



ENVISIONING FORDHAMOPOLIS

Funder: The Billionaire’s Club

The 2020 Fordhamopolis Team

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Executive Summary:

The “Envisioning Fordhamopolis” team is asking the Billionaire’s Club for \$100 billion to design a city which pays homage to the ways in which ecosystems function. Based on primary productivity, resiliency, redundancy, and sustainability, this new city of Fordhamopolis will overcome the major problems which face ordinary cities. The expected outcome of this project will provide 100,000 people with a healthy and living city to reside in which will serve as a model for all future city planning models.

Purpose:

Cities are currently facing many societal, environmental, and spatial issues which will only continue to worsen as the urban population grows. Projections show that by 2050, 70% of the world’s population will reside in cities; this will put a major strain on current methods of waste management, food production, transportation, energy consumption, and water conservation.¹ If current trends continue, cities will no longer be able to sustain themselves and will endure devastating consequences. The “Envisioning Fordhamopolis” project seeks to mimic ecological functions in order to create a sustainable, resilient, and redundant city which will be able to overcome the threats of a growing population. Implementation of composting projects and an increased waste management effort will enable the city to limit its landfill waste to only one percent. Through the adoption of urban agricultural practices, Fordhamopolis will be able to grow fifty percent of its food within city limits and grow the remaining in the surrounding hinterlands. The utilization of green energy and transportation methods will not only cut down on carbon emissions, but will also provide a more efficient way to navigate the city. Finally, through water harvesting and recycling used water, this city will be able to sustain itself in terms

of water consumption. This revolutionary city of Fordhamopolis, located in Western Washington, will provide a healthy city for urban dwellers and will serve as a model for future city planning initiatives.

Background:

With the outstanding rate of population growth within urban areas, city planners throughout the world need to reassess the standard urban planning model in order to accommodate for future population growth. According to the United Nations, currently 54 percent of the world population resides in cities. This number is expected to grow to 66 percent by the year 2050. This percentage translates to over six billion people who will be living in a dense urban environment.ⁱⁱ This increase in the urban population will challenge cities to provide the basic needs for their residents such as sufficient food sources, energy production, and water conservation in addition to a multitude of other essential services.

One serious issue which is currently facing cities and will continue to be a challenge is the excessive amount of waste produced by individuals and countries. The anaerobic decomposition of waste matter in landfills produces methane, a greenhouse gas, which greatly impacts the atmosphere. Through increased awareness regarding composting and recycling practices, city residents will be encouraged and required to engage in these citywide initiatives. Fordhamopolis will employ cradle to cradle techniques in order to greatly reduce the impact on the environment while simultaneously providing a healthy urban atmosphere. The waste management goal of Fordhamopolis is to have only one percent of all waste produced go into a landfill waste.

Sustainable food production for the city's dwellers will be a primary goal for Fordhamopolis as we aim towards producing half of one's caloric intake within the city limits. Through urban agricultural practices such as hydroponics, aquaponics farms, community gardens, and rooftop farms, in addition to other innovative methods, the city will employ



sustainable practices that will be able to feed the city's population. Through the maintenance of an urban growth boundary, the remaining percentage of food will come from local farms in the surrounding hinterlands.

Fordhamopolis will utilize electric vehicles, buses, and maglev trains to encourage transportation options throughout the city. This eco-approach to navigation throughout the city will decrease the amount of gases which are often emitted into the atmosphere allowing for a cleaner urban environment as well as efficient modes of transportation. In addition to public transportation options, bicycle usage will be encouraged throughout the city instead of personal vehicles. However, electric vehicles will be permitted under certain conditions for the convenience.

Only green energy methods will be utilized in Fordhamopolis and these will include a combination of solar panels and wind turbines outside of the city. All buildings will be equipped with transparent flexible solar panel windows for energy absorption. In addition to these methods, green architecture will be employed to encourage efficient heating and cooling abilities during the various seasons. Lastly, all sidewalks and streets will have PaveGen systems which will further produce more energy.

Lastly, water conservation is essential in this city as it is a nonrenewable resource and should be conserved in every way possible. Through rain water harvesting and water catchment systems, we will be able to obtain a large percentage of rainwater and use it for local needs. In addition, groundwater replenishment systems, water reclamation facilities will allow for already used water to be recycled and reused. Finally, to curb the amount of water wasted, both public and home fixtures and appliances will be water efficient.

