A Critical Evaluation of M-CORES: Impact Analysis and Exploring Alternatives

September 14, 2020

Cornell Consulting

Table of Contents

Fiscal Feasibility

- Key Fiscal Findings Slide 9
- Methods of Funding Slide 14
- Feasibility Evaluation Framework Slide 15

Environmental Impact

- M-CORES Pollution Promotion Slide 17
- Health Risks Slide 18
- Water Treatment Associated Costs Slide 19
- Current Economic Issues Slide 20
- Carbon Emissions from Development Slide 21

Economic Impact

- Economic Research Slide 23
- Alternative Investment Slide 25

Table of Contents

Broadband Investment

- Broadband Deployment Overview — Slide 27
- Aerial vs Underground Fiber Optic Cable Installation — Slide 29
- Average Cost of Broadband Implementation — Slide 30
- Benefit/Cost of Broadband Implementation — Slide 31

Traffic Congestion Alleviation

- Daily Traffic Congestion Solutions — Slide 36-37

Hurricane Evacuation Strategy

- Effective Fuel Distribution — Slide 39
- Efficient Usage of Roads — Slide 40
- Public Awareness Campaign for Emergency Preparedness — Slide 41
- Propose Alternatives to M-CORES — Slide 42

Cost Benefit Analysis — Slide 44

Agenda

Overview
A walkthrough of M-CORES and our key areas of study

Triple-Bottom Line Impact
Assessment of M-CORES's fiscal, environmental, and socioeconomic impact

Hurricane Evacuation and Traffic Congestion
In-depth analysis of effect on evacuation and best practice traffic measures

Conclusion
A recap of the key findings of the study

Agenda

Overview
A walkthrough of M-CORES and our key areas of study

Triple-Bottom Line Impact
Assessment of M-CORES's fiscal, environmental, and socioeconomic impact

Hurricane Evacuation and Traffic Congestion
In-depth analysis of effect on evacuation and best practice traffic measures

Conclusion
A recap of the key findings of the study

Project Scope

Cornell Consulting** conducted the research assigned to M-CORES task forces to fill research gaps that fully considered alternatives to road construction in coordination with the **No Roads to Ruin Coalition

1	**Examined M-CORES goals**	▪ M-CORES will not positively impact the communities in the study areas ▪ M-CORES is not feasible to implement
2	**Triple-Bottom Line Analysis**	▪ We provided a quantitative analysis of M-CORES' project impacts ▪ M-CORES is fiscally infeasible, and the proposed highway exacerbates existing environmental and economic problems
3	**Recommending Alternatives**	▪ There are cheaper and safer ways to meet M-CORES' economic development goals ▪ There are more efficient strategies to achieve hurricane evacuation and traffic decongestion goals

Across all study areas, quantitative results indicates M-CORES will fail to meet its goals

Agenda

Overview
A walkthrough of M-CORES and our key areas of study

Triple-Bottom Line Impact
Assessment of M-CORES's fiscal, environmental, and socioeconomic impact

Hurricane Evacuation and Traffic Congestion
In-depth analysis of effect on evacuation and best practice traffic measures

Conclusion
A recap of the key findings of the study

Fiscal Feasibility

Assessing the Financial Feasibility of M-CORES Toll Roads

Cornell Consulting used industry standard methodologies to develop a model projecting the M-CORES initiative fiscal returns

Context

The M-CORES program proposes three toll roads to benefit Florida.
The claims of economic feasibility lack empirical research or studies.

Solution Framework

Analyzed publicly available FDOT datasets with statistical methods for toll usage rate and case studies for economic growth projections

Determined construction cost, timeline, toll operating price, and expenses by using a series of FDOT data and public data

Evaluated feasibility through underwriting analysis and FDOT economically feasible framework

M-CORES was found to be not economically feasible nor significantly increase local county GDP

Key Fiscal Findings

*M-CORES toll roads were determined to be **not feasible** in over 500 simulated model trials*

Findings	Suncoast	Northern Turnpike	Southwest-Central	M-CORES Total
Development Cost (in Billions)	**5**	**2**	**3.3**	**10.3**
Miles	150	40	140	330
Cost/Mile (in Millions)	36.7	45.4	25.5	30.3
Years to Build	10	6	10	10
Government Funding (in Millions)	818	330	550	1700
FDOT Funding* (in Billions)	4.2	1.7	2.8	8.7
Feasible	✗	✗	✗	✗

*Assumes no interest during the construction portion and includes FDOT revenue, FDOT bonds, and private partnership

Comparable Methodology

We used a comparable methodology to ground our assumptions for highway construction cost, toll price, operating expenses, and economic discount

1 **Finding Dataset**
We found comparable highways by looking for similar types of projects through geography, topography, and mileage.

2 **Create a Scoring Metric**
The similarity scoring metric was out of the number of factors identified to change either cost/mile, expenses, or toll cost/mile

3 **Score the Highways**
A point was scored if the highway was similar in each category. This was determined by researching key influencing metrics on data-set highways and the proposed highways

Topography

Build Year

Population Density

Mileage

Environment

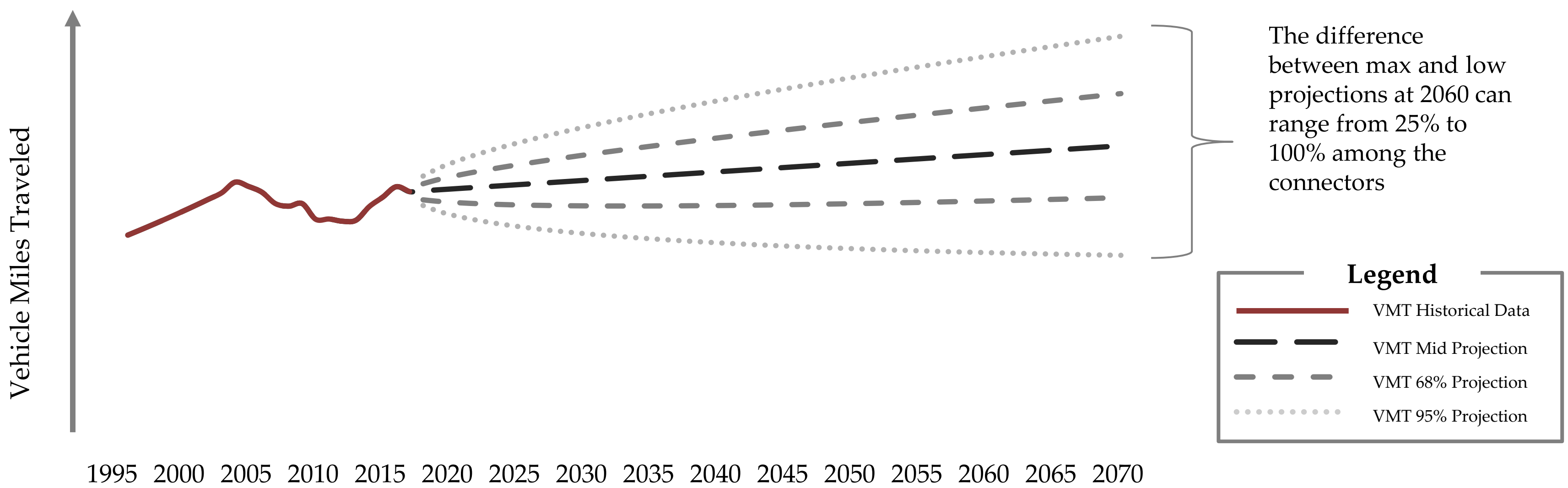
The assumptions differed across each connector due to different identified factors

