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THE SUSTAINABLE BUILDINGS E-LEARNING PROGRAM

Module 8

EMISSIONS TRADING SYSTEMS AND THE BUILDING SECTOR

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TÜRKİYE SUSTAINABLE BUILDINGS NETWORK

The Türkiye Sustainable Buildings Network was established as part of the “Türkiye Sustainable Buildings Network Project,” which is co-funded by the European Union under the Civil Society Action towards European Green Deal Grant Scheme. The project is coordinated by WRI Türkiye, in partnership with the Zero Energy and Passive House Association (SEPEV) and with the support of the Danish Green Growth Network (DGGN).

The network operates with the aim of supporting climate action in the building and construction sector, promoting green transformation, enhancing the technical knowledge and skills of sector stakeholders, and mainstreaming the concept of sustainable buildings.



As part of this effort, the Sustainable Buildings E-Learning Program has been developed to serve as a comprehensive knowledge resource for all stakeholders in the building sector. The program consists of 10 training modules designed to contribute to the sector's sustainability, energy efficiency, and low-carbon transition goals.

Module 1: Overview of Sustainable Buildings

Module 2: Decarbonization in the Building Sector and the Whole Life-Cycle Approach

Module 3: Sustainable Building Materials

Module 4: Sustainable Construction and Demolition Practices

Module 5: District Heating and Cooling Systems

Module 6: Innovative Building Technologies

Module 7: Financing Instruments for Sustainable Buildings

Module 8: Emissions Trading Systems and the Building Sector

Module 9: Energy-Efficient and Passive Building Design

Module 10: The European Green Deal and the Building Sector

For more information about the Türkiye Sustainable Buildings Network and to access other modules, please visit [the link](#).



MODULE OBJECTIVES

General Purpose and Objectives

The primary objective of this e-learning module is to enhance the awareness of construction sector professionals regarding carbon markets, Emissions Trading Systems (ETS), and related regulations. This module presents topics in a clear, comprehensible, and engaging manner, supported by both theoretical knowledge and practical application examples.

The module content is summarized as follows:

- **Carbon Markets and the Emissions Trading System (ETS):** The functioning of emissions trading and carbon markets will be explained in detail, including how the European Union (EU) ETS operates. Additionally, key information on how carbon credits are obtained and their significance will be provided.
- **Building Sector and EU ETS-2 Compliance:** The role of the building sector within the scope of EU ETS-2, the responsibilities of stakeholders in the sector, and compliance processes will be discussed. Special emphasis will be placed on energy efficiency standards, which are crucial for building owners and investors.
- **Monitoring and Management Tools for Greenhouse Gas Emissions:** Methods for monitoring and managing greenhouse gas emissions in buildings will be introduced, demonstrating how effective management can be achieved using Building Information Modeling (BIM) and other digital tools.
- **Policies and Financial Incentives:** The incentives and investments provided by the EU in line with its energy efficiency and carbon reduction targets for the building sector will be outlined.

This module has been designed to meet the needs of construction sector professionals by offering up-to-date information on the latest regulations and regulatory risks, thereby facilitating informed decision-making processes.



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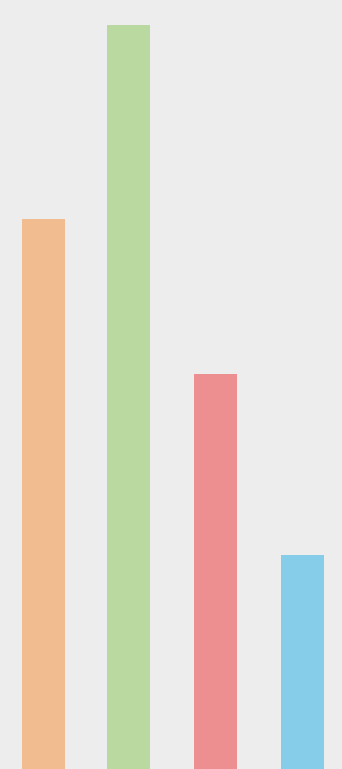
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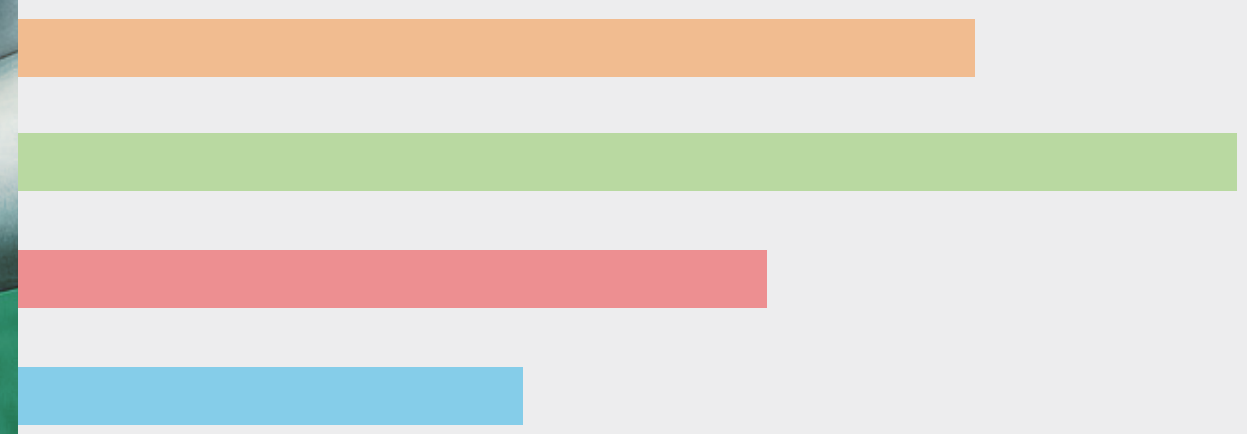
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Section 1

INTRODUCTION



1.1. What Are Carbon Markets?

The fundamental operation of carbon markets is based on assigning a price to carbon emissions, effectively turning them into a tradable commodity. A carbon market allows investors and companies to simultaneously trade carbon credits and carbon offsets. This system provides a market-based solution to a complex problem, aiming to compensate for environmental damage through trade mechanisms.



VOLUNTARY CARBON MARKETS

- Voluntary Carbon Markets operate independently of official regulations and are open to all stakeholders, including companies, local governments, non-governmental organizations, and individuals. The primary objective of these markets is to offset carbon emissions by reducing them elsewhere. Growing environmental awareness and increasing concern over climate change have driven the rapid expansion of these markets. The certificates used in voluntary carbon markets are called “Voluntary Emission Reduction (VER) Certificates.” Companies purchase these certificates as part of their environmental responsibility efforts to offset their emissions. (1)
- Carbon offsetting refers to compensating for the carbon emissions caused by an organization or an individual by reducing emissions elsewhere.

COMPLIANCE CARBON MARKETS

- Compliance Carbon Markets are systems established within the framework of international agreements such as the Kyoto Protocol and the Paris Agreement, incorporating legally binding obligations. These markets typically function under a **cap-and-trade** system, where each organization is allocated a specific emission limit. Organizations that exceed their allocated limit must legally purchase additional emission allowances from other organizations within the system. This exceedance is not an illegal breach but rather a regulated mechanism within the market framework. Similarly, organizations that emit less than their allocated limit can sell their excess allowances, generating revenue.

1.2. What is the European Union Emissions Trading System (EU ETS)?

- Established in 2005, the European Union Emissions Trading System (EU ETS) is the world's first major carbon market. It serves as the EU's primary tool for achieving its target of reducing emissions by 55% by 2030 compared to 1990 levels. As of 2022, the system covers 36% of the EU's total greenhouse gas emissions.
- EU ETS mandates emission allowances for every ton of CO₂ emitted, ensuring that companies within its scope operate within their allocated allowances. Companies that reduce their emissions can sell their surplus allowances on the market, creating an incentive mechanism for lowering greenhouse gas emissions. The system operates based on two fundamental principles to regulate emissions from energy and industrial facilities (such as iron and steel, aluminum, cement, and glass production):
 - Each facility must obtain an emission allowance for every ton of CO₂ emitted.
 - Facilities can trade unused allowances with other facilities.



Benefits of the system:

- Creates an economic incentive for emissions reduction.
- Accelerates the transition to clean technologies.
- Generates revenues that are reinvested in climate action and energy sector modernization. This system plays a crucial role in the EU's goal of becoming a carbon-neutral continent by 2050.

- Between 2005 and 2023, the EU ETS successfully reduced emissions from energy and industrial facilities in Europe by 47%.⁽²⁾ In 2023 alone, thanks to a significant increase in renewable energy use, emissions dropped by a record 15.5% compared to 2022.

Scope of the system:

- Operates in 30 countries (the 27 EU member states, Iceland, Norway, and Liechtenstein).
- Covers over 10,000 industrial and energy facilities.
- Includes the intra-EU aviation sector.
- Since 2020, Switzerland has been integrated with the ETS.

As of 2024, the EU ETS remains the largest and oldest among the 36 carbon trading systems worldwide. Its market size has been continuously expanding, accounting for 87% of the €881 billion global carbon market in 2023.⁽³⁾

1.3. How Does the Emissions Trading System (ETS) Work?



The Emissions Trading System operates on the “**cap and trade**” principle. The key rules of this system are:

- Each facility must hold an emission allowance for every ton of greenhouse gas it emits.
- The total number of emission allowances is subject to a cap (limit).

Entities covered by the ETS must hold **an emission unit (allowance) for each ton of greenhouse gas emissions**. However, they are granted flexibility to buy and sell these allowances. The total number of allowances reflects the cap level within the ETS. In this system, the carbon price is determined by the balance between demand (total emissions) and supply (distributed and available emission units). Once a cap is set, the government or regulatory authority distributes tradable allowances among companies.

Allowances can be freely allocated to facilities, sold through auctions, or distributed based on historical emissions data or performance criteria. The carbon price is determined by market supply and demand, encouraging companies to find cost-effective solutions for emission reductions.

System Operation:

- Facilities measure and report their annual emissions.
- They submit allowances equivalent to their emissions.
- They can sell surplus allowances or bank them for future use.
- Non-compliance results in financial penalties

1.4. What Are EU Emission Allowances and Carbon Credits in the EU ETS?

- **Carbon credits** are certificates that companies can purchase to offset their emissions. One carbon credit represents the reduction or prevention of one ton of CO₂-equivalent emissions through a project or activity. Carbon credits are typically acquired through independent projects via voluntary markets and carbon trading systems. Environmental activities such as **renewable energy projects, forest conservation, and energy efficiency** enable the creation of these credits.
- Although in various sources the term carbon credit is used to refer specifically to credits obtained in exchange for preventing one ton of CO₂ equivalent emissions through voluntary market carbon offset projects, **carbon credit** essentially refers to an umbrella concept.
- The carbon credits that entities within the scope of the European Union Emissions Trading System are required to hold are referred to as European Union Allowances (EUA).
- In the EU Emissions Trading System, each emission allowance (**European Union Allowance, EUA**) grants the right to emit one ton of CO₂ equivalent. These allowances are mostly sold through auctions and can be traded. However, initially, especially for companies in emission-intensive sectors, free emission allowances are allocated to help them maintain their competitiveness. This allocation of free allowances is intended to allow



companies to adapt to carbon prices in the system's early years. Over time, a transition process is foreseen in which the proportion of these allowances will be reduced. As the cap gradually decreases each year, the supply of allowances tightens, leading to an increase in carbon prices, which incentivizes companies to reduce emissions in a cost-effective manner.