Introduction to Fordhamopolis Society



Based on the basic principles of ecosystem ecology, Fordhamopolis will be a resilient, sustainable, diverse, and robust city. Located in western Washington State, this city of 100,000 people in a 15 mile squared area will live in a recreational, diverse, and clean environment. In order to prevent urban sprawl from occurring, and to further protect the city's foodsheds, an urban growth boundary similar to that of Portland, OR will be set. Portland's urban growth boundary is required under Oregon State law and requires that each city develop a growth border around the city to protect surrounding farm land and forests. This is used to control urban sprawl into the surrounding region and encourage density within the city limits.ⁱⁱⁱ This city will be located in the western area of Washington because of its temperate rainforest which will allow for ample agricultural opportunities and its close proximity to the Pacific coastline for recreational purposed and trading opportunities. This city will serve as a model for all future city planning initiatives and will be at the forefront of sustainable design based on ecological principles.

In addition to growth management, Fordhamopolis will also boast high literacy rates, low unemployment, and eco-friendly practices. Public schooling, free health care, and multiple job opportunities will allow this city to flourish. With an emphasis on health, no fast food chains will be permitted in the city; only wholesome food options will be available and will be equally accessible to all economic classes. Strategic city planning will allow for recreational parks to be within a ten minute walk from every residence. All sidewalks will be adorned with greenery and trees to encourage the local wildlife into the city realm. The ultimate goal of Fordhamopolis is to be an urban environment that embraces natural components through symbiotic relationships and interconnected systems.

Waste Management



An average 4.40 pounds of waste is produced per person daily in the United States. In addition to this incredible statistic, 55 percent of the 220 million tons of waste which is produced each year in the United States ends up in more than 3,500 landfills.^{iv} Moreover, the existing 1.3 billion tons of waste globally produced each year is expected to rise to 2.25 billion tons by the year 2025.^v There is an incredible amount of environmental degradation associated with this kind of landfill waste. For this reason, waste management and reduction is at the forefront of our mission. In order to combat excessive waste production, we will implement mandatory composting, recycling, and cradle to cradle manufacturing in order to achieve our goal of 99 percent non-municipal solid waste.

Through the adoption of ecological principles of zero waste and the reuse of resources through the biomimicry of natural cycles, we will be able to achieve only one percent of waste ending up in landfills. Through a complex system of nutrients and metabolisms, nature works in a way in which no waste is ever produced.^{vi} Rather than simply ameliorating the issue of waste, Fordhamopolis will encourage cradle to cradle manufacturing which will address the root cause of waste production. This sort of manufacturing will utilize only local materials that can naturally decompose in the environment. Instead of synthetic fabrics, naturally occurring materials for clothing, appliances, accessories, and everyday use items will be able to either be recycled or composted accordingly. By requiring this cradle to cradle approach instead of a cradle to grave approach, Fordhamopolis will eliminate the primary issue of waste management. “To eliminate the concept of waste means to design things from the very beginning on the understanding that waste does not exist.”^{vii}

Fordhamopolis will follow the innovative waste management techniques of Linköping, Sweden where garbage trucks do not come to pick up garbage, but rather technologically

advanced garbage chutes are placed on every street corner. In Linköping, 99 percent of all household waste is reused, recycled, and used to create electricity. Similar to Fordhamopolis, less than 1 percent is put in landfills. This garbage is sorted into recyclables, compostables, and regular landfill waste. It is then taken to an incinerator which provides 1,000 GWh of heating for the city and 200 GWh of electricity.^{viii} This will require a waste management facility that will be located outside of the city limits in order to maintain healthy air quality. Finally, ecosystems are based on complex systems which are interconnected. This city will function in a similar manner. The composting projects which will be turned into nutritious compost that can be used to replenish soils will be utilized in community garden and other urban agricultural initiatives throughout the city. Not only will this allow for food production, but there will be opportunities for job in the agribusiness sector.