Usage Projections

Usage rate growth and demand varied across M-CORES connector counties with usage growth dependent on GDP and population growth

Methodology

We found the best methodology to account for time sensitive usage rates and long-term projections to be the exponential smoothing model based on FDOT modeling recommendations



We accounted for forecast variations in the feasibility models

*6-8 Year Usage Increase not included in figure

Sources: World Bank, FDOT

Connector Usage

Using FDOT data on road usage and mileage, Cornell Consulting projected starting usage rates for each of the three M-CORES Corridors at the times of their completion

Methodology

We calculated the total miles of major arterial highways in each corridor project completion and found the proportion of total roadway miles occupied by each new connector. This proportion was used to scale demand in vehicle miles traveled (VMT).

$$\text{Starting Usage Rate} = \frac{\text{Proposed Connector Miles}}{\text{Total Highway Miles in Corridor} + \text{Proposed Connector Miles}} \text{ x Projected Total Highway Demand (VMT)}$$

Total VMT Proportion

86%
Cars

14%
Trucks

Suncoast Connector

Proposed Connector Miles: 150
New Miles in Corridor: 989.395
% of Demand: 15.16%
Completion Year: 2030

Projected Mean Connector Usage
Total 2030 Car VMT: **292,205,888**
Total 2030 Truck VMT: **47,568,400**

Northern Turnpike Connector

Proposed Connector Miles: 40
New Miles in Corridor: 862.208
% of Demand: 4.64%
Completion Year: 2026

Projected Mean Connector Usage
Total 2026 Car VMT: **221,333,591**
Total 2026 Truck VMT: **36,031,050**

Southwest-Central Florida Connector

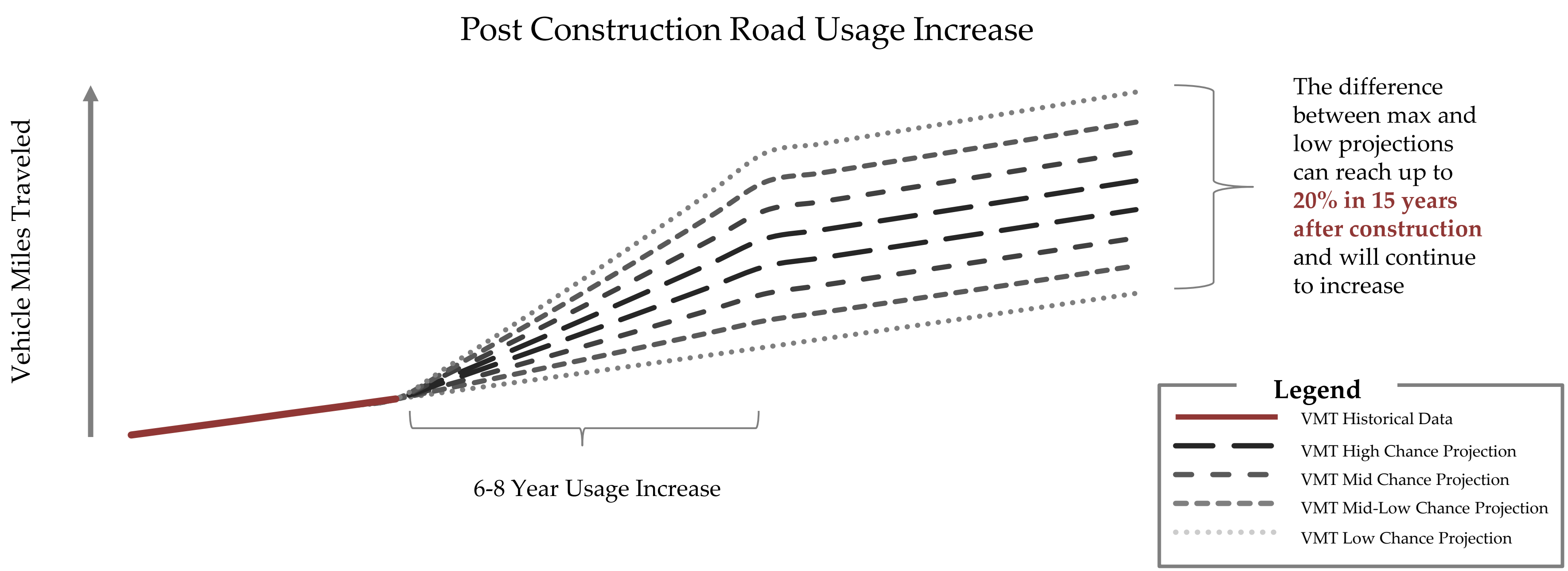
Proposed Connector Miles: 140
New Miles in Corridor: 1,929.432
% of Demand: 7.26%
Completion Year: 2030

Projected Mean Connector Usage
Total 2030 Car VMT: **979,289,678**
Total 2030 Truck VMT: **159,419,250**

Sources: 1997-2018 FDOT DVMT and Centerline Miles by County Annual Official Report, Federal Highway Administration

Short-Term Post Construction Increase

Usage rate growth and demand varied across M-CORES connector counties but may increase due to (a) economic activity and (b) latent demand



Short-term increase in usage after completion

- The key inputs for FDOT models for projecting road usage use (a) population and (b) GDP
- Our research concluded building more roads **may** increase GDP due to decreases in transportation costs
- Urban planning theory suggests **road usage will increase as road development increases**
- Individuals make decisions about whether to drive based on time - if there is traffic people will not drive, if there is no traffic people will drive
- Using these inputs we assumed a short-term increase in usage **of 0%-4.25% for 6-8 years** before returning to steady state growth

Sources: NBER, World Bank, FDOT

Methods of Funding

M-CORES will need $+10B in funding for road construction alone

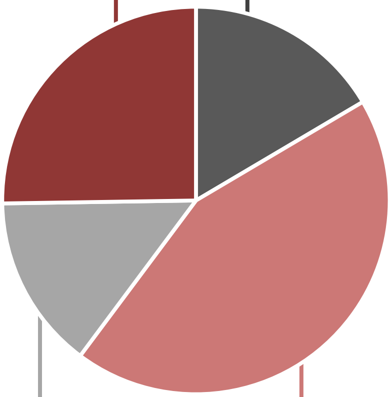
Florida Funding

The Florida legislation signed into the M-CORES bill $480M for the roads before the fiscal years of 2022-2023 and $165Mper year to 2030

The stimulus to FDOT will be for construction purposes totalling **~$1.7B**

Private Partnerships

Private debt partnerships with banks/private equity could allow FDOT to fund M-CORES which will reduce the amount of necessary FDOT revenue and FDOT bonds. This can range from **$.5B to $6B** depending on capital structure



FDOT Revenue

FDOT current net revenue is $681M of which $255M will go to debt service. Including the previous 5-year plan and assuming FDOT requires an internal debt service of 1.5 – that leaves ~$220M per year for the project. While this is not necessarily fiscally savvy, FDOT can fund the project with total **10-year revenues at $2.2B**

FDOT Bonds

FDOT legal bond capacity is $10 billion of which currently, $2.6 billion of bonds are outstanding with a Five-Year Capital Plan that calls for $1.5 billion of additional bonds to be issued leaving **$5.9B available for projects**

M-CORES can be funded but the project will heavily strain the FDOT financial system

