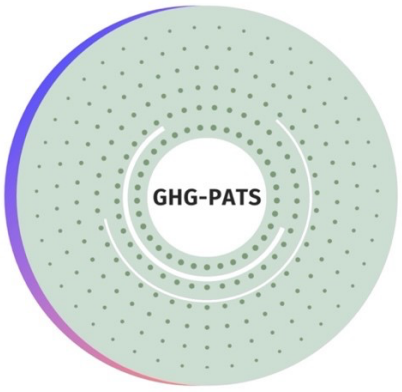
# Greenhouse Gas (GHG) -
# Permit Allowance Trading System (PATS)

**GHG-PATS**




## The UN Environment Assembly (UNEA-6)
## Article 6 Mechanism Expanded to

## Accelerate Decarbonization,
## Remediate Pollution,
## Fund the Rejuvenation of Global Ecosystems and
## Stem Biodiversity Loss

## Single Derivative ETS Mechanism to
## Remediate the Triple Planetary Crises
## In Concert with Climate Finance

**Tony S. Hamer,** November 10, 2023

## Contents

# Mission Statement

***"Everything should be made as simple as possible, but not simpler."***
***Professor Albert Einstein***

*A single environmental derivative in a properly designed compliance Emissions Trading System (**ETS**) will effectuate global pledges through a methodical mechanism to remediate the Triple Planetary Crisis.*

1. *Climate Change*
2. *Petrochemical Pollution (e.g., plastics, pesticides, industrial chemicals)*
3. *Biodiversity Loss*

*The root cause of the interconnected Triple Planetary Crisis is the presence of negative and positive externalities, amplified after the surge in economic and population growth following the Industrial Revolution.*

*Negative externalities incentivize pollution freeloading and overproduction. Positive externalities incentivize underinvestment in preserving global ecosystems, food webs, and sustainability.*

*Eliminating externalities increases global resource allocation efficiency, productivity, and profitability, while remediating the Triple Planetary Crisis and preserving, restoring, and rejuvenating global ecosystems.*

*The greenhouse gas permit allowance system (**GHG-PATS**) is a compliance emissions trading system (ETS) following the legal principle of "Polluter Pays." It works outside the tax system to create a virtuous environmental funding cycle to eliminate externalities, aligning financial incentives transparently with global imperatives.*

# Executive Summary

As the former Head of JP Morgan Chase (f/k/a Chase) interest rate derivatives trading, I have a granular understanding of international capital markets' structure and end users, exchange-traded and OTC derivatives used for risk management, the cost of carry and variation margins applicable to Climate Finance, and portfolio risk management.

Current compliance and voluntary carbon markets are too volatile and do not function properly because they are highly fragmented and lack the supply-demand structure necessary for viable derivative markets.

This can be redressed by modifying the underlying Coasian law and economic framework for conflicting property rights, which is necessary, given the complexities of a $100 trillion global economy.

The methodology to establish an effective mechanism to effectuate global pledges and remediate **GHGs**, petrochemical **pollution**, and the **loss of biodiversity** ("**Triple Planetary Crisis**") is:

1) Establish an emissions trading system (**ETS**) using a single environmental derivative contract as a common utility: the negative utility of an EU allowance (**EUA**) [e.g., 1000tCO2e]

2) Translate disparate pollutants and offsets adversely or favorably impact the Triple Planetary Crisis to the common utility contract using (+/-) scientifically calibrated 100-Year **GWP** factors as scalars.

EUA = 1000 tons of carbon dioxide (**CO2**) or equivalent = 1000tCO2e, where e = 100-Year Global Warming Potential (**GWP**) factor, CO2 = 1.0.

For example, the price of methane (**CH4**) with GWP = 25, costs 25 × CO2 ton price Global Warming Potential (GWP) factors were developed to allow comparisons of the global warming impacts of different GHG gases. Specifically, it is a measure of how much energy the emissions of 1 ton of gas will absorb over a given period (e.g., 100-years) relative to the emissions of 1 ton of carbon dioxide ($CO_2$) with GWP = 1.0.

Using (+/-) GWP factors expanded beyond GHGs as scalars assigned to disparate industrial and commercial petrochemical pollutants, natural offsets establish a market price using calibrated utility.

