Opportunities in infrastructure creating carbon offsets based on pending regulatory changes
by Spenser Robinson and George Sullivan

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Infrastructure projects seldom consider or include potential carbon offset generation income during development. Due primarily to weak controls and opaque pathways to monetization, carbon offset values were somewhat unpredictable. However, numerous regulatory guidelines from the United Nations and emerging regulations in the United States provide rapidly evolving opportunities.
This article briefly provides background on the changes, outlines what comprises a legal carbon offset and the standards behind it. The expectation of growing need for offsets creates potential opportunities for infrastructure owners; the article concludes multiple examples of current carbon offset projects in infrastructure demonstrating this market. [1]

The coming U.S. regulatory oversight of, and demand for, climate disclosure by Cloutier, Robinson & Sullivan (2021) outlines the regulatory push, demand drivers, and evolving standards expected to impact the ESG marketplace.[2] While the reader should refer to that journal publication for further details, a brief summary is included here.

In short, the SEC issued a risk statement and President Joe Biden issued an Executive Order requiring federal regulatory and mitigation plans for climate-related financial risk.[3] As verification requirements for climate related disclosure such as a future claim of carbon neutrality become codified, demand for United Nations (UN) compliant and SEC verified carbon offsets should increase.

The regulatory push builds upon significant market demand for certifiable and transparent carbon disclosure methods. Drivers of demand come from municipalities, pension funds, and investment funds. Increasing numbers of U.S. cities pledged carbon neutrality through the Carbon Neutral Alliance. The Climate Action 100+ lists 49 U.S.-based asset owners committed to carbon neutrality at a fund level and the Net Zero Asset Managers Initiative shows 87 asset managers with $37 trillion in assets similarly pledged. As the SEC tamps down on greenwashing, firms seeking carbon neutral capital will need verification of carbon neutrality.

Firms attempting to provide verifiable carbon neutrality claims will need to comply with the forthcoming regulation. While final details remain unavailable, all signs point to compliance with the measurement standards accepted by the United Nations Framework Convention on Climate Change (UNFCCC). These include the ISO 14000 family and the similarly ISO based corporate GHG Protocol and PAS 2050/2060 certification strategy developed by the British Standards Institution.

Steps to carbon neutrality include the measuring, mitigating and, to the extent it cannot be mitigated, offsetting of carbon output. Many infrastructure assets represent significant potential carbon offset projects yielding meaningful and growing revenue.

What is a carbon offset?
Conceptually, carbon offsets are securities representing systematically measured reductions in Greenhouse Gas (GHG) emissions or carbon absorption used to compensate, or offset, emissions from a

firm. Entities striving toward carbon neutrality typically require offsets with the revenue going to the provider of the offset.

The United Nations Framework Convention on Climate Change (UNFCCC) certifies carbon offsets. The Clean Development Mechanism (CDM) outlines compliant methodologies for large and small projects.[4] Further to that end, the UNFCCC Carbon Offset Registry identifies projects compliant with CDM Rules and their Certified Emission Reductions.[5,6]

A registry is a central clearinghouse where offsets are validated, issued and retired. The UNFCCC recognizes a handful of carbon offset registries as assuring valid carbon offsets through the UN Carbon Offset Platform.[7] Additional Carbon Offset Registries that meet the UNFCCC standards are Verra and Gold Standard.[8,9] These registries list carbon offsets from CDM Projects and develop new methodologies that follow the UNFCCC CDM Rules and Reference requirements.

Compliance and voluntary markets:
Compliance Markets serve areas where carbon offsets are required by statute, law or regulation.[10] By contrast, voluntary carbon markets serve all other needs for entities choosing to offset for ESG, financial or other reasons.

Since carbon offsets are securities, SEC and/or FINRA regulate their legal trade and registration requirements.[11] Securities must either be formally registered or follow the specific processes to be exempt from registration. Unfortunately, proper registration and compliance remains rare and trading in unregistered securities frequently occurs in the voluntary carbon offset marketplace. This trend should reverse with the regulatory spotlight coming to this market.

Infrastructure firms looking to create legal and compliant offsets should ensure they meet global CDM standards, use registered broker/dealers, and meet the labeling requirements for the Federal Trade Commission – 16 CFR part 260 and Green Guides 2020.[12] [13] Sophisticated sellers should be able to provide to potential buyers:

1. Record of compliance with UN strategies and markets
2. Evidence of their broker/dealer relationship and/or registered exception to sell
3. Chain-of-custody documentation for retirement

Are there SEC-regulated carbon offset markets?
At the time of this writing, the Entrex Carbon Market is the only U.S. SEC-regulated carbon offset market.[14] Entrex trades in compliance, voluntary, and regulated-market specific carbon offsets. [15]
For sellers, the strategic benefits of working with an SEC-regulated market include partners to ensure proper CDM methodology review, ISO 14000 family audits and legal registration to trade. This transactional paperwork is easily provided to sellers demonstrating global, domestic and regulatory compliance for ESG statements and verified carbon neutrality claims. Infrastructure providers creating offsets may benefit from the transparency and compliance framework of an SEC compliant market.

