



The Center for
Post Carbon Logistics

Comments on the Transportation Sector of the New York State Climate Action Council Draft Scoping Plan

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Draft Scoping Plan Comments

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- Chapter 2. The Time is Now to Decarbonize Our Economy
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Although these comments refer primarily to the Transportation Sector, we reserve the right to comment, in writing or in person, on the final version of the Scope of Work and any draft and final versions of the New York State Climate Action Plan and other documents, legislation, and regulations pertaining to the Climate Leadership and Community Protection Act of 2019 (CLCPA).

The Center for Post Carbon Logistics (C4PCL) is a New York State non-profit organization that envisions a world of resilient, re-localized communities connected to one another through post carbon transport

and logistics systems.ⁱ The Mission of The Center for Post Carbon Logistics is to research and assist in the implementation of appropriate post carbon maritime technology needed to keep commerce and transportation viable by responding to the interrelated connectivity, communication, equity, economic, ecological, and energy crises of the 21st Century.

Overview of the Scoping Plan and the Transportation Sector:

The C4PCL agrees with and applauds the Council's *Benefits of Adaptation and Resilience* and expects that the comments provided by the informed and engaged public will bolster the Council's resolve to implement policies, programs, and projects to reach and exceed these aspirational goals in the short, mid, and long term.

Adaptation and resilience planning is about protecting people and ecosystems from the changes caused by a changing climate. Individuals, communities, and regions have come to recognize the need to prepare for the risks posed to their quality of life, infrastructure, and physical safety by climate change. These risks are disproportionately high for Disadvantaged Communities. Investment in adaptation and resilience can improve quality of life, stimulate local economies, and protect the environment.

Chapter 2. of the Scoping Plan lays out the impacts of climate change in New York. The C4PCL agrees with the analysis of the impacts of the climate crisis and is willing and able to assist the Council in informing the broadest possible population with the immediacy of the threat and the need to act quickly with the necessary information to effect real change.

New York's geographic and socioeconomic diversity will lead to a wide range of experienced climate driven impacts. Warming trends and incidences of intense heat waves will contribute to greater localized heat stresses; heavy rainfall events that exacerbate localized flooding will continue to impact food production, natural ecosystems, and water resources; and sea-level rise threatens sensitive coastal communities and ecosystems. Climate-driven impacts are magnified when accounting for New York's most vulnerable populations, who are often disproportionately affected and on the front lines of climate change.

The Council has a responsibility to empower individuals and communities in the far-reaching actions required to mitigate and adapt to the negative socio-economic-environmental impacts of climate change. A key component must be a move away from a large-scale, global production/distribution model and toward re-localization – achieving fulfilling and equitable local livelihoods, lived in harmony with home bioregions.

Underpinning this transition is an understanding that the climate crisis requires urgent national, state, regional, and local action now. Without immediate action in New York's transportation sector, an era of far-more-costly, and less available, fossil fuels – marked by disastrous global supply chain interruptions and shortages – looms and is inevitable. We have lost the resilience needed to cope with such system shocks. So immediate adaptation is essential.

Because words have power, The Council, must listen carefully to the thousands of commentators and be prepared to tell a compelling collective story – the vision of what New York in a carbon constrained future might be – not so much in policy and technological terms, but by giving community leaders the information and tools they need to engage their communities, family, friends, neighbors, and colleagues about what a positive path through the climate crisis will entail – to explore an array of innovative heritage and leading-edge technologies by which New Yorkers can thrive in decades ahead – designing and realizing pragmatic, environmentally and economically sound tools for peacefully, equitably, and

intelligently transitioning away from fossil fuels. We must act together, using all our skill, ingenuity and intelligence, our home-grown creativity and cooperation, to unleash the collective genius of local communities, individuals, organizations, supported by the climate action plan, to achieve an abundant, connected, and healthier future for all.

As a species, we are storytellers. And the stories we tell collectively, whether they be found in Gilgamesh, the Bible, folklore, tradition, or government policy all serve as action plans for the time. They tell us what worked well in the past so we might move into a productive future. But sometimes those tales become outdated and the signposts pointing to safety in the past instead lead us down paths into danger.

The tale we've told ourselves over the last 300 years, since the "Age of Reason" and on into the modern Age of Expansion, is that we live in a time of limitless progress, of ever-expanding opportunity and possibility, in which there is a high technological fix for every problem.

In this story, we tell ourselves that unlimited growth and soaring GDP is a real measure of economic health and community wellbeing; that a rising stock market protects us, no matter how rundown our neighborhoods; that deregulation stimulates investment, even as climate destabilizing emissions rise; and that national security need only focus on existential threats beyond our borders, and not on quality of life and preservation of civil liberties.

Today, climate change — along with the socio-environmental and economic upheaval it brings — is turning the idea of endless progress on its head. That's why it is long past time for us to tell a new story: one that recognizes the turbulent sea of change we sail in; a story that recognizes the dangers around us but doesn't demand a fear or grief response. This new story inspires us to prepare together as communities with open eyes, minds, and hearts — ready to face the risks of impending calamity while embracing the promise of resilience and hope of regeneration.

We need to change the narrative now, embrace a new story truer to circumstance — a storyline in which we heroically face adversity together, creating abundance out of crisis together, moving with agility through chaos toward new community values that will sustain us in the unsettled years ahead. The roots of that story are certain: we will thrive only by being earth and community stewards, rather than exploiters; only by demanding that our leaders address not only the economic balance sheet, but also our ecological and equity balance sheets. Only then will we be able to go ahead with hope and find a safe harbor in the climate crisis. Only then can we leave a better world for our children.

1. For the Council to tell this story we must first **Assess and Evaluate:** Start by objectively assessing threats, then unflinchingly evaluate the greatest points of weakness — whether these take the form of infrastructure; social, public health, economic, environmental, or political structures. We need to fortify those weaknesses against the storms to come — work that will enrich our State, cities, towns, and neighborhoods in the present, while reducing risk and enhancing resilience for the future. Unfortunately, the Transportation Sector is tepid in its goals and strategy for finding solutions in a timely way to the unfolding climate crisis in New York. It is time for bold action not "hedging.," because there is generally resistance to change, and The Council and its recommendations have powerful adversaries.

An astroturf¹ organization, New Yorkers for Affordable Energy, a [fossil fuel industry front group](#), retained [SKDKnickerbocker](#), a public relations and lobbying firm with a history of operating similar front groups working to undermine workers' and tenants' rights.

The corporate interests behind New Yorkers for Affordable Energy have already succeeded in [eliminating a proposal](#) from the state budget to ban fossil gas hookups in newly constructed buildings – which was recommended by the Climate Action Council in its draft scoping plan – and are now [promoting misinformation](#) to further weaken New York's agenda as the Climate Action Council reviews comments on its proposed plan.

New Yorkers for Affordable Energy launched a [television ad](#) that seeks to drum up opposition to the proposal through misinformation. The ad claims that the bill would "ban gas stoves and furnaces... sticking you with a \$30,000 price tag to replace them." [Energy Citizens](#) an arm of the [American Petroleum Industry](#) is telling an untruthful but [compelling story](#)..... *Want Albany to choose your appliances? And Don't let the government tell you what kind of appliance you can buy.*"

The first thing that the Council must do to counter this negative propaganda is [clarify the crisis](#) and provide the informed and engaged public with attainable goals for a somewhat softer landing for our children and grandchildren in what is likely to be a chaotic midcentury future. *And hire an equally talented public information/crisis management consultant to counter the incessant and misleading negativity of the New Yorkers for Affordable Energy.*

2. Re-evaluate the use of terms like growth and competitiveness in addressing the Climate Crisis:

The faster we produce and consume goods, the more we damage the environment," Giorgos Kallis, an ecological economist at the Autonomous University of Barcelona, writes in his manifesto, "[Degrowth](#)." "There is no way to both have your cake and eat it, here. If humanity is not to destroy the planet's life support systems, the global economy should slow down."

In "[Growth: From Microorganisms to Megacities](#)," Vaclav Smil, a Czech-Canadian environmental scientist, complains that economists haven't grasped "the synergistic functioning of civilization and the biosphere," yet they "maintain a monopoly on supplying their physically impossible narratives of continuing growth that guide decisions made by national governments and companies."

In the mid-1970s, the phrase "small is beautiful" became a counterculture slogan against the industrial threat to the environment and the scarcity of resources. Arguing against excessive materialism and meaningless growth, the late [Dr. Ernest Friedrich Schumacher](#)—the author of [Small Is Beautiful: Economics as if People Mattered](#),

... promoted the use of small-scale technology to benefit both humankind and the environment. As an economist trained in a market-oriented discipline, his thinking evolved from believing that large-scale technology could be salvation for industrial civilization to believing that large-scale technology is the root of degrading human beings and the environment.