The manner in which disparate pollutants and offsets are translated to CO2e through (+/) GWP scientifically calibrated factors will be discussed later.

The short answer to why this is necessary is to defragment environmental derivatives for increased liquidity and stability and to expand the solution set to accelerate environmental progress.

With all pollutants priced relative to CO2e using (+/-) GWP factors, taking pollutants and energy sources off the table would typically be suboptimal, as all primary, secondary, and tertiary negative externalities are included in the pricing for optimal resource efficiency.

Thousands of technical, process, and innovative solutions are available to reduce pollutants and increase natural offsets. Eliminating externalities clarifies the true peak utility to cost solutions for various industries, companies, and regions around the globe.

A **Article6** mechanism remediating the Triple Planetary Crisis with a single compliance environmental derivative ETS creates an international flow of

investment funds for transitional projects sans externalities, clarifies entity-level peak utility to cost solutions, and can lock the rate of return (IRR) to hedge Global Climate Finance (**GCF**) projects.

## Environmental Clarity for Systematic Solutions

The current state of carbon markets is highly fragmented and lacks the market structure necessary for effective functioning.

However, environmental derivatives reach all international capital market end users necessary to remediate the Triple Planetary Crisis.

Compliance with environmental derivative markets needs to be defragmented and coherent to achieve global environmental requirements.

This requires translating all negative and positive externalities into a common utility:.

EUA = 1000 tons of CO2 or equivalent = 1000tCO2e, where
e = GWP scalar factor and the GWP for CO2 = 1.0

When adopted by the treaty as the mechanism to prompt pledges to action, a single compliance mechanism will create a very liquid global environmental derivative market structure, supporting futures volume on global exchanges and liquidity in long-dated OTC derivatives used to manage forecastable environmental exposure.

All material, industrial, and commercial pollutants and offsets will embed the cost or benefit of externalities in production and commercial pricing,

with the retail price change from embedding externalities dependent on the price elasticity of the product or service.

Subjective assessments of the environmental impact will not be needed, as market pricing reflects the true economic price of resources. The Conference of the Parties (**COP**) sets a downward slope for annual CO2e emissions (now quantified as 56 billion tons CO2e).

One objective of COP is to employ the Subsidiary Body for Scientific and Technological Advice (**SBSTA**) and Subsidiary Body for Implementation (**SBI**) to broaden the calibration and monitoring of GHGs, Pollutants, and Biodiversity Component Risks to the utility of CO2e using (+/-) GWP factors to determine environmental debits and credits.

1) **Climate Change** – GWP measures the amount of energy the emissions of 1 ton of a GHG will absorb over a given period (e.g., 100-years) relative to CO2.

2) **Petrochemical Pollution** – GWP is calculated to include GHG released from petrochemical pollution over 100-years relative to CO2e, and the adverse impact on global ecosystems, health, and biodiversity.
    a. The relationship between petrochemical pollution and its impact on both **Climate Change** and **Biodiversity Loss** includes primary, secondary, and tertiary impact relative to CO2e to calibrate a (+/-) GWP factor. See "**Environmental Component Risk**."

3) **Biodiversity Loss – Climate Change** and **Petrochemical Pollution** are major factors driving Biodiversity Loss. Mapping food webs is key to managing the primary component risk to Biodiversity Loss,

in addition to the elements impacting global ecosystems. This will be discussed in "**Environmental Component Risks**," with the same objective of translating the utility of the primary, secondary, and tertiary component risks to CO2e using calibrated (+/-) GWP factors.

## Single Mechanism Remediates Triple Planetary Crisis

A logical environmental permit allowance trading system:

1) Debit negative contracts (**short position**) equal the consolidated weighted-average GWP factor to entities based on the scientifically calibrated utility of disparate pollutant emissions translated to 1000 CO2 tons.

2) Credits positive contracts (**long position**) equal to the consolidated weighted-average GWP factor to entities based on the scientifically calibrated utility of disparate pollutant offsets translated to 1000 CO2 tons.

Such an ETS is based on the fungible utility of the translated elements impacting the Triple Planetary Crisis. This is critical for economic efficiency and logical for accelerating environmental restoration. But a more comprehensive rationale for offsets will be discussed in detail in "**Environmental Component Risks**."

