出國報告(出國類別：研習)

綠色成長聯盟德國碳定價研習

服務機關：金融監督管理委員會
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摘要

為因應我國 2030 至 2035 年逐步提升的減碳目標，環境部自 2025 年起正式啟動碳費制度，並規劃於 2026 年試行總量管制與排放交易制度（TW ETS），目標在 2027 至 2028 年間與碳費制度形成雙軌併行的碳定價體系。為強化制度設計與國際接軌，本次環境部帶領綠色成長聯盟共同赴德國研習歐盟 ETS 制度、實務經驗、碳市場交易機制運作及企業減碳誘因等議題。

研習期間深入了解歐盟推出 ETS 制度之歷程、總量管制、推動 MRV（監測、報告與查驗）制度、政策推動前利害關係人溝通，以及多種政策間連動關係等。歐洲能源交易所（EEX）亦分享其碳配額現貨與衍生性商品（如期貨、選擇權）市場運作模式及風險控管措施。此次臺灣碳權交易所與 EEX 完成簽署合作備忘錄（MOU），除象徵雙方在碳定價制度建構上的深化合作外，也有助於未來我國在平台建置、人才訓練、產品設計等層面獲得技術支持，加速與國際碳市場的實質接軌。

報告建議政府在推動 ETS 政策時，應同時考量產業特性與國際趨勢，例如對排放隨產量波動的產業（如半導體業）可評估導入強度型或混合型制度；並建議 ETS 初期可評估是否納入市場穩定機制、從初級市場現貨開始，並將 ETS 視為政策工具而非商業機制。同時，政策推動宜廣納利害關係人意見，並預先釐清自願市場抵換、免費配額、金融中介角色等關鍵設計問題，以建立具韌性與效率的碳市場。

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壹、背景

賴總統於今（2025）年初召開氣候變遷對策委員會會議時，宣示我國 2030 年減碳新目標，從原本較基準年（2005 年）減量 24±1%提升至 28±2%。此外，2032 年國家自定貢獻（NDC）目標為較基準年減量 32±2%，2035 年則進一步提高至 38±2%。

為因應上述新目標及全球氣候變遷挑戰，臺灣自 2025 年起正式啟動碳費制度，象徵我國邁入碳定價元年。依據環境部規劃，碳費將以每公噸二氧化碳當量（CO_2e）300 元為起徵基準，企業須於 2026 年依 2025 年實際排放量進行申報與繳納。首波預估涵蓋約 252 家企業、共 464 家工廠。為鼓勵企業積極投入減碳，環境部依據「碳費收費辦法」與「自主減量計畫管理辦法」，提供兩種優惠費率（每噸 CO_2e 為 100 元及 50 元），供提出減碳計畫並經審核通過之業者申請使用。

根據環境部統計，目前約九成企業表達採用優惠費率的意願，其中兩成更積極爭取最優惠之每噸 50 元費率，須達年減碳率 40%以上，對國家整體減碳貢獻甚鉅。預計 2026 年首波碳費繳納完成後，環境部將同步啟動「先期總量管制與排放交易制度」（Taiwan Emissions Trading System, TW ETS）之試行，逐步建構碳費與碳交易「雙軌制」碳定價體系，並預計於 2027 至 2028 年間正式上路。

「總量管制與排放交易」為一種具價格誘因與市場競爭優勢的碳定價機制，能有效驅動企業轉型與引導綠色投資，進而強化臺灣在全球淨零經濟中的競爭力。具體運作方式為由政府設定溫室氣體排放總量上限及交易制度，受控企業可依一定標準免費或經由拍賣取得排放額度（碳權）。若企業實際排放超出許可額度，須於市場上購買其他企業所釋出的碳權。目前歐盟、英國、中國、南韓與印尼等國皆已實施排放交易制度，日本亦處於試行階段。

碳交易代表「碳的價值」將透過市場機制決定。國內目前減碳成本每噸從 3,000 元至 30,000 元不等，建立更健全的碳交易機制，有助推動臺灣綠色金融與碳資產認定。環境部自 2025 年起研議總量管制制度，但仍需完備相關法令，預計需半年至一年進行法規調整。此外，考量許多企業有減碳意願，且有與國際碳權合作需求，環境部於 2025 年 4 月成立「綠色成長聯盟」，邀請具減碳成效之企業試行總量管制，作為我國公私協力推動淨零轉型的重要合作平台。

綠色成長聯盟初期邀集 17 家高排放、具自主減量意願，或已參與國際科學

基礎減量目標倡議（SBTi）之企業加入，並結合經濟部、國科會、金管會、臺灣碳交所等跨部會單位，共同參與政策試行與制度設計。聯盟重點工作包括：碳定價與國際合作能力建構、TW ETS 試行制度設計、促進國際碳市場合作、強化綠色產業鏈與推動公私協力機制，並辦理論壇、培訓與交流活動。參考日本於 2023 年推動的 GX（Green Transformation）促進法，我國亦期望透過聯盟機制推動綠色金融發展，並創造產業轉型動能。

為深化制度規劃與借鏡國際經驗，環境部於 2025 年 6 月 24 日至 26 日率領綠色成長聯盟成員赴德國柏林，舉辦「德國碳定價研習會」。此次由環境部長彭啟明帶隊，隨行包括經濟部、金管會、證交所、臺灣碳權交易所、氣候署及綠色成長聯盟 11 家企業代表。團隊與德國聯邦環境署（UBA）所屬排放交易管理局（DEHSt）進行深入交流，學習歐盟 ETS 制度運作方式與政策規劃經驗，為我國 2026 年試行 TW ETS 及後續制度落地奠定基礎。

DEHSt 為德國政府負責歐盟總量管制與排放交易（EU ETS）之主管機關。自台德雙方於 2018 年簽署碳交易合作意向書以來，雙方持續就碳定價制度與碳市場建構等議題進行交流。德國在能源政策溝通與社會共識建立方面長期努力，對臺灣極具借鏡價值。而臺灣在數位治理、AI 應用與資源循環技術上的創新發展，也獲德方高度關注，雙方將持續拓展氣候治理與循環經濟領域的合作機會。

本次研習活動最大特色，在於與過往多由政府單方面參與不同，環境部此次特別邀請企業代表共同前往。考量綠色成長聯盟所匯聚之企業皆為推動臺灣綠色轉型的領導者，具備高度減碳企圖心與政策敏感度，也是未來試行 ETS 制度的重要合作夥伴，因此此行期盼企業與政府單位共同學習並進行實質交流，獲取更直接且具體的效益。

值得借鏡的是，德國早在 20 年前即推動碳定價與 ETS 制度，目前也正積極規劃自 2027 年實施 ETS2，涵蓋建築、陸上交通與家戶等領域，影響層面更廣，排放涵蓋率達全國 85%，所面對之挑戰與壓力亦更加嚴峻。

淨零減碳與環境保護已深植德國與歐盟國家社會，內化為其政策與文化 DNA，政府與民間均有高度共識，即使須付出一定代價，仍堅定推進。德國完善的利害關係人溝通制度與轉型機制，亦設有專責單位，未來臺灣在制度推動與治理上均可借鏡其經驗。

此外，此次德國研習亦促成臺灣碳權交易所與歐洲能源交易所（European Energy Exchange, EEX）簽署合作備忘錄（MOU），象徵我國在碳權市場國際接軌

上邁出實質且關鍵的一步。

貳、研習內容重點

本次研習，先由 DEHSt 介紹建立 EU ETS 體系的先期準備，接著由歐盟環境智庫 Adelphi 說明 EU ETS 主要架構與最新發展，並強調 EU ETS 拍賣所得將投入創新基金與現代化基金來推動低碳技術。此外，本次研習會也邀集了德國聯邦經濟與能源部、德國應用生態研究所、德國氣候顧問公司 Future Camp、EEX、國際碳行動夥伴關係、全球永續賦能倡議組織等各方國際專業領域的機構或團體，分享德國 ETS、EU ETS 2 制度現況、國際上碳交易市場實務經驗、自願減量交易機制的數位解方，以及氣候政策推動時的利害關係人辨識與溝通等內容，希冀能藉助德國碳交易實質推動經驗，逐步建構臺灣的 ETS 制度，接軌國際碳定價趨勢，帶動產業綠色成長並達到我國淨零排放的目標。

謹將本次研習內容以主題之方式摘要報告如下：

一、歐盟碳排放交易制度（EU ETS）的建立與德國的參與

（一）早期籌備與利害關係人參與

德國是 EU ETS 的主要推動者之一，早在 2000 年 EU ETS 規劃初期，即高度重視各方利害關係人的參與。由德國聯邦環境署(UBA)主導，成立常設工作小組，成員來自碳密集產業、查驗機構與法律專業界。

此工作小組定期召開會議，形成長期對話平台，涵蓋制度設計、執行機制與回饋機制等層面。例如在第四個交易期啟動前，曾召開多達 12 場利害關係人會議，廣泛蒐集意見，並針對制度調整進行溝通。德國政府與產業界甚至共同出資，支持這些溝通工作。

同時，非政府組織（NGOs）與公民團體亦被納入參與架構，特別關注政策透明度與公平性。主管機關為此設計了公開資訊機制，並確保公民參與不設資格限制，也不須負擔費用，成功降低參與門檻，進而提升制度的社會接受度與監督效能。

（二）主管機關與執行架構

德國由中央主管機關 DEHSt 負責 EU ETS 制度的設計與執行。DEHSt 隸屬於 UBA，但具有高度自主性，並與 UBA 每六週定期會議，

針對政策方向進行溝通。

雖然地方機構並非主管機關，但在環境監測與執法面向上扮演重要輔助角色，與中央形成明確分工、功能互補的治理架構。

DEHSt 組織規模龐大，具高度專業性，下設 4 個大部門與超過 30 個專業單位，涵蓋氣候行動、查驗作業、能源政策、碳邊境調整機制（CBAM）、碳洩漏補償與 IT 系統等領域。人力自初期約 100 人擴增至現今約 250 人，具多元專業背景，包含工程、氣候科學、法律與化學等。

依歐盟法規，德國以「設施」（installation）作為排放管控單位，而非以「法人」為單位。此舉有助於更精確對應實際排放行為，確保每一排放源可具體監測與申報。若同一法人擁有多座設施，則每座設施皆須個別負責監測與查核，有助提升數據品質及制度的準確性與可執行性。

（三）電子化管理與行政效率

德國自制度啟動初期即導入電子化治理。所有設施均透過表單管理系統（FMS）與電子文件系統（Domea）進行排放申報。每個設施皆有專屬識別碼，便於資料整合與追蹤。

系統內建流程規範與錯誤預防設計，並提供操作指南與培訓課程，大幅降低人工負擔，提升申報品質。FMS 系統亦提供統一格式的申報文件，協助企業快速完成作業流程，並依據使用者回饋持續優化系統設計。

（四）挑戰與解決方案

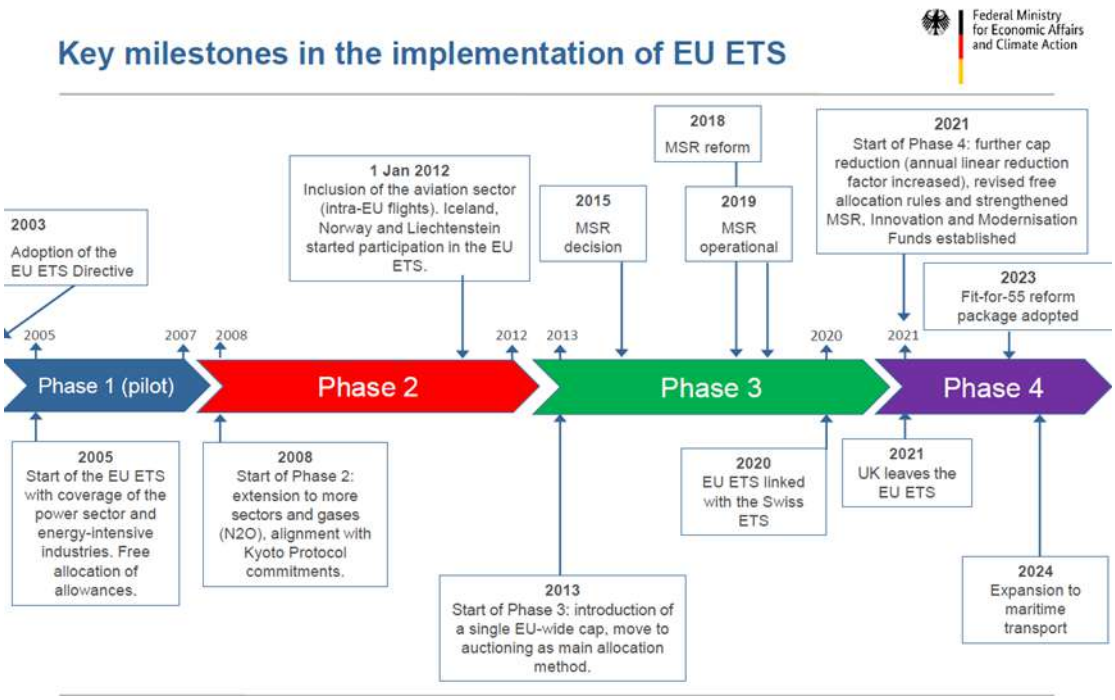
1. 法律訴訟：德國過去曾累積約 8,000 件與碳配額分配有關的訴訟案件，特別集中於第一與第二交易期。企業主要針對免費配額申請結果或分配公式提出異議，認為自身配額過低。隨著制度逐漸成熟與分配邏輯的優化，相關爭議已逐年下降。
2. 專業人才招募：德國公部門提供穩定的聘用制度，吸引環境與工程領域專業人才，包括終身聘任、職涯發展計畫與退休保障。同時重視內部持續教育與在職訓練，並鼓勵參與國內外技術合作。此外，德國社會對公共職務的高度使命感與制度的長期穩定性與公信力，也是吸引人才的關鍵因素。
3. MRV 制度設計：德國的監測、報告與查驗（MRV）制度由 DEHSt 統籌

設計與監督，查驗作業則由經過認證的第三方驗證機構（Verifier）執行。這些機構須通過專業認證，並接受持續監督。若出現重大錯誤或疏失，DEHSt 有權通知並暫停或撤銷其查驗資格。主管機關亦會進行隨機抽查與現場審查，以強化資料可信度與查驗制度的公信力。

二、歐盟碳交易制度(EU ETS)的核心要素與最新發展

(一) 制度演進與涵蓋範圍

歐盟 ETS 自 2005 年啟動以來，經歷了四階段改革，持續擴大涵蓋範圍與部門。初期僅管制二氧化碳(CO_2)，到第三階段開始納入氧化亞氮(N_2O)與全氟碳化物(PFC)。剛開始僅管制發電部門及高耗能產業，以下游管制之方式進行，於 2024 年起將海運納入管制。目前制度涵蓋了超過 11,000 座設施，管制部門包括電力/熱力、能源密集產業（如煉油、鋼鐵、水泥、玻璃、化工等）、歐盟境內民航與海運。各部門的門檻依排放量與裝置容量設計。以 2024 年為例，總排放量上限為 13.86 億歐盟排放配額(EUA)，其中海運部分上調了 7,840 萬 EUA。



(二) 配額分配與市場機制

2013 年起引入全歐盟統一總量上限，主要分配方式改為競標。配額的主要分配方式為拍賣，拍賣份額最多可達總量的 57%。其中 90%的拍賣配額依據各會員國的實際排放量分配，另外 10%則分配給低收入會員國。拍賣由 EEX 每日舉行，採單回合、密封出價、統一價格的方式進行。目前電力業的配額全面採取拍賣方式；製造業則採標竿法免費核配，並依產業的碳洩漏風險調整減碳比率。

大量免費配額會根據各產業績效基準予以分配，以因應碳洩漏風險。在第四階段中，這些基準值會更新兩次，以反映各產業的技術進展。每個基準設有年度減少率，其中鋼鐵業因減排成本高與碳洩漏風險大，適用固定減少率。從 2026 年到 2034 年，對特定產業的免費配額將逐步取消，並預計在 2034 年全面取消免費配額，並透過碳邊境調整機制(CBAM)來減緩碳洩漏風險。自 2023 年起，各會員國的拍賣收入必須全數用於氣候與能源轉型。

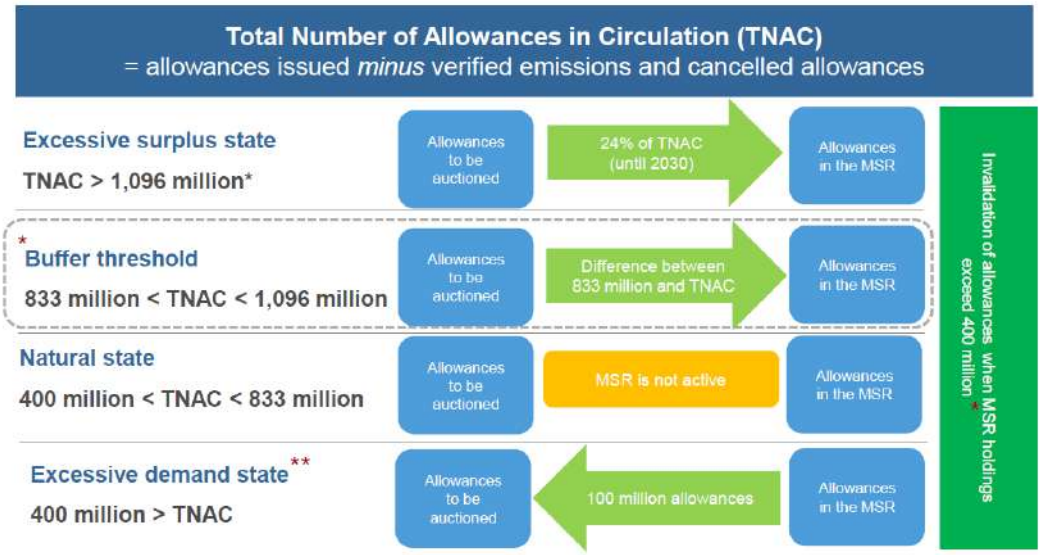
歐盟也設立了重要的基金來支持轉型，這些基金都用於支持低碳技術發展與能源轉型：

- 創新基金(Innovation Fund)：提供補助金，支持創新的低碳技術和產業解決方案的商業化，推動歐洲邁向氣候中立轉型。
- 現代化基金(Modernization Fund)：由歐盟碳排放交易體系資助的團結計劃，協助低收入會員國現代化能源系統並提升能源效率，促進公平且順利的氣候中立轉型。

(三) 市場穩定儲備(MSR)機制

MSR 於 2019 年正式運作，目的是穩定市場價格，避免碳價劇烈波動，並依據總流通配額(Total Number of Allowance in Circulation, TNAC)自動調節拍賣供給。具體機制為，若 TNAC 超過 10.96 億，則將 24%的配額轉入儲備；若 TNAC 低於 4 億，則從儲備中釋出 1 億配額。當儲備超出 4 億配額上限時，配額會被註銷。此外，依據 ETS 指令第 29a 條，若遇到價格劇烈變動，可啟動額外拍賣以穩定市場。

儘管 MSR 能夠在 2030 年前穩定市場額度，但由於部分產業長期累積大量免費配額，仍是當前的挑戰。歐盟執委會定期發布檢討報告，內容涵蓋 MSR 調整、碳洩漏議題、負排放等。



(四) 國際連結與未來展望

歐盟 ETS 目前已與瑞士、挪威完成連結，並與英國展開協商。協調 MSR 設計是主要的挑戰。不同碳市場的連結是正面的發展，理想的碳價是每個國家、每個排放源都一樣，以達到相同的減量目標和減量成本。雖然實際操作因管轄區不同而存在差距，需要長期溝通才能取得共識。

講師指出，EU ETS 的設計有助於臺灣未來制度發展與國際接軌，並強調市場連結可提升全球碳價一致性與減碳效率，也有助於解決 CBAM 議題。

三、歐盟排放交易系統第二階段(EU ETS2)概覽

(一)ETS2 的目標與時程

EU ETS2 屬於歐盟「Fit for 55」政策套案的一部分，目標是到 2030 年較 1990 年減量 55%。其立法於 2021 年完成，2023 年生效，2024 年啟動排放申報，並預計於 2027 年正式開始交易（若能源價格過高則可能延後至 2028 年）。ETS2 採用上游設計，主要監管燃料供應商，配額全部透過拍賣，沒有免費分配。排放上限自 2024 年起逐年遞減，預計到 2044 年達成零排放。為了維護 ETS1 的穩定，初期兩個系統將不互通。

(二)ETS2 的涵蓋範圍與複雜性

ETS2 主要涵蓋道路運輸、建築排放，以及鍋爐容量 20MW 以下的小型能源與工業設施。其中，約半數的排放來自家庭，其餘來自商業用戶。由於燃料用途難以精準掌握，申報與驗證(MRV)具有一定的複雜性。目前尚未涵蓋的排放源包括泥炭燃燒、都市廢棄物、農業燃料、小型船舶與非公路運具，但未來各成員國可自願選擇將其納入。

選擇上游制度的主要考量是下游管理（例如要求歐盟 3 億戶家庭提交排放報告）不具可行性且行政成本過高。上游管理成本較低，效率較高。

(三)ETS2 的市場穩定機制

ETS2 設有市場穩定儲備(MSR)，類似 ETS1，以穩定價格、避免碳價劇烈波動。它設定了三種價格控制機制，每年最多啟動一次。

- 若碳價高於 2020 年基準價 45 歐元（預估 2030 年約 60 歐元），則釋出 2,000 萬配額。
- 若碳價在半年內倍增，則可能觸發更大規模的釋放量（例如 5,000 萬或 1.5 億配額）。
- 這些額外配額均透過拍賣方式進入市場，並在 12 個月內釋出。

這些數據來自歐盟委員會的模型評估與政治協商結果，旨在兼顧減量目標與社會衝擊。ETS1 至今從未觸發此類機制，這顯示其設計著重於應對極端情況。

(四)預期碳價與社會氣候基金(SCF)

根據市場分析師預測，2027 年 ETS2 碳價預計為每噸 50 至 90 歐元，到 2030 年可能達到 90 至 160 歐元。碳價對各成員國的影響不同，德、法、義三國的排放量占歐盟近一半，因此其政策行動對碳價具有關鍵影響。相對地，較貧窮的國家因支付能力限制，承擔壓力更大。

為減緩社會衝擊，歐盟設計了社會氣候基金(SCF)。部分資金來自拍賣收入（例如當碳價為 50 歐元時，約 25%的收入撥入 SCF），總額約 650 億歐元（2026-2032 年預估）。SCF 的目標是減輕碳價對弱勢家庭、微型企業和運輸用戶的社會影響，並具有再分配功能，低收入成員國可獲得較高比例的資金。此外，各國必須提交「社會氣候計畫」，將資金用於交通與供暖的去碳化投資，例如電動車、熱泵等，避免僅提供現金補貼。德國制定了根據建築能效來分攤房東與租戶碳成本的法律，

以鼓勵供暖系統升級，讓弱勢群體能夠擺脫碳價負擔，這比單純的收入補貼更具可持續性。歐盟內部也會討論如何定義和辨別「能源貧戶」以適用 SCF 補助。

四、歐洲能源交易所（EEX）的市場營運與平台

(一) EEX 背景介紹

EEX 在歐洲能源和商品市場中扮演著核心角色，提供電力、天然氣、農產品、航運和環境產品(如原產地保證 GO 和再生能源憑證 REC）的交易服務，在電力交易量上居全球第一，天然氣交易量全球第二。

EEX 集團旗下實體包括 Epex Spot、新加坡的 EEX Asia、歐洲清算所（ECC，負責歐洲和亞洲的清算與結算）、Grexel 提供登記服務、美國的 Nodal 和 NodalClear 則專注於美國的環境衍生品。在全球四大洲八個時區設有 22 個辦事處，業務範圍涵蓋 27 個歐盟成員國、3 個歐洲自由貿易協會國家、美國、紐西蘭和德國。

歐盟自 2010 年起指定 EEX 作為 ETS 拍賣平台，為所有歐盟成員國、歐洲經濟區自由貿易協定國家和英國（北愛爾蘭電力）營運排放配額拍賣，幾乎每天進行拍賣。EEX 提供歐盟配額（EUA）的現貨、期貨和期權交易，近 100%的配額在交易所進行交易，被認為是最安全的方式。

此外，EEX 也負責其他排放交易系統，包含德國國家排放交易系統（nEHS）、紐西蘭 ETS(與紐西蘭交易所（NZX）合作擔任拍賣營運商)、提供 RGGI、加州、華盛頓、西方氣候倡議的期貨與期權。另外，旗下自願性碳市場 Nodal 平台上列出 CORSIA 合格、基於自然和移除類型的產品。另 EEX 亦與中國大陸、哈薩克及土耳其的交易所簽署 MOU，支持國家碳市場的發展。

EEX 設有交易所委員會、經營層、市場監督辦公室（MSO）和裁罰委員會，並受監事會、管理委員會和交易所監管機構的監督。市場監督功能獨立於營運業務，確保市場的公平有序運作。

(二) 歐盟 ETS 的發展與拍賣成就

歐盟 ETS 自 2005 年啟動以來，已成功幫助電力和工業部門的排放量減少了近 50%。透過拍賣碳許可證每年為歐盟帶來可觀收入，累積至 2025 年 6 月已超過 2360 億歐元。EEX 自 2010 年以來成功舉行了超過 3000 場歐盟 ETS 拍賣。市場交易量，特別是次級市場的衍生品交易，自 2018 年引入市場穩定儲備機制（MSR）後顯著增長，價格也明顯上漲。

(三) 拍賣機制細節：

拍賣是歐盟 ETS 配額分配的基本原則，其中 57%的配額透過拍賣分配。

- 產品：歐盟配額（EUA），每單位相當於一公噸二氧化碳當量。
- 最小訂單量：500 個 EUA（相當於 500 噸二氧化碳當量）。
- 結算方式：採用「交割付款（Delivery versus Payment, DvP）」機制，確保配額交付與款項支付同步進行，降低信用風險。
- 參與者：目前約有 116 家機構獲准參與，包括合規買家(compliance buyer，包含固定設施營運者、飛機營運者、航運公司)、投資公司、金融機構，以及代表客戶投標的商業團體或中介機構。
- 拍賣流程：通常是單輪密封投標，並採用統一價格結算，以保障了公平性和價格透明度。
- 同價競標（Tie Bid）處理：如果多個投標在拍賣結算時出現相同價格，系統會採用隨機演算法來決定每個參與者獲得的數量。
- 初級市場：指配額首次發行的拍賣，EEX 是全球第一大初級市場。
- 次級市場：指市場參與者之間對已拍賣或分配的配額進行買賣交易，EEX 是全球第二大次級市場。次級市場提供連續交易，參與者可以買入和賣出配額，進行風險管理。

初級與次級市場兩者都涉及配額發放日期的決定、參與者資格審核、市場監管、報告和登記服務、以及清算與結算。

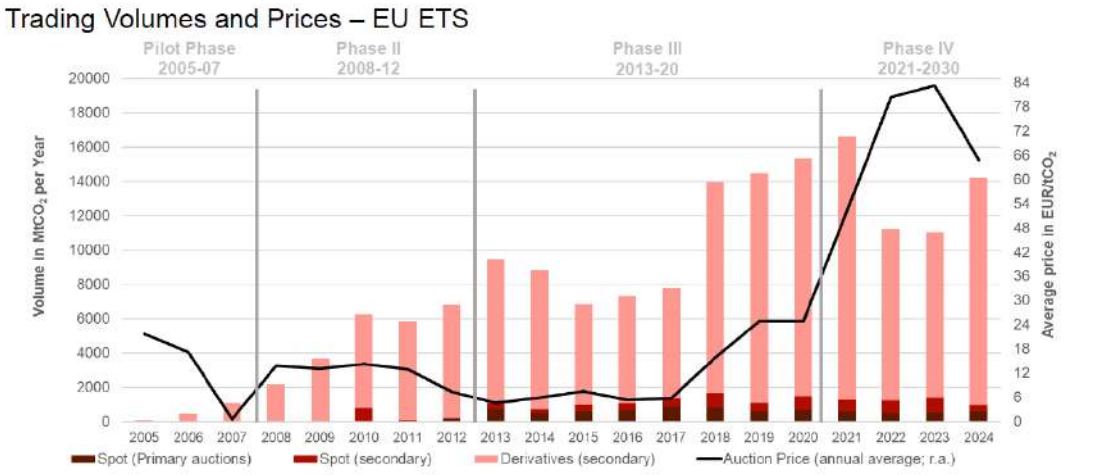
(四) 交易量：

EEX ETS 之成交量以衍生性商品（Derivatives，主要為期貨及期貨選擇權）為多，遠高於現貨市場（無論是拍賣或次級市場），尤其在 2013

年之後，衍生性商品的顯著成長。以 2022 年為例，現貨初級市場拍賣及次級市場交易合計約僅 1,000 多萬噸 CO_2，但衍生性商品交易約超過 14,000 萬噸 CO_2。比例上，衍生性商品交易量大約是現貨交易量的 10 倍以上。這種現象符合其他碳市場的普遍情形，因為有更多的避險、投資及投機需求。

若再以拍賣均價變化趨勢來看，2005-2017 年拍賣價格波動平緩且相對低迷，大約介於 5~10 歐元/噸，但 2018 年後價格快速拉升，2022 年一度到達 80 歐元/噸以上，2023 至 2024 年雖有回跌，但仍處於歷史高位。

EU ETS 自 2005 年以來，促使電力和產業碳排減少近 50%。每年碳權拍賣為歐盟帶來可觀收益，支援潔淨能源專案。EEX 自 2010 年起，幾乎「每個工作天」都有一次拍賣，累計超過 3 千場。



- The **EU ETS has helped bring down emissions from power and industry by nearly 50% since 2005**, and the money raised each year through the auctioning of carbon permits brings in **a substantial amount of income to the bloc**, with billions channeled towards clean energy projects.
- EEX successfully conducted **more than 3,000 EU ETS auctions** since 2010, by running EU ETS auctions almost **every weekday**

五、德國國家碳交易制度(nEHS)概覽

(一) nEHS 的背景與定位

德國國家排放交易系統(nEHS)於 2019 年氣候運動與綠黨崛起的背景下推動，作為當年氣候法案的核心政策之一，並自 2021 年起實施。nEHS 與歐盟的「Fit for 55」政策套案相互呼應，「Fit for 55」計畫在 2027 年啟動涵蓋建築與運輸的歐盟排放交易系統第二階段(EU ETS2)。

