

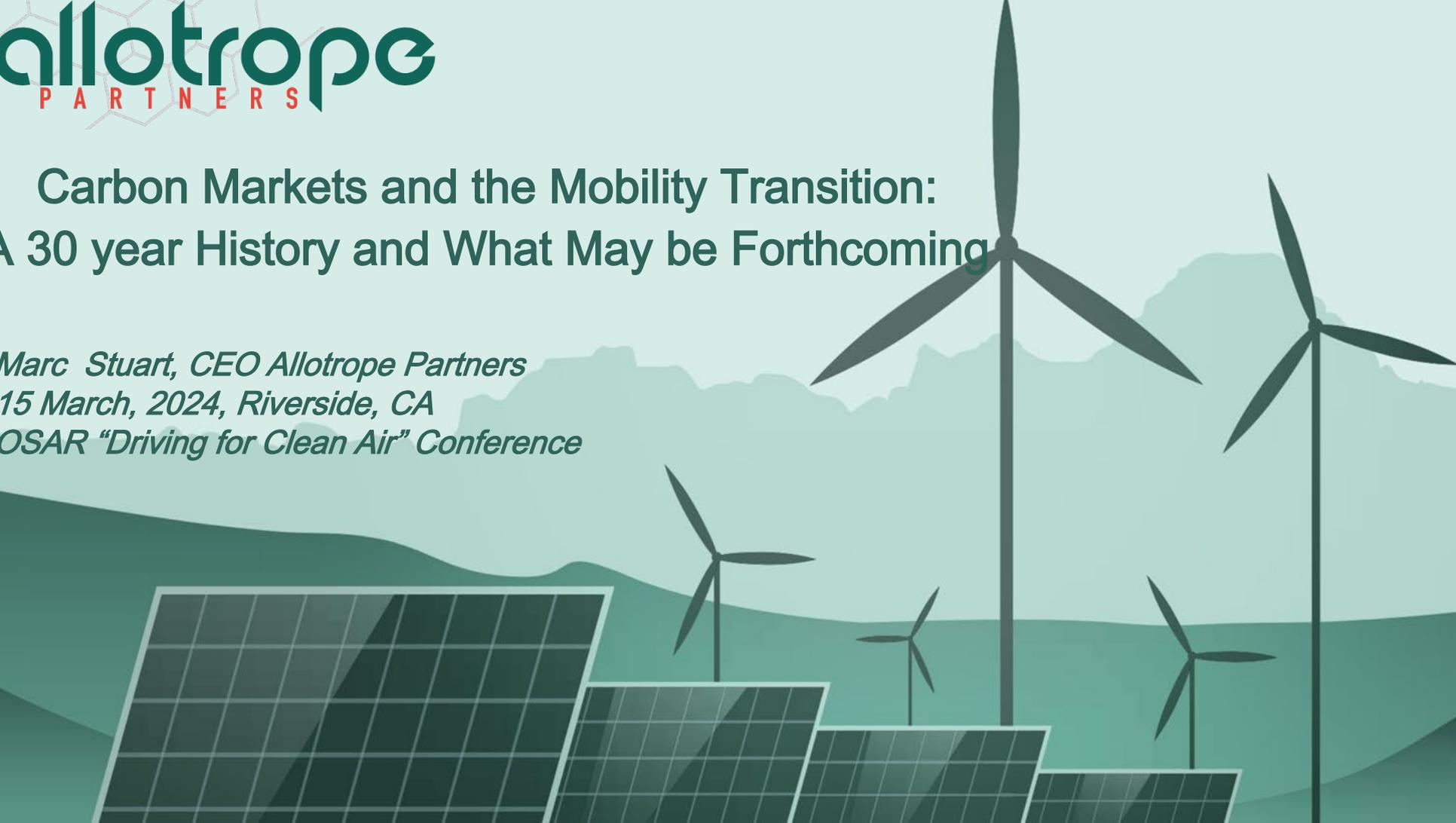


# Carbon Markets and the Mobility Transition: A 30 year History and What May be Forthcoming

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*OSAR "Driving for Clean Air" Conference*





## Today's Topics

1. **A Life in Carbon Markets**
2. What is a Carbon Offset?
3. Brief History of the Carbon Markets and Possible Futures
4. Carbon Markets and Transport Emissions and EV changeover
5. Concluding Thoughts and Observations

