From Permits to Liability: Modernising the EU Emissions Trading System and Agricultural Emissions Control

Rebalancing Rights and Responsibilities for a Fair and Effective Green Transition Inspired by Coase 2.0

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The authors gratefully acknowledge Janez Potočnik and Milan Petit for their valuable comments and suggestions on earlier drafts of this manuscript. Any errors or omissions remain the sole responsibility of the authors. The views expressed in this article are those of the authors alone and do not necessarily reflect those of any affiliated institutions or contributors.

1 Executive Summary

Restoring What We Harm: Why Europe Needs a New Equation for Externalities

Europe has made real progress on climate action, but one critical piece is still missing. While we regulate emissions and incentivise land stewardship, the tools designed to address climate damage operate in parallel, not as a unified system. The question is simple: **who is responsible for restoring the damage caused by pollution?**

The **Externality Equation** provides an answer. It links emissions, restoration, and liability into a transparent, measurable framework that can accelerate Europe's path to net-zero while supporting agriculture, industry, and trade.

Externalities: Why Carbon Is More Than an Emission Number

Externalities are the unintended side effects of human activity, costs that fall on society rather than the actor. Carbon emissions are a classic example: they drive global warming, disrupt ecosystems, and reduce agricultural resilience.

Europe's current climate instruments address emissions and environmental impacts separately: carbon pricing (through the EU Emissions Trading System, ETS), border adjustments (Carbon Border Adjustment Mechanism, CBAM), and incentives for land management (Common Agricultural Policy, CAP). But these instruments **rarely connect the emitter directly to the cost of repair**.

This is where the Externality Equation comes in: it reframes environmental governance around restoration and accountability, rather than permission alone.

Where Europe Stands Today

Europe has built a strong climate policy architecture. The EU Emissions Trading System (ETS) remains the backbone of carbon pricing, complemented by new instruments such as the Carbon Border Adjustment Mechanism (CBAM) and the Carbon Removal Certification Regulation (CRCR). Together, they help cap emissions, reduce leakage, and build trust in carbon removals.

In parallel, the Common Agricultural Policy (CAP) has increasingly integrated climate and environmental goals. Recent reforms promote eco-schemes, carbon-farming pilots, and improved soil and methane management.

Yet these two domains - carbon pricing and land stewardship - still operate in largely separate policy tracks. The ETS prices emissions; the CAP rewards sustainable practices. The result is a fragmented approach that treats emitters and land managers differently, even when they contribute to the same climate challenge.

The Externality Equation offers a way to unify this landscape.

The Externality Equation: A Modern Take on Coase

Traditional carbon policy assigns the right to emit within regulatory limits. The Externality Equation flips the perspective: it focuses on liability and restoration.

Key principles:

- The **affected party** receives restoration rights.
- The **causing party** assumes measurable restoration obligations.
- Restoration becomes a **verifiable economic activity**, not a moral aspiration.

By applying a modernised version of the Coase Theorem, the framework provides fairness, legal enforceability, and economic clarity. Emissions are no longer merely allowed, they must be restored.

Five Strategic Objectives for EU Externality Policy

To operationalise the Externality Equation, the EU would align around five strategic goals:

1. Internalisation aligned with policy priorities
   Translate emissions into proportional restoration duties that help achieve 2040 and 2050 targets.

2. Correct pricing based on verified restoration costs
   Move from theoretical shadow prices to real, measurable environmental costs.

3. Legal empowerment of affected parties
   Strengthen liability frameworks and provide a clear legal basis for restoration claims.

4. Shared restoration duties across value chains
   Ensure fair responsibility from farm to fork, industry to consumer.

5. Fairness in current vs. historical emissions
   Current emitters pay for today's damage; society addresses legacy pollution through public policy.

These objectives build a more coherent and equitable policy landscape.

What Europe Gains: Five Expected Benefits

1. A Unified, Measurable Pathway to Net-Zero
   The Externality Equation aligns emissions and restoration in one framework. Agricultural soils, forests, and ecosystems become recognised carbon assets, measurable parts of the solution, not just recipients of subsidies.

2. Market-Driven Investment in Restoration and Clean Technology
   By turning restoration into a quantifiable obligation, Europe unlocks a new market for natural and technological carbon removal. This attracts private capital, supports green jobs, and accelerates innovation across farming, industry, and land management.

3. A Fair and Competitive Carbon Economy
   Building on ETS, CBAM, and CRCR as an integrated architecture, the Equation ensures:

   - transparent carbon responsibility across sectors,
   - consistent obligations across borders,
   - alignment with competitiveness goals.

   It also lays the foundation for a carbon passport, providing a product-level environmental profile for global trade that balances fairness, competitiveness, and climate integrity.

4. Incentive Alignment: Rewarding Results, Not Bureaucracy
   Instead of compliance checklists, farmers and firms are rewarded for verified

impact-real soil restoration, real methane reductions, real carbon removals. This turns climate action into opportunity rather than administrative burden.

5. Transparency, Credibility & Simplified Compliance
   Combining emissions and restoration in one verifiable equation reduces fragmentation. Digital tools and independent audits streamline oversight, particularly for diffuse sectors like agriculture.

Strategic Take-Away

Europe has the ambition, the tools, and the momentum. The missing piece is integration.

The Externality Equation offers a strategic pathway to

- unify emission reduction and ecosystem restoration,
- mobilise private and public investment,
- protect European competitiveness and rural livelihoods,
- reward measurable environmental performance,
- and deliver transparent, efficient governance on the path to net-zero.

The strategic question for Europe is simple:
Are we ready to evolve from simply reducing emissions to fully restoring the damage we cause?

Content

2 Introduction

Europe faces unprecedented challenges, from geopolitical tensions to increasingly frequent extreme weather events. In this context, the European Commission recognizes the urgent need to address externalities - unintended consequences of human activities that harm third parties who are not involved. Externalities like excess carbon in air, water, and soil threatens public health today and the well-being of future generations, making their management central to EU sustainability policy.

Nevertheless, two major issues persist: carbon crosses sectoral boundaries and accumulates over time. Emissions from livestock, energy, transport, and industry all converge in the same atmosphere, while land-use and nitrogen leaching exacerbate the impact on the environment. Carbon stored in forests or soils can be lost due to changes in land-use in other sectors. By addressing sectors separately and ignoring historical emissions and the international context, there is a risk that problems will simply be shifted rather than solved, underscoring the need for a cross-sectoral approach with shared responsibility. This is particularly evident with Greenhouse Gases where Europe's efforts could be undermined in other parts of the world with less stringent carbon regulations and in agriculture where farmers are expected to both reduce emissions and act as carbon sinks.

This paper argues that the European Union needs to review and renew the Coase theorem, a cornerstone of externality theory, in the light of today's environmental, health, and social challenges. A policy framework that only considers the profitability of polluting sectors is no longer adequate for a Union committed to climate neutrality and resilience. **Building on the concept of the *Externality Equation*, this paper proposes a new paradigm that places the *affected party at the center of the solution*, creating true equivalence between those who cause externalities and those who suffer from them**. This reformulation transforms externalities from unavoidable market failures into drivers of restoration, innovation, and shared value creation.

