

Undergraduate Thesis Prospectus

**Enterprise Risk and Resilience of Container Freight Operations**

(technical research project in Systems Engineering)

**Sustainable Development: How Divergent Ideas Can Accomplish a Common Goal**

(STS research project)

by

Robert Donnan

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technical project collaborators:  
SYS 4053 Capstone Group 14

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

signed: \_\_\_\_\_ date: \_\_\_\_\_

approved: \_\_\_\_\_ date: \_\_\_\_\_  
Peter Norton, Department of Engineering and Society

approved: \_\_\_\_\_ date: \_\_\_\_\_  
James H. Lambert, Department of Engineering Systems and Environment

## **General research problem**

*Is the economic growth model obsolete?*

Global markets demand economic growth, and politicians recognize this. After the GDP grew roughly 3 percent in 2018, President Trump recently stated that the U.S. “accomplished an economic turnaround of historic proportions,” (qtd. by The White House, 2019). But the benefits of growth are mixed. Economist Richard Easterlin (1974) found that growing wealth does not necessarily entail happiness. This idea, called the *Easterlin Paradox*, raises questions about how national success is measured.

The economic growth frame faces a second challenge. In 2018, the Intergovernmental Panel on Climate Change (IPCC) reported that to reduce risk of permanent damage to the planet (e.g. through extreme sea level rise), global warming must be limited to 1.5°C; the current projected rise is 2.0°C by 2100. This task, however, requires quick and substantial changes across industries, cities, energy sources, and uses of land. The IPCC warns that human-caused carbon dioxide emissions must fall roughly 45 percent from 2010 levels, and reach net zero by 2050.

## **Stimulating economic growth at the Port of Virginia**

*How can the Port of Virginia increase its economic impact in the United States?*

Led by Professor James H. Lambert of the Department of Engineering Systems and Environment, the team for the capstone project, Enterprise Risk and Resilience of Container Freight Operations, aims to identify areas in which the Port of Virginia (PoV) can improve its operations and increase its economic impact.

The port is a major driver of economic activity for both Virginia and the United States. According to the Mason School of Business at the College of William and Mary, a total of 374,000 Virginia jobs – almost ten percent of Virginia’s workforce – is connected to PoV activity (Pearson & Swan, 2014). The PoV also accounts for nearly five percent of all container shipping in the U.S., ranking seventh among U.S. ports (Burnson, 2019). Therefore, there exists an opportunity for the PoV to seize a larger portion of the U.S. shipping market and thus creating more jobs for the citizens of Virginia.

The goal of the project is to capture this growth opportunity and while the work is constrained to the port itself, the avenues to achieve this goal are numerous. Systems Engineering students have worked with the port in past years and most recently the 2018-2019 capstone team recommended that the port should offer liquefied natural gas (LNG) bunkering (Coleman et al., 2019). A few months later, CEO John Reinhart stated that, “LNG bunkering would represent a complimentary capability to [the PoV’s] land and waterside assets and investments” (qtd. by Davison, 2019). This capability has not been fully implemented, so its full impact is unknown; however, the previous capstone team set a precedent to identify disruptive opportunities for the PoV to adopt. The current capstone team has a number of potential ideas for the port, including: alternative maritime power, increased refrigerated container capacity, and a new manufacturing facility. Once an idea arouses sufficient interest from the port, an analysis of its feasibility and economic impact will be conducted and presented to the PoV. If the team is successful and the opportunity is worthwhile, the port will likely then implement the proposed idea to improve its operations.

## **Sustainable development: how divergent ideas can accomplish a common goal**

*How do the BedZED, Masdar City, and Poole's Land communities represent divergent ideas about sustainable development?*

In her nonfiction work, *Payback: Debt and the Shadow Side of Wealth*, Margaret Atwood (2008) depicts an unsettling future in which mankind's quest for endless growth exhausts the earth of its natural resources. In this world, money and power are worthless and primitive survival is the sole motivator. Atwood suggests, however, that if humanity forgoes growth for the sake of sustainable development, we may be able to avoid this dark future.

*The Brundtland Report* defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987). The report does not explain how to achieve this, but we can assess efforts to implement sustainable development. Therefore, with this definition in mind, three different sustainable communities will be examined: BedZED, Masdar City, and Poole's Land.

Journalists and researchers have written about these communities as innovators of sustainable development. Poole's Land, in British Columbia, was featured in a 2018 Vice Canada documentary, which looks at the ideas, interests, and values of the community and its founder, Michael Poole (Vice Canada, 2018). Zhu et al. (2015) studied BedZED and Masdar City as technical case studies.

Beddington Zero Energy Development (BedZED) is an energy-efficient housing development in Hackbridge (London), England. The project was led by Peabody, a London housing association, and designed by Bill Dunster Architects to be the “first

large-scale ‘carbon-neutral’ development” (qtd. by Hyde et al., 2007, p. 44). Peabody manages the 82 homes in BedZED, promising its residents value for their money, transparent business plans, and a serious approach to climate change (Peabody 2019). With its car-free roads, open pavilions, and gardens, BedZED has fostered a friendly community. Familiar neighbors, social events, and distinctive character are among what one former resident miss most about BedZED (Smith, n.d.).

Masdar City is a developing city project near Abu Dhabi in the United Arab Emirates. The project is led by Masdar, a portfolio company of the global investment firm Mubadala. Masdar (2019a) considers itself a “global leader in renewable energy and sustained development,” and aims to be a “model for the commercial adoption of clean technologies.” Construction began in 2008 and two years later the Masdar Institute of Science and Technology became the first tenant. This was part of Deputy Prime Minister Sheikh Mansour’s commitment to “the development of human capital as a foundation to drive the country’s long-term economic viability” (qtd. by Atef, 2010). Today, Masdar city hosts over 450 companies and acts as a “real-time laboratory to monitor and study how cities, use, conserve and share resources” (Masdar, 2019b).

Poole’s Land is a 17-acre community in the rainforest of Tofino, British Columbia. Established in 1988 by Michael Poole, Poole’s Land is home to “wayward souls, transitory workers, travelers, gardeners, and a host of creatures large and small” (Poole 2019). In Vice Canada’s 2018 documentary, one resident describes it as “a hostel campground for people who want to feel loved.” The facilities of Poole’s Land are minimalist. Residents live in broken-down school buses and shoddily built shacks. The few rules in Poole’s Land include: respect all beings, recycle as best as you can, commit

no violence, and use no hard drugs (Vice Canada, 2018). For 33 years the community has existed in harmony with Tofino and even Mayor Josie Osbourne has acknowledged that it “confronts our perceptions and our biases about lifestyles and the way people choose to live” (qtd. by Renwick, 2018). However, the future of Poole’s land is uncertain as its founder considers pursuit of a new development project (Renwick, 2018).

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