Sustainability Action Study

Draft Technical Appendix

Acronyms / Abbreviations

AAS	As a Service
AFC	Alternative Fuel Corridor
BBO	Buy-Build-Operate
BET	Battery Electric Truck
BEV	Battery Electric Vehicles
BIL	Building and Infrastructure Law
BOT	Build-Operate-Transfer
CARB	California Air Resources Board
CI	Carbon Intensity
CMV	Commercial Motor Vehicle
CNG	Compressed Natural Gas
CNG	Compressed Natural Gas
CRISI	Critical Rail Infrastructure and Safety Improvements
DB	Design Build
DCFC	Direct Current Fast Charger
DERA	Diesel Emissions Reduction Act
DOE	Department of Energy
EA	Environmental Analysis
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EPD	Environmental Product Declaration
EV	Electric Vehicle
EVSE	Electric Vehicle Service Equipment
FAR	Floor Area Ratio
FCET	Hydrogen Fuel Cell Electric Truck
FHWA	Federal Highway Administration
FOG	Fats, Oils, Grease
FPPA	Farmland Protection Policy Act
FRA	Federal Railroad Administration
GFA	Gross Floor Area
GHG	Greenhouse Gas

GWP	Global Warming Potential
HB	House Bill
HD	Heavy Duty
HFC	Hydrofluorocarbon
ICE	Infrastructure Carbon Estimator
ICET	Internal Combustion Engine Truck
INFRA	Infrastructure for Rebuilding America
ITE	Institute of Transportation Engineers
JA	Jurisdictional Area
JCLRP	Joint Chiefs Landscape Restoration Partnership
LCA	Life Cycle Assessment
LCFS	Low-carbon Fuel Standard
LD	Light Duty
LID	Low Impact Development
LNG	Liquified Natural Gas
LPA	Local Public Agency
LPG	Liquefied Petroleum Gas
MARAD	US Maritime Administration
MEP	Mechanical, electrical, and plumbing
MOVES	Motor Vehicle Emission Simulator
MPDG	Multimodal Project Discretionary Grant
NAAQS	National Primary or Secondary Ambient Air Quality Standard
NEVI	National Electric Vehicle Infrastructure
NRCS	Natural Resource Conservation Service
NWI	National Wetland Inventory
NWQ	Northwest Quadrant
O&M	Operation and Maintenance
OED	Office of Energy Development
OEM	Original Equipment Manufacturer
P2	Pollution Prevention Grant Program
P3	Public Private Partnership
PM2.5	Fine Inhalable Particles, with Diameters that are Generally 2.5 Micrometers and Smaller

RAISE	Rebuilding American Infrastructure with Sustainability and Equity
RBF	Results Based Finance
RCO	Riparian Corridor Overlay
RD	Renewable Diesel
RH2	Renewable Hydrogen
RMP	Rocky Mountain Power
RNG	Renewable Gas
RNG	Renewable Natural Gas
SAS	Sustainability Action Study
SEP	State Energy Program
SIP	State Implementation Plan
SITLA	School and Institutional Trust Lands Administration
SLB	Sustainability Linked Bonds
SLCIT	Salt Lake City Intermodal terminal
SRA	Source Reduction Asssistance
TCO	Total Cost & Ownership
TFP	Transmission Facilitation Program
UCC	Utah Clean Cities
UDEQ	Utah Department of Environmental Quality
UDOT	Utah Department of Transportation
UIPA	Utah Inland Port Authority
USDOT	United States Department of Transportation
UTA	Utah Transit Authority
VGF	Viability Gap Funding
VMT	Vehicle Miles Traveled
WBLCA	Whole Building Life Cycle Assessment
WRI	Watershed Restoration Initiative
WTW	Well to Wheel
ZNZE	Zero- and Near Zero-Emission
ZE	Zero Emission

Organization of the Technical Appendix

This document provides the technical supporting information for the Utah Inland Port Authority's (UIPA's) Sustainability Action Study (SAS).

Current air quality conditions and the potential impacts of future development on the area's air emissions are major concerns of UIPA and its partners and stakeholders. Therefore, this Technical Appendix includes details on the zero- and near-zero-emission (ZNZE) transportation technologies that can reduce and mitigate air quality impacts.

This Technical Appendix also summarizes factors considered in the analysis of the land carrying capacity within the UIPA jurisdictional area (JA). Carrying capacity refers to the ability of a region to accommodate development in consideration of a variety of factors. In this assessment, the factors considered include air quality and energy, natural resources, habitat, and animal life, and the transportation system.

Insights from carrying capacity analysis have informed a sustainable land use development framework for the UIPA JA. The framework will inform UIPA's efforts for influencing coordinated land and transportation system development within the JA.

Finally, the Technical Appendix provides an overview of the federal and state funding sources and finance options that can help UIPA advance sustainability strategies and standards and zero-emission (ZE) technologies within the JA.

UIPA may update this Technical Appendix as new and/or additional information about the underlying data become available.

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Appendix A: Zero- and Near Zero- Emission Technology Options and Cost Analysis

There are several alternative fuels that can be considered for use in port-related vehicles depending on their application, each with respective environmental benefits and practical advantages and disadvantages. Emissions from these vehicles are typically measured in the following two ways:

- **Well-to-Wheel Emissions:** Well-to-wheel (WTW) emissions include all lifecycle emissions related to fuel production, processing, distribution, and use. WTW emissions for the same fuel derived from different feedstocks can vary due to the emissions resulting from the use of those different feedstocks. For example, electricity produced using coal will have different WTW emissions than electricity produced using wind.

- **Tailpipe Emissions:** Tailpipe emissions include only those emitted directly from a vehicle or equipment when the vehicle or equipment is in operation. Unlike WTW emissions, tailpipe emissions do not account for greenhouse gases or criteria pollutants emitted from the production, processing, or distribution of fuel.

Figure 1 shows how alternative fuels compare to diesel from a WTW perspective. The WTW emissions data below is generalizable because it is reported in grams of carbon dioxide equivalent per megajoule (gCO2e/MJ) energy for each fuel. By comparison, tailpipe emissions are not shown as they can vary depending on several factors, such as the type of vehicle and engine used, the model year of the vehicle and engine, and what types of after-treatment systems are used in the vehicle. There are a number of factors that influence the WTW emissions of these alternative fuels. As shown, electricity as a vehicle fuel, although it does not generate tailpipe emissions, can still contribute to CO2 emissions depending on how the electricity is originally produced. It is important to ensure that the electricity fueling EVs is derived from relatively renewable sources, or else it may offset the efforts put towards transitioning from fossil-fuel-powered vehicles to cleaner alternatives. Nevertheless, alternative fuel heavy-duty vehicles will undoubtedly help remove pollutants from being released directly into the air in the Salt Lake County region.

FIGURE 1: WHEEL-TO-WELL EMISSIONS BY FUEL TYPE (GCO2E/MJ)

Fuel Type		Fuel Source	Well-to-Wheel (WTW) Emissions (gCO2e/MJ)
Conventional Fuels	Diesel	US Average	90.47
	Gasoline	US Average	90.17
Near Zero Tailpipe Emission Alternative Fuels	Compressed Natural Gas	US Average	73.74
		Landfill Gas	11.71
	Liquified Natural Gas	US Average	76.68
		Landfill Gas	12.91
	Liquified Petroleum Gas (Propane)	US Average	78.76
		Landfill Gas	13.07
	Biodiesel (BD100)	Soybean	29.85
	Renewable Diesel (RD100)	Corn	32.62
Zero Tailpipe Emission Fuels	Electricity	US Average	122.15
		CA Average*	75.32
		Renewables	0.00
	Hydrogen	Natural Gas	95.54
		Electrolysis (Solar)	0.00

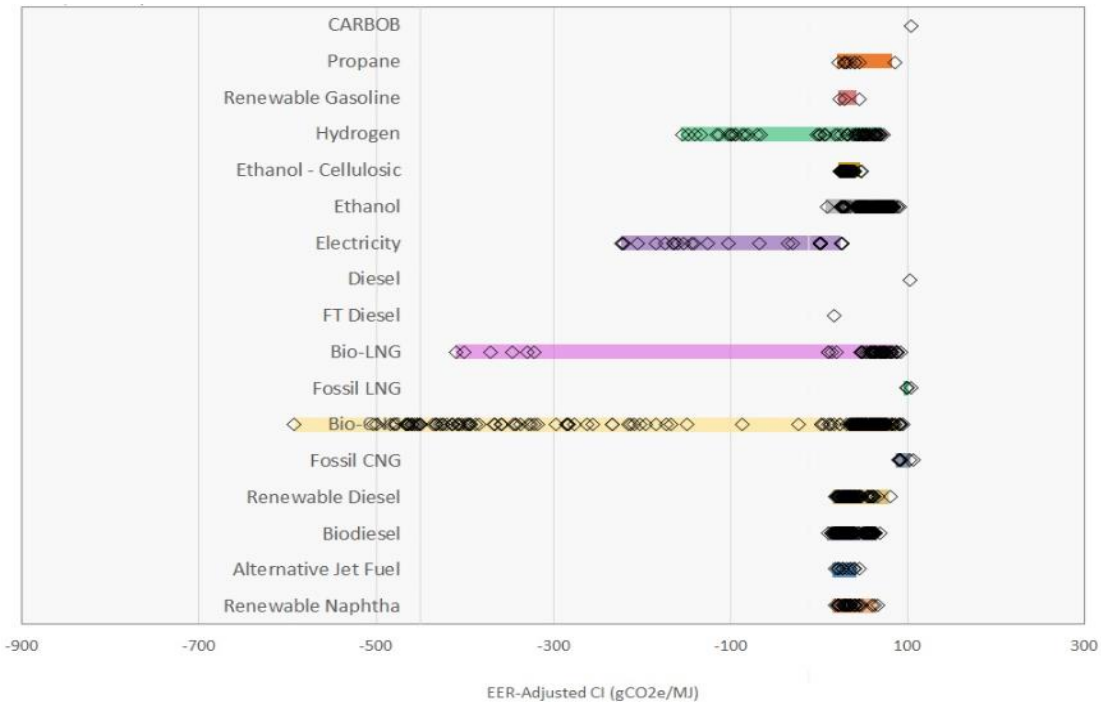
Source: Argonne National Laboratory, Greet WTW Calculator and Sample Results from GREET, 2021. In Argonne National Laboratory. Retrieved March 29, 2022, from https://greet.es.anl.gov/results.

*This source from Argonne National Laboratory (Footnote 14) only includes California state average data; it does not include state-based electricity emissions data for the State of Utah. However, U.S. Energy Information Administration data shows that Utah's monthly statewide electricity in June 2022 was generated using 80% fossil fuels (natural gas, coal) and 20% renewables (hydroelectric, nonhydroelectric renewables). By comparison, California's monthly statewide electricity in June 2022 was generated using 40% fossil fuels (natural gas) and 60% renewables (nuclear, hydroelectric, and nonhydroelectric renewables). Because of this, the well-to-wheel emissions of electricity generated using Utah's average grid mix is expected to be higher than the 75.32 gCO2e/MJ shown for California in the table above. Source: U.S. EIA Electric Power Monthly, June 2022.

Replacing conventional gasoline and diesel vehicles with alternative fuel vehicles is necessary to achieve local and regional environmental targets, particularly in the heavy-duty vehicle sector. The UIPA will need to utilize a diverse set of available alternative fuels and technology options to meet the needs and scale of UIPA operations. The most viable zero- and near-zero-emission fuels for heavy-duty trucks include renewable diesel, natural gas, hydrogen, and electricity. Each of these fuels can provide varying levels of emissions reductions, which depend on a number of factors, including fuel production processes, fuel feedstocks, and the uses of the vehicles.

Figure 2 shows the ranges of carbon intensity (CI) for a variety of fuels compared to the two baseline fuels (gasoline and diesel), represented as the grams of carbon dioxide equivalent per megajoule of energy provided by that fuel (gCO2e/MJ). Each marker represents an individual certified fuel pathway CI, adjusted by its Energy Economy Ratio (EER). Importantly, the CI of each fuel may vary depending on the feedstock used to produce the fuel, as well as the production processes used by fuel producers; each diamond on the figure represents a single fuel product, and the colored range bars represent the range of CI for each fuel across all producers. For example, bio-CNG has a CI range between roughly 600 to 100 gCO2e/MJ depending on the feedstock, production facility energy use, and distance from the production site to the customer.

FIGURE 2: TRANSPORTATION FUEL CARBON INTENSITY VALUES FROM CALIFORNIA'S LCFS



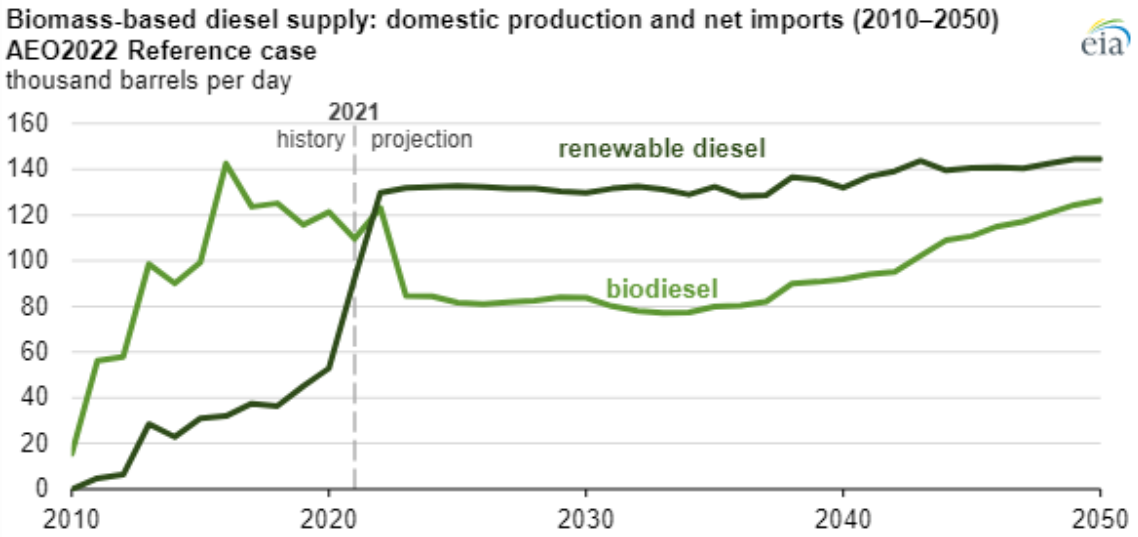
Source: CARB, LCFS Pathway Certified Carbon Intensities, 2022.

Renewable Diesel

Diesel will likely remain a primary transportation fuel for a number of years until low- and no-carbon fuels reach market maturity, particularly in the heavy-duty sector. Heavy-duty vehicles have long been fueled by diesel due to their reliability and availability in the market. Diesel fueling infrastructure is also ubiquitous. Renewable diesel (RD) is chemically identical to conventional diesel but is produced from renewable sources, including fats, oils, grease (FOG), solid waste, and biomass feedstocks. RD produces similar tailpipe emissions to conventional diesel, though it reduces lifecycle emissions by up to 85 percent, depending on the feedstock and facility.[1] RD production in the United States has increased significantly since 2010 and is projected to soon surpass biodiesel in barrels produced, according to EIA's Annual Energy Outlook 2022 (Figure 3).

[1] Oregon DEQ. (n.d.). Renewable Diesel 101. Retrieved from https://www.oregon.gov/deq/FilterDocs/cfpdieselfaq.pdf

FIGURE 3: CURRENT AND PROJECTED U.S. RENEWABLE DIESEL PRODUCTION



Source: EIA projects, U.S. renewable diesel supply to surpass biodiesel in AEO2022, 2022: https://www.eia.gov/todayinenergy/detail.php?id=51778

With the introduction of ultra-low sulfur diesel (ULSD) regulations in 2010, diesel-fueled vehicles have shown a reduction in tailpipe emissions, an important step in reducing criteria pollutants like nitrogen oxides and PM.[2] As a next step, the California Air Resources Board (CARB) established three standards for low NOx HD engines in 2013: 0.02 grams per brake horsepower-hour (g/bph-hr), 0.05 g/bhp-hr, and 0.10 g/bhp-hr. As of February 2022, no diesel-fueled engines are certified to meet the CARB low NOx standard, and all certified engines are either natural gas engines or those fueled by liquefied petroleum gas (LPG, commonly propane).

These voluntary standards only apply to vehicles in California, but they can be used as a guide for other entities exploring HD vehicle deployment in other states. They can also qualify entities for additional federal funding. Under U.S. EPA's Diesel Emissions Reduction Act (DERA) program, a replacement vehicle with an engine certified to meet CARB's low NOx standards can be funded at 35 percent compared to the typical 25 percent funding for vehicles only meeting the EPA's 0.20 g/bhp-hr standard.[3,4]

Natural Gas

Conventional natural gas, although small in scale compared to diesel – accounting for about 4 percent of U.S. transportation energy consumption in 2021 – offers advantages compared to diesel. Primarily, natural gas tends to produce fewer NOx and CO2 emissions. Moreover, with breakthroughs in engine technologies, many low NOx engines run on natural gas. As of February 2022, CARB has certified over 40 low NOx heavy-duty engines that run on natural gas and 11 that run on LPG.[5]

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[2] U.S. Environmental Protection Agency. Diesel Fuel Standards and Rulemakings. Retrieved from https://www.epa.gov/diesel-fuel-standards/diesel-fuel-standards-and-rulemakings

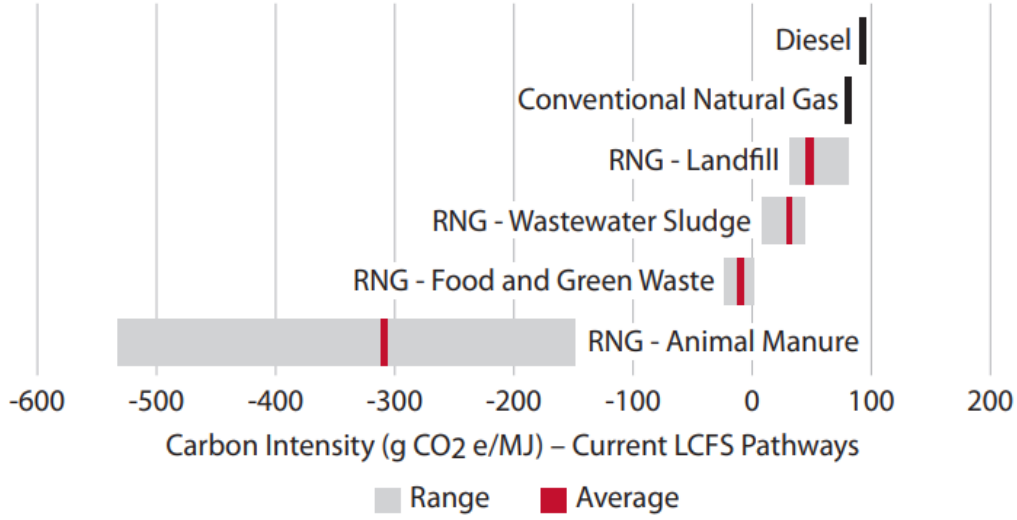
[3] U.S. Environmental Protection Agency. (2021, January). How to Identify Low NOx Certified Engines. Retrieved from https://www.epa.gov/sites/default/files/2021-01/documents/420f21002.pdf

[4] California Air Resources Board. (2022, February 24). List of Optional Low NOx Certified Heavy-Duty Engines. Retrieved from https://ww2.arb.ca.gov/sites/default/files/2022-03/Optional%20Low%20NOx%20Certified%20Heavy-Duty%20Engines-as%20of%2002242022-1_0.pdf

[5] CARB. (2022, February 24). List of Optional Low NOx Certified Heavy-Duty Engine. Retrieved from https://ww2.arb.ca.gov/sites/default/files/2022-03/Optional%20Low%20NOx%20Certified%20Heavy-Duty%20Engines-as%20of%2002242022-1_0.pdf

Renewable natural gas (RNG), also called biomethane, is considered a pipeline-quality gas that can be used interchangeably with conventional natural gas. RNG can be produced from different feedstocks, and each exhibit different carbon intensities. With that said, regardless of feedstock, RNG is produced through the decomposition of organic matter, including through the collection of biogas from landfills, wastewater treatment plants, and livestock fertilizer. Figure 4 shows the carbon intensity of diesel, conventional gas, and RNG by feedstock and shows that RNG generally has fewer emissions compared to conventional fuels. That said, RNG produced from animal manure shows a substantial reduction in carbon intensity compared to green waste, wastewater, and landfill gas.

FIGURE 4: RNG CARBON INTENSITY BY FEEDSTOCK



Source: University of Utah, Renewable Natural Gas: A Sustainable Approach to the Energy Transition, 2021: https://gardner.utah.edu/wp-content/uploads/Renewable-Energy-Dec2021.pdf?x71849

RNG is increasingly being converted into liquified (LNG) and compressed natural gas (CNG) to be used as a replacement fuel in natural gas vehicles, including heavy-duty trucks. In order to be used in vehicles, RNG undergoes purification that removes water, carbon dioxide, hydrogen sulfide, and other trace elements. The upgrading process increases the methane content and produces a suitable transportation fuel.[6] According to the University of Utah, there are approximately 8.1 billion cubic feet per year of RNG that could be produced within Utah across all feedstock sources. Animal manure is estimated to be the highest source of RNG within the state, followed closely by food waste (Figure 5).

[6] AFDC. (n.d.). Renewable Natural Gas Production. Retrieved from https://afdc.energy.gov/fuels/natural_gas_renewable.html#:~:text=Renewable%20natural%20gas%20%28RNG%29%20is%20a%20pipeline-quality%20gas,matter%29%20that%20has%20been%20processed%20to%20purity%20stand

FIGURE 5: UTAH FEEDSTOCKS FOR RENEWABLE NATURAL GAS

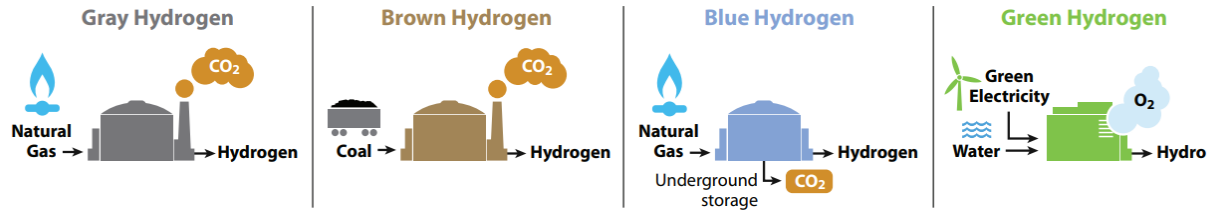
Source		Annual RNG Feedstock	Potential RNG (billion cubic feet/yr)	Range of Feedstock Carbon Intensity (gCO2e/MJ)
Animal Manure	**Swine - 1 MM**	**1.2MM tons manure**	**3.7**	**(525)-(150)**
	Cows - 95,000	**2.6MM tons manure**		
Landfill Gas	**8 Landfills**	**2.6 billion ft3 biogas**	**1.0**	**40-80**
Wastewater	**2 Facilities**	**92,000 gallons sludge**	**0.7**	**10-40**
Food waste	**Wasatch RR**	**1MM ton of food waste**	**2.7**	**(25)-0**
Total Utah RNG Production			**8.1**	**-**
Utah Natural Gas Demand in 2020			**211.6**	**-**

Source: University of Utah, Renewable Natural Gas: A Sustainable Approach to the Energy Transition, 2021: https://gardner.utah.edu/wp-content/uploads/Renewable-Energy-Dec2021.pdf?x71849

Hydrogen

Hydrogen production can be categorized into four different types: gray hydrogen, brown hydrogen, blue hydrogen, and green hydrogen. Gray hydrogen is produced using fossil fuels, typically natural gas. Brown hydrogen is produced using coal. Blue hydrogen is produced from fossil fuel feedstocks but incorporates carbon capture to reduce emissions. Lastly, green hydrogen is produced using a carbon-neutral energy source such as wind power or biomass (Figure 6).[7]

FIGURE 6: HYDROGEN PRODUCTION PROCESSES



Source: CEC. (n.d.). Hydrogen Fact Sheet, 2021: https://www.energy.ca.gov/sites/default/files/2021-06/CEC_Hydrogen_Fact_Sheet_June_2021_ADA.pdf

In the United States, steam-methane reforming (SMR) is the most common hydrogen production method due to the abundance and low cost of natural gas. The process uses high-temperature steam to heat methane and produces hydrogen, with carbon monoxide and carbon dioxide as by-products.[8]

Renewable hydrogen (RH2), or green hydrogen, is produced by splitting water into hydrogen and oxygen using renewable electricity or organic material (biomass). This process produces hydrogen and oxygen, the former of which is collected and used in various end uses, including as a transportation fuel. The oxygen is typically released as a by-product unless there is a local need for it. Renewable hydrogen can be produced using two technologies: electrolysis and anaerobic digestion. A third technology, thermochemical processes, is currently in the commercial prototype phase. RH2 technology options are summarized in Figure 7.

[7] CEC. (n.d.). Hydrogen Fact Sheet. Retrieved from https://www.energy.ca.gov/sites/default/files/2021-06/CEC_Hydrogen_Fact_Sheet_June_2021_ADA.pdf

[8] U.S. DOE. (n.d.). Hydrogen Production: Natural Gas Reforming. Retrieved from https://www.energy.gov/eere/fuelcells/hydrogen-production-natural-gas-reforming

FIGURE 7: RENEWABLE HYDROGEN PRODUCTION TECHNOLOGY SUMMARY

Technology Group	Subgroups	Description	Deployment Status
Electrolysis	• Alkaline • Polymer Electrolyte Membrane (PEM) • Solid Oxide	Uses applied voltage to drive a catalyzed electrochemical reaction completed via an electrolyte to evolve hydrogen and oxygen	Commercial
Anaerobic Digestion	• High vs. low solids • Batch vs. continuous	Decomposition of organic material via anaerobic reaction to form methane, CO_2, and minor constituents	Commercial
Thermochemical	• Gasification (several types) • Pyrolysis • Hydrothermal	Use of heat and/or pressure to extract volatile material from biomass-producing syngas (mostly hydrogen and carbon monoxide), which is further reacted and purified to hydrogen or methane	Commercial Prototype

Source: CEC., Roadmap for the Deployment and Buildout of Renewable Hydrogen Production Plants in California, 2020: https://www.energy.ca.gov/publications/2020/roadmap-deployment-and-buildout-renewable-hydrogen-production-plants-california

There is currently no hydrogen production capacity in Utah, according to the Energy Information Agency (EIA). However, there are plans to convert the existing coal-fired power, Intermountain Power Plant, to a hydrogen production facility. Such development would increase the capacity of hydrogen fuel production in Utah, which could support the fueling of future hydrogen fuel cell electric vehicles (FCEV) deployed and operated in and around the UIPA JA. An important consideration would be the method used for hydrogen production as some processes, such as electrolysis or Green Hydrogen production, require large amounts of water, which can be a challenge in Utah if climate change results in less precipitation.