目前，德國約 85%的排放已納入碳定價機制。其中，EU ETS1 涵蓋能源、工業、航空與 2024 年起的海運。nEHS 則補足了建築、運輸以及部分能源與工業排放，農業僅部分涵蓋。從數據來看，ETS1 涵蓋約 41%的排放，nEHS(未來 ETS2)則涵蓋約 36%的排放。

(二) nEHS 的運作模式

nEHS 是一個上游總量管制與交易制度，意指碳價的義務方是燃料分銷商。他們透過配額拍賣產生碳價，排放上限則逐年遞減。焚化部門是一個例外，採用下游履約（直接向焚化廠收取費用）。其排放上限是依據歐盟的「努力分享規章」(ESR)目標設定：從 2021 年的 3 億噸，預計到 2030 年降至 1.8 億噸，並目標在 2045 年達到氣候中和。

(三) 價格階段與收入運用

nEHS 在 2021-2025 年採用固定碳價（每噸 25 至 55 歐元），此階段配額沒有上限。這本質上可以被視為一種碳稅，因為價格固定且供應無限。在此階段，實際的交易活動非常有限。2026 年將轉為價格走廊（價格有上下限區間）。從 2027 年起將實施市場定價並固定排放上限。

碳價對燃料價格的影響較為溫和，例如 2021 年每公升汽油僅增加 6 歐分，2023 年增至 15 歐分。2023 年，nEHS 收入達到 100 億歐元，這些收入主要用於弱勢支援與技術轉型。

(五) 與 EU ETS2 的整合

根據「Fit for 55」規劃，nEHS 將於 2027 年併入 EU ETS2。兩者皆為上游制度，由燃料分銷商負責。然而，EU ETS2 自啟動就直接採市場定價，並設有 6 億噸的市場穩定儲備。德國目前正在討論將鐵路、農林燃料選擇性納入 EU ETS2，而焚化部門則可能併入 EU ETS1。

EU ETS2 的目標是到 2030 年較 2005 年減量 40%，這意味著每年需減量近 6,000 萬噸，減碳壓力極大，預期價格波動性也會較高。歐盟將透過法規、財政與社會氣候基金(SCF)等輔助政策，減緩對弱勢族群的衝擊。

六. 碳排放交易系統（ETS）中的利害關係人參與

(一) 為何需要利害關係人參與？

1. 提升政策品質與透明度：透過雙向溝通，政策制定能更全面，並增加公眾對政策的信任與接受度。
2. 確保順利執行：當利害關係人理解並支持政策時，ETS 的實施將更有效率。
3. 預防誤解與質疑：及早溝通能釐清疑慮，解決擔憂，使決策更明智。

(二) 參與機制的建立步驟：

1. 找出關鍵利害關係人：包括受影響最大的產業、企業、環保團體、政府機構、媒體、智庫、工會等。
2. 評估其理解與態度：了解他們對 ETS 的認識程度、立場與潛在疑慮。
3. 提出具體政策選項：引導大眾討論，例如德國會發布「綠皮書」來啟動對話。

(三) 不同階段的參與工具：

1. 設計初期（制度改革）：著重於能力建構，讓利害關係人充分了解政策優勢。工具包括媒體宣傳、資訊出版、網站、常見問題（FAQs）、研討會等。
2. 實施階段：重點在於專業諮詢與合規培訓，協助參與者順利遵守規範。工具如諮詢文件、常設討論平台、聽證會、研討會、熱線服務、線上模擬等。
3. 制度上路後（審查與修正）：持續開放回饋與溝通，確保政策的可持續性與各方參與。

(四) 歐盟與德國的經驗：

1. 歐盟：建立了正式的「表達意見（Have Your Say）」和「徵求證據（Call for Evidence）」線上平台，廣泛收集公眾意見。歐盟執委會還編纂了「較佳法規工具箱（Better Regulation Toolbox）」，其中第七章詳細規範了利害關係人諮詢的程序與方法。
2. 德國：

(1) 正式參與機制：立法程序明定兩種利害關係人諮詢方式--「團體諮詢」（與

產業協會、公民團體等）及「公聽會」（開放社會參與）。政府會將相關意見公開上網，確保政策經濟影響充分討論，並提升透明度。

(2) 非正式參與機制：德國排放交易工作小組(AGE)

AGE 是德國環境部成立的常設性諮詢平台，成員來自產業界、政府部門、環保非政府組織和工會代表。其主要功能是政策溝通、能力建構和技術建議，協助利害關係人正確理解碳市場制度，並為歐盟 ETS 的實施提供解決方案。

AGE 自 2000 年成立以來，已召開超過 180 次會議，其成功關鍵在於「非正式性質」和「保密原則」，讓與會者能自由交換意見，不受政治壓力或外部公告影響，且會議不需做出具約束力的決策。

DEHSt 設有約 20 人的專責團隊，負責與碳交易參與者日常溝通，並向查驗機構、研究機構、媒體等間接利害關係人說明政策。他們透過網站、出版物、活動和客戶服務等多元管道確保資訊透明及時。

(3) 中小企業的參與：

中小企業常缺乏處理法律與交易事務的資源。德國經驗顯示，可透過專業輔導團隊或與中介機構（如銀行）合作，協助中小企業進入市場並簡化操作流程，降低參與門檻。

(4) 溝通中的挑戰與成本傳遞：

在碳價制度中，一個普遍的擔憂是如何將成本有效且公平地轉嫁給終端消費者。例如，法國的「黃背心運動」就是因為燃料稅提高但缺乏配套措施而引發。

歐盟 ETS 2 的設計考慮到如何透過拍賣收入來補償弱勢群體，而非僅僅降低碳價，這有助於提升社會接受度。政府可以選擇通過商業機制支持企業，或對綠色交通工具提供補貼，因為這些通常由支付能力較強的群體率先採購。

七. 碳排放交易系統(ETS)與其他氣候政策的交互作用

單一的碳排放交易系統可能不足以應對所有氣候變遷的挑戰，仍應著重全面且協調一致的政策組合，才能有效實現減排目標。

(一)ETS 的優勢與局限：

1. 優勢：ETS 的核心是提升減排效率。它不強制規定具體減排方式或技術，而是透過市場機制讓排放者自主選擇成本最低的減排途徑，直到減排成本與碳價相等。這避免了政府過高的干預成本和資訊不對稱問題。
2. 局限：ETS 作為一種廣泛的「價格型工具」，在某些情況下效果有限，例如：
   (1) 市場失靈或障礙：如業主與租戶之間的「利益分離」，導致節能投資動力不足；或新興技術初期風險高、回報低，單靠碳價難以推動。
   (2) 其他政策目標：例如改善空氣品質、提高能源效率以減少化石燃料進口、或推動產業升級與就業。
   (3) 不同轉型階段：短期內碳價有利於基於現有技術的優化；但長期而言，碳價雖然必要，但不足以推動大規模創新、基礎設施調整和行為改變。
   (4) 政治與社會阻力：過高的碳價可能引發民眾和產業的反彈。

(二)補充性政策(Complementary Policies)的角色：

1. 彌補 ETS 的不足：處理碳價難以觸及的減排潛力，例如農業部門，或提供長期創新與技術支持。
2. 創造有利的環境：移除現有障礙與扭曲（例如化石燃料補貼），使各方誘因一致，並調整監管框架（如電力市場自由化）。
3. 減輕負面影響：透過配套措施（如社會援助計畫或對產業的競爭力補償）來增加公眾接受度，並協助弱勢群體適應轉型。歐盟成員國已利用拍賣收入資助社會援助計畫，並補償工業電力用戶因 ETS 造成的電價上漲。
4. 確保公平一致性：使不同部門的減排誘因一致，確保以最低成本實現減排。例如，部分歐盟成員國對 ETS 未涵蓋的部門（如交通、建築）徵收碳稅，以達到類似的碳定價效果。

(三)「水床效應」（Waterbed Effect）：

當 ETS 的碳排放總量（總排放上限）是固定時，針對 ETS 範圍內的相同排放源實施其他減排政策，並不能產生額外的總體減排量。這是因為這些額外的減排措施會釋放出市場上的碳排放配額，這些被釋放

的配額會被其他排放者買走並使用，從而抵消了最初的減排效果。然而，這些補充政策的價值在於降低了整體減排的成本，並為制定更嚴格的 ETS 排放上限創造了條件。

2018 年歐盟 ETS 改革引入了「市場穩定儲備機制（MSR）」，作為調整碳權供需的「溢流閥」，係因應水床效應的策略方式之一。當市場配額過剩時，MSR 會將其移入儲備，並在達到一定數量後將其註銷，從而收緊供應；反之則釋出配額。此外，成員國也可以選擇自行註銷配額，以確保國家層面的額外減排措施產生實際的氣候效益。

最後，建議臺灣政府需要先評估現有和預期政策在各部門的減排貢獻，並根據這些預測，考慮經濟增長和燃料價格等因素，設定 ETS 的總量上限。定期審視假設，並根據實際情況調整 ETS 總量或補充政策。此外，宜實施如 MSR 等機制，自動應對碳權供需的變化，確保市場韌性。

八、全球碳排放交易系統(ETS)概況與國際合作

本次學習之旅亦邀請國際碳行動夥伴(ICAP)協助，介紹全球 ETS 概況。ICAP 是一個由 43 個國家與次國家政府組成的國際論壇，總部設於柏林。ICAP 的核心目標是為各司法管轄區提供一個互相學習的平台，支援全球碳交易機制的發展與政策制定，並探討這些機制在實現溫室氣體減量目標中的作用。ICAP 的三大主要支柱包括：知識共享、能力建設與技術研究。透過報告、出版物和訓練課程，ICAP 協助成員提升制度設計與實施能力，並深入探討 ETS 等機制的設計與效能。

(一)全球趨勢與現況

ETS 制度正在全球穩步擴展，特別在新興國家如巴西和土耳其。制度設計也日趨多元，從傳統的「總量管制與交易」（cap-and-trade）模式，轉向更具彈性的「排放強度型設計」（intensity-based schemes），並開始整合碳額度（offsets）和碳稅（taxes）等工具。

目前全球共有 38 個 ETS 制度正在運作，涵蓋全球近三分之一的人口與 58%的 GDP。實施 ETS 的密集區域包括歐洲、北美、中美洲及亞洲部分地區。歐盟、英國與韓國的 ETS 制度發展較為成熟，而印度與越南

等國家則處於開發或評估階段。臺灣也被 ICAP 列入觀測範圍。自 2005 年歐盟 ETS 實施以來，新的 ETS 機制數量與涵蓋的排放量持續增長，尤其在 2019 年後增長更加顯著。

(二) 產業涵蓋與收入

大多數 ETS 制度主要涵蓋工業與電力部門。部分制度也擴展至建築、交通與廢棄物等領域，但目前尚未有涵蓋農業生物源排放的制度。ETS 帶來的收入逐年成長，特別是自 2008 年以來，並在 2020 年代快速上升。這些收入主要來自歐盟、德國與英國，約占總收入的四分之三。然而，由於碳權價格下降，2023 至 2024 年間部分制度的收入有所下滑。

(三) 碳抵換機制

各國對碳額度（亦稱碳權）的抵換使用規定不同。例如，歐盟與英國等地完全不允許使用抵換機制。加拿大、美國與韓國等國家則允許部分使用，並設有比例與類型限制，通常偏好國內抵換（domestic only）。部分制度允許最多 5%的碳額度來自抵換來源，但前提是這些抵換必須符合嚴格的標準。

(四) 自願性碳市場(VCM)與數位解決方案的潛力

自願性碳市場(VCM)是一個企業和組織自願購買碳信用以抵消自身排放或支持氣候行動的市場。然而，目前的 VCM 面臨價格下滑、市場波動與可信度不足等問題。部分以自然解決方案為主的碳額度存在監管

風險，影響了企業的參與意願。此外，多數現行 VCM 標準（如 Verra 的 VCS、Gold Standard、Climate Action Reserve）主要聚焦於林業、廢棄物與農業等領域，尚未涵蓋數位減碳貢獻的量測方法與核證機制。

本次環境部亦邀請全球永續倡議組織(GeSI)介紹數位碳交易的發展。GeSI 是一個全球性聯盟組織，專注於永續發展與數位科技交匯議題。GeSI 彙集了超過百個政府與私部門夥伴，致力於推動「數位賦能」以促進各部門的減碳效率。GeSI 認為數位科技能夠驅動能源、農業、水資源管理、運輸等領域的轉型，從而實現減量目標。GeSI 與聯合國氣候變遷綱要公約(UNFCCC)、歐盟執委會及歐洲綠色數位聯盟等組織合作，共同推動數位減碳策略。GeSI 在臺灣也與電子電機工業同業公會等產業組織建立連結，其成員涵蓋多家科技與通訊大廠，並延伸至能源、水務與食品企業，共同聚焦數位科技在永續領域的貢獻。

(一)數位科技的巨大減碳潛力

根據 GeSI 的研究報告（如 Smart 2020、2012、2015 年報告），數位解決方案有望在 2030 年協助全球減少約 20%的碳排放量（約 12 億噸二氧化碳當量），這相當於將全球碳排放量維持在 2015 年的水準。這不僅創造了每年一個中國大陸 GDP 等值的商業機會(其中 6 成可轉化為企業直接收入，5 成則為供應鏈效益)，更顯示數位科技具有超過 10 兆美元的減量潛力。

除了碳排放減少，ICT(資訊與通訊技術)還能帶來額外的環境效益，例如節省數十億桶石油、減少數億輛汽車的使用、節省數百兆公升水，並增加智慧農業的作物產量。預計到 2030 年，ICT 還能連接 25 億此前未連網的人口，使更多人能夠享受到遠距醫療和線上學習服務。ICT 有望帶來超過 6 兆美元的新收入和近 5 兆美元的成本節約，其中 2.3 兆美元來自能源效率的提升。綜合來看，ICT 在 2030 年產生的效益（減少的碳排放量）預計將是其自身排放量的 9.7 倍。

近期研究更指出，人工智慧(AI)和數位解決方案有望在 2030 年前幫助全球減少 5-10%的溫室氣體排放，這相當於歐盟一年的總排放量。能源、工業、交通和農業是 AI 驅動減排的最大潛力領域。例如，在歐洲，AI 可以將大型建築的能源效率提高 20-40%，直接減少排放。生成式 AI 甚至有望在十年內為歐洲經濟增加 1.2 兆歐元，同時支持氣候目標。然而，要充分實現這些潛力，需要政策支持、數位基礎設施投資、開放數據和跨部門合作。同

時，必須確保 AI 的部署是能源高效的，以最大化其淨減排效益。

(二)數位自願性碳市場(Digital-VCM)方案

為了解決現有 VCM 的問題並釋放數位科技的潛力，GeSI 提出了「數位 VCM」方案。其核心目標是建立一個以「淨正面影響」（Net Positive Impact）為前提的機制，將碳交易與數位解決方案的實際貢獻緊密連結。此方案需具備可信度與一致性原則，並符合聯合國及歐盟倡議的標準方法。數位 VCM 強調即時驗證、透明度與創新性，涵蓋從專案開發、測量驗證、碳額度發行到交易註冊的全流程。

在實務上，數位 VCM 的買方可能是 Shell、Microsoft、ENGIE 等企業或政府，而賣方則是提供數位解決方案與專案開發的科技公司。其運作模式聚焦於數位技術如何精準測量與追蹤排放減量，建立高可信度的減量貢獻證據，並鼓勵更多開發者投入此領域。此市場的獨特之處在於：

1. 獎勵技術解決方案的開發者：與現有 VCM 不同，數位 VCM 旨在為創新技術創造一個自願性市場，讓技術開發者能透過其所部署的解決方案所帶來的「避免排放」效益或「淨正面影響」獲得實際收益。這將產生進一步的誘因，鼓勵數位解決方案的開發、應用和推廣，從而實現額外的減排效益。
2. 以「淨正面影響」而非單純「避免排放」為核心：GDC 開發的方法論更著重於技術的「淨正面影響」。在計算時，會同時考量解決方案在供應鏈中可能產生的排放（負面影響），以及該解決方案在特定環境中應用所帶來的效益（正面影響），最終計算的是兩者相抵後的淨效益。這與日本的「避免排放」方法論相似，但 GDC 的方法專為數位產業設計，並已納入國際電信聯盟(ITU)的全球數位標準。
3. 高度的透明度與可信度：數位 VCM 運用了歐洲綠色數位聯盟(EGDC)的標準化、科學化方法學來量化 ICT 解決方案的淨碳影響，並建立碳信用。這包括嚴格的專案驗證流程、基線設定、影響計算、不確定性分析和關鍵審查，確保碳信用的高品質和可信度。該方法學與歐盟分類法規（EU Taxonomy）標準保持一致。
4. 解決範疇三(Scope 3)排放問題：數位解決方案能更準確地測量和報告其在供應鏈中實現的排放減少，提供更精確的範疇三影響全貌。透過允許供應商聲稱碳信用，這個 VCM 鼓勵開發和部署更有效的數位減排解決方案。人工智慧技術的發展預計能收集更多數據，進一步提高範疇三計

算的透明度和可信度。

5. 機制託管與平台運作：此機制將獨立於現有的 Verra 或 Gold Standard 等標準。整項工作應納入聯合國氣候變遷綱要公約(UNFCCC)的環境框架內。UNFCCC 已要求開發一個數位平台作為數位解決方案的市場，這與自願性碳市場不同但互補。全球創新中心(UN GIH)有望提供一個類似的平台推動此機制，進入 UNFCCC 全球創新中心的解決方案，將帶有 EGDC 方法論的「印記」，確保其嚴謹性和可信度。

總體而言，GeSI 的倡議將數位科技視為尚未被充分認識但具有巨大潛力的氣候行動工具，並主張建立一套專屬於數位減碳的自願性碳市場，以釋放其在全球減碳中的關鍵作用與經濟效益。減排責任將歸於技術開發者，因為他們是從這些解決方案產生的碳信用中受益的一方。

九、碳交易制度案例：韓國 ETS (K-ETS)的挑戰與調整

碳排放交易系統（ETS）的基本概念源自歐盟 ETS，其最初設計是為了在電力市場自由化後推動脫碳。然而，隨著越來越多國家導入 ETS，其電力市場結構卻不盡相同，例如部分國家仍為非自由化市場、存在單一企業壟斷或容量市場等情況。這些差異可能導致 ETS 無法充分發揮其預期的成本傳導作用。因此，設計 ETS 時，需要深入理解特定市場結構與目標需求，並評估其碳價格在發電端、系統營運商與下游售電行為者等不同階段的適用性，以確保制度能有效傳導碳價訊號。

(一)韓國 K-ETS 的特點與挑戰

韓國的 K-ETS 被視為一個具代表性的制度調整案例，展示了 ETS 如何因應特定國情進行運作。K-ETS 涵蓋了電力、工業、建築、交通、航空、海運與農業等部門，覆蓋約 80%的韓國溫室氣體排放量（若僅計直接排放則為 72%），是韓國氣候政策的重要支柱。

然而，K-ETS 也面臨多項核心挑戰：

- 電力市場非自由化：由於電力市場非自由化，難以將碳價直接反映至消費者電價，削弱了其價格傳導機制。
- 再生能源推動障礙：韓國在推動再生能源方面面臨生產容量受限與離岸風電等高成本投資障礙，影響了投資誘因。

- 制度設計缺陷：K-ETS 目前仍以大量免費碳額度為主，拍賣比重低，導致碳價偏低。相較於歐洲，韓國的碳價較低，市場活躍度也有限。儘管允許使用國際碳額度，但相關規則尚未完備。

- 排放量未顯著下降：K-ETS 自 2015 年啟動以來，尚未顯著觀察到排放量下降的趨勢，朝向 2050 年淨零排放目標的挑戰依然巨大。

- 政治與社會壓力：南韓面臨巨大的政治和社會挑戰，民眾對便宜電價的預期根深蒂固，導致政府在說服人民接受電價上漲方面展現的政治意願較低。歐盟也曾有類似情況，但透過加入氣候基金政策，減輕氣候政策衝擊，並為低收入戶提供設備或電價優惠。

- 電力市場法規：韓國電力價格受到政府調控，導致零售端價格難以直接反映 ETS 市場價格。政府需要創造足夠的誘因，鼓勵開發商投資風力發電等再生能源。

(二)韓國的應對措施與經驗啟示

面對這些挑戰，韓國提出多項應對措施，包括：將熱電與熱力供應的間接排放納入管制範圍；增加拍賣比重以提升碳價；引入氣候調度與氣候附加費，鼓勵再生能源優先併網並調整用電價格。此外，韓國也研議導入價差合約（CfDs）機制，以保障一定的碳價，穩定投資回報，特別是針對碳成本較高的離岸風電等項目。

韓國的經驗顯示，ETS 設計應依據各國國情進行彈性調整，無法採一體適用的標準模式。K-ETS 的推動過程展現了從因應特定背景出發，逐步導入變革與政策工具的彈性。這也強調了 ICAP 等國際合作平台的重要性，有助於促進各司法管轄區之間的學習與互助。

雖然韓國電價沒有直接上漲，但政府會透過環境附加費等工具間接傳遞價格訊號。部分家戶的電價確實有所上漲，但不能直接歸因於 ETS 造成的直接結果。相對而言，德國的 ETS 則會提供補償，例如為弱勢群體提供暖氣補貼。

在碳抵換方面，韓國允許來自國內外（目前可抵銷排放量的 5%）的碳抵消，也鼓勵不涵蓋在 ETS 範圍內的產業進行投資。然而，若允許外部碳抵消，需要留意如何管理，避免企業大量購買碳額度以規避減碳責任，導致難以觀察到實際減量成果。因此，開放時應搭配嚴格的資格審查。

此外，針對「排放強度型設計」（intensity-based schemes）制度，開

發中國家如印度、越南、土耳其正在開發此類政策。已開發國家如美國科羅拉多州、加拿大聯邦 ETS 及中國，亦將其納入電力密集度的考量。強度型制度通常是政策組合之一而非單一政策，通常搭配碳稅、目標價格等工具，目的在於達成減碳目標或吸引投資者。

參、參訪及歐洲能源交易所(EEX)

一、參訪 EUREF-Campus

本次赴德參訪特別安排造訪位於柏林舒恩貝格區的 EUREF-Campus 園區，該園區為德國能源轉型與永續城市政策的重要展示場域，聚焦能源、智慧城市與永續交通等主題。透過本次參訪，學習德國如何透過制度設計與企業支持機制，推動本土能源新創產業，有助於我國未來在能源轉型政策及產業創新發展上的規劃與參考。

EUREF-Campus 自 2008 年啟動以來，已發展為歐洲獨樹一格的「未來城市實驗場」，聚集超過 150 家企業、研究機構及新創公司，約 7,000 名人員在此工作、研究與學習。

(一)園區主要功能與特色

1. 提前實現氣候目標：自 2014 年起即達成德國聯邦政府設定於 2045 年達成的碳減量目標，展現其高效永續的發展實力。
2. 多元產業聚落：涵蓋能源科技、智慧交通、永續建築等產業領域，並透過企業、研究機構與大學合作，推動創新方案落地。
3. 再生能源應用：園區積極導入風能、太陽能與生質氣等再生能源，並透過熱電共生與智慧調度系統實現低碳營運。
4. 智慧電網系統：設有 Micro Smart Grid 微型智慧電網，搭配數位化控制平台，實現能源即時監控與高效整合，為企業提供導入多元能源策略的寶貴經驗。
5. 創新交流平台：園區內經常舉辦論壇、展覽與創意活動，強化跨界合作、鼓勵創新實作，形成良性創新生態圈。
6. 教育與實作場域：不僅提供產業創新空間，更設有國際學分課程與氣候變遷教育資源，為歐洲培育綠色人才重鎮。
7. 歷史建築再利用：園區圍繞歷史悠久的煤氣塔建設，融合文化遺產與現代科技，體現永續理念與地方特色。

(二)重點觀察

1. 實體化創新展示與創意生態圈建構

EUREF-Campus 特別強調將節能減碳構想「實體化」，建立創新技術的示範展示環境，不僅讓參訪者得以親身見證新創技術效益，也有助於新創方案驗證與市場推廣，形成創新、測試、再創新的正向循環。

- 園區內設有多項節能設施：太陽能板、風力發電、沼氣發電設備、智慧電網、電動車充電樁與智慧交通系統等，皆為新創技術的實地應用展示。
- 匯聚國際企業與新創能量：包括 Cisco、Alphabet、施耐德電氣等國際企業皆進駐園區，與新創公司及大學共同合作、研發並推廣節能創新解決方案。
- 定期舉辦交流活動：透過論壇、工作坊與「氣候黑客松」等活動，鼓勵創意提出並推動可行計畫的實體化。

2. 國際化教育課程與永續人才培育

EUREF-Campus 同時發展為全球節能減碳教育中心，與歐洲多所大學合作推動國際學分課程，並結合園區內部專案，提供學生實作與參與機會。

- 與 Climate-KIC（歐盟氣候創新社群）合作，開設永續發展、能源管理、碳盤查等課程，吸引國際學生參與。
- 學生可直接參與園區創新專案，學習新技術開發流程，增進實務經驗。
- 提供線上課程與資源，擴大教育觸及面，提升全球氣候知識普及。
- 學程強調產學合作，提供就業與實習機會，為未來投入綠色經濟做好準備。

該模式展現教育與產業結合的典範，值得我國在發展綠色產業人才培育時作為借鏡。

二、見證碳權交易所與 EEX 簽署 MOU

歐盟是全球最早實施 ETS 的區域，具備完整的法規體系與制度架構，是各國推動 ETS 制度的重要參考標的。EEX 則是 EU ETS 指定的主要碳排放配額拍賣平台之一。

我國未來 ETS 制度的推動，將由環境部主責建立法規體系與制度架構，並由臺灣碳權交易所（碳交所）負責執行配額交易等相關事務。為此，環境部亦將與金管會、經濟部等部會展開跨部會合作，加速完善

法規環境，全力支持碳交所業務發展。

2024 年 6 月 27 日，碳交所與 EEX 於德國萊比錫正式簽署合作備忘錄（MOU）。簽署儀式由駐德代表謝志偉大使、環境部部長彭啓明、政務次長施文真、氣候變遷署副署長張根穆，以及金融監督管理委員會代表、金融市場發展與創新處處長胡則華等人共同見證。

代表團亦與 EEX 交流，了解其運作機制。未來，EEX 將分享其受託執行 EU ETS 的豐富經驗，與我國資源共享，提供相關教育訓練課程，協助臺灣建構碳交易市場平台及相關能力。

此次碳交所與 EEX 簽署 MOU，旨在借重其協助其他國家建置 ETS 制度的成功經驗，涵蓋人才培訓、平台設計及未來營運等面向。尤其在「巴黎協定」第六條通過後，全球將朝向單一碳市場的整合趨勢發展，碳交所與 EEX 的合作更加重要且迫切。

碳交所田總經理指出，EEX 已完成與瑞士 ETS 市場的連結，並規劃進一步與英國 ETS 鏈接。結合周邊國家推動碳市場體系的發展，已成為區域合作的趨勢。目前日本、韓國已建立或積極推動本國 ETS，有鑑於 EEX 在國際合作方面的豐富經驗，將有助於我國未來拓展與其他碳市場的連結，進而為達成 2050 年淨零排放目標鋪路。

EEX 執行長 Peter Reitz 在簽約儀式中強調，全球碳排放交易機制對推動去碳化與能源轉型具有關鍵作用。EEX 樂於分享其制度設計與營運的深厚經驗，協助新興制度建立，攜手推進全球碳定價與碳交易市場的發展。

環境部目前規劃於 2026 年啟動 ETS 試行階段，並預計於 2027 至 2028 年推動 ETS 正式制度，與碳費制度雙軌並行。本次碳交所與 EEX 簽署 MOU，不僅象徵臺德雙方在碳定價制度建構上的深度合作，也期望藉助 EEX 協助，建立穩健透明的碳排放交易平台，為未來 ETS 制度的試行與正式推動奠定堅實基礎。

參、心得與建議

一、兼顧減碳與產業競爭，評估以強度為基礎 ETS 之可行性

本次出國參訪期間研讀 ICAP 發布的國際趨勢報告，筆者觀察到全球越來越多新興市場的碳交易制度，係採用以強度為基礎的碳目標設計（intensity-based system），即依據單位產值或產量的碳排放表現進行控管，而非僅以絕對總量（absolute cap）作為唯一標準。這樣的制度設計，反映出這些國家在推動碳定價與產業發展之間，嘗試尋找更具彈性的平衡機制。

以我國半導體產業為例，未來在面對國際晶片需求持續成長的情況下，即使業者透過製程改善與再生能源之使用，有效降低單位碳排放量，但因整體產量增加所導致的總排放，仍可能突破絕對排放上限，造成產業推動減碳過程的壓力與困難。

因此，建議我國在設計 ETS 時，可評估是否對特定產業（如高技術、高出口依賴產業）採用強度為基礎之系統，或納入與絕對總量制度相結合或價格區間的混合型制度（hybrid system），以提高制度彈性並兼顧產業競爭力。然而，強度型或混合型制度在實務上亦存在挑戰，包括監理複雜度上升、需要更精準的數據盤查與產出統計，以及整體碳排總量較難預測或控制等問題。因此，建議環境部在政策研擬過程中，進一步評估相關制度選項

的優劣，並廣泛蒐集利害關係人的意見，確保碳定價機制在推動淨零轉型的同時，也能符合我國產業結構與發展需求。

二、將 ETS 視為政策工具而非營利機制

依據 EU ETS 的推動經驗，其在制度初期主要僅有現貨碳權拍賣，交易量相對有限，實際納管設施約 1,700 個，參與交易人數僅約 110 位，真正產生大量交易與流動性的部分是在期貨及期貨選擇權市場，其交易量遠超過現貨市場十倍以上。此情況顯示，在碳市場推動初期，碳交所可能因產品種類與參與者基礎尚未成熟而難以快速達到自償營運。

從 EU ETS 的經驗可知，碳交易所初期的核心任務不在於追求盈餘，而是扮演政策工具的角色，專注於價格發現、制度建構與市場培育。我國碳市場目前仍處於早期建置階段，預計於 2026 年試行、2027 年正式上路，相較於歐盟當年已具備完善產業碳排數據與市場機制的背景，我國在制度發展上仍需循序漸進。

因此，建議政府在推動碳市場發展時，應將其定位為協助產業轉型的政策工具，而非短期內必須獲利的商業機構。可考慮透過小規模試作，逐步擴大涵蓋產業範圍、參與家數及交易對象，並審慎評估是否納入金融商品。同時，應提前規劃中長期發展路徑，如是否引入期貨、期權等衍生性商品，並建立相應的金融監理、風險管理與教育宣導機制。另可研議階段性支持措施，協助碳交易所穩定營運，逐步培養其商業模式與產品創新能力，邁向永續發展。