"Externalities Are Everywhere, But responsibility isn't"

The paper translates these insights into seven overarching policy recommendations designed to guide the EU's approach to externalities. It then examines two critical domains - greenhouse gas management and agriculture - to assess how current EU policies address these externalities in practice. From this analysis emerge six targeted recommendations for each domain that will strengthen EU climate and agricultural policy.

3 From reimagining Coase to the Externality Equation Coase 2.0

More than fifty years ago, Ronald Coase demonstrated that externalities could be resolved through negotiation provided governments ensured a legal basis, feasibility, and enforceable agreements.

Today, the EU faces a new challenge: translating that insight into a self-correcting economic system were environmental integrity and market efficiency work together. ***The objective of this Coase 2.0 is to no longer view externalities as inevitable side effects but as manageable, restorable elements of value creation, a basis for resilient and regenerative growth.***

"Liability, Not Property: Who Must Restore?"

Five actionable objectives for EU policy embody this modern interpretation:

1. **Internalize Externalities:** Embed externalities, the unintended costs of human activity, into the regular economy to the extent determined by policymakers.
2. **Correct Pricing:** Grant affected parties a *liability right to restoration*, ensuring damages are transparently valued and compensated through rules-based mechanisms.
3. **Legal Empowerment**: Guarantee standing for those affected by externalities so they are heard, can seek redress and fair compensation.
4. **Shared Restoration Duties**: Apply equal rights and responsibilities across the value chain, from producers to intermediaries, to guarantee a level playing field.
5. **Fairness regarding Ongoing and Historical Emissions:** Make current polluters liable for ongoing emissions while addressing historical impacts as a collective societal duty (also see reference 3).

Together, these principles translate the updated theorem into a policy framework capable of aligning growth with restoration and prosperity with planetary health. It embodies the principle that those who create and those who bear externalities are bound by a shared responsibility - the ***Externality Equation*** - where environmental integrity and market efficiency converge.

3.1 Actual policies regarding externalities

Ronald Coase's work frames externalities, such as noise or pollution, as reciprocal challenges. His famous example described a confectioner whose machinery disturbed a neighbouring doctor to properly examine his patients. ***Society could resolve the problem either by restricting the confectioner's right to make vibrating noise (property rights) or by compensating the doctor for the disturbance (liability rights)***. Coase argued that his approach, based on the opportunity cost of either causing and affected party could produce the most efficient outcome - provided ideal conditions exist, such as perfect negotiation and clear, enforceable rights.

"Old Rules, New Gaps"

The varying valuation (price) of the same externality (like vibrating noise) between different agents reflects different opportunity costs associated with the unique marginal benefits for each affected party. This inconsistent pricing of identical externalities leads to market imperfection, making it inherently impossible to achieve a market balance between costs and benefits.

3.2 The Externality Equation – Coase 2.0

In order for market forces to reflect the true social cost of production, the *Externality Equation* offers the following framework (also see reference 2):

"Restoration Rights: Turning Damage into Duty"

The *Externality Equation*

When an externality causes damage, the primary interest of the affected party is to remain un*affected*. The value of the externality therefore reflects the inverse of the affected party's self-interest - the desire to stay undamaged. Once harm occurs, this value must be translated into a duty to restore the situation to its original state. Accordingly, the Equation establishes that: "*The cost of an externality equals the cost of restoring the damage it has caused.*"
As a formula:

- ***externality*** = (-1) x ***self-interest third party***
  = (-1) x no damage
  = ***damage***

o ***cost externality*** = ***cost of damage*** = ***cost of restoration***[1]***.***

Identifying and empowering the affected third party helps manage the externality by setting a market price for damage that internalizes costs and ensures a fair balance of self-interest between causing and affected party.

The *Externality Equation* illustrated: "What happens when farting cows face green policies?

Imagine a peaceful countryside scene, were cows graze lazily on vast grasslands. To most of us, it is a picturesque postcard. To the farmer, it is his livelihood, selling milk and meat. For planetary health, those same cows are also methane-belching, nitrogen-producing, eco-villains. Now, add this twist: the government decrees that air and soil must contain less greenhouse gas and more soil carbon. In other words: cows must fart and poop less - or, in a utopian future, not at all. Unsurprisingly, the farmer is less than amused. But what if those gaseous emissions and nutrient-rich droppings became hot commodities? Imagine a cleanup market where methane burps and nitrogen-packed manure could be traded profitably. The farmer could offset emissions by purchasing cleanup services and passing on the costs, while keeping his business afloat. This can be expressed numerically. Imagine the government wants to reduce emissions from 10 to 9. They have two options:

✔ **Multiplicative Externality Control**: Mandate that each cow produces 10% less manure. As a formula: 10 x 0.9 = 9

✔ **Subtractive Externality Control**: Require the cleanup of 10% of the manure. As a formula: 10 - (10 x 0.1) = 9

Both approaches achieve the same outcome, but with a key difference. **Multiplicative control restricts the *property right of the farmer* - continuously tightening** manure limits, ultimately make livestock farming unviable. **Subtractive control,** based on **the *Externality Equation*'s liability rights of citizens***,* creates a *price for purifying manure* and capturing methane from air, allowing farmers to keep their cows, while meeting environmental targets.

As can be intuitively understood, restoration rights naturally encourage prevention. This is logical, as the externality framework is grounded in the principle of liability rights. The primary purpose of any liability regime is to deter potential actors from causing harm by attaching a cost to behaviours that generate undesired effects. Such penalties act as a deterrent, discouraging

[1] The cost of restoration includes all current repair expenses and any possible future problems

actions that would otherwise impose harm on others and incentivizing preventive conduct.

Restoration and Restoration Rights

Restoration Rights are the cornerstone of the ***Externality Equation***, shifting focus from the *opportunity cost of production* to the *duty of restoration*.

- o In classical Coasean theory, externalities are monetized through market transactions, with prices reflecting opportunity costs equal to the value of goods that could have been produced instead.
- o Under the *Externality Equation***,** by contrast, Restoration Rights monetize the obligation of the causing party to repair or offset the harm inflicted on third parties and ecosystems.

This difference becomes critical when externalities go beyond the profits of a product that affect public health or the environment. Carbon emissions, for example, can lead to respiratory and cardiovascular problems, ecosystem degradation, and intergenerational problems. In such cases, it is not enough for producers to voluntary discuss the profit or losses of the products they produce or that are affected by their production (the opportunity costs). Liability rights and a correct definition of who is effectively affect must replace the above to ensure accountability and protection of the public interest. Externalities cannot therefore be assessed merely by the profits of the products that generate them. The costs of externalities lie in the measurable harm to public health, biodiversity, and ecosystem services**.** In a fair system, these costs should be borne by the polluter rather than the affected party. **Restoration Rights therefore redefine externalities as** quantifiable obligations to restore**.**

While prevention remains the ethical ideal, the costs of environmental damage or damage to health once it has occurred, can only be defined in terms of restoration rather than avoidance**.**

- o In the **classical externality framework**, the emphasis lies on avoidance, preventing harm before it occurs. Yet, total avoidance would in practice amount to prohibition and is often, as in the case of greenhouse gas emissions, economically and socially unfeasible.
- o Under the ***Externality Equation***, by contrast, **restoration becomes the key metric**. It quantifies the resources required to restore the damage already done, ensuring that economic activity contributes to the recovery of the systems it affects.