# Life as a Carbon Finance Entrepreneur (in one slide)

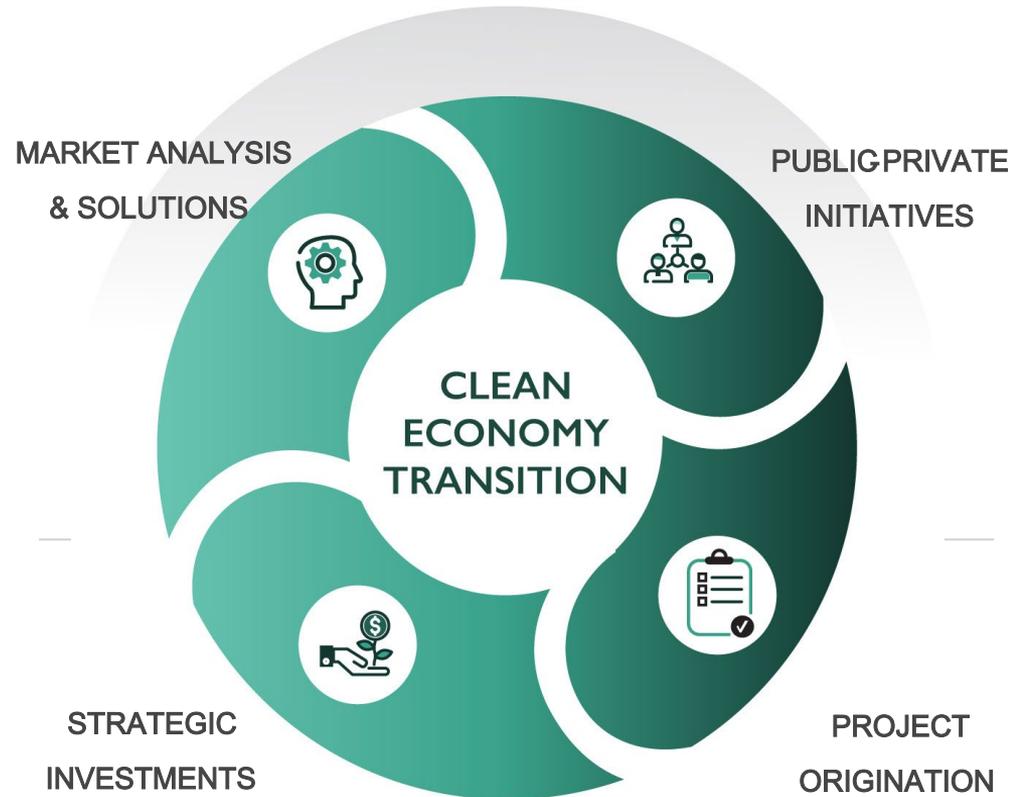
- 1993 First work in emission credit projects
- 1997 Co-founded EcoSecurities (ECO)
- 2005 IPO in London with Cargill as lead investor
- 2005 -09 Develops broadest global carbon portfolio
- 2006 First project developer elected to Board of Intl Emissions Trading Association
- 2007 Founding/current board member of Verra (Voluntary Carbon Standard)
- 2009 Bidding war for ECO emerges (JP Morgan wins)
- 2014 Start Allotrope Partners, **NOT** a new carbon platform
- 2015-20 Primary focus on supporting clean energy procurement in emerging markets and incubation of project development platforms
- 2021 Carbon crediting reemerges in Allotrope Vietnam (World Bank and Australia)
- 2023 Allotrope LCFS: Advanced biofuels from woody biomass in California



# Introduction to Allotrope Partners

## About Allotrope

- Clean energy advisory firm specializing in emerging markets and technologies.
- Founded in 2013 with staff in the U.S., Vietnam, Philippines, Singapore, and Indonesia.
- Team of experts with decades of experience in clean energy, policy and regulatory engagement, project origination, carbon markets, and investment mobilization.
- Advisory clients include governments, philanthropies, multilateral institutions, and major companies.
- Strategic focus on public-private partnerships driving sustainable, low carbon transformation and bringing together business voices and policymaking to enable innovative clean energy solutions in emerging markets





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# What are Carbon Offsets and Additionality?

- Most simply, a reduction in emissions from **sector or geography that is not covered** by an emission regulatory regime
- Not exclusive to carbon: NOx, PM10, and SO2 also have “offset” protocols
- In theory, **any asset that emits CO2 can become a carbon reduction asset**
  - In compliance markets, that frees up emission allowance demand
  - Outside of compliance markets, **that asset can earn carbon credits** (to be exported to compliance regimes)
- **Key term for credits is “additionality”**. Regulators (or other arbiters) cannot allow emission values to be given for actions that “would happen anyway”.
  - This is true in both qualifying projects and quantifying absolute outcomes

***Additionality is Never “Certain” and Inherently Counterfactual***

# What are Carbon Offsets and Carbon Markets?

- **For offset sellers**, carbon revenue provides projects the necessary capital to establish technology tackling global warming and providing societal benefits
  - Project examples: land use change, energy efficiency, decarbonized electricity, waste management, etc.
- **For compliance market buyers**, offsets are 100% about economic efficiency
- **For *voluntary/net zero* corporate objectives**, the attractiveness of any individual offset project is truly in the eye of the beholder
  - **Co-benefits around offsets** (e.g., biodiversity preservation, poverty alleviation, human health objectives, etc.) can become a major part of the decision process
  - Question: Are AQI co-benefits around decarbonized transport a monetizable attribute?

