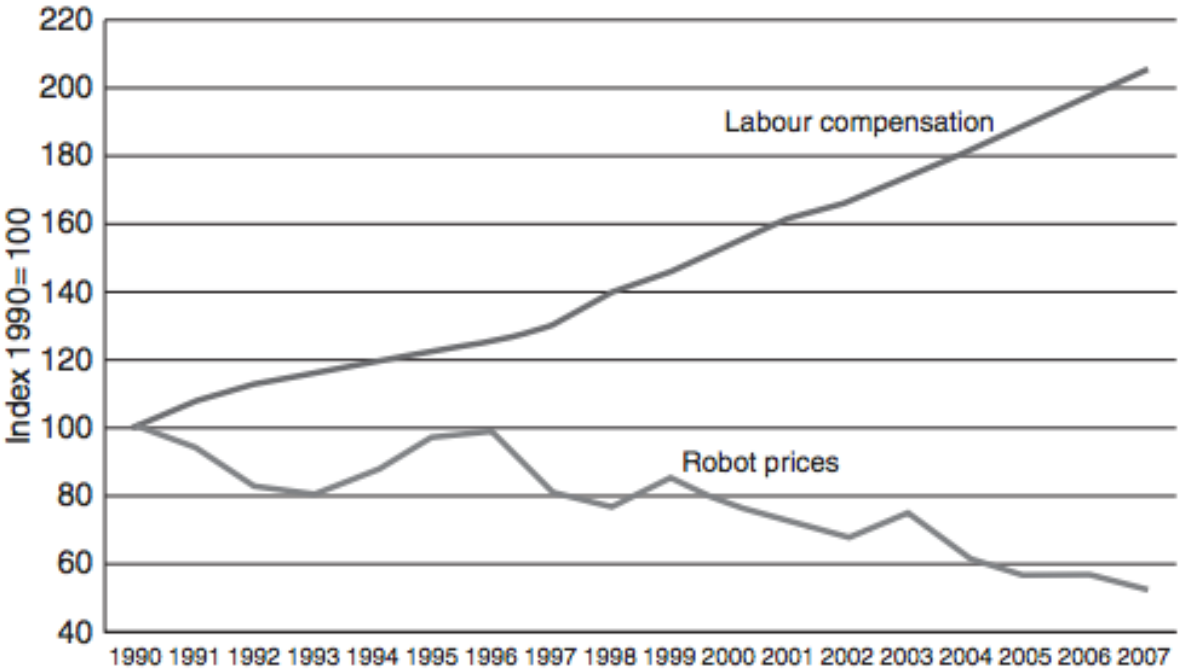


Fig. 2.5 Trends in capital costs of robots versus European labour costs. (Source: International Federation of Robotics, Annual Review World Robotics Magazine 2008.)

it would work is through large-scale vertical farms to be able to produce, sustainably, at the rate in which a city consumes. Automated industrialized processes within a vertical farm require technology that can keep up with the demand. Hydroponics is the only solution for production on this scale, because it requires less energy and material to produce faster. Advancing sustainable technology is so important because it will allow us to produce all we need independently, and promotes a healthy community standard of living.

A city becoming self sufficient through a combination of renewable sources will eventually need to happen if environmental responsibility is a concern. The mass production of solar panels would be used to power the majority of each building on a city, but wind power could be something used to offset the remainder. Structures that employ passive heating and cooling strategies in their design and allow the collection of water for potable use is a simple way that the culture of architecture can begin to shift towards ecological modernization. Green Roof textiles are an additional way to enhance the design mechanics and responsibility of a building. Interestingly, nanotechnology is emerging technologies that can be used to micro manage the process's of transitioning towards ecological modernization, and serves as a technological and natural synthesis that oversees the efficiency of introduced systems.