Conversion of Intermountain Power Project to Hydrogen

The Intermountain Power Plant near Delta is transitioning from coal at its two 900-megawatt units to natural gas and hydrogen. The plant will host two combined cycle units to use those two energy resources in a transition expected by mid-2025. By 2045, it will run purely on hydrogen.

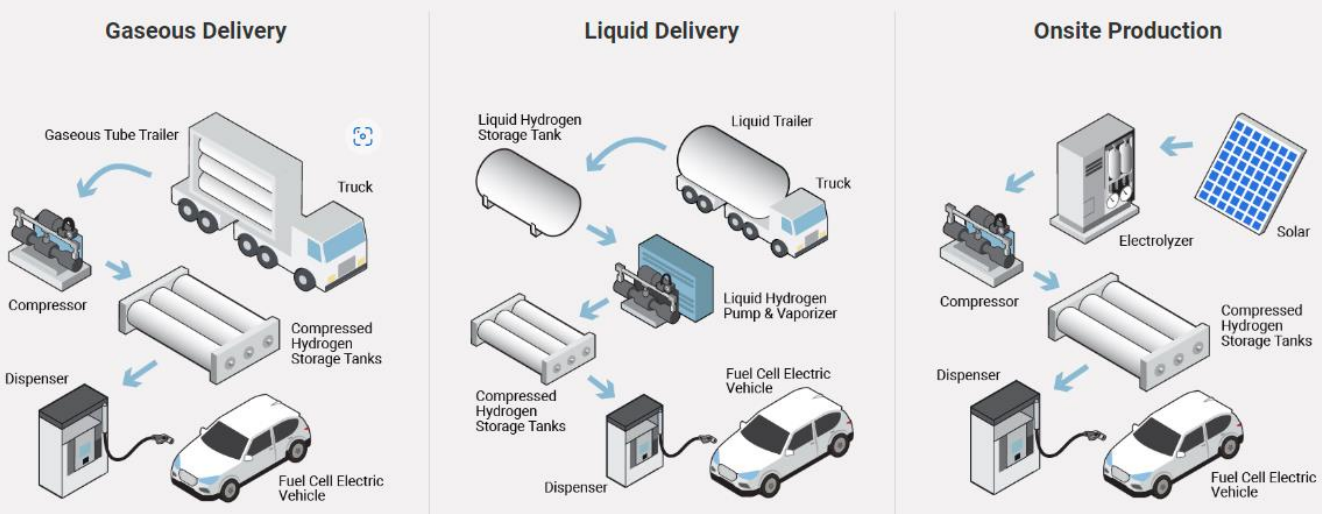
Source: Green Hydrogen Coalition. (n.d.). Intermountain Power Project in Delta, Utah, is the world's first gas turbine intentionally designed and built to operate on 100% carbon-free green hydrogen, 2020.

In addition to considerations for how hydrogen is produced, one must also consider how hydrogen is delivered to the end user. Current hydrogen delivery systems include gaseous hydrogen delivery, liquid hydrogen delivery, and on-site hydrogen production and storage. Gaseous hydrogen delivery entails compressing hydrogen prior to transport, which is then delivered by truck or pipeline to the customer. Liquid hydrogen delivery converts hydrogen to liquid form by cooling it below -423 degrees Fahrenheit using a process called cryogenic liquefaction. It is then transported as a liquid in super-insulated, cryogenic tanker trucks to its end destination. Before dispensing the hydrogen, it is vaporized into a high-pressure gaseous product. Hydrogen may also be produced on-site using several processes, including the methods discussed in Table 10. On-site

production can reduce transportation and distribution costs but increase production costs due to the high capital costs of constructing production facilities.

UIPA should consider these various delivery pathways as it plans the development of hydrogen fueling infrastructure. Each has its own set of advantages and disadvantages with respect to emissions reduction, production capacity, and cost. For example, on-site hydrogen production via electrolysis would emit zero emissions since solar power would be used to power an electrolyzer that splits water into hydrogen, but it may have higher capital costs than other forms of hydrogen delivery. On the other hand, gaseous and liquid delivery of hydrogen would emit more emissions than electrolysis but may have lower capital costs, relatively. Figure 8 depicts the three types of hydrogen delivery pathways.

FIGURE 8: HYDROGEN DELIVERY PATHWAYS



Source: California Fuel Cell Partnership. (n.d.). Costs and Financing. Retrieved from https://h2stationmaps.com/costs-and-financing

Electricity

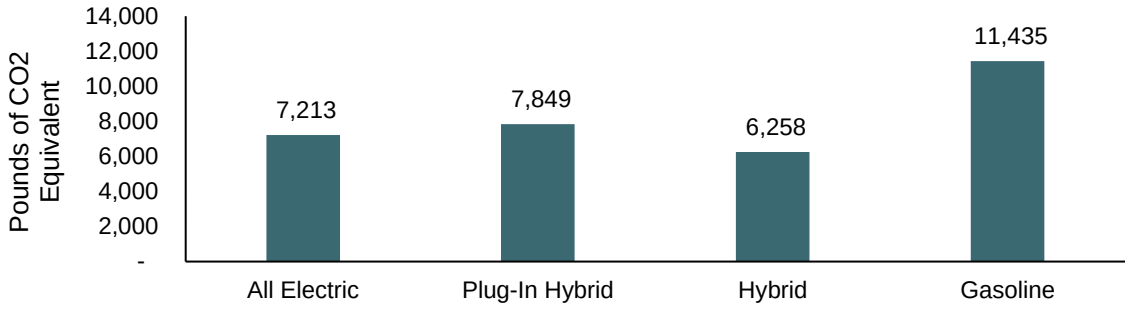
Electricity as a fuel provides the potential to significantly lower vehicle emissions, particularly as a state or region's electricity source mix transitions to more renewable resources (e.g., solar and wind). Battery electric vehicles (BEVs) are being designed for all vehicle weight categories and are becoming more ubiquitous in the market. Light-duty (LD) electric vehicles have been gaining market share in the past decade, particularly with the popularity of Tesla and as more incumbent OEMs offer more affordable electric vehicle models. Battery-electric vehicles in the heavy-duty vehicle segment have lagged behind, though, with only about 0.02 percent of the U.S. heavy-duty fleet being battery-electric.[9] Heavy-duty BEVs present unique technological barriers to the electric grid due to their significant power requirements. Utilities are beginning to work with governmental agencies and private industry to understand and plan for the impending demand that will come as more HD fleets begin to electrify. The required upgrades to energy infrastructure will be critical to reliably supply electricity to the HD vehicle segment.

When electricity is used as fuel in electric vehicles, there are zero tailpipe emissions. However, emissions are still produced when looking at the full WTW lifecycle based on the electricity's generation source. Indeed, electricity produced from fossil fuels, such as natural gas or coal, generates higher lifecycle emissions compared to electricity that is produced from renewable resources, such as solar or wind. Since 2015, the majority of new electric generating capacity in the state of Utah has been solar energy; however, the majority

[9] Muncrief, R. (2021, September). A Comparison of Nitrogen Oxide (NOx) Emissions from Heavy-Duty Diesel, Natural Gas, and Electric Vehicles. Retrieved from https://theicct.org/sites/default/files/publications/low-nox-hdvs-compared-sept21.pdf

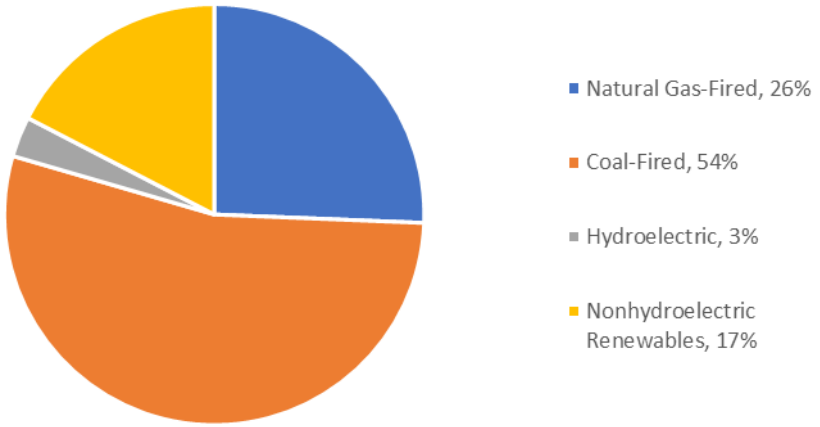
of electricity in Utah is still generated from coal.[10] With the current electricity mix in Utah, an all-electric LD vehicle will produce approximately 37 percent fewer emissions compared to a conventional gasoline vehicle (Figures 9 and 10). Moreover, lifecycle vehicle emissions will continue to decrease as the state of Utah adds more renewable energy resources. For UIPA, this means that future deployments of electric vehicles will be powered by increasingly cleaner sources of energy generation.

FIGURE 9: AVERAGE ANNUAL WELL-TO-WHEEL EMISSIONS PER VEHICLE, UTAH STATE AVERAGE



Source: US DOE Alternative Fuels Data Center, 2022: https://afdc.energy.gov/vehicles/electric_emissions.html

FIGURE 10: UTAH ELECTRICITY GENERATION BY SOURCE



Source: US Energy Information Administration Electric Power Monthly, June 2022, https://www.eia.gov/state/?sid=UT#tabs-4

Total Cost and Ownership Analysis

TCO Comparison #1: Class 8 Battery Electric Truck vs. Internal Combustion Engine Truck (Diesel)

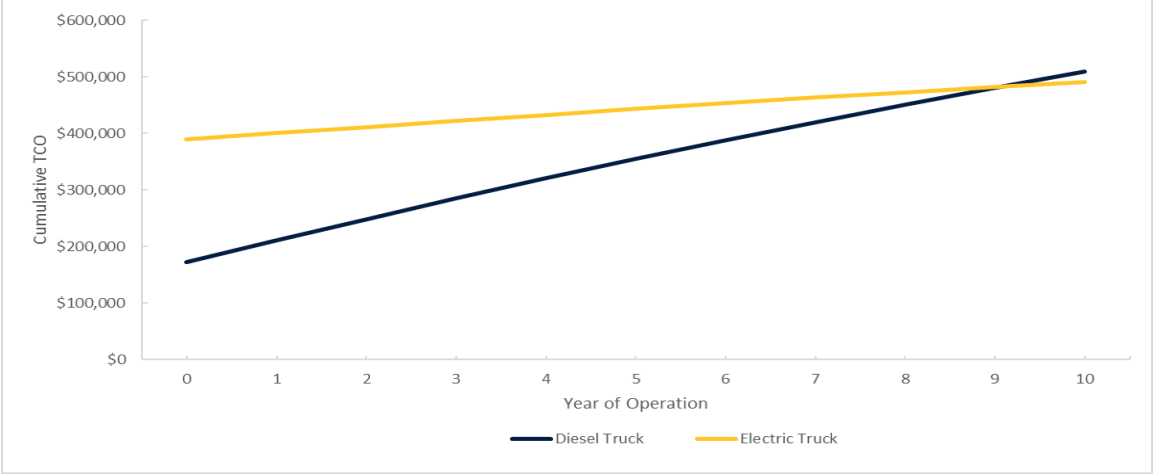
The following presents examples of the vehicle types for short-haul operations as well as the inputs and assumptions used for the comparison of the TCO costs associated with each. A total lifespan of 10 years is considered for both internal combustion engine truck (ICET) and battery electric truck (BET) vehicle engine types. While the initial purchasing price for BET is more than two times the price of ICET, the unit fuel cost for electricity is significantly lower than the unit diesel cost.

[10] U.S. Energy Information Administration. (2021, March 18). Utah State Profile and Energy Estimates. Retrieved from https://www.eia.gov/state/analysis.php?sid=UT

Assuming the same annual mileage (short-haul operation with about 37,000 miles per year), BET is expected to reach price parity with ICET in the ninth year of operation, indicating that with the current fuel prices, BET is not a quick cost-saving option for short-haul, low mileage operations.

Figure 11 below shows the estimated cost comparisons for a 2022 model year BET vs. ICET.

FIGURE 11: ESTIMATED CUMULATIVE TCO – DIESEL VS. BET CLASS 8 SHORT-HAUL TRUCK



Source: ICF analysis, 2022.

FIGURE 12: TCO COMPARISON #1 ASSUMPTIONS

Parameter	ICET Inputs	BET Inputs
Vehicle Lifespan	10	10
Vehicle Purchase Price	$143,862	$300,000
Infrastructure Cost	-	$20,000 (30 kW EVSE) $10,000 (installation)
Unit Fuel Cost	$4.877/gal	$0.0886/kWh
Vehicle Fuel Efficiency	5.42 MPG	16 MPGe (2 kWh/mi)
Vehicle Maintenance Cost per Mile	$0.19/mi	$0.14/mi
Annual Mileage	37,500	37,500
Federal Excise Tax	12% on Vehicle Purchase	12% on Vehicle Purchase
State Sales & Use Tax	7.75%	7.75%
Discount Rate	5%	5%
Maintenance Cost Escalation Rate	3.5%	3.5%
Fuel Cost Escalation Rate	US EIA AEO 2020 Reference Case	US EIA AEO 2020 Reference Case

Source: ICF analysis, 2022.

Findings from the BET VS ICET Comparison:

- The cost of electricity is lower than the cost of diesel, enabling the BET to yield operating cost savings which contribute to its relatively quick payback period. Lower BET maintenance costs also contribute to this.
- In the near- and mid-term future, the vehicle purchase price differential between BETs and ICET is expected to be lower than it is today due to expected reductions in battery pack costs and with economies of scale improvements.
- While vehicle and infrastructure purchase price incentives would lower the TCO of the BET in this example, a payback is estimated to occur without them after the ninth year of operation.
- Diesel price is one of the most sensitive variables in the TCO analysis; if diesel prices increase over time, the financial case for electric vehicles is improved.

TCO Comparison #2A: Class 8 Tractor – Hydrogen Fuel Cell Electric Truck vs. Internal Combustion Engine Truck (Diesel)

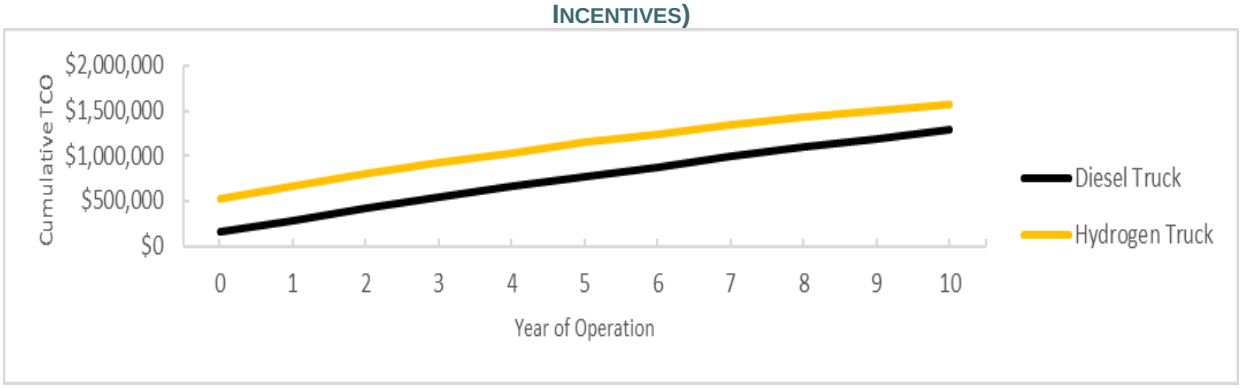
The following presents examples of the vehicle types for long-haul operations compared in this section, as well as the inputs and assumptions used for the comparison of the TCO costs associated with each. A total lifespan of 10 years is considered for both engine types. Of note about ICET assumptions is the two values that are different for short-haul vs. long-haul operations: 1) vehicle purchase prices are based on two separate publicly available data sources, both of which are within the typical price range for a Class 8 tractor (~$130K-$140K); (2) annual mileages are different due to the assumption of 150 miles/day for short-haul and 500 miles/day for the long-haul.

The short-haul operations in this scenario would be used for local deliveries (drayage-style route), while the long-haul truck would be used for more regional or line-haul deliveries.

The graphs below show the estimated cost comparisons for a 2022 model year fuel cell electric truck (FCET) vs. ICET. Due to the current significant fuel costs for FCET, hydrogen operations will not come into cost parity with ICET. But as shown below, this can change if the hydrogen costs come down in the future due to widespread adoption. Financial incentives for FCET purchases can also help these operations break even with ICET operations.

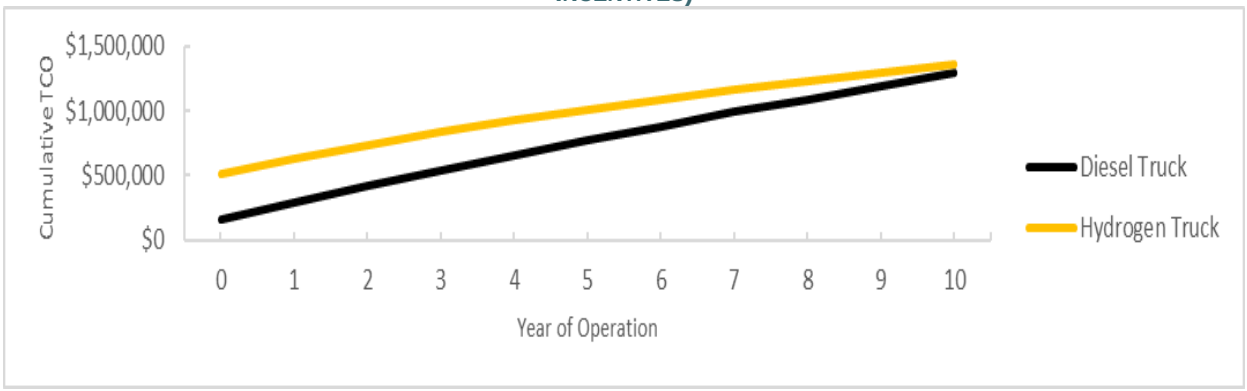
FCET Model:	ICET model:
Nikola Two FCEV	PeterBilt Model 579

FIGURE 13: ESTIMATED CUMULATIVE TCO - DIESEL VS. HYDROGEN CLASS 8 LONG-HAUL TRUCK ($10.21/KGH2, NO INCENTIVES)



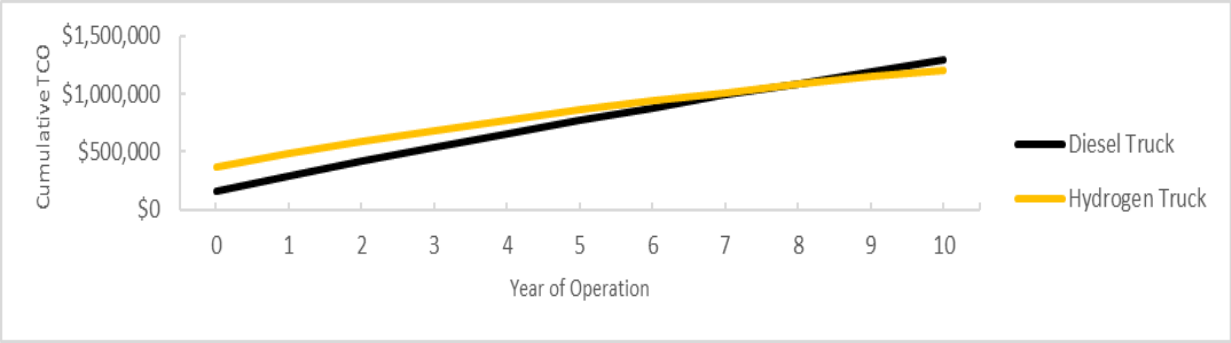
Source: ICF analysis, 2022.

FIGURE 14: ESTIMATED CUMULATIVE TCO - DIESEL VS. HYDROGEN CLASS 8 LONG-HAUL TRUCK ($7.50/KGH2, NO INCENTIVES)



Source: ICF analysis, 2022.

FIGURE 15: ESTIMATED CUMULATIVE TCO - DIESEL VS. HYDROGEN CLASS 8 LONG-HAUL TRUCK ($6/KGH2, $150,000 PURCHASE INCENTIVES)



Source: ICF analysis, 2022.

FIGURE 16: TCO COMPARISON #2A ASSUMPTION

Parameter	ICET Inputs	FCET Inputs
Vehicle Lifespan	10	10
Vehicle Purchase Price	$130,000	$431,480
Unit Fuel Cost	$4.877/gal	$10.21/kg
Vehicle Fuel Efficiency	5.42 MPG	10 mi/kgH2
Vehicle Maintenance Cost per Mile	$0.19/mi	$0.19/mi
Annual Mileage	125,000	125,000
Federal Excise Tax	12% on Vehicle Purchase	12% on Vehicle Purchase
State Sales & Use Tax	7.75%	7.75%
Discount Rate	5%	5%
Maintenance Cost Escalation Rate	3.5%	3.5%
Fuel Cost Escalation Rate	US EIA AEO 2020 Reference Case	Assume CAGR of -4%

Source: ICF analysis, 2022.

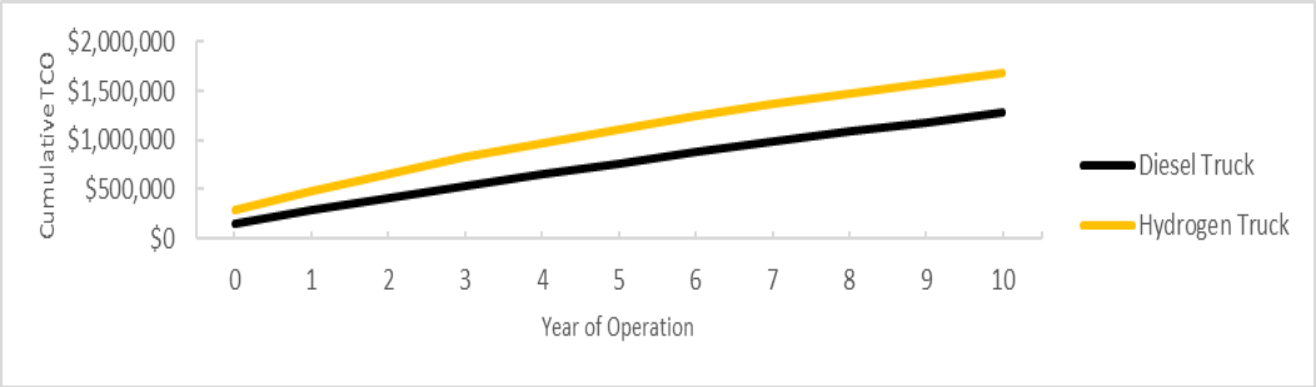
TCO Comparison #2B: What if a Conventional Truck is Retrofitted to a Hydrogen Fuel Cell Electric Truck?

Conventional diesel engine trucks can be retrofitted to use ZE propulsion technologies. An example is Hyzon Motor's Class 8 retrofit that runs on a hydrogen fuel cell system. The purchasing price for a retrofitted FCET is expected to be lower than a new FCET vehicle, while the fuel efficiency of a retrofitted FCET is expected to be lower (by at least 28%). Due to a lack of data on the average maintenance costs for such systems, it is assumed that the maintenance costs for retrofitted ICET are the same as a new ICET vehicle.

FCET Model: Hyzon Class 8

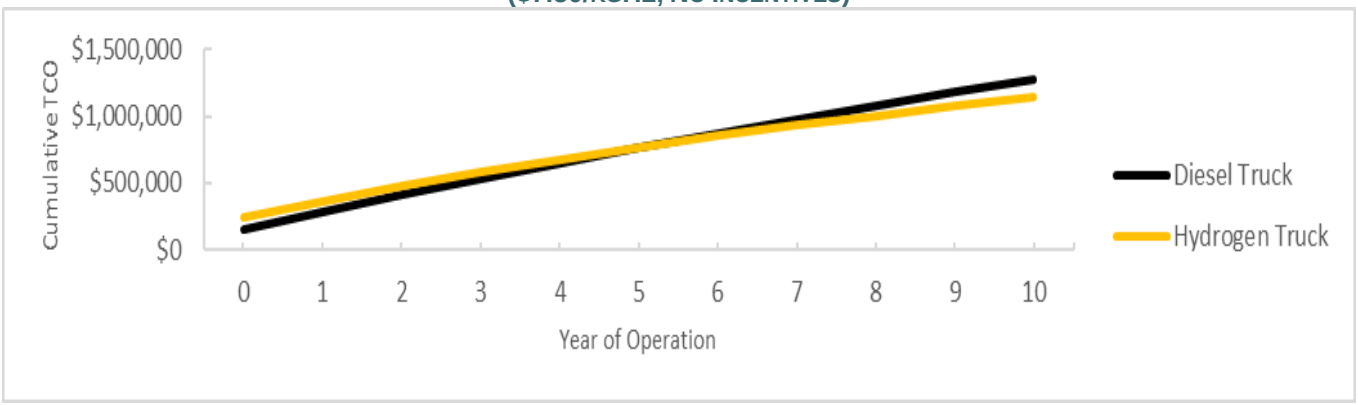
The graphs below show the estimated cost comparisons for a 2022 model year ICET vs. a retrofitted FCET. Similar to the previous scenario, due to the current significant fuel costs for FCET, hydrogen operations will not come into cost parity with ICET. But as shown, this can change if the hydrogen costs come down in the future due to widespread adoption. Financial incentives for FCET purchases can also help these operations break even with ICET operations faster.

FIGURE 17: ESTIMATED CUMULATIVE TCO - DIESEL VS. RETROFITTED HYDROGEN CLASS 8 LONG-HAUL TRUCK ($10.21/KGH2, NO INCENTIVES)



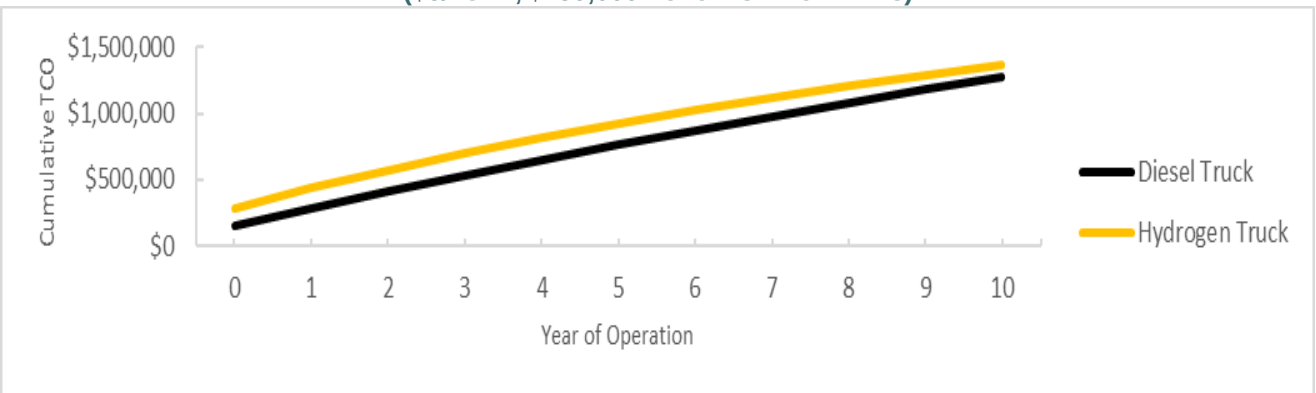
Source: ICF analysis, 2022.