1.5. What are Carbon Credits / Carbon Offsetting? What Are the Differences?

Carbon credits are tradable certified permits representing the reduction of carbon emissions resulting from environmental sustainability activities such as renewable energy projects, forest conservation, and energy efficiency. In this context, carbon emission reduction and systematic mitigation are not solely achieved through emission trading systems.

Carbon offsetting, or carbon compensation, is defined as a type of compensation process where a company financially supports emission reduction projects implemented elsewhere to balance its own emissions. In other words, a carbon offset is a certificate obtained through projects that invest in balancing carbon dioxide emissions.

- When a company purchases carbon credits (usually from the government or an international organization), it gains the right to emit one ton of CO₂. Companies with excess credits can sell these credits to other companies.
- In carbon offsetting, a company can create a carbon offset by removing one unit of carbon from the atmosphere through its business activities (e.g., planting more trees or investing in renewable energy). Other companies can purchase these carbon offsets to reduce their own carbon footprint.

The term “offset credits” is commonly used for carbon offset mechanisms. However, it is essential to distinguish between compliance credits for mandatory systems and offset credits in voluntary carbon markets.



1.6. European Union Allowance and Carbon Credits

Carbon Credits	
EUA (European Union Allowances)	Carbon Offsetting Credits
EUA can be bought and sold in the EU Emissions Trading System.	These credits are traded in Voluntary Carbon Markets.
Although EUA is a specific type of carbon credit, it is mandatory for regulated entities under the ETS to hold these allowances.	There are no regulatory or mandatory requirements associated with them.
EUA can only be obtained through criteria set by the European Union and authorized institutions.	The standards for acquiring these credits are set by independent organizations. Well-known project certification companies such as Verra and Gold Standard are examples.
<ul style="list-style-type: none"> Allowances allocated based on operational and emission reports can be used. In the case of exceeding the allocated allowances for emissions, companies that emit fewer emissions than anticipated and thus have remaining EUA can sell them through the ETS market. 	<ul style="list-style-type: none"> The monitoring, reporting, and verification processes are overseen by these independent organizations, which also ensure the certification of the credits. These credits can be freely bought and sold through brokers, agencies, or individual/corporate marketing methods.
According to EU regulations and the EU ETS Directive, all companies operating in sectors defined by these regulations and whose emissions fall within the scope must hold these allowances.	In Voluntary Carbon Markets, there is no obligation of this kind. Any organization or individual wishing to offset their emissions can purchase these credits to compensate for their negative environmental impact.
The system began with the implementation of the EU ETS in 2005.	The first examples of these credits appeared in the 1980s.

1.7. Trade Mechanism in the EU Emission Trading System



EXAMPLE SCENARIO

Let's examine the system's operation through two companies:

Initial Situation:

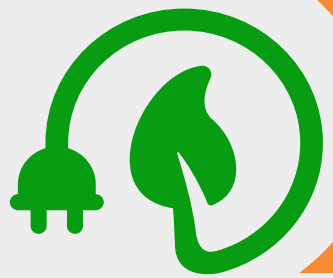
- Both Company A and Company B are allocated an annual emission allowance of 1,000 tons each. The carbon emission values and submitted reports of both companies are reviewed.
- Company A: Will emit 1,200 tons (above the limit)
- Company B: Will emit 800 tons (below the limit)
- Companies with excess emission allowances can sell them to companies in need.

Solution:

- Company B has 200 tons of unused emission allowance.
- Company A purchases 200 tons of emission allowances (EUA) from Company B to cover the excess emissions beyond its limit.
- This way, both companies remain within the legal limits.

1.8. How Are Carbon Credits Obtained?

Businesses from various sectors can create carbon credits by reducing, capturing, and storing emissions, and they can generate income by trading these credits commercially. Notable projects in this context include:



Renewable Energy Projects:

Renewable energy projects began long before the emergence of carbon credit markets. In countries rich in renewable energy resources, these projects are not only cost-effective but also investments with the potential to generate carbon credits.

Energy Efficiency Projects:

Projects aimed at increasing energy efficiency complement renewable energy projects by reducing the energy needs of existing infrastructure. Simple changes, such as replacing incandescent bulbs with LED bulbs in everyday life, can also reduce energy consumption and contribute to the environment. On a larger scale, activities such as building renovations, optimizing industrial processes, or procuring high-energy efficiency devices are included in this field.



Carbon and Methane Capture and Storage:

Carbon and methane capture aim to remove harmful gases from the atmosphere. Methane is 20 times more harmful to the environment compared to CO₂ and is usually converted to CO₂ by burning. This process can reduce net emissions by more than 95%. Carbon is typically captured at sources like chemical plants or power stations and stored underground by injection. This practice is based on methods used for decades to enhance oil production, now focusing on long-term carbon storage.

Land Use and Reforestation:

Forests and soils are natural carbon sinks. These projects aim to absorb carbon from the atmosphere through the protection of existing forests, creation of new forests, and soil management. Through photosynthesis, plants convert CO₂ into organic matter, and this process not only enhances soil properties but also increases agricultural productivity and reduces pollution.



1.8. How Are Carbon Credits Obtained?



The validity of carbon credits can only be ensured through certification by accredited organizations. The European co-operation for Accreditation (EA) works with national accreditation bodies responsible for identifying verification organizations under the EU Emissions Trading System and provides access to their lists. This mechanism guarantees the conformity and reliability of carbon credits with international standards.

There is a transparent process for verifying the alignment of carbon credits with an organization's standards:

- **Project Planning and Proposal:** At this stage, a project developer clarifies their predictions on the project's climate impact, plans the design, and evaluates the project according to the standards of the verification organization.
- **Pre-Approval:** The verification organization conducts an initial review of draft reports and assessments (including monitoring plans) and provides approval for the project developer to proceed.
- **Third-Party Verification:** A third-party organization, such as Verra, CDM, Climate Action Reserve, SCS Global Services, or The Gold Standard, performs an evaluation, including a site visit, to confirm that the project meets the standard requirements.
- **Final Project Review and Approval:** Once the verification process is completed, the project is approved and certified. The project developer can then begin selling the credits produced through a carbon registry.
- **Project Monitoring:** The project developer implements the monitoring plan and submits annual reports and monitoring reports to the verification organization. This step is crucial to ensure the project is meeting its objectives and remains in compliance.
- **Third-Party Verification of Project Performance:** Every five years, another third-party verification and evaluation organization conducts an independent assessment to confirm the project's compliance with the standards.

1.9. EU Emissions Trading System Compliance and Penalties

Businesses included in the EU Emissions Trading System (EU ETS) must submit one emission allowance for each ton of CO₂ equivalent emissions. The maximum allowed emissions for each company (emission cap) are calculated based on the general emissions limit set for the company's size and the sector it operates in.

The process for obtaining and submitting these emission allowances is as follows:

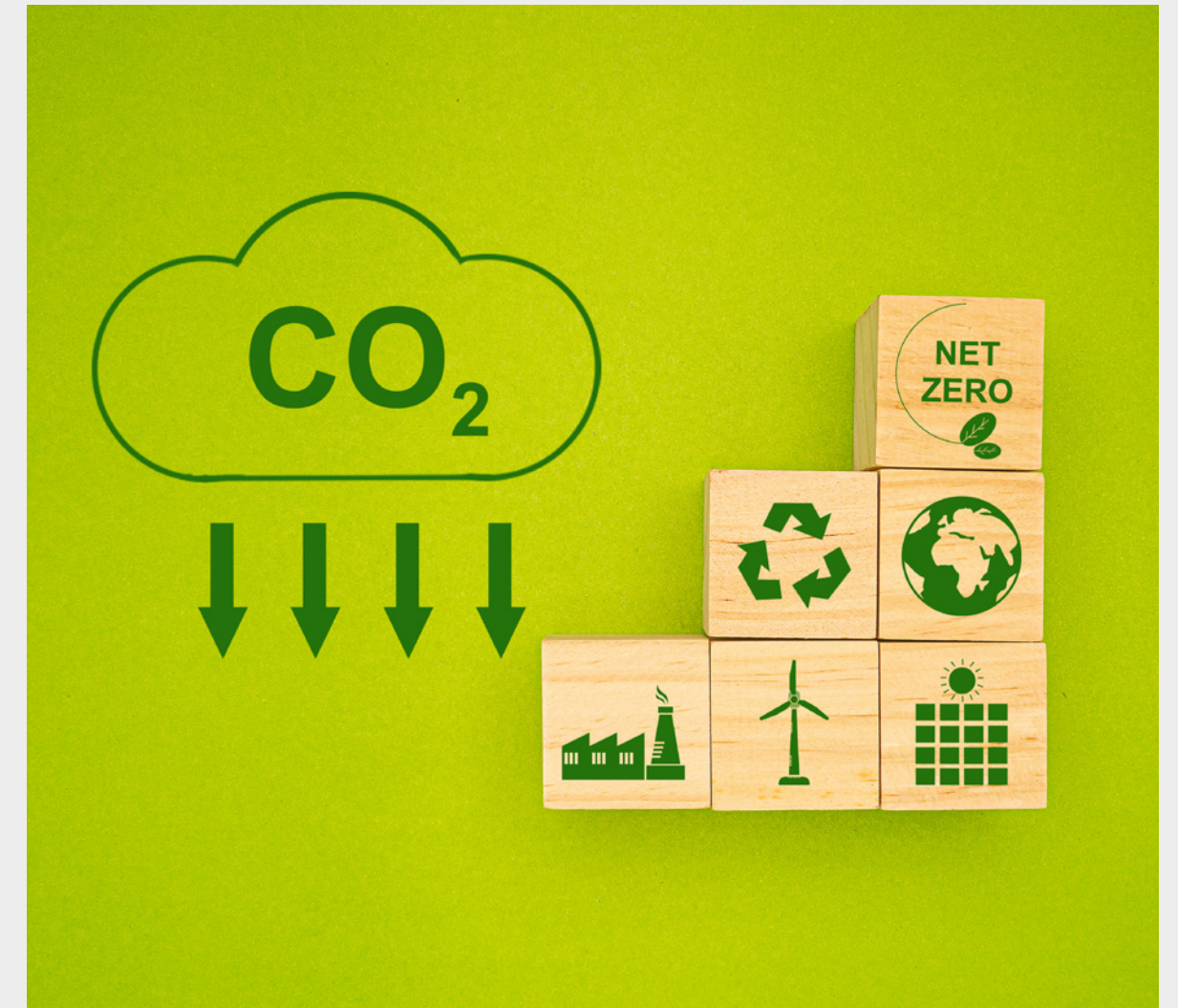
Monitoring, Reporting, and Verification (MRV)

- **MONITORING:** Each facility operating within the scope of the EU ETS, as well as air carrier operators and maritime transport operators, must have an emission monitoring plan approved by a national authority. The deadline for submitting the emissions report is the end of March of the following year (for the previous calendar year).
- **REPORTING:** Emission reports are submitted annually using specific templates.
- **VERIFICATION:** Emission reports are verified by independent accredited verifiers by the end of March of the following year. Once verified, operators must submit the equivalent number of emission allowances by the end of September.

