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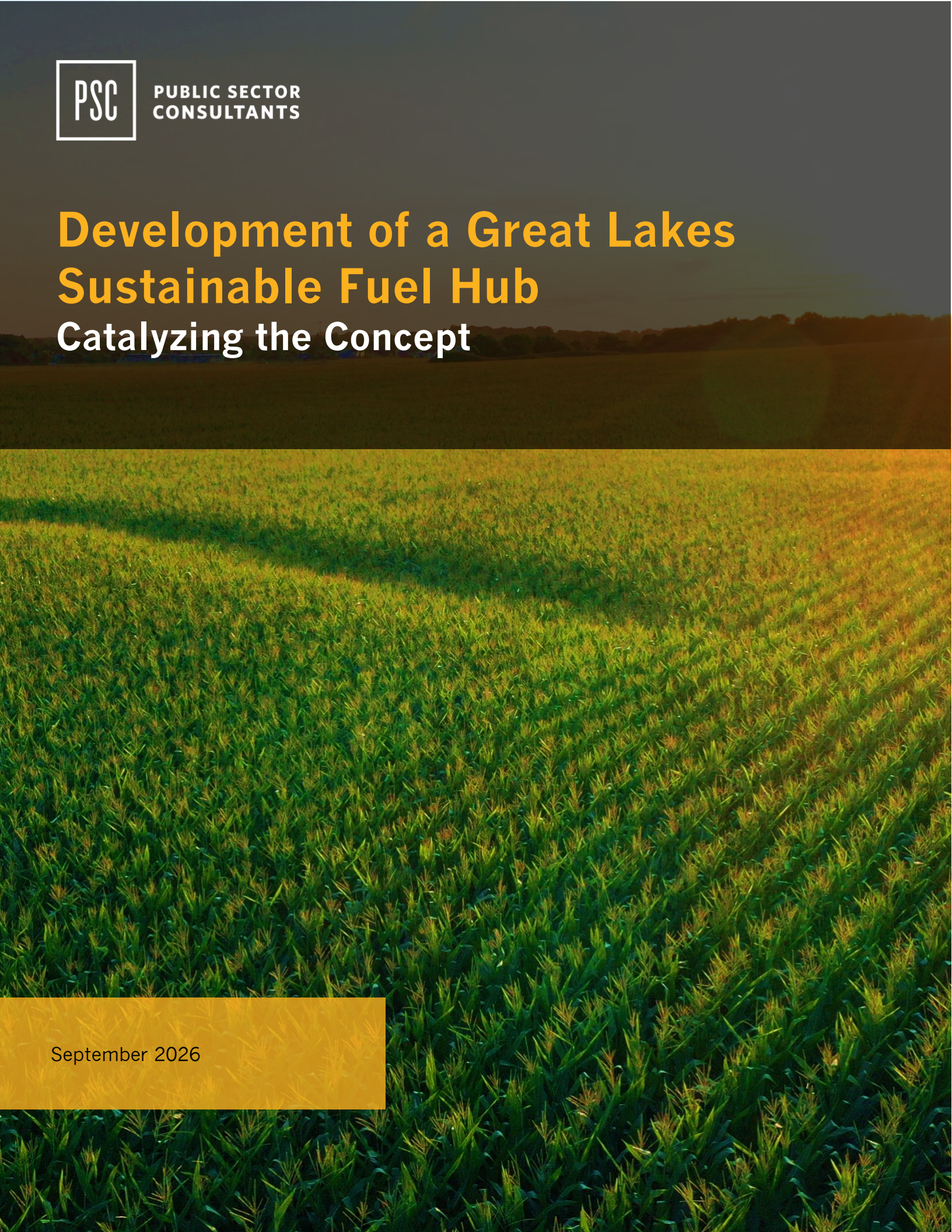
Development of a Great Lakes Sustainable Fuel Hub

Catalyzing the Concept



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The Vision

Michigan's 11,000 corn farmers plant over 2 million acres each year, producing more than 300 million bushels of grain to supply livestock and ethanol feedstock locally and globally. High crop yields coupled with slowing demand has caused crop surpluses, providing an opportunity to consider an expanded role in creating a sustainable future. At the same time, the transportation sector, especially aviation, is establishing ambitious climate goals.