FIGURE 18: ESTIMATED CUMULATIVE TCO - DIESEL VS. RETROFITTED HYDROGEN CLASS 8 LONG-HAUL TRUCK ($7.50/KGH2, NO INCENTIVES)



Source: ICF analysis, 2022.

FIGURE 19: ESTIMATED CUMULATIVE TCO - DIESEL VS. RETROFITTED HYDROGEN CLASS 8 LONG-HAUL TRUCK ($6/KGH2, $150,000 PURCHASE INCENTIVES)



Source: ICF analysis, 2022.

FIGURE 20: TCO COMPARISON #2B ASSUMPTION

Parameter	ICET Inputs	Retrofitted FCET Inputs
Vehicle Lifespan	10	10
Vehicle Purchase Price	$130,000	$240,000
Unit Fuel Cost	$4.877/gal	$10.21/kg
Vehicle Fuel Efficiency	5.42 MPG	7.14 mi/kgH2
Vehicle Maintenance Cost per Mile	$0.19/mi	$0.19/mi
Annual Mileage	125,000	125,000
Federal Excise Tax	12% on Vehicle Purchase	12% on Vehicle Purchase
State Sales & Use Tax	7.75%	7.75%
Discount Rate	5%	5%
Maintenance Cost Escalation Rate	3.5%	3.5%
Fuel Cost Escalation Rate	US EIA AEO 2020 Reference Case	Assumed -4%

Source: ICF analysis, 2022.

Findings from ICET vs. FCET Comparison:

- Hydrogen prices are currently high, creating less opportunity for payback on FCETs compared to diesel trucks. However, prices are projected to decrease as the market for hydrogen fuel scales. California Air Resource Board (via analysis by Trillium) projects costs of roughly $6-$8/kg at intermediate volume (by 2030) and roughly $4-$6/kg at high-volume adoption (by 2050).
- Assumptions based on various resources such as the US Environmental Protection Agency and California Air Resource Board consider FCET & diesel truck maintenance costs to be equal. Data on maintenance costs for Class 8 FCETs is limited due to the nascence of this market.
- Purchase price incentives are useful to improve the business case for FCETs in the early years of their market entry when vehicle and fuel prices remain high.
- Generally, heavy-duty FCETs are most suitable for the following use cases:
    - High mileage/long-haul
    - Heavy loads (electric truck batteries can reduce cargo carrying capacity due to weight limits)
    - Operations requiring fast refueling times (hydrogen fueling is more akin to diesel fueling, whereas electric charging can take hours unless very high-powered chargers are used)
- Retrofitting existing diesel trucks to have fuel cell powertrains may cost fleets less in upfront capital costs than new trucks, but the retrofitted truck may have a shorter lifespan and higher maintenance costs compared to a new truck, given existing wear and tear on the retrofitted truck.
- Compared to ICET, both FCET and retrofitted FCET operations would become more cost-effective as the total annual mileages increase. This makes FCET operations ideal for high-mileage

operations within a relatively small area, i.e., a terminal facility or any other facility with drayage movements along fixed routes.

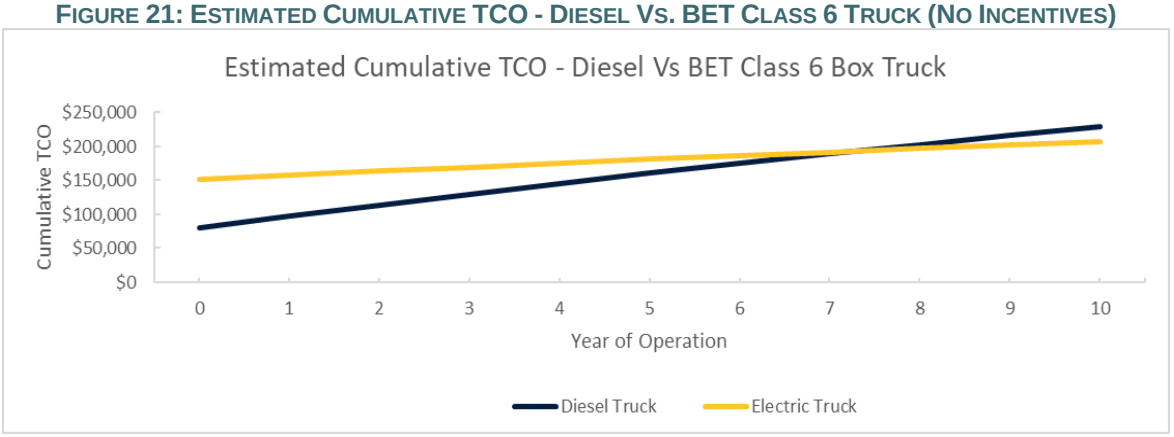
TCO Comparison #3: Class 6 Battery Electric Box Truck vs. Internal Combustion Engine Box Truck

The following presents examples of the vehicle types for box truck operations as well as the inputs and assumptions used for the comparison of the TCO costs associated with each. A total lifespan of 10 years is considered for both box truck engine types. The graphs below show the estimated cost comparisons for a 2022 model year BET vs. ICET box truck.

Due to the relatively higher purchasing price of BET box trucks and lower annual average mileage associated with box trucks compared to other types of operations, price parity with ICET operations would be possible if a vehicle purchase incentive is made available.

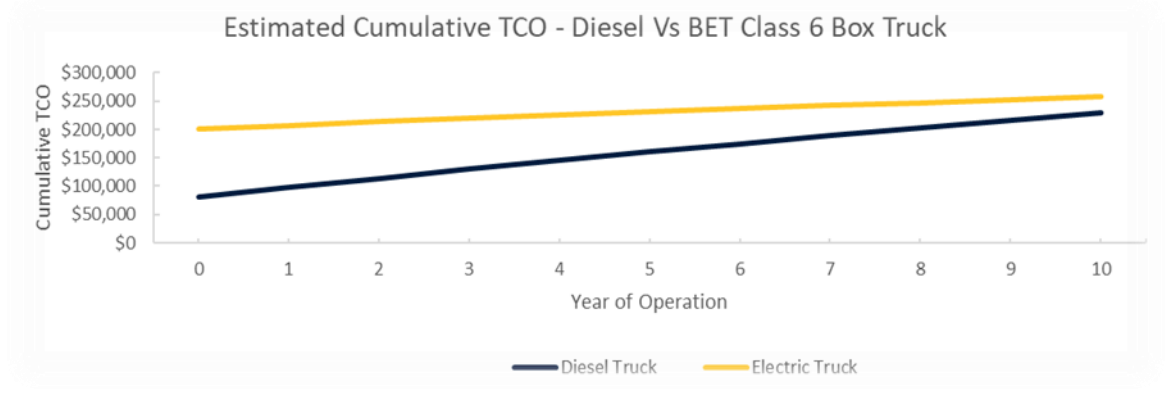
ICET Model: Freightliner m2 106	BET Model: Lion Electric – Lion 6
	

FIGURE 21: ESTIMATED CUMULATIVE TCO - DIESEL VS. BET CLASS 6 TRUCK (NO INCENTIVES)



Source: ICF analysis, 2022.

FIGURE 22: ESTIMATED CUMULATIVE TCO - DIESEL VS. BET CLASS 6 TRUCK ($50,000 VEHICLE PURCHASE INCENTIVE)



Source: ICF analysis, 2022.

FIGURE 23: TCO COMPARISON #3 ASSUMPTION

Parameter	ICET Inputs	BET Inputs
Vehicle Lifespan	10	10
Vehicle Purchase Price	$75,000	$167,000
Infrastructure Cost	-	$8,500 (15 kW EVSE); $12,700 (installation)
Unit Fuel Cost	$4.877/gal	$0.0886/kWh
Vehicle Fuel Efficiency	9.0 MPG	22.48 MPGe (1.5 kWh/mi)
Vehicle Maintenance Cost per Mile	$0.17/mi	$0.13/mi
Annual Mileage	25,000	25,000
State Sales & Use Tax	7.75%	7.75%
Discount Rate	5%	5%
Maintenance Cost Escalation Rate	3.5%	3.5%
Fuel Cost Escalation Rate	US EIA AEO 2020 Reference Case	US EIA AEO 2020 Reference Case

Source: ICF analysis, 2022.

Findings from BET vs. ICET Comparison:

- Like the Class 8 electric truck in TCO Comparison #1, electric trucks are estimated to have higher upfront capital costs but lower fuel and maintenance costs.
- In this example, no payback period is estimated to occur without incentives; this is largely due to relatively short daily and annual mileage for box trucks. The more miles a truck drives, the more opportunity it has to generate a payback compared to diesel trucks.
- With the help of a $50,000 vehicle purchase price incentive, the payback period of the electric truck, in this example, is expected to occur in Year 7.

TCO Analysis Conclusion

The UIPA is in a unique position to foster and incentivize sustainable and smart logistics to benefit businesses and communities both in terms of economic development and mitigating the emission and other societal impacts of additional freight activity in the JA. This further highlights UIPA's role as the champion of sustainable development and operation.

A summary of major findings is provided below:

- While the upfront costs for BETs and FCETs are higher than diesel trucks, relatively lower operating costs lead to a lower lifetime TCO making these vehicles a good investment option for UIPA in the long run. It is important to note that while TCO is an important factor in fleet management decisions, it is not the only consideration for sustainability. The fuel efficiency, telematics, and safety features offered in BETs and FCETs will help fleet managers to control fuel and maintenance costs, reduce truck-involved crashes, and mitigate air emissions.
    - Short- and regional-haul duty cycles are most suitable for medium- and heavy-duty electric trucks and long-haul trips are better suited for hydrogen FCETs.
    - 98% of truck trips to and from the UIPA JA are estimated to be relatively short in length. This makes battery electric truck technology a great option for the majority of the Port's operations.

- Medium- and heavy-duty BET and FCET purchase prices are higher than diesel trucks, making upfront incentive funding a useful tool that UIPA can use to accelerate near-term deployments as the industry ramps up.
- Significant BET vehicle price reductions are expected as early as the 2025 to 2030 timeframe due to expected reductions in battery pack prices and due to economies of scale as ZE truck industry competition grows and as manufacturers produce more units.
- Most importantly, the total cost of ownership is highly case-specific. UIPA, companies located within the JA, and fleets operating trucks to, from, and within the JA should evaluate TCO on a case-by-case basis.

Appendix B: Land Carrying Capacity Assessment

Most of the UIPA JA, particularly the developable portion, is already zoned as industrial.[11] Also, much of the land in the JA is privately held. Thus, entitlements to developing the land have already been conveyed. However, this does not mean that there are no challenges associated with future developments within the JA, including other regulatory as well as infrastructure issues.

Many factors besides the regulations contained within a zoning ordinance have the potential to constrain development and limit the types of land uses. Although the majority of the vacant land within the JA is zoned for industrial development in certain areas or for specific parcels, particularly where the JA borders the natural and protected land, there could be some constraints created by:

What Is Carrying Capacity?

Carrying capacity refers to the ability of the built and natural environment of an area to accommodate development. Understanding the factors that can impact or be affected by development under each of these topic areas **is critical to the development and implementation of effective sustainable development strategies** and standards.

- Transportation and trip generation: land use is associated with trip generation. A limited level of service or traffic congestion at a specific location may be a constraint to development. Also, land uses that require specific services like road or rail access may be constrained by existing transportation infrastructure.
- Provision of utilities: some uses may require more electricity, sewer, and water resources which are not always available or economically viable.
- Building type and suitability to a site: land uses may imply a certain building type that may not be economically viable for the construction of a specific site.
- Adjacencies: the context in which a building is built may limit the building or use that is viable. Examples are development sites that are located in wetlands and/or adjacent to protected wildlife habitats or natural areas.
- Stormwater management: the amounts of stormwater runoff, runoff pollution, and soak-in differs based on the type of land, type of use, and specific activities at the parcel level and can pose development limitations, especially because the runoff from industrial sites north of the JA would wash into the historic drains that eventually pour into the Great Salt Lake.

This section describes, at a high level, the carrying capacity of the land UIPA JA in terms of air quality, energy and utility access and demand, natural resources, wildlife habitat, and transportation and will touch on sustainable building design requirements.

[11] Includes light industrial, commercial, and manufacturing uses which may be used interchangeably throughout the Working Paper.

Air Quality and Energy

The Wasatch Front area is in non-attainment for ozone, sulfur dioxide, and fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller (PM2.5), meaning that the amount and rate by which these pollutants are released into the air is in excess of the maximum levels set in the National Primary or Secondary Ambient Air Quality Standard (NAAQS).[12] Thus, UDEQ has a State Implementation Plan (SIP) for reducing ozone and PM2.5 emissions in order to achieve attainment.

On the other hand, development inside the UIPA JA has the potential to contribute to the overall emission levels unless the growth is directed towards a net-zero emission goal. As transportation contributes a large share of air emissions, moving toward ZE vehicles and reducing vehicle miles traveled (VMTs) are two key strategies to achieve this goal. The air quality impacts of transportation activity within the JA are primarily associated with emissions related to truck and rail operations, as well as industrial equipment. Addressing emissions related to these sources that are necessary for the operations of companies located within the area will be central to contributing to improved air quality across the Wasatch Front.

While air quality does not constitute a development constraint, because the Wasatch Front region and the UIPA JA suffer from poor air quality conditions, it should be a focus of future development and ongoing operations. Development should aim to decrease emissions throughout the area and ultimately reduce emission rates across the state (as they relate to the movement of goods to and from the JA).

Trucking Considerations

The potential for the use of renewable energies and ZE vehicles, as well as the maturity level and availability of ZE vehicle technologies, are explored in Appendix C. Reasonable adoption rates for ZE trucks over the next 10 and 30 years depend on several considerations, including vehicle pricing and availability timeline, charging and fueling infrastructure availability, and the presence or lack of regulations.

Locomotive Considerations

While rail is a more efficient mode for moving freight in terms of fuel consumption and emissions,[13] locomotive emissions remain a concern for the region.

Union Pacific's Emission Reduction Goal

In early 2022, Union Pacific railroad company (UP) committed to repower some of its Utah-based locomotives with cleaner, Tier 2 equipment.

Source: UP, 2022.

EPA's locomotive emission standards are set in tiers, depending on the year they became effective and their requirements. Tier 0 established the first set of locomotive emission standards (effective 2000) and applied to locomotives and engines manufactured from 1973 through 2001 and remanufactured at any time. Tier 1 standards apply to locomotives and engines manufactured from 2002 through 2004 and remanufactured at any time. Tier 2 standards apply to locomotives and engines manufactured in 2005 and later and significantly reduce

[12] For more information on NAAQS, see: https://www.epa.gov/criteria-air-pollutants/naaqs-table#:~:text=Primary%20standards%20provide%20public%20health,crops%2C%20vegetation%2C%20and%20buildings.

[13] A major factor contributing to rail's fuel efficiency is that they can haul more freight compared to the amount of fuel they consume. According to UP Railroad, trains consume just a single gallon of fuel to carry one ton of freight over 480 miles, making them 3-4 times more fuel efficient than trucks. For more information, see: https://www.up.com/customers/track-record/tr040522-locomotive-fuel-efficiency-improvements.htm

the Hydrocarbon, Carbon Monoxide, Nitrogen Oxide, and Particulate Matter emission levels compared to Tier 1 and 0.

Figure 24 below describes the existing federal locomotive emission levels and their percent emission control standards. As shown, Tier 3 and 4 standards offer substantial improvements in locomotive emission reductions over traditional locomotives.

FIGURE 24: CURRENT LOCOMOTIVE EMISSION STANDARDS

Existing Emission Standards for Line Haul Locomotives							
Emission Tier	Year of Manufacture	NOx		PM		HC	
		Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control
Pre-Tier 0	1973-1999	13.50	n/a	0.60	n/a	1.00	n/a
Tier 0	2000-2001	9.50	30	0.60	0	1.00	0
Tier 1	2002-2004	7.40	45	0.45	25	0.55	45
Tier 2	2005-2011	5.50	59	0.20	67	0.30	70
Tier 3	2012-2014	5.50	59	0.10	83	0.30	70
Tier 4	2015	1.30	90	0.03	95	0.14	86
Existing Emission Standards for Switch Locomotives							
Emission Tier	Year of Manufacture	NOx		PM		HC	
		Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control
Pre-Tier 0	1973-1999	17.40	n/a	0.72	n/a	2.10	n/a
Tier 0	2000-2001	14.00	20	0.72	0	2.10	0
Tier 1	2002-2004	11.00	37	0.54	25	1.20	43
Tier 2	2005-2011	8.10	53	0.24	67	0.60	71
Tier 3	2012-2014	5.00	71	0.10	86	0.60	71
Tier 4	2015	1.30	93	0.03	96	0.14	93

Source: Nichols, M. D. (2017, April 13). Petition for Rulemaking: Seeking the Amendment of the Locomotive Emission Standards Engines. In California Air Resources Board. Retrieved from https://ww2.arb.ca.gov/sites/default/files/2020-07/final_locomotive_petition_and_cover_letter_4_3_17.pdf

Current EPA standards require locomotives manufactured in or after 2015 to meet Tier 4 standards. However, there is interest in creating a Tier 5 standard to move locomotives to near-zero emissions. The California Air Resources Board (CARB) has developed a Tier 5 standard and proposed it to the EPA. This standard would further reduce nitrogen oxides (NOx) and particulate matter (PM) emissions from locomotives and other off-road equipment by 50 to 90 percent. Figure 25 shows the initial concept for the Tier 5 standard considered by CARB.

FIGURE 25: PROPOSED TIER 5 LOCOMOTIVE EMISSION STANDARDS FOR NEWLY MANUFACTURED LOCOMOTIVES AND LOCOMOTIVE ENGINES

NOx		PM		HC		GHG	
Standard (g/bhp-hr)	% Control	Standard (g/bhp-hr)	% Control	Standard (g/bhp-hr)	% Control	Standard (g/bhp-hr)	% Control
0.20	99+	<0.01	99	0.02	98	n/a	10-25%
With the capability for zero-emission operation in designated areas.							

Source: Nichols, M. D. (2017, April 13). Petition for Rulemaking: Seeking the Amendment of the Locomotive Emission Standards Engines. In California Air Resources Board.

If adopted by the EPA, Tier 5 standard would apply to newly manufactured locomotives and locomotive engines with a manufacture year of 2025 or later. Tier 5 standard would apply to both switchers (1,006 to 2,300 horsepower) and line haul (2,301+ horsepower) locomotives. To date, the Tier 5 proposed standard has not been adopted by the EPA.

In addition to improving locomotive standards, freight railroads employ route optimization and energy management technologies to reduce fuel consumption and, as a result, the amount of emissions. Examples of these technologies are anti-idling systems, also known as stop-start systems, to cut unnecessary use of fuel, power distribution by strategically positioning the locomotives, and breaking/throttle optimization systems similar to cruise control in cars.

Energy Demand Considerations

Demand for electricity will certainly exceed the current supply, as noted by multiple stakeholders.[14] Simply electrifying current operations would already exceed the existing supply, with an increase in operations requiring even more energy. According to Rocky Mountain Power (RMP), there is already a recognized need to increase electrical capacity and distribution in the UIPA JA. Should UIPA wish to obtain renewable electricity, this will need to be contracted soon so that RMP can work on increasing renewable generation and transmission capacity.

Other UIPA stakeholders also noted that demand for renewable natural gas is also expected to exceed the current supply.[15] While most natural gas pipelines are already in place, new infrastructure is needed to capture and transfer the renewable natural gas (RNG) released from the landfill remediation operations that are currently happening in the area.

Another major consideration is the expected growth in energy demand due to new buildings. Therefore, to help achieve net-zero goals, new buildings should be designed based on sustainable design standards and strategies.[16] Buildings should also be designed with onsite renewable generation and strong battery storage for vehicle charging. However, energy conservation and onsite alternative power generation would not remove the need for broader, area-wide renewable generation and transmission upgrades.

[14] CPCS team consultations with Lancer Energy, Rocky Mountain Power, ASPIRE, Utah Department of Energy, Utah Clean Cities, and Utah Clean Energy, March and April 2022.

[15] CPCS team consultations with Dominion Energy and Utah Department of Energy, March and April 2022.

[16] As discussed in Appendix C.

Natural Resources, Habitat, and Animal Life

Land and soil conditions at the future construction sites and their proximity to agricultural and natural areas can, directly and indirectly, influence the development potential of the sites and the extent or complexity of measures to overcome construction issues at sites with less-than-ideal development conditions.

Wetland Considerations

Restrictions associated with developing wetland areas are related to excavation or dredging and fill operations,[17] as many of the benefits they provide, such as flood storage, would be compromised with such activities. For planning purposes, the land area in wetlands would generally not be developable, or an equivalent (or greater) area of land would be needed to mitigate the loss of wetland areas.

While there are wetlands in the JA, development has been allowed on or near some of that land, and therefore, wetlands do not appear to be a large constraint. There are no known jurisdictional wetlands[18] within the UIPA boundaries. However, portions of the periphery of the UIPA JA are within and adjacent to a Utah Watershed Restoration Initiative focus area. The Watershed Restoration Initiative (WRI) is a partnership to improve high-priority watersheds throughout the state, focused on improving three ecosystem values:

- Protection of watershed health and biological diversity
- Water quality and yield
- Opportunities for sustainable uses of natural resources.

Additionally, some parts of the JA are considered wetlands, and herbaceous and riverine wetlands areas are stretched along the Surplus Canal in the northwestern periphery of the JA. There are also prominent playa wetlands in the southern portion of the area. These categories may impact the nature of development in these areas and might be considered candidate locations for environmental protection buffers or other conservation treatments. In addition, certain land types, especially playa wetlands, could become new sources of fugitive dust air pollution, particularly when disturbed.

Invasive Plant Considerations

The State of Utah maintains a Noxious Weed List (Utah Noxious Weed Act; per the authority vested in the Commissioner of Agriculture and Food under Section 4-17-3). The Salt Lake County Noxious Weed List is comprised of 54 noxious weeds adapted from the State Weed Committee. Wetlands and other habitats in the UIPA JA are threatened by a number of invasive plants, the most problematic of which is non-native phragmites (*Phragmites australis*). Eradication of phragmites is likely not possible, given its high degree of invasiveness. Strategic and prioritized management approaches for this and other invasive species are critical and will be contingent upon coordination amongst land managers to develop robust treatment techniques and coordinate their management to reduce invasions. An integrated pest management plan approach will be required that includes (1) limiting invader propagule pressure and seed bank densities, (2) optimizing native plant revegetation following invader removal, (3) early detection and control of new

[17] For instance, replacing portions of the wetland area with dry land, including sand, rock, clay, construction debris, wood chips, etc.

[18] A "jurisdictional wetland" is land classified as a wetland under the regulatory authority of a Governmental Authority, such as the U.S. Army Corps of Engineers, EPA, Department of Environmental Quality, and water management districts. This definition shall apply to any area of the Property which has been formally delineated as a Jurisdictional Wetland.

invaders, (4) potential for refined hydrologic management to promote invader control, and (5) quantitative documentation of impacts from invaders on various habitats and water quality, especially given the continental importance of this habitat to migratory birds. Collaborative and science-backed management can continue to be effectively implemented through UIPA partnerships and practices.

Soil Considerations

Soil type influences development in two ways: runoff characteristics and water table depth. The runoff characteristics of the existing soils must be taken into consideration for stormwater flow control. The UIPA JA has moderate to low runoff potential. Therefore, the required flow control mitigation area on each site would be low to moderate. Nevertheless, a portion of the sites would need to be reserved for stormwater flow control unless direct discharge to the Goggin Drain or the Great Salt Lake can be developed. Depending on the resolution, stormwater management could place some limitations on the amount of development or could require some portion of the JA acreage dedicated to that process.

Soil type is also an indicator of the depth of the water table; higher water tables reduce the potential for stormwater infiltration. Since the developable sites in the UIPA JA generally have high water tables (about 4-5 feet from the surface), infiltration on a large scale would be infeasible in the area. While there is little to no infiltration, runoff flow is not a substantial issue due to the topography, as described above. The issue regarding the lack of infiltration is how to treat or filter stormwater in the area before the runoff from construction sites or industrial facilities is poured into the Goggin Drain.

In general, the NWQ area contains wetlands, highly liquefiable soils, flood plains, and fault lines, which should be taken into consideration while planning for new developments.

Stormwater Considerations

As discussed in the previous section, managing stormwater is one of the largest development challenges in the UIPA JA. There is a need for required stormwater controls for peak flow management and water quality. The JA has moderate to low runoff potential under existing conditions. Therefore, flow control mitigation would be low to moderate per Salt Lake County code requirements.[19] There is no specific maximum amount of land that can be covered, but as mentioned before, a portion of each site would need to be reserved for stormwater flow control unless direct discharge to the Goggin Drain or the Great Salt Lake can be developed. It may be possible to avoid the need for peak flow control if direct conveyance paths to the Great Salt Lake or Goggin Drain are constructed. However, other direct receiving water would need flow control, which includes all the land south of Interstate 80 (I-80) and much of the southern portion of the JA below the Jordan River meander water feature.

Low-impact stormwater control measures using rooftops for flow control or cisterns for landscape watering are also possible. However, the area is a poor candidate for pervious pavements due to the large impervious surfaces (buildings and lots) planned for construction in the area,[20] as well as the area's high-water tables.

In addition, the entire JA, including discharges to the Goggin Drain, is required to provide stormwater quality control measures per the Salt Lake County Stormwater Code,[21] including filtration swales, wet ponds, settling basins, constructed wetlands, and media filtration. All such options would require varying levels of land area

[19] Salt Lake County Stormwater Management Plan, 2020. https://slco.org/contentassets/434540c0b37245dcb222c8a22e76ab21/2019_slco_swmp_vfinal_certified.pdf

[20] According to information shared by the major landowners and developers in the UIPA jurisdictional area.

[21] Salt Lake County Stormwater Management Plan, 2020. https://slco.org/contentassets/434540c0b37245dcb222c8a22e76ab21/2019_slco_swmp_vfinal_certified.pdf

and cost. Wetland buffers may be needed, and there may be limitations to providing stormwater facilities in these buffers. These stormwater quality control measures are found to be effective for most urban stormwater runoff. Source tracing may be considered if existing uncontrolled stormwater in the UIPA is expected to contribute to low-quality runoff, the findings of which could lead to proposed stormwater retrofitting projects for existing developed areas in the UIPA.

The JA also has drainage limitations due to its flat topography and poorly defined natural drainage systems. Thus, the area's drainage system will likely require a higher-than-normal land area. Although drainage ditches have been designed in some areas to provide additional drainage, these systems are mostly informal and not designed to meet specific levels of service for drainage or flood protection. In addition, the distances between drainage sites and natural drainage systems are long, requiring a relatively large system footprint to convey water from flat land and low-lying areas.