In the Transportation Sector, as well as the entirety of the Scope of work for the Climate Plan, a new way of looking at the economy, culture and environment of New York must be adopted. The idea that growth is necessary skews the plan away from true mitigation and adaptation to the Climate Crisis. The

¹ Astroturfing is the practice of masking the sponsors of a message or organization (e.g., political, advertising, religious or public relations) to make it appear as though it originates from and is supported by grassroots participants.

document also does little to explain the role of public and private transportation policy and implementation decisions made in New York, in conjunction with the federal government, in creating and exacerbating the climate crisis.²

The transportation challenge: We in New York need to think differently about how to move goods and people from place to place in a carbon constrained future because we are living in an age of unprecedented change, with several crises converging. These calamities have been exacerbated by the profligate use of cheap, non-renewable fossil fuels. This “quadruple crunch” of overlapping events, a global financial crisis, pandemics, accelerating climate change, and aberrant fluctuations in energy prices exacerbated by imminent peak oil makes it increasingly clear that this combination of events threaten to develop into a “perfect storm” with devastating economic and environmental consequences for not just the New York but for the country and the world.

New York’s transportation sector contributes almost 30% of carbon emissions. And the seminal questions that should be asked by the Council in this sector is:

- In a carbon constrained future, how will goods and people be moved from place to place, and what role will The Climate Action Plan provide in resources and leadership?
- How should we meet the looming challenges of climate change, rising sea level, aging infrastructure, changes to global shipping and supply chains, threats to food security, and the risks these changes bring to New York’s environmental, cultural, and financial wellbeing?
- How do we address this daunting multitude of challenges and turn them into opportunities for transforming transportation to serve our State far effectively and efficiently into the future?

Summary of Recommendations:

C4PCL’s comments focus on opportunities, adaptation, and mitigation in the Transportation Sector and on solutions that use and enhance New York’s entrepreneurial, commercial, and industrial enterprises, makers, processors, local resources, and by training and employing New Yorkers in a carbon constrained future.

Recommendation 1. Decarbonize Maritime Transportation

Moving goods and people from place to place in a carbon constrained future will be dependent on sailing vessels, hybrid/fossil free electric ships, and people/electric, powered transport for first and last mile logistics.

Recommendation 2. Converting ICE vehicles to EVs/ZEVs/alternative fuels

There is very little disagreement that EVs/ZEVs are the future of the automobile and light truck industry. Over the lifetime of a ZEV the carbon footprint is significantly less than an internal

² The Council on behalf of the State must admit culpability. For the last fifty years the State of New York, the Governors, departments, the legislature, and its [congressional representatives](#) have had ample information, data, and scientific evidence of the impacts of a changing climate on the environment of New York, including but not limited to the impacts of subsidies for road building over rail, urban sprawl, air and water pollution, and squandering of opportunities to mitigate or begin to adapt to the climate crisis that has been exacerbated by transportation policy and actions.

combustion vehicle. One huge problem given short shrift in the Scope is what happens to all those ICE vehicles that get traded in?

Recommendation 3. **Improved and Free Transit**

Tallinn, Estonia made international headlines when it became the first capital city in the world to introduce [free public transport](#) for its residents in 2013.

Recommendation 4. **Demand Responsive Transportation (DRT):**

When it comes to improving public transportation in rural areas—flexibility is key. The first step is to provide an easy and efficient way for more people to access public transportation. On-Demand Public transportation, also known as Demand-Responsive Transportation (DRT) provides a way to increase the geographical coverage of a traditional public transit service.

Recommendation 5. **Electrification of commuter, interstate, and municipal buses**

Close to 90% of commuter intra and interstate buses are diesel powered. Some municipalities are transitioning to hybrid and electric buses, but the Plan should include regulation, incentives, and subsidies for the conversion of all diesel-powered buses.

Recommendation 6. **Electrification and Solarization of freight and passenger trains**

Trains are one of the most efficient and sustainable form of transport. Worldwide around 75% of trains have been electrified, while 25% still use fossil fuels. The bad news is that even electric locomotives use a partially polluting mix

Recommendation 7. **Improved bicycle and E-bike transportation opportunities:**

Although electric bicycles didn't receive much attention during the COP26— [to the chagrin](#) of some sustainability mobility advocates — 2021 was the year they found a more welcoming home around the world. [An analysis by Business Research published in mid-November](#) estimated global e-bike sales at \$36.5 billion for the year, a compound annual growth rate of more than 12 percent over 2020. Within three years, revenue could reach \$53.3 billion, the market research firm predicts.

Recommendation 8. **Airships and electric aircraft**

Airships are relatively inexpensive, they can carry a substantial amount of cargo, and they are significantly more environmentally friendly than their heavier-than-air relatives. Once thought to have passed into memory, airships are having something of a renaissance.

Recommendation 1: Decarbonize Maritime Transportation

Moving goods and people from place to place in a carbon constrained future will be dependent on sailing vessels, hybrid/fossil free electric ships, and people/electric, powered transport for first and last mile logistics.

Despite its present dominance, our current maritime logistics system is fragile. It is reliant upon carbon-based fuels driving internal combustion engines. It is interwoven into long-distance, globalized world trade. It is designed for [Just-In-Time delivery](#). And it depends upon its present ability to avoid paying for [negative externalities](#) such as carbon emissions and environmental pollution, and to avoid being governed by meaningful labor, environmental, health, and other laws.

The international shipping industry is [one of the largest greenhouse gas emitters](#). If the maritime sector were a country, it would be one of the top six carbon polluters. The shipping industry has been reluctant to take unilateral leadership on emissions. [The International Maritime Organization](#) (IMO) is puttering around the edges. It recently declined to make a greenhouse gas reduction plan or commitment. The United States for a variety of reasons, chief among them that there is a [tiny US flag fleet](#), has remained almost silent on this issue.

The [Center for Post Carbon Logistics](#) (C4PCL), along with a local, regional, and international coalition posit an alternative. *That alternative is disruptive competition from an emerging suite of technologies – solar, wind/sail, and [green hydrogen](#) powered shipping on New York waterways.* Water-borne shipping, even now, is dramatically more energy-efficient than its land-based counterpart. New York, with its network of waterways connecting the Great Lakes to the Hudson, to New York Harbor, and the ocean, has a leadership opportunity in growing this industry.

Achieving New York State's [Climate Act's](#) goals will require addressing the enormous footprint of transporting goods and people using fossil fuels. Building Future Proof ships in New York's Hudson River shipyards is the first step toward a regenerative shipping industry on New York's canals, the Hudson River, The Harbor, the East Coast, Caribbean, and transatlantic routes.

New York's Waterways:

What role will New York's waterways play a carbon constrained future? How should we meet the looming challenges of climate change, rising sea level, aging infrastructure, changes to global shipping patterns, threats to food security, and the risks these changes bring to New York?

The [USDOT Maritime Administration](#) (MARAD) [America's Marine Highway](#) Program was created by Congress in 2007 and expanded in 2012 and 2016. Marine Highways are water-based freight corridors. For example, M-87 includes the Hudson River and connects ports and harbors from New York City to Albany and navigation channels such as the Erie Canal. The MARAD program was created to expand the use of the country's navigable waterways to relieve landside congestion, reduce air emissions, and provide new transportation options to increase the efficiency of the surface transportation system. MARAD administers a grant program to fund system improvements. New York is served by Marine Highways M-87, M-90, M-95, and M-295.

The Hudson River, a Water Highway

Not so long ago the Hudson River was a bustling highway linking even the smallest communities to a web of regularly scheduled commercial routes. Schooners, sloops, barges, and (much later) steamboats provided a unique way of life for early river town inhabitants. Farmers, merchants, quarrymen, brick factories, and oystermen relied on this vibrant and diverse fleet of vessels to bring in supplies and deliver their goods to market. This arm-of-the-sea was an integral part of the lives of those who worked New York's waterways.

However, life at the water's edge is rapidly changing. The impacts of new technology, patterns of urban development, and globalization are redefining global logistics, and while some waterfront cities will thrive as ports and grow under these new conditions, others will need to evolve to survive and succeed.... [How will New York re-invent its maritime transportation sector?](#)

How do we address this daunting multitude of challenges and turn them into opportunities for transforming our waterways and ports to serve our regional and national economy effectively and efficiently into the future?

- If present trends continue, New York and its largest and smallest ports will need to be transformed into the spokes of a hub for "short sea shipping" rather than serving as terminus for [unsustainable container cargo](#). The good news: the New York has an extensive network of waterways, and so is very well suited for the short sea shipping mode of freight transport. [Moreover, public agencies](#) and private companies are investigating the potential economic and environmental benefits of transferring more cargo from road to sea.
- As New York moves forward to low/no carbon shipping and the working waterfronts of tomorrow, the constraints, and in some cases the advantages, of [smaller and \(s\)lower tech](#) modes of transport must be considered to support these imminent changes.
- If the New York's maritime transport and working waterfronts are to thrive, 19th, 20th, and 21st Century technology must meld seamlessly into new, mid-century methods of transport with an emphasis on what might seem like bygone, but productive, methodologies to become more self-sufficient and sustainable.

Priorities, amendments/additions to Transportation Sector:

1. The Council Adopts a Hudson River Green Shipping Corridor:ⁱⁱ

Achieving zero emissions from maritime transportation over the coming years and decades will require research, development, demonstration, and deployment at a massive scale, as well as enabling policies that incentivize the shift to low- and zero-emission fuels and technologies as soon as possible. Adoption of these fuels and technologies, while limited in the short term, will rapidly accelerate once the supply chain is established and governments and the shipping sector signal their intent for energy transition.