In addition, starting from January 2025, a specific monitoring, reporting, and verification framework will be applied for non-CO₂ effects of air transport.

PENALTIES: Businesses subject to regulations must pay a penalty of **EUR 100 per ton of CO₂ (tCO₂)** for any unsubmitted emissions, in addition to acquiring and submitting the emission allowances. This penalty is updated annually based on inflation rates. The name of the non-compliant operator will be publicly disclosed. Member States have the discretion to apply different penalties for other forms of non-compliance.

Companies can acquire emission allowances through auctions organized on the European Energy Exchange (EEX).



1.10. Emissions Trading System – 2023 Revision



- With the tightening and expansion of the EU ETS, the European Union's goal of reaching zero emissions by 2039 has gained a more concrete foundation.
- The comprehensive revisions made in 2023 project a 62% reduction in carbon dioxide emissions by 2030 compared to 2005 levels. This represents a significant increase from the previously set 43% target, demonstrating the EU's determination to reach its net-zero emission goals. (3)
- In this context, the emission cap has been tightened, and as of 2024, emissions from maritime transport have also been included in the EU ETS. Additionally, the gradual reduction of emission allowances and the rise in carbon prices are encouraging companies to make larger-scale and long-term carbon reduction investments.
- While the reduction of emission allowances will occur gradually, from 2027 onward, this decrease will accelerate. The annual emission reduction rate will rise to 4.3% by 2024 and reach 4.4% by 2028, making it more ambitious. These rates exceed the typical efficiency gains, which range between 1-2% annually, and will require significant additional investments in the sectors covered by EU ETS-2. (4)
- The tightening measures, which aim to reduce the carbon emissions of over 10,000 participants in the system to zero by 2039, will gain momentum, especially from 2027 onward.

1.11. Carbon Leakage and the Carbon Border Adjustment Mechanism (CBAM)

- Carbon leakage refers to the situation where businesses relocate their production to countries with looser emission regulations due to the costs associated with climate policies.
- To address the risks of carbon leakage, the European Council and Parliament have introduced the Carbon Border Adjustment Mechanism (CBAM) as part of the ETS reform. Starting in 2026, importers in sectors covered by CBAM (such as cement, aluminum, fertilizers, electricity, hydrogen, iron and steel, as well as some precursors and downstream products) will be required to submit new CBAM certificates corresponding to the embodied emissions of their products if a similar carbon pricing system is not applied in the exporting country.
 - In this context, the carbon prices within Türkiye's national ETS will play a decisive role in determining the amount of the tariffs imposed on certain products exported from Türkiye to the European Union. To avoid the obligations introduced by the EU under the Carbon Border Adjustment Mechanism, Türkiye needs to have a carbon regime similar to the EU Emissions Trading System (EU ETS).
 - According to this system, Turkish producers or European companies purchasing goods from ETS sectors in Türkiye will only be exempt from the CBAM if they effectively pay their taxes under the newly established emissions trading system.

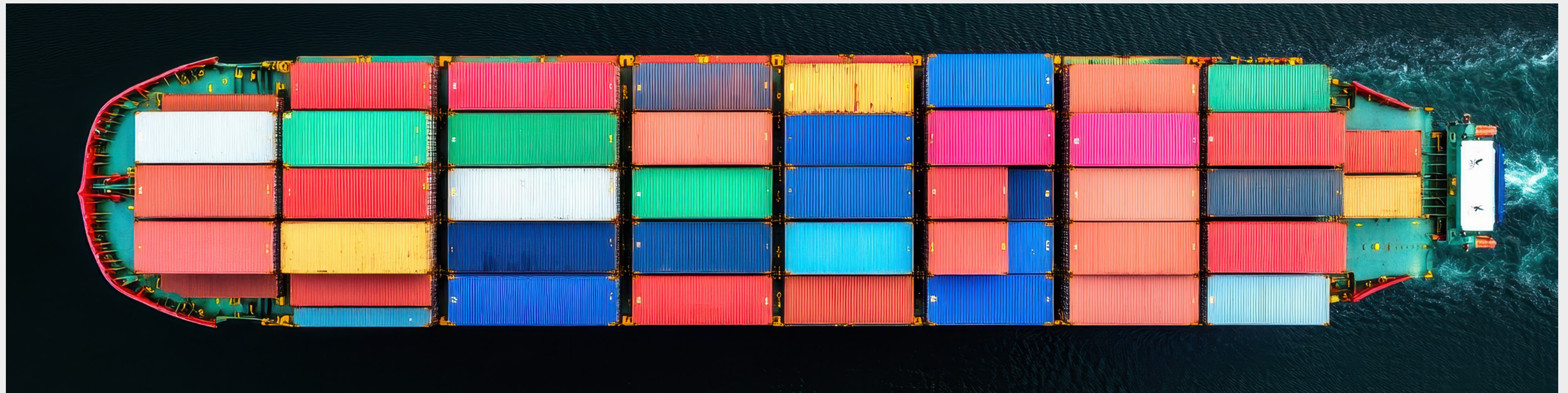


- The free allocation of ETS allowances will gradually end between 2026 and 2034 for sectors covered by CBAM. For sectors outside the CBAM scope, the European Commission will determine when free allocation will end. Moreover, facilities receiving free allocations are required to implement energy audits or energy management recommendations. The bottom 20% of facilities in terms of performance on the benchmark curve will be required to implement plans to reduce carbon emissions.

1.11. Carbon Leakage and the Carbon Border Adjustment Mechanism (CBAM)

Carbon Border Adjustment Mechanism (CBAM)

- This system is outlined in Regulation 2023/956, which governs the Carbon Border Adjustment Mechanism (CBAM). While closely related, CBAM and the Emissions Trading System (ETS) have different purposes. ETS is a system designed to price carbon emissions in order to promote low-carbon production. On the other hand, CBAM aims to apply equal carbon pricing to both domestic and imported products, level the playing field in terms of competition, and reduce the risk of carbon leakage for countries outside the ETS framework.
- However, the introduction of CBAM also affects the ETS. Currently, operators of greenhouse gas facilities at risk of carbon leakage receive free emissions allowances. Due to CBAM's goal of reducing carbon leakage using a different method, these free emissions allowances will be gradually phased out.
- Starting in October 2023, CBAM applies to products such as iron and steel, aluminum, fertilizers, hydrogen, electricity, and cement. During the transition period, importers of these products will not yet be required to purchase and submit certificates. However, this obligation will begin in 2026. From that point onwards, operators emitting greenhouse gases will receive fewer free emissions allowances each year, ultimately resulting in the complete cessation of free allowances by 2034.



1.12. EU Allowances (EUA) Price Trends

- The price of EU Allowances (EUAs) has exhibited significant fluctuations since its early stages. Initially, the publication of verified emissions in 2006 revealed that companies within the EU ETS had been allocated far more allowances than necessary, leading to a sharp decline in demand. Secondly, the 2008 Global Financial Crisis had a severe impact on the EU ETS, shrinking overall demand, which was also reflected in the carbon market. Subsequently, EUA prices continued to fall but remained stagnant for several years due to the combined effect of supporting policies that remained effective despite over-allocation. Indeed, national policies that encouraged the spread of renewable energy and improved energy efficiency reduced demand for allowances from polluting firms.
 - As a result of these factors, by the beginning of Phase III (2013), a surplus of approximately two billion allowances had accumulated (this amount was greater than the total volume of annual emissions under the EU ETS). As expected, this large surplus severely suppressed EUA prices. In 2012, the European Commission began addressing this issue by postponing the auction of 900 million allowances from 2014-2015 to 2019-2020. However, recognizing that more action was needed, the Market Stability Reserve (MSR) became operational in January 2019, and the surplus allowances were transferred to the MSR as the first reserve.
 - The EUA price began to rise in 2020 and reached 100 €/ton in February 2023. This increase can be attributed to several factors, including the rise in gas prices, the stricter rules introduced with the revision of Phase IV of the EU ETS, and the approval of the European Green Deal in 2020. As of January 2025, the price is hovering around 70 €/ton.
- (5)



1.13. EU Allowances (EUA) Price Projections

- According to Enerdata's projections(6), the price of EU Emissions Allowances is expected to evolve as follows in the coming years:
- The studies suggest that EUA prices could remain relatively stable at around 70 Euros per ton until 2030. These projections assume that EU member states will strive to meet renewable energy and efficiency targets for 2030 independently, without overly relying on EU ETS-2. This would lead to the achievement of these targets.
- After 2030, prices are expected to gradually increase to around 130 Euros per ton by 2040. This increase will be influenced by the market becoming more constrained and the Market Stability Reserve (MSR) injecting new allowances into the market to moderate the rise.
- However, with the current design of the market and MSR, if high climate goals and a restricted emissions cap scenario are used as the only tool to balance demand and supply, the EU ETS-2 price could rise rapidly in the early to mid-2040s. If the European Commission sets a stricter allowance allocation limit than currently envisioned in this study, this price increase could occur earlier, which is highly likely.
- These findings raise concerns about the future of the EU ETS and emphasize the need to update its design to be compatible with a very low greenhouse gas (GHG) emission environment by 2040-2050. One of the most important factors in this design will be the inclusion of negative emissions technologies in EU ETS-2 in the future, even if it is not in the same form as today.

There are also scenarios that suggest EUA prices could rise above 300 Euros per ton after 2030 as allowances decrease progressively, or alternatively, prices could drop to zero if public awareness and technology for emissions reduction improve, reducing the demand and need for allowances.



1.14. Global ETS Programs: China ETS

- China's national Emissions Trading System (ETS) was launched in 2021 to effectively control and gradually reduce carbon emissions. It is the **world's largest ETS in terms of covered emissions**, estimated to regulate approximately 5 billion tons of CO₂, accounting for more than 40% of the country's total CO₂ emissions.(7)
- The system currently regulates **over 2,000 companies** in the power generation sector that emit more than 26,000 tons of CO₂ annually. This includes combined heat and power (CHP) generation as well as on-site power plants in other industries. Over time, the system is expected to expand to additional sectors.
- Entities covered under the scheme must submit emission allowances for all their covered emissions, with allocation based on emission intensity benchmarks. Allowances are **distributed for free** according to production-level-based criteria. While no specific timeline has been announced, interim regulations indicate that an auctioning mechanism will be introduced and gradually expanded.
- In 2021, companies were allocated allowances equivalent to 70% of their verified emissions. These allocations were later adjusted based on actual production levels in 2021 and 2022. The load-based adjustment factor allowed facilities operating at less than 85% capacity to receive additional allowances. This approach may have resulted in more allowances being granted to less efficient power units.