The water in the broader area generally flows to the Great Salt Lake via the Goggin Drain, although there is some local drainage that enters the lake via small local drainage ways. The Goggin Drain's capacity is well understood and is expected to be adequate for flow to the Great Salt Lake. The UIPA JA's topography, though, poses a technical challenge as much of the site north of I-80 is lower in elevation than the Goggin Drain under certain conditions, meaning stormwater discharge in some locations at times must be raised in order to flow into the Drain or another path used to the Great Salt Lake. While the Great Salt Lake is currently at low levels, which indicates positive drainage for much of the area north of Interstate 80, the Great Salt Lake was at near historic high levels as recently as the 1980s. When the Great Salt Lake is at high levels, Goggin Drain performance is reduced, and drainage from the JA is restricted. Historic Great Salt Lake levels must be considered for capacity and level of service. It is likely that sites draining to the Great Salt Lake, Goggin Drain, and other natural waters in the area will require pumping systems or significant fill[22] on the site to provide positive drainage. Also, the Goggin Drain flows through a relic river feature known as Bailey's Lake. There is interest in restoring this feature, but it is unlikely that the restoration would impact the area's drainage.

A stormwater and drainage master plan is therefore critical to define, plan, reserve, and construct drainage infrastructure in order to provide positive site drainage and to inform individual site connections and stormwater control measures.

Farmland Considerations

The UIPA JA contains several areas considered "farmlands of statewide importance" and some smaller areas considered "prime farmland if irrigated and drained."[23]

- **Prime Farmland** is land with the best combination of physical and chemical characteristics for agricultural production that is important for meeting national short- and long-range needs for food and fiber.
- **Farmland of Statewide Importance** is land that does not quite meet the criteria of prime farmland but that nevertheless produces high yields.

Prime farmlands and farmlands of statewide importance are subject to the provisions of the 1981 Farmland Protection Policy Act (FPPA).[24] Projects that irreversibly convert these lands to non-agricultural use and that

[22] Not a sustainable option.

[23] US Department of Agriculture, Natural Resources Conservation Service Maps, 2022.

[24] Natural Resources Conservation Service, Farmland Protection Policy Act: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/landuse/fppa/

are completed by a federal agency or with assistance from a federal agency are subject to FPPA. While private landowners can develop their properties as they desire, there are limits on public development projects involving federal support.

Natural Areas, Habitat, and Animal Life

There are numerous wildlife areas located in and around the UIPA JA that need to be accommodated and preserved. These areas provide valuable resources to the public and house a wide variety of wildlife.

The Lee Kay Wildlife Conservation Area is at the center of the UIPA JA. Lee Kay is owned and managed by the Utah Division of Wildlife Resources. In addition to being a wildlife conservation area, Lee Kay contains 934 acres of land for public use. This includes a public shooting range with seven outdoor ranges that are operated by the Utah Division of Wildlife Resources. Lee Kay also offers areas for dog training (the largest in Utah), exercise, and birdwatching. Over 220 species of bird, including 18 rare birds, have been identified in Lee Kay.[25] Also, while not within the UIPA boundaries, the proximity of the Kennecott Inland Sea Shorebirds Reserve to the inland port area is such that development impacts within the JA should be considered. The Reserve is a 3,700-acre reserve created in 1997 by Kennecott Utah Copper to mitigate habitat disruption by its mining operations. Today, 120,00 birds and over 100 species call the area home annually, including the American Avocet, the Snowy Plover, and the Black-necked Stilt.[26]

The Utah Division of Wildlife Services uses a rectangular grid distributed over the state to estimate the number of threatened, endangered, and sensitive animal and plant species. The rectangle covering parts of the UIPA JA identifies 16 species that meet these classifications. Some of these species are impacted by habitat loss, development, and agriculture. This rectangle encompasses the area west of 4800 West, north of 900 South, easter of 900 west, and south of 150 South.

The UIPA JA also falls within the apparent year-round habitat of the Ring-Necked Pheasant, which is identified as having substantial value. Small portions of the JA appear to fall within the Utah-California Quail habitat.

While there are no related development constraints for the vacant land development within the JA, development, particularly in the northwestern portion of the area, has the potential to impact wildlife and habitats in nearby areas.

Transportation System

Given the current development plans and the amount of land that is developable within the UIPA JA, the demand for the transportation system is expected to increase, especially commercial vehicle demand, as almost all of the currently developable land is zoned as industrial.

While the expected increase in demand for the area's transportation system does not constitute a development constraint, it should be a focus of UIPA's sustainable strategy and standard development. Transportation, and particularly freight, plays an important role in the amount of GHG and other pollutants released into the environment. In addition, other safety and quality of life concerns can be exacerbated by growing truck activity.

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[25] Lee Kay Public Shooting Range, Utah Division of Wildlife, July 2022. https://wildlife.utah.gov/lee-kay.html

[26] Families check out bird reserve, Deseret news, Joseph Dougherty, September 2007. https://www.deseret.com/2007/9/1/20038951/families-check-out-bird-reserve

The future industrial developments in the JA will create many jobs, but an important factor in attracting this workforce is providing safe and reliable commuting options. While there are currently several transit projects planned and ongoing within the JA, UIPA can work with landowners and developers to promote sustainable commuting services.

Truck Considerations

Analysis of sample vehicle GPS data (INRIX) spread across four weeks in 2019 for the Wasatch Front area showed that about 58 percent of the commercial vehicles traveling in the area were light- and medium-duty local delivery trucks or vans, while 42 percent were heavy-duty, private sector trucks. The same GPS data analysis showed that about 16 percent of the truck trips in the UIPA JA begin, end, or occur entirely within the Wasatch Front area. About 84 percent of the truck traffic in the UIPA JA is through traffic. Figure 26 summarizes the sample truck GPS data analysis.[27]

FIGURE 26: SAMPLE TRUCK GPS DATA ANALYSIS FOR THE UIPA JURISDICTIONAL AREA

Trip Type	Origin	Destination	Trips	%of Total Trips
1	UIPA	UIPA	7,662	3.14%
2	UIPA	Non-UIPA	4,441	1.82%
3	UIPA	Non-NWQ	10,924	4.48%
4	Non-UIPA	Non-UIPA	41,579	17.04%
5	Non-UIPA	UIPA	4,012	1.64%
6	Non-UIPA	Non-NWQ	39,088	16.01%
7	Non-NWQ	UIPA	11,152	4.57%
8	Non-NWQ	Non-UIPA	38,659	15.84%
9	Non-NWQ	Non-NWQ	86,557	35.46%

Source: CPCS analysis of sample INRIX Truck GPS Data, 2019.

A trip generation assessment based on the various types of industrial uses provides an estimate of the number of truck trips that will be added to the existing traffic in the UIPA JA. This assessment pulls the trip generation rates from the Institute of Transportation Engineers (ITE) Trip Generation Manual (10th & 11th Editions). For each type of land use, the ITE manual provides the total trip generation and directional distribution for all-vehicle traffic. Therefore, the projected trips are converted to trucks and passenger vehicles based on estimates provided in the ITE Trip Generation Data Plots for trucks. Important to note is that these values are high-level estimates of potential levels of vehicle activity when the developable land in the UIPA JA is completely developed, and the results are highly dependent on the assumptions related to the specific types of land use, portions of land area covered by buildings, and types of vehicles serving the facilities.

Figure 27 shows the all-vehicle and truck generation rates per 1,000 sq. ft. of gross floor area (GFA) for a general urban/suburban setting. As shown, for each type of industrial land use, all-vehicle and truck trips are estimated for both weekdays and when the streets adjacent to the properties are in peak-hour traffic conditions. For instance, for each 1,000 sq. ft. GFA of general industrial development, close to 5 vehicle trips will be added to the UIPA JA road network, about 5 percent of which would be trucks, and half of these trips enter the facility while the other half leave the facility for a regular weekday.

[27] For this analysis, 2-weeks samples of GPS data from four months of the year 2019 was used to capture seasonal variations. For more information on sampling considerations, see: https://www.fhwa.dot.gov/policyinformation/tmguide/tmg_fhwa_pl_13_015.pdf

FIGURE 27: TRUCK TRIP GENERATION RATES PER 1,000 SQ. FT. GROSS FLOOR AREA

Type of Land Use	ITE Land Use Code	Type of Day	Vehicle Trip Ends	Truck Trip Ends	% Entering	% Exiting
General Light Industrial	110	Weekday	4.96	0.25	50%	50%
	110	Peak Hour of Adjacent Street Traffic	0.7	0.01	50%	50%
Manufacturing	140	Weekday	3.93	0.45	50%	50%
	140	Peak Hour of Adjacent Street Traffic	0.62	0.03	56%	44%

Source: CPCS analysis based on UIPA's land use information and ITE Trip Generation Manual (10th & 11th Editions), 2022.

Based on an analysis of land use data and information collected through consultations with the landowners and developers in the UIPA JA, about 8,037 acres of land in the JA is developable (vacant) with industrial and manufacturing zoning. About 4,608 acres of the developable land is currently shovel-ready, meaning land that has the required infrastructure in place for development in the short term.

Figure 28 summarizes the land availability and approximate timelines for potential development by type of use. The area built is calculated based on a maximum floor area ratio (FAR) of 0.8, meaning 80 percent of the industrial or manufacturing-zoned land can be developed for building. Utah and Salt Lake City have specific FAR requirements for specific zoning types and use conditions. Therefore, an average FAR considered for this high-level analysis. As shown, when the shovel-ready land in the UIPA JA is developed, an estimated 109,482 truck trips will be added to the area, about 7 percent of which will be during morning and afternoon peak periods.

FIGURE 28: TRUCK TRIP GENERATION ESTIMATES FOR THE UIPA

Zoning	Land Area (acres)	Area Built* (sq. ft.)	Daily Vehicle Trips	Peak Hour Vehicle Trips	Daily Truck Trips	Peak Hour Truck Trips
Light Industrial	195	6,811,864	33,787	24	1,703	68
Developed	67	2,042,118	10,129	7	511	20
Vacant	129	3,918,263	19,435	14	980	39
Shovel Ready	117	3,558,758	17,651	12	890	36
Other	12	359,504	1,783	1	90	4
Manufacturing	11,962	364,746,155	1,433,452	889	164,136	10,942
Developed	4,055	123,630,350	485,867	301	55,634	3,709
Vacant	7,908	241,115,805	947,585	588	108,502	7,233
Shovel Ready	4,491	136,937,528	538,164	334	61,622	4,108
Other	3,417	104,178,277	409,421	254	46,880	3,125
		Total Trips	1,472,924	912	165,839	11,011
Toral Trips Added in the Future			970,195	601	109,482	7,273

Source: CPCS team analysis of data provided by UIPA, 2022. *Each Acre is 43,560 sq. ft.

Additional vehicle travel, particularly additional trucks on the road, can cause or exacerbate existing mobility problems. Depending on the types of vehicle engines and the fuel types used for these additional trips, future developments may also lead to an increase in GHG and pollution emissions.

According to Salt Lake City's Traffic Index maps,[28] the City saw an increase in congestion levels in 2021, with the average travel time for each vehicle increasing by about 1 minute compared to 2020. Congestion levels are generally higher during the weekdays, with the highest congestion levels being around 37 percent, between 4 and 6 in the afternoon.[29] According to the same source, the roadways in the UIPA JA are currently not suffering from any delays. Some intersections, such as the SR-154 intersections with SR-201 and California Ave., have minor delays during peak hours.

With the addition of more than 970,000 total trips in the future, mobility conditions may decline in the JA. On the other hand, the ongoing and planned roadway expansion projects in the UIPA JA, including the 7200 W (from SR-201 to 700 North) and the last segment of the Mountain View Corridor (from SR-201 to I-80), are expected

[28] Salt Lake City Traffic, accessed June 2022: Salt Lake City traffic report | TomTom Traffic Index

[29] Congestion level is a measure representing the difference between average travel time at each our of the day and the baseline travel times under non-congested conditions. A 37% congestion level means that average travel times are 37% longer than when there is no congestion.

to expand the overall regional transportation capacity and improve efficiency while the planned rail freight and transit projects are expected to shift the traffic away from the road system.[30] While the exact extent of this shift and the potential impacts of traffic demand growth on the area's road network is currently unknown, it is clear that there is a need for UIPA to promote and incentivize sustainable transportation strategies to ensure that the quality of life of communities and integrity of natural areas in the NWQ of Salt Lake City is protected.

Rail Considerations

UP's Salt Lake City Intermodal Terminal (SLCIT) is located within the UIPA JA with a capacity of 250,000 TEUs per year. The railroad currently uses diesel switchers to assemble and dispatch the trains for interstate shipments. Due to the area's air quality issues and the NOx and PM pollutants emitted from the switching operations,[31] the Utah Legislature introduced House Bill (HB) 405 aims to enact terminology definitions and deadlines for the replacement of all rail switchers operating in the state:

> *"By no later than January 1, 2028, the owner of a switcher shall ensure that the switcher is powered wholly by a hydrogen fuel cell or battery-electric power if the switcher is located at a rail yard in the state that has four or more switchers at the rail yard."* [32]

Once adopted, HB 405 mandate will improve rail freight transportation's contribution to state and region-wide locomotive emissions.

The expected increase in demand for freight has led to UIPA 's decision to develop a container transload facility adjacent to the existing SLCIT facility, providing up to 102,000 containers of transload capacity annually.[33]

Additionally, the SITLA site north of I-80 offers an opportunity to provide direct rail access to the UP line for the light industrial parcels developed in the future. Environmental considerations related to providing direct rail access to parcels north of I-80 include:

- Survey of existing wildlife communities, specific species in the area, and their habitat characteristics,
- Assessment of the impacts of rail lines as barriers to wildlife activity and methods to provide functional connectivity for migration and reproduction, and
- Noise and vibration impact assessment and mitigation.
- Use of wildlife crossing structures, fencing, passage tunnels, and other methods to minimize interactions.[34]

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[30] Mountain View Corridor Pathway to Future Phases, 2021: https://mountainview.udot.utah.gov/wp-content/uploads/2021/09/MVC_Phased_Implementation_Flyer_FIN_WEB.pdf

[31] According to Utah Department of Environmental Quality, UP switchers in Utah emitt 407.9 tons of NOx and 8.8 tons of direct PM2.5 annually . This amount is the combined emissions for UP's 45 switchers in Utah, operating in three railyards. For more information, see: https://le.utah.gov/interim/2020/pdf/00001391.pdf

[32] H.B. 405 Utah Inland Port Authority Amendments, 2022 General Session, State of Utah, Mike Schultz, Kirk Cullimore, Mar 2022. https://le.utah.gov/~2022/bills/static/HB0405.html

[33] Based on preliminary analysis of potential transloading capacity conducted by CPCS in 2022, with the assumption of 24-hour/5-days-a-week operation.

[34] For more information, see USDA, A Technical Guide for Monitoring Wildlife Habitat, 2013 and Railways as Barriers for Wildlife by Rafael Barrientos & Luís Borda-de-Água, 2013.

Air Cargo Considerations

The SLC airport has completed several projects to expand commercial and air cargo operations since 2014, adding new concourses, terminals, parking areas, and taxiways. The area east of the airport has also seen rapid growth in industrial parks and warehousing and distribution development in the past few years. Still, additional land is available north and east of the airport's main terminal that can be used for high-density industrial development to enable less intense development of new natural areas.

Appendix C: Sustainable Land Use Development Framework

Sustainable Development Framework Goals

The UIPA sustainable land use development goal of this design framework is to create an inland port that is:

- Economically robust
- Sustainably developed, ecologically integrated
- Generative and supportive of jobs and community

Drivers

Planning, designing, implementation, and management within this multi-dimensional framework must balance the needs and goals of the following categories. As is the case with any system, there is a complex set of inputs, interactions, and outputs which, if balanced properly, will result in a rich, resilient, and highly functioning system. An integrative focus is put on finding mutual benefit rather than trade-offs and balance over negotiation. This requires seeing this landscape with a heterogeneous lens of use, benefit, and economy over the long term. As such, this framework is centered around three drivers:

Landscape / Ecology:
- Natural systems restoration and conservation
- Agriculture
- Recreation

Port Development
- Industry
- Mixed and diverse uses
- Public spaces
- Infrastructure

Transportation / Connectivity:
- Ecological systems
- Urban and trail connections
- Freight and logistics operation
- Transportation systems

Integration:
- Industry and,
- Freight/Logistics and,
- Natural Resources and,
- Recreation and,
- Commercial Land Uses

Landscape and Ecology

Land use planning based on landscape ecology works with natural patterns and interactions within an ecosystem or region. Landscapes are made up of areas of habitat and connective elements like rivers, canals, and linear areas of a habitat that are critical in maintaining the integrity of a landscape for ecological health. Human ecologies are integrated in positive ways if development respects and supports landscape services and functions by not fragmenting the system. Ecological value often translates to economic value (tourism, agriculture, recreation, higher efficiency, ecosystem services), adding diversity of vitality and support for maintenance over time. The following are key objectives of development considering landscape and ecology:

- Restoration and conservation - repairing and maintaining healthy systems, habitats, and connections.

- Recreation and tourism - connecting people and nature.
- Supporting inland port and transportation-related uses.
- Agriculture - supporting existing and proposed alternatives such as, but not limited to, micro-farming, aquaponics, greenhouses, farm-scale permaculture, and 'recreation agriculture.'

Port Development

Land use planning around port development focuses on efficiencies in port functions, flexibility based on the market, limiting adverse land impact, maintaining critical linkages and habitat, and integrating port systems into natural ones. UIPA'S jurisdiction area has the scale and flexibility to accommodate a diversity of land uses around manufacturing and port-related activities while not compromising the ecological systems within it. Key development objectives considered for developing the framework include:

- Multi-use employment centered around an industrial core (these include office, hotel, light manufacturing, assembly, commercial, logistics, and storage).
- Diverse land uses to create a resilient economic zone.
- Innovative and sustainable functions and services.
- Multiple types of job opportunities (not just warehousing jobs).
- Public spaces and parks integrated within the port area, with connections to adjacent communities and recreation.
- Dense development to reduce impact and improve experience and efficiency.
- Clustered and coordinated land uses to maximize efficiencies.

Transportation and Connectivity

Both human and landscape connectivity must be designed to maintain linkages within the JA and outside of it. Barriers must be avoided or mitigated, and connections and movements can be co-aligned. To do so, transportation should be organized along coordinated corridors to consolidate and limit adverse effects; sensitively developing infrastructures such as overpasses, roads, and bridges that maintain habitat and water flow; and leveraging technology to help in moving people and goods efficiently and sustainably. Key transportation and connectivity objectives considered for developing the framework include:

- Consolidated transportation hubs that make efficient connections between rail, truck, and airport.
- Mobility strategy within the port.
- Mobility strategy to/from the port
- Diversity and integration of movement for both freight, people, and nature - Rail, transit, roadways, and trails designed together, not segregated.

Integration

Space and function must be integrated to respect the spatial needs of people, port functions, and natural systems. The integration of port and other industrial functions with local ecology can enhance the quality of spaces created and mitigate potential negative effects caused by development or land uses. Prioritizing needs will highlight areas where integration will become more granular and intentional and areas where larger swaths of port development and landscape conservation can occur. Key transportation and connectivity objectives considered for developing the framework include:

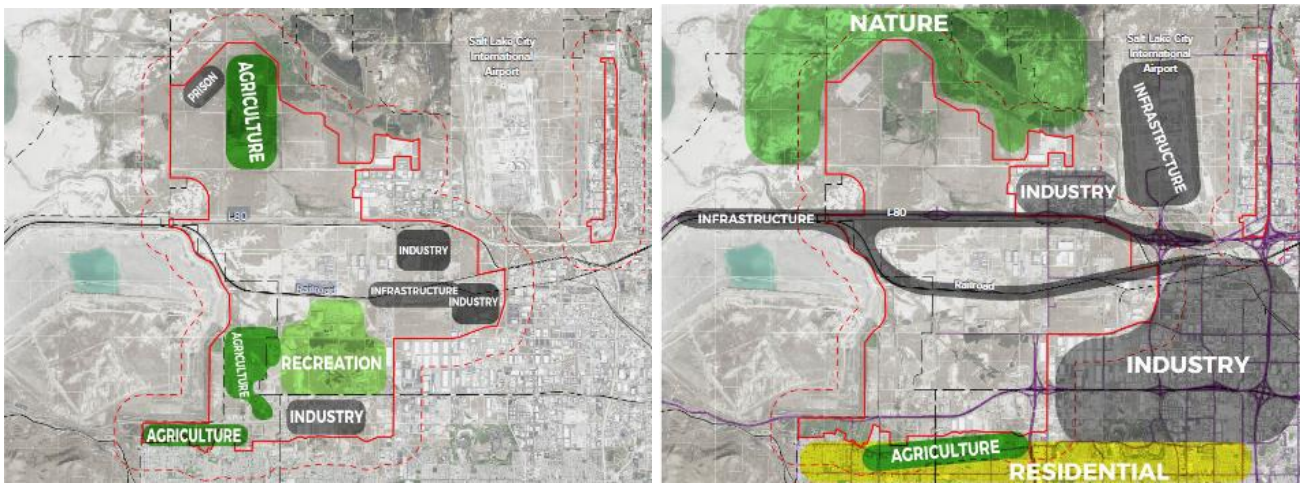
- Edges and buffers that are not simply separators but stitch together seemingly disparate uses.
- Areas of density that support place-making for people and economy; and allow for areas of nature.
- Connection and repair of natural spaces to create desired buffers as well as connections into the bigger landscape.
- Vegetative buffers assist with air and noise emission mitigation.
- Overlap and cluster non-conflicting uses, such as recreation and environmental buffers, and offices and warehouses.

Site Context

Land Use Assumptions

A majority of the JA is currently open space with some recreational and agricultural land uses occurring. Impacted but functioning natural habitat exists to the west and north. Industrial use and the airport bookend the JA on the east side and residential on the south. Although a rail and highway bisect the site, it currently serves as an important habitat connector within the larger landscape matrix of the region, including the Great Salt Lake, Farmington Bay Wildlife Management Area, and the Wasatch Front.

FIGURE 29: KEY EXISTING LAND USES WITHIN AND SURROUNDING THE JURISDICTIONAL AREA



UIPA's JA currently has a concertation of port-related businesses on the east and south side with proximity to the airport, current industry, and the Glendale neighborhood. Further industrial development is planned on the parcels colored in yellow, as indicated in the map below. For this framework, additional areas are considered 'shovel ready' based on the willingness of land developers and adjacency to current development.

Ecology Assumptions

UIPA's JA has ecological and hydrological importance to the local area and the region. The seasonal wetlands that continue to change due to the lake recession remain an important migratory bird habitat. The riparian corridors, both natural waterways and human-constructed canals, are the hydrological arteries of this landscape. They feed agriculture and connect tributaries to the lake, which should be preserved and enhanced. The diverse habitat they create supports a wide ecological web, as well as human recreation and bird watching.

Development Framework

The criteria used for establishing the UIPA sustainable development framework are summarized below. For each of the three categories (development, ecology, and transportation), a set of high, medium, and low development criteria is presented.

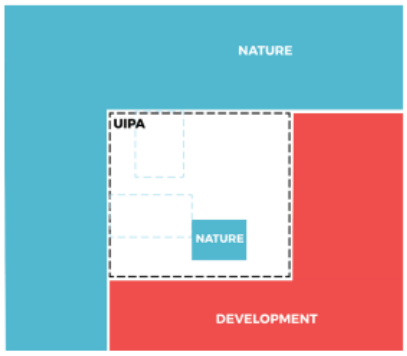
CATEGORIES

Port Development	Ecological Systems	Transportation
Light Manufacturing	Recreation	Rail
Office, retail, restaurant	Agriculture	Highway
Residential, hotel	Buffer	Roadway
	Conservation	Air
		Ped/Bike

CRITERIA FOR DEVELOPMENT FRAMEWORK

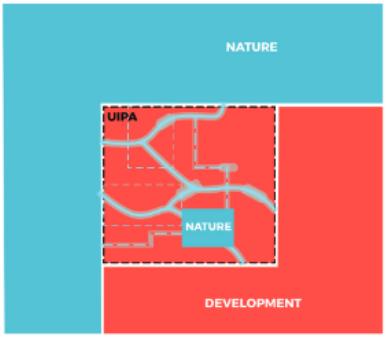
	Focus	Port Development	Ecological Systems	Transportation
1	High	Dense, central, connected	Wetlands, rivers, streams and buffers	Rail
2	Med/high	Zoning in place, existing road access	Seasonal wetlands, impacted or degraded connections	Truck and vehicle
3	Medium	New development to connect		Air

The following shows the step-by-step process for establishing the development framework:

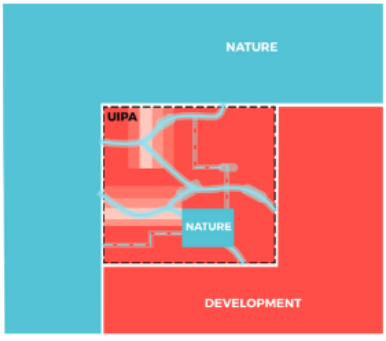


1. IDENTIFY PRESERVATION ZONES AND DEVELOPMENT ZONES WITHIN AND SURROUNDING THE JURISDICTION AREA

2. ESTABLISH ECOLOGICAL CONNECTIONS AND CONNECT RELATED LAND USES AND DEVELOPMENTS



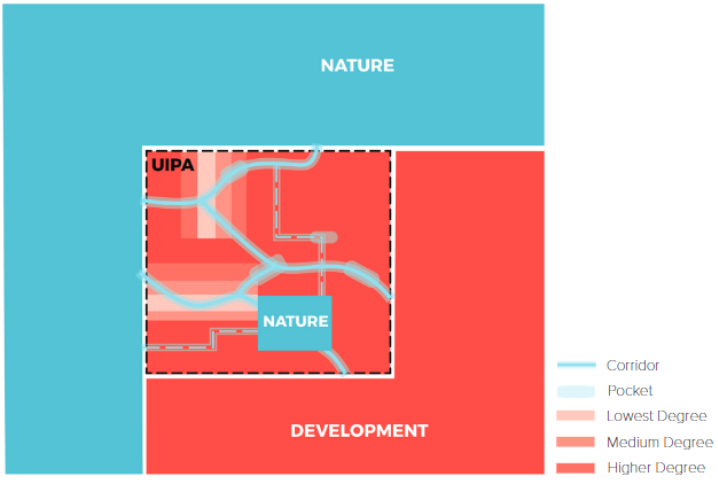
3. APPLY EXISTING ENVIRONMENTAL PROTECTION REGULATION ON ECOLOGICALLY PROTECTED ZONES AND IDENTIFY ADDITIONAL AREAS FOR CONSERVATION



4. WITHIN IDENTIFIED ZONES, DEVELOP ACCORDING TO LOW IMPACT DEVELOPMENT PRINCIPALS (L.I.D) AND STANDARDS ALLOWING DIFFERENT LEVELS OF IMPACT

The **ecological framework** focuses on patches of habitat connected by corridors of water or native vegetation. These are high-value areas to protect. Additionally, Salt Lake City created a “Riparian Corridor Overlay” (RCO) to address development along city streams. The same rules that govern other city riparian corridors should be used to legibly guide development in the JA. Degrees of development intensity should adhere to the ecological framework:

- Restore and maintain existing ecological corridors.
- Identify ecologically critical zones.
- Ensure ecological connectivity of water and wildlife habitat.
- Active landscape to assist with the mitigation of potential noise, light, and air pollution.