三、ETS 推動前應研議之關鍵項目

我國未來推動 ETS 時，建議可預先就以下重點政策議題進行研議與制度設計，以利碳交所的運作與整體碳市場穩定發展：

(一) 碳權抵換來源與標準之設定

許多國家建置 ETS 時亦討論是否允許自願減量市場（VCM）或國際碳權納入抵換，此將涉及市場供需、碳價穩定等因素，建議若需納入，宜清楚界定可接受的碳權標準、驗證機制與交易規則，並審慎防範常見風險，如雙重計入（double counting）、減量成效不明、品質差異等問題。

(二) 涵蓋產業範圍之策略規劃

初期是否納入排放強度高且減碳困難的產業（如水泥、鋼鐵、航空等），

除考量監理成本及產業轉型能力外，亦需評估行政可行性。建議或可採分階段納管策略，並輔以其他工具（如技術補助、轉型基金），以利順利導入 ETS。

(三) 市場穩定儲備機制（MSR）之制度設計

歐盟經驗顯示，MSR 可協助抑制碳價過度波動、維持市場信心。我國如擬導入，建議自制度初期即設計啟動條件、配額存入與釋出機制，並研議由何種機構執行管理。MSR 調控參數可參考歐盟作法，設計拍賣量、配額累積量或與市場供應過剩程度連動的標準。

(四) 免費配額與產業補貼機制之設計

針對高碳密集或具國際競爭壓力之產業，是否給予免費配額或補貼，及其退場時程，應兼顧公平性與誘因設計。建議引入明確評估標準，例如依產業歷史排放量、排放強度或產值比，配合產業減碳改善表現，逐步調整配額分配方式，避免造成碳洩漏（carbon leakage）或削弱減碳動機。

(五) 市場中介機構與金融監理安排

若未來碳市場將發展期貨、選擇權等衍生性金融商品，建議初期即規劃金融機構作為中介機構的角色與參與條件。可參考歐盟後期發展經驗，限制由受監理之金融機構擔任中介者，以提升交易安全、流動性與價格發現機能。同時，本會亦應研議是否需調整相關規範與監理框架，確保金融機構可順利參與。

附錄：簡報

Umwelt Bundesamt

DEHSt
Deutsche Emissionshandelsstelle

Taiwan Study Visit to Berlin
24th and 25th June 2025

Umwelt Bundesamt

DEHSt
Deutsche Emissionshandelsstelle

Early preparations for establishing the EU ETS

Karin Fritz

Section V 2.4 – Legal Department

Berlin, 24th June 2025

Overview

- EU ETS – legislation/ Stakeholders involvement
- Installations covered/Where to settle the task/Roles of Ministry
- Structural questions/ What kind of professionals/ Calculation of expenses (example)
- E-governance/ Outsourcing tasks/Examples

EU ETS Legislation/Stakeholder Involvement

- ETS Legislation EU-Germany: process of several years of intense discussion (in force in 2003)
- Stakeholder Consultation > ongoing, started 4 years before start of EU ETS (2000) and
- Stakeholder Information > ongoing

Stakeholder consultation in Germany („soft law“)

Stakeholders: operators, verifiers, authorities, legal offices

- since 2000: Working group under chair of ministry
- with all relevant participants (sub-working groups)
- financed by German government and German industry
- Meetings: Once per month, annual reports

➢ permanent consultation process
to all aspect of EU ETS
goes into legislation process

Stakeholder information in Germany (through DEHSt)

- Implementation workshops for stakeholders:
  12 Workshops for 4th Trading period in 2019 and 2020, ongoing for all new tasks
- Updated webpage with necessary information in German and English
- Operators can contact the customer service (Mon-Fr)
- Publication of guidelines and FAQs
- Information via Newsletter
- Electronic Communication, procedures, templates
  (e-government from 2003 on)
- Client-orientation of DEHSt

Installations covered/Where to settle the task

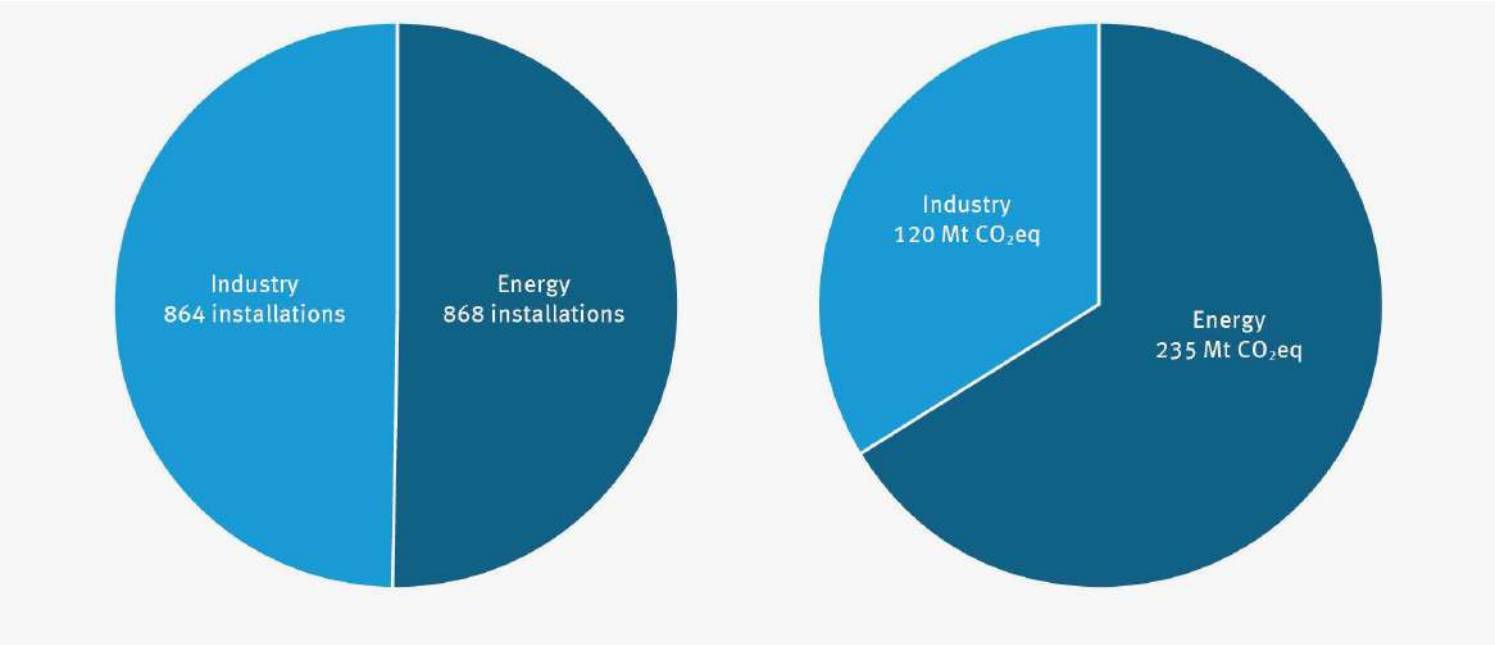
- How many and what kind of installations are included
- Energy/Industry
- Where to settle the task/Roles of Ministry

How many installations are included?

Sectors, size, emissions

- 1700 installations in Germany , >20 MW (in some cases production capacity), CO2 Emissions
- Nitrious oxides from 2013 on included
- Sectors: Power and heat generation, oil refineries, steel works, production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard
- Acids and bulk organic chemicals were added in 2018.

Installations and Emissions under German regime in 2023



Source: DEHSt, As of: May 2024

Where to settle the new task I

- Generally, the Federal States (Länder) are responsible for enforcing environmental law. However, the German Emissions Trading Authority (DEHSt) was founded on the federal level in 2003 to enforce the EU ETS.
- This **division of tasks was controversial in the beginning of the EU ETS,** but Germany wanted to centralise the enforcement. This turned out to be reasonable because of the **equal treatment of facilities.**

- A private –public entity was not considered because we have the principal structures for enforcement of laws in various federal agencies already (altogether 120 FAs, e.g. the UBA). Also the task is „sovereign“ and was considered so important (and extensive) that the governement wanted to have the enforcement „close-by“.

- The Ministries in Germany are per law only in exceptional cases responsible for enforcement tasks (e.g. high political meaning). However this is different in other countries and might be manageable as well.

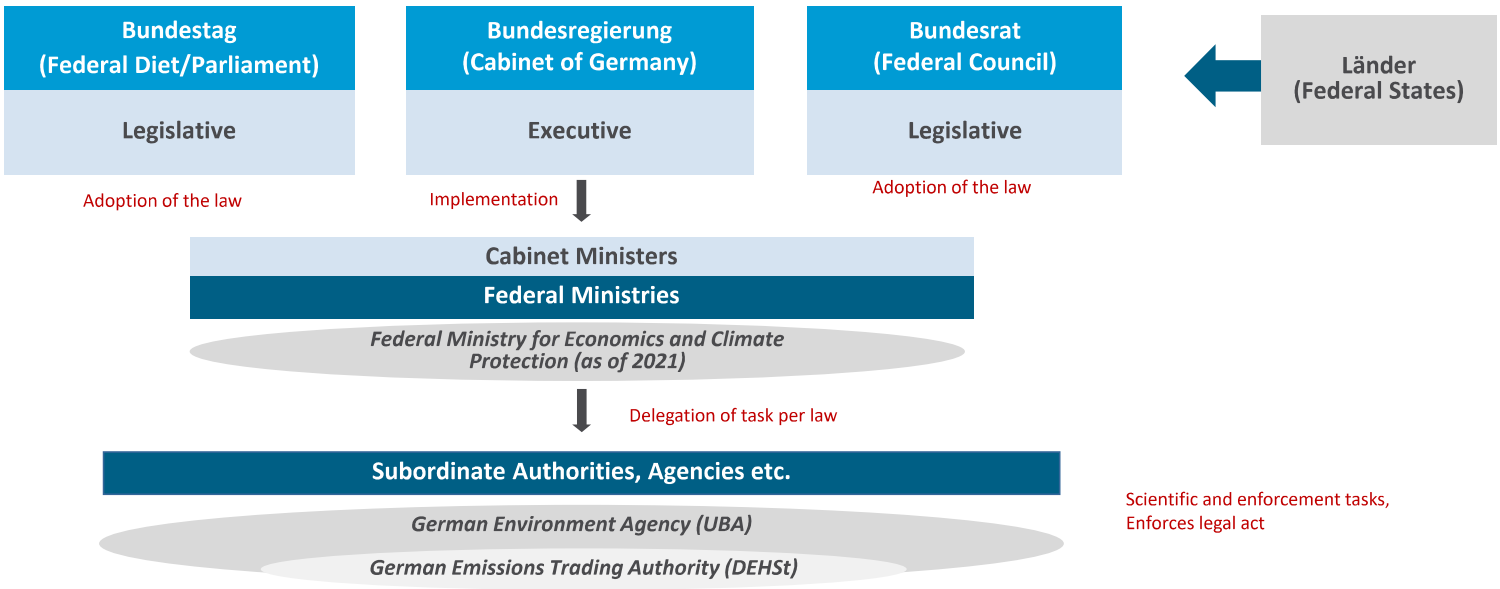
Where to settle the new task II

- After that decision, UBA was asked by the Ministry of Environment to set up a new division (DEHSt) for the EU ETS.

- The UBA/DEHSt is independent with the actual enforcement from the Ministry. However, there is a legal and functional supervision by the Ministry (= „appropriate action“ has to be supervised, comprises e.g. instructions for information or the set up of new units) Common practice shows a good cooperation without actual control.

- Jour fixe every 6 weeks with the involved colleagues: All current questions/problems/tasks are discussed. A direct order is possible, but was very rarely placed in the past.

Roles of Ministry and subordinate Agencies



Source: BMU

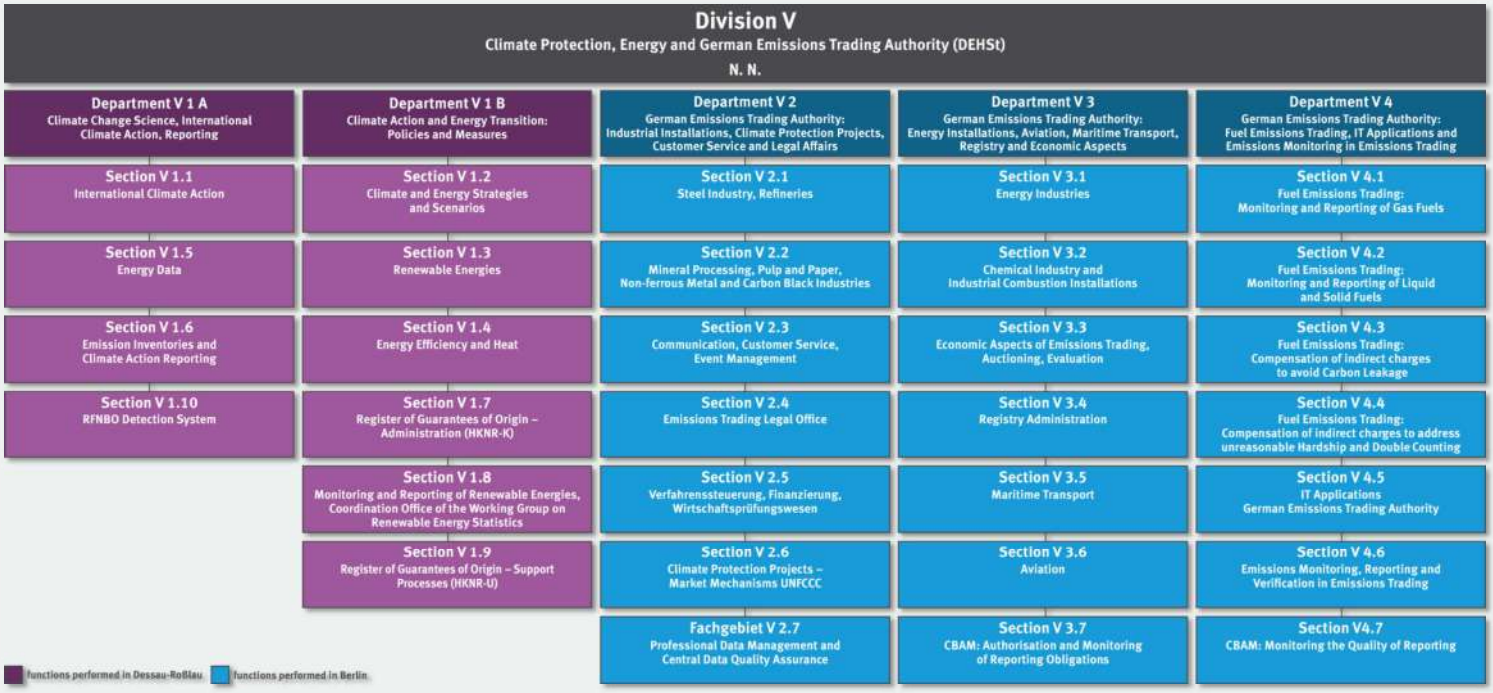
Structural questions

- How many units/divisions
- What kind of professionals
- Calculation of expenses (example)

Structural Questions

- Energy sector : 2 units
- Industry sector: 2 units
- Communication unit
- Legal unit
- IT unit (e –governance decision)
- Finance and administration procedures unit
- Registry unit
- Auctioning and economic aspects unit
- Later: aviation, maritime units, CDM, currently 2 CBAM units
- > altogether now 3 departments, financed by revenues of EU ETS

Division V



What kind of professionals and how many do we need?

- Every sector mirrors at least one professional employee
- Compliance cycle and number of installations account for estimation of employees
- We started with 100 employees (now around 250)
- Professions in DEHSt (e.g.): chemist, biologist, environmental engineer, ressource manager, mathematician, mechanical engineer, industrial engineer, energy engineer, environmental process engineer, bio pharmacist, lawyer
- Thinking through the process of one installation (compliance cycle):
  - Approval of Monitoring plan (one year before each trading period)
  - Examination of application for certificates (via Templates)
  - Issuance of administrative acts for each applicant/coordination of auctioning
  - Objections and lawsuits against acts – legal departement (up to now 8000 legal proceedings over all trading periods)
  - Examination of certified emissions – annually
  - Enforcement (sanctions)
  - Management of German accounts -Registry

Calculation of expenses

Example of annual tasks for installation engineers

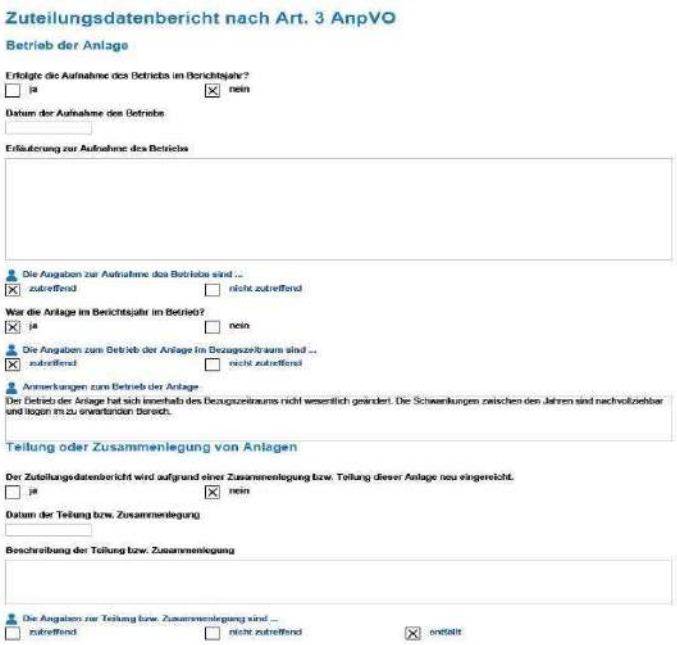
- Calculation of tasks (compliance cycle – 4 annual tasks) x number of installations (1.700) = case count (6.800 processes)
- Expense per process (e.g. examination of certified emissions): 4 -8 hours (average 6 hours)
- 24 hours (all tasks) x 1700 installations = 40.800 personnel hours annually
- 1 personell year = 1.340 personell hours
- = 30 employees (account for expenses depending on annual income levels)

E-governance/ outsourcing tasks

Outsourcing of IT (examples):

1. Process and communication via Templates > development of a tool > FMS (Formular Management System)
   bidding process was short because of framework treaty with Federal government (IT contractors).
   One template takes 3-12 months to develop, depending on complexity of application
   Ongoing task > for every new machanism we need new templates
2. Electronic file management > licence > Domea (existed already)
   now mostly just updates/internal adjustments
3. For both tools external hosts, however our employees also have support (of users) and training tasks

FMS (Formular Management System)



Zuteilungsdatenbericht nach Art. 3 AnpVO

Betrieb der Anlage

Erfolgte die Aufnahme des Betriebs im Berichtsjahr?
☐ ja ☒ nein

Datum der Aufnahme des Betriebs

Erläuterung zur Aufnahme des Betriebs

Die Angaben zur Aufnahme des Betriebs sind ...
☒ zutreffend ☐ nicht zutreffend

War die Anlage im Berichtsjahr im Betrieb?
☒ ja ☐ nein

Die Angaben zum Betrieb der Anlage im Bezugszeitraum sind ...
☒ zutreffend ☐ nicht zutreffend

Anmerkungen zum Betrieb der Anlage
Der Betrieb der Anlage hat sich innerhalb des Bezugszeitraums nicht wesentlich geändert. Die Schwankungen zwischen den Jahren sind nachvollziehbar und liegen im zu erwartenden Bereich.

Teilung oder Zusammenlegung von Anlagen

Der Zuteilungsdatenbericht wird aufgrund einer Zusammenlegung bzw. Teilung dieser Anlage neu eingereicht.
☐ ja ☒ nein

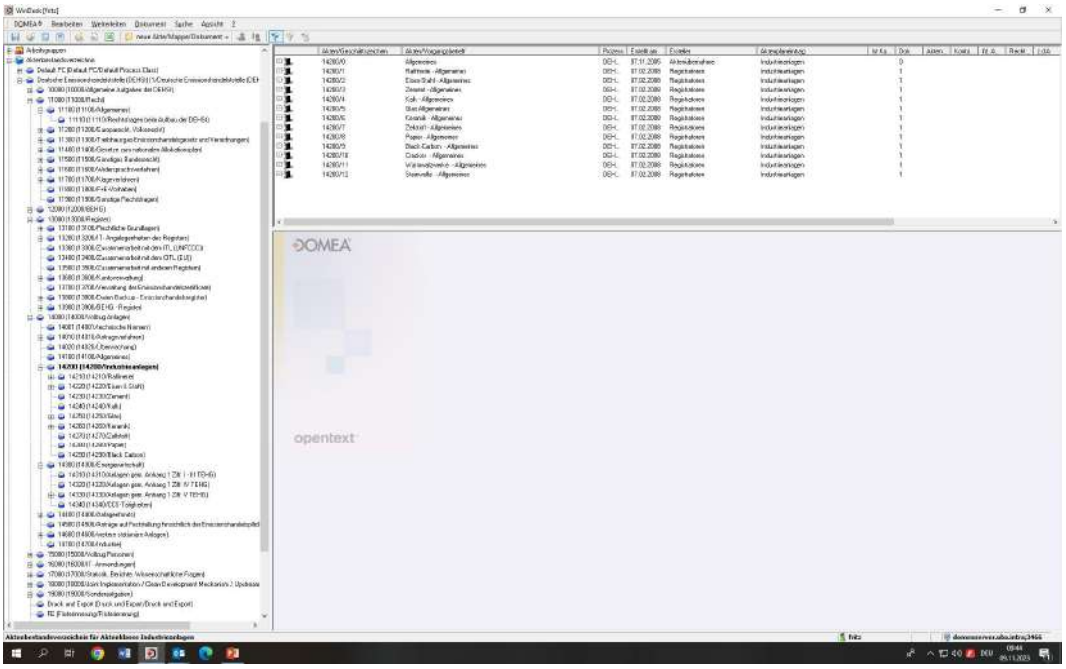
Datum der Teilung bzw. Zusammenlegung

Beschreibung der Teilung bzw. Zusammenlegung

Die Angaben zur Teilung bzw. Zusammenlegung sind ...
☐ zutreffend ☐ nicht zutreffend ☒ entfällt

Allocation data report

Domea



Inventory of files

Thank you for your attention!

Karin Fritz

E-Mail: emissionshandel@dehst.de
Internet: www.dehst.de

Federal Ministry
for Economic Affairs
and Energy

EMISSIONS TRADING SYSTEM
Capacity Building

The EU ETS:
Main elements and latest developments

ETS Training Taiwan, 24 June 2025

Dr. Baran Doda, adelphi

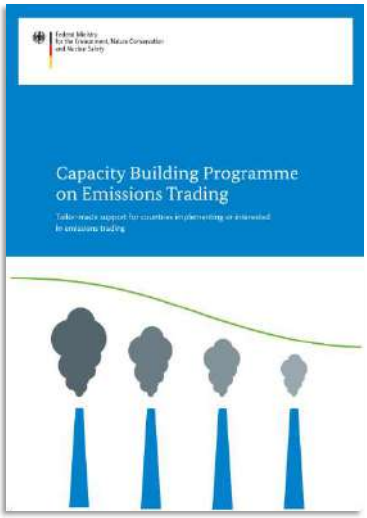
adelphi eco logic :FutureCamp Climate GmbH Öko-Institut e.V. Institut für angewandte Ökologie Institute for Applied Ecology

Federal Ministry
for Economic Affairs
and Energy

EMISSIONS TRADING SYSTEM
Capacity Building

About the Programme (I)

- International dissemination of basic ETS knowledge and best practices supporting selected countries in designing national ETS or installation based MRV.
- Practical experiences from the EU ETS and Germany as a starting point for developing and implementing own ETS.
- Expert consultations on specific issues to support countries during implementation of ETS.
- Phase I (2011-2013); Phase II (2013-2017), Phase III (2018-2022), Phase IV (from 2023)



adelphi eco logic :FutureCamp Climate GmbH Öko-Institut e.V. Institut für angewandte Ökologie Institute for Applied Ecology

About the Programme (II)

Programme by:

Federal Ministry for Economic Affairs and Energy

Division KB II: *„Climate Legislation, Emissions Trading“*

In cooperation with:

Umwelt Bundesamt | DEHSt Deutsche Emissionshandelsstelle

Consortium:

adelphi

eco logic

:FutureCamp Climate GmbH

Öko-Institut e.V. Institut für angewandte Ökologie Institute for Applied Ecology

Partner Programmes:

giz

中欧关系

ICF

SinoCarbon Innovation & Investment Co., Ltd

ClimaEast

Other partners:

eex

icap International Carbon Action Partnership

verico

TÜV SÜD

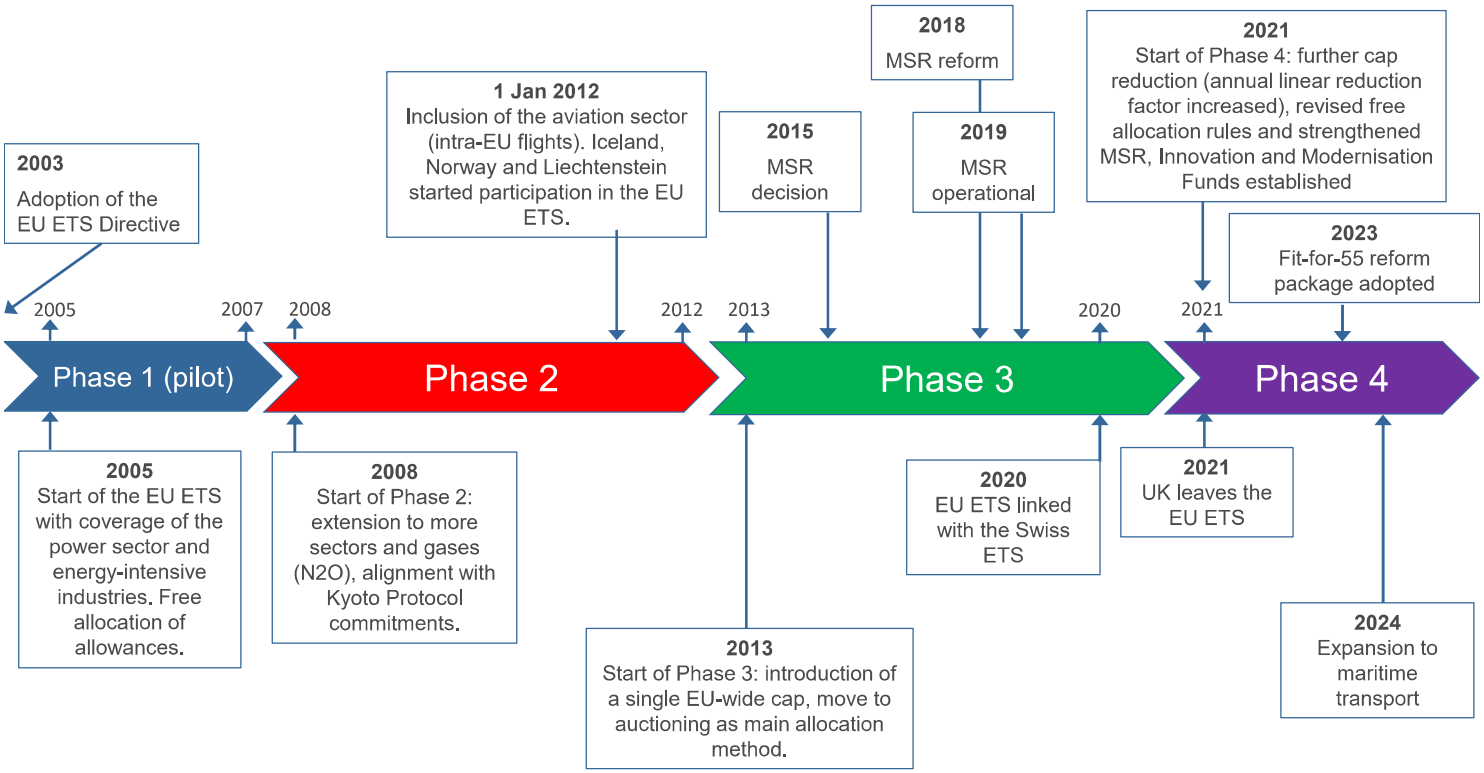
Outline

Federal Ministry for Economic Affairs and Energy

1. Key milestones in the implementation of EU ETS
2. Scope and coverage of EU ETS
3. Cap setting in EU ETS
4. Allocation of EUAs
5. Revenue use in EU ETS
6. Market stability in EU ETS: MSR
7. Linking with other ETSs
8. Reviews and revisions

Key milestones in the implementation of EU ETS

Federal Ministry for Economic Affairs and Climate Action



Scope and coverage in EU ETS (I)

Federal Ministry for Economic Affairs and Energy

Gases

- Initially, the EU ETS focused on CO_2
- N_2O and PFCs from some industrial activities were added in phase III.

Point of regulation

- Downstream

Sectors

- **Energy**: Power and heat generation
- **Industry**: Energy-intensive sectors including oil refineries, coke ovens, iron and steel, aluminium, metals, gypsum, nitric cement, lime, glass, bricks, ceramics, pulp, paper, cardboard, acids, and bulk organic chemicals, petrochemicals, ammonia
- **Civil aviation**: intra-EEA flights
- **Maritime (from 2024)**: large vessels entering EU ports

The EU ETS currently covers 11,000+ installations.