The key **elements of the mechanism** are as follows.

1) The longstanding legal framework of "**Polluter Pays**" provides the funding source and financial incentive for entities to implement peak utility to cost solutions to increase profitability, efficiency, and productivity after embedded negative externalities clarify their choices.

2) Primary market short contract positions can be covered at the market price to permit pollutant emissions, or long-term transitional closed-loop projects can be financed and hedged with OTC derivatives and futures contracts in concert with Climate Finance to lock in project IRR.

3) Primary market long positions for offsets provide quarterly revenue with environmental futures contract expiration, ensuring that utility does not fall materially short of contract credits.

4) Primary and secondary environmental futures and OTC purchases or sales have a variable factor applied to the notional by maturity, consistent with the COP SBSTA and SBI downward slope trajectory for decarbonization.

5) Long-term forecastable adverse environmental exposure would be carried below the line in Accumulated Other Comprehensive Income (**AOCI**) as unrealized losses, providing the financial incentive to aggressively minimize realized costs while avoiding income distortion in transition.

6) Once all externalities are included in the market price of pollutants and offsets and progress is monitored, micromanaging resource options would be the exception.

The single compliance environmental derivative mechanism to redress:

1. *Climate Change*
2. *Petrochemical Pollution*
3. *Biodiversity Loss*

creates a deep, liquid global financial exchange and OTC market in international capital markets to reach environmental stakeholders outside the tax system for entities to adopt peak utility to cost solutions in concert with **GCF**, defragmenting existing carbon markets, and expanding the coverage of pollutants and offsets.

## Environmental Component Risks

Given the optimal **SBSTA** and **SBI** analytical capabilities, all negative and positive externalities responsible for the Triple Planetary Crisis were monitored and identified at a granular level.

Sophisticated tools for identifying the location and type of various GHG emissions at a granular level are provided by the **Climate TRACE** initiative involving Mr. Al Gore, a breakthrough analysis critical for establishing a compliance mechanism at the entity level to eliminate negative GHG externalities.

Extending the Climate TRACE global modeling of GHGs to comprehensively distinguish between all GHGs with highly skewed GWP factors and modelling petrochemical pollution as component risks impacting Biodiversity Loss would ensure global progress is monitored, met, and accelerated as practicable.

A compliance mechanism can be adopted to redress the most material factors driving the Triple Planetary Crisis before modeling capabilities meet such exacting standards. Pollutant emissions that could not be monitored at a granular level may either be subject to a ban or a GWP factor estimate reflecting the uncertainty.

Petrochemical pollution affects GHG emissions that fit within the framework for calibrating GWP factors. However, negative externalities extend beyond GHG emissions.

For instance, approximately 300,000 whales, dolphins, and porpoises become entangled and die annually from marine plastic pollution. Whales sequester CO2, feed phytoplankton that converts CO2 to produce 50% of global oxygen, and reduce oceanic sequestration, which exacerbates extreme weather.
Petrochemical insecticides harm organisms that are essential to healthy soils, which have a complex ecosystem that accounts for 25% of the planet's biodiversity. They are responsible for a precipitous decline in the global insect population, which is an important part of the food chain. Petrochemical insecticide concentrations exist in animals and humans with significant health costs and adverse long-term effects.

Translating the financial externalities of petrochemical pollutants that emit GHGs, cause human health issues, and degrade global ecosystems leading to a loss of biodiversity and food webs is discussed in
"**Environmental Translation to CO2e**."

Misconceptions about environmental offsets are critical to a sensible ETS.

Environmental offsets, including funding natural preserves such as rain forests based on their utility in converting CO2 to oxygen and hosting

biodiverse ecosystems, are logical to change the economics behind deforestation when viewed as a perpetuity.

When accounting for primary, secondary, and tertiary impacts, areas that include nature, such as golf courses, are likely to have negative utility after a comprehensive analysis.