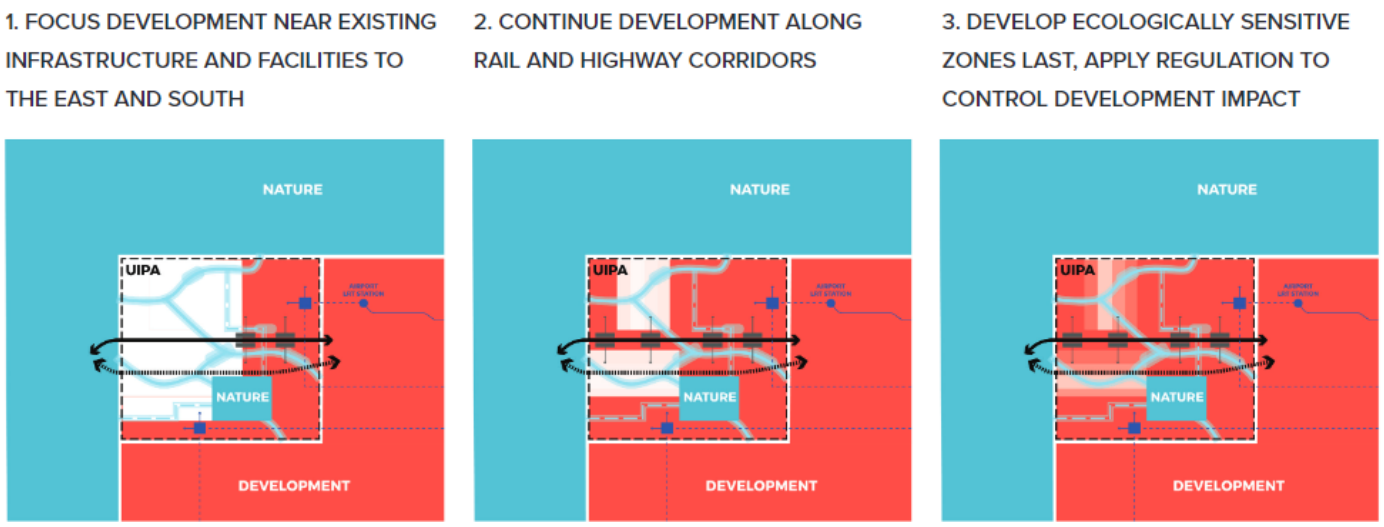
The **land development** framework focuses on various levels of Low Impact Development (LID) as outlined below:

Land Type	Conserve / Develop Strategy	Use / Function
Ecologically Sensitive Zones	Create a gradient of categories of development	Port development fits into the gradient zones defined by impact on ecology; and land use needs
	Define development guidelines for each category that integrates both ecological and port development goals	**Category 1:** Low to no impact development including trails, recreational open space, and development (docks, boardwalks, restrooms), low LID limited lot coverage, and low density
All development includes guidelines based on Low Impact Development (LID), smart growth, density, and land coverage requirements. Categories: 1. Low degree 2. Medium degree 3. High degree		**Category 2:** Middle to low impact, traffic and density, medium LID, and lot coverage **Category 3:** high impact, traffic and density, standard LID, and lot coverage

The **transportation framework** links freight modes on and off-site and leverages existing freight channels (rail, road, and air) to maximize efficiency and minimize its footprint. Transportation should be coordinated with land uses and integrate multiple modes, and consider freight, employees, and visitors as part of one integrated plan. Key objectives of this framework include:

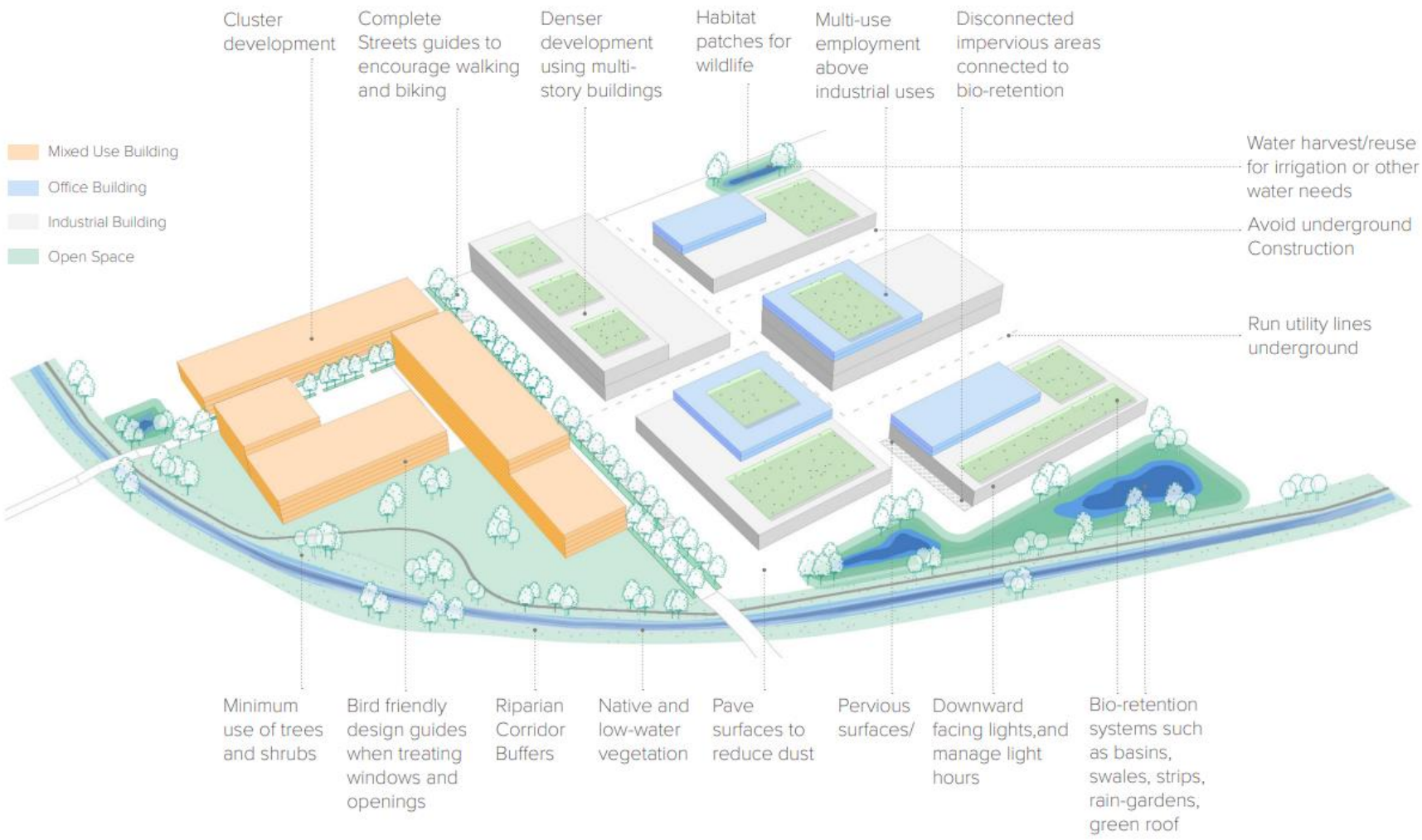
- Manage transportation within the JA to reduce trips of freight as well as employees
- Use multi-modal hubs leveraging buses, shuttles, and LRT to transport employees.
- Encourage bike and pedestrian movements when feasible.
- Use technology to coordinate parking and entrance/exit to/from the JA.
- Share parking for compatible uses.

Considering landscape ecology, port development, and transportation frameworks together, the following development sequence is established, focusing on maximizing efficiency by capitalizing on existing



infrastructure and facilities while delaying construction in ecologically sensitive zones such that development can be evaluated as the market needs changes.

The following graphic shows site development guidelines that can be encouraged by UIPA. The example site is an actual parcel located north of I-80 in the UIPA JA, bordering sensitive natural areas.


Cluster development
Complete Streets guides to encourage walking and biking
Denser development using multi-story buildings
Habitat patches for wildlife
Multi-use employment above industrial uses
Disconnected impervious areas connected to bio-retention
Mixed Use Building
Office Building
Industrial Building
Open Space
Water harvest/reuse for irrigation or other water needs
Avoid underground Construction
Run utility lines underground
Minimum use of trees and shrubs
Bird friendly design guides when treating windows and openings
Riparian Corridor Buffers
Native and low-water vegetation
Pave surfaces to reduce dust
Pervious surfaces/
Downward facing lights,and manage light hours
Bio-retention systems such as basins, swales, strips, rain-gardens, green roof

Site Development and Construction Strategies and Standards

There are many methods and standards to reduce site development emissions and embodied carbon footprint, including using less material, designing buildings for longevity, and optimizing purchases/processes. These methods vary in applicability, cost, and effectiveness. The following sections provide recommendations for quantification tools and standards that can help mitigate greenhouse gas and PM emissions during the site design and development stages.

Greenhouse Gas Quantification Tools

Assessing the greenhouse gas impacts of a project can assist with developing more sustainable design decisions, including construction schedules, equipment selection, waste management, materials selection, and operational parameters. There are several tools that can be used to calculate greenhouse gas emissions and reductions. These models require varying levels of detail and, in turn, provide results of varying accuracy and specificity.

Models such as EPA's Motor Vehicle Emission Simulator (MOVES) program calculate highly detailed and accurate emissions estimates based on project-specific data provided by the user. MOVES allows the user to develop greenhouse gas emission estimates based on construction equipment specifications and operational data. Other models do not require such detailed inputs, such as the Federal Highway Administration's Infrastructure Carbon Estimator (ICE) tool. The ICE tool requires high-level inputs but allows the option for users to supply more detailed information. It also provides options for mitigation measures that can be easily factored into greenhouse gas emissions inventories.

Figure 30 summarizes the most versatile and applicable tools. A comprehensive GHG analysis would likely utilize several of these models to capture the extent of a project's impact.

FIGURE 30: SUMMARY OF GREENHOUSE GAS QUANTIFICATION TOOLS

Tool	Applicability	Scope of Analysis	Scope of Data Sources
ICE	Construction, facility footprinting, vehicular emissions	Functions as a starting point for GHG reduction strategizing by calculating high-level estimates of GHG emissions for a construction project with limited data	National
MOVES	Construction equipment operations, mobile vehicular emissions	Tailpipe emissions (i.e., emissions from the operation of construction equipment and motor vehicles)	Localized, county, state, national
CMIP	Climate projections	Localized climate change and GHG projections	Localized
AFLEET	Alternative fuel and vehicle technology	Economic and emission quantifications	State
LCA Pave	Roadway and pavement materials	Life cycle environmental impacts of pavement materials and design decisions	National, with flexibility for user-supplied information
GREET	Materials	Life cycle emissions for a large variety of materials (i.e., emissions from the cradle to the grave)	State, National
FLIGHT	Facilities	Provide GHG data reported by large facilities of varying industries, locations, fuel type	Localized, state
WARM Waste Reduction Model	Solid waste	GHG tracker and reduction quantification tool for solid waste	National

Source: WSP's analysis of sources listed in the table, 2022.

Fugitive Dust Mitigation Measures and Strategies

Construction activities are a significant contributor to fugitive dust in Salt Lake County. The main activities that contribute to fugitive dust emissions include vehicle travel on unpaved and paved roads, storage piles, materials handling, and construction and demolition. There are many dust suppression strategies, standards, and mitigation measures, though they vary in feasibility and effectiveness. Figures 31 through 35 below, adapted from the recommendations from California's South Coast Air Quality Management District and the WRAP Fugitive Dust Handbook, provide recommendations for various aspects of construction. Many of these

strategies recommend watering roads and open construction sites, which may not always be feasible.[35] However, there are other alternatives that are still effective and more feasible to implement.

FIGURE 31: MITIGATION MEASURES FOR UNPAVED ROADS

Source Activity	Mitigation Measure [1]	PM_{10} Control Efficiency	Comments
Travel over unpaved roads	Pave unpaved roads and unpaved parking areas.	99%	Based on a comparison of paved road and unpaved road PM_{10} emission factors.
	Apply chemical dust suppressant annually to unpaved parking areas.	84%	
	Implement watering twice a day for the unpaved industrial road.	55%	
	Limit maximum speed on unpaved roads to 25 miles per hour.	44%	Assumes a linear relationship between PM_{10} emissions and vehicle speed and an uncontrolled speed of 45 mph.

Source: Unless otherwise noted, the information presented in this table is from *WRAP Fugitive Dust Handbook*, September 7, 2006: http://www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf). ND = No Data.

[35] Utah DEQ is a member of the WRAP; therefore these measures are considered applicable in Utah.

FIGURE 32: MITIGATION MEASURES FOR STORAGE PILES

Source Activity	Mitigation Measure [1]	PM_{10} Control Efficiency	Comments
Storage pile wind erosion	Water the storage pile by hand or apply cover when wind events are declared.	90%	
Windblown dust from inactive areas[2]	Apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least four consecutive days).	Up to 80%	Wind erosion from inactive areas.
Storage pile wind erosion	Require construction of 3-sided enclosures with 50% porosity.	75%	Determined through modeling of open area windblown emissions with a 50% reduction in wind speed and assuming no emission reduction when winds approach open side
Windblown dust from disturbed areas[3]	Plant vegetative ground cover in disturbed areas as soon as possible.	15%	
Windblown dust from disturbed areas[3]	Plant tree windbreaks on the windward perimeter of construction projects if adjacent to open land.	4% (15% for mature trees)	

Sources: WRAP Fugitive Dust Handbook, September 7, 2006; U.S. EPA, "AP-42, Vol. I." Pg. 11.2.4-1 (http://www.epa.gov/ttn/chief/old/ap42/4th_edition/ap42_4thed_withsuppsa_f.pdf); SCAQMD, SIP for PM10 in the Coachella Valley, 1990, Pg 5-15.

FIGURE 33: MITIGATION MEASURES FOR PAVED ROADS

Source Activity	Mitigation Measure [1]	PM_{10} Control Efficiency	Comments
Mud/dirt track out	Install pipe-grid track out control device to reduce mud/dirt track out from unpaved truck exit routes.	80%	
Mud/dirt track out	Install gravel bed track out apron (3 inches deep, 25 feet long, 12 feet wide per lane, and edged by rock berm or row of stakes) to reduce mud/dirt track out from unpaved truck exit routes.	46%	
Mud/dirt track out	Require paved interior roads to be 100 feet long, 12 feet wide per lane, and edged by rock berm or row of stakes, or add 4-foot shoulder for paved roads.	42%	
Local streets	Implement sweeping street program with Rule 1186 compliant PM_{10} efficient vacuum units (14-day frequency)	16%	For PM_{10} efficient sweepers, based on 86% efficient sweeping, 8.6 day return time, and CA-VMT weighted sweeping frequency (7 to 30 days)
Arterial/collector streets		26%	
Local, arterial and collector streets	Require streets to be swept by Rule 1186 compliant PM_{10} efficient vacuum units (once per month frequency)	9%	For PM_{10} efficient sweepers, based on 86% efficient sweeping, 8.6 day return time, and CA-VMT weighted sweeping frequency (7 to 30 days)

Source: Unless otherwise noted, information presented in this table is from: *WRAP Fugitive Dust Handbook*, September 7, 2006: http://www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf). ND = No Data.

FIGURE 34: MITIGATION MEASURES FOR CONSTRUCTION AND DEMOLITION

Source Activity	Mitigation Measure [1]	PM_{10} Control Efficiency	Comments
Demolition Activities	Prohibit demolition activities when wind speeds exceed 25 mph.	98%	Estimated for high wind days in absence of soil disturbance activities. Demolition of 1,000 ft^2 structure on 1.2 acres.
Grading	All trucks hauling dirt, sand, soil, or other loose materials are to be tarped with a fabric cover and maintain a freeboard height of 12 inches.	91%	Arizona Department of Transportation Construction Analysis Services, "Final Field Study Report - PM_{10} Control Management Study for ADOT Construction Projects," June 1994
Post-demolition stabilization	Apply dust suppressants (e.g., polymer emulsion) to disturbed areas upon completion of demolition.	84%	For actively disturbed areas.
Scraper loading and unloading	Require minimum soil moisture of 12% for earthmoving by use of a moveable sprinkler system or a water truck. Moisture content can be verified by a lab sample or moisture probe.	69%	AP-42 emission factor equation for materials handling due to increasing soil moisture from 1.4% to 12%.
Construction Activities	Apply water every 3 hours to disturbed areas within a construction site.	61%	3.2-hour watering interval.
Construction traffic	Limit on-site vehicle speeds (on unpaved roads) to 15 mph by radar enforcement.	57%	Assume a linear relationship between PM_{10} emissions and an uncontrolled vehicle speed of 35 mph.
Track out	Use a gravel apron, 25 feet long by road width, to reduce mud/dirt track out from unpaved truck exit routes.	46%	
Active demolition and debris removal	Apply water every 4 hours to the area within 100 feet of a structure being demolished to reduce vehicle track out.	36%	
Demolition Activities	Apply water to disturbed soils after demolition is completed or at the end of each day of cleanup.	10%	14-hour watering interval.
Grading	Replace ground cover in disturbed areas as quickly as possible.	5%[2]	EPA, "Control of Fugitive Dust Sources" EPA-450/3-88-008, September 1988

Sources: WRAP Fugitive Dust Handbook, September 7, 2006.

FIGURE 35: MITIGATION MEASURES FOR MATERIAL HANDLING

Source Activity	Mitigation Measure [1]	PM_{10} Control Efficiency	Comments
Storage piles	Water the storage pile by hand at a rate of 1.4 gallons/hour-yard^2, or apply cover when wind events are declared.	90%	
Storage piles	Require construction of 3-sided enclosures with 50% porosity for storage pile.	75%	Determined through modeling of open area windblown emissions with a 50% reduction in wind speed and assuming no emission reduction when winds approach the open side.
Conveyors	Continuous water spray at the conveyor transfer point	62%	The control efficiency achieved by increasing the moisture content of the material from 1% to 2% is calculated utilizing the AP-42 emission factor equation for materials handling, which contains a correction term for moisture content.

Sources: WRAP Fugitive Dust Handbook, September 7, 2006.

Summary of Site Development Emission Mitigation Measures and Strategies

Meaningful emissions reductions can be achieved by applying mitigation measures and strategies. These strategies can be measured with a variety of quantification tools and further improved upon. Figure 36 provides recommendations that are most applicable to UIPA and potential partners.

FIGURE 36: EVALUATION OF MITIGATION MEASURES AND STRATEGIES

Action	Reduced Greenhouse Gases	Reduced Particulate Matter	Associated Tool(s)	Reductions Potential
Replace traditional vehicles with electric vehicles	*	*	AFLEET	Good
Utilize a renewable/conventional diesel blend in construction equipment	*	*	N/A	Fair
Utilize renewable energy for power rather than traditional generators	*	*	MOVES	Good
Select more sustainable construction materials	*		LCA PAVE, GREET	Good
Engage in sustainable waste management practices	*		WARM	Fair
Collect and report baseline GHG emissions for new facilities and evaluate areas for reductions	*		FLIGHT	Good
Pave over unpaved roads		*	WRAP Handbook	Good
Cover storage piles and other open construction areas		*	WRAP Handbook	Good
Cease demolition activities at high wind speeds		*	WRAP Handbook	Good
Implement vehicle speed limit on construction sites		*	WRAP Handbook	Fair

Source: WSP, 2022.

Scoring of Partners' Commitment to Sustainability

UIPA seeks local construction partners that align with its mission of sustainable construction, investment, and business development. Partners who show an exemplary willingness to invest in and practice sustainable methods will help to advance sustainability progress in the region.

Potential partners may be ranked based on their willingness to explore and quantify greenhouse gas reductions prior to and during construction to varying levels of detail. The scoring for the criterion shown in Figure 37 is based on the rigor of associated greenhouse gas emission analyses. For the following criterion, a score of 0 is the lowest score, while a score of 3 is the highest score. The more comprehensive and detailed the greenhouse analysis, the higher the score; if a partner refuses to conduct a greenhouse gas analysis, they will achieve a score of 0.

FIGURE 37: SCORING COMMITMENT TO SUSTAINABILITY STRATEGIES AND STANDARDS

Greenhouse Gas Analysis – Level of Detail	Tools	Ranking
Detailed life-cycle GHG analysis	MOVES, GREET, WARM, LCA PAVE	3
Mid-level GHG analysis of construction and operations	MOVES, GREET	2
High-level GHG analysis	ICE	1
No GHG Analysis	N/A	0

Source: WSP, 2022.

Partners may be ranked based on their willingness to cooperate with UIPA and set targets for sustainable achievements. The following ranking criteria are scored from 0 to 1 – a score of 0 indicates no willingness, and a score of 1 indicates a willingness to engage in the following sustainability practices.

- Willingness to set the agreed-upon benchmark with UIPA to replace equipment with EVs or utilize renewable/conventional diesel blend for equipment
- Willingness to set the agreed-upon benchmark with UIPA to utilize renewable energy in construction and/or operations
- Willingness to set the agreed-upon benchmark with UIPA to source recycled/sustainable materials
- Willingness to conduct a life cycle analysis for processes and materials used for the project
- Willingness to explore innovative sustainability practices (e.g., vegetation barriers, state-of-the-art filtration technology, etc.)

Partners that accumulate the most points will rank higher in their commitment to sustainable initiatives and alignment with UIPA goals.

Building Operation and Demolition

The energy consumed by the building, operating, and demolition of buildings accounts for approximately 40 percent of global GHG emissions. Within this 40 percent, most of the carbon emissions are attributed to the energy consumed during the building's operations (operational carbon). For this reason, energy efficiency has been the focus of building designers and engineers for decades. As technology and design continue to innovate to decrease the energy consumption of new and existing buildings, the amount of carbon emissions attributed to the materials that create and maintain buildings (embodied carbon) grows in proportion. The extraction, processing, manufacturing, transportation, construction, replacement, and disposal of building materials has an impact on the environment's carbon and other emissions.

Embodied carbon is the sum of all greenhouse gas emissions (mainly carbon) resulting from the entire construction lifecycle of a building. Since 11 percent of carbon emissions result from the construction life cycle itself, the construction industry needs to prioritize its efforts to reduce embodied carbon emissions or become net zero. Architects, designers, and owners can make significant embodied carbon reductions with cost-neutral measures.

Prior to selecting an embodied carbon reduction strategy, we recommend setting a target for reduction. Embodied carbon reduction strategies fall into different stages of a building project:

- **Design:** The greatest reductions can be achieved by prioritizing design strategies early in a project. Designers can encourage the reuse, renovation, and retrofitting of all or part of an existing building which will have less environmental impact and disruption compared to new construction. Other design strategies include using whole building life cycle assessment (WBLCA) to optimize envelope design and assess the trade-offs in embodied and operational carbon.
- **Material and system selection:** Another way to reduce embodied carbon within buildings is with key selections of materials and systems. By selecting carbon-storing structural, envelope, insulation, & finish materials such as bio-based materials, the load and size of supporting structural members can be considerably reduced. Bio-based materials like mass timber, laminated bamboo, wood fiberboard, straw, hempcrete, cork, etc., are lighter than alternatives and have the potential to store carbon over the life of the building. Choosing low-carbon insulation has the potential to balance operational and embodied carbon. Materials such as HFC-containing rigid polyurethane spray foam and XPS products should be avoided due to their high embodied carbon and environmental impacts. Other strategies

include selecting an MEP system with low-carbon refrigerants, selecting salvaged or refurbished materials, and use of cool pavement technologies to reduce heat islands.[36]

- **Specification and procurement:** The last category of strategies to reduce embodied carbon lies within specifications and procurement. Architects can integrate EPDs and GWP limits into project specifications. Low-carbon materials can also be substituted for high-carbon ones, like concrete mix, which has a huge impact on embodied carbon. The specification and mix design of concrete can lead to a 14%-33% reduction when the volume of Portland Cement is replaced with Type IL cement, fly ash, slag, and other supplementary cementitious materials (SCMs) and longer cure times are arranged. To truly reach a net-zero carbon target, both operational carbon and embodied carbon must be addressed. Whole Building Life Cycle Assessment (WBLCA) applies Life Cycle Assessment (LCA) to the built environment. LCA is a systematic method for evaluating the environmental impacts of products and services.

The Utah Inland Port Authority has the opportunity to promote embodied carbon emission reductions that are most relevant to the location and project type. The basic process strategies to reduce embodied carbon include:

1. Setting embodied carbon targets for projects and properties within UIPA's JA.
2. Collaboration across disciplines, including architects, engineers, owners, and builders.
3. Identifying embodied carbon as a priority and set up a project-wide embodied carbon reduction target to ensure it is a cross-team priority.
4. Using WBLCA to evaluate design options and system/material selections for carbon impacts and track project-specific reduction targets. This step can be conducted using a variety of LCA tools for buildings, including Tally, OneClick LCA Grasshopper Plugin, EC3, e-Tool, etc.
5. Specifying and using Environmental Product Declarations (EPDs) during procurement, along with other product and material data, to help select the lowest-carbon option.
6. Adopting commitments and practices related to embodied carbon and raising awareness across projects.

Life Cycle Assessment Tools for Buildings

The first step to monitoring and mitigating a building's embodied environmental impact is to quantify it by completing a WBLCA to calculate the total values of environmental impact categories such as global warming potential, ozone depletion potential, acidification potential, eutrophication potential, and smog formation potential. Several LCA tools for buildings with varying functionalities are available to complete these calculations. A summary of popular tools currently available is provided below. See Appendices D and E for additional details.

1. ***Tally by Building Transparency:*** Tally is a Revit plug-in that can be used to calculate Global Warming Potential, Acidification Potential, Ozone Depletion Potential, Smog Formation Potential, and Eutrophication Potential for the Cradle to Grave plus Module D stages. Tally leverages Building Information Modeling (BIM) capabilities and can be easily and iteratively integrated throughout the design process as material quantities and weights are auto-generated based on the Revit model. The use of Tally requires intermediate to advanced knowledge of Revit and necessitates a comprehensive Revit model, as the LCA can only be as accurate as the model. Additionally, the EPD database used by Tally has a limited number of product-specific EPDs available, leading to the use

[36] EPA, Using Cool Pavements to Reduce Heat Islands, 2022. https://www.epa.gov/heatislands/using-cool-pavements-reduce-heat-islands

of generic materials in calculations. The annual cost of a floating commercial license for Tally is $695.

2. ***One-click LCA by Bionova Inc.:*** OneClick LCA is a web-based application with Grasshopper, Revit, IES, IFC, ArchiCAD, DesignBuilder, and CSV integrations, meaning that results are to be produced with or without a Revit model. OneClick LCA can be used to calculate Cradle Grave Global Warming Potential, Acidification Potential, Ozone Depletion Potential, Photochemical Smog Potential, Eutrophication Potential, and Fossil Fuel Depletion. An export license is required for any reporting beyond carbon. OneClick LCA includes all third-party verified EPDs, which allows for the use of very few generic materials, but also relies on products with EPDs being specified. The annual cost of an expert floating license for OneClick LCA is $2,500.