- Currently, compliance obligations are relatively limited and vary across different types of energy generation. However, in February 2024, the State Council of China issued a regulation that significantly increases penalties for non-compliance, data fraud, and market manipulation within the national ETS.
- Unlike the EU ETS, China's national ETS **allows the use of carbon offset credits (China Certified Emission Reduction - CCER)**. Companies covered under the scheme can use CCERs generated from projects outside the national ETS for up to 5% of their verified emissions.

1.15. Global ETS Programs: California Cap-and-Trade

- California's Cap-and-Trade Program is one of the largest multi-sector emissions trading systems in the world. The program plays a central role in California's efforts to reduce greenhouse gas emissions to 1990 levels by 2020 (a target achieved in 2016), 40% below 1990 levels by 2030, and 80% below 1990 levels by 2050. Additionally, California has set targets to achieve 100% carbon-free electricity generation by 2045 and carbon neutrality across the entire economy.
- The Program was launched in 2012 with the establishment of a tracking system for allocation, auction distribution, and the trading of compliance instruments. The program covers approximately 400 facilities in the energy, industrial, transportation, and building sectors, along with their emissions. Covered entities are required to report their total emissions and obtain emission allowances accordingly.
- Allowances are distributed through a combination of auctions, free allocations, and consignment-based free allocation methods. Revenues generated from auctions are reinvested in emission reduction projects that strengthen the economy, public health, and the environment, particularly in disadvantaged communities.
- The use of compliance offset credits is permitted. These credits are issued either by the California Air Resources Board (CARB) or under the authority of a linked cap-and-trade system and are recognized as compliance instruments within the California Cap-and-Trade Program.

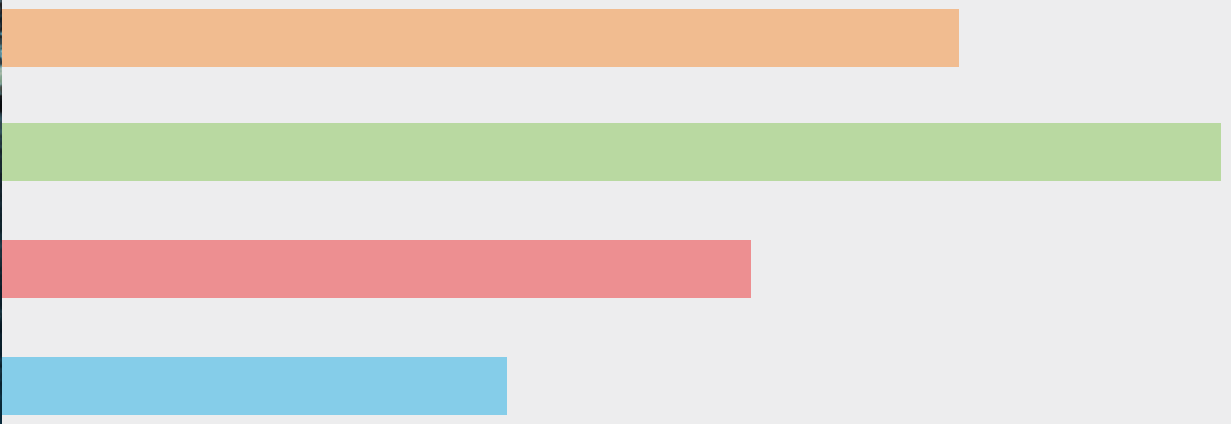


- For emissions between 2013 and 2020, entities were allowed to meet up to 8% of their compliance obligations using offset credits. For post-2020 emissions, lower limits set by Assembly Bill (AB) 398 apply. The proportion of offset credits that can be used to meet compliance obligations is set at 4% annually for emissions from 2021 to 2025 and 6% annually for emissions from 2026 to 2030.(8)



Section 2

EMISSIONS TRADING SYSTEM FOR THE BUILDING SECTOR



2.1. What Are Direct and Indirect Emissions?

- **Direct Emissions (Scope 1):** Direct greenhouse gas (GHG) emissions originate from sources owned or controlled by the reporting entity. For example, emissions from factory smokestacks generated during the production of goods are considered direct emissions. This category does not include emissions resulting from biomass combustion.



- **Indirect Emissions from Energy (Scope 2):** This category includes GHG emissions resulting from the production of purchased energy sources such as electricity, steam, heating, and cooling. These emissions physically occur at the facilities where the electricity, steam, cooling, or heating is generated. However, as the consumer of this energy, the organization is still considered responsible for the associated GHG emissions.
- **Indirect Emissions (Scope 3):** These emissions originate from sources not owned or directly controlled by the reporting company but are related to its activities. This typically refers to the company's supply chain and includes emissions from suppliers, outsourced activities, employee commuting, and business travel. In many industries, Scope 3 emissions make up the largest share of total GHG emissions. This is due to the outsourcing of many tasks in today's economy and the fact that few companies own their entire value chain.
- **Direct and energy-related indirect emissions** are generally much easier to calculate compared to other indirect emissions, as they fall directly under the company's control. However, to effectively measure our indirect emissions, a more in-depth analysis of our value chain is required.

2.2. Expansion of the ETS and ETS-2



As part of the EU's "Fit for 55" package, the EU Emissions Trading System (EU ETS) has been revised to align with the goal of reducing net emissions by at least 55% by 2030 compared to 1990 levels. A series of legal regulations related to the EU ETS were adopted on May 10, 2023. The revised EU ETS Directive (2003/87/EC)(9) has increased the emissions reduction target, requiring emissions from EU ETS sectors to be reduced by 62% by 2030 compared to 2005 levels. This target is significantly higher than the previous 43% reduction set by earlier legislation.

The revised Directive also expands the scope of the EU ETS to include emissions from maritime transport. Accordingly, shipping companies will be required to surrender emission allowances (EUAs), starting at 40% in 2024 and reaching 100% by 2026. For ships arriving from non-EU countries, 50% of their emissions will be covered under the system.

The revised Directive also establishes a separate EU Emissions Trading System 2 (EU ETS 2), which will come into effect in 2027 for emissions from road transport, heating fuels used in buildings, and process heat in small-scale industries. EU ETS 2 aims to reduce greenhouse gas emissions in these sectors by 42% by 2030 compared to 2005 levels. Unlike the existing EU ETS, under EU ETS 2, all emission allowances (EUAs) will be sold through auctions, with no free allocations.

Additionally, by the end of 2026, the European Commission will assess the inclusion of emissions from municipal waste incineration in EU ETS 2, potentially bringing them under the system from 2028 onward.

2.3. European Union Emissions Trading System 2 (EU ETS-2)

- Like the EU ETS, the EU ETS-2 is also a “cap-and-trade” system, where emission allowances are allocated and traded among market participants, contributing to the gradual reduction of emissions. There is a specific “carbon budget” allocated to the economy, and this budget decreases over time, allowing the European Union to achieve carbon neutrality by 2050.
- As mentioned above, under the EU ETS-2 framework, the responsibility for purchasing and surrendering carbon allowances shifts from those consuming fossil fuels to energy suppliers who operate directly.
- Additionally, the new system is designed to respond to sharp price fluctuations. If EU ETS-2 EUA prices exceed €45 for a certain period, regulators will intervene in the economy with a certain amount of allowances. However, they can only do this once every 12-month period. Therefore, €45 is not a price cap, but rather a signal used by regulators to increase supply.
- The stability mechanism, which is triggered when EU ETS-2 emission allowance prices exceed a certain threshold, will remain in place until 2030. Afterward, a new directive in 2031 will determine whether this price trigger will be removed.



2.3. European Union Emissions Trading System 2 (EU ETS-2)

- In sectors covered by the EU ETS, greenhouse gas (GHG) emissions have significantly declined over the past decade, largely due to reductions in emissions from the energy sector and the expansion of renewable energy. However, progress in other sectors has not been as promising.
- Emissions from construction, buildings, heating, and road transport have contributed substantially to the overall increase in GHG volumes released by the EU. The building sector accounts for 12.4% of Europe's GHG emissions, while road transport represents nearly 19%. However, these sectors have not been included in the EU ETS until now. To address this gap, EU ETS-2 will be launched in 2027, though there is a possibility of postponement to 2028.

Monitoring, Reporting, and Verification (MRV) Timeline:

- **MONITORING:** Begins in 2025. The monitoring approach will involve the use of scope factors and emission factors based on fuel types to distinguish final consumption sectors.
- **REPORTING:** Starts in 2025. Covered entities must submit their first reports by the end of April 2025, detailing their past emissions from 2024. From 2026 onward, entities will report their verified emissions based on ongoing monitoring.
- **VERIFICATION:** From 2026, emission reports must be independently verified by an accredited verifier, making verification mandatory.

Expansion with the New ETS-2:

- Starting in 2027, a separate emissions trading system, EU ETS-2, will be implemented to address CO₂ emissions from **fuel consumption in buildings, road transport, and additional sectors not covered under the existing EU ETS, primarily small-scale industries.**
- Similar to the current ETS, EU ETS-2 will introduce a mandatory CO₂ target and carbon pricing for these sectors, promoting sustainable heating and cooling solutions as well as the use of low-carbon fuels.
- EU ETS-2 will play a complementary role to other policies under the European Green Deal, supporting Member States' emission reduction targets set by the Effort Sharing Regulation (ESR) and contributing to the EU's 2050 climate neutrality goal.
- The carbon price set by EU ETS-2 will create market incentives for building renovations and investments in low-emission mobility.

Although EU ETS-2 will be a **“cap and trade” system** similar to the existing EU ETS, it will cover emissions at upstream stages, meaning before they reach the **end user**. In this context, those responsible for monitoring and reporting emissions will not be end consumers such as households or vehicle users, but rather fuel suppliers. These entities will be subject to regulation under EU ETS-2 and will be required to submit a sufficient number of emission allowances (EU2A) to cover their emissions. Regulated entities will purchase these emission allowances through auctions. The cap for EU ETS-2 is set to reduce emissions within its scope **by 42% compared to 2005 levels by 2030.**

2.3. European Union Emissions Trading System 2 (EU ETS-2)



All emission allowances under EU ETS-2, as mentioned above, will be sold exclusively through auctions. There will be no free allocations.