Examples of infrastructure offset generation
Three of the project types discussed involve gas infrastructure projects--Fossil Methane and two Renewable Methane. These represent a large set of existing asset classes when considering natural gas pipelines, boiler systems, waste water treatment plants, and electrical grid infrastructure in North

America. The fourth project type is a waste heat to renewable energy asset class, which represents a behind the meter renewable energy system that can be applied in regulated and deregulated energy states. Further, combining that with waste food aggregation to sewage treatment anaerobic digestion or combined heat and power significantly increases the offset generation over the uncombined project. The overview description in the table below provides an outline of where each project type fits in a carbon offset project.

Example Infrastructure Projects that Generate Carbon Offset Projects						
Project Type	*Offset Project Type*	*Compliance Market Offsets*	*CORSIA Compliant Offsets*	*Oceangoing Freight Cap and Trade Compliance Offsets*	*Voluntary/Corporate Market Offsets*	*Fuel Type Required*
Capping Oil and Natural Gas Wells	Upstream Oil and Natural Gas Leakage	YES, in some Compliance Markets	YES	YES	YES	N/A
Food Waste Aggregation to Sewage Treatment Anaerobic Digestion	Methane Generation, Capture, and Destruction (Renewable Natural Gas)	YES, in some Compliance Markets	YES	YES	YES	Renewable Natural Gas
Combined Heat and Power	Thermal Renewable Energy Credits and Renewable Electric	YES, in some Compliance Markets	YES	YES	YES	Renewable Natural Gas
Waste Heat Capture and Renewable Electricity Generation	Thermal Renewable Energy Credits and Renewable Electric	YES, in some Compliance Markets	YES	YES	YES	Varies
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High level overview of project classes

These projects are complex and require specific capabilities, such as expertise in ISO 14000 standards, to execute. At a high level, plugging oil wells involves first measuring and determining methane and hydrocarbon emissions. The leakage(s) are then plugged using EPA and/or state-level approved current best practices. The elimination of measured carbon output then becomes a saleable carbon offset. This is considered a negative carbon offset project, where carbon output is mitigated.

Food waste aggregation to sewage treatment anaerobic digestion can be applied to multiple infrastructure areas including landfills and sewage treatment. The EPA Waste Reduction Model (WARM) outlines a number of these processes.[16] Bacterial digestion of organic material is used in a closed circuit to trap methane, which can then be used in renewable energy generation. Other benefits include soil management and diversion of organics from landfills.[17] A number of offsets in those related areas may potentially be generated.

Combined heat and power (CHP) programs include the use of natural and/or renewable gas systems to generate heat and electricity. As the U.S. Department of Energy says, “Instead of purchasing electricity from the distribution grid and burning fuel in an on-site furnace or boiler to produce thermal energy, CHP provides both energy services to a facility in one energy-efficient step.” [18] Offsets can potentially be generated through the creation of thermal energy among other avenues.

Waste heat capture and renewable electricity generation represents arguably three quarters of the energy produced by humanity, most of which is currently wasted.[19] Any time a machine is operated, such as in a data center, it generates heat. The majority of this heat dissipates into the atmosphere as waste heat. Programs and technologies that capture this heat, use it to generate steam electricity and related heat-based energy could create offsets.

Cost to create offsets

Carbon offset creation project costs depend on the scale and type of project; however, a median project might run between $350,000 to $500,000 for the first-year cost to setup the project and to begin

generating carbon offsets. Successive annual costs would vary for the 10-year crediting period prior to recertification.

A general rule of project offset development is: "If the cost of generating the carbon offset is more than $1.50/carbon offset the project needs to be reexamined." The following is a breakdown of our examples above:

1) $350,000 first year carbon offset project set up is based on the number of offsets the project generates. In this example, the project generates 233,333 Carbon Offsets (MT CO2e) at a cost of $1.50/offset, or an estimated 2,333,330 carbon offsets (MT CO2e) for the 10-year crediting period.
2) $500,000 first year carbon offset project set up is based on the number of offsets the project generates. In this example, the project generates 625,000 Carbon Offsets (MT CO2e) at a cost of $0.80/offset, or an estimated 6,250,000 carbon offsets (MT CO2e) over the 10-year crediting period.

All carbon offset projects can be recertified for an additional 10-year crediting period if they meet carbon offset methodology requirements that are current at the time of recertification.

Sale process and markets

Carbon offset sales prices vary widely depending on market-driven decisions:

1) *Enrolling the carbon offset project in a specific cap and trade market (compliance market)* – Cap and trade markets all have price floors and ceilings, and volumes of carbon offsets traded at various time intervals. The following should be evaluated when analyzing a cap and trade market:
    a. Price floor has a conservative income stream, price mean has an average income stream, or price ceiling has a potential high income stream along with trading volume at time intervals. There are a number of financial models that can be used to evaluate a cap and trade market including seasonality, trading history, etc.
    b. Different types of carbon offsets, i.e. transportation specific, industry specific, compliance grade specific, etc., have different pricing and placement parameters. You should be working with a licensed broker/dealer to advise you.