Scope and coverage in EU ETS (II)

Federal Ministry for Economic Affairs and Energy

Thresholds

- **Energy:** 20 MW annual thermal capacity per installation
- **Industry:** Varying thresholds for different sectors; small installations with fewer than 25,000t CO_2/year may be excluded
- **Civil aviation:** 10,000t CO2/year for commercial aircraft operators and 1,000t CO2/year for non-commercial aircraft operators
- **Maritime (from 2024)**: vessels of at least 5,000 gross tonnage (general cargo vessels and off-shore vessels between 400-5,000 gross tonnage will be reviewed for EU ETS inclusion in 2026)

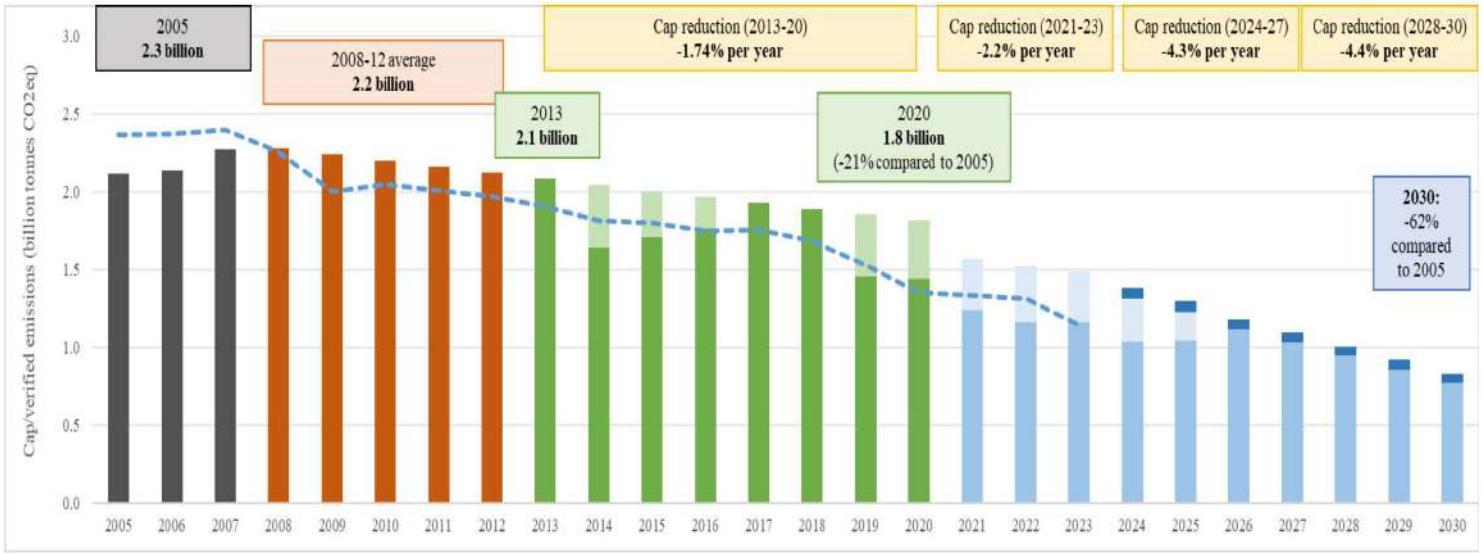
The EU ETS currently covers 11,000+ installations.

Cap-setting in EU ETS

Federal Ministry for Economic Affairs and Energy

EU ETS cap for 2024: **1.386 billion allowances;** inter-EEA aviation emissions capped at **27.6 million allowances**

Maritime transport is covered under the EU ETS cap since 2024. The 2024 cap was increased by 78.4 million allowances based on the sector's average emissions reported for 2018 and 2019 (marked in dark blue).



Allocation of EUAs: auctioning

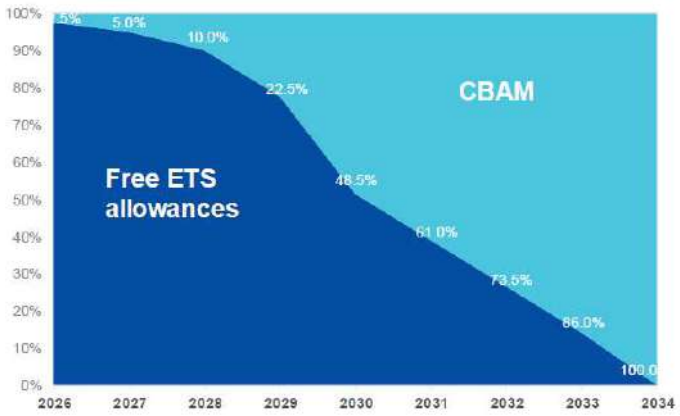
Federal Ministry for Economic Affairs and Energy

- Auctioning is the default method of distributing allowances, accounting for up to 57% of the cap.
- Of the share of allowances to be sold, 90% are distributed to Member States based on their share of verified emissions, with 10% distributed among the lower-income Member States under the solidarity provision.
- Uniform price auctions with single rounds and sealed bids, conducted daily by EEX.

Allocation of EUAs: free allocation & CBAM

Federal Ministry for Economic Affairs and Energy

- A significant volume of allowances is allocated for free to address the risk of carbon leakage, based on sectors-specific performance benchmarks.
- Benchmark values are updated twice in Phase 4 to reflect technological progress in different sectors.
- An annual reduction rate is determined for each benchmark. For the steel sector, which faces high abatement costs and leakage risks, a fixed reduction rate applies.
- Free allocation to specific sectors will be gradually phased out from 2026 to 2034, in parallel to the phase-in of the EU's CBAM for third-country imports.
  - Covered sectios: iron and steel, cement, aluminium, fertilizers and hydrogen.



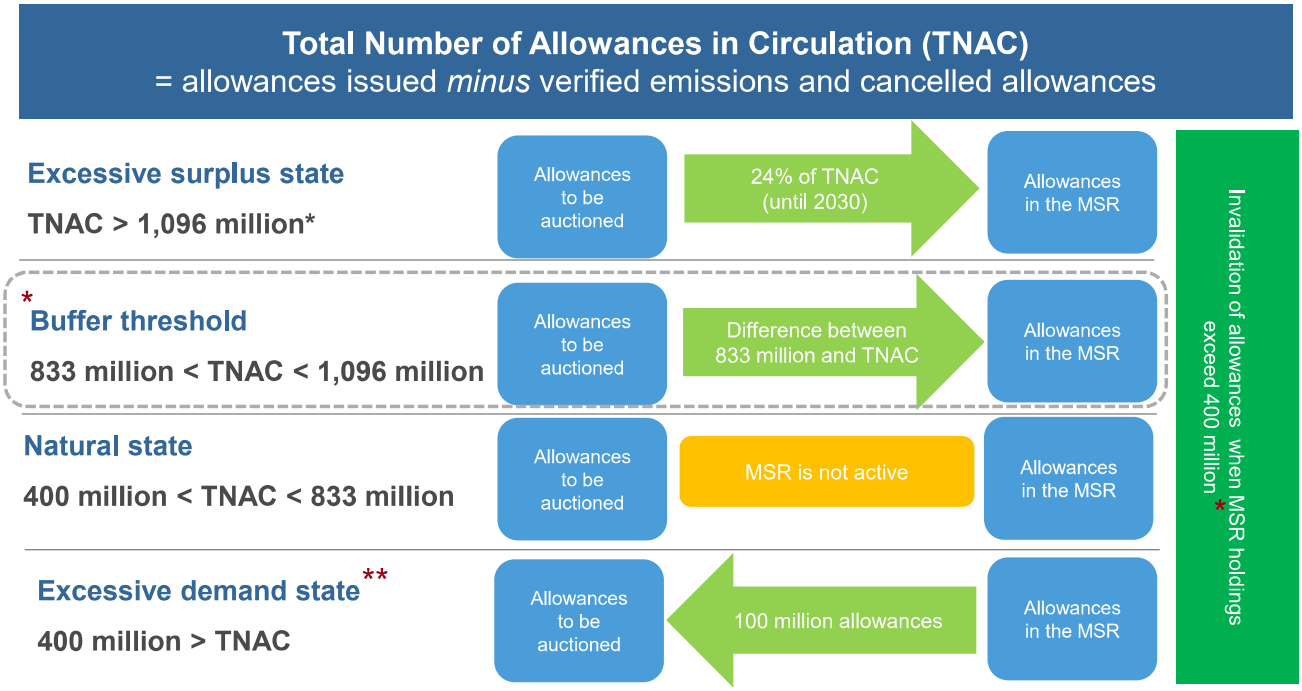
Revenue use in the EU ETS

Federal Ministry for Economic Affairs and Energy

- Revenue from the auctioning of allowances under the EU ETS accrues primarily to national budgets
- As of June 2023, countries are required to use all ETS revenue (or an equivalent financial value) to support climate action and energy transformation
- EU Member States can use their ETS revenue to finance state aid to certain electricity-intensive industries to compensate for the additional electricity costs they face as a result of the carbon price pass through
- A share of EU ETS allowances is auctioned to supply two funds established to support decarbonization and modernisation investments in ETS sectors.
  - **Innovation Fund:** provides grants to support the commercialization of innovative low-carbon technologies and industrial solutions, helping to drive Europe's transition to climate neutrality.
    - Its estimated budget is up to EUR 40 billion (USD 43.3 billion) until 2030, depending on the EUA price.
  - **Modernization Fund:** a solidarity programme financed by the EU ETS that supports lower-income Member States in modernizing energy systems and improving energy efficiency for a just transition to climate neutrality.
    - It has an estimated budget of EUR 56 billion (USD 60.6 billion) from 2021 to 2030, distributed among beneficiary countries based on a fixed allocation key.

EU ETS Market Stability Reserve (MSR)

Federal Ministry for Economic Affairs and Energy



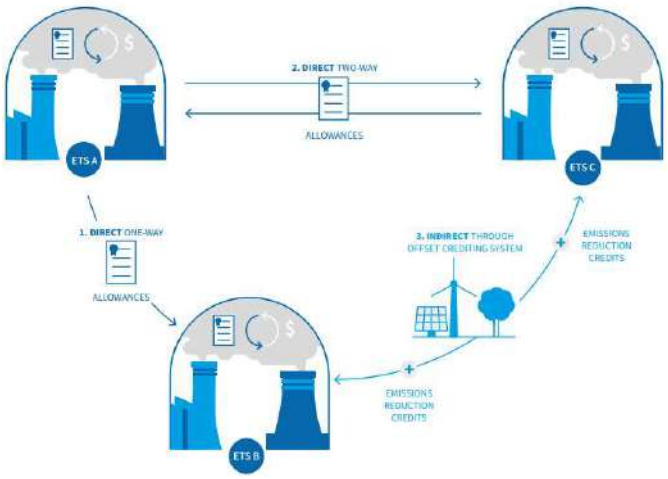
* Changes introduced with the Fit-for-55 legislative package that was adopted in 2023.

Source: Based on PMR & ICAP 2021

** Article 29a also releases allowances from the MSR when certain conditions are met.

Linking EU ETS with other carbon markets

- Linking ETSs enables allowances (and offset credits, where permitted) issued in one jurisdiction to be used cor compliance in another one.
- EU ETS - Norway ETS link in Phases 1 and 2
  - Norway ETS Merged into EU ETS from Phase 4
- EU ETS and Swiss ETS have been linked since 2020.
  - Negotiations
- EU-UK Announcement in May 2025
  - Process to link with UK ETS to start soon



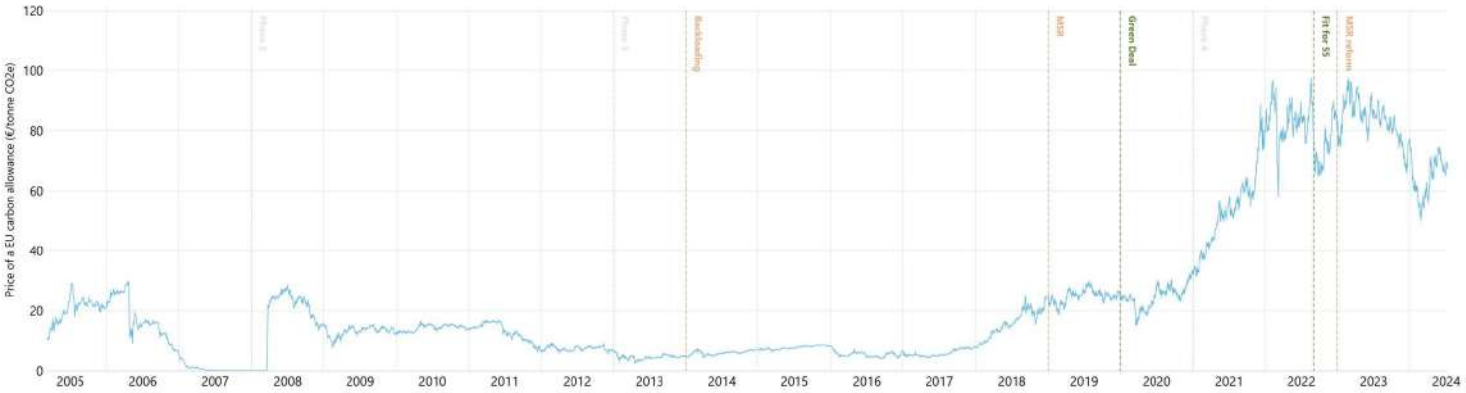
Reviews and revisions of the EU ETS

- EU Commission publishes annual reports on the functioning of the European carbon market
- ETS Directive stipulates that the system is kept under review in light of the implementation of the Paris Agreement and the development of carbon markets in other major economies.
- Three major EU ETS reviews — before Phase 3, before Phase 4, and in the context of increasing the EU 2030 climate target — have been conducted to date.
- Next review is due until July 2026, focusing on MSR, carbon leakage, the integration of negative emissions (removals) and other elements

A final thought: EUA price evolution 2005-2024

Federal Ministry for Economic Affairs and Energy

Figure 1: EU Carbon allowance price evolution



Federal Ministry for Economic Affairs and Energy

For more information please contact:

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Further reading and information

European Commission:
https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en

German Federal Ministry for Economic Affairs and Energy (BMWE):
https://www.bmwk.de/Redaktion/EN/Artikel/Energy/emissions-trading.html

German Emissions Trading Authority (DEHSt):
http://www.dehst.de/EN/Home/home_node.html

International Carbon Action Partnership (ICAP):
https://icapcarbonaction.com/

Components of the EU ETS

GHGs included in the EU ETS:

- Carbon dioxide (CO_2),
- Nitrous Oxide (N_2O)
- Perfluorocarbons (PFC)

Sectors affected by the ETS

Affected sectors:

- Thermal power plants (if capacity of over 20 MW)
- Iron and steel smelting,
- Coking plants, refineries and crackers,
- Cement and lime production,
- Glass, ceramics and brick industries,
- Paper and cellulose production,
- Chemical industry,
- Non-ferrous metals,
- Other incineration,
- Mineral processing industry

BACK UP SLIDES

Components of the EU ETS

Federal Ministry for Economic Affairs and Energy

Cap and allocation of allowances

Since 2013 :

- EU-wide cap and centralized allocation
- From 2021 to 2030, linear reduction factor of total emissions cap of 2.2% per year.
- Auctioning as default allocation method

Allocation rules:

- Auctioning
- Free allocation
- Support of sectors with risk of „carbon leakage“
- Use of CER & ERU
  - ➢ Not possible anymore after 30.4.2021 !

Components of the EU ETS

Federal Ministry for Economic Affairs and Energy

Allocation of Allowances

Allocation of EUA by auction

- increasing amount

Free allocation

- **Free allocation according to the principle of best available technology ("benchmark")**
  - Defined by average performance of the 10% most efficient plants
  - Only energy-intensive plants
- **Carbon leakage prone industry**:
  - From 2021 to 2030: 100% free allocation according to benchmarks
- **Non-carbon leakage prone industry:**
  - 1st allocation period (2021-2025): 30% free allocation according to benchmarks
  - 2nd allocation period (2026-2030): Free allocation decreasing from 30% to 0% by 2030

About to come: CBAM

➔ Phase out of free allocation to covered sectors

➔ From 2026 to 2034: gradually reduced amount of free allocation

Components of the EU ETS

Federal Ministry for Economic Affairs and Energy

Monitoring, Reporting and verification

Monitoring and reporting of GHG Emissions

- Annual submission of reports, recording emissions during the preceding year
- Description of the installation monitored and its performed activities

Object of verification:

- Emissions report based on the approved monitoring plan
- Verification of the monitoring report by an accredited independent authority
- Unless a report has been accepted as satisfactory: no possibility for transfers of allowances

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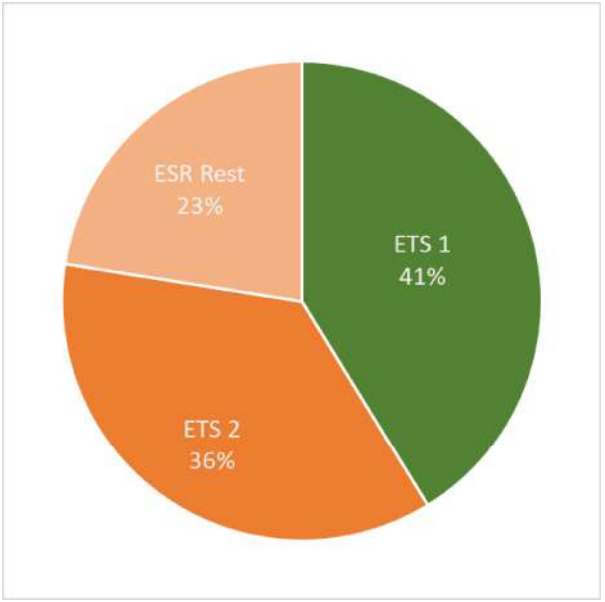
Overview of the new EU ETS 2

Jakob Graichen | Berlin, 24 June 2025 | Workshop for Taiwanese delegation

ETS 2 at a glance

- Timeline
  - Proposed in 2021, adopted in 2023
  - First emission reporting in 2025 (for the year 2024)
  - Start in 2027 (2028 in case of very high energy prices)
- Upstream approach, covered entities are fuel suppliers
- 100% auctioning, no free allocation
- Cap:
  - LRF of 5.1% based on 2024 emissions in ETS2 scope
  - 43% below 2005 until the year 2030
- Opt-in for additional sectors possible
- No interaction with ETS 1

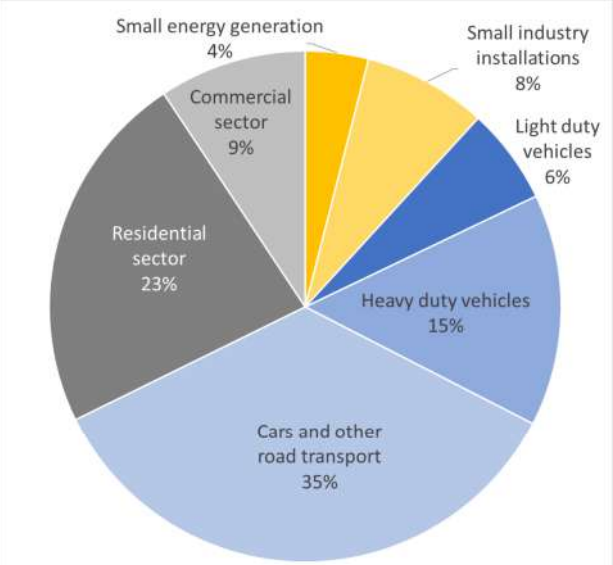
Coverage of emissions by instrument



Values are shown for average emissions 2016 – 2018
Source: https://www.oeko.de/fileadmin/oekodoc/Next-Stop-climate-neutrality.pdf

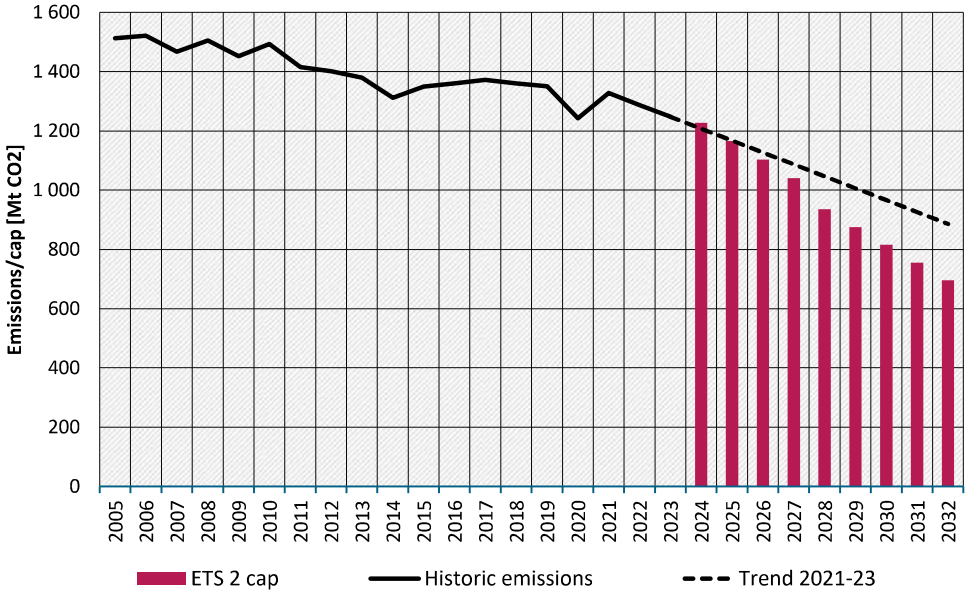
Sectoral coverage

- CO_2 from fuel combustion from
  - Road transport
  - Buildings
  - Small energy and industry installations below 20 MW
- ETS 1 emissions are excluded
- Fossil CO_2 not included in any ETS
  - Peat and Municipal Solid Waste outside of ETS 1
  - Energy use in agriculture
  - Off-road transport (rail, small shipping, small aviation, construction machinery, …)



Values are shown for average emissions 2016 – 2018
Source: https://www.oeko.de/fileadmin/oekodoc/Next-Stop-climate-neutrality.pdf

Historic emissions and the cap



Annual reductions:

- Historic rates:
  - 2005-2021: 11 Mt/yr
  - 2021-2023: 40 Mt/yr
- Cap: 63.5 Mt/yr

Source: Update of https://www.umweltbundesamt.de/publikationen/supply-demand-in-the-ets-2

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Market stability mechanisms

- Quantity control
  - MSR II
    - 600 Mio. allowances on top of cap, expire after 2030
    - Same mechanism as MSR I, thresholds 440/210 Mio allowances
  - Frontloading (+30% in first year, deducted over 2029-31)
- Price containment mechanism Art. 30(h)
  - Max one per year, three different triggers
  - Price > 45 EUR_{2020}): +20 Mio from MSR II
  - Very fast doubling of price: +50 Mio from MSR II
  - Very fast tripling of price: +150 Mio from MSR II
- Limited political intervention
  - COM and MS can trigger Art. 30(h) a second time per year if price >45 EUR_{2020}

Cap 2027 – 2030:
≈ 4 000 Mio allowances

Foto: https://pxhere.com/en/photo/606080

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Expected CO_2 price in the short term

Latest price projections

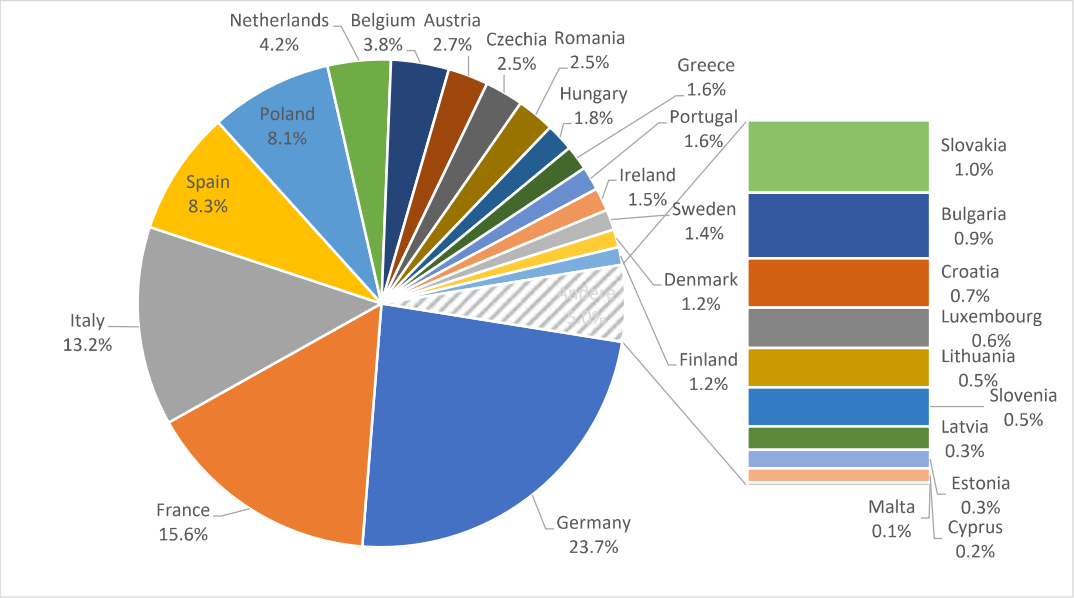
- 55 – 90 EUR/t in 2027 (≈ 40 – 60 EUR2020)
- 90 – 160 EUR/t in 2030 (≈ 60 – 110 EUR2020)

Impact of 100 EUR/t CO_2 on prices

- ≈ 2.2 ct/kWh gas
- ≈ 30 ct/l liquid fuels

Source: https://www.kas.de/documents/d/guest/wie-weiter-mit-dem-ets2

A few MS will determine the CO_2 price



- Six MS responsible for 75% of emissions
- Complementary policies and ability to pay in these MS will set price
- DE especially problematic: high income, low ambition, largest MS

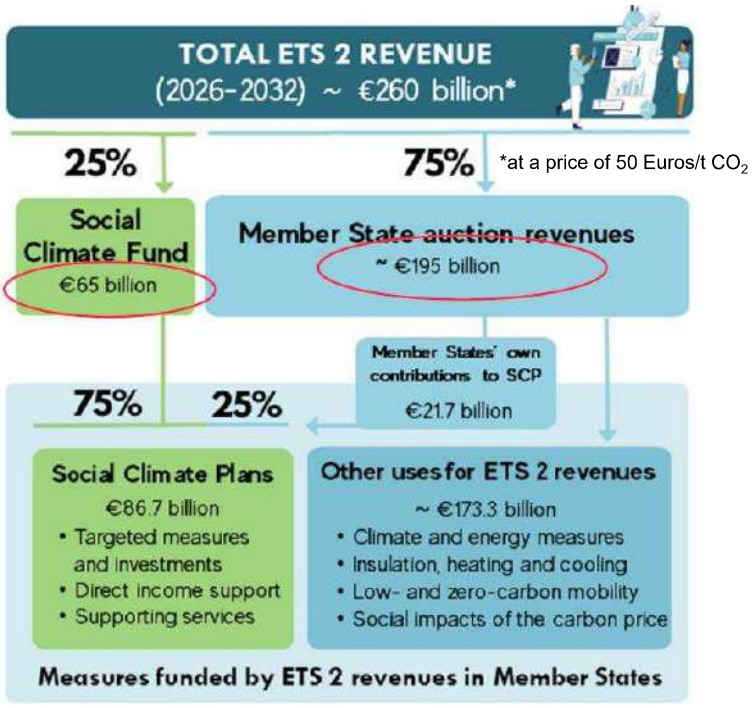
Source: https://www.oeko.de/fileadmin/oekodoc/Next-Stop-climate-neutrality.pdf

ETS 2 revenues

Social Climate Fund: Size is **fixed.** Must be used for **targeted** measures for those vulnerable to the carbon price introduction

Other revenues: Size **depends on carbon price.** Should be used by Member States for **non-targeted** climate and energy measures

- Funds at 50 EUR/t CO_2 (2026 to 2032)
  - MS revenues: ≈ 195 billion EUR
  - SCF share: ≈ 25% of revenues
- Funds at 100 EUR/t CO_2 (2026 to 2032)
  - MS revenues: ≈ 470 billion EUR
  - SCF share: ≈ 12% of revenues

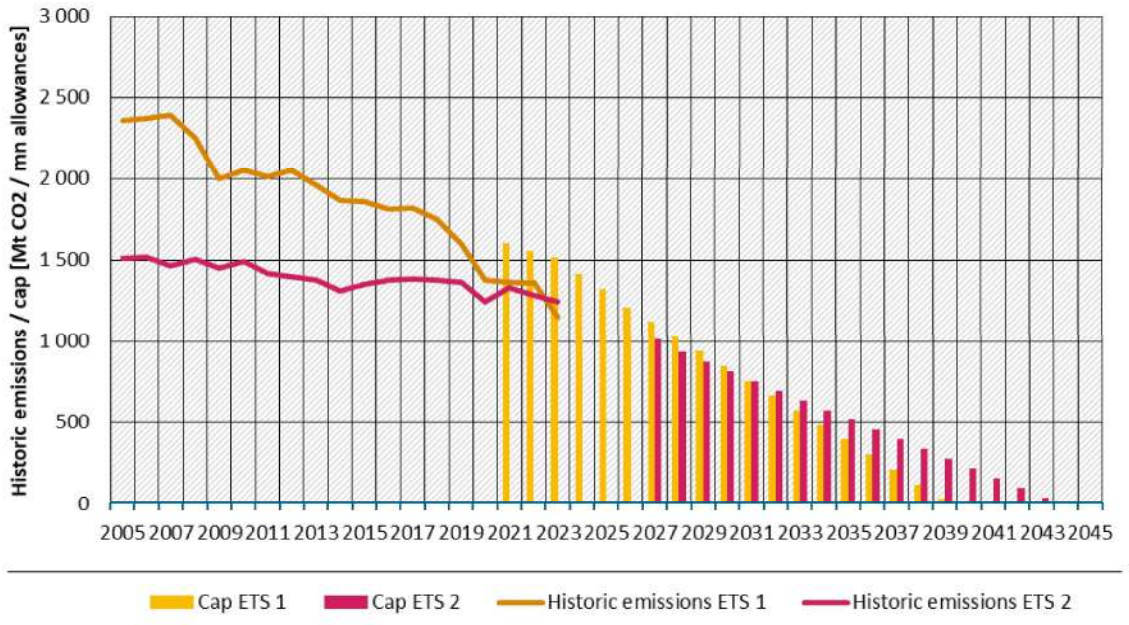


**For the period 2026-2032, it is estimated that a total of 5,736 million allowances will be auctioned within the ETS 2. Assuming an average price of EUR 45, total revenues would be EUR 258.6 billion (pg.11, Oeko-Institut 2022) Source: Eden et al. 2023 "Putting the ETS 2 and Social Climate Fund to Work: Impacts, Considerations, and Opportunities for European Member States"*

The current EU context: Regulation establishing a Social Climate Fund (SCF)

- SCF aims to mitigate the social impacts of the proposed emissions trading system for buildings and road transport (ETS BRT) on vulnerable households, micro-enterprises and transport users, through measures and investments as well as temporary direct income support.
- Temporary direct income support shall not represent more than 37.5% in each country => the larger share of the Fund is to be used for financing measures and investment.
- Emphasis is on measures and investments targeted for vulnerable groups to reduce reliance on fossil fuels and reduce social impact of CO_2 costs.
- Support under the Fund shall be additional to other Funds, programs and instruments.
- Eligible measures and instruments are described in the Regulation, need to be laid out in Social Climate Plans and will be subject to Commission assessment.
- Social Climate Plans are due at the end of June 2025
- Payment will be made upon completing and reporting milestones and targets indicated in the Social Climate Plans

ETS 1 and 2 cap development until 2045



Source: Update of https://www.umweltbundesamt.de/publikationen/supply-demand-in-the-ets-2

Questions, comments, discussion points?