However, offsets would also fund new businesses and industries focused on the need to repair, restore, and rejuvenate global ecosystems and food webs, including the calculated utility of

-Seagrass
-Mangroves
-Coral reef rejuvenation
-Oceanic alkalinization
-Food web dynamics, analyses, and restoration
-Soil regeneration and topsoil restoration
-Mycorrhizal fungi inoculation for strong root growth and carbon pools -Removal and quick fungi enzymatic degradation of plastics from oceans, lakes, and landfills
-Whales and other marine animals for carbon sequestration, feeding phytoplankton that produce 50% of global oxygen, and reducing oceanic stratification that amplifies extreme weather

When natural offsets are undervalued by utility when translated to CO2e for GWP factors, underinvestment in positive externalities is as detrimental as the negative externalities of GHGs and other petrochemical pollutants.

Natural offsets and activities expand the solution set to remediate the Triple Planetary Crisis and increase the capacity of the planet for

sustainability and rejuvenation while reducing the risk of non-linear environmental risk.

It is well understood that the goals expressed by many companies, entities, and nations to reach carbon neutrality are not economically sensible without including offsets.

The marginal cost for individual entities to achieve carbon neutrality varies widely.

It is much more logical to have a combination of positive and negative CO2e producing entities with carbon neutrality achieved through the ETS market for accelerated decarbonization and global ecosystem repair, restoration, and rejuvenation using the most cost-efficient methods, technologies, and innovations.

## Environmental Translation to CO2e

Analytical initiatives, such as **Climate TRACE**, are critical for the COP Subsidiary Body for Scientific and Technological Advice (**SBSTA**) and the Subsidiary Body for Implementation (**SBI**) to precisely monitor and measure:

1) Granular sources of GHG pollutants are translated into CO2e tons (**presently 56 billion tons annually**).

2) The broader translation of petrochemical pollutants to CO2e using + GWP factors as scalars for **emitting GHGs and adversely affecting global ecosystems, impacting health, biodiversity, and food webs.**

3) The broader translation of natural offsets involving preservation, restoration, and rejuvenation of ecosystems using GWP factors as scalars for **offsetting GHGs and restoring global ecosystems favorably impacts biodiversity and food webs.**

As mentioned, 1 ton of CO2 has a GWP factor of 1.0, and CO2e is a measure of how much energy the emissions of 1 ton of GHG will absorb over a given period (e.g., 100-years) as a negative externality utility.

Petrochemical pollutants, loss of biodiversity due to degraded ecosystems, and food web fragility have calculable costs to sustainability of soil, oceans, lakes, human health, food security, in addition to GHG emissions…

and plastic waste in oceans is responsible for the death of marine life, contributing to the food web, offsetting GHGs, and other measurable negative externalities that can be quantified in terms of the common CO2e utility.

Thus, translating the 1st, 2nd, and 3rd order impact of petrochemical pollutants and loss of biodiversity can be achieved by calculating the cost of various petrochemical pollutants and elements impacting biodiversity, global ecosystems, and food webs and iterating the market price utility of CO2e with the annual calibration of GWP factors.

This would extend +GWP factors to cover petrochemical pollutants to various types of plastics and insecticides by including calculable costs to ecosystems, biodiversity, food webs, and human health…

and extend GWP factors to cover the restoration, repair, and rejuvenation of global ecosystems, strengthening and replenishing food webs, while providing established GWP credits for clearing and degrading plastics from land and sea, and regenerating soil.

This allows all debits and credits of disparate GHGs, petrochemical pollutants, and elements impacting biodiversity loss and food web frailty to be expressed as the CO2e GWP factor number of derivative contracts to eliminate negative and positive externalities.

Consolidating the net weighted-average GWP number of contracts at the entity level debits a short environmental derivative position equal to GWP contracts, for which a market price exists. This may be cash settled or financed through the GCF for long-term forecastable environmental risk management.

Offsetting entities are credited with net weighted-average GWP factor contracts for quarterly cash settlements, with utility subject to regular audits.

## Defragmenting Carbon Markets with (+/-) GWP Scalar Factors

Eliminating fragmented carbon markets with a single globally traded compliance environmental derivative that uses scientifically calibrated (+/-) GWP factors as scalars to distinguish between the environmental impacts of:

-GHGs
-Petrochemical Pollution (types of plastics and insecticides)
-Loss of Biodiversity and Food Webs

established a global liquid market traded on financial exchanges consistent with how international capital market end users use derivative markets to manage and quantify risks.