- Green shipping corridors are meant to accelerate this early adoption phase. They therefore should strive for emissions reductions that push the envelope beyond business-as-usual, demonstrating a commitment to achieve full decarbonization through sustained efforts. Green shipping corridors will not achieve zero emissions across all aspects of the corridor overnight. Instead, the journey to establish a fully

decarbonized corridor is a series of steps and actions taken over time to cover all aspects of the route.

- One of the first steps in creating a green shipping corridor is to convene relevant stakeholders across the value chain and to outline anticipated timelines, targets, and achievements. Creating a fully decarbonized green shipping corridor is a process, which will require long-term plans to help participants achieve their emissions reduction goals. Stakeholder engagement will be critical, especially with residents in communities with environmental justice concerns, to ensure strategies are tailored to address the priorities and goals of near-port communities. New York State through its Climate Plan establishes the Hudson River, and the New York State Canal System as the nation's first Green Shipping Corridor.

2. The Council/New York DOT Support a MARAD [Marine Highway Project Designation](#) for M-87 Hudson River:

In April 2022 the C4PCL and colleagues³ provided the [NYS DOT](#), with materials for consideration to become the applicant for the Maritime Administration, [Marine Highway project designation](#) for Hudson River based maritime commerce projects. The Department responded after several weeks of deliberations, without explanation, that the project did not qualify. We, adamantly disagree and although the deadline for applications for project designations has passed for this year, we believe that these projects have merit and will continue to pursue them, and specifically ask that this **project designation** is included in the Climate Plan's Transportation Sector.

Why this designation?

The Hudson River properly prides itself in being the cradle of pioneering maritime technology and the birthplace of the environmental movement. It has always been a magnet for innovative thinkers and doers in transportation technology, maritime commerce, engineering, agriculture, business, and artisanship who are inventing new ways of doing business and employing people with a smaller environmental footprint and a passion for equity and inclusion. Our regional post carbon maritime strategy is designed to engage and support the creative economy, broadly defined, and to be disruptive in a positive way.

This collaborative effort extends the entire length of the M-87 Marine Highway⁴ corridor and revolves around, but is not limited to the New York State Canal System, Hudson River, New York Harbor, the US East Coast, and Caribbean.

To highlight the benefits, increase public awareness and promote The Hudson River as a necessary alternative to "landside" shipping and transportation options, a group of maritime professionals and advocates from all around the region propose a series of Marine Highway project designations to:

- Adopt a Hudson River Green Shipping Corridor

³ [The Schooner Apollonia](#), [Eriemax/ShipShares](#), [The Center for Post Carbon Logistics](#), [Sustainable Hudson Valley](#), [RevX](#), and [Solar Sal Boats](#), [Martin, Ottaway, van Hemmen & Doyle, Inc](#),

⁴The M-87 Route is the Hudson River, connecting commercial navigation channels such as the Erie Canal, ports, and harbors from New York City to Albany, NY. It spans eastern New York State. It connects to the M-90 Route at Albany, NY and the M-95 Route at New York City.

- support existing and proposed low/no carbon commercial maritime ventures and post carbon logistics,
- enhance ship building and repair industries,
- the revitalization and resilience of small Hudson River ports,⁵
- and the re/training of shipwrights, longshore and logistics professionals, and mariners. (see 6. The Hudson River Maritime Innovation Center)

In the 19th until the mid-20th centuries, the Hudson River bustled with commerce and lay at the heart of a thriving network of “Marine Byways” — waterways stretching from the Atlantic west to the Great Lakes linking cities and the smallest communities to a web of regularly scheduled transportation routes. For hundreds of years, thousands of ships and boats of all sizes served local cargo and passenger needs. The Hudson River — and the ships and boats sailing her — were vital to those who lived and worked along these inland waters, putting those communities on the map.

Today, however, waterways like the Hudson River, and its small ports are underutilized. Incentivizing shippers to use this critical transportation corridor more consistently would create significant public benefits and opportunities, including but not limited to a lower carbon footprint for the movement of freight and passengers.

This initiative is well along in the process with initial vessels such as the sail cargo [Schooner Apollonia](#), and the Solar Electric CG inspected passenger vessel [Solaris](#) already in service, the Hudson River Maritime Museum’s [Boat School](#) and maritime [history exhibits](#), [sail freight exhibit](#), [sail freight conference](#), and [education projects](#), and major [sailing vessel restoration](#) projects, as well as active commercial, [shipwrights](#), [shipyards](#) and [boat builders](#) throughout the corridor. Within the next 1 – 5 years, it will create and enhance a wide array of public benefits for the people in this strategic corridor. It will:

- create and sustain jobs on New York built vessels, and at ports, and shipyards
- relieve landside congestion in transportation and shipping
- show by practical example, the use of emerging resilient and renewable propulsion technologies
- improve New York’s and the US economic competitiveness by adding new cost-effective freight and passenger transportation capacities
- improve environmental sustainability of New York’s and the US transportation system by using less energy and reducing greenhouse gases per passenger or ton-mile of freight moved

Marine Highway Proposal for Project Designation:

Although the M-87, the Hudson River from NY Harbor to the Erie Canal is designated a Marine Highway, until recently with the reinvigoration of sail cargo and solar powered passenger service, there has been underutilization of the river’s small ports. The primary commercial vessels currently transiting the

⁵ MARAD defines a small port as a coastal seaport, Great Lakes, or inland river port to and from which the average annual tonnage of cargo handled during the 3 calendar years immediately preceding the time of application is less than 8,000,000 short tons.

Hudson are petroleum and chemical barges, some ocean-going ships, and tug and barge project cargo going directly from New York Harbor to Albany/Troy, and some seasonal tour and cruise ships.

The proposed Marine Highway project designations will address this limitation as it activates a network of maritime transportation advocates, shipping and agricultural products processing enterprises, “makers” and small manufacturers, first and last mile logistics businesses, ship yards and boat builders, community organizations, municipalities, counties, and The State of New York to revitalize the Hudson’s maritime economy anticipating the challenges and advantages of moving goods and people by water in a carbon-constrained future, and to ensure that this vision is aligned with community, ecological, and equity values and sensibilities; to achieve this goal. The following are the projects that are proposed for designation to make them eligible for funding under the [Maritime Administration, Marine Highway grants program](#).

Proof of Concept:

[The Schooner Apollonia](#) is engaged in commerce under sail on the Hudson River and New York Harbor. Apollonia is a 64-foot steel-hulled schooner built in Baltimore, MD in 1946. She is designed to move efficiently through the water, powered by a traditional gaff-rig sail plan designed by naval architect J Murray Watts. With a 15’ beam and rugged steel construction, she’s a stout work boat capable of carrying 20,000 lbs. of cargo. Being a schooner, the crew requirements are smaller, and the variety of sails gives flexibility for different conditions that we will encounter on the river. Apollonia is the descendant of the Hudson River Sloop and the proof of concept for Jones Act compliant, purpose-built sail cargo vessels designed for River, Harbor, and short sea coastal trade.

- **Hudson River/New York Harbor Sail Cargo Service**

- a. When designated, the project funding will be used to expand the operations of the [Schooner Apollonia](#) and the ports and customer she services. Apollonia is an existing sail cargo business transporting primarily malt, flour, and grain to distilleries and breweries, other agricultural products to processors, and shelf stable local food and beverage products to customers. To continue to develop the route, secure docking, loading, and unloading facilities, warehousing, first and last mile low carbon logistics, secure haul back cargoes, upgrades to existing vessel, and R&D and design a purpose-built ship(s) for this route will require significant public and private investment.
- b. Develop a low carbon logistics system, more of a “warehouse in transit,” than “just in time” model. To implement the “parallel” low/no carbon logistics system, a “post carbon” third party logistics company (PC3PL) will be established. This PC3PL provider is a specialist company that will provide a range of distribution, storage, transport, and fulfillment services to Apollonia, (and to other vessels as the fleet expands) as well as low/no carbon first and last mile logistics companies, producers, purveyors, wholesalers, retailers, and end users. These companies would outsource these types of operations to the PC3PL business and rely on the PC3PL to offer end-to-end management of specific services.ⁱⁱⁱ

- **The expansion of an existing maritime cargo service:**

To meet the emergent climate crisis, and to confront the immense carbon pollution of the existing fossil fueled transport of goods and people throughout New York and the Hudson Valley, a new generation of [“future proof” Liberty from Fossil Fuel Ships](#) will be upgraded, repurposed, and locally built to enable the continued movement of goods and people from place to place by water in a carbon constrained future, and to highlight the benefits, increase public awareness, and promote The Hudson River as a necessary alternative to "landside" shipping and transportation options.

These ships will be brutally simple, but elegant, re-used, re-purposed, and purpose built by local shipwrights to kick start the revival of US flagged ships in domestic, short sea, and international trade. Using proven construction techniques and tried and true (as well as innovative) sail propulsion/electric propulsion technology these “flagships of the future” will be the first steps in adapting to and mitigating the climate crisis, that in significant part is caused by fossil fueled transport.