Sources: Florida Senate, FDOT

Feasibility Evaluation Framework

Cornell Consulting used FDOT's "economically feasible" framework for new projects to evaluate each connector in over 500 scenarios

FDOT Requirements

FDOT has stringent requirements on new projects that require after the project is complete:

- **50% debt service coverage ratio at year 12**
- **100% debt service coverage ratio at year 30**
- **Construction cost payback period of 15 years**

We ran a Monte-Carlo Simulation to find (a) what assumptions make the connectors feasible, (b) account for assumption errors, and (c) what % of the time are the requirements are met

Requirement	Suncoast	Northern Turnpike	Southwest-Central
Year 12 DSCR 50%	0%	71%	99%
Year 30 DSCR 100%	0%	37%	95%
Year 15 Construction Payback*	0%	0%	0%

The toll roads were not economically feasible in all 500 simulations

*Includes the interest accrued during construction
Source: [Florida Statues]

Environmental Impact

M-CORES Pollution Promotion

Highway development leads to high pollutant levels especially during the sprawl phase

Construction

Concentration of **Alkali metals** are particularly high around construction areas

Any **spillage**, **fluid disposal**, and **improper handling** potentially impacts groundwater quality

Increase in **impervious surfaces** leads to an increase in potential contaminants

Transportation

Proposed M-CORES would run over **unconfined aquifer regions**

Multiple **transportation-related pollutants** such as Cu, K^+ and Cl^- are found close to highway edges

NO_2 and other air pollutants affect groundwater **300-500 meters** from highway

Sprawl

Road construction is **empirically linked** with urban development

Sprawl is associated with more **water contamination**, **impervious surfaces**, and **runoff**

Phosphorus, **nitrogen**, and **mercury** leaching into spring sheds, the Everglades, and other water bodies

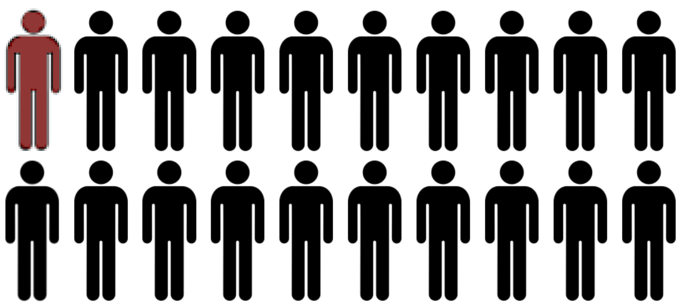
Groundwater quality would be affected in both the short-term and long-term

Sources: CATO Institute, EPA, ELPC, Florida Atlantic University, International Journal of Environmental Research, Transport Research Centre, University of Washington, WHO

Health Risks

Potential health risks to those that use unsophisticated water treatment plants and domestic wells

90% of Floridians get their drinking water from aquifers



900,000 people potentially lose access to domestic wells

1/20 Floridians affected by aquifer contamination

Nitrates & Phosphates

- Excess nitrates in drinking water **depletes blood oxygen levels**, **enlarges the thyroid gland**, and increases risk of **15 cancers**
- Excess phosphates can cause **kidney damage** and **osteoporosis**

Heavy Metals

- Higher levels of heavy metals are associated with **toxicity**, liver, kidney, and intestinal damage, **anemia**, and **cancer**
- Alkali metals increase risk of **chronic congestive heart failure** in adults and **kidney immaturity** in children

Groundwater Decline

- Groundwater drawdown not only decreases the quantity of potable water available but **increases pollutant concentration**
- Pumping at a lower water table increases risk of **saltwater intrusion**

Without water supply, Floridians won't have access to safe water

Sources: St. Johns River Water Management District, Minnesota Department of Health, Lenntech, HHS Public Access, WHO, USGS

Current Economic Issues

Problems associated with Florida's water under current circumstances

	Issue	Takeaways
Water Treatment	Florida needs to invest between **$18.4 - $29.4 billion** in water treatment projects over the next 20 years **7.5 million** Floridians received water from utilities that violated standards	High pollutant concentration requires **more advanced** water treatment plants
Drinking Water	Florida needs to invest a total of **$21.9 billion** into potable water over the next 20 years Florida's daily water demand is expected to increase by **20%** over the next 10 years	**Population growth** exacerbates existing water issues
Shortages	Numerous counties face **scarce water availability** due to dry seasons Florida has reached the **aquifer extraction limit** in the south	An already **over-tapped water infrastructure** should not be stressed more due to M-CORES

Sources: ASCE , JEA, FDEP, Congress Research Service, Surfrider, NY Times, EPA, My Sun Coast, Tampa Bay Times

Carbon Emissions from Development

New Toll roads will increase carbon emissions through construction, increase in traffic, and industrial GDP growth

Correlation between GDP Growth and Carbon Emissions

As industrial GDP grows, industries which utilize fossil fuels increase production, leading to a rise in carbon emissions

M-CORES Specific Issues

1	**Manufacturing Growth**	M-CORES **may** encourage manufacturing growth due to transportation cost decline leading to increased carbon
2	**Increase in Traffic**	Construction and new traffic will **add ~1 and ~20 million tons of CO_2 emissions** respectively by 2070
3	**Less Service Industry**	Introduction of new industries with M-CORES may change current economic service-oriented landscape

Numerical Relationship

With all the factors that cause GDP growth to effect carbon emissions, a 1% increase in GDP leads to a .93% increase in CO_2 emissions in industrial GDP, a nearly direct correlation

1: .93 ratio

Sources: ESPR, EDF, NCBI

Economic Impact

Economic Research

Research on highway development impact on the economy have shown both positive and negative economic consequences

Diminishing Returns

The economic returns resulting from highway construction are **positive, yet diminishing**, going from an AROR of 55% in the 50s to **13%** in the 90s

Highway construction today is **not worth the cost**

Manufacturing Increase

Highway construction spurs increases in manufacturing, however almost all **other industries suffer,** and **carbon emissions increase** along with sprawl

Manufacturing growth harms other industries and the **environment**

Beneficial in Unconnected Areas

Highway construction can **stimulate industrial growth** in connected counties with private industrial investment, yet this is only shown in **less built-out areas**

New Highways can **benefit an economy** currently lacking extensive infrastructure

Developing highways today is too costly for the societal return to make sense

Sources: FHWA, RAND

Comparable Case Study

North Carolina reveals meaningful takeaways regarding the effectiveness of infrastructure projects

The "Good Roads State"

- 1920-60s, NC built 78,000 miles of highway to connect every county
- Government proposed it would support rural economic growth

A Research Approach

- Univ. of North Carolina Urban Planners assessed the state policy
- Used literature evidence to guide guide empirical study

Key Metrics

- Employed market size, urbanization, business cycles, and transportation accessibility and more metrics
- Extracted and compared county level data between 1970-2000

Research Takeaways

1/ "Highway density is **negatively correlated** with rural employment growth"

2/ Increasing highway mileage **does not directly correlate** to economic growth

The Issue with Highways

Highways disconnect rural communities from existing urbanized economic systems

Increasing highway density threatens the rural lifestyle by encouraging urbanization

Encouraging smart growth in rural regions can lead to greater economic growth than highways

Source: University of North Carolina

Alternative Investment

Investing into highway infrastructure will be an inefficient use of taxpayer dollars

M-CORES Claims	Proposed Benefits	Drawbacks
Support industrial/manufacturing economies	▪ Highways reduces industrial transportation costs ▪ $1b in infrastructure reduces business costs by $180,000	▪ Industrial sector only accounts for 15% of the region's GDP ▪ The tertiary sector accounts for 70% of the region's GDP
Provide construction employment	▪ Highway construction will provide temporary employment ▪ $1.7 billion directly produces 13,400 jobs	▪ These temporary jobs will have minimal impact on GDP ▪ Most job growth will come from indirect/ induced employment such as suppliers

M-CORES Economic Takeaways Development

- Existing mature highways mean new infrastructure will have **low impact**
- Rural geographies with industrial type industries produce **minimal economic value**
- Investing in M-CORES will yield low benefits

Telecommunications investment has a higher cost benefit ratio than M-CORES

Source: Department of Transportation and University of North Carolina

Broadband Investment

Broadband Deployment Overview

The government can impact the economics of the area by deploying broadband in underserved areas without jointly doing a highway construction project.