Food Production

Food is, by far, the most important aspect of any city. Without sufficient food sources, the population will cease to exist. Current food systems in urban areas are inefficient and rely on mass produced food from industrialized systems to feed their cities. In the United States, the average distance food travels from farm to plate is 1,500 miles.^{ix} For this reason, Fordhamopolis would rely heavily upon urban agricultural practices within city limits in order to produce half of the society's caloric intake. The remaining 50 percent of food produced for the city would take place directly outside of the city in the farmland that will be conserved as a result of the urban growth boundary. Not only will this urban agribusiness provide job opportunities, it will also reconnect urban dwellers with this food and their farmers which ultimately reinforces a sense of community.



Fordhamopolis will employ both hydroponic and aquaponics methods of farming for maximum yield production of food regardless of weather conditions. These methods allow for healthy and organic food to be produced within city limits while using 70 to 95 percent less water than traditional farming methods.^x There would be ten major food producing factories within the city, each specializing in various kinds of produce and grains. This sort of agritecture would complement the urban landscape by introducing primary productivity into the city so that the urban residents are not reliant upon food sources that are shipped from thousands of miles away. This sort of sustainability and resiliency of producing one's own food will allow our city to mimic ecosystem functions and to sustain itself. Additionally, the food sold in the local grocery stores must be grown within the same multi-use building similar to that of Gotham Greens in New York City (Figure 1).

In addition to these large hydroponic and aquaponics farms throughout the city, Fordhamopolis will have community gardens spread throughout the city, within a 15 minute walk from every residence, so that urban dwellers are able to have a deeper connection with the earth and the food in which they consume. The government will provide incentives for rooftop gardens to encourage that at least half of all city roofs are utilized in some sort of agricultural way. Finally, food education will be taught from an early age to encourage sustainable eating practices and vegetarianism. Although not mandated, the hope is that through proper knowledge of the environmental impact of our food sources, city dwellers will opt for healthier alternatives to meat products.

Transportation

Urban dwellers in Fordhamopolis would rely upon bicycles, electric trolleys, and maglev trains for navigation throughout the city. Electric taxis would also be available for more

convenient transportation and in certain instances, depending upon one's physical ability, electric vehicles would be permitted.

Fordhamopolis would follow Copenhagen's model of bicycling as the primary mode of transportation for its efficiency, eco-component, and communal aspect. Bike lanes would be present on each street throughout the city and certain roads would be designated solely for bicycles (Figure 2). For efficiency, electrically powered buses and trams would be utilized. Lastly, maglev trains would operate on an overhead platform to enable faster transportation methods. Maglev trains use electrically charged magnets which allow the train to levitate and move.^{xi} Public transportation and the use of bicycles would be the primary mode of travel throughout the city except for EV (Electric Vehicle) cabs. Although public transportation is efficient, the convenience of cars cannot be disputed and for this reason there would be employment opportunities for taxis throughout the city. Additionally, depending upon one's physical ability and in certain cases, EV permits would be given to some individuals to encourage travel. For most of society however, cars would not be illegal but would only be allowed to be driven outside of the city limits as to discourage congestion within Fordhamopolis.

Energy

Fordhamopolis will rely solely on green energy systems including solar panels, wind turbines, green architecture, and PaveGen products. In natural ecosystems, all energy comes from the sun and is then transformed into various kinds of energy for food. Similar to this basic ecological principle, this city will rely heavily upon solar panels. Each roof, if not already converted to a green roof, will be equipped with solar panels. In addition to these solar panels on top of roofs, all buildings within the city must have flexible solar windows which can absorb additional energy. SolarWindows™ allow for 50 times more light to be absorbed and

transformed into energy than traditional photovoltaics.^{xii} Solar panels will be able to produce 75 percent of the city's energy consumption. The remaining energy will come from wind turbines placed outside of the urban growth boundary. There will also be some additional energy produced from the waste incinerators which can be used to heat and cool urban dwellings.

All streets and sidewalks within city limits will have PaveGen technology that will harness kinetic energy for use throughout the city. "The recycled rubber PaveGen paving slabs harvest kinetic energy from the impact of people stepping on them and instantly deliver tiny bursts of electricity to nearby appliances. The slabs can also store energy for up to three days in an on-board battery, according to its creator."^{xiii} The energy harvested from footsteps and cars will be enough to light up streetlights, traffic lights, and other public amenities.