This presents a market opportunity for Michigan's growers and transportation industry, as sustainable aviation fuel (SAF) is the main tool that regulators and airlines are considering in decarbonizing the challenging aviation sector. Michigan's existing corn and ethanol economy is well-positioned to develop ethanol-to-jet (also called alcohol-to-jet, or ATJ) hub that connects growers, ethanol producers, and the transportation industry directly into an emerging market.

Driving this work are four forces converging to create a real, if not yet fully mature, market opportunity:

Mandates and Targets

The European Union's ReFuelEU program mandates increasing SAF blends at European airports, while the United Kingdom has its own SAF mandate and a new low-carbon fuels fund. The US SAF Grand Challenge set a national target of 3 billion gallons of SAF annually by 2030 (US DOE 2022).

Supply

US corn and ethanol production are at or near record levels, creating idle or convertible capacity that could be redirected to ATJ feedstock (Lohawala 2026; K. Swanson 2025).

Location

Southeast Michigan sits inside the US corn belt, on two Class I railroads and three interstates, at an international airport with a resident major-carrier hub, and on a Great Lakes seaway port with existing liquid-bulk storage and international customs infrastructure.

Partners

Airlines under pressure to show decarbonization progress and an ethanol industry looking for a growth market beyond the motor-fuel blend.

This paper argues for a SAF production hub and supporting campus in Southeast Michigan, where a top-20 North American international airport (Detroit Metropolitan Wayne County Airport [DTW]) and Michigan's largest seaport (the Port of Detroit, on the St. Lawrence Seaway) sit within a single logistics footprint. No other location combines feedstock access, an international air gateway with an onsite refueling market, and deepwater export capacity within a 30-mile radius.

The project is conceived as grower-anchored, designed first and foremost to open a new, durable outlet for Michigan corn supply, one which converts a portion of the state's surplus into a value-

added, price-supported product. The Michigan Corn Growers Association, which is committed to enhancing the economic viability of corn farmers, will serve as a driving partner in these efforts. The remainder of this paper works through the questions a credible catalyst paper must answer, including opportunity, technology, feedstock, markets, site, farmer participation, economic impact, certification, policy, and cost, followed by a pre-feasibility study outline that scopes the technical, financial, and logistics work needed to move from concept to investment decision.

The Global Demand Signal

The demand for sustainable fuel is powered by a global shift to limit carbon emissions, diversify fuel sources, and reduce reliance on volatile energy markets. Even as US fuel guidelines and long-term sustainability targets loosen, international aviation and maritime shippers operate globally and must meet the climate and fuel standards of the countries they enter. And separate from any US policy requirement, many companies are voluntarily building their value proposition around renewable, sustainable, and predictable fuel sources.

The European Union has mandated use of sustainable fuels, particularly SAF, with the goal of reducing carbon emissions 50 percent by 2030 and 100 percent by 2050. For the rest of the world, individual organizations and companies have set goals to meet similar carbon emission reductions. For the aviation industry to reach a worldwide goal of net-zero by 2050, the International Air Transport Association (IATA) estimates the global fleet will need 150 billion gallons of SAF annually, 250 times more than current production.

The maritime industry is also transitioning portions of its fleet to use biobased fuels to meet sustainability goals. The International Maritime Organization's (IMO's) greenhouse gas initiative aims to reach net-zero emissions by 2050, requiring a significant investment in renewable-fuel options and supply chains to support shipping demands (IMO 2023).

For sustainable aviation fuel specifically, the ReFuelEU program sets escalating SAF blend mandates for European airports, starting at 2 percent in 2025 and rising in steps to 70 percent by 2050, and the United Kingdom has adopted its own SAF mandate alongside a new low-carbon fuels fund (Lohawala 2026). In the United States, the SAF Grand Challenge set a target of 3 billion gallons of SAF production annually by 2030 (Bracmort 2026).

The scale of global demand is clear, but scale and demand alone do not guarantee the viability of a sustainable fuel project. SAF projects will be most successful when the following conditions can be met (ICAO 2023):

What is sustainable fuel?