Situation

M-CORES proposes that a highway development project will benefit underserved rural areas by providing access to broadband

Objective

Determine if there is a more efficient way to connect underserved M-CORES areas to broadband independently of road development

1. Determine best method to deploy broadband: aerial versus underground installation
2. Identify the economic costs and benefits of deploying broadband without road development

Our framework

- Identify M-CORES counties <70% with access to broadband
- Estimate installation cost/mile using data from comparable construction projects for aerial and underground fiber optic cable
- Assume government only bears construction cost and estimate total fiber optic cable installation cost for each county
- Estimate proposed increase in GDP growth rate after broadband deployment using data from comparable Florida counties

We found total costs to be ~$160 million and benefits to be $1.6B in GDP growth across three years

Cornell Consulting

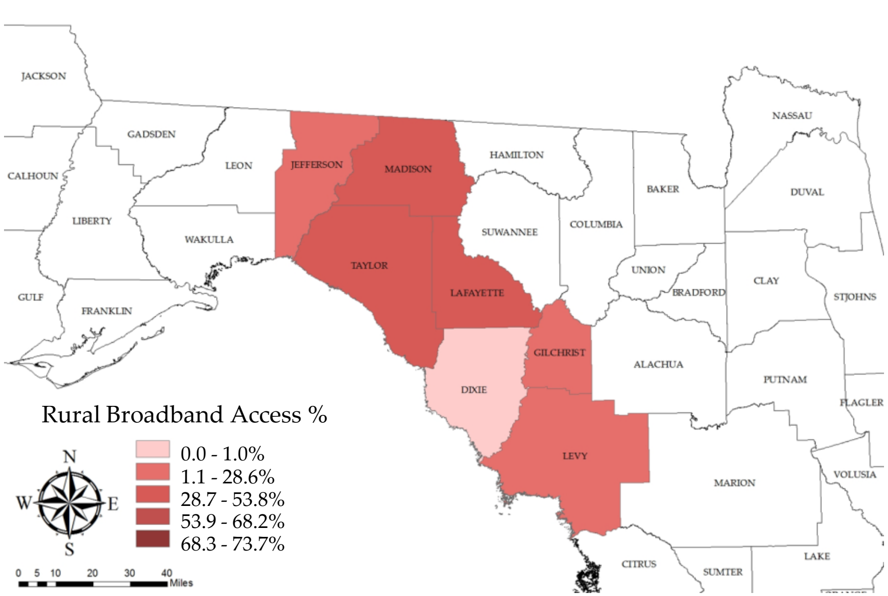
Primary Target Counties

We focused on M-CORES counties of <70% population with broadband access.

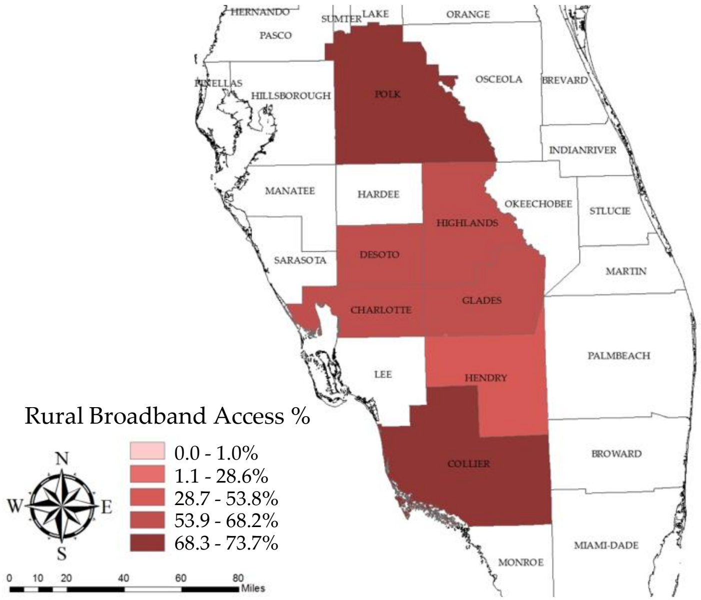
Methodology

1. Determined percentage of county population without fixed 25 Mbps/3 Mbps
2. Analyzed difference between Broadband Access % in Rural versus Urban areas

Suncoast Identified Counties



Southwest-Central Identified Counties



Rural populations have far less broadband access

Source: Federal Communications Commission

Aerial vs. Underground Fiber Optic Cable Installation

Aerial fiber optic cable installation is approximately cheaper by $3,350 per mile and less environmentally detrimental than underground installation.

Methodology

Determined installation costs using estimates from US-wide broadband study. Assumed presence of existing conduit and overlash from electricity lines and previous DSL/cable installations.