The implementation of green architecture practices will reduce overall energy consumption. For example, evaporative cooling methods will efficiently cool down a house without the use of energy. Proper placement of windows and blinds in addition to carefully selective building mediums will enable a building to absorb heat during the colder months. Through these cost-effective and innovative architectural practices, buildings will be able to greatly reduce the amount of energy necessary for heating and cooling.

Water

Water conservation within cities is essential in order to reduce the environmental impact. Since water is not a renewable resource, groundwater needs to be protected and water must be protected so that the hydrologic cycle is able to occur to purify the used water. Naturally occurring ecosystems efficiently use resources with the intent of that resource being recycled and reused at a later time. A family of four in the United States uses around 400 gallons of water a

day, 70 percent of which is used for indoor needs. Since most of this water is later deemed unsuitable for drinking, it is unable to be reused at a later time and is instead disposed of.^{xiv}

Fordhamopolis will utilize rain water harvesting processes and water catchment systems in order to obtain rainwater, process it, and transform it into potable water. Both of these practices are important because they allow the water to be filtered and stored for later use. Since it does not tap into local aquifers, this important ground water is conserved for its environmental significance.

All water used within this city will undergo filtration at the water reclamation facility. Similar to that of the facility in California, this operation will ensure that all contaminated water undergoes microfiltration, reverse osmosis, and UV disinfection. This efficient treatment option will ensure that all wastewater is suitable for drinking. Three forms of treatment for sewer water in the microfiltration phase allow for water to adequately be filtered for complete purification. Secondly, reverse osmosis puts pressure upon the water which results in the elimination of viruses and bacteria. Finally, UV disinfection further removes any harmful particles. This water is then placed into the ground for natural purification until it can be safely accessible for drinking.^{xv} While this is a complex issue which needs to be solved it is necessary to restore drinkable water to its initial state rather than allowing contaminated water to seep into the environment. Following ecological principles found in nature, Fordhamopolis seeks to work towards sustainable methods that allow for redundancy recycling of resources found in the environment. Finally, in order to solve the root problem of excessive water waste, water efficient fixtures will be required in all buildings. Innovative solutions for faucets, showerheads, and toilets will greatly reduce the amount of water wasted during daily activities.

Expected Outcomes

This revolutionary city of Fordhamopolis will serve as a model for future city planning initiatives since it is at the forefront of innovative solutions to urban problems. Following basic principles of ecosystem ecology such as resiliency, sustainability, primary productivity, and diversity, Fordhamopolis will mimic the interconnected systems found in nature in order to completely redesign the ways in which we view city life. Fordhamopolis will boast decreased health issues among its residents. The ultimate goal of this project is to develop an urban environment that embraces natural components through symbiotic relationships and interconnected systems which benefit both the environment and the urban dweller in this time of increasing urbanization throughout the world.

Appendix:



Figure 1: Gotham Greens hydroponic greenhouse on top of Whole Foods supermarket in Brooklyn, NY. Courtesy of www.gothamgreens.com



Figure 2: Bike Lanes in Copenhagen courtesy of Matthew Blackett.^{xvi}

Endnotes:

ⁱ Food and Agriculture Organization of the United Nations. Food for the Cities.

ⁱⁱ "World's Population Increasingly Urban with More than Half Living in Urban Areas | UN DESA | United Nations Department of Economic and Social Affairs." UN News Center. July 10, 2014. Accessed March 31, 2016.

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ⁱⁱⁱ "Urban Growth Boundary." Metro. September 18, 2015. Accessed March 24, 2016.

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^{iv} "Municipal Solid Waste." Municipal Solid Waste. March 27, 2016. Accessed March 29, 2016.

<https://www3.epa.gov/epawaste/nonhaz/municipal/>.

^v "World Bank. 2014. Results-Based Financing for Municipal Solid Waste. Urban development series; knowledge papers no. 20. Washington, DC. © World Bank.

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^{vi} McDonough, William, and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point Press, 2002, 92.

^{vii} McDonough, William, and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point Press, 2002, 104.

^{viii} "The Sustainable Cycle in Linköping." Cleantech Stergland. Accessed March 27, 2016.

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^{ix} "How Far Does Your Food Travel to Get to Your Plate? | CUESA." CUESA. Accessed March 26, 2016. <http://www.cuesa.org/learn/how-far-does-your-food-travel-get-your-plate>.

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