EU ETS-2 will include certain safeguard mechanisms to prevent excessive CO₂ costs and to mitigate their impact on end users. Specifically:

- First, if energy prices (gas and oil) are excessively high in 2026, the start date may be postponed by one year, from 2027 to 2028.
 - Second, if the average price of allowances exceeds €45 per ton (adjusted for inflation based on 2020 prices) for two consecutive months, additional emission allowances from the market stability reserve will be auctioned. In cases of sudden and rapid price increases, additional allowances from the reserve may also be released.
- A portion of the revenue generated from the auctioning of all EU ETS-2 allowances will be allocated to support vulnerable households and micro-enterprises through a dedicated Social Climate Fund (SCF). These revenues will be used for investments in more efficient buildings and low-emission transportation, as well as for financing temporary income support for households, transport service users, and micro-enterprises.
 - Member States will be required to allocate the remaining EU ETS-2 revenues to climate action and social measures, with mandatory reporting on how the funds are spent.
 - The Social Climate Fund is expected to collect €65 billion from EU ETS-2 auctions over the 2026–2032 period. Additionally, around €5 billion will be generated from the auctioning of 50 million emission allowances under EU ETS-2, with Member States contributing 25% from their own resources. This will create a total compensation fund of approximately €86.7 billion. (10)



2.4. Regulated Parties

- EU ETS-2 does not aim to impose direct obligations on individual vehicle owners or property owners who consume fuel and produce emissions. Instead, the party responsible for compliance with the regulation (regulated party) is typically the person or entity responsible for paying the excise tax on the fuel. This is usually different from the final fuel consumer. The definition of “regulated party” is quite broad, making it difficult to precisely identify who falls within this scope, and it requires the application of the European Union’s excise tax regulations. Generally, the regulated party (in priority order) includes:
 - 1. Warehouse operator:** In cases where fuels are stored in taxable warehouses, the warehouse management.
 - 2. Storage or holding party:** The person who stores or holds fuel outside of a tax warehouse.
 - 3. Producer or importer:** The party that produces or imports the fuel.
 - 4. Non-exempt party:** If the fuel is not exempt from excise duty, the person who is obligated to pay the tax.
 - 5. Party designated by the Member State:** If none of the above situations apply, any party designated by the relevant Member State.
- Therefore, the regulated party could, for example, be a refinery distributing fuel or a person importing fuel ready for distribution to service stations. However, in some cases, payment of the excise duty may become necessary due to violations. For instance, if a violation occurs during the transport of goods subject to excise duty under an “exemption regime,” the person responsible for transporting the fuel may also become liable.
- Additionally, Member States have the authority to decide which party within the same category will be liable when more than one party is present.
- There is a significant difference between natural gas used for heating and fuels used for road transport. This difference lies in the timing of when the excise duty is levied. For natural gas used for heating, excise duty is applied at the moment the gas is delivered to the final customer. In this case, the regulated party will be the supplier providing the gas to the end user. However, for road fuels, the excise duty typically applies when the fuel is released onto the market for consumption, usually when it is sent from a warehouse to a service station. In this case, the regulated party will be the relevant tax liable warehouse. (11)

2.5. The Importance of the Building Sector in ETS-2



Decarbonizing Buildings

- Although buildings appear to be static structures, they have a significant carbon footprint. According to the United Nations Environment Programme, the construction, use, maintenance, heating, and cooling processes of buildings account for more than 34% of total energy demand and approximately 37% of CO₂ emissions globally. (12)
- According to statistics published by the European Commission, Eurostat, and the EEA Greenhouse Gas Inventory, in the EU, this rate accounts for about 40% of energy demand and 36% of energy consumption.(13) In residential buildings in the EU, approximately 80% of the energy consumed is used for heating, cooling, and hot water supply.

- The European Union aims to increase the energy efficiency of its building stock in order to avoid the consequences of having 85% of buildings in Europe constructed before 2001(14), 75% of which have low energy efficiency. Regulations such as the **Energy Performance of Buildings Directive (EPBD)** and the **Energy Efficiency Directive** have been enacted for this purpose.
- In particular, buildings with insufficient insulation and dependence on fossil fuels for heating and cooling significantly increase energy poverty and the EU's dependency on imported oil and gas. The effects of Russia's invasion of Ukraine have exacerbated this situation. According to current data, more than 42 million individuals in the European Union cannot afford to meet their heating needs, while the fossil fuel industry continues to achieve high profit margins despite its ongoing impact on the climate crisis.

2.6. The Building Sector and EU ETS-2

- Decarbonizing buildings is an area that directly affects people's lives. Therefore, reducing dependence on fossil fuels, offering more energy-efficient and comfortable homes with better insulation, improving living standards, and permanently reducing fuel poverty are of vital importance.
- The **EU Emissions Trading System (EU ETS-2)**, starting in 2027, aims to reduce emissions by pricing greenhouse gas emissions from fuel use in buildings. The goal is to achieve a building stock with better insulation and reduce reliance on fossil fuels.
- However, this could risk increasing heating and cooling costs and disproportionately impact lower-income member states or individuals. To address this, the **Social Climate Fund (SCF)** has been established. Member states can access the SCF by preparing national social climate plans that explain how they will spend the funds to reduce energy poverty. Whether this fund will achieve effective results remains to be seen, but since the fund is limited to €86.7 billion, the additional income and contributions from member states will also be crucial.



2.7. (EU ETS-2) Emission Allowances (EU2A) Market Price Projections

- Similar to the EU ETS, various initiatives have presented projection studies that include price forecasts for EU ETS-2 based on different scenarios. In an article published by Homaio, researcher Monna Dimitrova examined the future trend of EU ETS-2 emission allowances (EU2A) under different scenarios based on emission levels(15):
- **BASELINE SCENARIO:** Prices are expected to gradually increase, reaching **€222.2 per ton by 2030**. Vertis carbon experts shared forecasts during a webinar, estimating prices at **€68 in 2027, €75 in 2028, €175.1 in 2029, and finally €222.2 in 2030**.
- **LOW-EMISSION SCENARIO:** If emissions in the European economy decrease, prices may stabilize at lower levels. In this case, prices are expected to be **€58.3 in 2027, €59.5 in 2028, €103 in 2029, and €111.7 per ton in 2030**.

- **HIGH-EMISSION SCENARIO:** Due to the impact of rising emission levels, prices are projected to reach as high as €259.4 per ton in 2030. In this scenario, prices are estimated to be **€73.7 in 2027, €83 in 2028, €217.9 in 2029, and €259.4 in 2030**.

These different scenarios illustrate the potential impact of EU ETS-2 emission allowances (EU2A) on the carbon market and the possible implications of emission levels on prices.

One reason why EU ETS-2 allowances (EU2A) are expected to be priced higher compared to EU ETS allowances (EUA) is that free allocations, which are part of the EU ETS processes, will not be applied in EU ETS-2. With the implementation of EU ETS-2, all EU2As will be acquired exclusively through auctions.

2.8. Role of Stakeholders in the Building Sector Under EU ETS-2

The inclusion of building emissions under EU ETS-2 increases the significance of stakeholders in the building sector. These stakeholders include the European Union, national governments, municipalities, building owners, tenants, construction companies, and energy providers.

The EU, Governments, and Municipalities

- Both the European Union and the governments of Member States will develop regulations and incentives to reduce emissions in the building sector and implement strategies to enhance energy efficiency in buildings. The Energy Performance of Buildings Directive (EPBD) and Minimum Energy Performance Standards (MEPS) are among the key measures introduced by the EU to support these efforts
- The revised EPBD introduces significant requirements to promote energy renovations. Some of the most debated aspects include MEPS, a near-mandatory solar energy requirement, and regulations aimed at reducing carbon emissions from heating and cooling in buildings. Under MEPS, Member States will be required to undertake necessary renovations to meet specified energy-saving targets within given timeframes, ultimately aiming for climate neutrality by 2050.
- This new approach has raised concerns among investors, property owners, and tenants regarding the costs of the Renovation Wave, particularly due to challenges in the supply chain, including labor shortages and rising material costs caused by inflation.



- Municipalities, on the other hand, must monitor energy consumption in buildings and carry out oversight and enforcement activities at the local level to ensure that energy efficiency targets are met. Additionally, they can implement local incentives, such as supporting green energy transitions, tracking progress, and assisting with necessary physical transformations.
- Furthermore, local governments can play a crucial role in addressing concerns surrounding emissions trading systems and carbon credits—issues often criticized for weak environmental integration and negative impacts on local communities where projects are implemented. By facilitating communication and solutions, municipalities can become key actors in ensuring a just transition.

2.8. Role of Stakeholders in the Building Sector Under EU ETS-2

Building Owners and Investors

- Building owners and investors will need to ensure compliance with EU ETS-2 obligations by investing in innovative solutions and low-emission technologies that enhance energy efficiency.
- During building renovations, the use of energy-efficient materials and systems will become increasingly important to reduce emissions and improve energy performance.
- However, it is crucial to recognize that these costs are part of an overall effort to renovate buildings and mitigate environmental impacts. In this regard, ensuring that costs are not passed on to tenants is of particular importance. Effective utilization of the Social Climate Fund (SCF) and similar financial support mechanisms will be critical in this process.
- Regulations such as ETS-2, EPBD, and Minimum Energy Performance Standards (MEPS) create cost concerns for investors and property owners due to the requirements for energy efficiency upgrades and emission reductions. In this context, Energy Performance Contracts (EPCs) offer a key solution.

Energy Performance Contracts (EPCs) are agreements based on guaranteeing energy savings after the implementation of a project, with the costs being covered through the savings achieved. These contracts are typically signed between the building owner (the client) and an Energy Service Company (ESCO) (the provider). EPCs provide financial flexibility and cost-effective solutions for building owners while offering security for investors.

- By guaranteeing energy savings, EPCs help building owners overcome high upfront costs and offer structured payment plans to finance energy efficiency projects. Additionally, EPCs support compliance with regulations such as the EPBD by reducing carbon emissions and improving energy efficiency. As a result, they contribute to alleviating financial pressures while promoting sustainable energy use and achieving environmental goals.

2.8. Role of Stakeholders in the Building Sector Under EU ETS-2

Tenants and Users

- Tenants will make more conscious choices to optimize their energy consumption, thereby avoiding increased costs under EU ETS-2. However, it is crucial not to overlook the fact that a significant portion of buildings in the EU were constructed before 2000 and that families living in older buildings may have lower socio-economic status.
- By using energy-efficient appliances and systems, tenants can reduce both their energy bills and overall emission levels.