Aerial

Rural aerial overlash cost per mile

$12,190

Consequences

Birds can collide with aerial lines

Negative visual effects on the landscape

Underground

Rural underground construction cost per mile given existing conduit

$15,547

Consequences

Wetlands can suffer irreparable harm

Beetles, amphibians and seed plants are especially affected

Sensitive water flow areas will be hurt

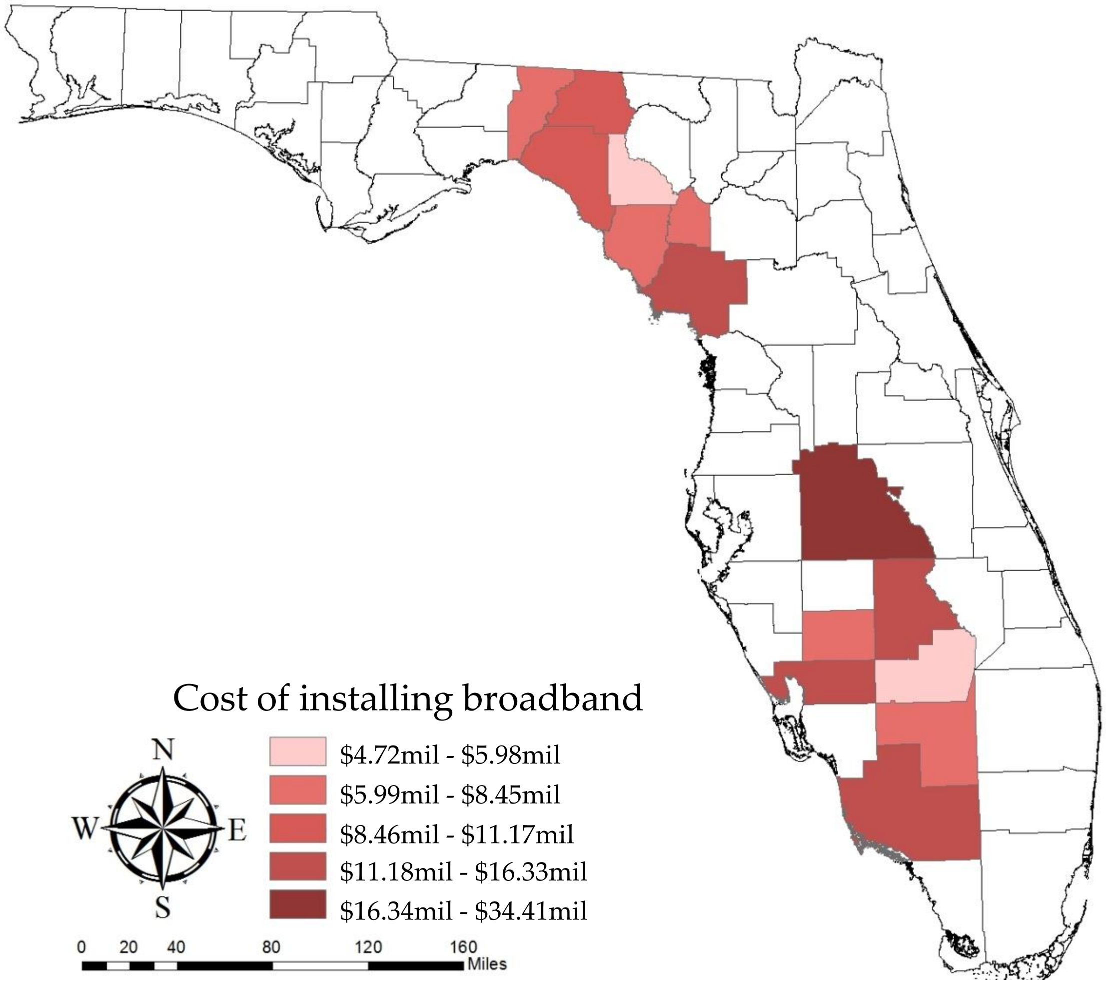
Soil compaction can hurt biodiversity

Aerial fiber optic cable installation is the best method to deploy broadband to underserved M-CORES counties

Sources: CTC Technology and Energy Consulting, Renewable Grids Initiative
*Based on cost and population density data from Alabama, Florida, and North Carolina, relationship between population density and installation cost determined to be unclear. gathered

Average Cost of Broadband Implementation

We created a heatmap displaying a mid estimate of ~160 million to install broadband in identified underserved broadband M-CORES counties.



Findings

We calculated a cost estimate for installing broadband in currently underserved populations.

We found a lower estimate of **~$110,663,350** for installing broadband aerial in rural areas and an upper estimate of **~$209,336,043** for deploying broadband across all county areas.

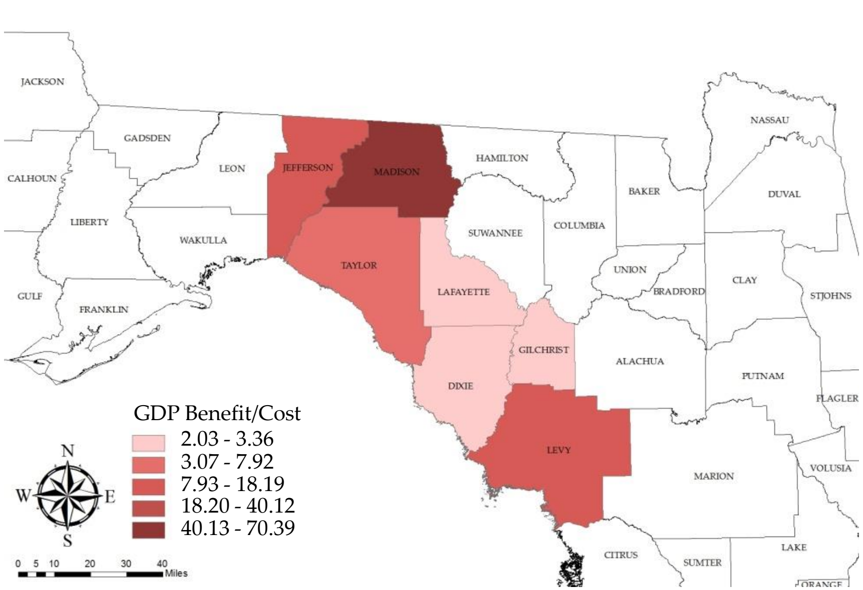
Benefit/Cost of Broadband Implementation

Aerial fiber optic installation is highly beneficial in all target counties in which it is deployed

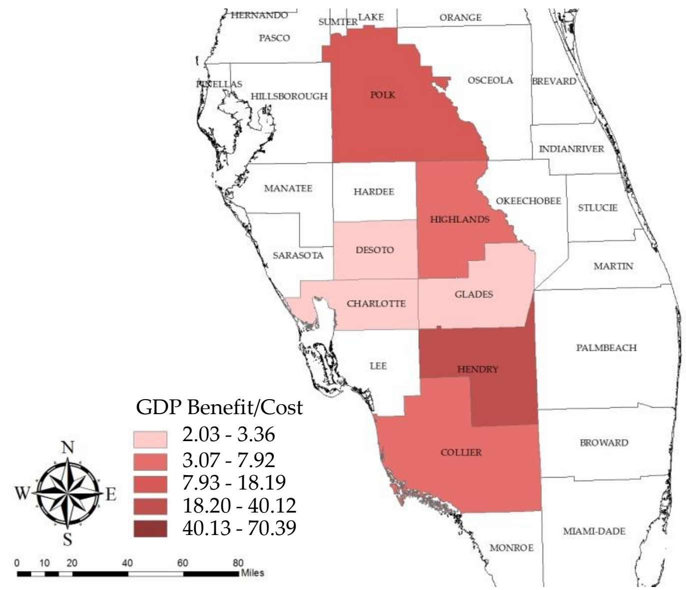
19:1 benefit/cost ratio total for identified counties

1. Measured economic benefit as difference in GDP before and after broadband implementation
2. Assumed 1% additive increase in GDP growth rate (Lake County, FL as a case study had 3%)[1]
3. Calculated change in GDP before and after broadband, compounded over 3 years
4. Found overall equation of Benefit Across 3 Years/Avg Cost = 1942.1*(% increase in GDP) - 0.3125

Suncoast Connector Target Counties



SW Central Connector Target Counties



The total benefit would $+1.6B across all identified counties over three years

Source: [1]Review of Urban & Regional Development Studies, Vol. 17, No. 3, pp. 219-229, 2005

Questions

Agenda

Overview
A walkthrough of M-CORES and our key areas of study

Triple-Bottom Line Impact
Assessment of M-CORES's fiscal, environmental, and socioeconomic impact

Hurricane Evacuation and Traffic Congestion
In-depth analysis of effect on evacuation and traffic measures and best practices

Conclusion
A recap of the key findings of the study

Issues with M-CORES

M-CORES's current proposal will exacerbate the problem it seeks to resolve due to latent demand

M-CORES Proposal

Two of the main goals of the M-CORES proposal are:

Congestion mitigation

Hurricane Evacuation

Latent Demand

The well-documented concept of latent demand is the reason **new capacity cannot reduce congestion**. With the availability of more roads, more people instinctively decide to utilize them over previously preferred methods of transportation, thinking that there will be less traffic.