- Supply and demand in the ETS 2: https://www.umweltbundesamt.de/publikationen/supply-demand-in-the-ets-2
- Umsetzung des ETS II und des Klimasozialfonds in Deutschland: https://www.oeko.de/projekte/detail/umsetzung-des-ets-2-und-des-klima-sozialfonds-in-deutschland/
- Identifying and supporting vulnerable households in light of rising fossil energy costs https://www.umweltbundesamt.de/publikationen/identifying-supporting-vulnerable-households-in

Your contact persons

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Thank you for your attention!

Formal Stakeholder Engagement Process

ETS Training Taiwan, 25 June 2025

Andreas Wehrl, The Climate Desk / FutureCamp Climate

adelphi eco logic :FutureCamp Öko-Institut e.V. Institut für angewandte Ökologie Institute for Applied Ecology

Content

Federal Ministry
for Economic Affairs
and Energy

Part I

- Foundations and principles on stakeholder engagement for ETS
  - Rationale
  - Stakeholder identification
  - Engagement process
  - Instruments for stakeholder engagement
- Formal stakeholder engagement in the European Union
- Formal stakeholder engagement in Germany

Part II

- Informal stakeholder engagement in Germany

Stakeholder engagement: Rationale & building a strategy

Federal Ministry for Economic Affairs and Energy

Stakeholder engagement…

…provides information by fostering ***acceptance*** and developing ***credibility.***

…helps make informed choices: correct misconceptions, alleviate doubts, address concerns.

…enhances quality of future policy decisions.

…ensures smooth and efficient functioning of an ETS.

…enhances legitimacy by creating ***ownership*.**

Establishing a strategy

Identify stakeholders

- Who is most affected?
- Who else should be engaged?
- How involved will the general public be?

Stocktaking

Level of ***knowledge*** and ***attitude*** towards ETS of key stakeholders and general public?

Prime the debate

Introduce ETS to political debate, e.g. via a ***Green Paper*** presenting options and potential solutions to ***stimulate discussion.***

Actors and Target Groups

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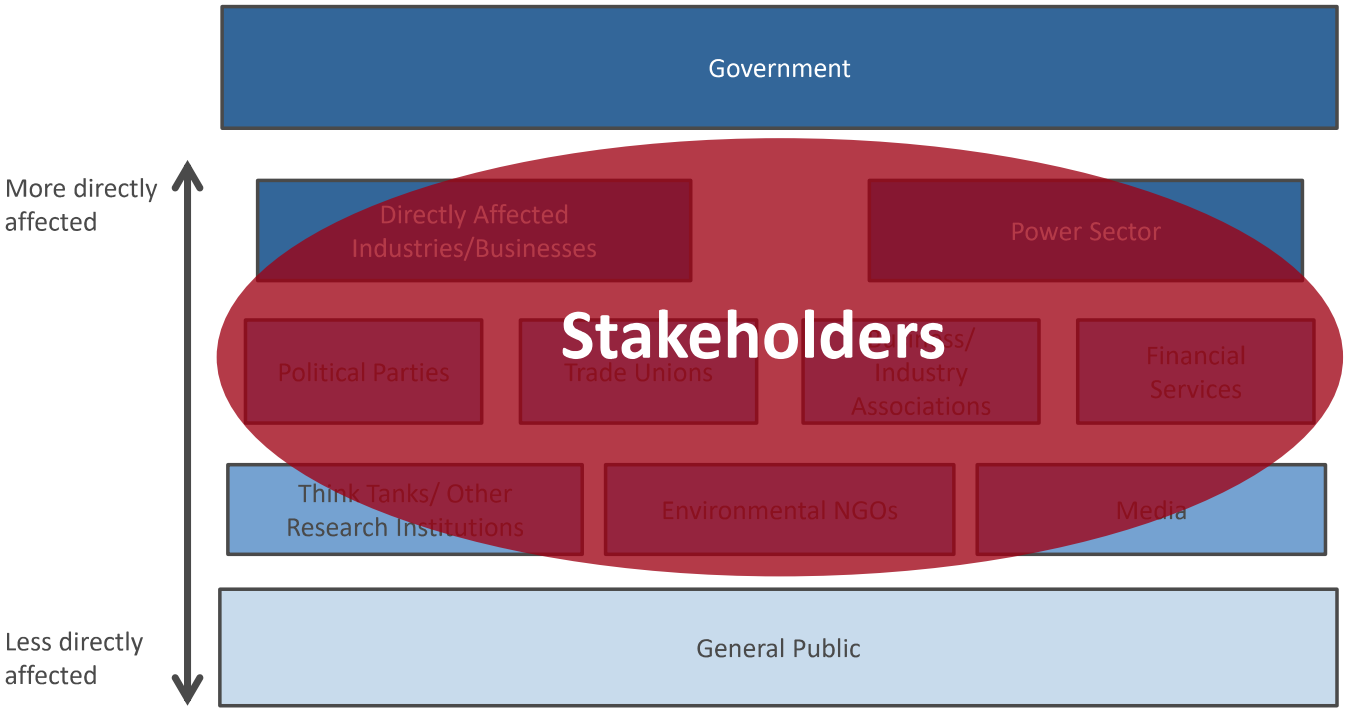
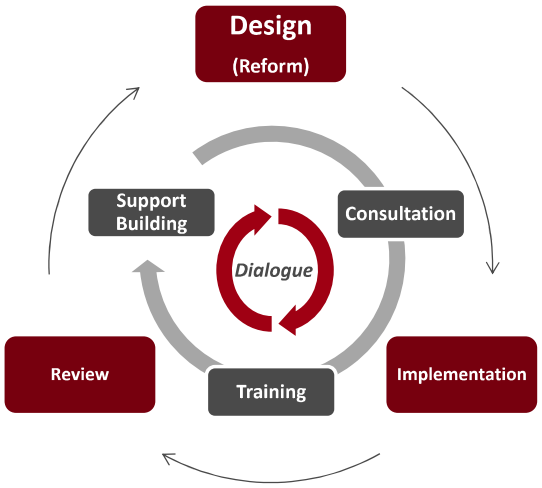


Source: adelphi

Goals and instruments differ by process stages



Goal: Building support
Convey advantages of ETS

Instruments: Media, information publications, websites, social media, FAQs, conferences

Goal: Consultation
Improve policy, foster sense of ownership

Instruments: consultation documents, permanent discussion fora, hearings and debates

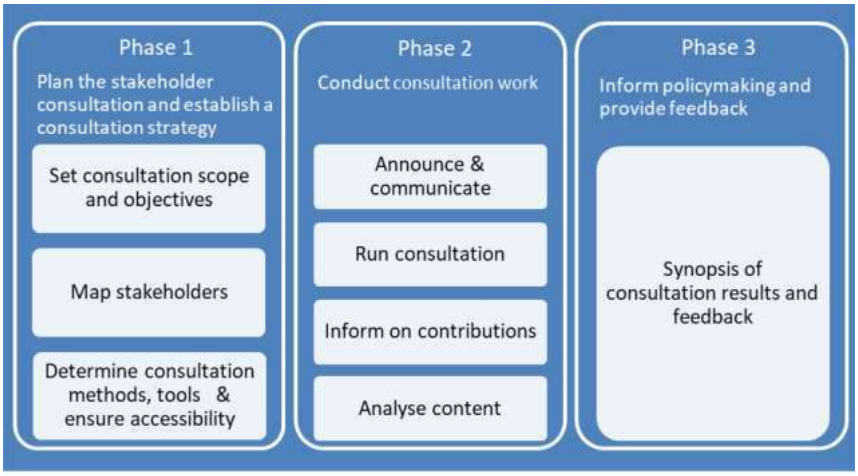
Goal: Training
Facilitate compliance, maximise flexibility

Instruments: workshops, helpdesk, hotline, webinars, simulations (e.g trading)

Note: applicability of instruments may vary by target group. Instruments may be applied for various goals.

Formal stakeholder engagement in the EU

- Regarding the EU ETS, the fundamental decisions on the ETS are taken on EU level.
  → Stakeholder engagement on EU level is of high importance for German stakeholders!
- The European Commission maintains a consultation system that frequently offers opportunities to stakeholders to contribute their perspectives to policymaking.
  - Covers Commission initiatives, legislative proposals, draft acts, suggestions for simplification.



Stakeholder consultation process in the EU.

EU: “Have your say” and “Calls for evidence”

Federal Ministry for Economic Affairs and Energy

- ***Have your say:*** central online portal for stakeholder engagement
- ***Call for evidence:*** streamlined type of document published on *Have your say*
  - Option 1: collecting general views on this document ***(= feedback***)
  - Option 2: more formalised input based on this document and additional specific questions ***(= consultation)***
- General duration of publication on *Have your say*: 12 weeks

https://ec.europa.eu/info/law/better-regulation/have-your-say_en

Example: EU Consultation on 2026 review of ETS 1

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Call for Evidence structure (here: 6 pages)

- Political context, evaluation, problem definition
- Objectives and policy options: Lists the most important issues of the ETS review and possible options for changes → guiding discussion
- Likely impacts: environmental protection, incentives for clean technology, competitiveness effects , employment, growth
- Better Regulation instruments: Role of evaluation and impact assessment, consultation strategy and reasoning, target audience

→ Stakeholders – companies, associations, citizens – can upload their contributions on *Have your say*.

https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14549-EU-emissions-trading-system-for-maritime-aviation-and-stationary-installations-and-market-stability-reserve-review_en

EU: The Better Regulation Toolbox

Chapter 7 of the EU Commission's ***Better Regulation Toolbox*** contains useful methods and guidance for stakeholder consultation, many of which remain applicable outside of the EU context.

TOOL #51. Consulting stakeholders 444
TOOL #52. Consultation strategy 460
TOOL #53. Conducting consultation activities 469
TOOL #54. Analysing data and informing policymaking 476
TOOL #55. Horizontal matters – publication of responses, data protection, access to documents and transparency register 490

Five tools for implementing stakeholder consultation.

https://commission.europa.eu/law/law-making-process/better-regulation/better-regulation-guidelines-and-toolbox_en

Formal Stakeholder Engagement in Germany

Stakeholder consultations in the legislative process:

- **Association participation**: In order to assess the consequences of a law, in particular the costs for the economy, the responsible federal ministry obtains information from the associations/NGOs.
- Once a legislative proposal is submitted to the Parliament, the responsible committee can conduct **public hearings** of experts and stakeholders.

Transparency: The Federal Government participates in the Open Government Partnership. The federal ministries therefore publish the opinions obtained as part of the so-called association participation on the Internet.

Key Lessons

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Stakeholder engagement and public acceptance matters

- **Planning ahead:** Planning of public / stakeholder communication and participation at the outset of an ETS will help create ownership and facilitate effective implementation
- **Targeted approach:** Different groups have different interests and concerns, and level of knowledge. They need to be targeted with different instruments according to the different purposes of the ETS policy cycle
- **Transparency:** Provide information on how the ETS works and how it will achieve environmental objectives in order to ensure legitimacy
- **Continuity:** Maintain ongoing information availability and continue consultation process after implementation in order to guarantee the sustainability of the policy and involvement of stakeholders

Stakeholder Engagement in Practice – example Germany

Federal Ministry for Economic Affairs and Energy

Informal Stakeholder Engagement in Germany

- Working Group Emissions Trading to Combat the Greenhouse Effect (AGE)

  of the German Federal Ministry for Economic Affairs and Climate Action
- Stakeholder communication and other services at DEHSt
- Other activities

Working Group Emissions Trading to Combat the Greenhouse Effect (AGE)

Federal Ministry for Economic Affairs and Energy

AGE
Arbeitsgruppe Emissionshandel zur Bekämpfung des Treibhauseffektes

- Permanent stakeholder consultation concerning questions of emissions trading
- Established by the German Federal Cabinet in October 2000 at the initiative of the German Ministry for the Environment
- Financed by the Ministry for the Environment and companies – larger contribution by companies

- Currently ~ 80 members – representatives of companies, trade associations, environmental NGOs, trade unions, parliamentary factions of political parties, federal states and agencies:
  - Companies (more than 25)
  - Trade associations (15)
  - Environmental organizations (3)
  - Trade unions (2)
  - Government agencies / ministries (7)
  - Parliamentary groups (5)
  - Representatives of the federal states (3)

Working Group Emissions Trading to Combat the Greenhouse Effect (AGE) (ctd.)

Federal Ministry for Economic Affairs and Energy

Principles

- Support (Funding): Financial and human resources come from both the German Federal Government and the private sector
- Capacity Building
- Confidentiality / Chatham House Rules: Communication limited to members of the AGE

Establishment

- Secretariat in Berlin, with staff from industry and research institutes
- Chaired by the Ministry for the Environment, co-chair Ministry of Economics and Technology
- 7-8 meetings per year. 186 meetings so far.
- Additional meetings by four sub-groups focusing on specific issues (cross-cutting issues, administration of the EU ETS in Germany, legal issues, flexibility mechanisms and international aspects, national ETS for fuels).
- Budget: Approx. EUR 180 000 annually

Role and Achievements

- Most important national forum on emissions trading
- Central platform for implementation of the EU ETS in Germany
- Initially, discussions focused on the design and implementation of the European Climate Change Programme
- Since implementation of EU Emissions Trading Directive in national law, focus on issues arising as a consequence of the implementation of the EU ETS in Germany
- Further discussion about other areas of the carbon market, e.g. policy interactions or developments of the flexible mechanisms under the UNFCCC and the Paris Agreement

One unit at the compentent authority – the German Emissions Trading Authority (DEHSt) – is dedicated to Communication and Service (Staff of ~15 people)

Tasks:

I. External Communications

Customer service (hotline, e-mail, VPS, CRM, mailings)
Communication (website, publications, reports, fact sheets, FAQs)
Press relations
Events (workshops, fairs, conferences, EU-meetings)
Visitor groups, expert exchange

II. Internal Communications

Share-point
Co-ordination of seminars
Knowledge transfer

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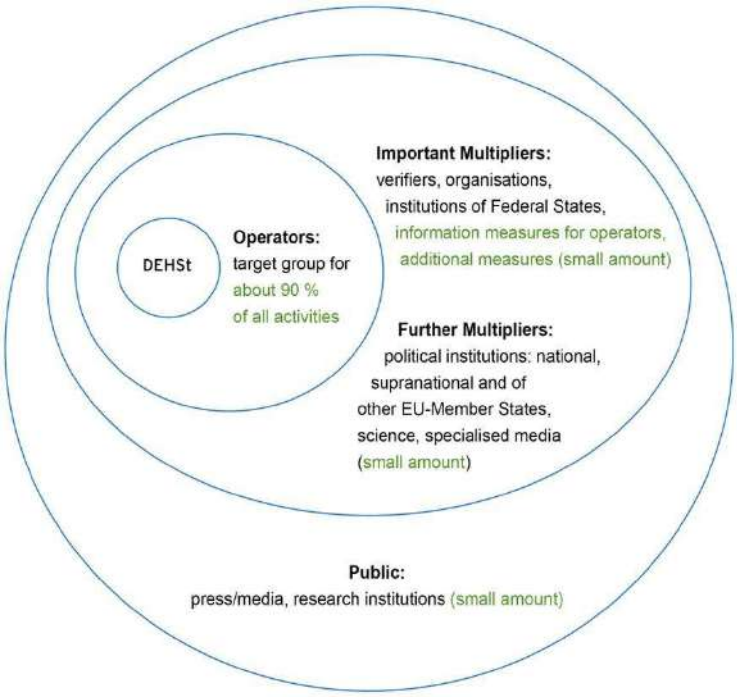
Target Groups for external communication

1. **Focus on Operators** (about 90% of activities)

2. **Other Stakeholders** (Verifiers, Political Institutions in Germany and Europe, Science)

3. **General Public and Media**



Thought experiment: How would a „Taiwan Working Group on Carbon Emission Trading" look like?

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台灣碳排放交易工作小組

Taiwan Working Group on Carbon Emission Trading

Who should be the members?

Who could be the chair?

Would the meetings be public or not?

When should the group have its first meeting?

How should the agenda of the first meeting look like?

議程

Agenda

- Item 1
- Item 2
- …….
- …….

Federal Ministry
for Economic Affairs
and Energy

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Overview of the German National ETS

German and EU ETS latest developments and outlook
25.06.2025

Dr. Daniel Detzer

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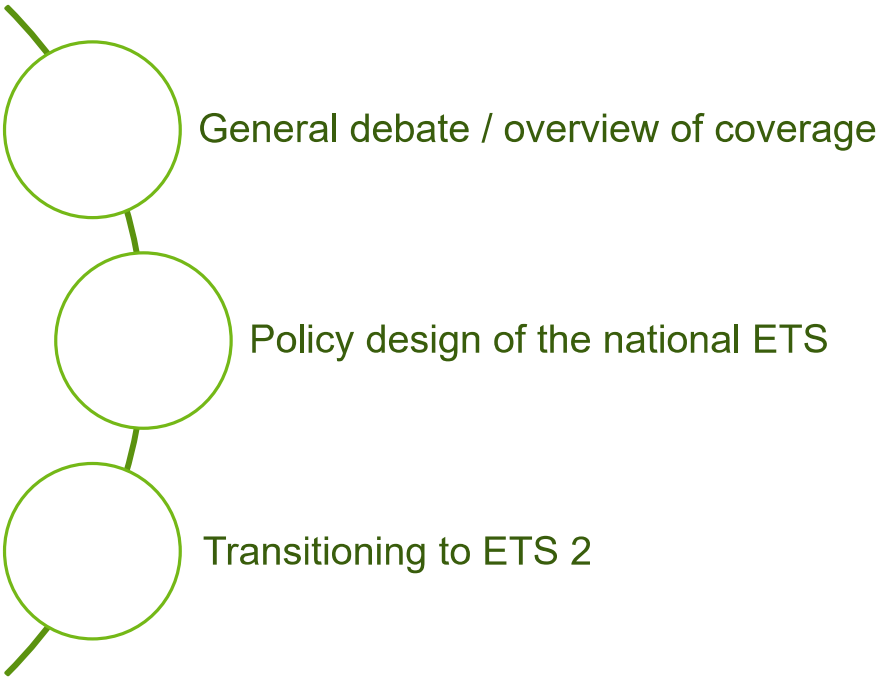
Outline



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Overview of the German National ETS

GENERAL DEBATE / OVERVIEW OF COVERAGE

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General debate and framing

Climate protests of 2019

EP elections 2019, Green agenda gaining momentum

Debate on a **comprehensive climate package in DE** end of 2019

Introduction of Fuel Emissions Trading System (**Fuel ETS**) **by 2021** in DE

Emissions Trading System for Heat and Transport (**EU ETS-2**) **by 2027** as part of **Fit-for-55-Package**

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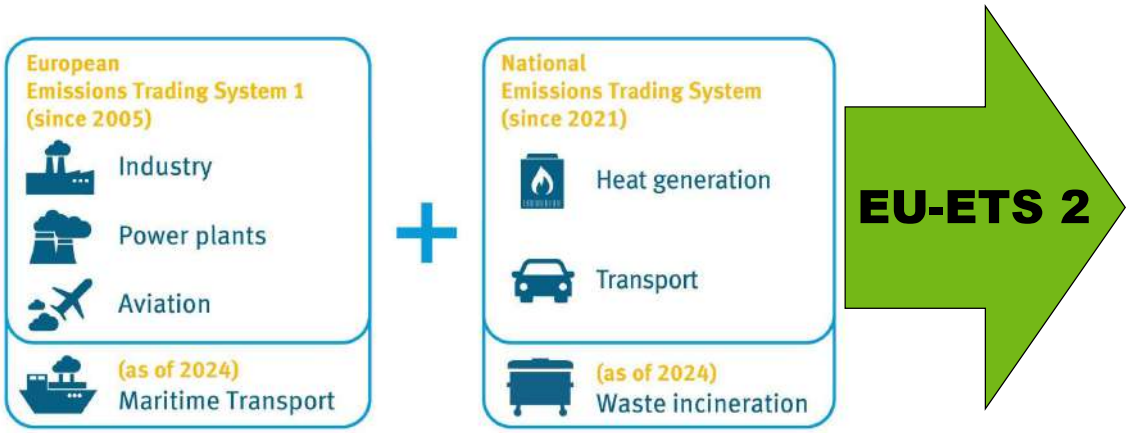
~85% of emissions covered by emission trading schemes



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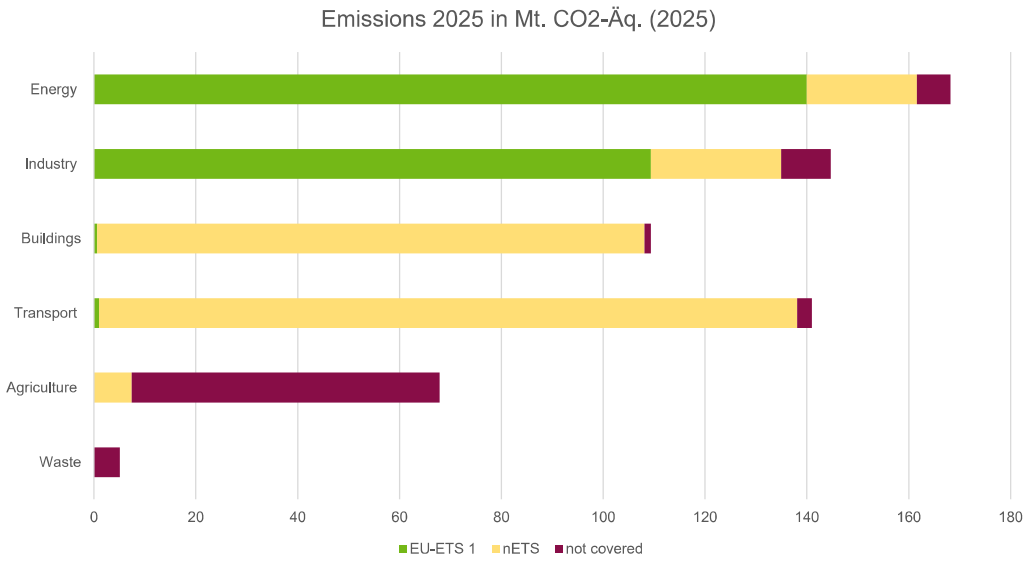

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Overview of the German National ETS

POLICY DESIGN OF THE NATIONAL ETS

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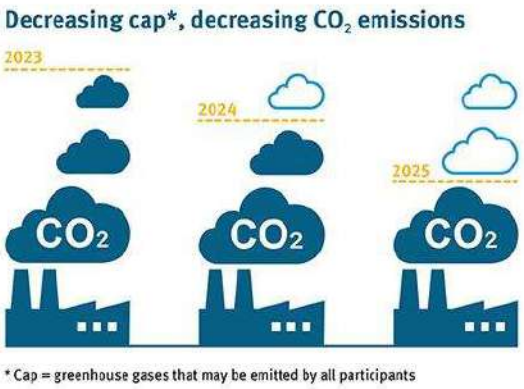
Policy design: Building a Fuel ETS

General idea: Set a **cap on emissions** based on climate goals, **auction** these allowances, **decrease** the cap annualy, establish an increasing **CO_2-price**



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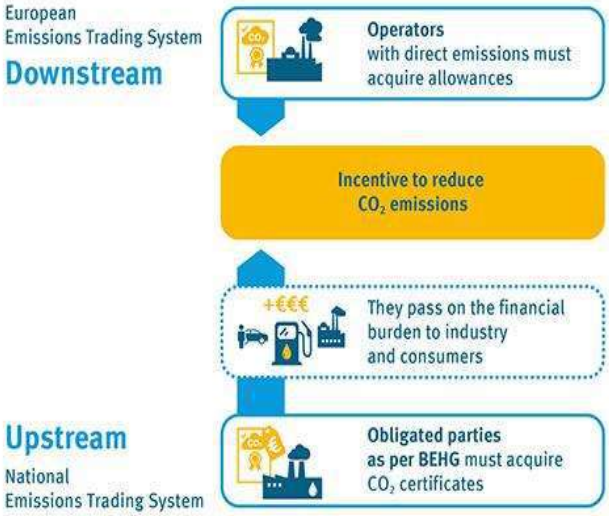
Policy design: Building a Fuel ETS

Upstream system:
Distributors must purchase emission allowances for each ton of CO2 released. The CO2 price can be passed on along the supply chain to the end consumer.



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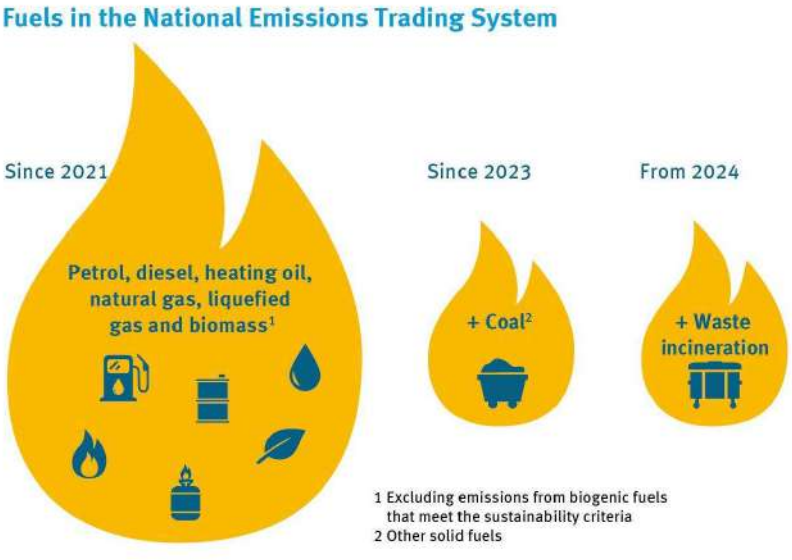
Policy design: Scope



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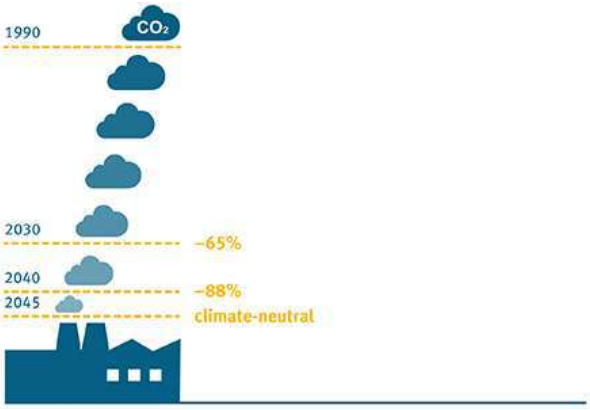
Policy design: Cap-Setting

The Cap is derived from the German reduction target under the EU-Effort Sharing Regulation



Year	nETS-Cap in t
2021	301 037 178
2022	291 116 621
2023	280 149 525
2024	275 998 949
2025	260 092 203
2026	254 774 703
2027	236 220 646
2028	217 666 514
2029	199 112 382
2030	180 558 250

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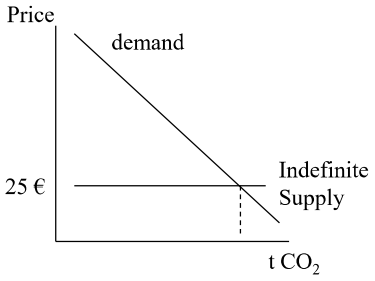
Policy design: Rising price path

Introduction phase
- fixed prices until 2025
- price corridor in 2026



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Emissions exceed cap in introductory phase

Year	nETS-Cap in t	Emissions / prognosis
2021	301 037 178	306 500 000
2022	291 116 621	288 500 000
2023	280 149 525	282 800 000
2024	275 998 949	*290 500 000*
2025	260 092 203	*282 400 000*
2026	254 774 703	*274 900 000*
2027	236 220 646	
2028	217 666 514	
2029	199 112 382	
2030	180 558 250	

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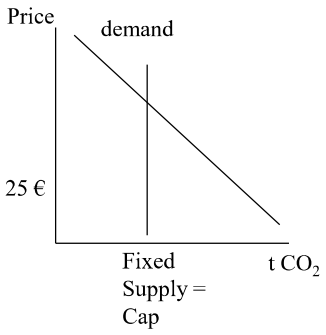
Policy design: Rising price path

Introduction phase
- fixed prices until 2025
- price corridor in 2026

Full fledged emission trading
- free market prices from 2027



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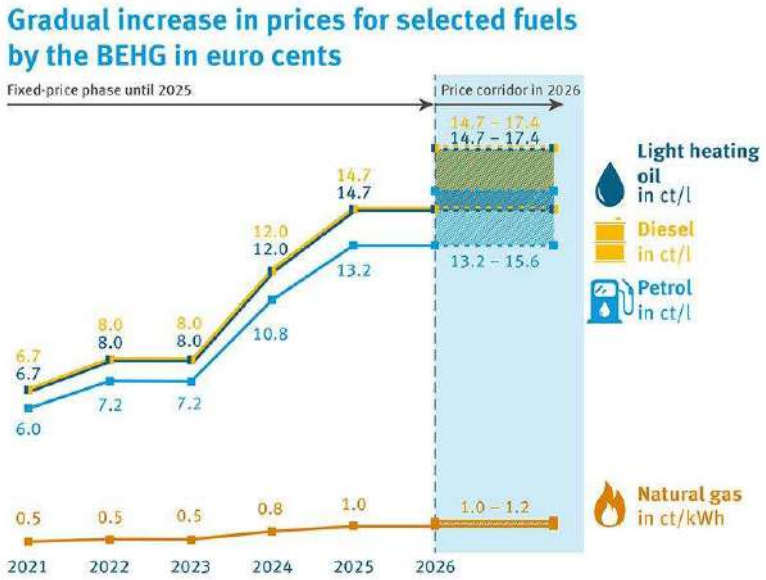
Revenues and effects on consumer prices

Revenues 2023: €10.7 bil.