Sustainable fuel is fuel made from renewable sources—like corn, soybean oil, or used cooking oil—instead of petroleum, and it's formulated to work with the planes, ships, and trucks we already use. Because it comes from crops and organic material that absorb carbon as they grow, it produces 50 percent fewer lifecycle carbon emissions than fossil fuel, which is why the aviation and maritime industries are moving quickly to secure supply.

- Sufficient feedstock supply that satisfies carbon-intensity reduction requirements

- Processing and technology capacity that supports SAF certification
- Aligned market demand and supply chain logistics
- Supportive regulatory frameworks, policies, and funding opportunities

Local Solutions to Global Demand: The Michigan Opportunity

SAF production is progressing in several regions, but the high demand means multiple regional production hubs are needed. States like Iowa and Nebraska are advancing despite being far from major aviation markets, while Georgia is investing despite relying on imported Brazilian sugarcane and facing tariffs and trade policy risks.

Project progress in states with feedstock or supply chain limitations shows that Michigan can be a leader in SAF development. Southeast Michigan compares favorably to other SAF projects around the country: it combines diversified regional feedstocks and processing capacity with existing industrial and multimodal infrastructure, access to major US and Canadian markets, and the potential for committed local demand at the DTW.

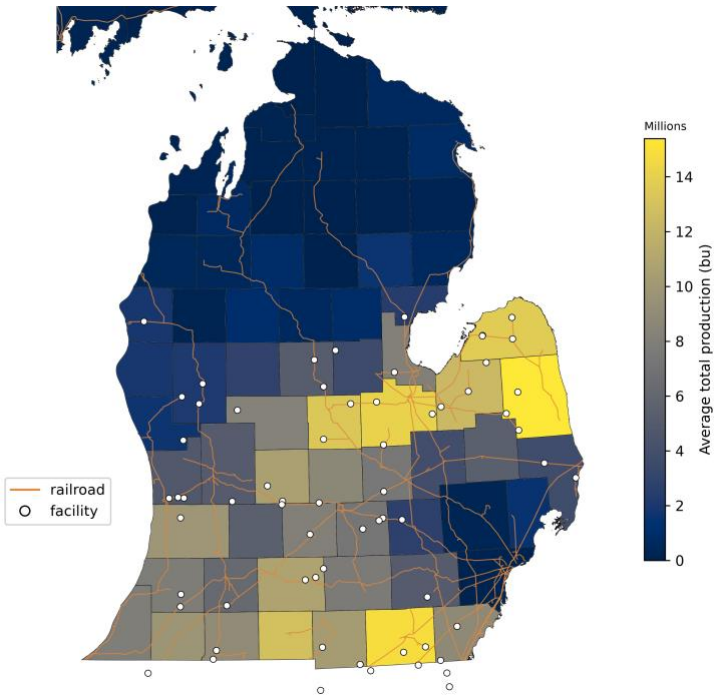
Homegrown Supply: Diversified Regional Feedstock

The most critical factor for success is access to feedstock with a verifiable carbon intensity that meets international SAF requirements. Farmers in the Great Lakes region have that well covered. Growers within 150 miles of Detroit—a radius spanning southern Michigan, northeastern Indiana, southern Ontario, and northeastern Ohio—produce over 4 million acres each of corn and soybeans annually, yielding about 712 million bushels of corn and 194 million bushels of soybeans. This region already supplies a significant amount of feedstock to meet both projected SAF conversion demand and existing food, export, and ethanol markets. With record corn production exceeding demand, farmers need new markets for their crops. Expanding ethanol production for SAF can create a significant new market for Michigan corn and soybeans while allowing the state to capture more of the value through in-state processing and refining (Michigan Farm Bureau 2026).