In conclusion, **Restoration Rights** provide a clear, quantifiable framework for assigning responsibility and financing environmental repair. They shift EU climate and environmental policy from attempts to **limit emissions** toward **actively restoring ecological balance**.

Integration with Existing EU policies

Addressing environmental and public health-related externalities requires shifting focus from ***property rights***, which allow emissions, to ***liability rights***, which guarantee protection from harm. In liability-based frameworks, harmful emitters compensate affected parties. The EU provides examples of this principle in action:

- **Water management**: The Urban Waste Water Treatment Directive, Water Framework Directive, and Industrial Emissions Directive hold companies responsible for water discharges while governments ensure overall water quality.
- **Waste management**: Germany's "Grüner Punkt" system, deposit-return schemes, and the EU Directive 2023/1542 on textile recycling assign producer responsibility and incentivize recycling under extended producer responsibility (EPR) schemes.

These existent mechanisms illustrate the *Externality Equation*. By establishing clear liability, environmental harm, from water pollution to waste to greenhouse gas emissions, can be addressed by the causing parties based on the right to restoration of the damaged party.

3.3 Strategic Priorities for Implementation

Implementing the *Externality Equation* framework demands coordinated legal, economic, and governance reforms that link responsibility, restoration, and prevention. The following priorities outline how the EU can do so (also see reference 3).

"What You Break, You Restore"

1. Strengthen Legal Foundations for Environmental Accountability
   - ✔ Establish liability frameworks that recognize nature, air, soil, and water as legal entities with enforceable rights.
   - ✔ Embed annual restoration duties in legislation to ensure continuous environmental recovery.
2. Align Carbon Pricing with Real Restoration Costs

- ✔ Replace shadow pricing with verified restoration costs that reflect true environmental repair.
- ✔ Shift from pollution permits and taxes to direct restoration duties directed to recovery projects.

3. Share Restoration Duties Fairly Across Value Chains (internal market level playing field)

- ✔ Require all sectors and economic agents to assume proportional restoration responsibilities.
- ✔ Limit bureaucracy by using independent audits to verify compliance transparently.

4. Enforce Responsibility: “What You Break, You Restore”

- ✔ Distinguish between current and historic environmental liabilities.
- ✔ Hold today’s emitters accountable for new impacts while addressing Europe’s historic carbon debt collectively.

5. Expand the *Externality Equation* beyond Carbon

- ✔ Apply the model to waste, nitrogen, and toxic emissions to cover all major pollutants.
- ✔ Replace fragmented rules with a unified framework for simpler, stronger enforcement.

6. Level Global Trade Through Externality Debt Adjustments (global level playing field)

- ✔ Use import levies and export incentives based on the *Debt of Added Externalities (DAE)* principle.
- ✔ Prevent carbon leakage and strengthen Europe’s competitiveness through cross sector and international harmonized pricing.

7. Establish a Dedicated Governance Body for Liability rights

- ✔ Create legal representation of third parties, possibly a trustee and accredit independent auditors for transparency.
- ✔ Define standards for restoration projects, manage registries and coordinate internationally.

Together, these priorities provide a practical roadmap for embedding the *Externality Equation* into European policy.

3.4 Conclusion

By recalibrating the balance between property and liability rights through the *Externality Equation*, the EU creates measurable incentives for emission reduction and restoration, enhances competitiveness through transparent pricing, assures accountability, fairness and secures long-term sustainability across borders and value chains. It forms the legal and market backbone of a resilient, circular, and externality-low European economy.

4 Upgrading the EU's carbon externality strategy

This renewed understanding of externalities allows the EU to shift its carbon strategy from restrictive controls toward a model based on shared responsibility and measurable restoration. The next section outlines Europe's key strengths in applying this model compared to the current property rights-based approach to climate change and agricultural policy.

4.1 Europe's Carbon Policy: From Property to Liability Rights

4.1.1 Current Policy - Introduction to Carbon in the ETS

The cornerstone of Europe's climate strategy is the **European Union Emissions Trading System (EU ETS)**. It regulates carbon and other greenhouse gases using a **cap-and-trade, property-rights approach**.

Emitters receive tradable **Emission Allowances**, granting the *right to emit* within a declining cap. Companies that reduce emissions efficiently can sell surplus allowances, creating financial incentives for prevention. Annual reductions of the cap (Linear Reduction Factor) drive progressive decarbonization. Revenues from auctions fund the Innovation Fund and Modernization Fund, supporting low-carbon technologies and the energy transition in less wealthy Member States.

The ETS ensures fairness and competitiveness via free allocations for sectors at risk of carbon leakage and through mechanisms like the **Carbon Border Adjustment Mechanism (CBAM)**. From 2027, the system will expand to buildings and road transport (ETS2), with maritime transport discussions ongoing.

While effective in energy-intensive sectors, the ETS remains **property-rights-based**, focusing on emission quotas rather than addressing restoration responsibilities and cumulative environmental harm.

4.1.2 The Externality Equation - Shifting to the "Duty to Restore"

The **Externality Equation** reframes carbon policy around **liability rights**—transforming emissions from a tradable *right* into a measurable *duty to restore*.

"From Quotas to Duties"

It operates through three steps:

- **Measurement** – Emissions are quantified to determine the restoration required, not just for compliance or trading.
- **Allocation** – Restoration obligations are assigned proportionally to verified emissions, reversing the question from "who may emit?" to "who must restore?"
- **Restoration** – Each actor offsets its emissions through certified recovery projects, generating **Restoration Rights** that represent verified removal or remediation.

Financially, restoration costs are recorded as operational liabilities rather than capital assets. Companies must weigh recurring restoration costs against investment in prevention, creating a transparent "pay-as-you-pollute" system. Restoration markets - ranging from reforestation and wetland recovery to carbon capture and storage - create a new economic sector for environmental repair, complementing the ETS by managing **flow** instead of **cap**.

4.1.3 Integration with Existing EU Policies

The ETS and the Externality Equation can be integrated along a continuum:

1. **Integration** – Companies comply through either emission reduction or certified restoration, aligned with the Carbon Removal Certification Regulation.
2. **Stabilized Caps with Rising Restoration Duties** – Emission allowances remain fixed, while annual restoration obligations increase.
3. **Full Transition** – The ETS is phased out, replaced by a restoration-based system where verified remediation defines compliance.

This approach allows a gradual transition from emission rights to market-based direct liability for environmental damage.

4.1.4 Key Added Policy Value Opportunities for Europe's ETS

1. **Less Net Emissions and Greenhouse Gases**
    - Restoration obligations drive demand for clean-up and recovery projects, reinforcing prevention.
2. **Uniform Pricing with Context-Specific Valuation**

- Restoration-based carbon pricing reflects local ecological conditions and true environmental costs.