Revenues feed into Climate and transformation funds

Price effect: 10 €/tCO2:

→ +2.8 cents per liter of gasoline
→ +3.2 cents per liter of diesel
→ +0.2 cents per kilowatt-hour of gas



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Overview of the German National ETS

TRANSITIONING TO ETS 2

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Transitioning to ETS 2

- Fit-for-55 package introduces an emissions trading system (EU ETS-2) for buildings, transport, and small industry starting in 2027
- From 2027, over 75% of EU emissions will be covered by a trading system: energy, industry, buildings, and transport
- German law stipulates that national emissions trading system (BEHG) will be fully integrated into the European system
- National emissions trading is very similar to ETS-2:
  - Upstream system
  - Market pricing from 2027, with a Market Stability Reserve (MSR, 600 million certificates)
  - Scope: BEHG is broader than ETS-2, but opt-in is possible

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Systematic differences in the scope of application: BEHG vs. ETS-2

BEHG

- CO2 pricing of all fuels placed on the market
- Final use of the fuels is irrelevant

≠

ETS-2

- CO2 pricing of all fuels placed on the market…
- …used in specific sectors:
  - Road transport
  - Building heating
  - Non-ETS-1 industry

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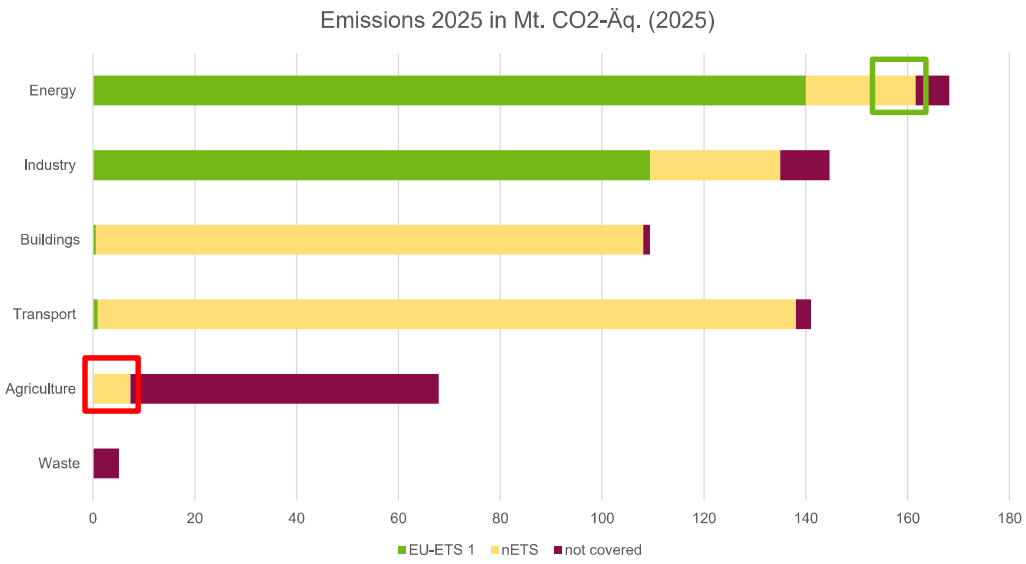
~85% of emissions covered by emission trading schemes

- fuel emissions agriculture (red)
- Waste incineration (green)



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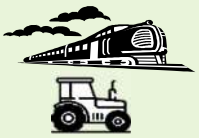
Continuity of CO2 pricing – BEHG / ETS-2

ab 2027

BEHG pricing in ETS-2 end-use sectors — Automatic → **EU-ETS 2**

Opt-in Art. 30j ETS Directive
- Rail transport
- Fuels in agriculture and forestry



Opt-in → **EU-ETS 2**

Opt-in → **EU-ETS 2**

- Waste incineration plants

Opt-in → **EU-ETS 1**

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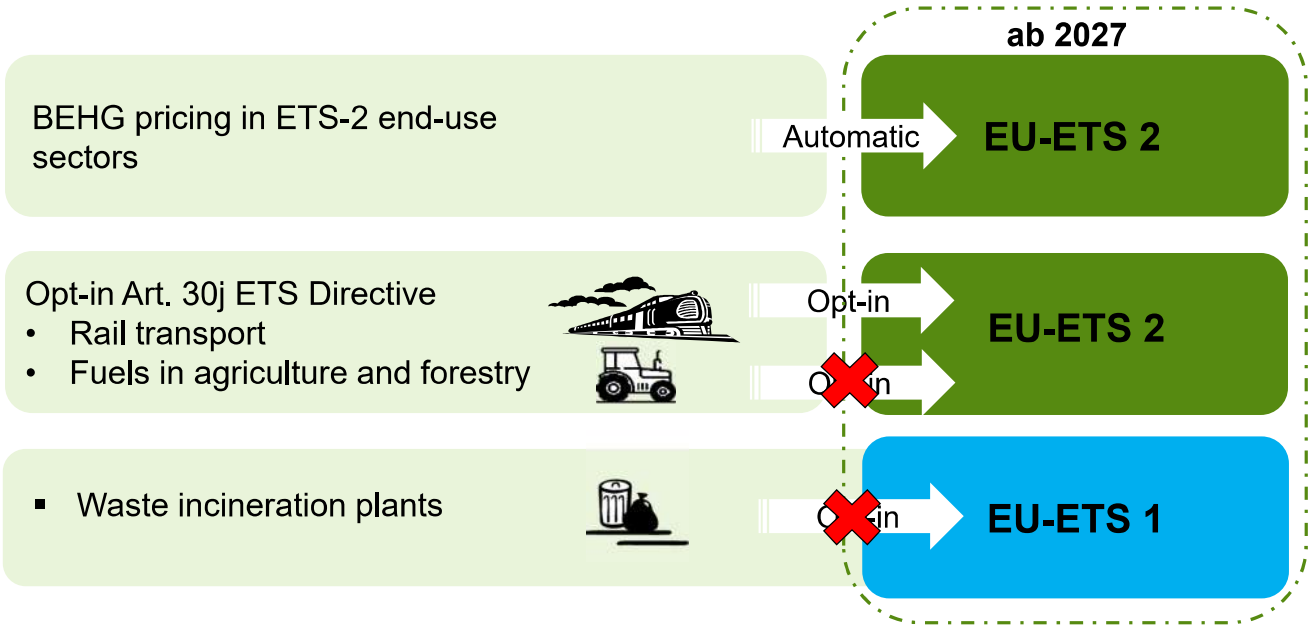
Continuity of CO2 pricing – BEHG / ETS-2



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ETS2 – Challenges

- **ETS 2 – Central Instrument for Achieving Climate Targets**
  - With the introduction of ETS 2, up to 75% of EU-wide emissions will be covered under an ETS.
  - Emission reduction target of -42% by 2030 compared to 2005 is very ambitious; emissions need to be reduced much faster.
- **Uncertainties about the price level remain.**
  - The ETS directive embeds instruments for price stabilization: frontloading, MSR (Market Stability Reserve), and price stabilization mechanisms.
  - Complementary emission reduction measures in individual member states are crucial to dampen the price level.
- **Strengthening social acceptance through transformative measures.**
  - With ETS 2, a Climate Social Fund has also been established. The goal is to support particularly vulnerable households during the transformation. A national climate social plan is currently being developed.
  - It is important, however, to use all revenues for the transformation. The coalition agreement (KoaV) also commits to this.

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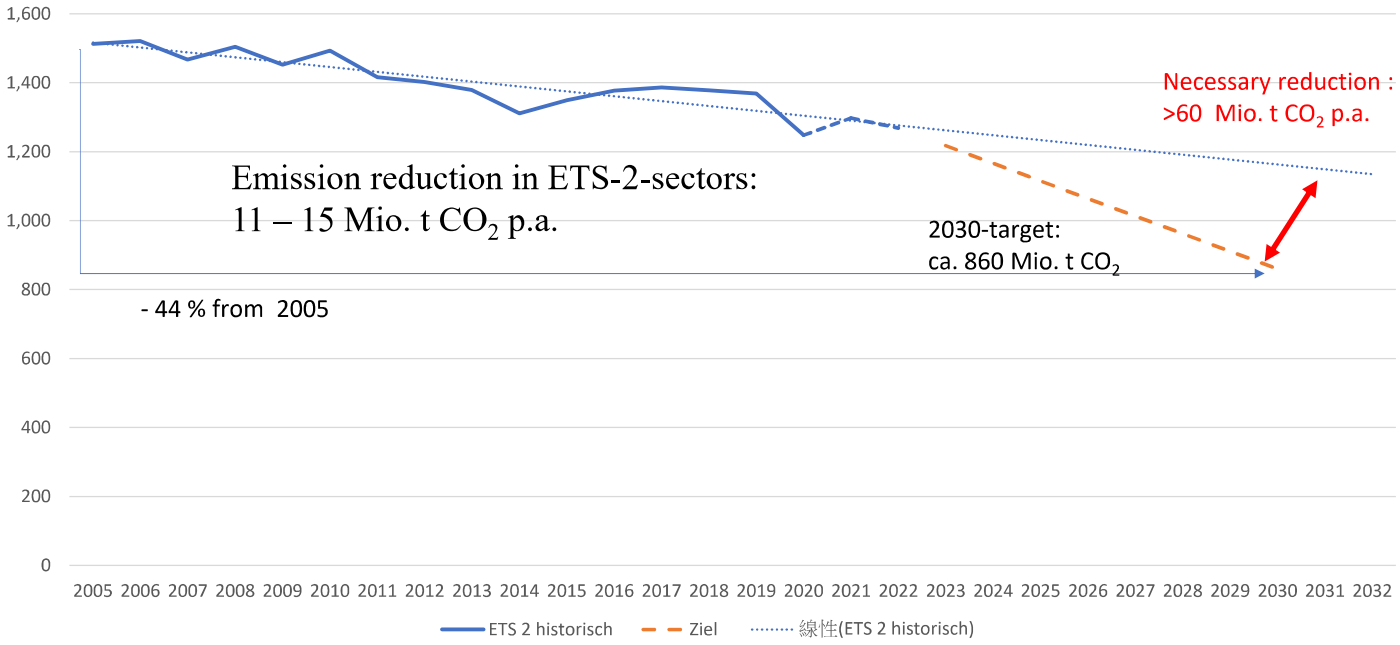
Emissions and reduction target



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Achieving targets with a policy mix of Fit for 55 and CO_2 pricing

Regulatory instruments, funding schemes, and other measures to reduce emissions

CO_2-Price

Impact Assessment:
The European Commission assumes an **ambitious implementation** of the Fit for 55 package.

Impact Assessment: CO_2-price of 67 – 112 € (2030)

Required emission reduction

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ETS2 – Challenges

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Questions?

ETS and the Climate Policy Mix – Understanding and Managing Interactions

Taiwan delegation visit, Berlin, June 25, 2025

Baran Doda, Senior Advisor, adelphi

adelphi eco logic :FutureCamp Climate GmbH Öko-Institut e.V. Institut für angewandte Ökologie Institute for Applied Ecology

Outline

Federal Ministry
for Economic Affairs
and Climate Action

- Why is it important to consider overlaps and interactions between ETS and other climate policy instruments?
- What is the Waterbed Effect?
- How can complementary policies support the ETS?
- Which types of climate policy instruments are there?
- How to manage the overlap between ETS and other policy instruments?
- What should be the role of the ETS in the climate policy instrument mix?

Outline

Federal Ministry for Economic Affairs and Climate Action

- Why is it important to consider overlaps and interactions between ETS and other climate policy instruments?
- What is the Waterbed Effect?
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- Which types of climate policy instruments are there?
- How to manage the overlap between ETS and other policy instruments?
- What should be the role of the ETS in the climate policy instrument mix?

Why carbon pricing?

Federal Ministry for Economic Affairs and Climate Action

- ETS does not prescribe individual emitters by how much they should reduce emissions, which choices they should make or which technologies they should use.
- Emitters will generally reduce emissions where it is cheapest to do so - up to the point where the cost of reducing emissions equals the cost of an allowance, i.e. the carbon price.
- Carbon pricing (including ETS) hence offers greater flexibility to individual actors than command-and-control policies.
- The regulator does not have to know exactly by how much covered entities can reduce their emissions, at what cost, and through which technologies: this information is revealed through the market

ETS and the Climate Policy Mix – Interactions

Federal Ministry for Economic Affairs and Climate Action

- ETS is a broad, general policy instrument that encompasses different sectors, technologies and emitters
  - ETS cap specifies a target level of GHG emissions
  - ETS price creates the necessary incentive to ensure GHG emissions remain within the cap, e.g. switching to clean energy or increasing energy efficiency
- An ETS alone would be sufficient to achieve climate objectives. The ETS cap could be derived directly from the emission target (if all sectors are included or the targets are broken down to sectors).
- Additional policy instruments ("companion policies") to complement the ETS and lower the costs of achieving the emission target:
  - Address market barriers, e.g. for new technologies or sectors with particularly high abatement costs.
  - If a sufficiently high carbon price is politically difficult to sustain or not possible due to a price ceiling in the ETS.

Why combine an ETS with other policies?

Federal Ministry for Economic Affairs and Climate Action

Reasons to consider additional policies:

A. Other policies have their own (related, but separate) objectives, such as:
   - Air quality: reduce air pollutants from fossil fuel combustion
   - Energy efficiency or energy conservation: reduce fossil fuel imports
   - Industrial policy: employment, investment, technology leadership, modernisation

   Tinbergen rule: separate policy objectives are best pursued through separate policy instruments

Why combine an ETS with other policies?

Federal Ministry for Economic Affairs and Climate Action

Reasons to consider additional policies:

B. Other market failures or barriers:

- Split incentives: e.g. landlord-tenant-dilemma, where one bears the cost and another reaps the benefits;
- Lack of access to finance, e.g. to pay for emission reduction measures, even if they are economically efficient (e.g. energy efficiency measures)
- Lack of information / transaction costs related to obtaining information
- Lack of suitable, affordable or accessible alternatives (e.g. public transport)

→ **Companion policies can explicitly address these barriers**

Why combine an ETS with other policies?

Federal Ministry for Economic Affairs and Climate Action

Reasons to consider additional policies:

C. ETS and companion policies have different roles in the transformation process in the short, medium and long term

- In the short term: optimisation based on existing technologies and infrastructure – ***best achieved through a carbon price***
- In the longer term: innovation and investment support, adjustment of infrastructure, change in social norms, better informed choices by consumers and investors, behavioural change etc. – ***carbon price is necessary, but not sufficient for cost-efficient emission reductions***

Why combine an ETS with other policies?

Federal Ministry for Economic Affairs and Climate Action

Reasons to consider additional policies:

D. Companion policies can mitigate undesirable side effects (e.g. distributional impacts of a carbon price), also to reduce political opposition

E. Companion policies can also serve as insurance against policy failure and increase policy credibility – ETS as a fallback if other policies fail or underperform

Why is it important to consider policy interactions?

Federal Ministry for Economic Affairs and Climate Action

Climate policy does not start from a blank page. ETS design needs to take existing policies into account, decide how the ETS should fit into the existing policy mix.

EU experience: Energy taxation, energy efficiency policies and policies to promote renewables existed before the ETS – effects of which were mostly taken into account when determining the cap.

Carbon price works best if other incentives are aligned. Framework conditions may need to be adjusted: Remove distortions and barriers, such as fossil fuel subsidies, price controls, enable cost pass-through.

EU experience: Liberalised electricity markets and auctioning of allowances for power generation.

Why is it important to consider policy interactions?

Federal Ministry for Economic Affairs and Climate Action

Implementation can build on existing structures. When setting up an ETS, it helps to build on institutional, legal, administrative structures that are already in place.

EU experience: Installation-based approach for determining the cap using existing regulatory structures and their definition of installations.

The policy mix must be consistent to be efficient. Otherwise the overlap of policies may increase the total cost of emission reductions.

EU experience: Additional national measures (e.g. increased energy efficiency targets or national coal phase-out) without adjusting the cap results in a 'waterbed effect'.

Outline

Federal Ministry for Economic Affairs and Climate Action

- Why is it important to consider overlaps and interactions between ETS and other climate policy instruments?
- What is the Waterbed Effect?
- How can complementary policies support the ETS?
- Which types of climate policy instruments are there?
- How to manage the overlap between ETS and other policy instruments?
- What should be the role of the ETS in the climate policy instrument mix?

What is the waterbed effect?

Federal Ministry for Economic Affairs and Climate Action

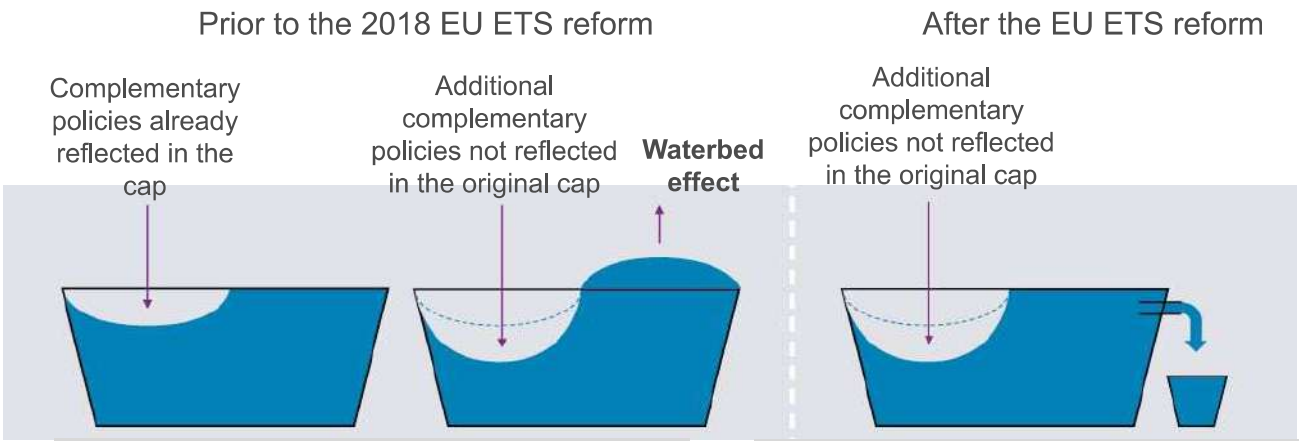
- If emissions are fixed ex-ante through the ETS cap, complementary policies addressing the same emission sources as the ETS *cannot* deliver additional emission reductions.
- E.g. in the case of renewables support policies:
  1. Higher share of renewable electricity will replace fossil-based power generation and thereby initially reduce emissions;
  2. This will free up allowances held by fossil power generators;
  3. Allowances are sold to other sectors or power generators in other countries;
  4. These can emit more, offsetting the initial emission reduction.

In an ETS, complementary policies have no direct climate benefit. But they reduce mitigation costs and hence allow to adopt a more stringent cap in the first place.

Addressing the Waterbed Effect: the EU ETS answer

Federal Ministry for Economic Affairs and Climate Action

How to enable individual EU Member States to implement policies that reduce emissions by more than what is implied by the EU target:



Source: Agora Energiewende & Öko-Institut 2018

Prior to the 2018 EU ETS reform, most complementary policies and respective targets were already reflected in the cap. But additional complementary policies – or policies that performed better than expected – lead to a waterbed effect.

After the reform, there will be two overflow valves: Member States can cancel allowances if they take national measures (Art. 12.4). Also, surplus allowances flow into the Market Stability Reserve as of 2018, the majority of which will be cancelled in 2023

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How to achieve a coherent and consistent climate policy mix

Federal Ministry for Economic Affairs and Climate Action

A coherent and consistent climate policy mix, which is:

- **Effective and reliable**: achieves the climate targets with reasonable certainty
- **Efficient** – achieves climate targets at least cost to society, mobilising the cheapest abatement potentials now and in the future – i.e. also provides incentives for cost-saving low-carbon innovation
- **Politically, legally and administratively feasible** – socially balanced, in line with existing laws and regulations, and can be managed with available resources

How can complementary policies support the ETS?

Federal Ministry for Economic Affairs and Climate Action

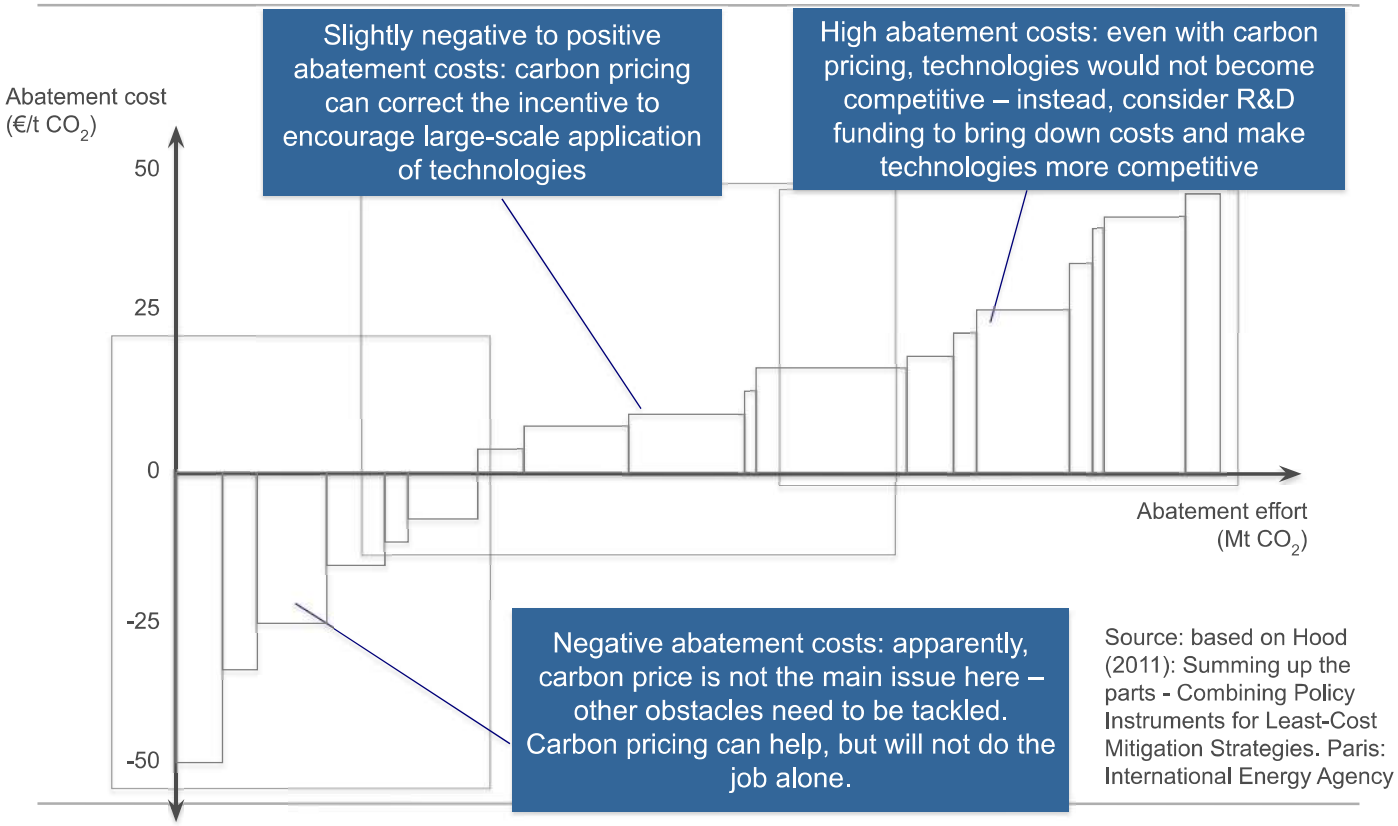
As part of a coherent policy mix, complementary policies should go hand in hand with the ETS. This can be achieved in different ways.

1. **Address mitigation potentials that the carbon price cannot address:**
   - Emissions reductions in sectors not suitable for pricing, e.g. because they are difficult to monitor (esp. agriculture)
   - Provide long-term impulse for innovation and technology support

- **EU experience:** The EU ETS focuses on the two sectors that are most amenable to carbon pricing – energy and industry. Other sectors are addressed through a suite of other policies, including taxes. The EU has used part of the proceeds from selling emission allowances to support low-carbon innovation (Innovation Fund, complemented by national programmes).

What sectors / technologies are amenable to pricing?

Federal Ministry for Economic Affairs and Climate Action



Source: based on Hood (2011): Summing up the parts - Combining Policy Instruments for Least-Cost Mitigation Strategies. Paris: International Energy Agency

How can complementary policies support the ETS?

Federal Ministry for Economic Affairs and Climate Action

As part of a coherent policy mix, complementary policies should go hand in hand with the ETS. This can be achieved in different ways.

1. Address mitigation potentials that the carbon price cannot address
2. **Provide the right framework conditions:**
   - remove other barriers and distortions (e.g. fossil fuel subsidies),
   - align incentives,
   - adjust the regulatory framework (e.g. price controls, market oversight).

- **EU experience:** Since the late 1990s, liberalization of electricity markets, to ultimately arrive at a common, EU-wide market. In this process, the price of emitting carbon is also factored into the price of electricity, However, not all distortions stemming from EU or national policies have been completely removed.

How can complementary policies support the ETS?

Federal Ministry for Economic Affairs and Climate Action

As part of a coherent policy mix, complementary policies should go hand in hand with the ETS. This can be achieved in different ways.

1. Address mitigation potentials that the carbon price cannot address
2. Provide the right framework conditions so that the carbon price will work
3. **Mitigate unwanted side-effects through flanking measures:**
   Increase acceptance or assist vulnerable groups in the transition process

- **EU experience:** Several Member States have used revenue from the sale of emission allowances to fund social assistance programmes (e.g. energy saving advice for low-income households in Germany). EU Member States can also compensate industrial electricity consumers for electricity price increases due to the EU ETS to preserve their competitiveness.

How can complementary policies support the ETS?

Federal Ministry for Economic Affairs and Climate Action

As part of a coherent policy mix, complementary policies should go hand in hand with the ETS. This can be achieved in different ways.

1. Address mitigation potentials that the carbon price cannot address
2. Provide the right framework conditions so that the carbon price will work
3. Mitigate unwanted side-effects through flanking measures
4. **Ensure a proportionate and leveled approach:**
   A coherent policy mix should provide a similar incentive across sectors to ensure emission reduction at reasonable cost

How can complementary policies support the ETS?

Federal Ministry for Economic Affairs and Climate Action

4. Ensure proportionate and leveled approach

EU experience

- Several EU Member States have introduced carbon taxes in addition to the EU ETS (Sweden, Ireland, France) in sectors or to installations not covered by the EU ETS (e.g. road transport or small emitters). The intention is to have a comparable incentive for ETS and non-ETS emitters.
- All EU countries impose taxes on fuels used outside the ETS (in particular transport and heating fuels). The tax level is not always linked to the carbon content, and they are labelled differently (energy taxes or ecotaxes), although their function is similar to a carbon tax.
- In 2013 the UK introduced the Carbon Price Support. National carbon tax (of about € 20) on emissions from electricity generation to augment the ETS price.

Outline

Federal Ministry for Economic Affairs and Climate Action

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Which types of climate policy instruments are there?

Federal Ministry for Economic Affairs and Climate Action

Policy Types	Rationale
Price-based instruments	Create an economic incentive to encourage low-carbon choices by the covered economic actors (emitters, investors, consumers); do not prescribe a certain technology or outcome (technology-neutral)
Command-and-control regulation	Define a standard that prescribes a certain outcome or the use of a certain technology; standard is typically mandatory for the covered actors
Technology support policies	Encourage certain (low-carbon) technologies through direct or indirect support: make the technologies themselves cheaper, invest into supporting infrastructure, create public demand to cover the learning costs of new technologies
Information and voluntary approaches	Provide better information about the available options (technologies, products) and their environmental performance, change underlying norms and values to encourage climate-friendly behaviour

Examples of climate policy instruments

Federal Ministry for Economic Affairs and Climate Action

Policy Types	Policy Instruments
Price-based instruments	Emissions Trading Systems Carbon / CO_2 taxes Other climate taxes (e.g. on vehicles, airline tickets etc.) Subsidies for emission reduction activities
Command-and-control regulation	Technology standards (e.g. minimum energy performance standards) Performance standards (e.g. fleet average CO_2 vehicle efficiency) Prohibition or mandating of certain products or practices Reporting requirements Land use planning, zoning
Technology support policies	Public and private RD&D funding Public procurement Green certificates (renewable portfolio / clean energy standard) Feed-in tariffs Carbon contracts for difference Public investment in clean energy infrastructure Removing financial barriers to acquiring green technology
Information and voluntary approaches	Rating and labelling programmes Public information campaigns Education and training

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Federal Ministry for Economic Affairs and Climate Action

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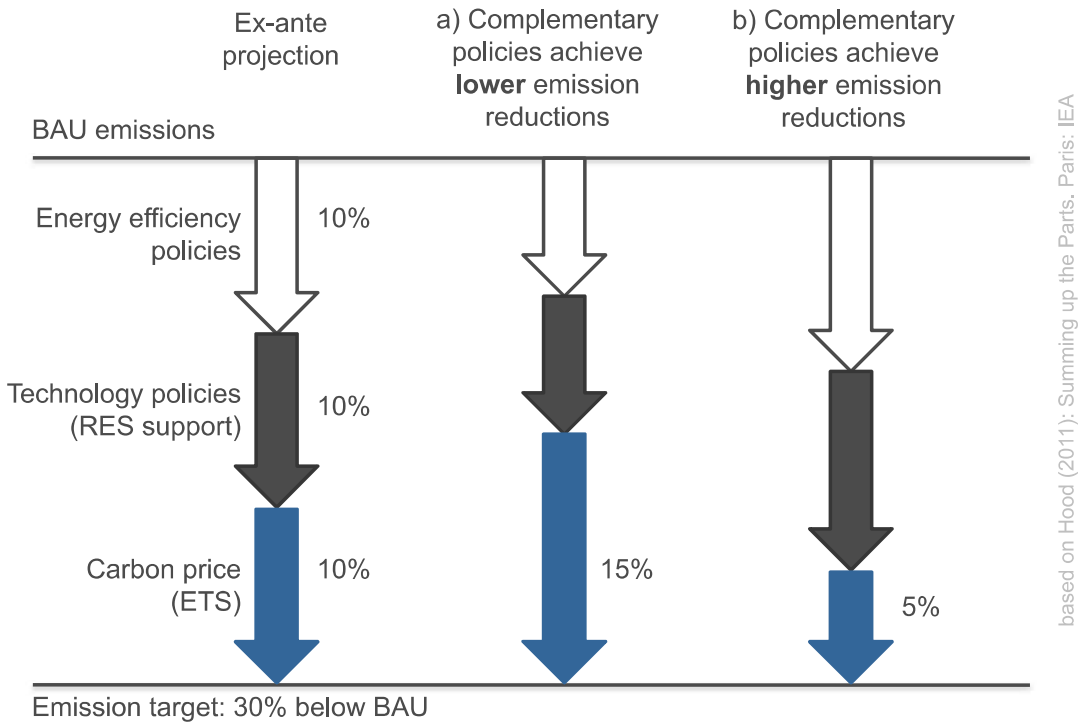
Managing the overlap between ETS and other instruments

Federal Ministry for Economic Affairs and Climate Action

1. **Start with existing targets and instruments**
   Plan / model the expected emission reductions of both currently existing and expected policy instruments based on sectoral targets (esp. energy efficiency or renewables), abatement cost (current and future), abatement potential, etc...
2. **Make assumptions**
   about all factors that have an effect on the emissions trend in the covered sectors (other policies, economic growth, fuel prices)
3. **Set the ETS cap**
   in line with these assumptions, the contribution of other policy instruments (current and future), and the emission target
4. **Revisit assumptions periodically**
   if necessary, adjust the cap (or the complementary policies)
5. **Implement a market stability mechanism**
   that (automatically) reacts to over- and undersupply of allowances

Accounting for different policies and their influences

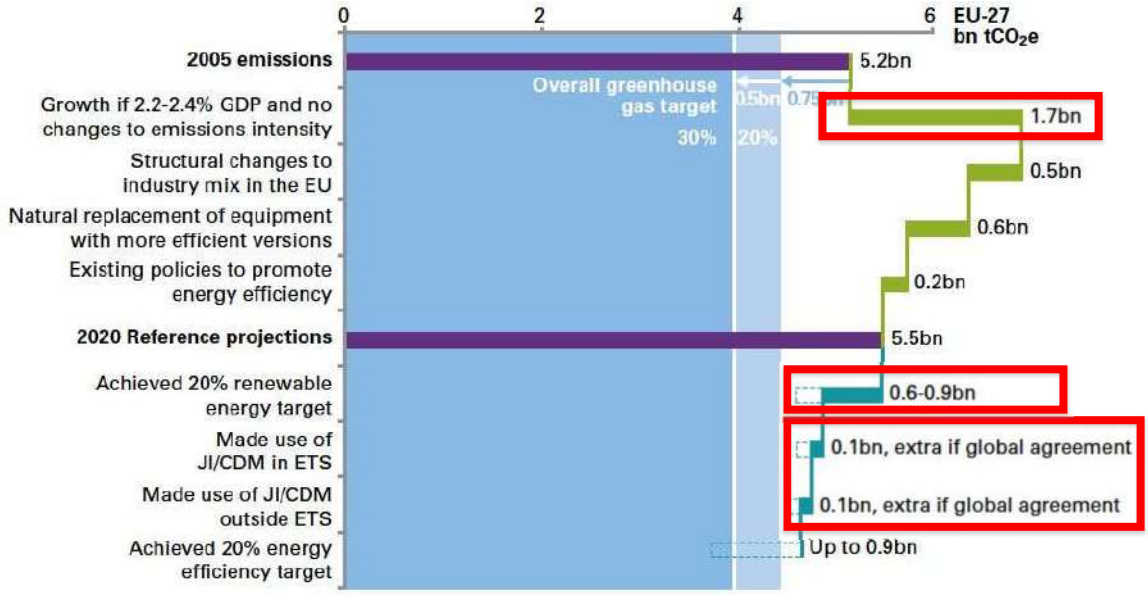
Federal Ministry for Economic Affairs and Climate Action



Accounting for different policies and their influences:

Federal Ministry for Economic Affairs and Climate Action

The importance of getting the baseline right: in 2008, the modelling for the EU ETS cap assumed annual GDP growth of 2.2%. In reality, due to the financial crisis, real GDP in the EU only grew by 0.9% per annum on average since 2008.