There are enormous differences in the use of various types of GHGs, petrochemical plastics, and insecticides, which adversely impact biodiversity, global ecosystems, and food webs.

Therefore, the ETS mechanism used to effectuate treaties governing climate change, pollution, and the loss of biodiversity must be sophisticated enough to accurately distinguish between such enormous differences in environmental impact, while elegant in simplicity to the international capital market end users to manage environmental risk like any other.

Climate TRACE is the best illustration of the way to move forward. By establishing the source and distinguishing between GHGs globally at a granular level, it would enable debiting CO2e contracts at the entity level using a consolidated weighted-average GWP factor to calculate the number of short contracts necessary to cash settle to eliminate the entity's GHG negative externality.

I believe further GHG distinctions might be necessary, but regardless of the initiative is the way to move forward with an Article6 mechanism that would be expanded to redress various petrochemical pollutants and other elements impacting biodiversity loss and food web fragility, with (+/-) GWP scalars.

To work effectively, COP STBSTI/SBI should debit and credit entities the consolidated weighted-average GWP factor number of 1000 ton CO2e derivative contracts in order of materiality.

Offsets are critical for inclusion in any efficient global ETS system. Voluntary Carbon Markets are based on the Coase Theorem, which, by its own enumerated constraints, shows that direct application is inappropriate. As a result, it has earned many critics despite its good intentions.

The true benefit of valuing offsets based on the market price of equivalent utility negative externalities comes from preserving rain forest GHG and biodiversity offsets, and rejuvenating global ecosystems through numerous technologies and innovations that are necessary to fund – including the removal and quick fungi enzymatic degradation of plastics in the oceans and landfills, oceanic alkalization, restoration of coral reefs, etc.

No energy source or pollutant need be taken off the table if GWP factors are scientifically calibrated outside of lobbyist interference. Complexities such as border tax credits and fragmented and bifurcated markets for GHGs, plastics, and biodiversity serve no purpose. Resource pricing becomes more transparent relative to the global price of CO2e.

## Externality Pricing

Externality pricing is straightforward, with (+/-) GWP factors used as scalars.

The definition of Global Warming Potential (GWP) factors will still apply to GHGs, but the GWP factor is also useful as a scalar to translate the

magnitude and value of disparate positive and negative externalities from petrochemical pollutants and the loss of biodiversity, as they are all interconnected.

COP STBSTI/SBI or a delegated party would debit or credit the number of 1000tCO2e contracts at the entity level based on the consolidated weighted-average GWP factor.

Entities with negative externalities could either cash settle the payment due or work with global climate finance (GCF) on a short or long-term financing of forecastable externalities that could be hedged over the maturity using environmental futures and OTC derivatives.

Investments in closed-loop efficient industrial and commercial equipment would both be clarified with respect to peak utility to cost solutions after the elimination of externalities, locking in an internal rate of return on investment given derivative hedges.

Offsetting entities would be credited futures contracts quarterly, which could be liquidated or mature for cash. The utility of the offsets is subject to an audit. Private entities could engage an offsetting entity in long-term OTC environmental derivatives for known income as an annuity, but the private party would take the risk of an offset utility shortfall.

The US Environmental Protection Agency (EPA) produces a greenhouse gas equivalency calculator to illustrate the conversion of emission and energy data to an equivalent amount of CO2 for both positive and negative externalities.

As an example,

If an entity emitted 1000 tons of methane (CH4),

and the scientifically calibrated GWP factor = 25,

and the price of a ton of carbon dioxide is $100,

The COP STBSTI/SBI or delegated party debits the entity:

(25) Environmental contracts = 1000tCO2e = $2.5 million.

However, the funds received would not become part of the government's tax revenue, from which 50% might be spent on a form of environmental remediation.

Surplus funds would be held by a supranational such as The World Bank to circulate to offsetting industries and entities engaged in cleaning and degrading plastics from oceans and landfills, preservation and rejuvenation of rain forests and coral reefs, restoration of food webs, and global resilience projects.