3. ***Embodied Carbon in Construction Calculator (EC3) by Carbon Leadership Forum and Building Transparency:*** EC3 is a free tool that utilizes building material data inputted by hand from construction estimates or imported from BIM software or Tally bills of materials. EC3 can be used to calculate Global Warming Potential at the Cradle Gate stages. EC3 is not a WBLCA tool itself but instead is intended to be a supplemental tool used at the specification, procurement, and construction phase to fill the gap between early design assessments at the systems level using available WBLCA tools and the actual procurement of low-carbon products. Users can set project-specific reduction targets and, after products have been procured, select the utilized products to document the project's actual reductions against the targets set. The Athena Impact Estimator (IE) for Buildings by Athena Sustainable Material Institute***.*** The Athena IE for Buildings is a free PC desktop app that can be used to calculate Cradle to Grave Global Warming Potential, Acidification Potential, Human Health Respiratory Effects Potential, Ozone Depletion Potential, Photochemical Smog Potential, and Eutrophication Potential. Data must be imported as text (by importing a bill of materials or building manually within Athena), allowing for results without a 3D model.

4. ***Beacon by CORE Studio, Thorton Tomasetti:*** Beacon is a free, Revit-integrated tool that provides visualization of a project's embodied carbon quantities by material type, building element, and floor level. Beacon provides quick, high-level feedback and clear visualizations of a project's embodied-carbon quantities and rates each model's embodied-carbon levels against the Carbon Leadership Forum's (CLF) Embodied Carbon Benchmark Study results. Beacon does not report impact measures beyond Global Warming Potential, provides little transparency into calculations, and does not allow for results to be customized.

5. ***Environmental Analysis Tool (EA Tool) by SOM (Skidmore, Ownings & Merrill):*** The EA Tool is a free tool that evaluates estimated carbon for building structures, performs a cost-benefit analysis of enhanced structural systems, and estimates damage expected over a building's service life. The EA tool is not typically used for WBLCA calculations, but it allows for Global Warming Potential to be quantified at the early conceptual stages of design with minimal information (location, number of floors, floor area) based on SOM's material quantity estimation algorithm.

Landscape and Vegetation

The site has high habitat and ecological value in a unique regional location adjacent to the Great Salt Lake and prominent wetlands. To minimize or avoid negatively impacting habitat and the environment, site design should integrate development into the site in a way that does not do ecological damage to natural systems and habitats. The intentional low-impact design has the potential to repair, restore and participate in the healthy ecological functioning of the site; development must site buildings, roads, and other infrastructure to not interrupt water flow (year-round or seasonal) and in locations that do not disturb habitat

connectivity. For example, clear habitat linkages must be maintained. Native plant materials must be used in all locations, with sensitivity to the habitat that the development is a part of. For example, distinct habitats will have specific plant palettes. It is advised that a vegetation survey be done to identify plant zones and landscape types such as potential uplands, wet meadows, emergent marshes, and mudflats.

Appendix D: Funding and Financing Sustainability

This Appendix identifies best fitting and realistic funding sources to support the implementation of recommended sustainability strategies and standards. Financial operating models are also explored, understanding how the private sector can inject efficiency, capital, and innovation for various infrastructure needs by taking on project risks and opportunities.

Federal Funding Sources

Air Quality and Energy

There is a wide variety of federal funding opportunities aimed at supporting ports and their partners with greenhouse gas emissions reduction and energy conservation-related infrastructure projects and initiatives. Figure 38 summarizes the funding programs based on qualifying activities (planning vs. capital costs) and UIPA eligibility, followed by a brief description of each program.

FIGURE 38: FEDERAL AIR QUALITY AND ENERGY PROGRAM TYPES AND ELIGIBILITY

	UIPA Eligible	Partner Eligible
Planning Funds	• DERA (EPA) • Reduction of Truck Emissions at Port Facilities United State Department of Transportation (USDOT)* • Discretionary Grant Program for Charging and Fueling Infrastructure (USDOT)* • SEP Department of Energy (DOE) • P2 Environmental Protection Agency (EPA) • US DOE Vehicle Technologies Office Program Wide Funding Opportunity	• DERA (EPA) • PIDP Maritime Administration (MARAD) • NEVI Formula Program (USDOT)* • Discretionary Grant Program for Charging and Fueling Infrastructure (USDOT)* • TFP (DOE)* • SEP (DOE) • P2 (EPA) • Battery Materials Processing Grants (US DOE)* • DOE Vehicle Technologies Office Program Wide Funding Opportunity • Small Business Innovation Research and Small Business Technology Transfer Programs (DOE) • US DOE funding for national labs*
Capital Funds	• DERA (EPA) • Reduction of Truck Emissions at Port Facilities (USDOT)* • Discretionary Grant Program for Charging and Fueling Infrastructure (USDOT)* • Improved Energy Technology Loans (DOE) • SEP (DOE) • P2 (EPA) • DOE Vehicle Technologies Office programs for battery materials* • DOE Vehicle Technologies Office Program Wide Funding Opportunity	• DERA (EPA) • PIDP(MARAD) • NEVI Formula Program (USDOT)* • Discretionary Grant Program for Charging and Fueling Infrastructure (USDOT)* • Improved Energy Technology Loans (DOE) • TFP (DOE)* • SEP (DOE) • P2 (EPA) • DOE Vehicle Technologies Office programs for battery materials* • DOE Vehicle Technologies Office Program Wide Funding Opportunity • Small Business Innovation Research and Small Business Technology Transfer Programs (DOE) • DOE funding for national labs*
* New program established under BIL with details forthcoming.		

Source: CPCS analysis, 2022

The US Environmental Protection Agency (EPA) established the **Diesel Emissions Reduction Act** (DERA) Program to allocate funding to projects designed to achieve significant reductions in diesel emissions. DERA includes funding for programs focused on existing diesel fleets, regulations for clean diesel engines and fuels, and regional collaborations and partnerships. Funding cycles occur annually. EPA made approximately $90 million in funding available for the fiscal year 2021.[37] UIPA is eligible to apply to this program or can support partner agencies in their applications.

Port Authority of New York and New Jersey

DERA Award (2021): $1,025,000

The Port Authority of New York and New Jersey was awarded DERA funds to continue the Truck Replacement Program (TRP), established by the port authority, to reduce diesel truck emissions by phasing out older trucks serving the terminals. The program allows independent owner-operators or licensed motor carriers that own Class 8 port drayage trucks and who frequently serve the Port to replace those port drayage trucks with newer, cleaner vehicles. It covers up to 50 percent of the cost of a replacement truck or a maximum of $25,000, whichever is less. The application process may take anywhere from 45 to 60 days before a qualified applicant can receive their new truck.

Source: Truck Replacement Program, Port Authority of New York and New Jersey, 2021.

The **Port Infrastructure Development Program (PIDP)** is a discretionary grant program administered by the US Maritime Administration (MARAD). The purpose of PIDP is to improve the safety, efficiency, or reliability of goods movement through ports and intermodal connections to ports. This grant program seeks to fund projects that improve port resiliency to address natural hazards and disasters, as well as projects that reduce or eliminate port-related criteria pollutants or greenhouse gas emissions.[38]

In 2021, UIPA signed agreements with the Port of Oakland[39] and the Port of Long Beach[40] to improve the flow of cargo between the major California gateways and the Utah logistics system. Though UIPA has not been directly eligible to apply to PIDP, based on previous eligibility requirements,[41] UIPA may be a partner in initiatives that aim to reduce long-haul emissions along corridors connecting the two California ports to Utah, including deploying electric vehicle charging and hydrogen fueling infrastructure.

[37] US EPA, Diesel Emissions Reduction Act (DERA) Funding, accessed September 2022.

[38] USDOT Maritime Administration, About Port Infrastructure Development Grants, accessed September 2022.

[39] UIPA Website, Utah Inland Port Authority Signs Deal with Port of Oakland to Improve Goods Movement, accessed September 2022.

[40] UIPA Website, Port of Long Beach sign agreement, accessed September 2022.

[41] The 2022 PIDP Notice of Funding Opportunity specified eligible projects to "be located either within the boundary of a port, or outside the boundary of a port and directly related to port operations or to an intermodal connection to a port", with a program focus on coastal seaports, Great Lakes ports and inland river ports.

Ohio – Port of Cleveland

PIDP Award (2021): $3,000,000

The project will conduct a harbor-wide and regional planning study for the Cleveland-Cuyahoga County Port Authority to address its comprehensive cargo handling, environmental, and economic development needs, in addition to regional-level planning goals. The planning study will include six components: 1) a market analysis, 2) a terminal capacity analysis, 3) an intermodal connection assessment, 4) a plan for port decarbonization, 5) a coastal resilience plan, and 6) a regional-level cargo capability study.

Source: U.S. Maritime Administration, 2021 PIDP Grant Awardees. Image source: Port of Cleveland, 2021.

The **Reduction of Truck Emissions at Port Facilities** is a new competitive program established by BIL. This program will provide $400 million in funding over five years to reduce truck idling and emissions at ports through projects that advance port electrification and operation efficiency, focus on heavy-duty commercial motor vehicles (CMVs), or other related strategies. Grant funding will be provided to port authorities to test, evaluate, and implement projects that reduce emissions from idling trucks, covering up to 80 percent of eligible project costs.[42] UIPA would be eligible to apply to this program.

The **National Electric Vehicle Infrastructure (NEVI) Formula Program** is a major component of the charging and fueling infrastructure program established under BIL. The NEVI program provides $5 billion in funding over five years to states to strategically deploy electric vehicle charging infrastructure along designated alternative fuel corridors and in communities. [43] The program sets aside 10 percent of the NEVI Formula funding for grants to states and local governments that require additional assistance to deploy EV charging infrastructure.

I-80 and I-215, which connect UIPA to the rest of the Utah and US markets, are both designated by FHWA as alternative fuel corridors (AFCs).[44] UDOT's approved EV Infrastructure Plan for Deployment, Development, and Adoption for the NEVI formula program lays out Utah's electric vehicle service equipment (EVSE) deployment plan along eight corridors in the State, including I-80 and I-215.[45] The EVSE stations along the two interstate corridors may inform UIPA's consideration of future EVSE infrastructure within its jurisdiction.

[42] USDOT, Biden-Harris Administration Takes Step Forward to Combat Climate Change, Announces Proposed Transportation Greenhouse Gas Emission Reduction Framework, accessed September 2022.

[43] USDOT, Federal Funding Programs, accessed September 2022.

[44] FHWA, Alternative Fuel Corridors, accessed September 2022.

[45] UD OT, Electric Vehicle Charging Plan, accessed September 2022.

Utah's Electric Vehicle Infrastructure Deployment Plan for I-80 and I-215 Corridors

UDOT's approved EV Infrastructure Plan for Deployment, Development, and Adoption identifies the need for seven EVSE stations in Utah and one station in Nevada along the I-80 West Corridor (Salt Lake City to the Utah-Nevada border) to meet NEVI spacing requirements.

The Plan also identifies the need for one to two EVSE stations along the I-215 corridor (rings the northern portion of the Salt Lake County area) to meet NEVI spacing requirements. There are numerous NEVI-compliant EVSEs currently located along this corridor, and more EVSEs are expected to be made available between Rocky Mountain Power and the private sector.

Source: UDOT, Utah Plan for Electric Vehicle Infrastructure Deployment, Accessed September 2022.

BIL also established a **Discretionary Grant Program for Charging and Fueling Infrastructure** to provide $2.5 billion in competitive funding over five years to states and local governments to deploy electric vehicle charging and hydrogen, propane, and natural gas fueling infrastructure along designated AFCs and in communities. There is currently one publicly accessible electric vehicle charging station within UIPA jurisdiction.[46] As the details of this new grant program become available, UIPA may consider applying to this program to provide more electric vehicle charging and alternative fueling infrastructure, including propane fueling infrastructure for medium and heavy-duty trucks.

The **Improved Energy Technology Loans** program, administered by the US Department of Energy (DOE), provides loan guarantees to eligible projects that reduce air pollution and greenhouse gases and support early commercial use of advanced technologies, including biofuels and alternative fuel vehicles. DOE may issue loan guarantees for up to 100 percent of the amount of the loan for an eligible project. Eligible projects may include the deployment of fueling infrastructure, including associated hardware and software, for alternative fuels. Past financing recipients include clean hydrogen and energy storage facilities and wind power generation projects.[47] UIPA would be eligible to apply or may consider supporting Rio Tinto, the largest landowner in the JA, in its effort to utilize clean energy and adopt hydro storage units through grant writing assistance. The Improved Energy Technology Loans program has also funded electricity transmission network expansion projects in the past.

[46] US DOE, Alternative Fuels Data Center, accessed September 2022.

[47] US DOE, Loan Program Office, accessed September 2022.

Nevada – One Nevada Transmission Line

Loan Guarantee (2021): $343 million

In February 2011, the DOE issued a $343 million loan guarantee to finance the One Nevada Transmission Line project, a 235-mile, 500 kV AC transmission line capable of carrying 600 MW of power to the grid running north-south between Ely and greater Las Vegas, Nevada. Using advanced electric transmission tower, One Nevada Line improves grid reliability and delivers renewable electricity to high demand areas.

Source: U.S. DOE, Loan Programs Office, 2022.

Another program that could support the expansion of transmission and distribution infrastructure in UIPA's jurisdiction is the **Transmission Facilitation Program (TFP)**. TFP is a $2.5 billion program administered by the DOE to help build out new interregional transmission lines across the country, as envisioned in the BIL (available until expended). The TFP is a revolving fund program that will provide federal support to overcome financial hurdles in the development of large-scale new transmission lines and the upgrade of existing transmission, as well as the connection of microgrids.[48] UIPA may support the jurisdiction's electricity provider, Rocky Mountain Power, in applying for this program.

The **State Energy Program (SEP)**, established by the US DOE, provides annual funding to states to support the energy infrastructure and implement energy efficiency and renewable energy measures nationwide. The SEP funding to Utah is administered by the Utah Geological Survey. Utah typically receives between $425,000 and $450,000 annually in SEP funding to support energy efficiency, energy conservation, and renewable energy initiatives in the State. The Utah Geological Survey also administers a number of SEP programs, including the Energy Efficiency and Energy Conservation Program, which focuses on reducing energy consumption by the transportation sector through funding initiatives on alternative fuel vehicles, advanced vehicle technology, and idle reduction programs in Utah.[49] UIPA may be eligible to apply for the use of alternative transportation fuels for and the electrification of the agency's vehicles and tenants' medium-and heavy-duty vehicles

The **Pollution Prevention Grant Program**, overseen by the US EPA, offers two grants: the Pollution Prevention (P2) Grant Program and the Source Reduction Assistance (SRA) grant program. The P2 program provides technical assistance to businesses to help them develop and adopt source reduction practices. EPA made $23.2 million in funding available over a two-year funding cycle (FY 2022 and FY 2023). Businesses eligible for the P2 should fall within one of the six national emphasis areas (NEAs). The SRA program offers grants to support research, demonstration projects, education, and training related to source reduction approaches, with up to a total of $1.135 million in federal funds available over a two-year funding cycle.[50] UIPA would be eligible to apply or may consider supporting tenants' source reduction and pollution prevention initiatives through providing grant writing support.

[48] US DOE, Transmission Facilitation Program, accessed September 2022.

[49] Utah Geological Survey, State Energy Program Comes to UGS, accessed September 2022.

[50] US EPA, Grant Programs for Pollution Prevention, accessed September 2022.

The BIL will invest more than $7 billion in the batteries supply chain over the next five years. With funds appropriated by the BIL, the U.S. DOE Vehicle Technologies Office provides two new grant programs for battery materials processing, recycling, and second-life applications for vehicle batteries:

- The **Battery Materials Processing Grants** allocate $600 million appropriated annually for fiscal years 2022 through 2026 (to remain available until expended) for demonstration projects, construction of commercial-scale facilities, and retrofitting or retooling of existing battery material processing facilities.[51]
- The **Electric Drive Vehicle Battery Recycling and Second Life Applications** program is anticipated to provide approximately $60 million over five years to fund research, development, and demonstration of electric drive vehicle battery recycling and second-use applications.[52]

The DOE Vehicle Technologies Office **FY 2022 Program Wide Funding Opportunity** also provides funding support for research, development, and demonstration pilots that address vehicle technology priorities, including medium/heavy duty vehicle corridor charging and advanced engine and fuel technologies to improve fuel economy and reduce GHG emissions.[53]

UIPA would be eligible to apply or may support other non-profit and for-profit private entities, other state and local governments, institutions of higher education, and national laboratories to apply to all of the three DOE Vehicle Technologies Office programs mentioned above. For small businesses looking to locate in UIPA's JA, the DOE's **Small Business Innovation Research and Small Business Technology Transfer Programs** provide funding of varying sizes to advance technologies in a range of topic areas defined by the DOE.[54] In addition, DOE national labs will receive $200 million in funding over the next five years for electric vehicles, batteries, and connected vehicles projects. UIPA may consider entering into partnerships with national labs to test, pilot, and deploy innovative vehicle and battery technologies.[55]

Alaska – Port of Alaska and Sandia Lab Partnership

A partnership between the Port of Alaska and Sandia Lab, one of the nation's top engineering labs, seeks to establish a large microgrid to ensure a dependable supply of electricity. Under the memorandum, Sandia will help the Port of Alaska as part of a major modernization effort to become more resilient and sustainable while providing the energy security of the Port of Alaska's neighbor, Joint Base Elmendorf-Richardson.

Source: Sandia National Laboratories, 2022.

[51] US DOE, BIL Battery Materials Processing And Battery Manufacturing, accessed September 2022.

[52] US DOE, BIL Electric Drive Vehicle Battery Recycling and Second Life Applications, accessed September 2022.

[53] USDOE, BIL FY 2022 Program Wide Funding Opportunity, accessed September 2022.

[54] US DOE, Small Business Innovation Research and Small Business Technology Transfer Programs, accessed September 2022,

[55] US DOE, Department of Energy Announces New Vehicle Technologies Funding and Future Partnerships with Battery Industry, accessed September 2022.

The recently passed Inflation Reduction Act (IRA) also includes several energy and climate provisions that provide funding opportunities for fleets and ports, including:[56]

- Clean energy Tax Credits: These credits include the New Clean Hydrogen Production Tax Credit, which provides a 10-year incentive for clean hydrogen production; the New Advanced Manufacturing Production Tax Credit, which supports other clean production efforts such as solar power generation; and the A New Clean Electricity Production Tax Credit which encourages practices such as carbon capture and renewable electricity production.
- Investment Tax Credits: Providing new credit programs or extending the existing programs to support clean energy investments. Example programs that UIPA's stakeholders can be eligible for include the Energy Investment Tax Credit and Advanced Energy Project Credit programs supporting domestic energy manufacturing and recycling.
- Fuel Tax Credits: Focusing on ZE and low-carbon fuel technologies such as second-generation biofuels and renewable diesel fuels.
- Clean Vehicle Credit: Supporting the purchase of commercial electric vehicles by providing a 30 percent investment tax credit for purchase prices up to $40,000 for medium- and heavy-duty vehicles and $7,500 for light-duty trucks

IRA also includes carbon management provisions to encourage and support carbon capture and direct air capture practices through various tax credit programs.

Transportation

Under the Bipartisan Infrastructure Law, the availability of funding for innovative transportation projects has significantly expanded. The DOT has placed an emphasis in many programs on equitable, sustainable, and efficient transportation system development, aligning with UIPA's vision for the port's future. The most relevant programs are listed below. Figure 39 summarizes the funding programs based on eligible activities and UIPA eligibility, followed by a brief description of each program.

FIGURE 39: FEDERAL TRANSPORTATION PROGRAM TYPES AND ELIGIBILITY

	UIPA Eligible	Partner Eligible
Planning Funds	● RAISE (USDOT) ● Mega or Multimodal Project Discretionary Grant (MPDG) ● INFRA (USDOT MPDG) ● CRISI Federal Railroad Administration (FRA)	● RAISE (USDOT) ● Mega (USDOT MPDG) ● INFRA (USDOT MPDG) ● CRISI (FRA)
Capital Funds	● RAISE (USDOT) ● Mega (USDOT MPDG) ● INFRA (USDOT MPDG) ● Advanced Transportation Technologies and Innovation (USDOT) ● CRISI (FRA)	● RAISE (USDOT) ● Mega (USDOT MPDG) ● INFRA (USDOT MPDG ● Advanced Transportation Technologies and Innovation (USDOT) ● CRISI (FRA)

Source: CPCS analysis, 2022

[56] Inflation Reduction Act Summary, Energy and Climate Provisions, 2022: https://bipartisanpolicy.org/download/?file=/wp-content/uploads/2022/08/Energy-IRA-Brief_R04-9.26.22.pdf

The **Local and Regional Project Assistance Program**, also known as the **Rebuilding American Infrastructure with Sustainability and Equity (RAISE),** provides funding for planning and capital transportation infrastructure projects that have a significant local or regional impact. This year, the US Department of Transportation (USDOT) awarded $2.2 billion to enable 160 projects under RAISE. Projects awarded have included public transportation projects in underserved communities, inland port infrastructure development, surface transportation improvements at airports, and improvement of surface infrastructure to prevent stormwater runoff. The federal share of RAISE project costs may not exceed 80 percent unless the project is located in a rural area, a historically disadvantaged community, or an area of persistent poverty. UIPA may apply as a special purpose public authority for the purposes of investment in port infrastructure, public transportation, or the development of intermodal facilities.[57]

Texas – Port of Port Arthur Navigation District Multimodal Laydown

RAISE Award (2022): $13,600,000

The Port of Port Arthur was awarded a RAISE grant to convert an abandoned railyard into a cargo storage and staging area. The project includes over 25 acres of site stabilization, fiber optic, stormwater management, and revitalization of existing structures to reduce flood risks. The project will help create more space for the efficient movement of freight and people while providing access to jobs and local economic development for nearby disadvantaged communities.

Source: USDOT, RAISE Grant Recipients; Image Source: Port of Port Arthur, Aerial Image, 2022.

The **Multimodal Project Discretionary Grant,** founded under BIL, provides funds for the development of competitively efficient, equitable, and sustainable surface transportation systems. Programs under this grant announcement focus on reducing the consequences of climate change, particularly in communities that are disproportionately affected by pollutants. The program also seeks applicants that improve regional connectivity through freight or affordable transportation in underserved communities with minimal effect on the environment. The program is comprised of three separate funding opportunities, each with different purposes, requirements, and eligible entities:

The **Infrastructure for Rebuilding America (INFRA)**, also known as the Nationally Significant Multimodal Freight and Highway Projects Program, are grants aimed at improving freight system efficiency and eliminating freight bottlenecks. The program offers $7.2 billion in funding over the next four years. Any projects that improve safety and resiliency as it relates to an entity's freight operations also qualify. UIPA can apply for this grant as a special purpose district any year until 2026.

The **National Infrastructure Project Assistance (Mega)** program's goals are similar to that of RURAL and INFRA but place an additional focus on regional or complex infrastructure improvements that improve connectivity and mobility for individuals and freight. Improvements to a multimodal freight system, public transportation access, or national highway system are all eligible projects. The program provides $5 billion in funding over the next four years and specifies eligibility for port authority improvement or development projects.

[57] USDOT, Notice of Funding Opportunity (transportation.gov), accessed September 2022.

UIPA should consider an application to the Mega or INFRA grants under this program as they specify opportunities for the development of intermodal systems within and around port boundaries.[58]

Advanced Transportation Technologies and Innovation[59] is a grant program established under the FAST Act, supporting the installation of innovative technologies that improve the safety and efficiency of a transportation system. The DOT has authorized $60 million each fiscal year for eligible projects, with grants covering up to half of the individual project costs. The program specifies eligibility for charging infrastructure, advanced public transportation systems, and advanced congestion management and information systems, among other project themes. The UIPA can apply independently as a subdivision of local government.[60]

Under the **Consolidated Rail Infrastructure and Safety Improvements (CRISI)** Program, the U.S. Federal Railroad Administration (FRA) administers $1.5 billion in funding to projects that improve the safety and reliability of rail operations. Eligible projects include the improvement of highway-rail grade crossing safety, projects that address congestion challenges, or regional rail and corridor service development or analyses. UIPA would be eligible as a public authority to apply independently for this funding. Applications with a proposed federal cost share of less than 50 are more competitive, but FRA may provide up to 80 percent in cost shares. In 2021, CRISI funded 46 projects at the state, local, and commercial levels.[61]

Arkansas – Little Rock Port Authority Freight Rail Capacity Improvement Project

CRISI Award (2021): $5,569,373

The project proposed to add 11,215 feet of track at the Little Rock Port Authority harbor and yard tracks, in addition to constructing an engine maintenance facility. The facility allows the storage of four locomotives in total, along with an inspection pit and support offices. The project significantly improved the efficiency and capacity of the multimodal facility.

Source: USDOT, FRA, CRISI Program: FY2021 Selections; Image Source: Port of Little Rock, Rail, 2021.

Natural Resources, Habitat, and Animal Life

There exist several federally funded grant programs targeted at mitigating the impacts of development on the natural environment. While the EPA provides the greatest variety of funding options for habitat, water, and landscape conservation, multiple other federal agencies also oversee programs that UIPA can

[58] USDOT, Notice of Funding Opportunity, 2022-06350.pdf (govinfo.gov), Accessed September 2022.

[59] Previously referred to as the Advanced Transportation & Congestion Management Technology Deployment Program, Accessed September 2022.

[60] FHWA, Grant Programs, Grant Programs | FHWA (dot.gov) , Accessed September 2022.

[61] USDOT, FRA, Consolidated Rail Infrastructure and Safety Improvements (CRISI) Program | FRA (dot.gov), Accessed September 2022.

leverage. Figure 40 summarizes the funding programs based on eligible activities and UIPA eligibility, followed by a brief description of each program.

FIGURE 40: FEDERAL NATURAL RESOURCES, HABITAT, AND ANIMAL LIFE PROGRAM TYPES AND ELIGIBILITY

	UIPA Eligible	Partner Eligible
Research / Assessment Funds	● Clean Water State Revolving Fund Intended Use Plan (EPA)	● Joint Chiefs Landscape Restoration Partnership (USDA) ● Clean Water Infrastructure Resiliency and Sustainability Program (EPA) ● Sewer Overflow and Stormwater Reuse Municipal Grants (EPA)
Implementation / Demonstration Funds	● Clean Water State Revolving Fund Intended Use Plan (EPA)	● Joint Chiefs Landscape Restoration Partnership (USDA) ● Clean Water Infrastructure Resiliency and Sustainability Program (EPA) ● Sewer Overflow and Stormwater Reuse Municipal Grants (EPA)

Source: CPCS analysis, 2022.