Locally built, from locally sourced and recycled materials, crewed with locally trained mariners, home ported along the Hudson, the Harbor, and the canals, carrying locally grown, locally processed, and locally manufactured goods – with liberty from fossil fuels, these future proof ships will be a positive disruption to the status quo.

- a. Purpose built vessels for M-87, M-95, and M-90 Marine Highway Service:

- i. Eriemax Sail/Electric Canal, River, and Coastal Cargo and Sail Training Vessel:

1. Develop final design, with upgraded electric propulsion system and rig, and develop shipyard plans for [Transtech Marine/Ship Shares](#)/Eriemax sail electric cargo and training vessel. Using the design and business plan, [Eriemax Progress Report 7 Final Report 25543 Rev2.pdf](#), developed by Naval Architect Geoff Uttmark for NYSERDA,
2. develop final design, building plans, and price of construction at a Hudson Valley Shipyard, for a purpose-built prototype 80’ canal, river, and coastal, sail cargo vessel for a new generation of climate adaptive modular design freighters using the best combination of traditional and new technology. The \$3.5 million (estimated) price for construction could come, in part from the [Federal Ship Financing Program \(Title XI\)](#) and significant public, private, and crowdfunded investment. Concept in Appendix 2.

- ii. R&D, design, and develop shipyard drawings for a purpose built 180-200’ “short sea” and transoceanic “Electric Clipper” sail freight and training vessel with a cargo capacity of up to 900 tons or 36 TEUs. A concept drawing of this vessel is included in appendix 2. The estimated \$7.5 million construction cost could come from the [Federal Ship Financing Program](#)

[\(Title XI\)](#) and significant public, private investment and crowdfunded investment.

- **Hudson River Solar Ferries.** This grant, when designated, will support a comprehensive ferry master plan to develop a new, modern, efficient, solar electric passenger and cargo ferry design for Hudson River transits. The plan will serve as a comprehensive analysis of operations and service needs, and help determine the types, sizes, and number of ferries that are needed in the future. With a regional and national push towards a low carbon economy transition, the Hudson River passenger ferry system can incorporate technologies within the vessels that can benefit the environment, passengers, and the communities the ferries serve. These funds will also be used to develop preliminary designs for these vessels and will make use of the three years of performance data from the operation of the solar electric Coast Guard inspected passenger vessel [Solaris](#). An additional option would be to convert the existing [Beacon/Newburg Ferry](#) to battery electric. This project then could be considered an expansion of existing service.
- **The Marine Byways and Resilient Small Port Toolkit,**^{iv} when designated, will collect, and disseminate (in reports, apps, and interactive websites) new and existing information to enable the revival of small port working waterfronts, and small to medium sized maritime and logistics businesses. This data collection will include but not be limited to review, analysis, and reporting of the findings of government and non-governmental reports and publications, as well as field checking and developing new sources of information.^v Examples already underway, or completed are [GIS port mapping](#) work being done by the Schooner Apollonia and the Center for Post Carbon Logistics with assistance from Vassar College interns,⁶ and GIS [flood mapping](#) work done by Kytt McManus at Columbia, and by Scenic Hudson's [Sea Level Rise Mapper](#).
 - a. **Rondout Riverport 2040/A resilient small port blueprint**
 - i. A paper prepared for a conference in September 2021 for the Wind Propulsion Conference held by the Royal Institute of Naval Architects. The paper was republished in two parts at Resilience.org. [Rondout Riverport 2040 Part 1](#), and [Part 2](#). This report and publication along with other materials can be the basis of planning for resilient small ports throughout New York.

5. Decarbonizing Recreational Boating

In 2018, 2019 there was total of 440,381 boat registrations, of which, **435,213** were registered for recreational purposes in New York. Those, primarily powerboats consist of fossil fueled 2 and 4 stroke outboards and inboard gasoline or diesel engines, many large and small sailboats have auxiliary outboard or inboard gasoline and diesel engines.

- Jet skis and pleasure boats combined accounting for 1.4 billion gallons of gasoline in the US.
- Resins in fiberglass boats, “Dacron” in sails and lines are derived from fossil fuels

⁶ https://docs.google.com/spreadsheets/d/1J8PlvNw8ZvBGocHFcGX_Fj0xmy3gyn1WvveK_cb7OHE/edit#gid=899225407

- Boats release numerous harmful substances into aquatic and marine environments, including nitrogen oxide, particulate matter, carbon monoxide, and non-methane volatile organic compounds (NMVOCs).
- ships and boats in the US produced about 44.5 million tons of carbon dioxide equivalent in 2019

E-boat and electric motor manufacturing opportunities

[Electric powered boats](#), like [electric automobiles](#) were ubiquitous in the early to mid-twentieth century and are seeing a resurgence as [motors, batteries, and solar panels](#) become lighter and more available. There are New York based electric boat and motor manufacturers and with the appropriate incentives, such as expanding the [Green Boat program](#) statewide will provide more employment opportunities and economic development while reducing the carbon footprint of recreational and tourism boating.

- [Solar Sal Boats](#) is a solar electric boatbuilding manufacturer founded by [David Borton](#) a New York based solar boat pioneer. Solar Sal boats was the client for the construction of Solaris, the Hudson River Maritime Museum’s solar electric Coast Guard inspected solar electric passenger vessel.
- [Elco](#) is a electric yacht and motor manufacturer located in New York. “Combining traditional and proven designs with trailblazing motor and control technology, Elco leads the industry in electric propulsion. Elco outboard and inboard electric and hybrid propulsion systems provide quiet and clean power for those water-based activities.”
- [Finger Lake Electric Boat](#) is an electric boat company located in the heart of the Finger lakes of New York. Taking over the production of Adirondack Electric Boat that started in the year 2001 they are continuing the production of Adirondack style electric boats. In addition to building the Adirondack style electric boats we are in the process of adding new electric boat models to the Finger Lakes Electric Boat fleet.
- [Halevai Boats](#) will build renewable energy solutions for the marine industry. We are developing better building materials and methods to build boats. Founded in 2020, Halevai is a new concept boat manufacturer focused on design, reliability and conservation. Our debut craft, the model 2050, was inspired by the goals of the historic COP21 UN climate conference and is the first high performance boat in its category to be fully electric powered.
- Scarano Boat Company [electric powered canal boat replica](#). Scarano Boat designs and builds period wood, aluminum, composite, and steel boats, Coast Guard–certified for public transportation and excursions. Scarano Boat has developed

a national reputation for modern wood construction. Scarano Boat has found a niche in the production of [replica sailing vessels](#), and certified passenger vessels with classic styling and appointments.

Converting Fossil Fueled recreational boats to hybrid/electric

Instead of developing technologies to replace current recreational boating equipment, some vessels can be “retrofitted,” for a more efficient performance.

- For example, in 2015, a small team of researchers successfully converted an 18’ Pursuit 2000 S2 gasoline-powered boat into a hybrid electric boat, or HEB. Specifically, they replaced a nonfunctional Evinrude 225 V6 engine with a battery-powered electric motor.⁷ The new eco-friendly design is intended for use in rivers and lakes, primarily. The deep-cycle batteries can be solar charged and powered by a hydrogen fuel cell unit as a bonus.
- In 2020, another team followed suit, aiming to “[convert] a traditional internal combustion engine-powered leisure boat into an electric propelled type.” This project also focused on battery power, particularly a Battery Energy Storage System (BESS). This reduces fuel consumption and could potentially save boaters money on refueling.⁸

According to the American Boating Association, “Clean boating and other forms of environmental stewardship (or the lack thereof) has the potential to affect a significant portion of the Nation’s economy.”. Electric propulsion can start to put an end to greenhouse gas production.

6. The Hudson River Maritime Innovation Center, a multiyear proposal: Year one, planning and facility(ies) identification) The Maritime Innovation Center will help the region’s maritime industry adopt new, and traditional maritime technologies, stimulate innovative entrepreneurship, promote knowledge transfer, business incubation, and workforce development to address maritime innovation challenges and opportunities.

The Maritime Innovation Center will provide training for the next generation of shipwrights, longshore and logistics professionals, and mariners, sustain maritime industries, and assist the Hudson Valley region’s ports to modernize and become more climate adaptive, enhance post carbon logistic operations, promote green shipbuilding, and provide good jobs in the marine industry, and key lines of businesses, services, and products.

Vision for the Center: The Hudson Valley will be a hub for resilient maritime businesses by creating a system of innovation that drives productive collaboration among non-profit,

⁷ Yildiz, F., Coogler, K. L., & Amador, R. (2015). Conversion of a gasoline powered boat to a hybrid electric boat. *Journal of Engineering Technology*, 32(1), 52-63. <https://www.proquest.com/openview/cfd13c6dbb26ed0fdebc07560b680916/1?pq-origsite=gscholar&cbl=32062>

⁸ Caprara, G., Martirano, L., & Balletta, C. (2020, June). Preliminary analysis of the conversion of a leisure boat into a battery electric vehicle (BEV). *IEEE Xplore*. <https://ieeexplore.ieee.org/abstract/document/9160492>

industry, academia, and local, county, and state government. Partnering with other maritime enterprises and organizations the Maritime Innovation Center will provide a physical place where professional practitioners, students, and apprentices can participate in theory and practice workshops for teaching and learning new maritime technologies while preserving the skills of the past to serve a carbon constrained future.