Current Projects & Efforts

One cannot continue to boast an argument without real life examples that are currently changing or in the process of changing the progression of ecological modernization. I have personally worked for the Newark Beautification Project, a small-scale urban revitalization initiative that converts unused city lots into community gardens. It was an effort to encourage sustainable communities in an urban environment, but being on the opposite spectrum of technical, doesn't boast much help towards ecological modernization. The experience, now, has helped me to understand the scale in which projects must with, and not only this, but the organizations who initiate these projects cannot be small grassroots companies who have no influence in the economic market of the world. It is sad to think that the seemingly impossible task of ecological modernization might have to be left to large corporations and government, but the amount of power and influence they hold is key to change.

One such example of an ecologically modernized industrial installation of heavy technological reliance would be the Ford Factory in Michigan. Although the factory hosts only a green roof, it is the largest green roof of its kind and performs how it was designed. The factory still draws its power from the grid, so the factory is not completely "greened". In my opinion, in the context of my research paper, seems more like a paradigm that can be understood by replacing the cars produced in the factory to producing the green roof textiles found on the factory itself. A sustainable factory producing a sustainable, cradle-to-cradle product at a competitive market speed; this is achieved through the existing technology already in place for producing things that generate income so to speak, but shifting the production of sustainable technology in

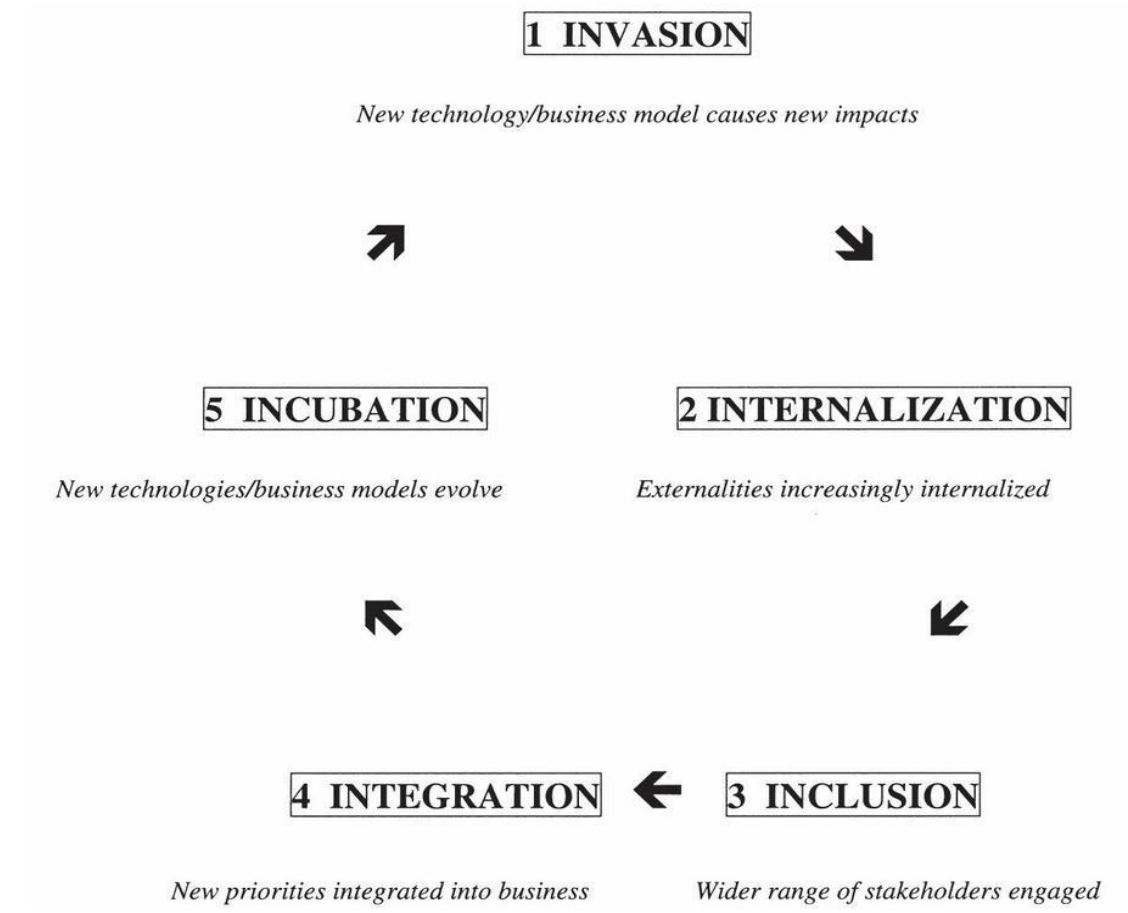
favor of the global marketing system is where other initiatives start to develop. Another example can be found in Manhattans Bell Book & Candle, restaurant that produces its own vegetables 10 months of year to be used in its cooking. Using hydroponics, the owner John Mooney is able to be self-sufficient and controls every aspect of the growing process, which constitutes what will be on the menu during the growing seasons.