The market price of one ton of CO2 is too volatile, underscoring the need to restructure and defragment carbon markets. Carbon and carbon offsets of equal utility and value will increase the GHG offset capacity of the planet, systematically reducing emissions by rank-ordering the highest utility to cost solutions.

# Climate Finance

To encourage all nations, industries, and entities to participate in a global compliance emissions trading system (ETS) it is logical to finance the cost of negative externalities via global climate finance to facilitate industrial and commercial modernization.

China is the only nation doing this, as a matter of course.

Long-dated funding for transitional projects can be structured to preserve capital, while providing incentives to methodically reduce assessed emissions.

The derivative to hedge the market price of CO2e along with other project financing risks will clarify and execute rank-ordered optimal internal rate of return (IRR) projects.

To qualify cash flow hedges, the effective portion of the change in the fair value of the derivative is recorded as a component of Accumulated Other Comprehensive Income (**AOCI**) below the line and recognized in earnings when the hedged cash flows affect earnings.

Regions rich in natural preserves, such as the Amazon rainforest, will receive income in perpetuity to preserve these ecosystems instead of going to alternative suboptimal use. This relieves the debt burden on nature-rich nations.

Climate Finance works in concert with the environmental derivative markets by supranationals and international capital markets, which may package diversified transitional financing projects for institutional investors and philanthropies seeking to support decarbonization acceleration.

# Risk Management and Accounting

One important objective in establishing a single, well-functioning, compliance environmental market is to enable companies to easily manage their environmental risk, just as they manage all other corporate risks.

The more fragmented derivative markets become, the less valuable and reliable they become risk-hedging vehicles.

The downward slope of the net CO2e supply would make the price unstable without a compliance market that incentivizes technological and process innovations to reduce GHGs and petrochemical pollutants and increase the available supply of long CO2 contracts from global ecosystem restoration and rejuvenation.

Long-term forecastable adverse environmental exposure would be carried below the line in Accumulated Other Comprehensive Income (**AOCI**) as unrealized losses, providing the financial incentive to aggressively minimize realized costs while avoiding income distortion in transition.

Transitional closed-loop projects undertaken to improve efficiency, productivity, and profitability to reduce emissions and pollutants can be financed through GCF and hedged using OTC environmental derivatives.

This quantifies the expected environmental exposure, while Value at Risk (**VaR**) models and Monte Carlo simulations provide short- and long-term exposure ranges. This avoids the subjective nature of the ESG and VCM.

# Summary

When it is profitable to decarbonize and rejuvenate global ecosystems, financial incentives will align with global imperatives, and the triple planetary threat will be averted.

1. Engineering higher productivity, zero-waste, closed-loop industrial processes.
2. Transforming planet waste into valuable products.
3. Rejuvenating the global ecosystems of oceans, lands, and climate.
4. Stemming loss of biodiversity and repairing food webs.
5. Decarbonizing the planet methodically by utility.

The **NOAA's GHG Index**, which tracks the warming influence of long-lived gases, has increased by over 40% from 1990 to the present.

Most GHGs have declined modestly since 1990, but the **NOAA GHG Index** has not. This is because fluorinated gas emissions in the U.S. alone have increased by 90% since 1990, with a 284% increase in hydrofluorocarbons (**HFC**).

HFCs are released by the leakage of refrigerants used in vehicle air-conditioning systems. Leakage can be reduced using better system components and refrigerants with lower GWP factors.

The most common was HFC-134a, with a GWP factor of 1,430.

(+/-) GWP factors are the key to establishing a liquid global carbon market for GHGs, petrochemical pollution, and elements that adversely impact biodiversity and food webs and offsets, internalizing the negative and positive externalities that create the Triple Planetary Crisis.

# Biography

Anthony Hamer is the CEO of GHG-PATS, advocating for a single compliance environmental derivative ETS for use as a Article6 mechanism expanded to redress Climate Change, Pollution, and Biodiversity Loss methodically in conjunction with Global Climate Finance (GCF).

Anthony is the former Managing Director and Head of USD Interest Rate Derivative Trading for JP Morgan Chase & Co. and Managing Director and Head of Proprietary Rates Trading for Bank of America.

He graduated from the University of Chicago Booth Graduate School of Business with an MBA in Finance, and from the University of California, Berkeley with an AB in Economics and Statistics.