*Cost vs Co-Benefits is a never ending dynamic in the “Voluntary Market”*



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# 1990–2000: Carbon Projects in Emerging Markets Begin as Voluntary

- Rational for participating companies (in industrial countries) was to get ahead of the market and learn... and potentially **reduce future climate compliance liabilities** from government policy.
  - Initially **buyers and sellers determined bilaterally** what would be measured and calculated as a “carbon offset”.
  - A key aspect was **“additionality”**. Projects needed to be able to readily demonstrate they would not have occurred without the incentives created by carbon finance.
- **Key Evolution #1** - The development of **third-party carbon offset project validation and verification** (run by trade certification agencies) changed the carbon “market” from bilateral one-off transactions to something more standardized that could scale.
- **Key Evolution #2** - The early creation of **dedicated carbon funds** (initially by the **World Bank** and other development institutions) helped catalyze and scale expertise throughout the value chain.

# 2000 –2009: Carbon Projects in Developing Countries are Driven by Compliance Objectives in the EU and Japan

## Continent-wide “Cap & Trade” system on major industries in Europe (2004–present)

- In 2005, the EU ETS “allowed” 2.2B tons of emissions from capped sectors.
- In 2020, that has decreased to ~1.5B tons.
- This clearly shows that trading can reduce emissions, and is now in China, California and other markets.

## Kyoto Protocol CDM comes online via the UNFCCC (2003)

- Intended to mitigate price challenges in compliance markets like EU ETS.
- Encouraged other industrial markets to approach carbon policy aggressively by creating a “release valve”.
- “A ton is a ton is a ton”—no real differentiation between different kinds of carbon units.

## However . . .the Copenhagen “Failure” (2009)

- Lack of global coordination and ambition dramatically reduced demand for carbon credits and trading.
- Destroyed the underlying presumption that the aggregate carbon compliance market would ALWAYS grow as more countries joined .

*Key Surprise and Evolution: The Voluntary Market doesn't just die!!*

# Despite Copenhagen...

## Two Reasons Why the 2010s Was a Positive Decade

1. **Renewable energy makes extraordinary progress**. Solar and wind energy becomes competitive, and by 2020, were already low-cost new generation option.
  - Climate-concerned companies have **bought countless terawatt-hours of renewable electricity** all over the world.
  - Many subsequently buy **carbon offsets** to compensate for remaining, hard-to-abate, emissions, driving the growth in the carbon market we saw from 2017-2022
2. Transportation began **breaking the monopoly** of internal combustion engine
  - Historically, transport has been **the most valuable use** of fossil fuel energy
  - Between 2017-2022, transport electrification and next-gen biofuels were infused with **hundreds of billions of dollars** of investment

*Nonetheless, hard-to-abate emissions like long distance transportation emissions are unlikely to decarbonize for decades.*

# Despite Copenhagen...

## Carbon Markets Survived... and Suddenly Boomed

### 1. Voluntary market comes back to life (or more like comes “into its own”)

- Gold Standard, Verra, American Carbon Registry, and Climate Action Reserve emerge in late 2000s
- Focus on CDM’s “unloved” sectors (e.g., forestry, terrestrial carbon, and ~~in~~ impact social projects)
- “Charismatic” development and biodiversity carbon projects become highly desirable
- Between 2016-2021, roughly 75% annual compounded growth for the voluntary market.

### 2. Problem: There is not a consistent demand curve

- All buyers have their own particular priorities and “~~top~~” areas
- No unified policy coalesces those demands into a single market response
- Need for standardization around claims corporates can make around “net zero” or “carbon neutral”
- Science Based Targets Initiative and Voluntary Carbon Market Initiative are trying to create this

*Is the 2020s Carbon Market a Commodity Market or an Art Market?*

# Key Observations for Carbon Finance in the 2020s

1. From the voluntary carbon perspective, most large clean energy generation projects are no longer considered additional, so there is no way to create standalone international credits.
  - Renewable energy and/or energy storage are part of most countries' Paris commitments and are generally the cheapest form of electricity in most markets.
  - Buying renewable energy directly or RECs means that electricity use already has zero emissions
2. Land use change projects have dominated the net zero market for corporates
  - Even with clean electricity, the balance of GHG footprints need offsetting
3. Carbon Removals (i.e., taking atmospheric carbon and returning it into stable geological carbon)
  - VERY EXPENSIVE and yet to be proven on a large scale.