Is Technological Progression Enough?

Technology alone is not enough to facilitate ecological modernization, especially since technology is not a cradle-to-cradle product itself. However, by using what we already have to create products that facilitate sustainable practices (ex. Solar panels, green roof textiles, wind turbines, etc.) we can begin to modernize ecologically within our industrial complexes. In the case of urban agriculture, sustainable products and materials are necessary in the creation of mainstream urban farming and for creating a competitive market comparison to replace the current agriculture system. A push towards urban agriculture will stem from the need to reserve what little land is available by allocating space in urban environments to perform the same functions.

Theories of ecological modernization, however, require cooperative government action and corporate responsibility. *Environmentalism and the Technologies of Tomorrow* goes in depth to the actions in which government must take in order to facilitate ecological modernization. "At the local level there is a remarkable outpouring of initiatives: the smart growth movement, sustainable communities and the "new urban-ism," state and local green plans, environmental design in buildings, and innovative state regulatory approaches." (Robert Olsen and David Rejeski, p.28) Comparatively, at the

global level, the book expresses the idea of almost impregnating the economy with the idea of ecologically modernizing corporate business. Local and global organizations are categorized as they pertain to their influence in the economy. For example, the corporate honeybee is an organization that produces the fuel needed to power cities, and the corporate locust is a destructive organization like developers in the rainforest; both are crucial, to some extent, to the growth of the economy, but must be handled differently when transitioning towards ecological modernization. This is a chart that describes a cycle in which an organization might transition itself.



What Might an Ecologically Modernized City Look Like?

A city in the future, in my opinion, will be more community oriented in the way that there are centralized nodes of infrastructure that all serve the purpose of propelling the city forward. Being heavily reliant on technology is an inescapable fate of the digital age we are currently experiencing, but, as expressed throughout the paper, technology is what will drive us towards ecological modernization. With the industrial production of sustainable technology, we have the possibility to make our infrastructure environmentally responsible for itself, which means total independence from outside sources. Cities, already being cultural centers and iconic representations for their country, will be able to produce everything that is required for it to function, keeping all jobs and transportation at the local level, creating a community oriented way of life rather then an every man for himself mentality.

Conclusion

It is clear that world needs to be ecologically modernized, and our best option is to embrace the technology that is part of almost every aspect of our lives to help benefit sustainable production and consumption. In the reality of the digital renaissance we currently live in, technology is inescapable, and as we advance, more resources will be required to make it possible. We look at industrialization as a viable comparison that can help gauge the extent in which production and efficiency can take us, while new sustainable technology and techniques give us a reason to produce such things at an industrial scale. There are many examples of technology being used to improve the performance of old techniques and inventions, but the way we use our technological

advancements to advance sustainable development is dependent on cooperative government and corporate responsibility. An economic market so intertwined with an outdated ideology that runs deep into the fabric of the earth leaves no room for change amongst individual efforts, therefore we must either change the law or change the culture of a throwaway society. Technology is certainly not enough to solve all our problems, but utilizing the industrial empire we have already created can definitely makes things easier for us, its just a matter of communication between these multiple networks and creating bridges between them in an effort to become a circular economy. The drive towards urban centers will certainly influence the multiple networks of trade, production and transportation to become more localized and self sufficient, rather then relying on energy and products that are imported into the city. Amazing opportunities exist within the technological realm that we will soon take advantage of, and technology by no means halts sustainable development, it is just being used without the intention of ecological modernization.

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