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Reshaping Our Cities: Sustainable Development and Green Technology Within a Historical Framework

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Author Robert B. Marks, in his book *Origins of the Modern World* proposes a construct called the “old biological regime,” which represents the natural and socio-political constraints upon the growing population of Europe. A major constraint on population growth was food, since Europe at the time of the 1400s was still an agricultural society, lacking modern technology to ensure consistently bountiful crop surpluses. Expansion beyond the old biological regime happened when people began to alter their methods of supporting the growing population. Marks argues that society officially escaped the old biological regime with the advent of the industrial revolution in England; this step in history marked a dramatic increase in the human impact upon the environment.

In the 18th century, England, the main hub of the Industrial Revolution, began to experience rapid population growth and severe air and water pollution from heavy coal use. Since that turning point, industrialization has occurred in cities around the globe, causing each one to suffer the effects of industry and heavy development, such as poor air and water quality, deforestation, and loss of diversity. It was not until 1948 that the United States passed its first environmental regulation with the Federal Water Pollution Control Act. In 1970, change began with the founding of the Environmental Protection Agency in the United States, and the past forty years has shown more progress in environmental

protection. Unfortunately, negative forces upon the environment still outweigh the positive changes due to regulation.

To understand the world today, it is important to know where each of us came from and how that affects our attitudes, beliefs, and actions. Those origins differ between nations and cultures across the globe. As society has progressed and developed into the modern age, we leave an ever growing imprint upon the natural world. We are draining the world's renewable resources faster than they can replenish, and using up every non-renewable resource till they become scarce and costly. Along with the industrial revolution came the formation of major cities; cities have continued to be one of the largest sources of pollution and waste today. Highly urbanized areas have large expanses of impervious concrete, which has a drastic effect on the natural water cycle. In natural landscapes, when it rains, about half of that water infiltrates the ground, replenishing aquifers, and causing river levels to rise slowly over time. In the urban water cycle, about 5% of water infiltrates the ground, and about half of the water is runoff. In this setting, the runoff water immediately enters streams, quickly raising water levels and increasing floods. The pollutants and chemicals that cover the streets are carried away by the runoff water as it enters rivers, streams, and soaks into the soil. This is just one example of the many harmful effects of cities today, resulting not from the inherent nature of cities but from the ways we build and organize them. To be more specific, what is harmful is the use of impervious surface materials, light reflecting building materials, ineffective transportation systems, and inefficient land use leading to urban sprawl. Many people recognize the urgent need to change our ways, to find alternative energy sources, to decontaminate the soil and water, and slow the process of global warming. Opposition is strong, however, and it seems that

many people view the environmental movement as a path to eliminating modern technology, comforts, and conveniences to which we are accustomed. I believe that a balance is possible between living in this fast paced, technological world, and diminishing our negative impact on the environment. With more people living in cities today than ever before, it is imperative that we significantly reduce the negative environmental impact of those cities.

I want to explore the methods we can adopt to live, build, and use resources more sustainably within the urban framework. Using the history of society's growth and urban development as a context, I want to examine how we can move away from standard city infrastructure, to create more dynamic urban spaces. I feel that every part of society needs to be changed to create a more sustainable way of life. After growing up in a city, and then spending three years in a small rural town in Ohio, I have developed a deep love of cities, due to the energy, culture, and opportunities they breed. I am also fascinated with alternative architecture and green building within cities, which is why I have chosen to focus my energy on how we can make cities more sustainable. I have broken down my concentration into four main themes: (1) green technology, (2) sustainability and environmental studies, (3) urban studies, and (4) history. Each of these topics will give me perspective and knowledge to understand how people throughout history have produced archetypal models to frame their understanding of the development and purpose of a city. By examining present-day models in light of many diverse alternatives, I hope to extend my own insight into how today's cities can be made more sustainable, and to contribute to the ideas and models necessary for the future development of sustainable urban environments. I want to

approach urban sustainability from the angle of how technology can be applied, especially in terms of buildings, to create more environmentally friendly spaces.