Focus: The Center will focus on marine technology, and marine policy. Attendees should expect to spend time on ships and in shipyards in all seasons with the Innovation Center's business and public partners. The Innovation Center will work to develop authentic activities on and around, ports and the river that create a sense of responsibility to the Hudson River and develop a new generation of maritime advocates, workers, and decision-makers who know how to use their heads, hearts, and hands.

It will be designed to help those who participate discover their interests and passions, not just prepare them for tests. At its core, the is about inspiring personal growth through craftsmanship, community, and maritime tradition. Paraphrasing the title of Transition Town Rob Hopkins' book, The Hudson River Maritime Innovation Center will be the embodiment of the ["Power of Just Doing Stuff."](#)

Facility, structure, and location: A new or climate adapted historic shoreside building(s), a vessel like the [Floating Hospital Ship](#) (Now moored in the Rondout Creek), or a [floating facility](#) like the [Floating Office Rotterdam](#) will be built, adapted, or restored, and modernized into a LEED-certified, "future proofed," and environmentally friendly facility. It will include a mix of classrooms and working space for incubators, accelerators, and anchor tenants along with fabrication and event space. The facility will be a "Living Structure" with advanced sustainability and resiliency features.

This center will benefit the region and the maritime community in several ways:

- Creating new employment opportunities for young people, and retraining experienced workers in the participating startups and established maritime businesses
- Building the region's status as a center for excellence in the maritime economy in a carbon constrained future.
- Elevating awareness of entrepreneurs and stimulating confidence in the maritime industry to create new (and renewed) products and services
- Creating new opportunities for established area businesses to develop relationships with early-stage companies
- Nurturing the next generation of diverse, inclusive, and representative maritime workforce with technological expertise and access to "green," living-wage jobs as mariners, ship and boat builders, logistics specialists, welders, woodworkers, riggers, sailmakers, and battery and solar electric propulsion installers, and maintenance techs among others.

Recommendation 2. Converting ICE vehicles to EVs/ZEVs:

There is very little disagreement that EVs/ZEVs are the future of the automobile and light truck industry. Over the lifetime of a ZEV the carbon footprint is significantly less than an internal combustion vehicle. One huge problem given short shrift in the Scope is – what happens to all those ICE vehicles that get traded in? Normally the vehicles whether sold privately or traded into a dealer will be resold and can operate for tens of thousands of miles more with the same or increased emissions. Even if all ICE vehicles are taken out of service in New York by a certain date, those vehicles will be sold in another state or overseas, so there will be no net reduction in emissions for the life of those vehicles.

Subsidize the ICE to EV,ZEV, alternative fuel conversion business in New York:

Presently ICE to EV conversions are limited to [specialty custom businesses](#) for customers with “classic” or “performance” cars, and some [kits](#) sold to DIY mechanics. The process can range in price from less than \$10 thousand to more than \$100 thousand. However, if New York made the decision to subsidize/incentivize new conversion businesses, re/training mechanics, and provide tax credits and other incentives to vehicle owner “first adaptors” that brought the cost down to less than the price of a new ZEV there are several overlapping benefits. Many people like their present cars and light trucks and may resist buying a new, expensive EV that feels, looks, and drives differently than their present vehicle.

Working with NYSERDA, NYSDOT, NYSDEC, NGO’s and other relevant businesses, institutions, and federal agencies initiate demonstration projects:

- Municipalities, counties, and state agencies decarbonize their fleets
- BOCES training and retraining programs for conversion specialists, for independent mechanics and dealer employees
- “Cash” for engines, exhaust systems, fuel tanks, and accessories for more than scrap value.
- Computerized supply chain for used and new motors, batteries, brake vacuum pumps, power steering, electric heaters, seat heaters, EV adaptable air conditioning, and regenerative braking systems.
- Subsidies and tax advantages for electric motor and battery manufacturers to relocate to New York.
- Work with vehicle producers to provide components for conversion, E.g. Ford Lightning parts for Ford ICE pickups.
- Incentivize dealers to convert ICE trade ins to EV’s
- Incentivize School districts to [convert diesel school buses to EVs and alternative diesel](#).
 - When we consider emissions from electric school buses, it is important to remember that the population most exposed to diesel school bus emissions are children. Children are especially vulnerable to the health effects of air pollution.
- Incentivize fleet operators and car rental businesses to buy conversions or set up conversion facilities
- Incentivize farmers to convert diesel tractors and other ICE vehicles to alternative diesel and EVs.
- Incentivize police, fire, and emergency departments to convert existing ICE fleets.
- Set regulations and standards and train inspectors for both professional and DIY conversions

- Prohibit the exportation of functioning ICE vehicles from New York to other States or overseas.
- Provide subsidies and incentives for “[fryer fat](#)” to [biodiesel conversion](#) facilities.
- Provide subsidies for biodigesters for [biogas from organic waste](#) facilities.

Recommendation 3. Improved and Free Transit:

Public Transportation:

- Improves Community Health
- Economic Benefits to the Community
- Improves Fuel Efficiency
- Public Transportation Reduces Air Pollution
- Improves Road Congestion
- Improves Community Mobility
- Provides an Equitable Transportation System
- Public Transportation Improves Commuters Productivity

Free Public Transit enhances all these benefits:

Tallinn, Estonia made international headlines when it became the first capital city in the world to introduce [free public transport](#) for its residents in 2013. With a population of almost half a million, the municipality undertook the measure to make access to public transport more equitable and for the perceived economic benefits.

“We wanted to improve social mobility and stimulate the local economy by getting people out and about on the evenings and weekends,” says Allan Alaküla, Head of Tallinn’s EU Office and spokesperson for the scheme.

Surveys conducted by the city in 2010 and in 2011 indicated that ticket costs had become the main barrier to increasing usage of public transport, which was in turn hindering the city’s broader economic development.

[Island Transit](#) has been a **fare-free bus system** since its founding in 1987. You don't need a ticket, cash, or coins to ride the bus, which makes bus transportation a very easy and convenient way to travel around Island County. Just hop on and go. Bus service is funded through 9 tenths of 1% of Island County's local sales tax and supplemented by state and federal grants.

Stinger Anderson got hooked on riding the bus after a colleague showed him how. He loves the tradeoffs including more time and money to spend in other ways.

Recommendation 4. [Demand Responsive Transportation \(DRT\)](#):

When it comes to improving public transportation in rural areas—flexibility is key. The first step is to provide an easy and efficient way for more people to access public transportation. On-Demand Public transportation, also known as Demand-Responsive Transportation (DRT) provides a way to increase the geographical coverage of a traditional public transit service. This means vehicles can cover a larger service area and reach more passengers. By utilizing DRT technology to improve fleet efficiency and give passengers a way to book public

transportation—Councils, Fleet Operators and Transit Agencies in rural communities can easily improve their Public Transportation offering.^{vi}

Recommendation 5. Electrification of commuter, interstate, and municipal buses:

Mass transit is the antidote to climate change,” MTA Chairman and CEO Janno Lieber said at a Midtown press conference, adding that transit avoids putting 17 million metric tons of greenhouse gases into the atmosphere annually (e.g., by keeping people out of cars). Transportation is the [second-largest contributor of greenhouse-gas emissions in New York](#), after buildings.

Close to 95% of commuter intra and interstate buses are diesel powered. Some municipalities are transitioning to hybrid and electric buses, but the Plan should include regulation, incentives, and subsidies for the conversion of all diesel-powered buses. The [MTA has an electrification program](#) but only a very small percentage of its fleet is electric.

The MTA now deploys 1,300 hybrid gas-electric buses, 399 of which sometimes operate solely on electric power in an “EV mode.” It pledges to purchase only electric buses by 2029. New York State budgeted \$1.1 billion for buying 500 electric buses in [the 2020-2024 capital plan](#). This goal must be ramped up and speeded up and should include all municipal and county transit systems in the State.

In the Portland, OR metro area, TriMet says it has [cut its carbon emissions by more than 50%](#) in the last six months by transitioning to renewable diesel and renewable electricity. It’s also trying to grow the number of electric buses in service.

According to the Sierra Club’s [Zero Emission Bus Fact Sheet](#):

- EV buses already have lower comparative lifetime costs than diesel buses and CNG buses, and costs continue to drop rapidly.
 - Government estimates of zero emission bus prices sharply decline as advances in battery manufacturing and increased demand drive down costs. By 2025 an electric bus is expected to cost \$480,000, equal to or less than the cost of a new diesel vehicle.
- Locked In O&M savings can then be used to expand the EV bus fleet, generating further savings
 - Electric buses also have substantially lower operating and maintenance (O&M) expenses as compared to their diesel and CNG alternatives. With an electric or hydrogen fuel cell bus, there are no oil changes or emissions tests, fewer parts that can break, and less wear on braking systems. The average lifetime maintenance cost for an electric bus is just \$.60/mile.
- EV Buses provide significant reductions in tailpipe and greenhouse gas emissions
 - It is also important to consider where these emission reductions will occur. Transit buses tend to operate in heavily populated urban areas and suburban corridors. Pollution from these sources falls directly upon the surrounding communities and commuters.