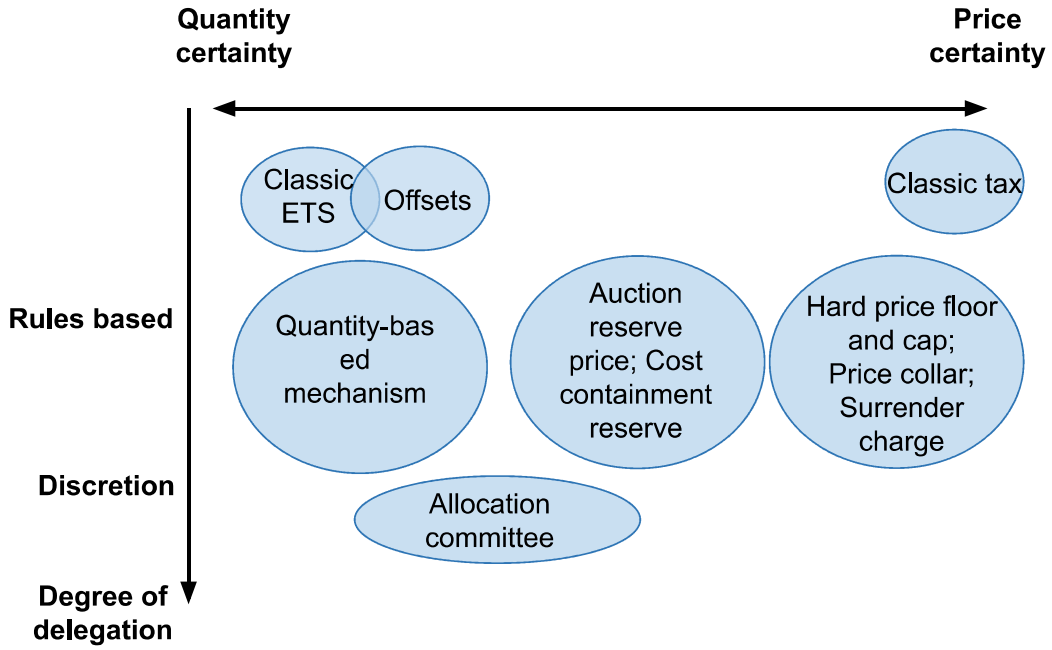


Source: Carbon Trust 2008, Cutting Carbon in Europe

Implement a market stability mechanism

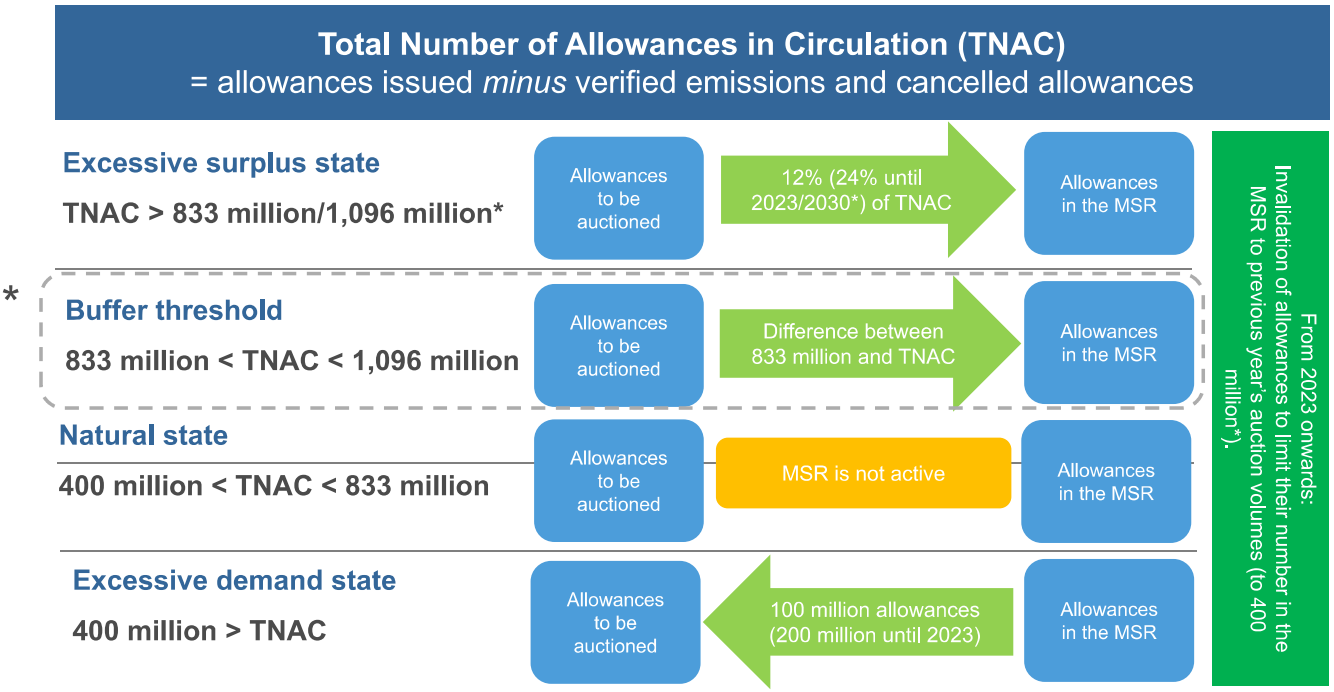
Federal Ministry for Economic Affairs and Climate Action

An ETS can adjust to changing conditions using:



Source: ICAP 2016 based on Grosjean et al. 2014

Case study: EU ETS Market Stability Reserve (MSR)



*According to Fit-for-55 legislative package proposal by European Commission from 14 July 2021

Source: Based on PMR & ICAP 2021

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Role of the ETS in the Climate Policy Mix

- The transition to a low-carbon economy is a complex process that cannot be planned precisely. Climate policy should be efficient but should also be resilient to surprises. ETS provides the quantified frame for climate policy.
- Carbon pricing is efficient, but additional instruments are needed. Each instrument has its function in the policy mix. Interactions between the different instruments need to be monitored and managed.
- Managing the interaction also means revisiting and occasionally changing the system.
- ETS as the flagship instrument of Climate Policy. ETS price signal can and should do some of the heavy lifting in the process of decarbonization.
- ETS as a safety valve to make sure that emissions meet long-term target, no matter how other policies (under-/over-) perform and how other parameters evolve (fuel prices, innovation, consumption, population)

part of eex group

Market Operation under EU ETS & Registry Demo

European Energy Exchange (EEX)

25 June 2025

Agenda

- EEX Group Introduction – Hsin-Yi Huang, Business Developer, EEX
- EEX's role in EU ETS Auction – André Tzschoppe, Expert Environmental Markets, Environmental Markets, EEX
- A Glance at the Auction System – Andrew Rimmer, Head of Development, KB Tech
- Secondary Markets & FAQ – Steffen Loebner, Head of Environmental Markets, EEX

EEX Group Intro & Products

01

European Energy Exchange Markets and Services

Exchange

- European Energy Exchange (EEX): Leading Energy Exchange in Europe
- Develops, operates and connects secure, liquid and transparent markets for energy and commodity products

Markets

- Power
- Natural Gas
- Freight
- Environmental
- Agricultural products
- Registry Services
- Gurantee of Origins (GO) / Renewable Energy Certificates (RECs)

Settlement

- Clearing and settlement of trades is performed by the clearing house ECC (Europe, Asia) and by Nodal Clear (USA)

Owner

- EEX belongs to Deutsche Boerse Group (75,05%)
- Saxony's shareholders include the State of Saxony and the City of Leipzig. (7,94%)
- Other shareholders of industrial, energy and financial companies, including Uniper, EnBW, EdF (17,03%)

Group

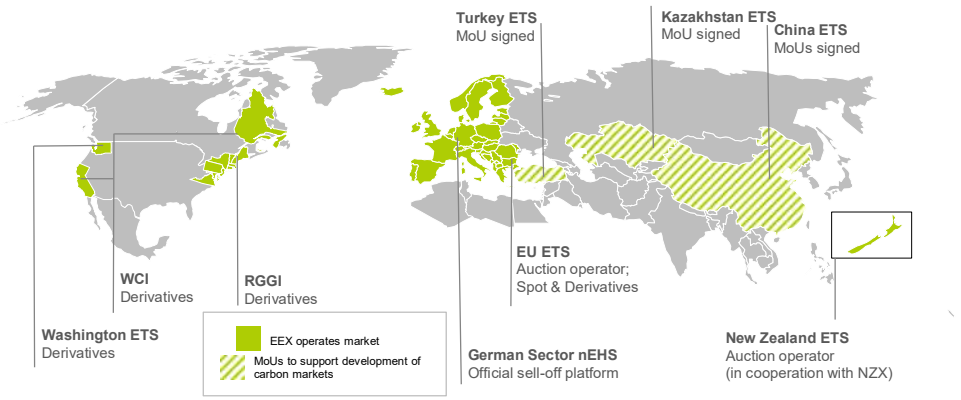
eex · epexspot · eexasia · ecc · pxe · nodal · nodalclear · getbaltic · grexel

Introduction

Facts & Figures

Strength	**# 1** in Power Trading worldwide	**# 2** in Gas Trading worldwide
Growth	More than **850** Trading participants from 41 countries, thereof >300 for carbon markets. The list of participants is available on our website (Link)	**# 1** in the diversity of environmental products
Trust	**22** offices in 8 time zones on 4 continents	**> 3,000** Emissions Auctions in the EU ETS

Carbon markets at EEX Group



Europe – Core market EU ETS1 with EU ETS 2 as enlargement of covered sectors is on the horizon

EU ETS1	- **Auction operator** for all EU governments, operating auctions on almost daily basis - **Secondary Market** (Spot, Futures, Options)
German nEHS	- **Official sell-off platform** for German Fuel ETS (transport, heat sectors)

NZ – Key tool for meeting NZ and international climate targets

NZ ETS	- **Auction** partnership with New Zealand Exchange (NZX)

NA – Growing NA markets with new schemes being developed on state level and first offering of VCM products

RGGI, California, Washington, Western Climate Initiative	- **Futures & Options** - Other Environmental Markets (RECs, RINs, SO_2/NOx)
Voluntary Carbon Market	- **VCM** product suite (e.g. CORSIA-eligible, Nature-based, Removal) listed at Nodal

International – Supporting the development of emerging carbon markets worldwide

International cooperation	- EEX has signed **MoUs with exchanges in China, Kazakhstan and Turkey** targeting the development of national carbon markets.

Carbon markets at EEX Group

Toolkit EEX - Market Offering

Registry provider
for environmental markets

- Transparent and secure registry, monitoring the carbon stock of the market
- Grexel (part of EEX Group) operates different environmental registries on behalf of the national governmental institutions

Technology provider

- Technology platform for governments and institutional operators
- Cooperation with National stock exchange for New Zealand (NZX) for the New Zealand ETS
- IT portfolio consisting of different solutions to meet the dedicated requirements per market

Service provider

- Operating auctions, sales platforms or RFQ on behalf of governments and other institutional providers
- Operating the EU ETS auctions successfully since 2010

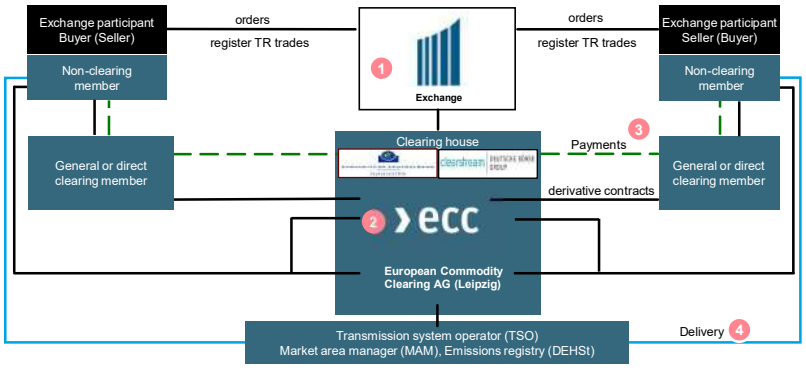
Continuous products for the secondary market

- Launching spot, futures and options with different expiries matching the need of the market to increase liquidity
- Financial clearing of OTC business
- Physical fulfillment of trades through ECC
- Setting clear price signals in carbon markets

Exchange Structure

The EEX group develops, operates and connects secure, liquid and transparent markets

Standardized contracts are listed and traded/registered at European Energy Exchange (EEX AG) and ready for clearing.
Clearing and settlement of all trading transactions are provided by the clearing house European Commodity Clearing (ECC AG).



eex

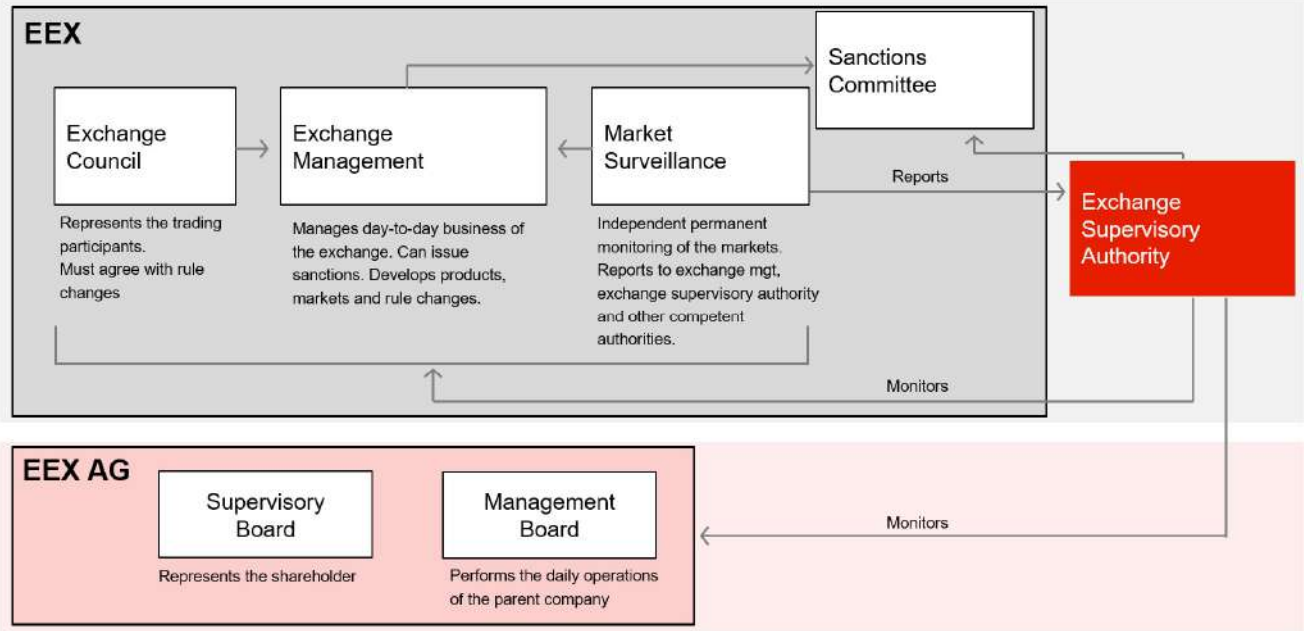
- Transparency: through recognized reference prices and the publication of market data (prices and volumes)
- Concentrated Liquidity: Access to trading participants
- Eliminate counterparty risk
- Anonymity in trading: ensure non-discrimination and equal treatment of all trading participants

ecc

- Physical settlement (delivery)
- Financial settlement (payment)
- Risk management services
- Straight-Through Processing (STP)
- Reporting Services

Exchange Bodies and Supervision

Various exchange bodies play a part in **ensuring the trustworthiness** of exchanges through both internal and external controlling processes.



EEX's product portfolio in emissions markets

EEX offers companies access to all existing EU ETS markets

A **Primary market** : EUAs auctioned

Auctions with physical delivery of allowances on the next day for:
- EU Allowances (EUA)

- ✓ Auctioning is the **default allocation method** in the EU ETS. 57% of allowances are auctioned.
- ✓ **As appointed Common Auction Platform, EEX operates auctions** for EU member states, EEA EFTA states and the UK in respect of generation of electricity in Northern Ireland.

B **Secondary market** : EUAs traded between market participants

Trading with physical delivery of allowances the next day for:
- Spot EU Allowances (EUA)

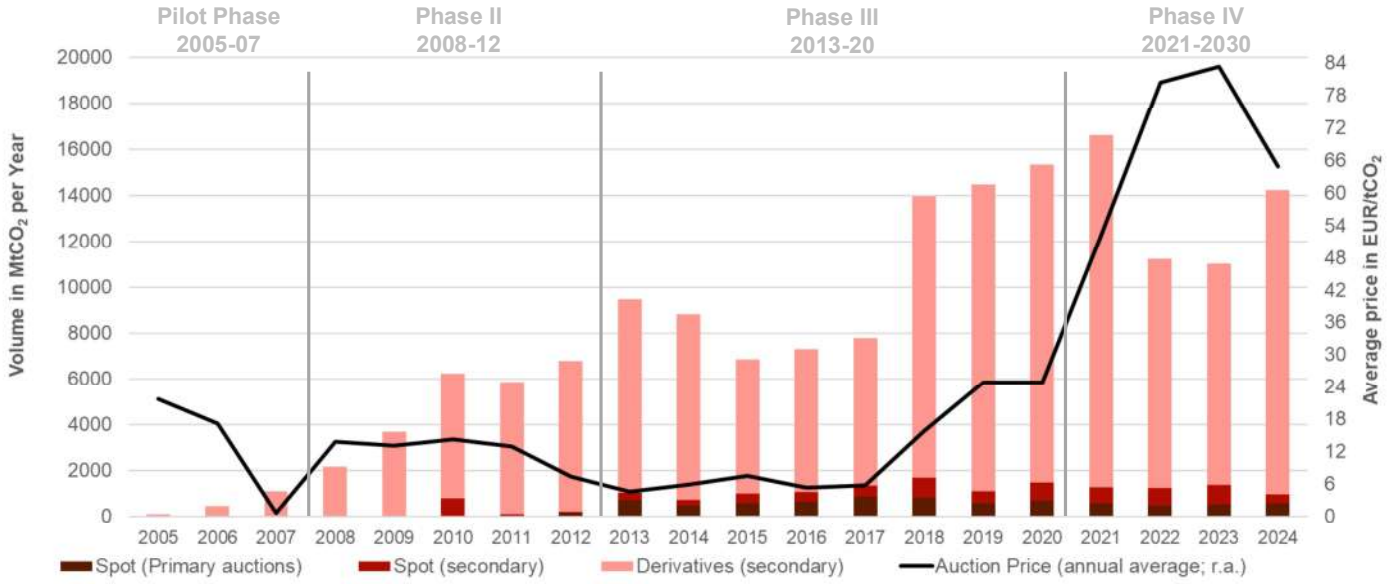
Trading with physical delivery of EUAs 2 days after expiry of the contract:
- Monthly Futures for the current and next two months
- Quarterly Futures for the current and next 11 quarters
- Yearly Futures with December maturities for the current and next 8 years
- Options of the above futures maturities

- ✓ EUAs traded between market participants are **traded close to 100% on exchanges, the most secure method**.
- ✓ Comprehensive risk management combining **long-term management of price risk** up to 9 years in advance with **short-term optimization of their portfolio**.

Auction

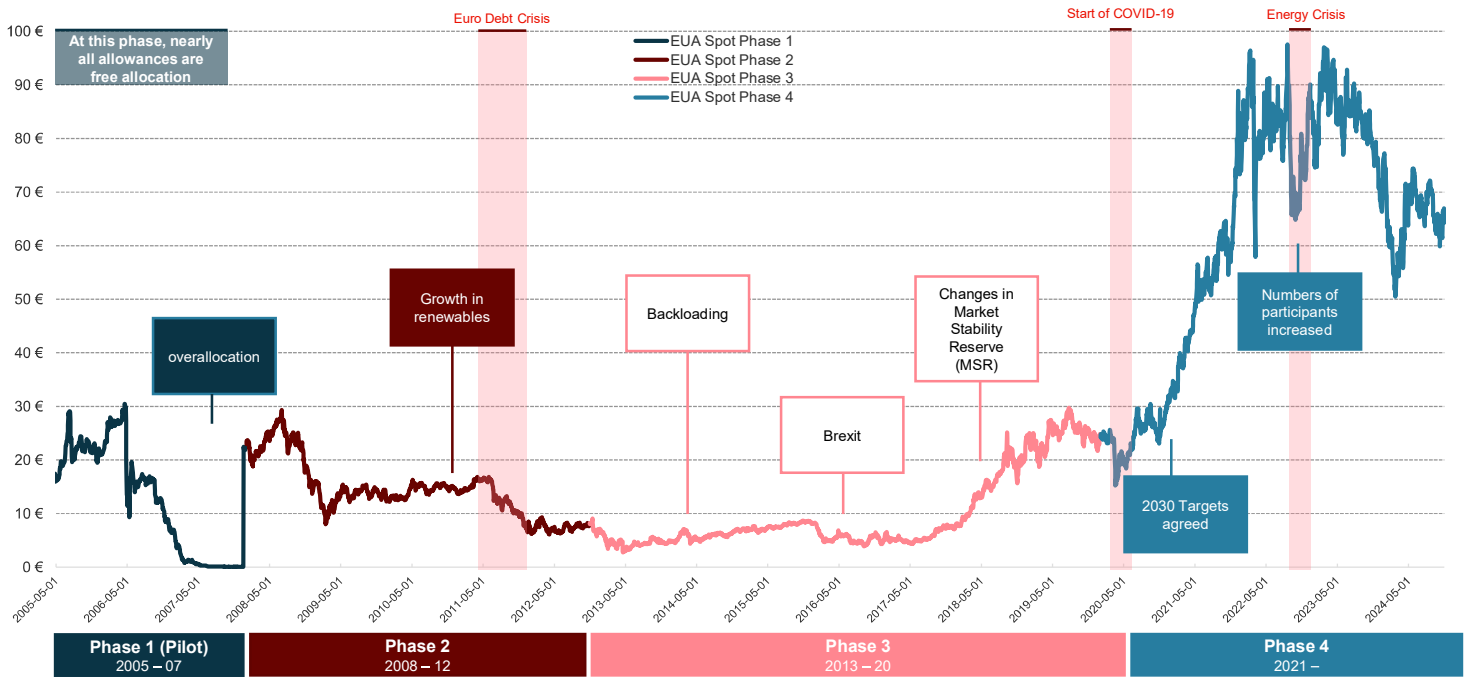
03

Trading Volumes and Prices – EU ETS



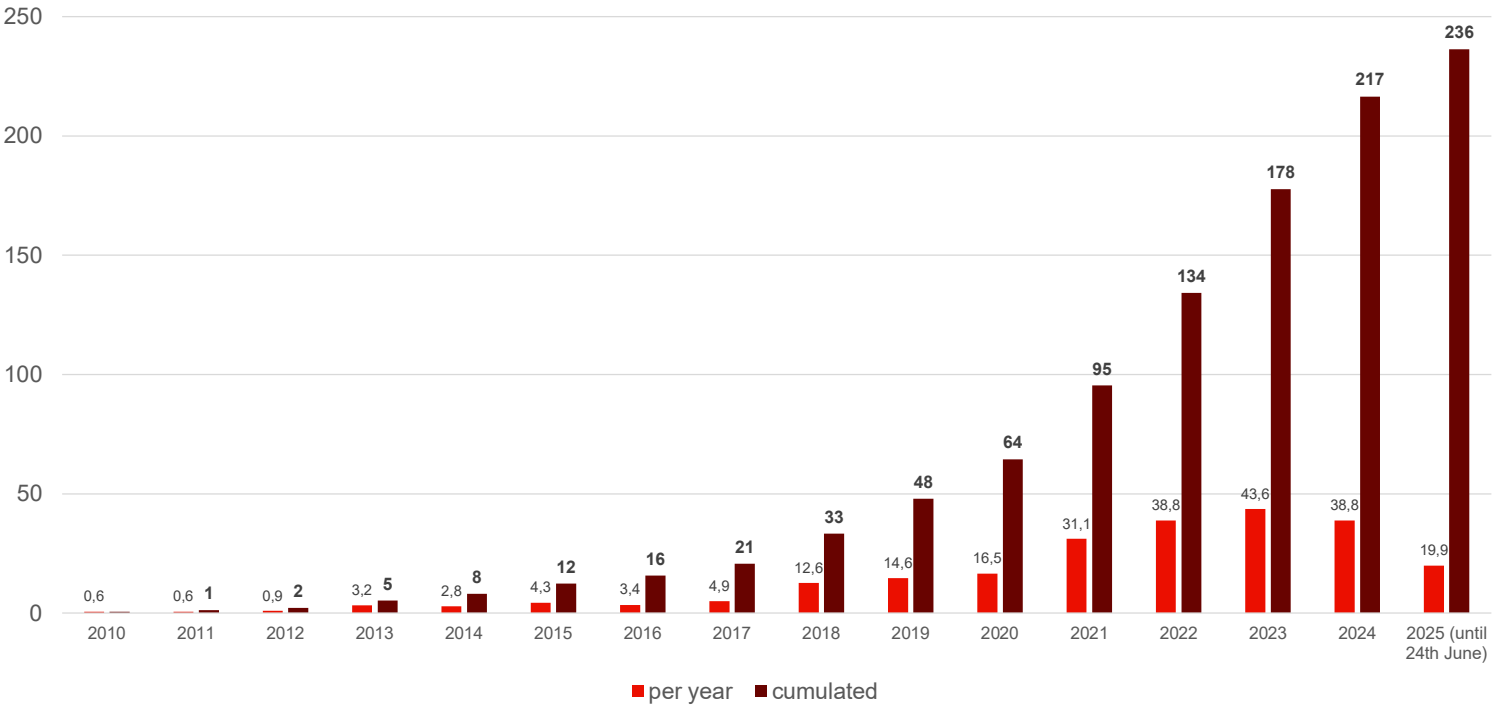
- The **EU ETS has helped bring down emissions from power and industry by nearly 50% since 2005**, and the money raised each year through the auctioning of carbon permits brings in **a substantial amount of income to the bloc**, with billions channeled towards clean energy projects.
- EEX successfully conducted **more than 3,000 EU ETS auctions** since 2010, by running EU ETS auctions almost **every weekday**

EU ETS Allowance (EUA) Historical Prices Development
2009 - 2024



Source: EEX, 2024

Auction Revenues generated for EU ETS countries via EEX auctions in billion EUR



Source: EEX, 2025

What are Emissions Auctions?

Auctioning is the basic principle of allocating allowances within the EU Emissions Trading System (EU ETS).