3. **Future-Proof and Scalable Framework**
    - Restoration markets encourage technological and natural negative-emission solutions, creating a self-reinforcing economic and ecological cycle.
4. **Market-Driven Clean-Up and Prevention**
    - Companies are incentivized to innovate in emission reduction and restoration, turning environmental responsibility into growth opportunities.
5. **Level Playing Field and Fair Competition**
    - A Debt on Added Externalities (DAE) ensures consistent treatment across sectors and borders, preventing carbon leakage.

6. **Comprehensive and Transparent Accounting**
    - Integrating emissions and restoration obligations within one measurable framework, supported by independent audits, enhances credibility and reduces administrative burdens.

4.1.5 Conclusion

The Externality Equation complements the EU ETS by shifting from **property-based emission rights** to **liability-based restoration duties**. By monetizing the duty to repair rather than the right to pollute, it integrates environmental responsibility into corporate financial and operational logic, strengthens market credibility, and channels financial resources toward both verified restoration and prevention.

"Restoration Markets: Opportunity, Not Burden"

This combined framework supports the EU's climate neutrality goal by 2050, linking emission reduction, ecological restoration, and market efficiency in a unified, scalable, and economically viable policy architecture.

4.2 Europe's Carbon Policy in Agriculture: From Property to Liability Rights

4.2.1 Current Policy - Carbon in the CAP and "Right to Farm Sustainably"

Europe's agricultural carbon policy seeks to align farming with the European Green Deal and the 2050 climate-neutrality goal. It pursues five main objectives:

- Enhance carbon storage in soils, agroforestry, and peatlands.
- Reduce emissions from fertilizers, livestock, and farm energy.
- Reward verified carbon removals through carbon farming.
- Integrate carbon goals into the Common Agricultural Policy (CAP) via eco-schemes and conditionality.
- Strengthen monitoring through digital and scientific data.

Under the reformed CAP (2023-2027), eco-schemes and the forthcoming Carbon Farming Initiative financially reward farmers for sustainable practices and verified removals. Supporting instruments such as the Soil Strategy 2030 and the Methane Strategy complement these efforts.

However, current policy remains rooted in a **property-rights logic**: farmers are granted support or incentives to reduce or avoid emissions, but environmental harm itself is not treated as a quantifiable liability. The system regulates access to subsidies and compliance, rather than directly linking responsibility to restoration.

4.2.2 The Externality Equation - Shifting to the "Duty to Restore"

The **Externality Equation** introduces a **liability-rights framework** for agriculture, converting environmental harm into measurable restoration obligations. Instead of rewarding the *right* to emit less, farmers assume the *duty* to repair what they emit.

This model applies three operational steps:

- **Measurement** - Beyond compliance, emissions data quantify the environmental damage that must be restored.
- **Allocation** - Restoration duties are assigned proportionally to verified emissions, shifting the policy question from "who may emit?" to "who must restore?".
- **Restoration** - Each actor offsets a defined portion of emissions through verified recovery projects, generating tradable **Restoration Rights**.

These Restoration Rights monetize environmental repair - such as soil carbon sequestration, methane reduction, or agroforestry - creating a "pay-as-you-pollute" mechanism. Restoration expenses become operational liabilities on the balance sheet, integrating ecological costs into normal business management.

"Farmers as Solution Providers"

The approach complements, rather than replaces, existing EU tools like the CAP, the Carbon Removal Certification Framework, and the Corporate Sustainability Reporting Directive. It turns compliance into opportunity, linking farm profitability with restoration outcomes.

4.2.3 Integration with Existing EU Policies

Combining current CAP instruments with the Externality Equation creates a coherent agricultural carbon governance architecture:

1. **Integration** - Farmers may meet obligations either through emission reduction or certified restoration, harmonized with the Carbon Removal Certification Framework.
2. **Stabilized Emission Targets with Rising Restoration Duties** - Existing limits remain, while annual restoration requirements expand progressively.

3. **Full Transition to a Restoration-Based Model** - Compliance ultimately rests on verified environmental repair rather than emission quotas.

This continuum allows gradual reform while maintaining policy stability and farmer participation.

4.2.4 Key Added Policy Value Opportunities for Europe's CAP

1. **Attractiveness - From Conditions to Incentives**
   Farmers who verifiably reduce or restore emissions gain tradable carbon or nature credits. Historic emissions remain a public responsibility, addressed through targeted EU restoration programs.

2. **Competitiveness - Equal Rights, Shared Duties**
   All actors in the agri-food chain account for their own carbon footprint. A "carbon passport" system could ensure global competitive neutrality, aligning trade with environmental responsibility and complementing mechanisms such as CBAM.

3. **Future-Proofing - Outcome-Based Restoration and Smart Compliance**
   Annual restoration targets focus on high-impact emitters, achieving measurable recovery without excessive bureaucracy. Independent audits and digital MRV tools verify on-farm results, ensuring transparency and reducing administrative load.

Together, these measures link agricultural productivity with verified restoration, creating a self-reinforcing cycle of innovation and environmental improvement.

4.2.5 Conclusion

The Externality Equation transforms Europe's agricultural carbon policy from a property-based system of subsidies and permissions into a **liability-based framework of restoration duties**. By monetizing the **duty to repair** rather than the **right to emit**, it embeds ecological responsibility into farm economics, stimulates innovation, and ensures fair competition across value chains.

This shift integrates prevention and restoration within one measurable framework, advancing the objectives of the Green Deal and the Farm-to-Fork Strategy and securing a climate-neutral, resilient, and competitive European agriculture.

5 Overall Conclusion - From Burden to Opportunity, A Policy Framework for Growth

Adapting the Coase Theorem to today's environmental and public health challenges - *Coase 2.0* - offers the European Union a forward-looking, pragmatic framework for policy reform. By placing the affected party at the center of environmental accountability and using the *Externality Equation* as its cornerstone, this approach reframes liability not as punishment, but as a mechanism for measurable restoration.

“Restore to Lead: Europe’s Competitive Edge”

Built around five strategic objectives - Internalize Externalities, Correct Pricing, Legal Empowerment, Shared Restoration Duties, Fairness regarding Ongoing and Historical Emissions - Coase 2.0 brings structure, fairness, and efficiency to both climate and agricultural policy.
It moves the EU from *penalty-based regulation* to *performance-driven incentives*, embeds real environmental costs into economic activity, and creates scalable restoration markets. Linking duties to verifiable outcomes, it drives innovation, supports global competitiveness, and simplifies compliance through transparent, auditable systems.

In doing so, Europe is uniquely positioned to lead a shift from fragmented environmental rules to a coherent, market-aligned policy model, one where sustainability becomes a catalyst for economic growth and resilience, rather than a constraint.

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The views expressed are solely those of the authors and do not necessarily represent the positions of the Systems Transformation Hub, its members, or other parties.

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6 Annex: Upgrading the EU's carbon externality strategy

6.1 Europe's carbon policy regarding climate change

The cornerstone of Europe's policy towards climate change is the European Union Emissions Trading System (EU ETS) regarding carbon and other greenhouse gases. In this section we will be guided by the EU's objectives regarding Greenhouse Gas, introduce the *Externality Equation* based solution in the EU ETS and demonstrate the key opportunities this approach offers.