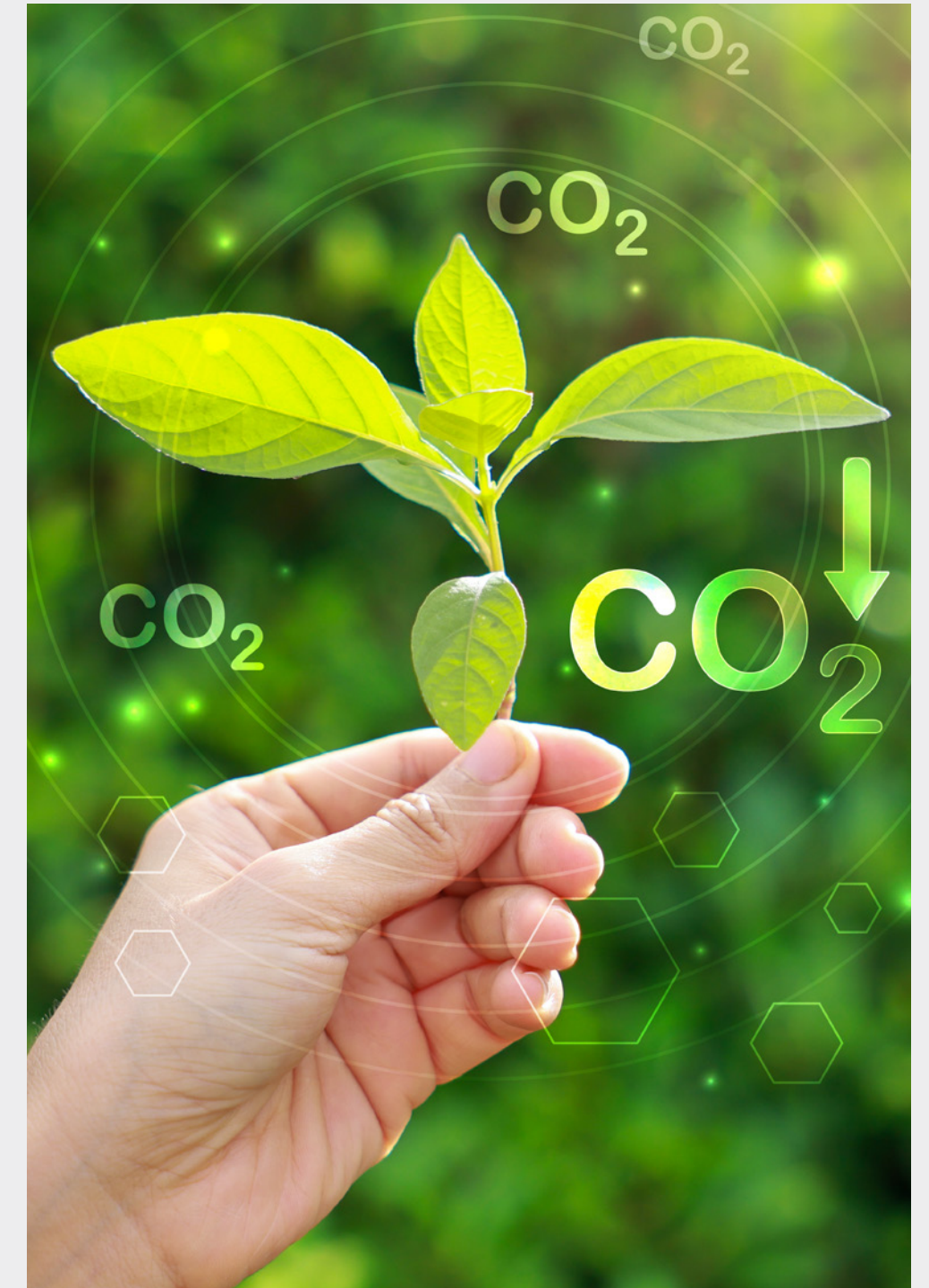
Construction and Renovation Companies

- Construction and renovation companies will build new energy-efficient and low-emission buildings or renovate existing ones.
- **Green Building Certifications:** Construction companies will obtain green building certifications (e.g., LEED, BREEAM) to minimize the environmental impact of buildings and adopt sustainable construction practices accordingly.

Energy Suppliers

- Energy suppliers can contribute to the goals of EU ETS-2 by providing buildings with energy sources that have a lower carbon footprint (renewable energy, biofuels, low-emission fossil fuels), thereby encouraging suppliers to take action.
- Energy suppliers will aim to optimize energy consumption by offering building owners technologies and solutions that enhance energy efficiency.

The collaboration and interaction of all stakeholders will be crucial in reducing carbon emissions from buildings under EU ETS-2. The responsibility and contribution of each stakeholder will play a critical role in achieving the overall targets.



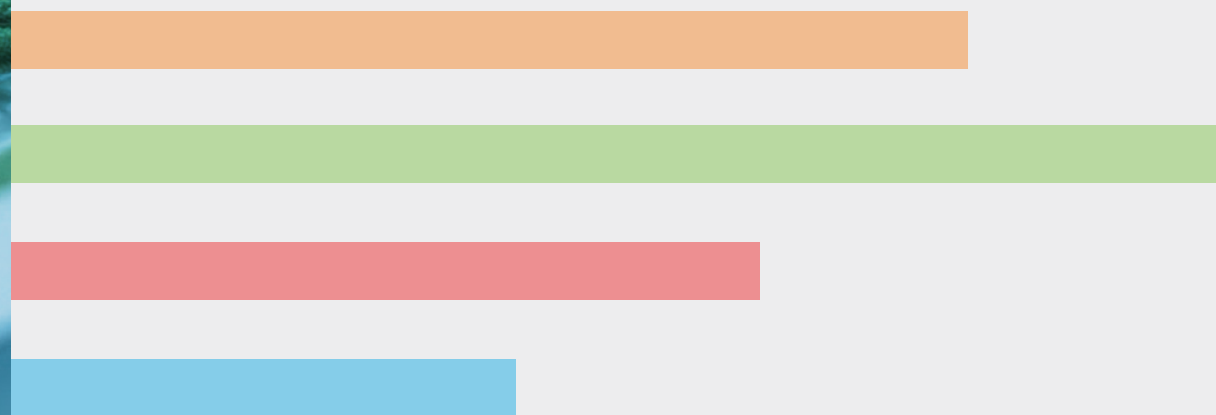
2.9. Risks of ETS-2 Specific to the Construction and Building Sector

- 1. Impact on Low-Income Groups and Member States:** With the introduction of EU ETS-2, rising heating and cooling costs could place a disproportionate burden on low-income individuals and less developed EU member states. This situation may further exacerbate energy poverty and increase social inequalities. When planning investments, the rise in energy costs should be taken into account, and access to affordable energy should be facilitated, particularly for vulnerable groups. Between 2010 and 2030, average electricity prices have been on an upward trend, and they are expected to increase by 31%, rising from €131/MWh to €172/MWh.⁽¹⁶⁾ If this increase in energy prices is not offset by fuel savings achieved through energy efficiency investments, the costs will be passed on to households and facilities. This could negatively impact vulnerable groups in both categories
- 2. Use of Revenues and Public Resistance:** If the revenues generated from EU ETS-2 are misallocated or inefficiently spent, it could hinder both the achievement of climate targets and the reduction of energy poverty. Directing revenues away from carbon reduction and social benefit efforts could weaken the system. Furthermore, the direct impacts of carbon pricing on daily life may lead to public resistance against the system and carbon reduction goals. If the effects of EU ETS-2 are not distributed fairly and disadvantaged groups are not protected, it could jeopardize public acceptance of the system.
- 3. Sectoral Inequalities and Policy Deficiencies:** While citizens indirectly bear the cost of carbon pricing, the continued allocation of free emission allowances to industrial sectors may contradict the “polluter pays” principle. This could make it more difficult for EU ETS-2 to be perceived as a fair system. Additionally, there is a risk that EU ETS-2 alone may not be sufficient to decarbonize the building sector, especially if complementary policies—such as improvements in energy efficiency and access to renewable energy—remain insufficient.
- 4. Shortcomings in Achieving Climate Targets and Social Plans:** The ineffective implementation of EU ETS-2 or the lack of complementary measures could lead to delays in the decarbonization of the building sector, jeopardizing the EU’s 2030 and 2050 climate targets. Moreover, if the national social climate plans that member states must prepare to access the Social Climate Fund are inadequate or of low quality, it could undermine efforts to reduce energy poverty and deliver social benefits.



Section 3

POLICIES, FINANCIAL MECHANISMS, AND CASE STUDIES



3.1. Summary of the Energy Performance of Buildings Directive (EPBD)



The EPBD revision introduces a series of innovations aimed at accelerating the continuous improvement of the EU building stock in terms of energy efficiency. These innovations are supported by efforts to make the process fairer and more inclusive:

- 1. Minimum Energy Performance Standards (MEPS):** Each country is required to establish minimum standards for building renovations to improve the energy efficiency of the overall building stock across the EU.
- 2. Strengthening Energy Certifications:** A more transparent system is proposed to provide building owners and tenants with access to information on energy performance.
- 3. 2030 and 2050 Targets:** The revised EPBD mandates that the entire building stock must contribute to net-zero emission targets.
- 4. Combating Energy Poverty:** Mechanisms aimed at supporting individuals in need are highlighted.
- 5. Financial Incentives:** EU-level financial mechanisms and funds have been developed to facilitate renovations.

The EPBD revision process holds significant potential for improving the energy performance of buildings while ensuring social justice. However, achieving these goals requires considering differences both between and within countries, implementing effective policies, and engaging all segments of society in the process.

3.2. Investments and Incentives Under the EU ETS-2 and EU Building Policies

- Significant expenditures are already being made for building renovations; however, these expenditures do not always target emission reductions (e.g., building expansions). In most countries, the required additional energy efficiency investments still represent a significantly lower share of total renovation expenditures.
- For instance, in 2023, total building renovation expenditures in Germany reached €145 billion, while the investment gap for energy efficiency was estimated at €42 billion. Specifically for Germany, additional annual investments slightly exceeding €40 billion are needed, representing the largest absolute shortfall. Relative to GDP, Portugal has the largest investment gap, amounting to 1.6% of its GDP. (17)
- Between 2024 and 2030, an estimated annual investment of **€297 billion** will be required to meet the EPBD targets. Achieving this goal will necessitate doubling the current renovation rates, which stand at around 1%. In this scenario, the total (public and private) **annual investment gap would amount to €149 billion.**
- Two mechanisms are available to partially bridge this gap:
 - First, the EU's post-COVID-19 economic recovery fund, the **Recovery and Resilience Facility**, is expected to provide €12 billion annually until 2027.
 - Second, if half of the revenues from EU ETS-2 emissions allowance auctions are reinvested in energy renovations, an additional €28 billion could be made available annually from 2027 onward. Under these conditions, the annual investment gap would be reduced to €134 billion until 2027 and to €119 billion thereafter—equivalent to approximately 0.7% of the EU's GDP. (18)

EU Funding

- The **Recovery and Resilience Facility** has increased financing for energy efficiency improvements, allocating €73 billion for the 2021-2027 period. This mechanism is the first European policy instrument to dedicate such a large fund to energy efficiency and renovation in buildings. However, the total impact of this funding on energy renovations remains unclear.
- The EU budget also contributes to the green transformation of the building sector and the goal of an energy-efficient, net-zero-emission building stock through instruments such as the **European Regional Development Fund, the Cohesion Fund, and the Just Transition Fund.** In the 2021-2027 EU budget, funding allocated to building renovations and energy efficiency projects has increased, albeit not significantly, reaching approximately €17 billion in total. (19)
- Carbon prices have risen significantly in recent years, with revenues from carbon allowance auctions increasing from €5 billion in 2017 to €30 billion in 2022. Over the past decade, EU countries have reported allocating 76% of these revenues to climate, renewable energy, and energy efficiency initiatives. Additionally, the **Social Climate Fund (SCF)** is financed through auction revenues and serves as a key EU policy tool for promoting an energy-efficient building stock and preventing energy poverty.
- Under EU ETS-2, emission allowance prices will be standardized across the EU. To address the inequalities and energy poverty risks that may arise from this pricing structure, the Social Climate Fund will redistribute approximately one-third of EU ETS-2 revenues from high-income to low-income countries. This redistribution will be based on factors such as per capita gross national income, the proportion of the population at risk of poverty in rural areas, and the percentage of households unable to afford their energy bills.