A recent three-year average of crop utilization in Michigan split roughly into thirds: 27 percent is processed as feedstock, 31 percent is processed into ethanol, and about 38 percent is exported, much of it moving through Detroit's port and rail infrastructure to overseas grain buyers. This export portion is the pool this project is designed to capture by redirecting a meaningful share of it to a new, in-state, value-added buyer instead of allowing it to leave the state as a raw commodity. Notably, Michigan growers and processors have more than doubled corn and ethanol production over the past 25 years without adding acreage, proof that the supply base can support materially higher in-state processing demand through yield and efficiency gains alone, without the need for additional land (ProExporter 2025). Exhibit 1 shows a heat map of Michigan's corn

production by county. The lightest colored counties produce more than 14 million bushels of corn annually. The orange lines indicate railroad lines and the white dots processing facilities. The existing oversupply of corn, together with the processing capacity and transportation infrastructure already in place, positions Southeast Michigan to be a hub for SAF production and distribution.

EXHIBIT 1. Michigan Corn Production by County, with Rail Lines and Processing Facilities



Source: Michigan Corn Growers Association

Further, Michigan already has systems to verify the implementation of conservation practices on farms, and in-state models are available to estimate carbon-intensity scores for farms with verified practices. Thousands of Michigan farms have been verified under the Michigan Department of Agriculture and Rural Development (MDARD) Michigan Agriculture Environmental Assurance Program (MAEAP) (MDARD 2025), which gives the state a credible foundation to standardize carbon-intensity scoring, quantify carbon benefit, and tie that benefit to produced biofuels as required by Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) standards (IATA 2026).

Established Processing Capacity and Infrastructure

Southeast Michigan's processing, refining, and multimodal transportation infrastructure provides a strong foundation for producing SAF and efficiently distributing it to regional and national markets (Exhibit 2).

EXHIBIT 2. Major U.S. Pipelines Carrying Jet Fuel

Source: Airlines for America 2021

Six biofuel production facilities already operate in Southeast Michigan, including The Andersons' 140-million-gallon ethanol facility in Albion. Each facility already relies on established rail, pipeline, and trucking connections used daily for commodity and fuel movement. This same logistics backbone, including the Buckeye Pipeline Terminal that already serves DTW airport and the Port of Detroit, means feedstock aggregation and finished fuel distribution can share existing infrastructure rather than requiring new investments. Few regions in the country offer this degree of alignment between feedstock supply, production capacity, and established supply chain logistics and infrastructure that reaches our nation's busiest airports.

The two leading conversion pathways illustrate why this regional processing base matters. The hydroprocessed esters and fatty acids (HEFA) pathway converts lipid feedstocks such as used cooking oil and animal fats, but that supply is limited and already oversubscribed by renewable diesel producers. The alcohol-to-jet pathway, by contrast, converts ethanol, meaning it can draw directly on the same corn-based ethanol production already operating in the region (Toman et al. 2026; Energy Solutions 2026).

Because ATJ facilities can buy ethanol rather than raw corn, the project can also expand demand indirectly: added SAF offtake gives Michigan's five ethanol plants a reason to run at higher utilization or add to their production, which in turn increases their corn intake without requiring the construction of a new grain-handling facility.

Regional Demand

Proximity to DTW will help establish a reliable early market for locally produced SAF. DTW alone supports over 32 million passenger flights and moves more than 300 million pounds of cargo annually (WCAA 2025), while the Port of Detroit ships an additional 8 million tons of cargo (Detroit Wayne Port Authority), concentrating enormous fuel demand within a single logistics footprint.

The most natural demand is Delta Air Lines. DTW is a Delta hub, so any SAF produced can be delivered directly into the existing airport fuel farm and pipeline system with minimal added logistics, rather than trucked or railed to a distant airport. The second tier is other passenger and cargo carriers operating at DTW's more than 125 nonstop destinations, plus buyers in Sustainable Aviation Buyers Alliance–type coalitions that purchase SAF certificates to offset their own business travel emissions even when the physical fuel is delivered elsewhere (a book-and-claim structure).

The third tier is a maritime and marine fuel market accessible through the Port of Detroit, since ATJ-adjacent renewable fuels (renewable diesel, marine biofuel blends) can be sold into Great Lakes and seaway shipping. This maritime channel is not hypothetical: Michigan already moves ethanol through the Port of Detroit to Canada, its largest ethanol trading partner, so the same port relationships and vessel traffic that carry ethanol north today are a ready-made distribution path for renewable marine fuel and, eventually, SAF exports (WCAA 2025; American Great Lakes Ports Association n.d.b.).