Europe states its Objectives regarding Greenhouse Gas as follows:

- Reduce emissions efficiently.
- Carbon pricing that promotes innovation and low-carbon investment.
- Ensure fairness and competitiveness.
- Integrate carbon pricing across sectors by expanding sector coverage (ETS 1, ETS 2, …).

The main goal of the EU ETS is to contribute to the EU's climate neutrality target by 2050 and to achieve its intermediate emissions reduction objectives, notably a 55% reduction in net GHG emissions by 2030 compared to 1990 levels.

6.1.1 Current policy - Introduction to carbon in the ETS

The European Union Emissions Trading System (EU ETS) is the cornerstone of the European climate policy. It aims to create a functioning carbon market that drives decarbonization across major industrial and energy sectors.

The ETS *offers Emission Rights for the Causing Party* and operates on a "cap-and-trade" principle: a declining cap limits total emissions, while tradable allowances create flexibility for businesses. The cap is reduced annually through the Linear Reduction Factor, ensuring progressive emissions cuts. Economic agents are expected to allocate resources toward investments that ensure their emissions remain within the legally prescribed maximum limits. Companies efficiently reducing emissions can sell excess allowances to those struggling to meet targets, creating an incentive to reduce emissions cost-effectively. *Prevention becomes the name of the game.* Revenues from allowance auctions are increasingly directed to the Innovation Fund and Modernization Fund, supporting green technologies and energy transition in less wealthy Member States. By linking with other carbon markets and strengthening monitoring and compliance, the EU aims to ensure the ETS remains the cornerstone of an integrated, market-based climate strategy driving Europe's transition to a sustainable, competitive, and climate-neutral economy. Today, a cap on the total amount of GHGs that can be emitted by installations and airlines is covered by the system. From 1 January 2027, coverage of ETS will expand to buildings and road transport (under the new ETS2). Discussions on maritime transport are still going on.

Fairness and competitiveness are targeted through mechanisms like free allocation for sectors at risk of carbon leakage and the agreed Carbon Border Adjustment Mechanism (CBAM).

6.1.2 The Externality Equation: operational design of restoration rights

In traditional markets, emitting parties prioritize production and sales while ignoring or shifting the environmental costs (externalizing) to others, including those associated with carbon emissions. By contrast, affected parties have a clear interest in recognizing and correcting these damages. Restoration Rights align these opposing interests by requiring emitters to offset their emissions through the purchase of restoration services that correspond to restoration targets.

An *Externality Equation*-based approach grants restoration rights to those affected by greenhouse gas emissions. Defining the appropriate third party ensures that what and who suffers from environmental harm is legally represented and compensated, while courts remain the final arbiters in disputes.

A. Scope

The EU Emissions Trading System (ETS) market-based design primarily addresses emissions through the regulation of property rights, that is the right to emit within capped limits. The ETS functions by creating scarcity in emission allowances, thereby assigning a market value to carbon. This mechanism has proven its value in energy-intensive sectors but is less suited to capturing the full spectrum of external costs and long-term environmental damage associated with cumulative carbon concentrations through a multitude of causing parties.

In contrast, the *Externality Equation* shifts the policy focus from the "***right to emit***" toward the "***duty to restore***". Instead of limiting emissions through tradable allowances, it establishes Restoration Rights that quantify the responsibility of each actor to remediate or offset the environmental harm they cause. This approach complements the ETS by addressing its inherent asymmetry: ***the ETS manages quantities with quota, whereas the Externality Equation manages flow with restoration***.

The operational design of the *Externality Equation* unfolds through 3 audited interdependent steps: measurement, allocating, and restoring.

⇒ **Measurement** is the foundation of both the ETS and the *Externality Equation*, but their objectives diverge.

- o In the ETS, emissions are measured primarily for compliance with cap limits and trading purposes. The focus is on verified emission quantities within a specific period.
- o Under the *Externality Equation*, measurement focuses on restoring the caused damage experienced by third parties and ecosystems.

Measurement remains the responsibility of the emitting or issuing party but is subject to independent verification of accredited auditors, consistent with the EU's Monitoring, Reporting, and Verification (MRV) frameworks. By broadening the scope beyond short-term emission volumes, the *Externality Equation* creates a continuous accounting system that tracks the persistence and cumulative effects of GHGs over time.

⇒ **Allocation** mechanisms mark a key point of differentiation between the ETS and the *Externality Equation*.

- o The ETS allocates emission allowances based on historical emissions, production benchmarks, or auction systems, thus governing who may emit and in what volume.
- o The *Externality Equation*, by contrast, allocates restoration obligations based on the quantified emissions that equal the damage received by third parties or the environment due to those emissions.

This inversion of perspective means that while the ETS determines "*who can emit*", the *Externality Equation* determines "*who must restore*". Allocation under this model is guided by the principle of proportionality, ensuring that restoration obligations correspond to the scale of environmental harm. It also allows differentiated restoration obligations across sectors and regions, when policy makers want to align with social desirability.

⇒ **Restoration - Restoration Rights** are the defining innovation of the *Externality Equation*.

A fundamental distinction between the current EU Emissions Trading System (ETS) and the proposed *Externality Equation* lies in *what is monetized* and *how these instruments are treated economically and financially.*

- Under the **EU ETS**, **emission rights** are the principal tradable unit. They represent the *right to emit* a specified quantity of CO_2-equivalent gases within a capped system. The ETS thus *monetizes the cost of prevention* by assigning a market value to the avoidance of future emissions. In the balance sheet, the prevention cost is classified as assets or investments, reflecting their role in maintaining production capacity within environmental limits. The ETS sets a *shadow price* on emissions, influencing investment in low-carbon technologies and energy efficiency. In summary, the ETS treats environmental performance as a *capital management issue*, where emission rights are investments in prevention.
- By contrast, the ***Externality Equation*** introduces **Restoration Rights** as a mechanism that monetizes the *duty to repair environmental damage already caused*. Each emitting actor is required to remediate a defined proportion of its verified emissions, expressed as a percentage of CO_2-equivalent gases to be removed, restored, or compensated. This obligation recognizes that emissions, even when permitted, impose measurable harm on ecosystems and society, and therefore must be accompanied by a quantified restoration responsibility. *In the balance Sheet they are classified as operational expenses or provisions, reflecting a current obligation rather than a capital investment*. Verified restoration projects generate *Restoration Rights* that can be purchased by emitters to fulfil their obligations. This embeds the *full life-cycle cost* of environmental impact in corporate financial reporting.

At the **company level**, the *Externality Equation* accounting logic incentivizes companies to weigh the long-term return on investment (ROI) of cleaner technologies against the recurring expense of restoration, creating a transparent “pay-as-you-pollute” system that funds recovery while encouraging prevention. This shifts the focus from purchasing carbon allowances or paying taxes, as under the Emissions Trading System (ETS), to directly restoring emissions-related damage and investing in prevention to reduce future costs. It embeds sustainability within standard business logic, ensuring that each emitter contributes proportionately to environmental repair.