Anecdotally there are no electric interstate buses operating in or to and from New York. This provides an additional opportunity to convert diesel and natural gas buses to alternative diesel and EV's. See *Solution 2*.

The Germany-based company [FlixBus](#) ran an electric [bus pilot](#) recently from Seattle to Eugene. The company [purchased Greyhound](#) in October, but it has been steadily expanding the U.S. market for intercity travel since it landed here in 2018.

Recommendation 6. Electrification and solarization of freight and passenger trains^{vii}

Trains are one of the most efficient and sustainable form of transport. Worldwide around 75% of trains have been electrified, while 25% still use fossil fuels. The bad news is that even electric locomotives use a partially polluting mix. The Council should set specific timetables for the electrification of all commuter and freight trains in New York and calculate the solar and other alternative electric power generation needed to accomplish this.

- Continue electrification of diesel branches of commuter rail
- Require that electricity be generated from non-fossil fuel sources
- Working with NYSERDA provide grants to encourage the development of solar electric^{viii} and fuel cell powered commuter and freight trains.
- Solarize all commuter rail stations (for trains, EV's, and E-bikes) and create charging stations at rail maintenance yards.
- Working with the [Federal Railroad Administration](#) and the [NYS DOT](#) begin the electrification of all freight/cargo trains in New York State.
- If electrification is not feasible research the use of hydrogen fuel cells, direct burning of green hydrogen or biogas or biodiesel in diesel/electric train engines and switching modes from rail to maritime. See Recommendation 1.

Recommendation 7. Improved bicycle and E-bike transportation opportunities:

Although electric bicycles didn't receive much attention during the COP26— to the chagrin of some sustainability mobility advocates — 2021 was the year they found a more welcoming home around the world. [An analysis by Business Research](#) estimated global e-bike sales at \$36.5 billion for the year, a compound annual growth rate of more than 12 percent over 2020. Within three years, revenue could reach \$53.3 billion, the market research firm predicts.

E-Bikes for commuting and first and first and last mile logistics:

- [According to calculations](#) touted by a legislative proponent of this idea, California Congressman Jimmy Panetta, if e-bikes handled many short-distance trips — particularly for commuting — currently traveled by cars, it would cut emissions by 12 percent.
- While e-bike proponents generally talk up the benefits for individuals and commuters, the format also holds substantial promise when it comes to last-mile delivery, especially in urban environments where tricycles or quadricycles powered by pedal assist/battery could be a [practical alternative to trucks and vans](#).

Commuting, recreation, local shopping, and first and last mile logistics using E-bikes and trikes will have significant public and private benefits:

- Improved health
- Manufacturing, assembly, maintenance, and sales contribute economic benefits to the communities in which they are located.
- Improves over all fuel efficiency
- Reduces air pollution if E-bike batteries are charged from alternative power sources.
- reduces road congestion
- Improves individual and community mobility
- Provides a more equitable transportation system

Next steps:

NYSERDA grants and state, county, and municipal subsidies and incentives for the manufacturing, sales, maintenance, and infrastructure for both recreational and commercial uses of E-bikes that include but are not limited to:

- BOCES and other training facilities for E-bike builders, repair technicians, and sales.
- Incentives for the development of E-bike, motor, and battery manufacturing facilities in New York
- Dedicated bike lanes for rural and urban roads
- Charging infrastructure and bike rental facilities at rail and bus stations and workplaces.
- Employee incentives for use of E-bikes for commuting. Establishing a benefit that lets employers offer bike-commuting workers — those who do it regularly rather than occasionally a per month subsidy.
- Higher tolls, [congestion pricing](#), taxes, and incentives for the elimination of large trucks in urban centers
- Traffic calming, street narrowing, de-paving, and [xeriscaping](#).
- The State working with other government divisions to change zoning to encourage and accommodate more bike friendly development patterns.
- Multiple uses of “rail trails:”
 - Rail trails are primarily used by recreational hikers, bikers, and horseback riders. A multi-use trail could accommodate small commercial E-bikes for cargo during certain hours and with some restrictions.
 - In many European countries bike paths, particularly in urban areas are shared with trolleys and other mass transit. Even some of our existing rail/trails could be modified to accommodate inter-city trolley traffic along with the current uses safely. The relatively small cost of replacing bridges and the use of self-contained battery electric rubber-tired trolleys would make this feasible. The trails were originally designed for trains with the correct grade.

<p>Recommendation 8: Airships and electric aircraft</p>
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Airships are relatively inexpensive, they can carry a substantial amount of cargo, and they are significantly more environmentally friendly than their heavier-than-air relatives. Once thought to have passed into memory, airships are having something of a renaissance.

- Over a decade ago, the International [Air Transport Association](#) (IATA) called specifically for cargo operators to embrace dirigibles to meet environmental targets.

An airship is estimated to produce 80 to 90% fewer emissions than a conventional aircraft.

Heavy Lift Cargo Airships:

- Made of aluminum frames- lightweight, solid, and proven
- Vertical take-off and landing
- Operates in strong front & cross wind conditions (50 Knots)
- Needs NO airport infrastructure/ground crew - operates on any flat space
- Burns 80 - 90% less fuel than equivalent aircraft
- Flies at 150-220 mph
- Costs 80-90% less than equivalent payload aircraft to purchase and operate
- Rivals in cost with truck or rail (point to point)
- At least 40 years working life expected

Short Haul Passenger Airships, More environmentally friendly air travel:

Airship journeys would take around the same time as airplane travel once getting to and from the airport is considered, however they would be a more environmentally friendly option. The airships generate a much smaller carbon footprint than airplanes. The CO2 footprint per passenger on its airship would be about 4.5kg compared with about 53kg via jet plane. Airships are 'ideally suited to inter-city mobility applications like Seattle to Vancouver or Buffalo to New York City, at a tiny fraction of the emissions of current air options.

With new flexible solar panels made part of the skin of the airship, and new electric motor and lightweight battery technology, not only could airship travel become a part of New York's transportation infrastructure, but with the appropriate subsidies and incentives, manufacturers could be encouraged to relocate manufacturing to the State.

Electric Airplanes:

Half of all global flights are shorter than 500 miles. That's the sweet spot for electric aircraft. Fewer moving parts, less maintenance, and cheap(er) electricity means costs may fall by more than half to about \$150 per hour For airlines, this makes entirely new routes now covered by car and train possible (and profitable) thanks to lower fuel, maintenance, and labor costs.

Electric propulsion nearly solves another problem for aviation: carbon emissions. Aviation emits more than 2% of the world's CO2 emissions, and it may reach nearly a quarter by mid-century. With no alternative fuel ready to leave the ground, and the number of air passengers set to double by 2035, electricity may offer the industry its best way forward in a climate-constrained world.

Conclusion:

As New York sails into an uncertain, but surely dangerous, climate crisis, we can move steadily away from reliance on increasingly undependable fossil fuels, giant transnational companies, and international finances. We can build energy, food, and economic redundancies into local communities to buffer them against international and national shortages and systems collapses. We can invest in our neighborhoods and our neighbors, working together to create "too small to fail" Main Street businesses, non-profits and local governments that strive in union to serve their communities and the people.

None of this will insure us totally against the dangers ahead, but preparedness will give our state resilience and staying power. By acting now with foresight and hard work, we can care for each other, reinvesting in people and the land, creating a future for the Hudson Valley that emphasizes [Earth Care, People Care and Fair Share.](#)

We can create organizational and institutional structures that are sustainable, endowed with ethical values that serve all citizens not only a privileged elite. The emphasis will not be on blind, reckless progress at all cost, but on the creation of an equitable society that avoids resource depletion while fostering slow growth, and most importantly, [hope for everyone, including the most vulnerable people and species.](#)

Appendix 1. Low/No Carbon Maritime Resources:

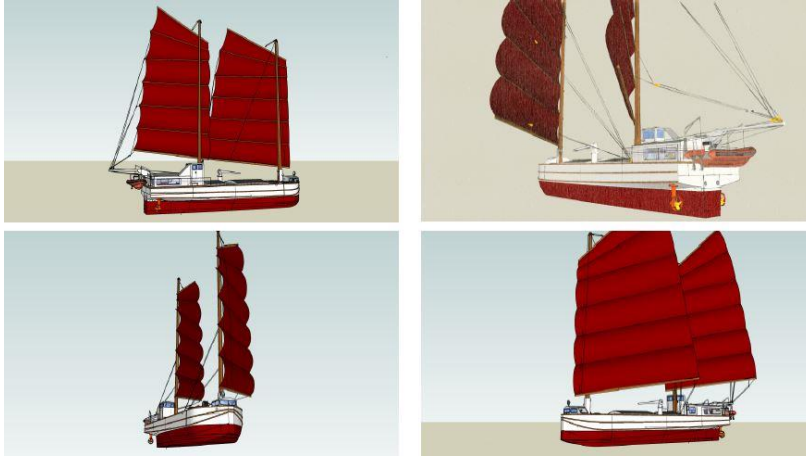
- [International Windship Association](#): “The International Windship Association (IWSA) facilitates and promotes wind propulsion for commercial shipping worldwide and brings together all parties in the development of a wind-ship sector to shape industry and government attitudes and policies.”
 - Network – create a clear sectoral approach, grouping like-minded organizations and individuals that can share ideas, skills, resources, technical and market information for the development of commercial wind-ships.
 - Promote – promoting the economic value of wind propulsion to the shipping industry
 - Incubate – assist in securing funding streams, project collaboration, grant applications, research and the pooling of resources.
 - Educate – act as a central information hub for the wind-ship sector, the media, NGO’s, equipment producers, shipbuilders, ports, governments, and the general public. Research papers, press releases etc.
 - Facilitate – initiating the establishment of common approaches/criteria for all stages of wind-propulsion projects, advise stakeholders and lobby legislative bodies on policies, activities, funding, and incentives required to retrofit, upgrade and the new build of commercial wind-ships.
- [Fairtransport](#)
 - For 10 years we have shipped cargo across the Atlantic by the power of the wind alone!
- [Hudson River Maritime Museum](#)
 - The Wooden Boat School was founded by the Hudson River Maritime Museum in 2015 to preserve the maritime craft traditions of the Hudson Valley and to teach a hands-on interpretation of the living history of the Hudson River.
- [Good Work Institute](#)
 - The Good Work Institute’s mission is to cultivate, connect, and support a network of local community members who are fostering resilience and regeneration in the Hudson Valley.
- [Post Carbon Institute](#)
- [New Dawn Traders Sail Cargo Alliance](#):
 - New Dawn Traders is co-creating the Sail Cargo Alliance (SCA) to support a new and growing community interested in shipping ethical cargo under sail. Beyond building viable trade for these sailing vessels, the SCA is committed to setting the highest standards for ethics across the supply chain. This is an alliance of ship owners, brokers, producers and anyone interested in working together in a healthy transport culture.
- [Drawdown](#)
 - Project Drawdown gathers and facilitates a broad coalition of researchers, scientists, graduate students, PhDs, post-docs, policy makers, business leaders and activists to assemble and present the best available information on climate solutions in order to describe their beneficial financial, social and environmental impact over the next thirty years.
- [Low Tech Magazine](#)
 - Low-tech Magazine questions the blind belief in technological progress, and talks about the potential of past and often forgotten knowledge and technologies when it comes to

designing a sustainable society. Interesting possibilities arise when you combine old technology with new knowledge and new materials, or when you apply old concepts and traditional knowledge to modern technology.

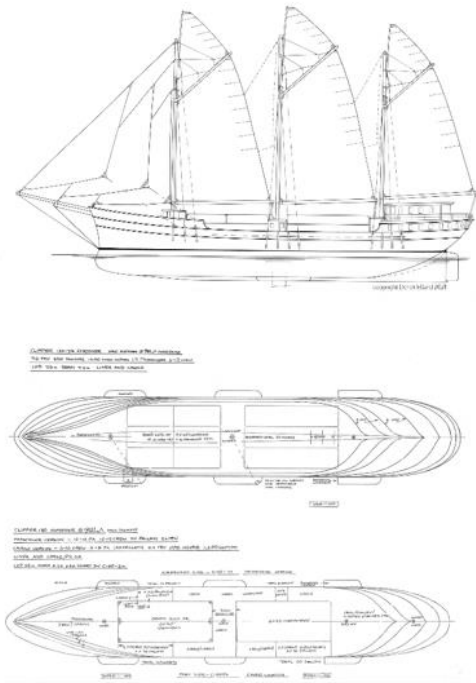
- **[Zero Emission Ship Technology Association](#)**
 - Our Mission is to prevent catastrophic climate impacts by assisting commercial shipping to reduce emissions on a steep trajectory in line with 1.5 degrees.
 - To accomplish this we will:
 - Influence regulators and policy makers at National & International levels to introduce legislation that obligates the uptake of zero emission technologies.
 - Create a platform for zero emission ship(ZES) technologies to collaborate on ZES projects.
- **[ECOCLIPPER](#)**
 - We are establishing a professional shipping company that offers emission free transport and travel, by making use of engine-less sailing ships.
 - The start-up crew combines top maritime expertise that is relevant to the sailing cargo industry, decades of experience in business development and sound management expertise.
- **[Sustainable Hudson Valley](#)**
 - Sustainable Hudson Valley's mission is to speed up, scale up, jazz up and leverage progress against climate change, creating communities where people and nature thrive. With a wide range of partners, we are:
 - leading a regional climate action planning process;
 - rolling out scalable programs for specific climate solutions such as shifting to 100% renewable energy;
 - growing the market for renewable technologies through consumer education, industry training, group purchases and other incentives.
 - helping communities plan for resilience and capture opportunities for positive change in this time of crisis.
- **[Revolution Rickshaws](#)**
 - Established in 2005, Revolution Rickshaws is a live-electric urban vehicle (LUV) systems & services enterprise based in New York City. Revolution researches, develops, and maintains LUVs in partnership with multiple world-class industry brands including [Cycles Maximus](#), our long-time bikemobile manufacturer and collaborator, to deliver optimal goods and services to market.
- **[Sail Cargo Inc.](#)**
 - Our mission is to prove the value of clean shipping
 - Eliminating fossil fuels from the maritime sector is achievable by using advanced technology and simple techniques. We combine innovative, clean technologies with readily-available, low-cost, natural systems to create solutions for a range of needs: from supporting vulnerable coastal communities to moving commodities at global scale.
- **[Original content, curated news, and articles](#), The Center for Post Carbon Logistics**
- **[Small-Scale Sail Freight On Coastal And Inland Waters](#), Author Steven Woods**

- Sail Freight has slowly worked its way into the realm of sustainability discourse as a way of reducing emissions from transportation, providing logistical solutions using the emissions free power of the wind and technologies proven effective for over 5000 years. This attitude toward Sail Freight and transportation in general has some merits, but none of these discussions seem to have examined the issue of readopting sail freight at scale. This paper proposes methods of understanding this issue of scale by calculating the needs of a city for food. Using foodshed analysis to calculate necessary fleet capacities therefrom, as well as the labor needed to support this fleet, a model is provided for the New York Metro Area. The capacity for building this fleet and training sailors with current sail freight infrastructure and operations is then examined, with recommendations and analysis for addressing these challenges over the coming decades
- **[New Age of Sail](#) looks to slash massive maritime carbon emissions**
 - If ocean shipping were a country, it would be the sixth-largest carbon emitter, releasing more CO₂ annually than Germany. International shipping accounts for about 2.2% of all global greenhouse gas emissions, according to the U.N. International Maritime Organization.
 - But change is on the way. Wind, solar electric, and hydrogen-powered ships offer innovative low- or no-carbon alternatives to fossil fuel-powered cargo vessels, with wind about to make a huge comeback in shipping, say experts. New experimental sail designs include hard sails, rotating vertical cylinders, and even kites.
 - Today, startup companies like Fair Transport (with its retrofitted wooden vessels Tres Hombres and Nordlys); modest sized proof-of-concept firms, with purpose-built vessels like Grain de Sail; and large cargo ship retrofits and purpose-built vessels like Neoline’s new large cargo vessels, are starting to address CO₂ emissions.
 - Through the late 1940s, huge steel sailing ships carried cargos on some ocean routes. By 2030 — less than 100 years since the end of the last great era of sail — fossil fuel-powered cargo vessels may give way to high- and (s)low-tech sailing ships thanks to a revolution in energy technology, that reduces shipping costs with less emissions.
- **[Industries for Small Communities](#), Arthur E. Morgan**
 - Morgan’s goal, through his life’s work and in the 1953 publication specifically, was to shift the prevailing mindset regarding small-scale industry. Then, as now, what Morgan termed “bigness” was glorified and small communities were rapidly losing young people to urban centers. Still, he knew that small businesses existed across the country, and that the communities that housed them could be vibrant and fulfilling places to live. Furthermore, small industries are vital to the success of the American economy as a whole; such independent firms serve as “laboratories and experiment stations” where progress can be made with relatively low risk

Appendix 2. Eriemax and Electric Clipper



Eriemax, 80' canal, river, and coastal sail freighter, Geoff Uttmark design



Electric Clipper, 180-200' short sea and trans-oceanic sail freighter, Derek Ellard design

Issues We Address:

Looking forward rationally at all the indicators, the “business as usual” choice takes us down a road to cataclysmic food and energy shortages, transportation disruption, infrastructure failure, inundation from sea level rise, financial meltdowns and its attendant social disarray.

Possible response strategies:

- Denial/blissful ignorance
- Last One Standing/anger, blame, war for food and natural resources
- Power Down/acceptance, adaptation
- Building Lifeboats – [preparing local areas to be sustainable in the event of a global economic and environmental collapse.](#)

We do These Things

Preserve, *knowledge*:

- The Center will house a traditional knowledge data base, library, and a pre/post carbon tool, technology, and machinery collection. This activity is an ambitious effort to preserve, restore and promote the re-use of traditional skills.