3.3. Opportunities within the Framework of EU ETS-2 and EU Building Policies



- Closing the investment gap to meet the 2030 EPBD target for energy efficiency renovations in buildings across the EU requires national governments to implement cost-effective policy instruments. These instruments should protect vulnerable low-income consumers from high upfront costs, ensure future energy savings, reduce administrative burdens, and address energy price imbalances to encourage the participation of private capital in the system.
- For buildings with the lowest energy efficiency performance, considering that governments should allocate the majority (approximately 60%)(20) of public support, the remaining investment gap can be closed by leveraging future energy savings.
- In this context, the “pay as you save” model and Energy Performance Contracts present a critical opportunity both for bridging the investment gap and for mobilizing the public toward energy-efficient building transformations.
- Through the pay as you save model, energy source conversions in residential buildings can be achieved without high upfront costs, and renovations aimed at improving the energy efficiency of the building stock can be facilitated. This approach would help mitigate additional fuel costs that are likely to be indirectly passed on to vulnerable low-income consumers through EU ETS-2. Moreover, if widely adopted, this model could create significant business opportunities for the green energy transition sector, as well as for the renovation and construction industries, which contribute to reducing the amount of fuel used for heating and cooling in households.
- For other private buildings, instruments such as preferential loans, tax incentives, and energy-efficient mortgages can be utilized. This approach could reduce the need for new public financing by up to €50 billion annually. Lastly, one-stop shops, mortgage portfolio standards, energy efficiency obligations, revolving funds, and contracts for difference have the potential to significantly accelerate energy renovation processes.

3.3. Opportunities within the Framework of EU ETS-2 and EU Building Policies

- In the context of financing emission-efficient transformation, which aims to achieve the goal of eliminating carbon emissions from buildings, Energy Performance Contracts (EPCs) serve as a key method, particularly for large commercial buildings and businesses. Under these contracts, companies provide clients (households or enterprises) with a guaranteed level of energy savings, and payments are linked to the actual energy savings achieved.
- These contracts typically involve a mix of funding sources, including energy service companies, customers, local and national subsidies, and third-party investors. These types of contracts are already in use across Europe in large industrial sites, public administration buildings, large multi-family apartment buildings, and social housing projects.
- To expand the use of EPCs, public funds can help reduce initial capital requirements, lower borrowing costs, and link renovations to actual energy efficiency gains.
- Solutions such as the pay as you save model and EPCs can create serious job opportunities and employment areas in the construction sector, as they provide financing that enables transformation and renovation, just as in small-scale family homes.
- In addition to all financing solutions, investments in energy renovation can be recouped through reduced energy bills and increased property values. In this context, according to calculations by Bruegel based on Eurostat data, achieving EPBD targets means €81 billion in annual savings by 2030. In other words, more than half of the investment gap can be covered directly through economic returns. (21)



3.4. Compliance with EU ETS-2

Annual Compliance Cycle

- The process of monitoring, reporting, verifying (MRV) emissions, submitting emission allowances, and the procedure for the competent authority to accept emission reports—along with all related processes—is referred to as the “compliance cycle.”
- Under EU ETS-2, regulated entities are required to have a greenhouse gas emission permit and an approved monitoring plan for tracking and reporting their annual emissions by January 1, 2025. Monitoring plans are an integral part of greenhouse gas emission permits.
- Each year, regulated entities must submit an emission report for the previous year’s emissions by April 30. From 2026 onwards, the data for each year must be verified by an accredited verifier.
- Starting in 2028, after annual verified emissions are reported, regulated entities will be required to surrender an equivalent number of emission allowances by May 31 for that year’s emissions (beginning with 2027 emissions).

The European Commission has published a Monitoring and Reporting Regulation (MRR) Guidance Document(22) for entities covered by EU ETS-2 regulations.



3.4. Compliance with EU ETS-2

Under the section “**Overview of the Compliance Cycle**” in the Guidance Document, the compliance cycle is summarized as follows:

- 1. Main Cycle:** The regulated entity monitors its emissions throughout the year. After the end of the calendar year (usually within four months), the entity prepares its annual emissions report, undergoes a verification process, and submits the verified report to the competent authority. Once emissions are verified, starting from 2028 (for example, for the year 2027), an appropriate number of emission allowances should be delivered corresponding to these emissions. At this point, the “a ton must be a ton” principle comes into play; meaning that for every ton of emissions delivered, one allowance is required.
- 2. Monitoring Process:** The monitoring process continues throughout the year and seamlessly transitions from one cycle to the next. Emissions are regularly monitored and reported, which is essential to ensure the system’s reliability.
- 3. Monitoring Plan (MP):** For the monitoring process, each regulated entity must document its monitoring methodology in writing. These written documents are referred to as the monitoring plan and must be submitted alongside the entity’s greenhouse gas emission allowance. This plan must comply with regulations that apply across the EU, particularly the MRR (Monitoring and Reporting Regulation).
- 4. Responsibilities of the Competent Authority:** The competent authority oversees the compliance of regulated entities. The first step is for the competent authority to approve each monitoring plan before its implementation. The compliance of the monitoring plan with the MRR is checked.
- 5. Checks on the Annual Emission Report:** The competent authority is responsible for verifying the accuracy of annual emission reports. These checks include random audits on the verified reports and cross-validation with the data in the record system. Additionally, the competent authority ensures that a sufficient number of emission allowances have been delivered.
- 6. Review of the Monitoring Plan:** The compliance cycle also includes regular reviews of the monitoring plans. This review can be informed by valuable input from verification reports. Furthermore, regulated entities are expected to continuously improve their monitoring methodologies.

PREPARATION FOR ETS-2

- For the compliance cycle to function effectively, the Monitoring Plans (MP) of all regulated entities must be approved by the competent authority before the start of the EU ETS-2 monitoring period, which will begin on January 1, 2025.
- Based on the experience gained from previous phases of the EU ETS, this approval process may take several months and requires thorough preparation.
- Relatively long timeframes are anticipated: first, the regulated entity may need several months to prepare its MP, depending on the complexity of its operations and particularly the market structure when identifying end-user sectors. This is because it may take several weeks or months to evaluate all submitted MPs by the competent authority (depending on the current workload), and regulated entities will need a few more weeks to implement the newly approved MP.
- Therefore, the MRR requires regulated entities to submit their MP for approval no later than four months before monitoring begins (i.e., by the end of August 2024).

3.5. Minimum Energy Performance Standards (MEPS) Case Study – Best Practices:

THE NETHERLANDS

- In 2018, the Netherlands introduced a regulatory amendment requiring all office buildings to comply with Energy Performance Certificate (EPC) class C. This means that office buildings with an energy rating of D or lower would be prohibited from use. The Dutch Government aims for all office buildings to achieve an energy class A rating by 2030, and approximately 62,000 office buildings are required to comply with this obligation.
- Historic buildings (those temporarily used as offices) and buildings where less than 50% of the total area is used as office space may be exempt from this requirement. However, office buildings that fail to meet the necessary standards may face penalties, including closure.
- This strategy is supported by technical guidance provided by the Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland [RVO]) and a comprehensive financing plan. This plan includes tax incentives and green loans with favorable interest rates.(24)



3.6. Minimum Energy Performance Standards (MEPS) Case Study – Best Practices

FRANCE

- In 2019, the government introduced a separate regulation for **large commercial buildings over 1,000 m²**. Under this regulation, building owners are required to reduce their final energy consumption by 40% by 2030, 50% by 2040, and 60% by 2050. Compliance will be monitored through an online platform that collects annual consumption data, and non-compliance may result in fines of up to €7,500.
- Renovation works are financed through a combination of tax incentives, subsidies, and Energy Efficiency Obligations (EEO). In 2019, these programs were consolidated under a single subsidy scheme called “MaPrimeRénov”, which prioritizes low-income households.
- Additionally, programs such as **SARE** and **France Rénov’** have been designed as public services to provide information and guidance for residential energy renovations. The **SARE program** is managed by the Environmental and Energy Management Agency and coordinated at the regional level, offering information and support for energy renovation projects targeting households and small private commercial spaces. **France Rénov’** is the new name for a government program that provides personalized assistance for home renovation planning, along with access to specific financial support mechanisms.(25)



- As seen in the best practice examples from France and the Netherlands, policy instruments such as EPBD and MEPS, which support EU ETS-2, along with various local initiatives and incentives, will help bring the EU closer to its goal of becoming a carbon-neutral continent by 2050.
- Furthermore, as such initiatives expand, the renovation of the building stock will provide significant support to the construction sector while also improving the quality of the buildings we live in.

3.7. Best Practices in Carbon Pricing



- If the EU effectively utilizes the revenues generated from carbon pricing, it can transform the new EU ETS-2 system for road transport and heating into a progressive policy that benefits more vulnerable households and businesses.
- There are several ways to redistribute carbon pricing revenues:
For example,
 - **Switzerland** returns two-thirds of its carbon tax revenues to households and businesses, while allocating the remaining one-third to environmental investments. (26)
 - **Sweden** reduced income taxes and social security contributions after implementing carbon pricing. (26)
- A portion of EU ETS-2 revenues will be used to finance the Social Climate Fund (SCF). This fund, set to launch in 2025—a year before the proposed implementation of ETS-2—will provide investment incentives for households and businesses to adopt green heating and transport technologies, such as building renovations, heat pumps, and low-carbon transportation.
- The framework of EU ETS-2, along with revenue recycling obligations and the Social Climate Fund’s dedicated role, aligns with international best practices in carbon pricing policy. When properly implemented, these mechanisms represent a comprehensive, inclusive approach that promotes a low-carbon transition across society.

3.8. Case Study: Inclusion of the Commercial Building Sector in Asian ETSs

- The direct inclusion of the building sector in emissions trading systems is a crucial tool for reducing emissions through demand-side measures implemented by local governments. This is particularly relevant in regions where electricity and heating production fall outside the jurisdictional boundaries of the authority or where the energy sector is subject to strict price regulations that limit its ability to pass carbon costs on to consumers.
- In Tokyo, electricity is imported from neighboring prefectures. As a result, the Tokyo Metropolitan Government does not have the authority to mandate low-carbon energy production. However, heating and electricity consumption in large commercial and industrial buildings account for approximately 20% of Tokyo's emissions. Consequently, the Tokyo Metropolitan Government has implemented a "cap and trade" system covering commercial buildings. (28)
- Under the Tokyo ETS, building owners are required to comply with obligations related to the indirect emissions of their buildings. Additionally, large tenants (those renting spaces larger than 5,000 square meters or consuming more than 6 million kilowatt-hours of electricity annually) are mandated to submit an annual emissions reduction plan.
- Beyond the obligations of building owners, the fact that tenants can also assume responsibility either alongside or in place of the owners encourages them to invest in demand-side mitigation measures.

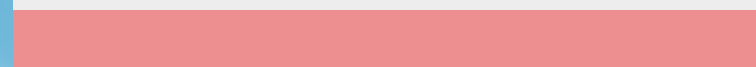
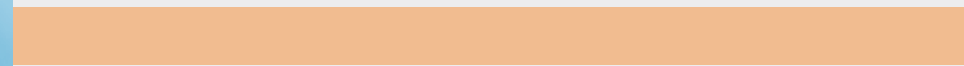
The commercial building sector is also included in the Korean ETS and certain pilot ETS regions in China, where building owners are required to surrender allowances for indirect emissions associated with electricity consumption. Since electricity prices in China and Korea are tightly regulated as part of broader socioeconomic strategies, policymakers focus on demand-side measures through cap-and-trade systems to achieve emissions reductions. This strategy is further reinforced by incentives aimed at reducing the carbon intensity of power generation.