At the **macroeconomic level**, balancing investments in prevention with restoration spending transforms environmental costs into sources of income for restoration industries, creating a self-reinforcing cycle that drives both economic growth and environmental responsibility. Emerging restoration industries include a combination of natural and technological solutions, such as:

- Natural pathways: reforestation, wetland recovery, peatland restoration, and blue carbon enhancement.
- Technological pathways: carbon capture and storage (CCS), direct air capture (DAC), mineralization, and long-term carbon storage solutions.

These markets will focus on negative emissions rather than emission rights. Ultimately, the ***Externality Equation*** reconciles two traditionally separate domains of environmental policy - emission prevention and ecosystem restoration. ***By translating environmental externalities into quantifiable economic obligations, it integrates them into the value chain and establishes a continuous feedback loop that strengthens both environmental protection and market efficiency***.

B. Integration with Existing EU policies

Together, the two instruments create the following climate governance architecture:

Complementarity ETS and Restoration rights

Dimension	Emission Rights (ETS)	Restoration Rights (Externality Equation)
Purpose	Limit and prevent new emissions of greenhouse gas through **cap and trade.**	Monetize and enforce the **duty to repair** environmental damage already caused.
Economic Function	Monetizes the cost of emission prevention via **tradable emission allowances.** Introduces an obligation to invest in order to emit less. Prevention cost = avoidance investment.	Introduces a **self-financing liability mechanism** where verified emitters bear proportional responsibility for environmental restoration. Restoration cost = liability expense.
Accounting Treatment	Emission rights treated as assets or **investments** in prevention.	Restoration costs recorded as **operational expenses** or provisions.
Allocation Principle	Allocates emission obligations according to **sectoral conditions and national implementation plans**.	Allocates **uniform restoration duties per unit of emission**, while allowing policy modulation for socio-economic balance.
Market Mechanism	**Regulated trading** of allowances sets a market price for carbon.	**Demand-driven restoration market** linked to verified clean-up generate credits that fulfill emitter obligations.
Temporal Focus	**Future-oriented** (reducing new emissions).	**Backward- and forward-looking**, linking past damage repair with future prevention.
Governance & Legal Basis	Based on **public regulation and conditional compliance**, monitored by CAP authorities and environmental agencies.	Grounded in **liability and restoration rights law**, with obligations verified under harmonised MRV systems, complementing existing EU legal and financial architectures.
Main Policy Outcome	Decarbonisation through **emission avoidance**.	Funds ecosystem recovery while embedding **full life-cycle accountability**.

Policy makers can consider three main options:

a) *Integration***.** Emission allowances are supplemented by Restoration Rights**,** enabling companies to meet compliance obligations either through emission reduction or certified restoration projects**.** This aligns with the Carbon Removal Certification Regulation (CRCR) and strengthens its implementation by embedding restoration outcomes within existing carbon accounting and certification frameworks.

b) *Stabilized Emission Caps with Increasing Restoration Obligations*. Here, current emission allowances are frozen, while annual restoration duties are progressively introduced and expanded. This enhances the predictability of target achievement.
c) *Full Transition to a Restoration-Based System*. In the medium term, the ETS could be phased out and replaced by a restoration policy. Under this model, compliance is determined by verified restoration performance in proportion to the own footprint.

Together, these options establish a continuum from complementary reform to systemic transformation. In the next chapter, we will explore the resulting 6 key added policy value opportunities.

6.1.3 Key Added Policy Value Opportunities for Europe's ETS

The *Externality Equation* offers Europe a unique opportunity to modernize environmental policy offering the following advantages:

1. Less Net Emissions and Greenhouse Gases in the Atmosphere

   ✔ **Driving Demand for Restoration and Emission Reduction**
   Restoration rights create direct demand for clean-up and recovery projects increasing their value and accelerating environmental recovery.
   ✔ **Maintaining Lower Net Emissions through Obligations**
   Restoration duties keep total emissions lower, as growing restoration obligations steadily boost prevention investments to avoid them.

2. Uniform Pricing with Context-Specific Valuation

   ✔ **Dynamic, Location-Sensitive Pricing**
   Enables uniform valuation of identical externalities while reflecting local restoration costs and ecological conditions.
   ✔ **Internalizing Environmental Costs in the Economy**
   A uniform carbon price based on verified restoration costs embeds the true environmental cost of production in the financial statements.

3. Future-Proof scalable Framework

   ✔ **Efficient, High-Value Restoration Markets**
   The model drives efficient organization of restoration activities, something emission rights overlook entirely, unlocking a market larger than emission reduction itself.

- ✔ **Stable Transition to Net-Zero**
  Gradually rising restoration targets provide a non-disruptive path toward zero net emissions.

4. Market-Driven Clean-Up and Prevention

- ✔ **Turning Restoration into a Growth Market**
  While other economies prioritize avoidance technologies, Europe can lead the global clean-up market for ongoing and historical emissions. This will drive breakthroughs in sectors from agriculture and forestry to cutting edge technologies.
- ✔ **Stimulating Investment and Innovation**
  Restoration rights attract capital more easily by aligning with average production margins, while cap-and-trade systems struggle under the limits of marginal investment returns.

5. Level Playing Field that Balances Market Forces with Regulation

- ✔ **Creating Fair Competition through Emission Based Pricing**
  A carbon cost based on a *Debt on Added Externalities (DAE)* ensures equal treatment across sectors and borders.
- ✔ **Preventing Carbon Leakage through Coordination**
  Cross-border pricing alignment preserves competitiveness and strengthens Europe's climate leadership.

6. Comprehensive and Transparent Accounting

- ✔ **Unifying Emissions and Restoration in One Framework**
  Integrates emission generation and restoration obligations within a single measurable equation.
- ✔ **Ensuring Credibility through Independent Audits**
  Third-party verification enhances transparency while limiting administrative effort.

With a dedicated governmental governance structure and independent audits, clear criteria for projects and standards will assure coordinated compliance and international integration.

6.1.4 Conclusion

The *Externality Equation* bridges the conceptual gap between emission mitigation and ecological restoration, ***converting environmental responsibility into an economic asset***. The operational design of Restoration Rights embeds verified restoration activities within the EU's carbon pricing and regulatory framework, creating a transparent, scalable, and economically viable complement to emission reduction efforts. By linking carbon prices to measurable restoration outcomes, it strengthens market credibility, boosts investor confidence, and channels capital toward both low-impact production and high-impact restoration. It supports the Achievement of climate neutrality by 2050 by advancing the Green Deal's industrial transformation and stimulating private investment in restoration and innovation.

6.2 Europe's carbon policy regarding agriculture

The EU's policy is designed to align farming with the EU's broader climate objectives, particularly the **European Green Deal** and the goal of **climate neutrality by 2050**. In what follows we will summarize the EU agriculture objectives regarding carbon followed by a brief description of the actual operational policy. Finally, as in the previous chapter, key opportunities based on the *Externality Equation* are outlaid.

Europe states its carbon Objectives regarding agriculture as follows

✔ **Enhance carbon storage** through soil management, agroforestry, peatland restoration, and permanent grasslands.

✔ **Reduce emissions** from fertilizers, livestock, and energy use on farms.

✔ **Encourage "carbon farming"** - a model that rewards farmers for verified carbon removals and sustainable practices.