Green Technology:

For my theme of technology and computer science, I want to explore how technology and computer controlled systems are used in sustainable building. This includes researching nanotechnology that is used in building materials, along with computers used for automated services, ventilation and water systems in buildings. I'm interested in exploring both the benefits and the possible negative effects of using such technology. What amount of energy, water, and other natural resources go into manufacturing these new technologies? Do these quantities outweigh the final product's positive effects on the environment? I also want to examine whether the use of these materials and systems are, in reality, helping the environment. Is there any actual evidence so far? If not, why is that, and when could we expect to see real changes? If there is no evidence thus far, what arguments do the supporters of these methods present to the skeptics? I plan to explore this field through Independent Study Projects (ISPs) in which I research specific areas within the field. I am developing one ISP that will focus on physical building materials using nanotechnology and alternative materials to what we typically use today. This would include roofing, paints, walls, doors, windows, and insulation materials. I plan not only to explore what is being created, but also to examine the environmental impact of the manufacturing of these materials. An example of this is a new roofing material called Ketone Ethylene Ester, which is, according to suppliers, a thin, lightweight, flexible, and durable alternative material for roofs. It also has bonding properties that eliminate the need for torching or toxic adhesives to install it. This could be a wonderful alternative, but I

would want to examine the manufacturing process, the resources needed to create this material, the reuse or recycling of this material, and the locations of the factories and those resources. Another ISP I would like to create would focus on systems in green building, from sophisticated ventilation systems to green roofs. For this ISP, I would look at different systems within buildings from an environmental point of view and compare those to older systems.

Sustainability and Environmental Studies:

The sustainability and environmental studies theme encompasses the current environmental issues I want to learn about. I would like to examine the different ways people in all over the world are combating the negative environmental effects of their life styles, along with understanding the individuals and collectives blocking progress towards a more sustainable future, and why they do so? I also want to learn about the politics of sustainability, both within the US and internationally. What is the role of the government policies and programs in promoting or blocking sustainable measures? Those are only a couple of the questions I wish to answer in my studies. I plan to take courses about broad environmental issues, human involvement in the natural world, and environmental and resource policy, such as ESTU 303: *Human Ecology and Sustainability* and PLSC 420: *Environmental Politics*. Through gaining this knowledge, my hope is that I will be better equipped to examine critically the effects of human actions on the environment. My goal is to analyze primarily the effects of climate change, pollution, resource depletion, and species extinction. Through understanding this larger context, I will be better able to examine the environmental impacts generated in all steps of processes of building (e.g., construction and demolition) and production of materials (e.g., alternative roofing materials).

Environmental Studies provides a broad context for understanding the content I focus on in my next theme.

Urban Studies:

Within my theme of Urban Studies, I want to focus on environmental issues that are present most predominantly within cities. I am interested in exploring how cities have developed, what environmental impacts they have and how those impacts have changed with urban development over time. There are several different components in studying the development of cities and their connection to the environment. Firstly, globalization is one key factor, as it influences the function and growth of cities different countries. I am currently taking FAIR 375A: *Globalization and Cities* to increase my understanding of the impact of globalization on cities. Secondly, the fluctuation of urban migration processes plays a significant role in the growth of infrastructure, diversity of uses, and population density. Thirdly, urban sprawl, connected to high urban migration, is important to examine as it represents the growth of a city spreading into the surrounding natural landscape, which adds to the environmental impact of a city beyond its core. The last element is the main purpose of the central city; some cities were originally built around the factories located in that region, and are primarily places of heavy industry, whereas some cities are well noted as being port cities or college oriented cities. Understanding the multiple forces that shape urban growth and development will aid in my greater understanding of cities in general.

A few questions come to mind in thinking about the environmental side of cities. What can we do to lessen those environmental impacts, and what is already being done? What can we focus our energy on that would show significant change in a city's impact? For

this theme, I plan to take courses such as FAIR 375A: *Globalization and Cities* and EGEO 314: *Urbanization: Processes and Patterns*, which deal with globalization, urbanization, use of urban space, and the social, political and economic issues that contribute to a city's environmental impact. These social, political and economic issues are important to understand because they are core contributors to an individual city's varying degree of sustainable infrastructure and growth processes.