The **Joint Chiefs Landscape Restoration Partnership** is a grant program launched with the start of the US Department of Agriculture's (USDA) Joint Chiefs Landscape Restoration Partnership (JCLRP) Initiative in 2014, which was formerly enacted as the Joint Chiefs Landscape Restoration Partnership Act in 2021. Through collaboration with landowners and local USDA experts, the program helps advance targeted management and restoration practices such as wildfire risk mitigation, water quality enhancement, and natural ecosystem restoration. In 2022, USDA awarded $48 million under this program to support 41 projects.[62] A wide variety of applicants are eligible for JCLRP funding, including county and state governments, non-governmental entities, utilities, and private landowners. Partnerships with local communities, farmers, and landowners are required for project proposals, which are accepted annually between May and August. UIPA can collaborate with environmental non-profits and landowners in the JA to prepare and submit project proposals for habitat restoration, watershed restoration, and even restoration-related educational activities.

New Mexico – Taos Valley Watershed Coalition

JCLRP Award (2018): $403,800

The Taos Valley Watershed Coalition (TVWC) efforts focus on 280,000 acres of the contiguous natural landscape. The area encompasses most of the headwaters of the Rio Grande within Taos County, waters critical to the economy and well-being of New Mexico's most populous regions, such as Taos, Santa Fe, and Albuquerque. TVWC's Landscape Restoration Strategy prioritizes areas for restoration treatments. These areas received a total of $403,800 in funding is JCLRP in 2018 to implement restoration activities on Taos Pueblo, private, and Carson National Forest managed lands.

Source: USDA, Joint Chiefs' Landscape Restoration Partnership - 2018 New Project Summaries.

[62] USDA, Joint Chiefs' Landscape Restoration Partnership, accessed 2022.

The EPA's **Clean Water Infrastructure Resiliency and Sustainability Program** provides $25 million in grants annually through 2026 to fund water conservation or enhancement of wastewater management systems. Areas especially vulnerable to natural hazards, such as irregular flooding or extreme droughts, are prioritized under the program's bill. The program aims to increase water use efficiency through stormwater management, green infrastructure, protection of nearby watersheds, and use of renewable energy in the area, among other efforts. The program offers to cover up to 75 percent of project costs, including the planning and construction of proposed infrastructure. UIPA can partner with state agencies like the Utah Department of Environmental Quality (DEQ) or Natural Resource Conservation Service (NRCS) to qualify for this grant program and obtain funding for stormwater management or renewable energy aspects of the area's development plan.[63]

Sewer Overflow and Stormwater Reuse Municipal Grants is a grant program established by the EPA in 2018 as an amendment to the Federal Water Pollution Control Act, aiming to protect local communities from flooding and water quality issues. The act expanded project grant eligibility to include the sewer/stormwater treatment facilities, or any project aiming to reduce sewer overflow or manage stormwater and subsurface drainage water. Funding opportunities exist for the planning and research of clean water strategies, as well as the implementation of infrastructure that mitigates stormwater collection impacts. The EPA solely awards funding to states or multistate coalitions that then distribute funds as they see fit. UIPA can request a grant on their **Clean Water State Revolving Fund Intended Use Plan** to qualify for any funding awarded to the State of Utah. In 2021, EPA awarded $67 million for eligible projects, including infrastructure revitalization and construction.[64]

Chester, Pennsylvania – Stormwater Overflow Green Infrastructure Improvements

Sewer Overflow and Stormwater Reuse Municipal Award (2021): $2,366,000

The city of Chester was awarded $2.4M in grant funds from the Pennsylvania Infrastructure Investment Authority in 2021 due to outdated and insufficient pipe and drainage infrastructure. The program will construct 1,600 feet of pipe and porous panels, a regional stormwater control basin, and restore nearby roadways to protect from area flood problems and filter stormwater runoff. Project efforts will eventually restore the Delaware River estuary and protect public health from toxic urban runoff.

Source: Stormwater, EPA awards $2.4M grant for Chester, Penn.'s stormwater overflows, 2021; Image Source: Chester Stormwater Authority, 2022.

Land Use

The primary federal grant program that can assist UIPA in addressing land use-related issues is the Brownfields Program by EPA and the Clean Energy Demonstration Program on Current and Former Mine Land by DOE. Figure 41 summarizes the funding programs based on eligible activities and UIPA eligibility, followed by a brief description of each program.

[63] U.S. Congress, Clean Water Infrastructure Resiliency and Sustainability Program, September 2022.

[64] EPA, Sewer Overflow and Stormwater Reuse Municipal Grants Program, March 2021.

FIGURE 41: FEDERAL LAND USE PROGRAM TYPES AND ELIGIBILITY

	UIPA Eligible	Partner Eligible
Assessment / Training Funds	● Assessment Grants (EPA Brownfields Program) ● MP Grants (EPA Brownfields Program) ● JT Grants (EPA Brownfields Program)	● Assessment Grants (EPA Brownfields Program) ● MP Grants (EPA Brownfields Program) ● JT Grants (EPA Brownfields Program) ● State and Tribal Response Program Grants (EPA Brownfields Program) ● Clean Energy Demonstration Program on Current and Former Mine Land (DOE)*
Cleanup Funds	● RLF Grants (EPA Brownfields Program) ● Cleanup Grants (EPA Brownfields Program) ● MP Grants (EPA Brownfields Program)	● RLF Grants (EPA Brownfields Program) ● Cleanup Grants (EPA Brownfields Program) ● MP Grants (EPA Brownfields Program) ● State and Tribal Response Program Grants (EPA Brownfields Program) ● Clean Energy Demonstration Program on Current and Former Mine Land (DOE)*
* New program established under BIL with details forthcoming		

Source: CPCS analysis, 2022

The primary federal grant program that can assist UIPA in addressing brownfield-related issues is the EPA's **Brownfields Program**. This program provides direct funding for brownfields assessment, cleanup, revolving loans, environmental job training, technical assistance, and research. There are six grants available under this program:[65]

- **Assessment Grants** provide funding for brownfield inventories, planning, environmental assessments, and community outreach through three options: community-wide assessment grants (61 grants ranging from $300,000 to $500,000 in FY 2023), assessment coalition grants (20 grants ranging from $500,000 to $1 million), and community-wide assessment grants for states and tribes (17 grants ranging from $1 million to $2 million).
- **Revolving Loan Fund (RLF) Grants** provide funding to capitalize loans that are used to clean up brownfield sites. EPA will award ten grants ranging from $800,000 to $1 million in FY 2023.
- **Cleanup Grants** provide funding to carry out cleanup activities at brownfield sites owned by the applicant. EPA allocated $60 million in funding to fund more than 70 projects of varying sizes for FY 2023.
- **Multipurpose (MP) Grants** provide funding to conduct a range of eligible assessment and cleanup activities at one or more brownfield sites in a target area. EPA will award 17 grants ranging from $400,000 to $800,000 per grant in FY 2023.
- **Job Training (JT) Grants** provide environmental training for residents impacted by brownfield sites in their communities.
- **State and Tribal Response Program Grants** provide non-competitive funding to establish or enhance State and Tribal Brownfields response programs.

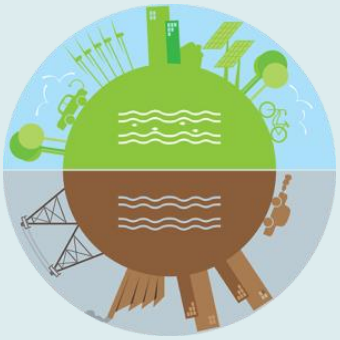
Active or closed landfills and other types of brownfields account for 13 percent of the UIPA JA. UIPA is eligible to apply to all the EPA Brownfields Programs, except for the State and Tribal Response Program Grants, but may partner with UDEQ to support the State's effort to address the four brownfield sites within UIPA's jurisdiction.

[65] US EPA, Types of EPA Brownfield Grant Funding, accessed September 2022.

Minnesota– Saint Paul Port Authority Brownfields Cleanup

Brownfields Cleanup Award (2022): $ 500,000

EPA has selected the Saint Paul Port Authority for a Brownfields Cleanup Grant. Grant funds will be used to clean up the Hillcrest Redevelopment Project located at 2200 Larpenteur Avenue E in the City of Saint Paul. The cleanup site is a vacant, 112-acre property that was formerly a golf course that was built in the early 1920s and is contaminated with metals and polycyclic aromatic hydrocarbons. Grant funds also will be used to monitor institutional controls and conduct community engagement activities.



Source: US EPA Brownfields 2022 Cleanup Fact Sheet, 2022.

The **Clean Energy Demonstration Program on Current and Former Mine Land Program**, established by US DOE with the BIL funds, is a $500 million program designed to demonstrate the technical and economic viability of carrying out clean energy projects on current and former mine land, available from 2023 through 2026. Up to five clean energy projects are to be carried out in geographically diverse regions, at least two of which shall be solar projects. Rio Tinto, the largest landowner in the UIPA JA with major mining operations, has a sustainability goal of becoming carbon neutral by 2030. As the details of this program become available in 2023, UIPA may consider exploring the possibility of partnering with Rio Tinto in carrying out energy demonstration projects.

State Funding Sources

Since a portion of UIPA's general fund is dedicated to supporting sustainable development activities in the JA, a primary role, at least in the short-term for UIPA, would be to educate the local businesses about their financial options and provide financial advisory support and sustainability strategy/standard oversight to start-ups and smaller businesses that want to establish and grow in Utah. UIPA can collaborate with Utah Clean Cities (UCC) in this endeavor as UCC compiles and regularly updates a comprehensive list of federal and statewide funding programs and incentives that can support alternative fuel and advanced clean technology adoption.

Air Quality and Energy

Several state-level funds and incentive programs support alternative fuel energy infrastructure projects. Programs like the Production Tax Credit (PTC) and Renewable Energy Systems Tax Credit have supported utility-scale renewable energy projects and research efforts throughout Utah.[66] Figure 42 summarizes the funding programs based on eligible activities and UIPA eligibility, followed by a brief description of each program.

[66] Utah Governor's Office of Energy Development, Public Utilities, Energy and Technology Interim Committee Renewable Energy Development in Rural Utah, 2018.

FIGURE 42: STATE AIR QUALITY AND ENERGY PROGRAM TYPES AND ELIGIBILITY

	UIPA Eligible	Partner Eligible
Capital Funds	● C-PACE (SRS) ● Non-Residential EVSE Rebate (RMP)	● State Tax Credit for Infrastructure (Utah OED) ● HCITC (Utah OED) ● C-PACE (SRS) ● Non-Residential Make-Ready Project Incentives (RMP) ● Non-Residential EVSE Rebate (RMP)

Source: CPCS analysis, 2022

The State of Utah's **State Tax Credit for Infrastructure** provides hydrogen fuel production incentives for businesses that switch from natural gas to hydrogen fuel or produce natural gas solely for use in the production of hydrogen fuel for ZE vehicles. The tax credit provided would be equal to the amount of the severance tax owed, up to $5 million per year. Another program provided by the State Government Office of Energy Development (OED) is the **High-Cost Infrastructure Tax Credit (HCITC)**. Infrastructure investment projects qualified for HCTTC include energy delivery systems. Qualifying businesses can receive a non-refundable tax credit for 30 percent of qualifying state revenues generated during a qualifying tax period.[67] While UIPA is not eligible to receive these incentives directly, it could inform hydrogen fueling station developers and operators about the programs to use them in consideration for the development of hydrogen fueling infrastructure in the JA.

An example program closer to UIPA's envisioned role for providing sustainable development oversight within the JA is the **Commercial Property Assessed Clean Energy (C-PACE)** program. CPACE combines private sector financial investments with public agency assessment and oversight to enable energy-saving improvements in commercial and industrial buildings. Interested businesses can fill out a Project Application Form and receive financial support to cover (up to 100 percent) of qualifying energy improvement project costs through private financing.[68] Meanwhile, OED, through collaboration with local governments such as the City of Salt Lake City, facilitates the financing process and provides free workshops to help businesses in their applications. UIPA could take a similar role in helping businesses in the JA apply for various financial programs that support various sustainability activities.

Rocky Mountain Power (RMP) offers the **Non-Residential Make-Ready Project Incentives (Utility Grant)** program to provide customers with support for developing make-ready infrastructure for EVSE deployment. No per-project funding cap exists for this make-ready program; awards are made on a case-by-case basis. Make-ready infrastructure consists of the to-the-meter (e.g., utility transformers) and behind-the-meter (e.g., site host electric panel) civil and electrical infrastructure that must be in place before an EV charger can be installed. Multiple utilities across the U.S. offer make-ready incentive programs and program offerings vary from utility to utility. While some utilities offer design, engineering, and construction support to applicants, RMP's program does not appear to offer these services, only offering to fund make-ready infrastructure costs. This is evident in their application for the program, which requires applicants to submit infrastructure designs, equipment specifications, site evaluations, and contractor bids with their application. As it develops plans and programs to support tenants of the JA, UIPA may consider whether to provide tenant fleets with grant writing support, along with support for make-ready

[67] Utah.gov, HIGH COST INFRASTRUCTURE TAX CREDIT (HCITC), Accessed September 2022.

[68] Utah CPACE, UTAH C-PACE FOR ENERGY EFFICIENCY CONTRACTORS, Accessed September 2022.

infrastructure design, engineering, and budgeting in order to prepare them for application to this RMP incentive program. [69]

Utah – Packsize International

Rocky Mountain Power Non-Residential EVSE Incentive Program (2017): $111,280

RMP awarded Packsize International with an incentive check that covered the costs of implementing 50 level 2 EV charging stations on the premise. This project was the largest installation of electric vehicle charging in the State of Utah. Over 25 employees at Packsize have begun to drive electric vehicles to work since the installation, and public charging options around the facility's perimeter have since been included in Packsize's project goals.

Source: Packsize, Media Announcements, 2017.

RMP also offers the **Non-Residential EVSE Rebate** program, which provides rebates for Level 2 chargers and direct current fast chargers (DCFCs), referred to as electric vehicle supply equipment (EVSE). RMP provides $30,000 or up to 75 percent of the total cost for single-port DCFCs and $42,000 or up to 75 percent of the total cost for double-port DCFCs. For level 2 single-port fast chargers, RMP provides $1,000 per charger or up to 75 percent of the total charger cost. The support amount for level 2 multi-port chargers is $1,500 per charger or up to 75 percent of the total charger cost. Both UIPA and tenants of the JA may apply for these EVSE rebates. RMP awards the projects based on applications submitted by the end of March 31, June 30, September 30, and December 31 of each year. [70]

Transportation

Utah Department of Transportation (UDOT) and Utah Transit Authority (UTA) partner with cities, Local Public Agencies (LPAs), and regional transportation offices to allocate federally-appropriated funds to various transportation and transit projects across the State. But because of the sustainability focus of this effort, in this section, we focus on those Utah-based public and private funding programs that can advance UIPA's transportation decarbonization and related infrastructure projects and initiatives, including the Utah Department of Environmental Quality's (DEQ's) Alternative Fuel Heavy-Duty Vehicle Tax Credit, Workplace Electric Vehicle Charging Funding Assistance, Conversion to Alternative Fuel Grant, and Utah Clean Diesel Program programs. While there are other programs that could potentially offer opportunities for UIPA for its transportation decarbonization efforts, UIPA should consider prioritizing these funding opportunities provided by Utah DEQ, especially in pursuing its near-term decarbonization efforts.

Figure 43 summarizes the funding programs based on eligible activities and UIPA eligibility, followed by a brief description of each program.

[69] RMP Website, Utah incentives for EV charging and make-ready projects, Accessed September 2022.

[70] RMP Website, Utah incentives for EV charging and make-ready projects, Accessed September 2022.

FIGURE 43: STATE TRANSPORTATION PROGRAM TYPES AND ELIGIBILITY

	UIPA Eligible	Partner Eligible
Capital Funds	● Workplace Electric Vehicle Charging Funding Assistance Program (Utah DEQ) ● Clean Diesel Program (Utah DEQ)	● Alternative Fuel Heavy-Duty Vehicle Tax Credit Program (Utah DEQ) ● Workplace Electric Vehicle Charging Funding Assistance Program (Utah DEQ) ● Conversion to Alternative Fuel Grant Program (Utah DEQ) ● Clean Diesel Program (Utah DEQ)

Source: CPCS analysis, 2022

DEQ's **Alternative Fuel Heavy-Duty Vehicle Tax Credit Program** is a state government tax credit for zero and near-zero emission vehicle purchases. The State of Utah provides an income tax credit for the purchase of qualified natural gas, all-electric, or heavy-duty hydrogen vehicle. Qualifying vehicles must be commercial category 7 or 8 vehicles per 59-7-618.1 and 59-10-1033.1 UCA. The credit for 2022 is $13,500, and it decreases over time through 2030. The credit is limited to an aggregate annual amount of $500,000.

The **Workplace Electric Vehicle Charging Funding Assistance Program** is an infrastructure grant that supports businesses, non-profit organizations, and other governmental entities (excluding State Executive Branch agencies) through reimbursement of up to 50 percent of the purchase and installation costs associated with preapproved EVSE projects. Reimbursements can be used for the purchase and installation of both Level 2 and DCFC.

The **Conversion to Alternative Fuel Grant Program** is a grant to support businesses that convert vehicles to run on natural gas, propane, or electricity to apply for a grant of up to $2,500 per conversion.

Finally, the **Clean Diesel Program** offered by Utah DEQ provides financial incentives in the form of rebates to public and private fleet owners who scrap their older heavy-duty diesel vehicles and non-road equipment and purchase new ones. Reimbursement amounts vary by replacement vehicle/equipment fuel type: 45% for new all-electric, 35% for new CARB-certified low NOx engines, and 25% for new diesel. UIPA's tenants in the JA should pursue this vehicle rebate to reduce the costs of procuring heavy-duty electric vehicles and equipment.

Utah – Logan City Public Bus Retrofitting

Utah DEQ Clean Diesel Program (2017): $40,000

Logan City used program funds to retrofit 19 city buses within their fleet with diesel oxidation catalysts and particulate filters that reduce emitted particulate matter by 95%. The fleet's CO2 emissions and hydrocarbon emissions were also reduced by 75 and 90%, respectively. Vehicles chosen for retrofitting were chosen due to their greatest footprint and most outdated equipment to maximize the project's effect on emissions. Logan City has since converted several other busses to similar technology and some to entirely electric engines.

Source: Utah DEQ, News release, 2017.

Natural Resources, Habitat, and Animal Life

Many national-level conservation acts have influenced the establishment of parallel state funding programs that assist a wider variety of parties in environmental protection efforts. Utah provides several financial assistance opportunities for governmental and private entities that align with UIPA's developmental strategies. Listed below are the most relevant programs to UIPA's natural resource conservation efforts.

Figure 44 summarizes the funding programs based on eligible activities and UIPA eligibility, followed by a brief description of each program.

FIGURE 44: STATE NATURAL RESOURCES, HABITAT, AND ANIMAL LIFE PROGRAM TYPES AND ELIGIBILITY

	UIPA Eligible	Partner Eligible
Research/ Assessment Funds	● CIG (Utah NRCS)	● CIG (Utah NRCS)
Implementation /Demonstration Funds	● CIG (Utah NRCS) ● Land and Water Conservation Fund (Utah DNR) ● Water Quality Assistance Program (Utah DEQ)	● CIG (Utah NRCS) ● Land and Water Conservation Fund (Utah DNR) ● Water Quality Assistance Program (Utah DEQ)

Source: CPCS analysis, 2022

Similar to federal funding opportunities under the USDA, Utah's Natural Resource Conservation Service (NRCS) offers **Conservation Innovation Grants (CIG).** CIGs use federal funds to stimulate the development of innovative conservation approaches and technologies and encourage environmental enhancement and protection in conjunction with agricultural production. The state program aims to provide such funding to smaller parties, including non-federal or non-governmental organizations or individuals that may not be able to compete for the national-level grant. UIPA can apply independently as a quasi-governmental organization for funding under the water optimization or soil health category of proposals. Eligible projects can receive between $20,000-$200,000 in funding for a one to three-year project.[71]

The Utah Department of Natural Resources (DNR) offers the **Land and Water Conservation Fund** as part of the national Land and Water Conservation Fund Act. The program provides federal reimbursement for the acquisition and/or development of public outdoor recreation areas. Eligibility is based on a proposal's relevance to development goals stated in Utah's 2019 Outdoor Recreation Plan. UIPA projects that could be eligible for funding under these criteria could include the creation of new recreation facilities, the creation of trails and walkways, parking facilities, or improved waterbody access. UIPA can partner with the city or county to apply for 50-50 matching related project costs.[72]

Finally, the State of Utah Department of Environmental Quality has a **Water Quality Assistance Program** that includes loans and grants for water quality projects that address existing water quality problems. The program encompasses any projects that address water quality within a watershed that improves human health, public education about water quality, or improves environmental conditions that influence state water quality. Previous recipients of non-point source grant funding have included efforts to manage storm

[71] USDA, Conservation Innovation Grants | NRCS Utah (usda.gov)

[72] Utah DNR, Land And Water Conservation Fund State-side Grant Program | Utah State Parks

and wastewater, development of surge irrigation to reduce runoff, and restoration of riverscapes for vulnerable habitats.[73]

UIPA can apply independently in 2023 as a quasi-governmental agency aiming to preserve and improve water quality in the JA. Once an application is submitted, Utah DEQ may determine what funding source is most appropriate for the proposed project.

Salt Lake County, Utah – Lower Jordan River Basin Watershed Restoration

Utah DEQ Non-Point Source Water Quality Improvement Assistance (2022): $30,000

Due to increasing variability in rainfall and evaporation rates, as well as declining oxygen levels in the river basin, the Jordan River has seen increasing bacteria levels in its systems. Salt Lake County used DEQ funds to continue the restoration of the river's southern portion. The project will focus on the identification and remediation of non-point source pollutants in the Emigration Creek sub-watershed. Eroding river banks will also be reinforced to make water flow for habitats more stable and prevent erratic flooding.

Source: Utah DEQ, News release, 2022; Image Source: Jordan River Commission, Restoration Projects, 2022.

Land Use

There are several state and local-level land use and economic development-related grant opportunities that may benefit existing and potential tenants within the UIPA JA. UIPA may consider compiling information on these grant programs and making them easily accessible on its website or assisting tenants in their applications. Figure 45 summarizes the funding programs and tax incentives for capital improvements that UIPA may support partners to apply, followed by a brief description of each program.

FIGURE 45: STATE LAND USE PROGRAM TYPES AND ELIGIBILITY

	Partner Eligible
Capital Funds	● U-Save (Utah OED) ● Economic Development Loan Fund (Salt Lake City) ● EDTIF (Utah OEO)

Source: CPCS analysis, 2022

- The **Utah U-Save Energy Fund Program** ("U-Save") by the Utah Office of Energy Development (OED) finances energy-related cost reduction retrofits for publicly owned buildings. Through U-Save, low-interest rate loans are provided to assist these institutions in financing their energy cost reduction efforts. U-Save funds are available to retrofit existing equipment and installations as well as water system-related improvements. Such projects may include rooftop solar, water and space heating systems, electric generation with photovoltaic or small wind systems, replacing undersized or leaking water pipelines with new adequately sized pipes, or hydroelectric projects.[74]

[73] Utah DEQ, Financial Assistance Programs: Water Quality - Utah Department of Environmental Quality

[74] Utah Department of Environmental Quality, Utah's Office of Energy Development's U-Save Energy Fund Program: Funding Opportunities , accessed September 2022.

- The **Salt Lake City Economic Development Loan Fund** could be applicable for businesses that are looking to locate in the UIPA JA. Loans are available for startup businesses for up to $100,000 and for existing businesses for up to $350,000 for a variety of activities, including equipment upgrades, building retrofits, and marketing. The program also provides micro-loans at $25,000 or less. Loan terms are between six months to seven years. The average interest rate is at 7.5 percent, with rate reduction incentives available. [75]
- The **Economic Development Tax Increment Financing program** (EDTIF), administered by the Utah Governor's Office of Economic Opportunity (OEO), offers tax credit rebates or grants for up to 30 percent of new state revenue, typically over 5-10 years. The tax credit rebates are disbursed after the company meets contractual performance benchmarks such as job creation, new capital expenditure, and payment of state taxes.[76]

Sustainable Land Use and Climate Finance Models

Sustainable finance models are funding structures for the specific purpose of encouraging developments and activities that meet the needs of the present without compromising the future generation's equitable access to resources like developable land, natural areas, water, energy, and clean air. Sustainability finance is closely intertwined with climate finance models as many sustainability objectives, such as emission reduction, energy and water use efficiency, and protection and preservation of the natural environment, directly contribute to encountering the adverse environmental and economic effects of climate change.

Sustainability finance models were once primarily focused on carbon emission trading and clean technology investments, but today many innovative methods and entrepreneurial opportunities can be leveraged by UIPA and its partners and stakeholders to support sustainable growth. These include bonds, loans, various incentive programs, and even frameworks for aiding businesses in setting and meeting sustainability performance measures. For instance, UIPA can help businesses and landowners in the JA take a systematic approach toward sustainability by setting boundaries and ecological limits [77] to ensure natural resources are not depleted, waste is reused or responsibly disposed, and air emissions are restricted to certain amounts defined based on the closed cycles of the natural environment.

Climate finance is often accomplished and performed through loans as financers often wish to see a return on their investment.[78] However, private sector investments in sustainability actions are still far below the levels needed. A primary example is the significant gap between the needed and the invested amounts in climate finance; in the 2019-2020 period, only 6 percent of total climate finance worldwide was funded with grants, although this was an increase from 5 percent in FY 2017/2018. Nevertheless, private investments rose by 13 percent between FY 2017/2018 and 2019/2020, almost double the public finance increase of 7 percent.[79] As Figure 46 shows, global climate finance investment hit $632 billion in FY 2019/2020. Unfortunately, this remains roughly five times below the levels of investment needed to ward off the most serious impacts of climate change.

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[75] Salt Lake City, Economic Development Loan Fund, accessed September 2022, https://www.slc.gov/ed/edlfloan/

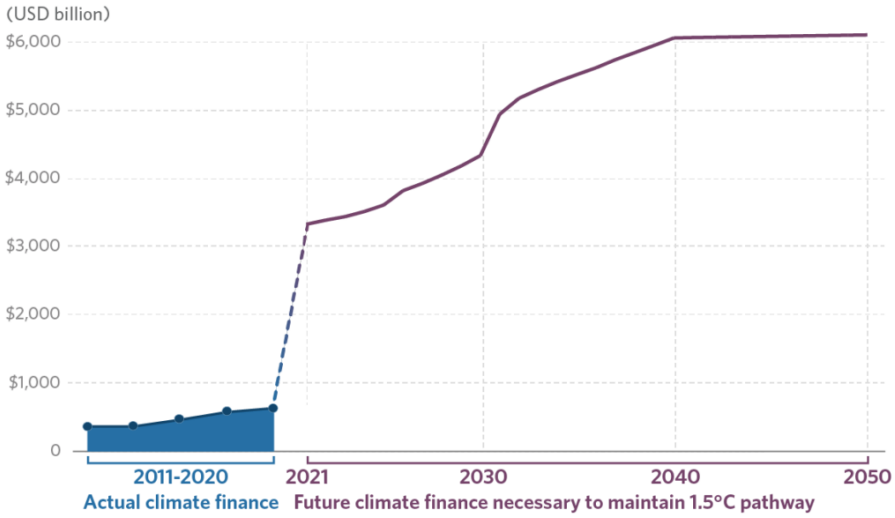
[76] Utah Governor's Office of Economic Opportunity, Utah's EDTIF & REDTIF Programs, accessed September 2022.