2) *Voluntary/corporate carbon offset markets* – Historically, little regulatory oversight has been enforced. Double counting and misrepresentations have been observed, creating an environment of caveat emptor. As discussed earlier, the regulatory environment is rapidly evolving. Using a licensed broker/dealer or a company that is under the supervision of a broker/ dealer is currently the best way to navigate this marketplace.

3) The only carbon market currently regulated by the SEC is the Entrex Carbon Market. An Entrex Carbon Offset Security represents 1,000 MT of CO2e. The market currently provides both sell and buy-side opportunities in:
    a. Cap and trade carbon offsets for ocean-going freight and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) market.
    b. Low Carbon Fuel Standard carbon offsets for transportation.

c. Nature and technology based carbon offsets.
d. Carbon offset futures for all of the above.

Potential offset revenue

Example revenue for carbon offsets breaks down into cap and trade (compliance) markets and voluntary/corporate market:

Cap and trade (compliance) markets — in the United States currently there are two markets:

1) Western Climate Initiative (WCI) is the largest and includes a number of provinces in Canada. The floor for WCI Carbon Offsets is $15.00/carbon offset and currently is not capped. As of this writing, carbon offsets are trading around $25.00/carbon offset.
    a. Low Carbon Fuel Standard (LCFS) offsets have a floor of $50.00/carbon offset and a cap of $210.00/carbon offset. As of this writing, they are trading in the range of $180.00 to $200.00/carbon offset.
2) Regional Greenhouse Gas Initiative (RGGI) currently does not have a floor or a cap. Carbon offsets, as of this writing, are trading in a range of $8.00 to $12.00/carbon offset.
    a. New York City has a cap and trade market that is scheduled to start trading in the near future and the city has set a price on carbon at $268.00 per MT (Local Law 97).

Voluntary/corporate offset market pricing can vary, in part due to the historically weak regulation. On the SEC-regulated Entrex Carbon Market, trading is in the range of $3.50 to $12.00/carbon offset, as of this writing. This pricing is typical of a regulated Broker/Dealer selling privately-conveyed offsets. In 2021, the largest volumes are trading at the $6.00 to $10.00/offset range for recent-vintage years (2017 to current) and used in the ocean going freight and CORSIA cap and trade markets.

The United Nations Framework Convention on Climate Change (UNFCCC) meets annually at the Congress of the Parties (COP). In 2021, COP 26 is expected to announce significant decisions on Article 6, which deals with carbon offset trading and cap and trade markets. These decisions are expected to bring the international markets into alignment. Additional announcements are expected to be made on the Kyoto-era Clean Development Mechanism methodologies and their retirement, which will remove a large number of carbon offsets from the marketplace, putting upward price pressure on the remaining carbon offsets.

Conclusion

Forthcoming domestic and international regulations pertaining to the reporting and governance of carbon offsets creates a potential opportunity for infrastructure owners and managers. Several typologies of carbon offsets across multiple infrastructure types and servicing multiple industries will be highlighted. Expected revenue generation will likely far exceed the expected costs, creating high-yield projects in this burgeoning market.

Carbon offsets are regulated as securities in the United States and internationally through the UN. Providers should seek the guidance of experienced professionals to ensure the proper calculation, documentation, and legal sale of carbon offsets.

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[1] Disclosure: This article represents the opinions of the authors and is not intended as legal or regulatory guidance. Please contact appropriate professionals to evaluate your specific situation.
[2] Cloutier, D., Robinson, S., Sullivan, G. (2021). The Coming U.S. Regulatory Oversight of and Demand for Climate Disclosure, Real Estate Issues, *forthcoming*
[3] https://www.whitehouse.gov/briefing-room/presidential-actions/2021/05/20/executive-order-on-climate-related-financial-risk/
[4] https://cdm.unfccc.int/
[5] https://cdm.unfccc.int/Registry/index.html
[6] https://cdm.unfccc.int/Reference/index.html
[7] https://offset.climateneutralnow.org/
[8] https://verra.org/
[9] https://www.goldstandard.org/
[10] At the regional level, U.S. examples include the Western Climate Initiative (WCI) and Regional Greenhouse Gas Initiative (RGGI);[10,10] these are Compliance Cap-and-Trade Markets

[11] Dodd-Frank Act, https://www.cftc.gov/LawRegulation/DoddFrankAct/index.htm
[12] Guides for the Use of Environmental Marketing Claims, Carbon Offsets and Renewable Energy Certificates, Public Workshop - 16 CFR Part 260 (ftc.gov)
[13] Green Guides | Federal Trade Commission (ftc.gov)
[14] http://www.entrexcarbonmarket.com/
[15] Disclosure: Author George Sullivan is President of Net Zero Analysis & Design Corp., which holds a minority share in the Entrex Carbon Market.
[16] https://www.epa.gov/sites/default/files/2016-03/documents/warm_v14_organic_materials.pdf
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[19] https://e360.yale.edu/features/waste-heat-innovators-turn-to-an-overlooked-renewable-resource