History:

The theme of history broadly encompasses the idea of understanding today through patterns and events of the past. I want to examine more closely the development of society from an agricultural society to market based economy, our use of resources, and the changing perspectives towards the natural world. I want to compare cultural differences around the world in terms of attitudes today towards development, the natural world, and our obligations to the future preservation of the planet and its resources. I am curious what factors incline certain cultures towards sustainability, while other cultures seem blind to the issue. I have already taken several history courses on different cultures (including HIST 340: *Russia and the Soviet Union*, HIST 200: *European History 1500-1815*, and HIST 450: *Vietnam in the 20th Century*), and a course on economic history (HIST 420: *Economic History*). Those courses have taught me basic cultural, political, economic, and social history, which has included learning about the formation of cities in different cultures, and the roots of globalized trade. Especially through European history and economic history, I have studied the use of resources in trade and energy production, along with exploitation of natural habitats in colonialism. Certain trends can be translated to modern times. One example is how England was facing a wood shortage in the 1700s, which was a motivation

to find and develop alternative energy sources such as coal. Similarly, we will soon face a shortage of oil, since we have exploited that resource to our advantage as the English did with wood. I want to bring these studies into my concentration, because I feel that historical roots greatly color a number of issues we have today, a fact too often overlooked.

Senior Project:

For my Senior Project, I would like to combine the work from my Green Technology ISPs with the perspectives on sustainability and urbanization that I gained in my coursework. This mix would lead me to examine buildings, or compare buildings in different countries, that are considered sustainably built. I want to analyze the culture of both the city and country in which the buildings reside, and the elements that make them sustainable. Part of this project would be learning about the various LEED standards (Leadership in Energy and Environmental Design) used in the U.S. I would be looking at building materials and engineered systems, the physical impact that building has on the environment around it, and how it functions within the city. Since it is not just in the United States that sustainable building is occurring, I would like to compare this movement in other countries, where cultural values and traditions are different, and where the reasons and incentives for building sustainably may be different as well.

Course Plan:**Green Technology****Total credits: 8**CompletedTo be completed

WWU		ISP: Alternate Materials in Green Building	Fall 2010	4	
WWU		ISP: Systems in Green Building	Winter 2011	4	

Sustainability and Environmental Studies**Total credits: 7/26**Completed

WWU	ESTU 202	Intro to environmental studies/sustainability	Spring 2010	3	
WWU	FAIR 335N	Visioning sustainable futures	Spring 2010	4	

To be completed

WWU	EGEO 327	Pacific Northwest: society and environment		3	
WWU	PLSC 417E	Special topics environmental politics		3	
WWU	ESTU 304	Environment and resource policy	Fall 2010	4	
WWU	ESTU 303	Human ecology and sustainability		4	
WWU	PLSC 420	Environmental politics		5	

Urban Studies**Total credits: 8/16**Completed

WWU	A/HI 415	Space and the urban environment	Fall 2009	4	A-
WWU	FAIR 375A	Globalization and cities	Spring 2010	4	

To be completed

WWU	EGEO 314	Urbanization: processes and patterns	Fall 2010	4	
WWU	EGEO 414	The urban environment	(Winter 2011)	4	

History**Total credits: 30/41**Completed

Otterbein	HIST 340	Russia and the Soviet Union	Fall 2007	5	A-
Otterbein	HIST 120	American Experience	Spring 2008	5	B+
Otterbein	HIST 450	Vietnam in the 20 th century	Spring 2008	5	B
Otterbein	HIST 245	Survey of Pre-modern Asia	Fall 2008	5	A
Otterbein	HIST 420	Economic history	Winter 2009	5	A-
Otterbein	HIST 200	European History 1500-1815	Winter 2009	5	A

To be completed

WWU	HIST 447	History of the sciences of nature		4	
WWU	HIST 460	American environmental history		4	
WWU	ETEC 215	History of industrial design	(Spring 2011)	3	

Other/Useful skills**Total credits: 8/8**Completed

WWU	COMM 224	Small group processes	Fall 2009	4	A
WWU	MGMT 311	Organizational management	Winter 2010	4	A

To be completed**Senior Project**

WWU	FAIR 401	Senior project	Spring 2011		
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