This activity consumes approximately 1.6 to 1.7 million gallons of jet fuel daily DTW and approximately 2.7 million gallons of petroleum diesel and marine fuels per year at the Port of Detroit, demonstrating significant demand for sustainable fuel sources. Southeast Michigan's broader transportation and distribution network can provide access to external markets as regional and national demand expands.

Site Selection

Supply, demand, and logistics for SAF all align in Southeast Michigan. Corn supply is concentrated across the Thumb and south-central counties and is reachable by truck or rail within roughly a 150-mile radius of a Wayne County site. Production infrastructure already exists in the form of Michigan's five operating ethanol plants (including POET Bioprocessing's Caro facility, which alone draws more than 20 million bushels of corn annually), any of which could supply ethanol feedstock to an ATJ-upgrading unit either onsite or via pipeline to a centralized conversion campus. Demand is also anchored onsite: DTW is Michigan's international air gateway and the Port of Detroit is Michigan's largest inland port, with existing liquid-bulk storage (including a 32-million-gallon facility at the Michigan Marine Terminal) and foreign-trade zone status (Michigan Agriculture Council 2024; Road Genius 2026; WCAA 2025; American Great Lakes Ports Association n.d.a.; Detroit Regional Chamber 2024; POET Bioprocessing n.d.).

That means the concept is not just a production site; it is a single logistics hub where feedstock arrives by truck and rail, conversion happens on campus or at a partner ethanol plant, and finished SAF moves out in two directions from the same footprint: by pipeline or truck to the DTW fuel farm for direct airline offtake, and by rail or barge to the Port of Detroit for export via the St. Lawrence Seaway to European and other international buyers, or for blending into marine fuel.

Economic Impact

A right-sized regional ATJ facility (on the order of 30 to 90 million gallons of SAF per year) would require roughly 100 to 300 million gallons of ethanol feedstock annually (depending on conversion yield), which translates to incremental demand for corn on the order of tens of millions of bushels a year: a meaningful share of Michigan's current in-state surplus. For participating farmers, the benefit shows up in three places: a firmer local basis as a new buyer competes for supply that currently gets discounted for export; a premium opportunity for growers who can document low carbon intensity practices and sell into that verified supply chain; and, indirectly, higher utilization (and thus more stable corn-buying behavior) at Michigan's existing ethanol plants if they become ethanol suppliers to the ATJ facility.

Funding and Policy Opportunities

State and federal policies and incentives are vital to SAF projects' financial viability. Although Michigan lacks SAF-specific policies or incentives compared to other states, this presents an opportunity for action rather than a barrier to exploration. One opportunity being explored is reauthorizing the federal Opportunity Zone program, which lets states re-designate distressed census tracts for investment incentives. Michigan's governor, guided by the Michigan Economic Development Corporation (MEDC), can designate new Opportunity Zones from a map of

distressed census tracts during a 90-day period starting July 1, 2026. These designations, certified by the Department of Treasury, will remain in effect for ten years. Several areas relevant to this project, including sites near Marathon Petroleum, DTW, and The Andersons' Albion ethanol facility, are potential Opportunity Zone candidates.

This includes a specific group of census tracts centered on the project's two main assets. In Prosperity Region 10, this covers the tract with DTW and nearby tracts near the Port of Detroit and petroleum infrastructure. In Prosperity Regions 6 and 8, the tracts around the Michigan ethanol plants in Albion, Bad Axe, and Caro could attract investment in infrastructure like carbon sequestration at the production end of the supply chain.

On the federal side, the 45Z Clean Fuel Production Credit is still the main subsidy for SAF production, but Congress lowered its SAF-specific rate from $1.75 to $1.00 per gallon in 2025, making SAF equal to renewable diesel instead of higher. (Starr and Lewis 2025; Fatka 2025; Ayoub and Parum 2025)

Benefits

A shared opportunity only becomes an actionable partnership when each stakeholder can see a specific, concrete benefit to their own participation. For a sustainable fuel hub to succeed, it must show the value it provides for farmers, end users, and the environment.