More roads → **Overutilization** → **Increased traffic**

Case Studies on Latent Demand

Case studies of road additions from different locations and setups all demonstrate latent demand.

Road Addition	Takeaway
Six randomly selected road additions in UK	**~26% uplift** in traffic compared to nearby existing road
Expansion of Houston's Katy Freeway to 26 lanes	**~55% increase in travel times** during evening commute from 2011-2014
Addition of northbound carpool lane to LA's 405 Freeway	Slight **increase in travel times** for those going northbound during rush hour
Addition of Sydney Harbor Tunnel	**38% increase in traffic** in three years despite only 4% population growth

Latent demand is a universal occurrence, indicating how increased capacity cannot reduce congestion.

Sources: UCLA, University of Toronto, Campaign to Protect Rural England

Traffic Congestion Alleviation

Daily Traffic Congestion Solutions

The government should place more emphasis on developing sustainable methods of transportation

The Problem

Residents experience **daily traffic congestion** and will continue to do so unless there is a meaningful push to change traffic patterns and habits.

Our Solutions

Virtuous Methods

- **Manage traffic lights** to prioritize bus lanes by synchronizing light phases to bus schedules
- Provide benefits to employers to **organize carpools**
- **Specify travel time** for large delivery trucks to reduce congestion
- Place emphasis on **cycling, bus services, and public infrastructure**

Improve Public Infrastructure

- **Promote public and non-motorized transport** through increased amount of buses and bus stops
- **Augment cycling infrastructure** by adding bike lanes to public and highly frequented areas
- **Invest in contactless ticket purchase and multi-door boarding**

Daily Traffic Congestion Solutions (continued)

A final strategy to alleviate traffic congestion utilizes tolls on existing roads to limit use of certain roads

Misconception

Increasing road capacity will reduce congestion. This **assumes demand is constant.**

Cities add or widen roads, which leads to more congestion because **more people choose to use the new road.**

Research

Latent demand is the culprit of new capacity failing to decrease congestion.

Increasing road capacity decreases time costs of driving and **makes usage more attractive** in the short term and leads to long-term congestion.

Pricing

Monetary costs (time costs) can be added to balance demand and capacity. While this will not be the most popular option among residents, **pricing is the most effective.**

Utilizing Tolls to Limit Traffic

Adding tolls to existing roads imposes monetary cost on commuter that wants to save time and avoiding congestion.

This would reduce demand as **not everyone is willing to pay**. Once demand is reduced, usage will decrease, as will congestion.

Hurricane Evacuation Strategy

Effective Fuel Distribution

Optimal fuel distribution techniques, such as one with a vaccine analogue, will reduce the amount of fuel-shortage related congestion issues

Problem

Fuel Distribution Bottleneck → **Unnecessary Congestion**

"We have a lot of fuel in Florida — it's just we have **limited capacity to bring it from the port to the gas stations** because you can only have so many trucks at one time doing that."

-Florida Gov. Ron DeSantis during Hurricane Dorian

- Long lines at gas stations
- Vehicles stranded on highways holding up traffic
- Unnecessary time spent searching for gas station with available fuel

Vaccine Analogue to Fuel Distribution

Sick Individuals	Gas stations with fuel shortages
Disease Spread	Gas stations near stations with fuel shortages are more likely to run out of gas
Modeling	Models that predict optimal refueling strategies

Our Recommendations

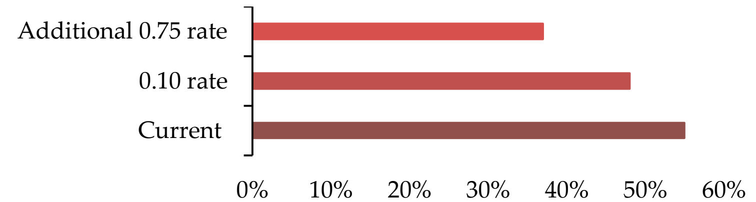
Revising fuel distribution strategy with a vaccine-analogue driven technique.

Cost effective

Easy to implement

Reduces fuel shortages

Impact of Analogue (Naples-Fort Myers)



During Hurricane Irma, refueling rate of 0.1 per capita using vaccine analogue would **reduce peak fuel shortage from 55% to 48%**. Additional refueling rate of 0.75 for half day would **further reduce shortage to 37%.**

Source: NIH, Politico

Efficient Usage of Roads

Investing in road manipulations such as contraflows will result in faster evacuation times and less congestion

Case Studies

	New Orleans	Baton Rouge
Initial Problem	Configuration of contraflow initiation	Bottleneck from freeway merge points
Proposed Solution	Moved contraflow initiation point upstream and add 2 loading points	Contraflow of ~100 miles from Louisiana into Mississippi
Impact	Increased outbound volume by 30,000 over 12-hour period	Evacuation lasted 1/2 of assumed 72-hour timeline

Key Insights

Optimal placement

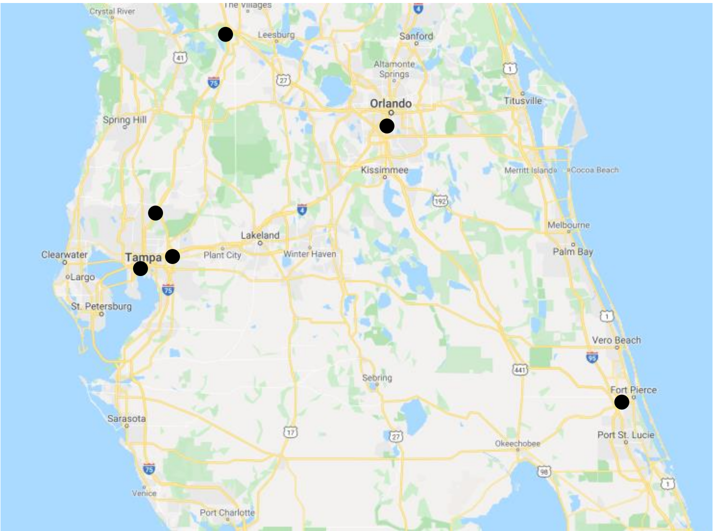
Contraflows should only be implemented in historically **high-volume areas** during evacuation. It is important to consider the emergency vehicles that still need to travel in opposite direction.

Initiation points

Efficiency of contraflow is highly dependent on where and how many **initiation and loading points** exist. It is important to continuously reevaluate where these points are located.

Our Recommendations

Adding a contraflow operation on **Florida Turnpike** from SR70 to north of Osceola Parkway, **I-75** from I-275 to Wildwood, **I-4** from the I-275 interchange to I-75 east of Tampa



- Location of contraflows drawn from analysis conducted by Atkins North America on identifying which routes might warrant contraflow operations during evacuation
- Projected to **increase capacity by 14,000-17,000** vehicles per hour on these roads

Source: National Academy of Engineering, Atkins North America (formerly known as PBS&J)

Public Awareness Campaign for Emergency Preparedness

It is important to invest in a public education campaign to inform the general population about optimal evacuation strategies

Methods

Virtual

- **Printed information**: fact sheets, newsletters, bulletins distributed to public venues
- **Informative website**: overcome literary concerns through audiovisual medium
- **Information hotline**: overcome internet access issues
- **Social media**: advertisements on multiple platforms

In-Person

- **Public meetings**: limited in size but could provide various stakeholders with valuable insights to disseminate further, requires coordination and funds that could be supplied by state government
- **Community engagement**: Informing people in schools and community centers