Section 4

PRACTICAL APPLICATIONS AND TOOLS FOR THE BUILDING SECTOR



4.1. Practical Steps for Building Stakeholders to Comply with ETS-2

To ensure compliance with EU ETS-2 (European Union Emissions Trading System-2) in the building sector, professionals should take the following steps:

- 1. Emission Monitoring and Reporting:** Collect accurate data to track carbon emissions from buildings and conduct regular reporting. This ensures precise emission calculations.
- 2. Energy Efficiency Improvements:** Implement necessary measures to enhance the energy efficiency of buildings and reduce their carbon footprint. This includes integrating renewable energy sources, improving heating and cooling systems, and strengthening insulation.
- 3. Carbon Credit and Emission Allowance Management:** In accordance with the EU ETS-2 Directive and related recommendations, maintain emission allowances equivalent to annual carbon emissions and ensure their timely submission as per the EU's designated schedule. For emissions beyond the mandatory compliance scope, acquire carbon credits through offsetting projects, provided they align with the goal of achieving "net zero" and minimizing environmental impact.
- 4. Establishing Monitoring and Audit Systems:** Utilize smart building management systems to continuously monitor energy consumption and carbon emissions. These systems enable data analysis to support ongoing compliance.
- 5. Legal and Regulatory Compliance Monitoring:** Stay updated on changes in the EU ETS-2 Directive and local regulations, ensuring timely adoption of necessary compliance measures for the building sector.



4.2. Building Emissions Monitoring Tools and Methods

SCOPE 1 EMISSIONS – DIRECT EMISSIONS

- Since greenhouse gas (GHG) emissions cannot be directly measured in buildings using a meter, like water or electricity, they are instead estimated based on the amount of electricity, gas, and other fuels consumed by the building.

Scope 1 Emissions – Direct Emissions

- Gas combustion occurring in boilers, furnaces, or kitchen equipment within buildings releases greenhouse gases (GHGs) as a combustion byproduct directly on-site (Scope 1 emissions).
- In most cases, calculating Scope 1 emissions can be as simple as reviewing gas consumption values in energy bills. However, these data are essential for annual benchmarking of large buildings and for assessments conducted by consulting firms specializing in this area.
- Building owners have the highest level of control over Scope 1 emissions. To reduce these emissions, they can and should plan to replace gas-burning equipment—such as water heaters, boilers, heaters, ovens, and stoves—with electric alternatives at the end of their operational life cycle.

Energy Consumption Monitoring Systems: Meters used to track gas consumption in buildings serve as fundamental tools for calculating direct emissions, particularly in residential properties with smaller-scale energy use. These systems indicate the amount of energy sources such as natural gas, coal, and liquid fuels consumed.

Building Automation Systems (BAS): These systems monitor the efficiency of heating, ventilation, and air conditioning (HVAC) systems and provide data on gas consumption.

SCOPE 2 EMISSIONS – INDIRECT EMISSIONS FROM ENERGY

- Calculating Scope 2 emissions, which are linked to grid-level electricity consumption, is more complex. Since electricity is indirectly supplied from multiple generation sources such as natural gas, biomass, and solar energy, greenhouse gas (GHG) emissions from consumption can vary significantly depending on the building's location, time of day, and season.
- However, the emissions intensity of grid-supplied electricity is evolving as the share of renewable energy and natural gas increases while coal-fired power plants decline. Although building owners cannot directly control grid emissions, they can reduce Scope 2 emissions by improving energy efficiency, installing on-site renewable energy systems, or purchasing off-grid green energy through **Power Purchase Agreements (PPAs) or Renewable Energy Certificates (RECs)**.
- To calculate location-based Scope 2 emissions, emission factors (EFs) are required. These factors measure the carbon intensity of a specific electricity grid, typically assessed within national boundaries, and express the amount of GHGs emitted per unit of electricity consumed (usually in kg CO₂e/kWh).
- It is essential to ensure that emission factors are based on the most recent data available. If a company operates in multiple countries, separate emission factors should be assessed for each location. To enhance efficiency, a centralized database for grid emission factors can be established.

4.2. Building Emissions Monitoring Tools and Methods

SCOPE 3 EMISSIONS – INDIRECT EMISSIONS

Scope 3 emissions, which originate from an organization's supply chain and business operations, often represent the largest share of total greenhouse gas (GHG) emissions. These emissions encompass the embodied carbon present throughout a building's entire life cycle, including:

- Material extraction and processing
- Building construction, maintenance, and renovation
- Demolition or deconstruction and waste disposal

Most companies are only required to report Scope 1 and 2 emissions. However, as climate change impacts intensify, organizations are beginning to assess Scope 3 emissions to fully understand their operational footprint. Companies can use the following three methods to calculate emissions from purchased goods and services:

- **Supplier-specific method:** Collect product-level data from suppliers, including life-cycle assessments and emissions impact analyses. A hybrid version of this method incorporates secondary data to estimate upstream emissions when supplier-specific data is unavailable.
- **Average-data method:** Gather data on the mass of purchased goods or services and multiply it by the relevant industry's average emission factor to estimate emissions.
- **Spend-based method:** Use financial data on purchased goods and services and multiply it by the relevant industry's average emission factor to estimate emissions.

Building owners can consider Scope 3 emissions by making informed material choices using existing tools or conducting a comprehensive Life-Cycle Assessment (LCA) of their buildings.



4.3. The Importance of Green Certifications



- **Green certifications** are recognized credentials awarded to buildings or construction projects that meet specific sustainability criteria. These certifications serve as a key indicator of a building's or project's commitment to environmental responsibility and energy efficiency. Holding a green certification demonstrates an organization's dedication to reducing its ecological footprint and contributing to a more sustainable future.
- For more information on certifications such as LEED, BREEAM, YeS-TR, CASBEE, and DGNB, refer to Module 1. The key benefits of obtaining these certifications include:
 - **Higher Market Value and Reputation:** Green-certified buildings gain a competitive edge in the real estate market as they are preferred by tenants and investors prioritizing sustainability. Their commitment to responsible practices enhances both market value and brand reputation.
 - **Attracting More Eco-Conscious Tenants:** A green certification signals that a building is designed and operated with environmental considerations in mind. This can attract tenants who want to be part of a more sustainable community.
- **Lower Operating Costs:** Green buildings typically consume less energy and water, leading to reduced utility expenses. Additionally, resource-efficient practices such as waste management and high-performance systems contribute to long-term cost savings.
- **Positive Impact on Energy Consumption:** Green-certified buildings are designed and constructed with energy efficiency in mind. By incorporating energy-saving technologies, effective insulation, and renewable energy sources, they reduce overall energy consumption and greenhouse gas emissions.
- **Efficient Water Use:** Green-certified buildings often include water conservation measures such as low-flow fixtures, efficient irrigation systems, and smart water management technologies like WINT. These solutions help minimize water consumption and contribute to sustainable water management.(29)

4.4. Carbon Monitoring Tools in Buildings - BIM

BIM (Building Information Modeling)

- Prefabricated structures have undergone a significant paradigm shift, transitioning from basic assembly line production to digitally assisted manufacturing. Building Information Modeling (BIM), along with 3D printing and the Internet of Things (IoT), are key technologies driving the digital transformation of the construction industry. For more information on these digital tools, please refer to Module 6.
- By automating and digitizing certain industrial construction processes, digital tools reduce the risk of human error and decrease reliance on manual labor. These tools facilitate the development of construction and building designs that promote human health, air quality, and natural light, playing a crucial role in making environmentally friendly solutions more accessible.
- Compared to Computer-Aided Design (CAD) methods, BIM offers a more advanced approach in building design, reducing design errors and ultimately lowering construction costs.(30)
- BIM is a powerful tool for overcoming challenges in obtaining the necessary building data for Life-Cycle Assessment (LCA) and, therefore, holds significant potential for conducting LCAs at the design stage of buildings:
 - A building's life-cycle energy consumption and CO₂ emissions can be calculated using BIM models.
 - BIM can also generate a vast amount of information, including project material quantities.
 - Resources and objects can be integrated into a single 3D model using BIM, allowing construction processes to be executed much more efficiently.



4.5. Digital Tools for Managing Emissions



This section provides a brief overview of digital tools for emission management. For more detailed information, please refer to Module 6.

Internet of Things (IoT):

From grid monitoring to smart cities and from mobility to household appliances, IoT technology plays a crucial role in sustainability by enhancing efficiency and reducing environmental footprints. IoT-based environmental solutions help industrial enterprises minimize their short- and long-term carbon impacts.

Smart Energy Grids:

Smart electrical grids utilize technology to monitor and manage the storage and transmission of electricity from its source to the end user. As a critical component in meeting the growing demand for energy and renewable energy sources, smart energy IoT solutions aim to minimize costs and environmental impact while maximizing grid reliability and stability.

IoT is fundamental in ensuring the efficient and effective operation of smart grids through continuous monitoring. IoT-based energy monitoring helps planners and operators optimize production and resource efficiency, while usage patterns and details are transmitted to individual households through smart home devices. Real-time data collection and trend analysis assist planners in identifying potential opportunities for grid expansion, leading to more efficient energy consumption for urban residents.

4.5. Digital Tools for Managing Emissions



Energy Grid Networks: Smart Metering

Smart metering methods, which provide the ability to predict electricity demand and consumption, are a critical IoT energy solution for service provider companies. By using sensors, operators can directly monitor fluctuations in energy consumption both citywide and at the industrial level.

Data collectors installed on field equipment connect to energy meters, transmitting collected data back to the server, enabling grid operators to easily gather consumer-related information. This data flow benefits both operators and consumers: while operators can dynamically adjust output in response to demand levels, consumers can monitor their own usage.

Green Transportation

Population growth has increased demand for commercial and public transportation, leading to more trains, buses, minibuses, and trucks on the roads. IoT-based sustainability solutions help the transportation sector reduce its carbon footprint while also addressing major challenges such as faulty equipment and inefficient route planning. Smart devices like sensors and data collection systems improve overall efficiency by reducing downtime and the need for costly repairs and maintenance.

IoT technology is not only beneficial for vehicles but also for monitoring broader network conditions. Operators can receive real-time updates on road conditions, allowing routes to be adjusted to prevent delays, making travel more time-efficient and fuel-efficient while reducing carbon emissions.

4.5. Digital Tools for Managing Emissions

Smart Building Management

Smart building management systems play a crucial role in IoT-driven environmental sustainability efforts and contribute to reducing carbon emissions. Office buildings and factories operate continuously, consuming electricity and maintaining indoor temperatures around the clock. Reducing carbon footprints is not just about turning off lights—it also means making resources like electricity and water more efficient while lowering carbon emissions.

Smart buildings can make automated decisions to optimize performance; small yet effective actions such as temperature monitoring, shutting down unused devices, and proactive maintenance can improve operations while minimizing environmental harm.

IoT technologies have revolutionized the way industries function. From agriculture to smart cities, numerous technological solutions are available to enhance efficiency while simultaneously reducing carbon emissions.



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