Farmer Benefits

Corn and soybean prices are set by national and international market forces largely outside of individual control. This project will give Michigan farmers an additional source of revenue by creating a new regional, value-added market for their crops. A buyer in the region can offer farmgate premiums tied to reduced transportation costs, and verified conservation practices can generate an additional carbon-intensity value that farmers can monetize through a book-and-claim system in addition to regular commodity sales. Rather than replacing existing commodity markets, this approach lets participating farmers earn additional value from both their crops and the conservation practices they already use, while increased regional demand could further strengthen market opportunities.

This new-market effect is likely the single largest benefit for farmers. Rather than competing for a shrinking share of existing feed, ethanol, and export demand, participating farmers gain an additional, in-state buyer for corn that would otherwise leave the state. Farmers who go a step further and document low carbon intensity practices stand to gain the most, since a lower feedstock carbon-intensity score directly increases the value of the 45Z tax credit available to the fuel producer and, in turn, the premium a producer can afford to pass back to growers.

End-User Benefits

For airlines, shippers, and other end users, the benefit runs the other direction: a dependable, regionally sourced supply of sustainable fuel offers price and supply predictability that fuel sources from refineries further away cannot. It also provides a documented, verifiable carbon

pathway, backed by MAEAP verification or CORSIA-aligned practices, that end users can point to when meeting their own climate commitments or regulatory requirements in markets like the EU.

Positive Environmental Impacts

Beyond the significant carbon benefit captured through farm-level conservation practices, this project offers a second, complementary environmental pathway: carbon sequestration tied to production itself. Michigan's geology allows for deep-well carbon capture, an advantage not shared by most other Midwest states, which means that carbon dioxide generated during ethanol or biofuel production can be captured and permanently stored rather than released. Several Michigan ethanol facilities are already implementing or exploring proximity carbon capture, giving this project a template from which to build. Combined with MAEAP-verified farm practices, this creates a dual carbon benefit—sequestration at the production site and verified farm-level reduction—that few competing regions can offer together.

To translate either carbon pathway into monetized value, certification under a recognized monitoring, reporting, and verification (MRV) framework is required. In the United States, the 45Z Clean Fuel Production Credit requires use of the Treasury and Department of Energy (DOE) 45ZCF-GREET model, but SAF producers can choose the CORSIA Default or CORSIA Actual methodologies instead. Internationally, fuel sold into markets subject to the ReFuelEU mandate must separately meet the EU's own sustainability criteria, which do not currently recognize corn-based ATJ fuel as qualifying.

Power of Partnerships

A project of this scale cannot succeed with any single stakeholder group acting alone. Feedstock, financing, production, distribution, and end users all depend on one another. Farmers and grain handlers, biofuel producers and technology providers, airlines and shippers, government agencies and regulators, and lenders and investors all must move in coordination to ensure the project's success. As the project moves from ideation to real investments, each partner will support key components of the work, including:

- **Feedstock aggregators and grower cooperatives:** Seed producers, Michigan Corn Growers Association members, elevators, and existing ethanol plants, to originate and stabilize corn and ethanol supply
- **A technology licensor:** An established ATJ process provider, such as LanzaJet-style ATJ licensors or corn-oil and ethanol upgrading technology providers, to de-risk the conversion step
- **A project developer and engineering, procurement, and construction (EPC) partner:** To manage permitting, construction, and commissioning of the conversion facility
- **An airline or airline alliance offtaker:** Ideally, this is Delta Air Lines, because DTW is a Delta hub; cargo carriers and marine bunker-fuel buyers are secondary offtake
- **Midstream and logistics partners:** The Wayne County Airport Authority (fuel farm access), the Detroit/Wayne County Port Authority (bulk liquid storage and export), and Class I railroads (CSX and Norfolk Southern both serve Southeast Michigan), to move feedstock and product

- **Public partners:** MDARD, the MEDC, and federal agencies (e.g., USDA, DOE), to administer grant and loan-guarantee programs relevant to biofuel infrastructure
- **Capital partners:** Infrastructure and agriculture-sector investors, and potentially the corn growers themselves through a cooperative equity structure

The Path Forward

Michigan has a strong agricultural base, a uniquely confluent set of logistics, and access to a large corn and soybean supply capable of supporting feedstock demand. A sustainable fuel hub of this type could support local agriculture, strengthen domestic sustainable fuel supply chains, and position Michigan as an early leader in the SAF market. As one of the first projects of its kind in the state and the region, there may also be long-term strategic advantages tied to early market positioning and future regulatory alignment.