Impact

- **Disseminating information** 2-3 days prior to an expected emergency, as well as continuously throughout year
- **Encouraging shorter distance** evacuation by **issuing evacuation orders** with specific times and resources
- **Promoting nighttime evacuation** when possible
- **Projected cost of $5.3 million dollars** is far cheaper than M-CORES

Source: Cornell Consulting Projection (See Appendix for $5.3 million costing model)

Proposed Alternatives to M-CORES

There are cheaper, more effective ways to mitigate congestion and streamline hurricane evacuation than M-CORES proposes

Daily Traffic Congestion

Utilizing **virtuous methods** such as traffic light management and truck travel times will encourage more people to use public transportation

Improving **public transportation infrastructure** and adding more bike lanes will also motivate people to drive less

While unpopular, **tolls** are highly effective at reducing traffic congestion and should be used strategically

Hurricane Evacuation

Using a vaccination analogue strategy to **reduce fuel shortages** will lower the amount of congestion during an evacuation

Contraflows have been effectively utilized on high density roads to create evacuation procedures that are as efficient as possible

Educating the public and having **clear communication channels** allows for better planned evacuations 2-3 days before the anticipated event

Due to latent demand, constructing a large highway as proposed by M-CORES will not resolve these two issues

Agenda

Overview
A walkthrough of M-CORES and our key areas of study

Triple-Bottom Line Impact
Assessment of M-CORES's fiscal, environmental, and socioeconomic impact

Hurricane Evacuation and Traffic Congestion
In-depth analysis of effect on evacuation and traffic measures and best practices

Conclusion
A recap of the key findings of the study

Cost-Benefit Analysis

The cost of M-CORES exceeds it potential benefits while alternatives independent of road construction are a superior option

M-CORES Goal Areas

Hurricane Evacuation **Traffic** **Broadband** **Environment**

M-CORES

Costs

Development

$10.3 Billion highway construction costs

Water Infrastructure

$21.9 billion investment currently required for potable water and **$18.4 - $29.4 billion** for water quality infrastructure. These costs could be **exacerbated by domestic well contamination**, requiring **hundreds of millions** in additional capital costs and yearly operating costs.

Outcomes

Increased evacuation times

Increased traffic

Environmentally harmful, cost inefficient, and overall unclear economic impact

21.08 million tons of CO_2 emissions and **900,000** people could lose access to domestic wells

Alternatives

Costs

Broadband

$160 million construction cost for aerial broadband

Hurricane Evacuation

$5.3 million to inform public of evacuation strategies

Total Costs

$165.3 million to deploy broadband and implement better hurricane evacuation

Outcomes

Decreased evacuation times

Decreased traffic

$1.6 billion benefit at 19:1 Benefit/Cost Ratio

Fewer cars on the road and environmentally friendly broadband implementation

While M-CORES is infeasible and creates negative returns—failing to meet its goals—alternative strategies could achieve success

Source: Cornell Consulting

Questions

Appendix

Highway Comparison Methodology

Through an analysis of several key factors, we can properly compare past highway projects with proposed ones

Highway Scores are out of 5 possible points	Suncoast Score	Northern Turnpike Score	Southwest-Central Score
Suncoast Parkway 2 P1			
Wekiva Parkway			
Southeast Extension (NC)			
Florida Turnpike			
Florida I-4			
Richmond Connector (VA)			
Florida SR 417			
Florida I-275			
Florida I-595			

Based on comparisons, several past projects can be used as examples against future construction

Toll Comparison Methodology

Through an analysis of several key factors, we can properly compare past tollway projects with proposed ones

Scores are out of 5 possible points	Suncoast Score	Northern Turnpike Score	Southwest-Central Score
I-75 (Everglades Pkwy)			
Florida's Turnpike			
SR 408			
SR 417			
SR 429			
SR 528			
SR 570 (Polk Pkwy)			
SR 589 (Suncoast Pkwy)			

Based on comparisons, several past projects can be used as examples against future construction

Highway Comparison Raw Data

Project	Build Year	Cost in MM (2020 $$)	Miles	Cost/Mile	Suncoast Connector Similarity Score 0-5 (Low-High)	Northern Turnpike Connector Similarity Score 0-5 (Low-High)	Southwest-Central Florida Connector Similarity Score 0-5 (Low-High)
Suncoast Parkway 2 Phase 1 – Cost Example	Expected completion 2022	134	13	10.3	3	2	3
Wekiva Parkway – Cost Example	Expected completion 2022	1740	25	69.6	2	3	1
Southeast Extension in NC	Expected completion 2023	2200	29	75.9	1	2	1
Florida Turnpike	1957	3900	265	14.7	3	2	3
Florida I-4	1959	4,125	264.666	15.6	2	2	3
Richmond & Petersberg Connector VA	1988	762.826	35	21.8	2	1	2
SR 417	1988	1,243	54	23.0	1	3	2
I-275	1973	774	61	12.7	2	3	2
I-595	1989	2564	13	197.2	0	2	0

Cornell Consulting

SunCoast Overview (Best Case)

Trial 1 — **SunCoast** — 15 Year PayBack $ (5,963,589,478)

	Total	Year 1 12/31/2020	Year 5 6/30/2025	Year 10 6/30/2030	Year 15 6/30/2035	Year 20 6/30/2040	Year 25 6/30/2045	Year 30 6/30/2050	Year 35 6/30/2055	Year 40 6/30/2060
Construction Costs	$ 6,961,730,701	$ 2,852,783,407	$ 3,521,954,824	$ 586,992,471	$ -	$ -	$ -	$ -	$ -	
Net Revenue		$ -	$ -	$ 349,240,955	$ 506,884,334	$ 602,759,812	$ 688,621,208	$ 785,308,101	$ 894,632,844	
Operating Expenses		$ -	$ -	$ 68,478,754	$ 99,389,281	$ 118,188,432	$ 135,024,033	$ 153,982,285	$ 175,418,551	
EBITDA		$ -	$ -	$ 280,762,201	$ 407,495,052	$ 484,571,380	$ 553,597,174	$ 631,325,816	$ 719,214,292	
Cashflows	$ (6,961,730,701)	$ (2,852,783,407)	$ (3,521,954,824)	$ (306,230,270)	$ 407,495,052	$ 484,571,380	$ 553,597,174	$ 631,325,816	$ 719,214,292	
Carbon Tonnes	$ 581,492	$ 177,920	$ 305,006	$ 56,896	$ 6,992	$ 6,655	$ 6,199	$ 5,844	$ 5,556	
Carbon Expense	$ 29,074,613	$ 8,896,003	$ 15,250,290	$ 2,844,813	$ 349,603	$ 332,747	$ 309,932	$ 292,222	$ 277,801	
Environmental Cashflows		$ (2,861,679,410)	$ (3,537,205,114)	$ (309,075,083)	$ 407,145,450	$ 484,238,633	$ 553,287,243	$ 631,033,594	$ 718,936,492	

Northern Turnpike Overview (Best Case)