*Distributed assets- building efficiency, street lighting, smallholder agriculture and TRANSPORT may be emerging low carbon asset classes*

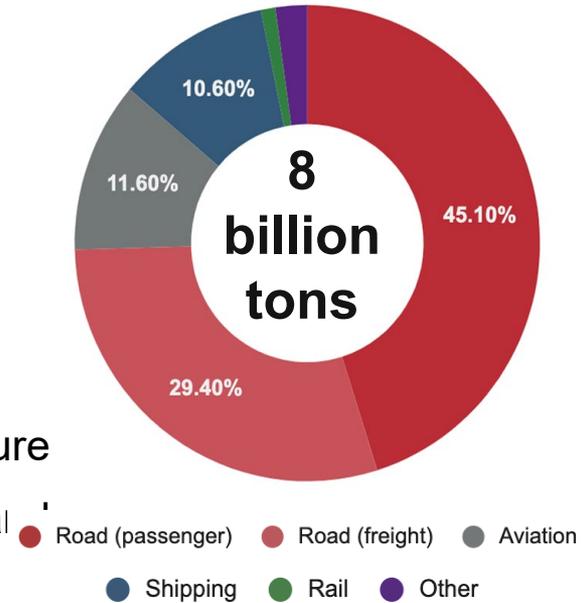


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# The Fossil Fuel Paradigm Shift in Transportation Has Begun

- Petroleum had an **iron-grip monopoly over all transportation** – and therefore arguably civilization for more than a century
- Only the rapid acceleration of EVs has created a pathway to **break the monopoly**, but is limited to short-hauling to date
- Transport represents roughly **8 billion tons of CO<sub>2</sub>/year (~20%)**
- However, there are **2 billion emitting vehicles/boats/planes**
- Capital costs for accelerated transition will **quickly stretch into trillions of dollars**, covering both vehicles and fueling infrastructure
- Decarbonizing long-distance subsets of transport (i.e., aviation and maritime) will require significantly more time, as **energy density remains a key limiting factor**

Global Emissions by Transport Sector



# Aggregating MicroEmissions Reductions

- **By and large, transport decarbonization is an aggregation problem and requires a novel approach to be addressed**
  - The traditional modalities of emissions reductions projects will not work; transaction costs are high and carbon revenue is not enough currently enough to solely drive changeover
  - Requires a shift from identifying specific assets with high impact to addressing incremental emissions that only have substantial impact when aggregated.
  - More likely that emissions value will ultimately be a layer of integrated financing constructs

*A single lowGHG vehicle may only reduce ~100 tons of CO2/year, but an aggregated fleet can (potentially) make project economics work.*

# Example Emissions Avoidance/Reduction Projects

\$0.74  
per  
credit

## India

Mass Rapid Transit  
Projects

Impact Equivalent:  
910,000 Passenger  
Vehicles



\$3.47  
per  
credit

## Brazil

Gasoline to Ethanol  
Switching

Impact Equivalent:  
9,440 Passenger  
Vehicles



\$7.90  
per  
credit

## United States

Electric Vehicle  
Charging Systems

Impact Equivalent:  
1,150 Passenger  
Vehicles



# Developing Appropriate Carbon Markets for Transport Emissions

## 1. Current voluntary carbon pricing will likely not move the needle on decarbonizing transport

- Net Present Value of carbon can cover roughly 25% of the incremental cost transport decarbonization
- A useful additional revenue stream (particularly in hard currency in emerging markets) but not a key driver

## 1. Voluntary transport mitigation activities are currently co-mingled with all other forms of carbon supply

- Scale and cost do not appear to be competitive in the current carbon markets

## 1. Sector-specific carbon markets may yield premiums for emissions reductions

- A sector-specific compliance market for ground transportation (likely national or regional) might create a premium sub-market for emissions reductions that can accelerate the low-carbon changeover
- **Example:** replicating the model of Carbon Offsetting and Reduction Scheme for International Aviation (CORSA), a self-imposed, sector-wide carbon compliance market

*What emission market tools can drive decarbonization  
in the transport sector?*



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# Final Observations and Questions

1. Like all emitting asset classes, **road transportation is potentially both a buyer or a seller of carbon performance**, depending on the jurisdictional policy framework
  - Low Carbon Fuel Standards (LCFS), CAFE, and ZEV mandates are **primary public policy tools** for reducing CO2 emissions from transportation
  - Carbon credit creation can **ONLY occur if additional** to those requirements
2. **Individual assets are far too small** to engage conventional carbon offset project modalities
  - Emerging technologies around **digital monitoring and reporting** may drop the scale down substantially
3. At current voluntary/net zero pricing, **carbon is a useful economic addition, but . . .**
  - Finding markets to **monetize local criteria pollutant improvements** alongside the carbon would help accelerate technology changeover far more quickly
  - Or if McKinsey claims about near future carbon pricing (~\$200/ton) come true. . .

**Thank You!!!**

[www.allotropepartners.com](http://www.allotropepartners.com)

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