[77] A Framework for Sustainable Finance, Rotterdam School of Management Erasmus University, September 2019.

[78] Playbook for Climate Finance, The Nature Conservancy, 2022.

[79] Global Lanscape of Climate Finance 2021, Climate Policy Initiative, December 2021.

FIGURE 46: GLOBAL INVESTMENT NEEDED VERSUS CURRENT INVESTMENT



Source: Global Landscape of Climate Finance 2021, Climate Policy Initiative.

In the US, private investments made up 90 percent of climate finance sources in the 2017-2018 period. Total climate finance averaged $74 billion, which is three times more than in 2014 but still just 13 percent of total investments worldwide.[80] Wind and solar energy generation made up over 80 percent of the country's climate finance. Despite the gap between the actual amount invested and the amount needed to mitigate climate-related disasters, the growing financial interest from the private sector suggests that they continue to see the value and potential returns (such as business legitimacy and continuity) from funding climate initiatives.

This section examines current sustainability finance models and indicates the most promising avenues for closing this financial gap.

Incentive Mechanisms

Results-based Incentives

Results-based finance (RBF) is a broad category of financing where investment is made only if certain agreed-upon objectives are met. The term "RBF" itself is often specific to finance programs for developing countries.[81] One of the most prominent examples is the World Bank's Pilot Auction Facility (PAF), a novel global RBF bond program funded by Germany, Switzerland, and the United States, that auctions off put options to investors who have the security of knowing that they can sell generated carbon credits (according to eligible emissions reductions) at an established price.[82]

In the US, terms other than "RBF" are used more frequently, though they are still, in effect, forms of result-based financing. These mechanisms include Performance-Based Contracting, Environmental Impact Bonds, and Sustainability-Linked Bonds. These types of financing provide a flexible tool to address a wide range of needs, including the need for improvements in air quality and sustainable land development practices within the UIPA JA. UIPA can collaborate with stakeholders such as the Cities of Salt Lake City and West Valley, Magna Town, and Salt Lake County to establish specific short, medium, and long-term

[80] The Landscape of Climate Finance in the United Stations, Climate Policy Initiative, March 2021.

[81] Results-Based Financing Approaches, Urban Institute, Matthew Eldridge and Rebecca TeKolste, November 2016.

[82] Pilot Auction Facility, World Bank Group, accessed October 2022.

sustainability objectives for the area. These could include preserving land as a wildlife habitat, expanding energy and water use efficiencies, and mitigating dust and noise pollution from ongoing and completed construction activities.

Performance-Based Contracting awards contracts to vendors who meet certain standards. The US Department of Defense issues contracts for weapon system support that effectively purchase performance outcomes from vendors rather than the support or tools used to achieve this outcome.[83] Similarly, the Maine Department of Health and Human Services ties contract renewal to the vendor's performance. This has proven to improve project outcomes.[84]

Environmental Impact Bonds (EIB) are another funding mechanism related to RBF, where the investor shares some of the project risks with the bond issuer and is either remunerated or penalized based on the ultimate environmental and sustainability impact of the investment. An example of this mechanism is the District of Columbia Water's Environmental Impact Bond.

In 2016, DC Water issued a $25 million bond, the first **Environmental Impact Bond** in the US. The funds were used to improve stormwater management and reduce sewer runoff into Rock Creek. DC also installed rain gardens, permeable pavement, and parks. The use of an EIB allowed the agency to share the risk of these projects with private investors. Because EIBs require frequent reporting on project performance, the agency gathered considerable information that will be valuable to similar agencies. Ultimately, the project was a success, with all the following objectives achieved:

- "Ensure responsible stewardship of ratepayer funds by transferring a portion of performance risk associated with technologies that had never been implemented on a large scale in the District,
- Enhance future decision-making about how much and which types of green infrastructure to build,
- Create a model funding mechanism that other municipalities can leverage to advance the use of green infrastructure to address stormwater management in their communities,
- Establish a Green Jobs initiative targeting local workforce development and sustainable job creation, including training and certification opportunities for District residents,
- Improve transparency to local ratepayers by formally predicting, measuring, and publicly reporting the environmental impact of the green infrastructure."

Source: DC Water, 2022.

Sustainability-Linked Bonds (SLB) are similar to other result-based finance instruments like Environmental Impact Bonds, with the major difference being that SLBs incorporate an increased coupon rate when sustainability goals are not achieved. SLBs are similar to other result-based finance instruments like Environmental Impact Bonds, with the major difference being that SLBs incorporate an increased coupon rate when sustainability goals are not achieved. In other words, if the bond issuer does not meet its established sustainability goals, the coupon rate is increased, and the issuer must pay back the bondholder at a higher interest rate. As a result, the bond issuer is incentivized to achieve its sustainability goals to avoid potential coupon rate increases.[85]

[83] Defense Logistics: Improved Analysis and Cost Data Needed to Evaluate the Cost-effectiveness of Performance Based Logistics | U.S. GAO

[84] Results-Based Financing Approaches, Urban Institute, Matthew Eldridge and Rebecca TeKolste, November 2016.

[85] Launch of the First Sustainability-Linked Bond for Enel, Credit Agricole Corporate & Investment Bank, Accessed September 2022.

The USDA Forest Service is working to develop novel finance models that incorporate private capital in conservation efforts. One such program, in partnership with Blue Forest Conservation, is the **Forest Resilience Bond (FRB)**, which invites private capital to conduct forest restoration activities like thinning and controlled burning. Stakeholders who have benefited from the activities pay back investors as work is completed and outcomes are achieved. These bonds have raised $4 million for the Tahoe National Forest to reduce the risk of wildfire.

Source: Conservation Finance Program, 2022.

Market-Driven Incentives

Incentive programs that are market-induced create profitable opportunities for transitioning from the traditional investment approaches. These programs are widely-used across the world, mostly to achieve environmental objectives. A fundamental step in establishing market-driven incentive programs is developing a policy instrument that clearly specifies objectives and targets, including revenue objectives. The effectiveness of programs also depends on the time it takes for changes in behavior to establish, and a key challenge to consider is that it will be difficult to determine the size of incentives offered. This challenge, however, can be addressed through timely benchmarking and feedback mechanisms. Examples of market-driven incentive programs are provided below, along with a few case studies to help UIPA's decisions regarding utilizing such options.

Carbon pricing is a market-driven incentive that incorporates the external costs of carbon emissions into business decisions. This is an effective means of incentivizing lower-carbon practices. One means of mandating this kind of consideration is through a government-imposed carbon market, like that developed in California or in the European Union. There has been some debate about whether these models are effective in practice.

California's cap-and-trade program began in 2013 and auctions off a limited supply of carbon allowances each quarter totaling a predetermined carbon cap. Every year, the number of these allowances in the market is reduced and the price floor per allowance is raised to incentivize emissions reduction. Allowances in the market can be traded or sold within the market. Businesses can purchase more carbon allowances within this market if they are higher polluters but are disincentivized by the financial costs associated with the limited supply of carbon allowances. There is thus a market-driven force that encourages businesses to internalize the costs of externalities and reduce carbon emissions.

The state has seen near 100% compliance, and in a sign that the program is working, 2020 reduction targets were met four years ahead of schedule. There are in fact unused carbon allowances in the market. These are removed from auctions after supply has exceeded demand for 24 months. The program allows polluters to purchase offsets to bypass the need to acquire carbon allowances. These might be investments in real carbon reductions in other sectors like forestry or agriculture. There has been some concern that this allows large polluters, often located in disadvantaged communities, to avoid reducing their emissions.

Source: California Air Resources Board, Cap-and-Trade Program; PLOS Medicine, Carbon trading, co-pollutants, and environmental equity: Evidence from California's cap-and-trade program (2011-2015), 2018.

Carbon capture refers to technologies that prevent carbon emissions from being released into the atmosphere and storing them in the ground or reusing them instead. Because it is one of the most effective ways to reduce GHG emissions and their impact on the climate,[86] there has been significant discussion about

[86] Carbon Capture, Center for Climate and Energy Solutions, Accessed September 2022.

tax incentives and bond structures to incentivize carbon capture and storage. One method would be to impose carbon taxes, perhaps set based on the social costs of emission and likely set above the cost of carbon capture, to encourage investments in the required technology and equipment. The existing **45Q tax credit** does the reverse, offering a tax credit to incentivize carbon capture. Under BIL, carbon capture solutions can be financed through tax-exempt private bonds by authorized issuers. The **Carbon Capture, Utilization and Storage (CCUS) Tax Credit Amendments Act** and the **Negate Emissions to Zero (NET Zero) Act were** introduced in 2021 in the Senate and the House, respectively, aiming to enhance the 45Q tax credit. Both CCUS and NET Zero would increase the level of 45Q incentives, extend the credit duration, and increase support for activities that use innovative technologies. Also, to ensure equity, credit holders with limited taxable income can receive the credit difference in the form of direct payments.[87]

The **credit for carbon oxide sequestration, or 45Q**, is a tax credit aimed at incentivizing the use of carbon capture technology to reduce the amount of carbon that is released into the atmosphere. To be eligible the carbon oxide must be one that would have been released or that already has been released prior to sequestration. The carbon should be stored in secure geological sites. The tax credit varied based on the date when equipment was installed and is determined based on the method of sequestration. The total credit is capped based on either the quantity of carbon captured or a time period after equipment installation.

Source: The Tax Credit for Carbon Sequestration (Section 45Q), Congressional Research Service, 2021.

There are several **municipal funding strategies** that cities are adopting to raise funds needed for investments in carbon reduction. Denver, Colorado, has introduced an additional 0.25 percent sales tax, the proceeds of which will go directly towards programs that reduce emissions and adapt to climate change. In Portland, Oregon, voters chose to add a 1 percent retail tax placed entirely on large retailers not based in Portland. In Long Beach, California, a new barrel tax is placed on oil producers for each barrel produced in Long Beach. Some cities have passed energy consumption taxes, including Boulder, Colorado's voters' approval of a carbon tax. Climate and resiliency bonds are another approach, like Miami's $400 million Forever Bond, which will be used to invest in climate resiliency.[88]

A new idea that has recently been developed is the **adaptation credit marketplace**. Instead of a carbon credit marketplace for current emissions, the adaptation credits would be purchased to help offset historical emissions with ongoing repercussions. Adaptation credits, each valued at the social cost of one ton of carbon emissions, would be created and listed on a marketplace for purchase by emitting companies. Thus, the credits would not represent arbitrary permits to emit, as in the case of the carbon market but would organize demand for climate adaptation financing with the extensive capital supply of firms seeking to recompense historical emissions.[89]

[87] Carbon Capture, Utilization and Storage (CCUS) Tax Credit Amendments Act of 2021 and Negative Emissions to Zero (NET Zero) Act of 2021, World Resources Institute, May 2022.

[88] 6 Innovative Ways to Fund Climate and Equity in US Cities, World Resources Institute, May 2021.

[89] A radical idea to fund climate adaptation globally, The Hill, Himanshu Gupta, September 2022.

Climate Adaptation in Salt Lake City

Salt Lake City is in particular need of the kind of climate adaptation financing made possible in the proposed adaptation credit marketplace. Both significant water demands from an increasing population and increasingly hot temperatures reducing snowpack runoff, have reduced the Great Lake Lake's size by about two-thirds since the 1980s. The lakebed contains arsenic, copper, and other metals which, when airborne as dust, will be toxic to surrounding residents, especially as more of the lakebed is exposed. Other effects are also imminent, including ecological impacts caused and degraded ski conditions. Dust mitigation strategies, water conservation efforts, emergency preparation, and other climate adaptation solutions all cost money. But without them, serious consequences are likely.

Source: As the Great Salt Lake Dries Up, Utah Faces an 'Environmental Nuclear Bomb', The New York Times, September 2022.

Impact investments are also market-driven incentives that offer significant benefits to the climate while offering a financial return. This is the case for the Nature Conservancy's climate-conscious **Cumberland Forest** project, which promises to conserve about 250,000 acres of forest in Appalachia while managing sustainable timber harvesting and selling recreational leases as a source of revenue that will serve as a return on the investment.[90]

Other Incentive Mechanisms

Incentive zoning is an effective means for government agencies to encourage development practices that adhere to specific objectives. This strategy may be particularly appropriate for UIPA since the authority's enabling legislation specifically directs it to "review and identify land use and zoning policies and practices to recommend to municipal land use policymakers and administrators that are consistent with and will help to achieve" sustainable land use goals.[91] Incentive zoning can take many forms but generally rewards developers for adhering to certain desired practices with appealing exemptions from zoning restrictions. This mechanism is used successfully in Bloomington, Indiana, and Seattle, Washington.

Considerations for UIPA

[90] Playbook for Climate Finance, The Nature Conservancy, 2022.

[91] H.B. 443 Utah Inland Port Authority Amendments, Utah State Legislature, 2022.

Market-based incentive mechanisms designed to support sustainability and climate action initiatives have the potential to direct markets towards the desired change by leveraging profitability as a guiding principle for changing private entity behavior. However, critics of market-based incentive approaches argue that they encourage corporations to delay the necessary changes in unsustainable business practices (through emission reduction, energy and water efficiency, natural environment protection, etc.) so long as they can offset the impacts of their current activities.

Seattle's incentive zoning program rewards developers with extra floor area or height (beyond the maximum amount permitted in the Land Use Code) when they provide a public amenity like affordable housing, childcare, and open spaces.

Bloomington, Indiana's Sustainable Development Incentives reward developers who adhere to different combinations of sustainability goals with tiered zoning incentives ranging from decreased building setbacks to increased maximum residential density. The city has four sustainability goals:

- Energy and resource efficiency (e.g., green roofs, renewable on-site energy sources, recycled construction, locally sourced building materials)
- Landscape and site design (e.g., use of permeable pavement, use of natural vegetation, retention of 90% of tree canopy, reuse of greywater and stormwater, conservation of land with 12% or greater slope)
- Public policy (e.g., mixed use development, provision of bicycle parking, decreased automobile parking)
- Public transportation (e.g., location near a transit stop, multiuse trail, etc.)

Result-based incentive mechanisms address this disadvantage because of their delivery governance focus. These incentives would provide an effective means for UIPA to directly link its specific sustainability goals and targets with the amounts and intervals of financial support provided to the private sector entities.

Risk Mitigation Mechanisms

A wide range of sustainability financial mechanisms focus on decision-making based on the potential adverse side effects of an activity on the environment and economies and how those effects or risks can be mitigated through strategic investments. In the risk mitigation context, sustainability goals are achieved through mitigating the underlying driving forces of emission, habitat loss, and/or quality of life challenges. Through collaboration with land and business owners and developers, UIPA can implement several initiatives in various sectors to measure and monitor progress towards sustainable development, including the reduction of air emissions.

In the construction sector, for instance, the **Leadership in Energy and Environmental Design (LEED)**, established by the US Green Buildings Council, sets voluntary and consensus-based standards for developing sustainable buildings. LEED-certified buildings for the Operation and Maintenance category can reduce GHG emissions from water use by 50 percent, from solid wastes by 48 percent, and from transportation by 5 percent.[92] According to US Green Building Council, 230 buildings and 43 homes in Salt

[92] Quantifying the Comprehensive Greenhouse Gas Co-Benefits of Green Buildings, The Center for Resource Efficient Communities and The Center for the Built Environment, University of California – Berkeley, Louise Mozingo and Ed Arens, August 2014.

Lake City are LEED certified, while 166 buildings have ENERGY STAR certification, meaning they have high levels of energy efficiency as set by the EPA.[93]

Sustainable Land Management (SLM) practices also offer opportunities for UIPA, as they heavily rely on multi-stakeholder collaborations and community engagement to identify the most pressing sustainability needs, select indicators, collect data and find innovative solutions. SLMs are especially common in agriculture finance, where conflicts in changing weather patterns, land degradation, and workforce access have worsened the conditions for subsistence farming. Biodiversity-based agriculture is an example of SLM practice in which crops and livestock breed selection is focused on fostering interactions with and supporting wild species. While some values of biodiversity-based agriculture can be captured by the farmers, the greater benefits of such practices are not fully captured by the markets. Therefore, policies and financial mechanisms are typically required to sustain biodiversity-based agriculture practices.[94] There are agricultural parcels within the UIPA JA that can benefit from SLM and award-like payment programs to foster innovative agricultural activities while protecting and promoting wildlife habitats and migratory paths. UIPA can collaborate with the Natural Resources Conservation Service (NRCS), Utah Department of Agriculture and Food, Local Conservation Districts, University extensions, and private partners to provide farmers and ranchers with the resources and support necessary to integrate practices that improve soil health, water quality, and habitat/plant diversity on farmlands, including those designated as “farmlands of statewide importance” and “prime farmland if irrigated and drained.” UIPA can also work with environmental organizations to sponsor the development of **a long-term Natural Resources and Invasive Species Management Plan** to guide the preservation and management of environmentally sensitive areas, including the identification of funding sources and partners.

A **land swap** refers to the exchange of property between two owners. When one owner is private and the other is a government, land swaps can be used by the government to encourage private owners to retreat from environmentally vulnerable land rather than outright purchasing the property. This strategy can be used to redirect development away from land that is prone to climate risks or from land that a public agency wishes to protect, like wetlands or wildlife habitats.[95] Such vulnerable areas exist within the UIPA JA.

A mechanism similar to a land swap is the **Transfer of Development Rights (TDR)**. While a land swap refers to the literal transfer of land ownership, TDR differs in that only land development rights are swapped between parcels. This allows a landowner to make use of the development rights for a particular parcel on a different parcel that is less environmentally vulnerable. Because the landowner has the option to use TDR, government agencies can legally prohibit development in certain areas without impeding a landowner’s ability to apply and profit from these development rights somewhere else.

> Montgomery County, Maryland makes use of **Transferable Development Rights** to preserve contiguous land for agricultural purposes. The County establishes “sending areas” in its Rural Density Transfer Zone from which development rights can be transferred elsewhere. These sending areas are thus preserved for farmland. The County also designates “receiving areas” where landowners in the “sending areas” can apply their development rights. These receiving areas are determined to have the resources and services needed to absorb the density resulting from this development.

Some risk mitigation mechanisms are backed by regulations. For instance, the US Securities and Exchange Commission proposed in March 2022 to adopt a rule that publicly traded companies must **disclose**

[93] Energy Star, accessed September 2022.

[94] Agricultural Biodiversity, Encyclopedia of Food Security and Sustainability, accessed September 2022.

[95] Managed Retreat Toolkit » Land Swaps - Georgetown Climate Center

information on climate-related risks associated with their businesses. This proposed rule would offer investors the tools to make better-informed investment decisions, like avoiding ventures in assets with high climate risks.[96] The disclosure requirement would also encourage companies to temper business practices that increase climate risks, thus directing funds toward sustainable practices.

Considerations for UIPA

A key benefit of risk mitigation mechanisms is focusing on actual sustainability targets rather than trying to achieve sustainability by reducing the risks associated with specific outputs (i.e., GHG emissions). In particular, risk mitigation incentives will be effective for UIPA in mitigating the potential adverse impacts of development close to naturally sensitive areas. Diverting developments from those sensitive locations to other areas can be the focus of UIPA's risk mitigation incentives.

As a Service Business Models

As a Service (aaS) models are primarily used for providing cloud computing or software services. In a typical aaS, organizations and entities will only pay for the portion of the cloud storage space or the software they use, bypassing the capital costs and maintenance complexities associated with developing and operating physical servers. Recently with the increasing demand for EV charging infrastructure, Charging as a Service (CaaS) models have become popular, allowing the users to pay a monthly subscription fee for charging equipment installation instead of paying the upfront cost of equipment, installation, permitting, and management software. A third-party entity would own and operate the equipment, but the users have the option to offset their subscription fees by sharing or renting their charging equipment with other chargers. Example third-party entities that currently provide CaaS include EV Connect, Greenlots, Shell Recharge Solutions, and WattLogic, each providing various market options.

UIPA can leverage the CaaS model to benefit from private sector expertise in designing and deploying charging facilities in implementing large-scale projects. The essential ZE charging service can be developed by the private sector on land provided by the UIPA. The Port could also consider partnering with the private entity (or a consortium of entities) by covering an agreed-upon portion of the capital and operating costs. UIPA can then work with a third-party entity to operate and maintain the charging facility and provide the charging service to the electric vehicles that operate in the JA.

There are several publicly available or commercial financial analysis tools that can equip UIPA with critical information on financial performance and desired return on investment for CaaS models. An example is the Microsoft-based **EV Charging Financial Analysis Tool** offered by Atlas Public Policy. This free tool evaluates the financial performance of charging facility investments through a variety of revenue streams over the lifetime of the charging equipment.

Considerations for UIPA

CaaS model offers a convenient option for UIPA to leverage private sector experience in charging facility development while helping the private partners mitigate the financial risks associated with large-scale investments. The greatest benefit of CaaS for UIPA would be the reduction in resources (staff and budget) needed to design and implement projects. CaaS model also helps eliminate high up-front costs and provides higher levels of revenue predictability over the long term.

[96] SEC.gov | SEC Proposes Rules to Enhance and Standardize Climate-Related Disclosures for Investors

Public-Private Partnership Opportunities

A Public-Private Partnership (P3) is a financial arrangement between a government-funded agency and a private sector entity to design, implement, or operate public infrastructure projects and initiatives. P3 contracts vary based on the partners' roles in providing the funds or owning and maintaining the assets at different stages. For instance, in a **Design-Build (DB)** P3 contract, the private sector designs and builds infrastructure with public funds and according to the specifications of the public-sector partner. In an **Operation and Maintenance (O&M)** P3 contract, a private firm operates a publicly owned asset over a certain period before the public partner retains the operating responsibilities. Various forms of DB and O&M contracts are common in the construction and operation of infrastructure projects, such as transportation facilities, electricity generation plants, broadband networks, and wastewater management.

The private sector can also hold the legal ownership of a public asset over an agreed-upon period in a **Buy-Build-Operate (BBO)** contract or collaborate with the public sector to design, finance, and build a facility on leased public land in what is called a **Build-Operate-Transfer (BOT)** contract. Once the lease term expires, assets' ownership will be transferred to the public sector. Such P3 contracts are normally used in large-scale projects in which the private entity is a special-purpose company often formed for the specific purpose of the project.

A P3 opportunity relevant to UIPA JA is the large-scale investment needed to mitigate the potential impacts of stormwater runoff and associated pollutants from new development north of Interstate 80; a **joint and shared stormwater management system** can be designed and constructed by a public agency (such as Salt Lake County Public Utilities or Salt Lake City Public Utilities) using utility fees or bonding and loan capacity. The private entities that connect to the system can then pay the costs based on the parcel size, the level of usage, or other factors. Ordinances, fee schedules, special purpose districts, access and easement agreements, and billing systems are some of the regulatory and governance requirements to implement a regional or special district stormwater system. Salt Lake City and County have stormwater utility fees generally based on the amount of impervious area on a parcel. These fees can be used for capital projects, operations, and maintenance of the stormwater system. Special districts could be set up with different utility fee schedules that have rates that match the capital program or maintenance needs of the special district. The fees are collected post-project completion, which limits its applicability to proactive capital projects such as regional facilities. Incentives for reduced fees can be applied to low-impact or sustainable stormwater techniques. Stormwater system connection fees are also collected for new development.

As it relates to transportation decarbonization, the following areas provide an opportunity for public-private partnerships:

1. **Charging infrastructure development, operation, and maintenance:** the use of electric vehicles is expected to continue to grow, but whether the growth will be exponential or slower adoption depends on a comprehensive nationwide network of charging infrastructure. While the federal and State governments are incorporating charging infrastructure policies and initiatives into their transportation programs, some states recognize P3 as a key to bringing private investments and helping comprehensive network-wide projects materialize. Florida's Charge Ahead Partnership, for instance, is a program enabled by the Florida State Legislature to prioritize investment and ownership of electric charging stations while ensuring fair electric rates for the private station owners and the users.[97] UIPA can foster collaboration among the state legislature and local utility companies to ensure fair energy rates while working with environmental non-profits, economic development agencies, and businesses to ensure that charging facilities will be developed where there is a need and not where it is most convenient for utility companies.

[97] Charge Ahead Partnership, What's Happening in Florida? Accessed September 2022.

Many P3 contracts for charging infrastructure development have been completed or are ongoing in China, most of which are BOT P3 models in which a consortium of private construction and utility companies is awarded a project through competitive consultation. The private consortium will then be responsible for financing, design, construction, operation, and maintenance of the charging facility, while the public partner(s) will cover the gap between the actual user revenues and the private consortium's expected revenues with viability gap funding (VGF). The VGF share varies depending on the project costs and agreed-upon profit margin but is typically between 10 to 20 percent of the total construction, operation, and maintenance costs.[98]

A Corridor of the Future

The I-5 West Coast Green Highway is a multistate collaboration between California, Oregon, Washington, and British Columbia, CA, to develop a unified alternative-fuel corridor. The State Departments of Transportation (DOTs) and other public transportation agencies, in collaboration with private sector entities, are establishing the groundwork for a shift toward widespread use of vehicles using electricity and other sustainable fuels. This includes planning and funding application efforts, development of incentives, and pilot projects.

According to the tristate Memorandum of Understanding developed for this collaborative effort, the state DOTs need to retain legal counsel to develop cost-sharing agreements and develop a Special Experimental Project (SEP-15) waiver with FHWA to enable flexible project management, including for transportation project tests and experimentation.

Source: West Coast Green Highway Website, Tristate Memorandum of Understanding, 2022.

2. **Zero-emission vehicle deployment and operation pilots and demonstration projects:** public agencies have an instrumental role in supporting innovation, especially through funding demonstration projects that help the technologies mature for widespread market adoption. Federal, state, and local agencies across the US have supported several ZE technology pilot projects, both through funds and incentives dedicated to research activities and establishing ongoing collaborations among public and private stakeholders. Implementing pilots and demonstration projects will allow UIPA to experiment with new technologies, identify challenges on wide implementation early, develop synergy with technology providers, be nimble with incorporating user feedback, and tailor the service model that will be necessary for larger-scale adoption.

   Of note is that some of the financial support options targeted at economic development activities are currently available to those businesses that have at least a three-year record of business receipts. This requirement poses limitations for some start-up businesses that are testing new methods and technologies but also offers an opportunity for UIPA to become the incubator for start-ups and fledgling companies by providing financial options that enable technology demonstrations and accelerated developments.

   UIPA can collaborate with its local public agency partners and environmental non-profit organizations such as Utah Clean Cities Coalition and Utah Clean Energy to create a business incubator program for the JA. The program would establish criteria to identify well-reasoned concepts relevant to sustainability, provide guidance on permitting processes and other legal requirements, and provide financial support, either through direct investments or by attracting various private sector investors.

[98] Wang and Ke, Public-Private Partnerships in the Electric Vehicle Charging Infrastructure in China: An Illustrative Case Study, Hindawi, 2018.