Trial 1	NorthernTurnpike				15 Year PayBack	$ (1,845,470,201)			
	Year 1 12/31/2020	Year 5 6/30/2025	Year 10 6/30/2030	Year 15 6/30/2035	Year 20 6/30/2040	Year 25 6/30/2045	Year 30 6/30/2050	Year 35 6/30/2055	Year 40 6/30/2060
	Total								
Construction Costs	$ 2,585,089,211	$ 1,534,239,938	$ 1,050,849,273	$ -	$ -	$ -	$ -	$ -	$ -
Net Revenue		$ -	$ 139,634,384	$ 323,253,798	$ 394,408,786	$ 454,248,515	$ 518,711,767	$ 591,542,271	$ 673,892,378
Operating Expenses		$ -	$ 27,379,345	$ 63,383,223	$ 77,335,209	$ 89,068,512	$ 101,708,391	$ 115,988,910	$ 132,136,022
EBITDA		$ -	$ 112,255,039	$ 259,870,575	$ 317,073,577	$ 365,180,002	$ 417,003,376	$ 475,553,361	$ 541,756,357
Cashflows	$ (2,585,089,211)	$ (1,534,239,938)	$ (938,594,234)	$ 259,870,575	$ 317,073,577	$ 365,180,002	$ 417,003,376	$ 475,553,361	$ 541,756,357
Carbon Tonnes	$ 542,618	$ 274,967	$ 238,123	$ 4,562	$ 4,309	$ 3,966	$ 3,692	$ 3,481	$ 3,309
Carbon Expense	$ 27,130,907	$ 13,748,368	$ 11,906,156	$ 228,100	$ 215,437	$ 198,293	$ 184,601	$ 174,052	$ 165,463
Environmental Cashflows		$ (1,547,988,306)	$ (950,500,390)	$ 259,642,475	$ 316,858,140	$ 364,981,709	$ 416,818,776	$ 475,379,309	$ 541,590,894

Cornell Consulting

Southwest-Central Overview (Best Case)

Trial 1 **SouthwestCentral** 15 Year PayBack $ (3,833,973,504)

	Year 1 12/31/2020	Year 5 6/30/2025	Year 10 6/30/2030	Year 15 6/30/2035	Year 20 6/30/2040	Year 25 6/30/2045	Year 30 6/30/2050	Year 35 6/30/2055	Year 40 6/30/2060
	Total								
Construction Costs	$ 5,276,964,680	$ 2,162,398,680	$ 2,669,628,000	$ 444,938,000	$ -	$ -	$ -	$ -	$ -
Net Revenue		$ -	$ -	$ 527,318,469	$ 764,102,810	$ 902,780,784	$ 1,031,259,033	$ 1,176,054,504	$ 1,339,776,050
Operating Expenses		$ -	$ -	$ 103,395,983	$ 149,824,377	$ 177,016,190	$ 202,208,053	$ 230,599,378	$ 262,701,705
EBITDA		$ -	$ -	$ 423,922,486	$ 614,278,434	$ 725,764,594	$ 829,050,980	$ 945,455,126	$ 1,077,074,344
Cashflows	$ (5,276,964,680)	$ (2,162,398,680)	$ (2,669,628,000)	$ (21,015,514)	$ 614,278,434	$ 725,764,594	$ 829,050,980	$ 945,455,126	$ 1,077,074,344
Carbon Tonnes	$ 596,901	$ 177,920	$ 305,006	$ 58,902	$ 9,293	$ 8,786	$ 8,183	$ 7,715	$ 7,334
Carbon Expense	$ 29,845,029	$ 8,896,003	$ 15,250,290	$ 2,945,101	$ 464,670	$ 439,313	$ 409,138	$ 385,759	$ 366,721
Environmental Cashflows		$ (2,171,294,683)	$ (2,684,878,290)	$ (23,960,615)	$ 613,813,764	$ 725,325,281	$ 828,641,842	$ 945,069,366	$ 1,076,707,623

Cornell Consulting

Government Funding

Fdot Cash Funding Sources for the Project https://www.flsenate.gov/Committees/billsummaries/2019/html/2065

All in Millions

Year	STTF	GR	Small Roads	Total Exc. Workforce	Total Before/After Fiscal 2022-2023	Construction Workforce Development
2019	45	83.9	30	158.9		2.5
2020	90	40.12	30	160.12		2.5
2021	132.5		30	162.5	**481.52**	2.5
2022	135		30	165		Excluded due to not in construction costs
2023	135		30	165		
2024	135		30	165		
2025	135		30	165		
2026	135		30	165		
2027	135		30	165		
2028	135		30	165		
2029	135		30	165		
2030	135		30	165	**1215**	
Total:					**1696.52**	

https://www.flsenate.gov/Committees/billsummaries/2019/html/2065

Funding to each road

We will assume this funding will be split proportionally to the cost of the projects.

	Before 2022 M	After 2022 M	Total Cost B	Total Funding
Suncoast Connector	232.2	586.0	4995.0	818.2
Northern Turnpike Connector	93.7	236.5	2016.0	330.2
Southwest-Central Florida Connector	155.6	392.5	3346.0	548.1
Total			10357	

https://www.flsenate.gov/Committees/billsummaries/2019/html/2065

Bonds Payable in Near Future

NOTES TO THE FINANCIAL STATEMENTS ($ amounts presented in thousands (000) unless otherwise noted)
FISCAL YEARS ENDING JUNE 30, 2018 and 2017

As of June 30, 2018, debt service requirements to maturity, including interest at fixed rates, were as follows:

Maturing	Principal	Interest	Total
2019	$ 141,130	$ 113,690	$ 254,820
2020	130,480	106,633	237,113
2021	137,070	100,028	237,098
2022	125,405	93,075	218,480
2023	123,195	86,747	209,942
2024 - 2028	614,805	344,088	958,893
2029 - 2033	522,270	222,244	744,514
2034 - 2038	428,425	108,201	536,626
2039 - 2043	206,380	27,562	233,942
2044 - 2045	25,455	1,404	26,859
Total	$ 2,454,615	$ 1,203,672	$ 3,658,287

Note: The amount of NOI required is 1.2. Fdot should keep this at 1.5 **at the least to remain secure**

https://www.flsenate.gov/Committees/billsummaries/2019/html/2065

Public Awareness Campaign for Emergency Preparedness Cost Estimate

Public Awareness Campaign for Emergency Preparedness Cost Estimate

Expenses		
Personnel		
Public Information Officer	$70,221	
Hotline Assistant	$31,200	
Total Personnel Costs	**$101,421**	
Marketing		
Printing		
- Newsletter	$3,805,654	
- Fact Sheet	$648,246	
- Pamphlets	$388,948	
TV Ads	$102,240	
Social Media		
- Facebook Ads	$37,908	
- Google Ads	$103,140	
Total Marketing	**$5,086,136**	
Telephone Hotline Service	$20,400	
Office Supplies	$104,159	
Total Expenses	**$5,312,116**	

Telephone Hotline	$1,700	per month	
Total Telephone Hotline Cost	**$20,400**	**per year**	
Printing			
Newsletter	4,517	public schools	
	28	community colleges	
	282	city halls	
	6,337,929	households	
Total Distribution	6,342,756	per month	
Total Distribution	**76,113,072**	**per year**	
Newsletter Cost	$0.05	per newsletter	
Total Newsletter Cost	**$3,805,654**		
Fact Sheet	6,337,929	households	
	4,517,000	public schools	1000 copies per school;
	700,000	community colleges	25000 per community college
	1,410,000	city halls	5000 per city hall
Fact Sheet Distribution	**12,964,929**		
Fact Sheet Cost	$0.05	per fact sheet	
Total Fact Sheet Cost	**$648,246**		
Pamphlet Distribution	12,964,929		
Pamphlet Cost	$0.03	per pamphlet	
Total Pamphlet Cost	**388,948**		

A public awareness campaign running for 1 year is likely to cost the state of Florida approximately $5.3 million.