✔ **Integrate carbon goals into the Common Agricultural Policy (CAP)** by tying financial support to environmental and climate performance through eco-schemes and conditionality.

✔ **Improve monitoring and verification** of carbon impacts using digital tools and scientific data.

In short, the EU's main goal is to combine its climate objectives with viable farming for European farmers and a secured food supply for its residents.

6.2.1 Actual policy - Introduction to carbon in the CAP

The European policy includes increasing carbon sequestration in soils and biomass, reducing agricultural emissions (methane, nitrous oxide, CO_2), and promoting sustainable land management.

The EU's strategy combines **incentives, innovation, and regulation**. The reformed **CAP (2023–2027)** dedicates significant funding to eco-schemes that reward carbon-friendly practices. The upcoming **EU Carbon Farming Initiative** aims to establish a certification framework for carbon removals, ensuring transparency and market credibility. Research and innovation under **Horizon Europe** will underpin this initiative.

The European Union has made significant progress in addressing greenhouse gas (GHG) emissions through the EU-ETS, while gradually integrating environmental and climate objectives into the Common Agricultural Policy (CAP). However, the two systems remain conceptually and operationally separate: one regulating emissions, the other supporting land stewardship. As said before, we recommend bringing both under a single framework - the ***Externality Equation*** - which modernises the **Coase Theorem** by embedding restoration duties, legal accountability, and fair burden-sharing across value chains.

The **Soil Strategy for 2030** and the **Methane Strategy** complement efforts to reduce emissions and enhance carbon sinks. Overall, the strategy seeks to transform agriculture from a net emitter into a key partner in achieving Europe's climate neutrality.

Despite these important steps, current policies remain insufficient in fully addressing agriculture's environmental footprint. While agriculture and Land Use, Land-Use Change, and Forestry (LULUCF) together contribute roughly 6 - 11% of total EU net greenhouse gas emissions, this aggregate mask significant variation across the subsectors - Livestock farming - Arable farming - Horticulture. Each subsector therefore requires tailored measures to neutralize its specific impacts.

6.2.2 The *Externality Equation*: operational design of restoration rights

Current EU sustainability policies largely focus on instruments such as cap-and-trade systems, emissions caps, and restrictions on the use of raw materials or chemical substances. While these mechanisms have contributed to measurable progress in emission control, they are often perceived by farmers as compliance obligations rather than opportunities for proactive participation or innovation. This perception risks alienating key stakeholders whose engagement is vital for achieving the Union's climate neutrality objectives.

To overcome these structural limitations, the *Externality Equation* proposes, as stated supra, a paradigm shift - ***from restricting property rights to enforcing liability rights***. As such, environmental damage by agriculture and carbon emission in particular, becomes a measurable liability, and those generating it assume proportionate obligations for restoration. This approach reframes carbon sustainability as a shared responsibility and creates carbon restoration markets that align economic productivity with environmental performance.

A. Scope

Implementing the ***Externality Equation*** in agriculture involves three operational steps: Measuring, allocating, and restoring environmental costs.

Applied to agricultural carbon policy, this model builds on the five actionable objectives for EU policy introduced earlier: Internalize Externalities, Correct Pricing, Legal Empowerment, Shared Restoration Duties, Fairness regarding Ongoing and Historical Emissions.

⇒ Measurement. **Both current EU policies and the *Externality Equation* rely on objective, uniform measurement, yet they differ in purpose and scope.**

- o **Current practice** focuses on verifying emissions within a defined period, primarily to monitor compliance and detect potential rule violations.

- **Under the *Externality Equation***, measurement serves a restorative function, quantifying the environmental damage caused and defining the portion that must be restored.

Responsibility for measurement remains with the emitting or issuing party, subject to independent verification under standardized Monitoring, Reporting, and Verification (MRV) protocols. These protocols ensure methodological consistency across Member States and alignment with EU carbon accounting systems. The key difference is that the *Externality Equation* connects data collection directly to restoration outcomes, creating a measurable bridge between emissions and remediation.

⇒ **Allocation** marks a central point of differentiation between existing EU policies and the *Externality Equation*.

- **Current frameworks** allocate emission allowances or obligations based on sectoral rules and local environmental conditions.
- **The *Externality Equation***, by contrast, allocates restoration obligations based on verified emissions - establishing identical restoration duties for equivalent emission levels, regardless of sector. In contrast to ongoing emissions, historical emissions remain a societal responsibility, addressed collectively through public policy.

This shift transforms the question from *"who may emit and how much?"* to *"who must restore and to what extent?"* Allocation follows the principle of **proportionality**, ensuring that restoration duties correspond to each activity's verified environmental footprint. Policymakers retain flexibility to modulate restoration rates over time to reflect social and economic priorities among subsectors such as livestock, arable, and horticulture.

⇒ **Restoration and Restoration Rights**

Operationalizing the *Externality Equation* converts restoration from a policy ambition into a quantifiable obligation. Each actor must remediate or offset a defined portion of their verified emissions, creating Restoration Rights expressed in tons of CO_2-equivalent (CO_2e) to be restored or removed.

These obligations foster a self-reinforcing incentive: reducing emissions directly lowers restoration costs, encouraging innovation and efficiency. Tailored measures to neutralize specific impacts are developed by market mechanism. Sector-specific examples include:

- **Livestock farming:** methane reduction, advanced manure and nitrogen management, rotational grazing, and verified carbon removal through biochar or agroforestry.
- **Arable farming:** soil carbon sequestration via cover crops, reduced tillage, organic amendments, and precision nutrient management linking restoration with productivity and soil health.
- **Horticulture:** renewable energy adoption in greenhouse systems, integrated nutrient management, and improved water retention to mitigate runoff.

Standardized MRV systems would ensure transparency and coherence, aligning with the **Carbon Removal Certification Framework**, **Corporate Sustainability Reporting Directive** and related EU monitoring initiatives. Through these mechanisms, restoration obligations become a driver of innovation rather than a compliance burden. They encourage adoption of climate-smart technologies, regenerative farming, and circular resource use, improving both environmental performance and the long-term competitiveness of EU agriculture.

Integration with Existing EU Policies

The *Externality Equation* is not a replacement for current EU instruments but a complementary framework that operationalizes them. It builds upon established regulatory and financial foundations. These existing policies already provide the financial incentives, governance architecture, and research capacity needed to integrate restoration rights into practice.