Bringing this project from concept to operation requires investment and action at a few key phases, with cost and commitment increasing as the project moves from coalition-building to construction.

Phase One: Build the Coalition and Define the Regional Supply Chain

Preliminary research suggests that Southeast Michigan has the feedstocks, infrastructure, market access, and potential partners needed to support a Great Lakes SAF Hub. Phase one will test these findings directly with prospective participants and convert preliminary assumptions into verified information, clearly defined roles, and documented commitments. Key actions include convening a steering group of anchor partners across agriculture, production, demand, and government; securing early letters of support from partners such as DTW and the Port of Detroit; and using the Great Lakes Sustainable Fuel Symposium as a public convening moment to formally assemble the coalition. Opportunity Zone designation filing is a time-sensitive action that should be done in tandem with the coalition-building rather than during the feasibility phase.

Before moving to phase two, the coalition will formally address and answer the following questions:

1. Is there sufficient partner interest and leadership to advance the opportunity?
2. Is there enough suitable regional feedstock? Are farmers willing and able to adopt and verify the conservation practices needed to meet carbon-intensity requirements?
3. Which regional assets could support production and distribution?
4. Is there credible early demand for regionally produced SAF, including interest in future purchase or offtake agreements?
5. Is the regional supply chain opportunity strong enough to justify a full feasibility study, and what questions must the next phase resolve?

The estimated cost of this phase is $1 million to $2 million for pre-feasibility study, coalition coordination and facilitation, and technology expert consultation.

Phase Two: Fund and Formalize Feasibility Work

A feasibility study, including evaluating site control, logistics, preliminary permitting, and capital structure options as well as a techno-economic analysis (TEA) to evaluate the economic performance of the SAF technologies will provide assurances for future investments that the hub is both technologically and economically realistic. Key actions include scoping, funding, and conducting the feasibility study and TEA analysis through sources such as DOE grants, MEDC funds, or a private sponsor.

A pre-feasibility study of this kind typically spans six linked workstreams: technology and site feasibility (selecting a conversion process and evaluating candidate sites for rail, pipeline, airport, and port access); demand and offtake strategy (securing airline, corporate, and marine anchor buyers before capital is committed); capital stack and funding strategies (identifying investors, structuring grower equity, and confirming Opportunity Zone and loan-guarantee eligibility); partnership structure (finalizing roles for feedstock aggregators, the technology licensor, the project developer, and offtakers); logistics and infrastructure planning (sizing storage, transportation mode, and distribution routes to DTW and the Port of Detroit); and financial modeling and scenario testing (stress-testing feedstock price volatility, policy changes, capital cost overruns, and SAF price premiums). Structuring the study around these six workstreams gives the coalition a concrete way to divide the brainstorming already underway into discrete, assignable questions for phase two and phase three.

Phase two work will clarify understanding of the feasibility, cost, and logistics of building a sustainable fuel hub. Proceeding to phase three depends on whether a viable financial model can be identified.

Phase Three: Structure the Investment

If feasibility confirms viability, this phase will be conducted in two parts. First, front-end engineering design (FEED), estimated at $50 million to $100 million, will produce detailed engineering, permitting-ready design, and firm equipment specifications. Construction and commissioning follow, and are estimated to cost between $1 billion and $3 billion based on comparable sustainable fuel production projects. Key actions include defining the capital stack (public incentives, private equity, anchor-partner equity) and securing at least one signed offtake agreement with a demand-side partner before approaching private capital in earnest.

Each phase de-risks and informs the next, and no phase requires the full investment commitment up front. The region's feedstock base, existing logistics infrastructure, and demand-side interest are already in place—what remains is coordinated action to move from concept to commitment.

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