Movement Building, *advocacy*:

- The Center promotes maritime, and first and last mile technology necessary for moving goods and people from place to place in a carbon constrained future.
- The Center is an advocate for existing and emerging low carbon shipping and post carbon transportation businesses and organizations.
- The Center is an advocate for appropriately sized working waterfronts in small to mid-sized ports throughout the the Hudson Valley, NY Harbor, Canals, and the Atlantic Coast.
- The Center advocates for a transition that people will embrace as a collective adventure, as a common journey, as something positive. Paraphrasing the title of Transition Town Rob Hopkins' book, The Center for Post Carbon Logistics will be the embodiment of the "Power of Just Doing Stuff."

Train, *individuals and organizations*:

- Partnering with other enterprises and organizations The Center will provide a physical place where professional practitioners and apprentices can participate in theory and practice workshops for preserving the skills of the past to serve the future
- The Center will host regional, national, and international conferences on post carbon logistics, traditional skills, and sail freight
- The Center will provide educational opportunities and creative, implementable, real world solutions to the 2st century environmental, economic, and social crises enabling people to work locally to transition our communities and bio-region away from a fossil fuel-based economy to a "restorative economy," one that is human-scaled, embraces alternative locally based energy, and that is less extractive.

ii Green Shipping Corridor:

In April 2022 the US Department of State put out a Fact Sheet, Green Shipping Corridors. That said in part:

In support of the effort to achieve global net-zero greenhouse gas emissions by no later than 2050, and in support of the effort to achieve zero greenhouse gas emissions from the international shipping sector by the same year, the United States is charting a course to advance domestic and international green shipping corridors.

iii This PC3PL providers is a vital part of maritime based supply chain management.

- Procurement: ordering and receiving goods from purveyors in the supply chain.
- Order fulfillment and Consolidation: Receiving an order from customers and arranging for the orders to be completed and shipped.ⁱⁱⁱ PC3PL will combine goods from multiple shipments into one shipment so they can be transported together.
- Storage: Providing temporary storage for goods in warehouses or similar facilities.
- Transportation and Distribution:ⁱⁱⁱ Arranging for consolidation, management, and transportation of goods from the producer, to the first and last mile provider, drayageⁱⁱⁱ to and from a temporary storage or warehouse to the water-based transport of goods and point of destination.
- Moving goods between methods of transport

To support this new logistics model certain data, need to be collected and analyzed based on previous and anticipated activities, this information includes but is not limited to:

- ports served
 - [In 2021 Apollonia sailed over 1200 miles, delivered 65,000 lbs. of Cargo to 15 different Hudson River Ports](#)
- Selected commodities/cargo handling ⁱⁱⁱ
 - Hudson Valley Malt to Brewers
 - Wild Hive Flour to Bakeries
 - Sustainably Harvested Oak Logs for Mushroom Cultivation
 - Peppers from Hepworth Farms to Hot Sauce Production
- service characteristics
- funding arrangements
- [organizations/businesses involved](#)
- marketing done prior and during service
- and shipper response to the service

PC3PL will also offer a range of supplementary services including IT, inventory management, and reverse logistics,ⁱⁱⁱ and tracking of goods using GPS and [Internet of Things \(IoT\) devices](#)

ivThe Marine Byways and Resilient Small Port Toolkit products will include but not be limited to:

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- a. A review and analysis of the pros and cons of previous short sea and Hudson River maritime cargo transport projects including the [Vermont Sail Freight Project](#), [Albany Express](#) Barge service, [The Hudson River Corridor Foodway Project](#), and the project cargo business of the [NY State Marine Highways Co.](#)
 - b. A compendium of pier/dock/bulkhead and navigation conditions, using field checks, existing and new photographs, and satellite images
 - c. A review of New York City's "[Delivering Green](#)" Plan to determine the location of appropriately sized small ship docks and piers, and accessibility for low/no carbon first and last mile logistics providers.
 - d. Make available, existing and newly created GIS maps and charts of small and medium sized ports throughout the M-87 Marine Highway System for the use of mariners and port operators
 - e. port gazetteers^v
 - f. Financing for port improvements
 - g. Guidance for local communities to develop working waterfront zoning, deed restrictions, and easements
 - h. links to sustainability and resilience resources.
 - i. links to local and regional naval architects, shipbuilders, and boat yards, as a resource for sail cargo and solar ferry entrepreneurs and public agencies with an interest in low/no carbon water transport of goods and people.
 - j. A compendium of local, state, and federal agencies and what assistance they offer, and sources of funding for:
 - planning assistance for small port improvements for low/no carbon commercial freight and passenger vessels.
 - Assistance in the creation of [working waterfront inventories](#)
 - [Protecting existing working waterfronts through land conservation, easements, and deed restrictions.](#)
 - Building waterfront EV charging stations including electric boat and ship hook ups
 - Accommodate existing or potential low/no carbon first and last mile logistics providers, storage, and warehousing
 - Develop waterfront recreation compatible with port operations
 - climate resilience projects, retreat strategies,
 - wetlands and benthic habitat restoration/adaptation strategies,
 - and sample [Zoning](#) ordinances to assist small port and riverfront towns to retain their water dependent businesses and ecological services.

^v [NYMTC Resiliency Planning](#)
[NYMTC Freight Planning](#)
[NYMTC Sustainability Planning](#)
[NYMTC Regional Freight Report](#)
[Delivering Green, a NYC sustainable freight plan](#)
[Final UCTC Year 2045 Long Range Transportation Plan](#)
[Kingston NY Climate Action Plan 2030](#)
[NY DEC Climate Action Plan](#)
[\(Mid\) Hudson Regional Climate Action Strategy](#)
[Rondout Riverport 2040](#)
 Kingston, NY's [Weaving the Waterfront](#),
[Scenic Hudson Sea Level Rise Reports](#),
[NY State Local Waterfront Revitalization Program](#)
[National Working Waterfront Network](#)
[Sustainable Working Waterfronts Toolkit](#)

financial and port and docking information gathered by the Schooner Apollonia's multi-port cargo operation, interviews with local, county, state, and federal transportation, and economic development agency officials, materials developed by non-governmental organizations, navigation, port, and logistics information from contemporary and historic sources (including the Hudson River Maritime Museum [Collections](#)) Interviews with farmers, food processors, brewers, distillers, and small local manufacturers, makers, and logistics providers interviews with local, county, state, and federal transportation, agriculture, and economic development officials, materials developed by non-governmental organizations, navigation, port, and logistics information from contemporary and historic sources

^{vi} DRT a form of shared [private](#) or [quasi-public](#) transport for groups traveling where vehicles alter their routes each journey based on particular transport demand without using a fixed route or timetabled journeys. These vehicles typically pick-up and drop-off passengers in locations according to passengers needs and can include taxis, buses or other vehicles.

One of the most widespread types of demand-responsive transport (DRT) is to provide a public transport service in areas of low passenger demand where a regular bus service is not considered to be financially viable, such as rural and [peri-urban](#) areas.

^{vii} [Electric Trains vs. Diesel Trains:](#)

Though trains are more efficient than trucks, not all trains are equally efficient. Diesel-powered trains transfer about 30-35 percent of the energy generated by combustion to the wheels, while supplying electricity directly from an overhead powerline transfer about 95 percent of the energy to the wheels. Powering trains with electricity rather than diesel has several other benefits.

- While prices of diesel fuel are currently low, many analysts predict that the long-term trend is for those prices to increase. Conversely, prices of electricity are falling with the fast-growing use of renewable energy sources. Even at current prices, with the energy conversion rates mentioned above, it is estimated that it is 50 percent less expensive to power a train by electricity than by diesel.
- The cost of electric locomotive engines is about 20 percent less than diesel locomotive engines on the global market, and maintenance costs are 25-35 percent less than for diesel engines.
- Eliminating diesel-powered locomotives would reduce air pollution including soot, volatile organic compounds, nitrogen oxides, and sulfur oxides, all of which affect public health as well as the environment. This is especially important as many railroads pass through urban areas. It would also reduce noise levels in cities, as well as traffic deaths due to trucks (rail freight causes only about one-eighth as many fatalities as truck freight per ton-mile).
- Switching from diesel to electricity would also help address the challenge of replacing petroleum-based liquid transportation fuels with cleaner alternatives as we seek to lower our greenhouse gas emissions.

viii **Are solar trains feasible?**

In research focused on providing solar power to electric trains, it is enlightening how efficient this transportation mode can really be. Electric trains are 50 percent to 75 percent less polluting than single-passenger cars and trucks and use comparably less energy per passenger-mile, according to a 2009 detailed analysis by [Chester and Horvath](#).

Electric trains are so efficient that a single 300-watt solar panel (about 4x6 feet) can provide up to 7,000 miles of an individual's commuting miles per year, or 5 to 20 miles per day. The national average, based on National Transportation Database data on the efficiency of the various U.S. electric train systems, is about 4,000 miles per year for each 300-watt solar panel. One mile of train tracks can support 1 megawatt to 3 megawatts of solar panels, which can provide 2 million and 6 million passenger-miles of train travel.

Wind power is another obvious option for powering electric trains with on-site renewables -- where there are strong wind resources. Distributed wind has not taken off in the U.S. anywhere near to the degree that distributed solar has, but it could be a viable option in many circumstances, particularly where there are state rebates to offset the cost of wind turbines. Wind power in desirable locations is still cheaper than power from solar panels and can also complement solar power by producing power at night.