Together, actual policies and the *Externality Equation* create the following agricultural carbon governance architecture:

Complementarity current EU agricultural carbon policy and Restoration rights

Dimension	Current EU Agricultural Carbon Policy	Externality Equation–Based Agricultural Policy (Restoration Rights Model)
Purpose	Reduce GHG emissions, enhance carbon sequestration through **eco-schemes, incentives, and regulation**.	Turn GHG emissions into measurable **restoration liabilities**, thereby linking agricultural productivity directly to measurable ecosystem repair.
Economic Function	Relies on **public funding** and **compliance incentives**.	Creates a **self-financing system** where emitters fund verified restoration.
Accounting Treatment	Recorded as **assets/investments.**	Recorded as **expenses/provisions**.
Allocation Principle	Different emission targets, based on sectoral conditions and **national plans**.	Applies **uniform restoration duties** per emission unit, while allowing policy modulation.
Market Mechanism	Focuses on emission, chemicals and sequestration for monitoring and relies on **incentives** and **voluntary carbon markets**.	Establishes **Restoration Rights Markets**, enabling the trading and pooling of verified restoration activities for cost-efficiency.
Temporal Focus	**Short- to medium-term program CAP cycles** (2023–2027).	**Long-term restorative perspective**, linking yearly emissions to ongoing restoration duties.
Governance & Legal Basis	Based on **public regulation and conditional compliance** under CAP oversight.	Grounded in **liability rights law**, complementing existing EU architectures.
Main Policy Outcome	Gradual, **compliance-driven** and **subsidy dependent** reduction.	Makes sustainability a **performance driver**, reducing emissions lowers restoration costs, stimulating innovation and competitiveness.

By embedding restoration duties into the economic logic of farming, the model transforms sustainability from a regulatory constraint into an engine of growth, fairness, and resilience. It aligns Europe's agri-food system with three of the EU's four overarching strategic priorities:

- **Attractiveness:** Encourages viable, future-oriented farming models that attract investment and skilled labour.
- **Competitiveness:** Integrates environmental responsibility with productivity, enhancing Europe's position in global agri-food markets.
- **Future-Proofing:** Embeds carbon restoration, climate adaptation, and resource efficiency into everyday practice, ensuring resilience and long-term viability.

In the next section, we outline six key policy opportunities linked to these strategic priorities.

6.2.3 Key Added Policy Value Opportunities for Europe's CAP

Implementing the *Externality Equation* means translating its principles into concrete, actionable policy. This involves adopting six principles that operationalize ***the shift from treating environmental damaged as an external cost to embedding it within market logic and legal responsibility***. Together they offer a coherent framework to accelerate progress toward environmental sustainability.

EU Strategic priority Attractiveness: Making farming a viable and appealing career

1) **Away from Conditions to Incentives** (Carrot & Stick)
   Ongoing emissions must be managed, and those responsible must fund restoration. At the same time, those actively investing in emission control should be rewarded. Verified carbon and nature credits will go to farmers and businesses that demonstrate real reductions. The system shifts from penalties to performance-based incentives.
2) **Protect and Restore Farmers' assets** (Defend what matters, restore what's possible) Farmers' most valuable assets - air, water, and soil - must be safeguarded. Historic emissions, the cost of past mistakes, are a *public bad*, and should be addressed by governments. In line with the *evolving bioeconomy strategy*, specific areas could be prioritized for accelerated restoration funded by Europe, reversing environmental damage where its most needed.

EU Strategic priority Competitiveness: Strengthening the sector's Global position

3) **Levelling the Playing Field** (Equal rights, shared duties)
   The carbon economy involves three key actors: Emitters (e.g., farmers, transporters), Affected Third Parties (communities and ecosystems) and Referees (governments and regulators). All agri-food chain actor, from supplier to consumer, must account for their own carbon footprint. Audited "added carbon debt" makes the true scale and cost of emissions visible. This principle can be reinforced through a revision of the Unfair Trading Practices Directive, ensuring equal access to subsidies and cleanup obligations.
4) **Global Competitive Neutrality** (Carbon passport for fair trade)
   Europe's carbon policy is at a turning point. It is evolving beyond the sole objective of reducing emissions to fully unlock its potential in building a fairer, more resilient, and globally competitive agri-food system. By linking responsibility with opportunity and addressing current and historical emissions, the EU can transform environmental liabilities into lasting public and economic value. The Carbon Border Adjustment Mechanism (CBAM), introduced under Regulation (EU) 2023/956 (adopted 10 May 2023), is a step in this direction. It places a carbon-price on selected imports such as cement, steel, aluminium, fertilizers, hydrogen and electricity by requiring importers to purchase CBAM certificates that reflect embedded emissions. In his way CBAM ensures parity with EU producers under the Emissions Trading System

(EU ETS), reduces carbon leakage, and levels the playing field within the internal market. However, CBAM does not support EU exports. This creates an imbalance: EU producers are protected at home but risk being undercut abroad. Given that WTO rules prohibit export subsidies, Europe must find alternative ways to safeguard competitiveness. One option could be the introduction of a "carbon passport" system, tracking the carbon footprint of goods across their value chain regardless of origin. This would allow the EU to apply consistent environmental standards to both imports and exports. Compliant EU exporters could then be supported indirectly through compensation mechanisms, trade incentives, or agreements with like-minded partners. Fair trade must also mean fair environmental responsibility.

EU Strategic priority Future-proofing: Innovation and sustainability for long-term resilience

5) **Annual Restoration targets** (Recovery goals with rising ambition)
Restoration should scale with impact. Annual restoration targets should be set and applied where they matter most, beginning with the top 20% of farming operations - (commercial) farmers that account for the largest share of emissions (Pareto principle) - while avoiding burdens on subsistence farmers. By concentrating efforts and resources on the biggest contributors to air, water, and soil damage - measurable progress can be achieved quickly. Unlike the EU Emissions Trading System (ETS), which relies on a multiplicative externality control mechanism (capping total emissions and creating a shadow price for pollution), restoration targets follow a subtractive logic. Instead of pricing emissions indirectly, they focus directly on removal, clean-up, and restoration. In agriculture, this could require high-impact commercial farms to deploy methane capture, soil carbon sequestration, or nutrient recovery systems. This outcome-based approach is often simpler, more transparent, and more cost-effective in a sector where diffuse emissions are hard to measure and regulate through traditional carbon markets. Restoration targets therefore unlock real environmental improvements without relying solely on emissions pricing.
6) **Smart Compliance** (Audit-Certified, Less Red Tape)
Sustainability compliance can be simpler, more targeted, and impact-driven. Independent third-party audits, supported by tools like the "On-Farm Sustainability Compass" provide transparency while reducing administrative burdens. This aligns with a subtractive externality framework, where the priority is proven restoration outcomes, rather than abstract pricing signals. Traditional systems like the ETS would generate high administrative

complexity, particularly in agriculture where emissions are diffuse and lack centralised emissions points. By contrast, audit-certified compliance shifts the focus to measurable, farm-level actions - soil restoration, nutrient cycling, or biodiversity improvements - that can be independently verified without excessive paperwork.

6.2.4 Conclusion

The application of the *Externality Equation* transforms the EU's agricultural carbon policy into a dynamic framework that incentivizes sustainable, innovative, and investment-attractive farming models. By integrating environmental responsibility with productivity, it reinforces Europe's leadership in sustainable agri-food systems. Moreover, by using a carbon passport for fair trade and embedding global principles of carbon restoration, climate adaptation, and resource efficiency into everyday agricultural practice, the policy framework enhances resilience, future-proofs rural economies, and ensures the long-term viability of the sector.

In doing so, it directly advances the objectives of the European Green Deal and the Farm to Fork Strategy, supporting the transition towards a climate-neutral, resource-efficient, and globally competitive agricultural sector that aligns economic growth with ecological stewardship.