- Businesses have to buy an increasing proportion of allowances through auctions in accordance with **EU Auctioning Regulation** (Commission Regulation (EU) No.2023/2830).
- EEX allocates **100%** of all allowances auctioned in the EU ETS

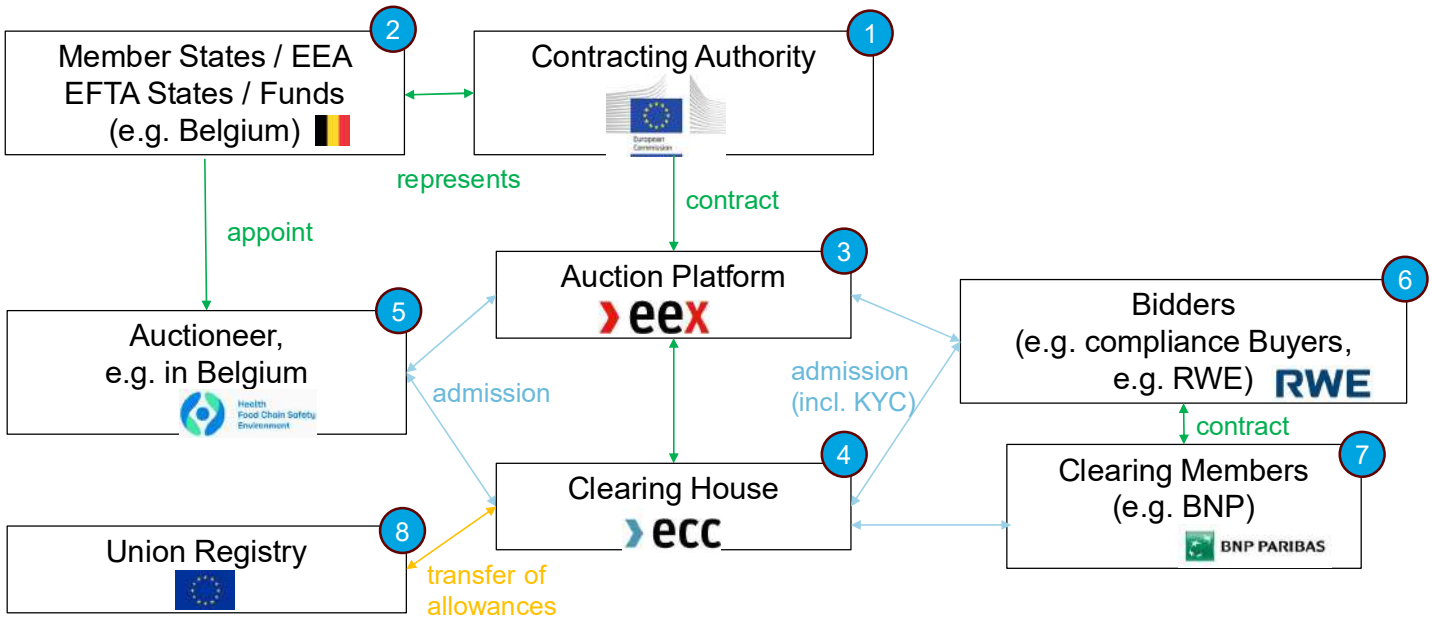
Auction Product	Delivery Day	Contract size	Contract Size	Minimum Size	Tick Size	Fulfillment
EU Allowances valid for compliance in the EU ETS	T+1	1 EUA	1 EUA	500 EUAs (=500 t CO2eq)	EUR 0.01 per allowance	Delivery versus payment

Eligibility: all participants have to fulfil admission requirements according to EU and EEX rules

Participants (currently 116 admitted):

1. Compliance buyers (operators of stationary installations, aircraft operators, shipping companies)
2. Investment firms and credit institutions bidding on their own account or on behalf of their clients
3. Business groupings of compliance buyers
4. Other intermediaries specifically authorised by the home Member State

EU ETS auctions: main roles



EU ETS Auctions: auction processes

T-X → T-2 → T → T+1 → T+X

Prior to the auction

Preparatory Tasks

- Website, publication auction calendar, admissions, collateral

Transfer of Allowances

- Transfer of allowances from EU Auction Account to the EU Auction Delivery Account of ECC

On the day of the auction

Bidding & Publication

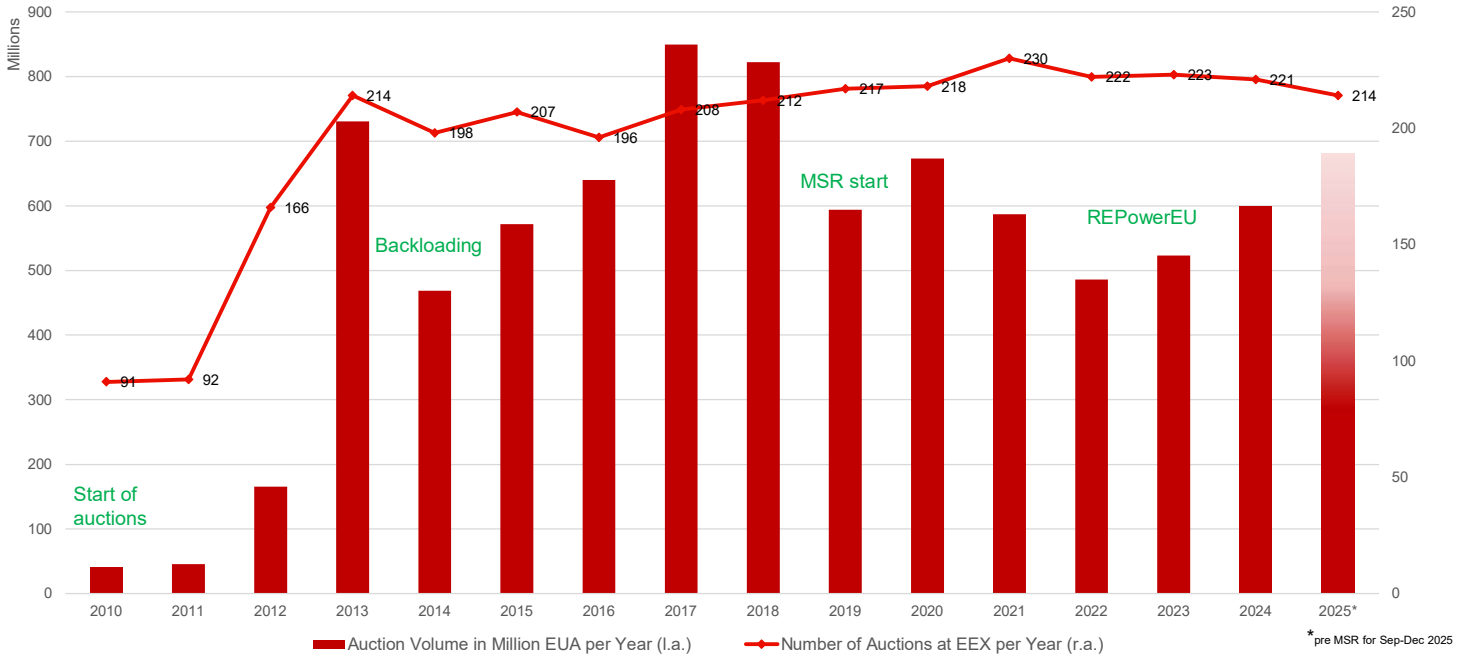
- Usually 9-11 CET: **bidding window** is open; **single round, sealed bid, uniform price**
- Usually 11 CET: Determination of the **auction clearing price**, **publication of auction results** on trading screen, data feeds
- Usually shortly after 11 CET: publication of auction results on website

After the auction

Settlement & Delivery

- **Payment** from Clearing Members (of successful bidders) to ECC and from ECC to Auctioneers within TARGET2 infrastructure
- **Delivery** to the ECC internal accounts of the successful bidders (and in the registry from ECC's Auction Delivery Account to ECC's trading account)
- **Delivery (upon request):** auctioned allowances will be transferred from ECC's trading account to the bidder's nominated registry account

EEX auctions for the EU ETS



→ More than 3,000 successful auctions (+12 cancelled auctions) to date for more than 8 quadrillion allowances

Comparison of current EEX emission allowances auction mandates

	EU ETS	nEHS	NZ ETS
Jurisdictions	All 27 EU Member States + 3 EEA EFTA States	Germany	New Zealand
Start of operation	2005 (auctions since 2010)	2021 (auctions planned as of 2026)	2008 (auctions since 2021)
Sectoral coverage	Power, Industry, Domestic Aviation	Transport, Buildings	Power, Industry, Domestic Aviation, Forestry, Waste, Transport, Buildings
Contractual relationship	EEX/ECC contracts with European Commission, Germany, Poland individually	EEX/ECC contract with Germany	EEX contract with local exchange NZX as provider of auction system and knowledge
Cap 2024	~ 1,414 MtCO2e (EUA)	~ 280 MtCO2e (nEZ)	~ 22 MtCO2e (NZU)

Auction System Demo

02

Secondary Markets

03

Comparison Primary and Secondary Emissions Market

Topic	Primary Market	Secondary Market
EEX worldwide	#1	#2
Trading	Auction (in M7 Auction) EUA usually 9-11am (almost daily)	Continuous Trading (in T7) 8am – 6pm (daily)
Participants can	Buy	Buy and Sell
Determination of Calendars and Tables	●	
Admission	●	●
Reserve Price	●	
Reporting	●	●
Market Surveillance	●	●
Registry	●	●
Clearing and Settlement	On T+1	Secondary Spot: On T+1 (if concluded until 4pm) Secondary Futures: second ECC business day after the last trading day

EEX's product portfolio in emissions markets

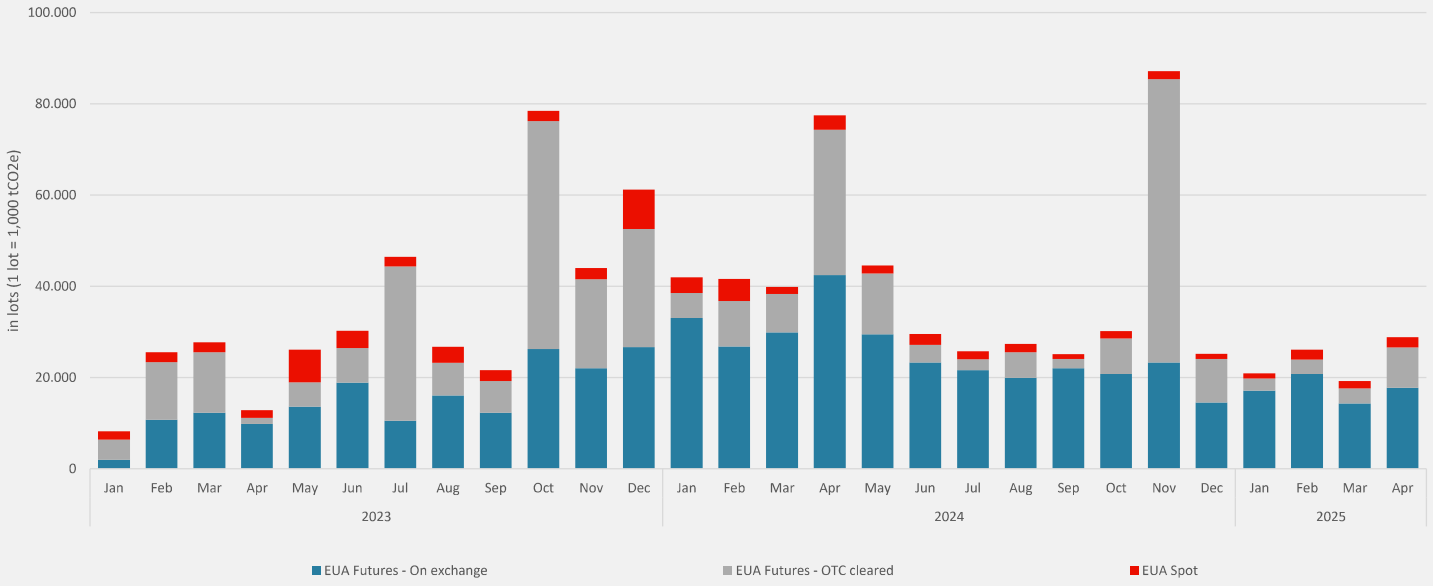
All important compliance instruments are offered for trading:

Spot	Derivatives
Primary Market	
Spot auctions with T+1 delivery EU Allowances (EUA)	
Secondary Market	
Spot trading with T+1 delivery EU Allowances (EUA)	*Futures trading with T+2 delivery after expiry, incl. related spreads* EU Allowances (EUA) up to 2027 *Options trading on Futures* EU Allowance (EUA) Futures

Clearing and settlement of trades are rendered by EEX's clearing house European Commodity Clearing AG.

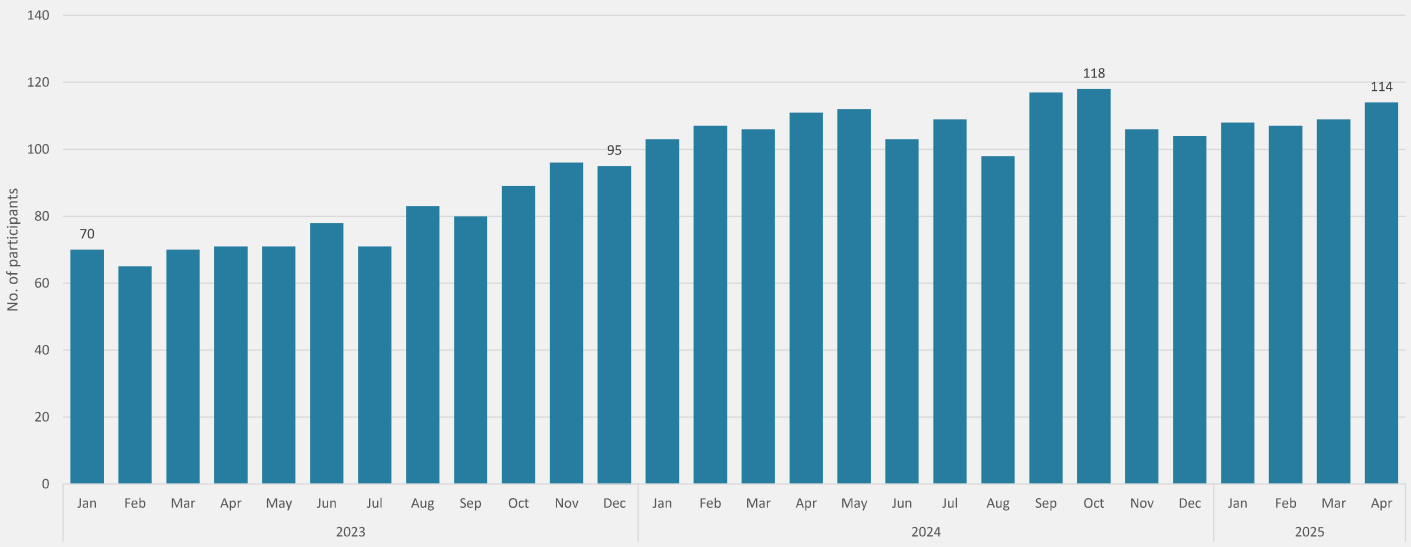
EUA Secondary Market

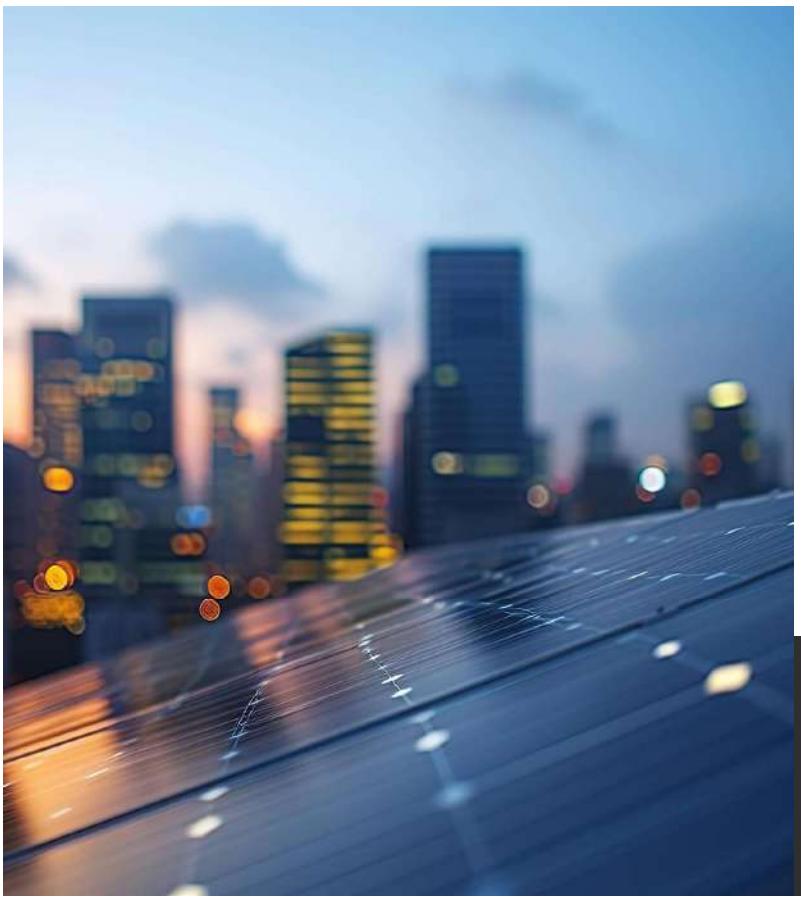
EEX Volume development in lots



EUA Secondary Market

Active participants per month





part of eex group

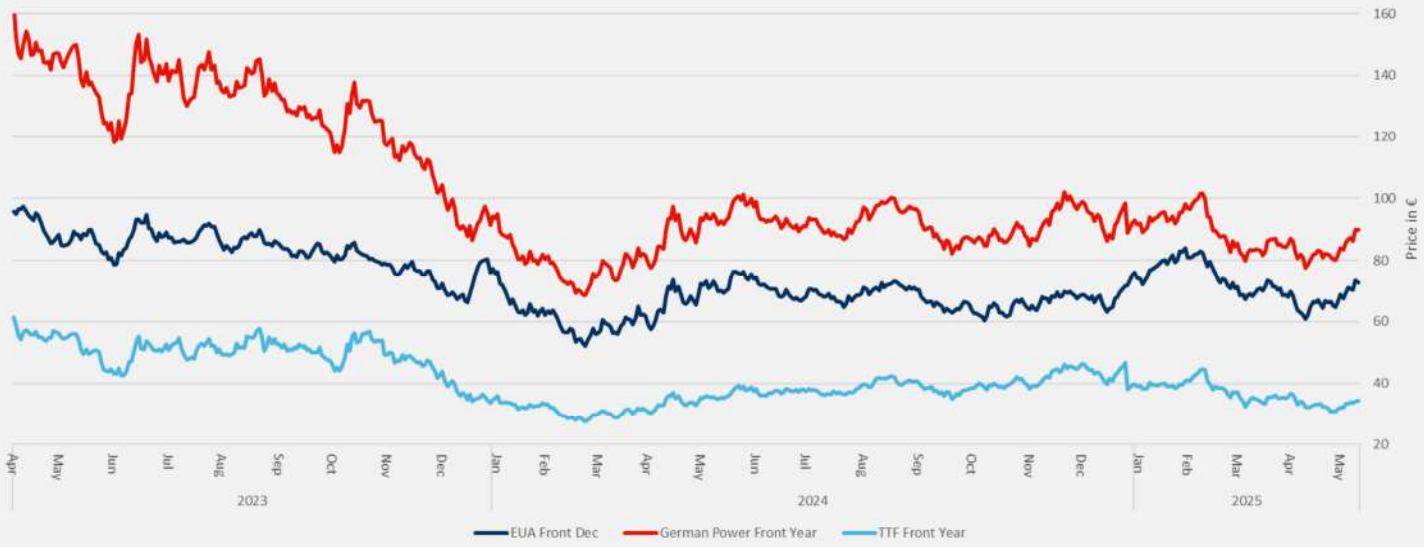
Frequently Asked Questions

Interaction Carbon Price with Energy Prices

Power traders often refer to fuel prices and carbon prices as basis for price changes. Carbon traders on the other hand refer to power, gas and coal prices. Both kind of traders are also very interested in (Clean) Dark and Spark Spreads. (gross margins of power plants from selling a unit of electricity, having bought the fuel (+ emission allowances) required to produce this unit of electricity)

EUA Secondary Market

EUA Front Dec, German Power Front Year, and TTF Front Year – Price Development



Following a six-month low on April 9th due to geopolitical disruptions, EUA prices have steadily recovered, reaching pre-tariff levels by early May.

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Q&A

Contacts

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環境部
Ministry of Environment

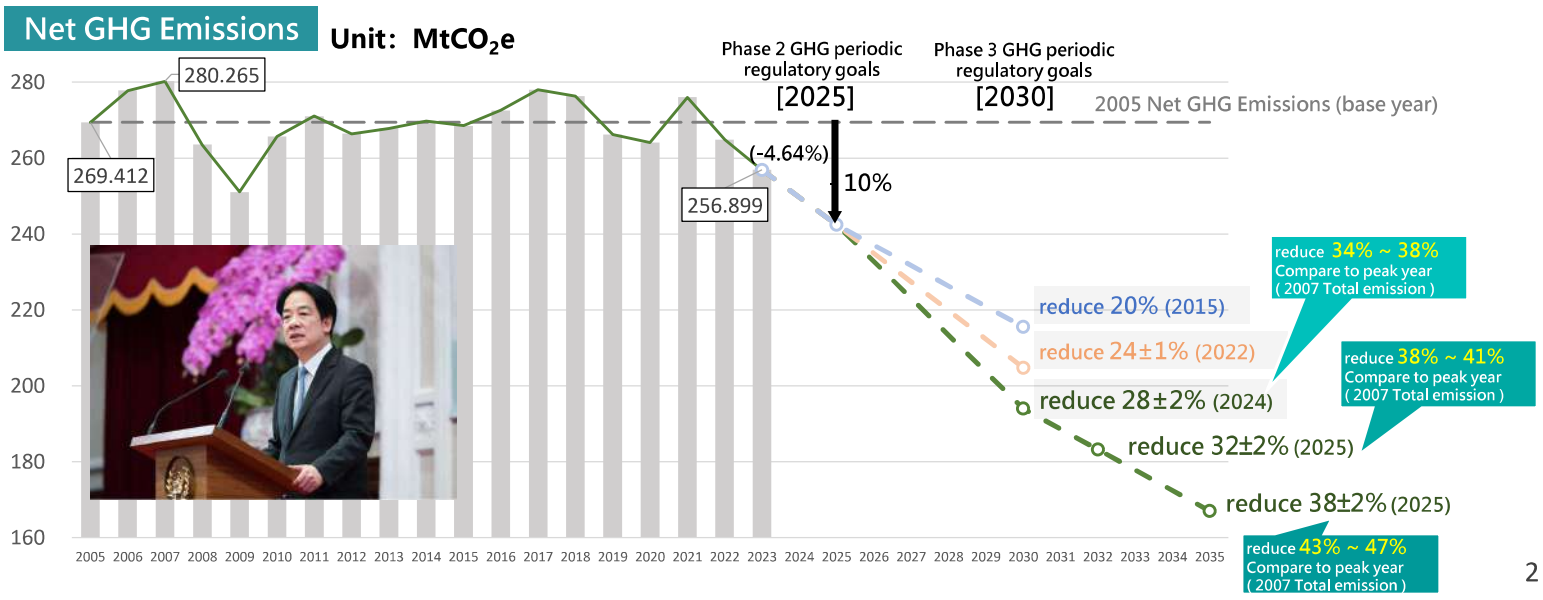
Taiwan's carbon fee and carbon pricing plans

Climate Change Administration,
Ministry of Environment

25 June, 2025

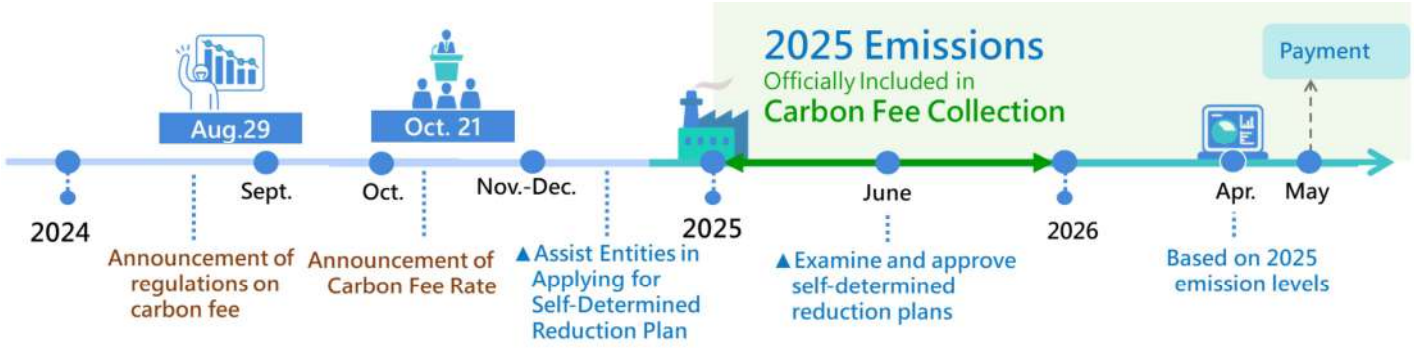
Setting Carbon Reduction targets

- Taiwan promulgated amendment for "Climate Change Response Act" in 2023, initiating the implementation of net zero emissions by 2050.
- President Lai proposed a draft proposal on 23 Jan. 2025, setting Taiwan's new 2035 NDC targets at emissions reductions of 38±2%, compared with 2005, to keep up with the global NDCs 3.0 submission trend.



Implementation of Carbon Pricing

- On **August 29, 2024**, the Ministry of Environment (MOENV) announced the three regulations for the carbon fee system, **officially putting the policy into effect**.
- The carbon fee rates announced on **October 21, 2024**, **have taken effect in 2025 :**
  - **Standard Carbon Fee Rate**: **NT$300 (US$9.34)** per ton of carbon dioxide equivalent (tCO_2e) for general entities subject to the carbon fee.
  - **Preferential Carbon Fee Rate A: NT$50 (US$1.56)** per ton of carbon dioxide equivalent (tCO_2e) for entities that apply for a self-determined reduction plan and meet the industry-specific designated reduction rate.
  - **Preferential Carbon Fee Rate B: NT$100 (US$3.11)** per ton of carbon dioxide equivalent (tCO_2e) for entities that apply for a self-determined reduction plan and meet the technology benchmark designated reduction rate.



Key points of three regulations on Carbon Fee

❶ *Regulations Governing the Collection of Carbon Fees*

Entities subject to carbon fees: **power and gas supply industries**, as well as **manufacturing industries**, with annual emissions of 25,000 metric tons of CO_2e or more.

Payment timing: The fee rates **take effect on January 1, 2025**, the payment for the 2025 emissions must pay carbon fees by the end of May 2026.

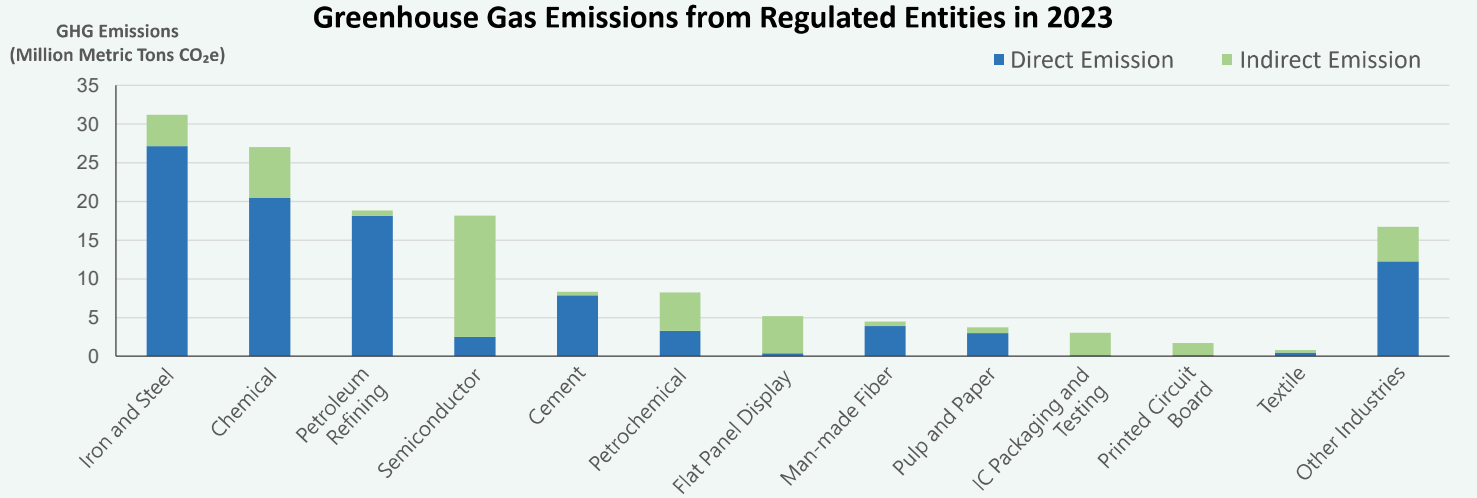
Carbon fee calculation: **carbon fee payment = chargeable emissions × fee rates**

Transitional adjustment mechanism: chargeable emissions = (annual emissions – K) × **emission adjustment coefficient**

1. **For industries classified as emissions-intensive trade-exposed (EITE) industry** (based on international assessment approach, considering trade intensity and emission intensity, and **having submitted a Self-determined Reduction Plan that has been reviewed and approved**), the initial **emission adjustment coefficient will be 0.2**. In the future, the coefficient will increase to 0.4 in the second phase and 0.6 in the third phase.
2. **For industries not classified as EITE industry,** the annual emissions will be reduced by the carbon fee threshold value K (25,000 metric tons, with future phased adjustments).
3. **Use of emission reduction credits**: Domestic credits can be used to offset up to 10% of the chargeable emissions. International credits must be approved by the MOENV and can only be used by non-high carbon leakage risk industries, with a maximum offset limit of 5%

Sectoral Analysis of Industries Subject to Carbon Fee

- Based on the 2023 inventory registration and verification results of emission sources subject to greenhouse gas inventory, registration, and verification requirements, it is estimated that approximately 260 companies (474 facilities) will be subject to the carbon fee.
- The greenhouse gas emissions from these regulated entities amount to approximately 147 million metric tons of CO_2 equivalent, accounting for about 54.8% of the nation's total emissions.



Key points of three regulations on Carbon Fee (cont.)

❷ *Regulations for Administration of Self-Determined Reduction Plan*

- Entities subject to the carbon fee that effectively reduce their emissions and achieve designated targets by **switching to low-carbon fuels, adopting negative emission technologies, improving energy efficiency, utilizing renewable energy, or enhancing industrial processes** may submit a Self-determined Reduction Plan to apply for approval of preferential rates.
- **By April 30th of each year, entities must submit an execution progress report for the previous year** to the MOENV for review. The report must include details on any required improvements and circumstances that could lead to the cancellation of preferential rates. **If, upon review, the entity fails to meet the designated targets, the rates for that year will revert to the general fee rate.**

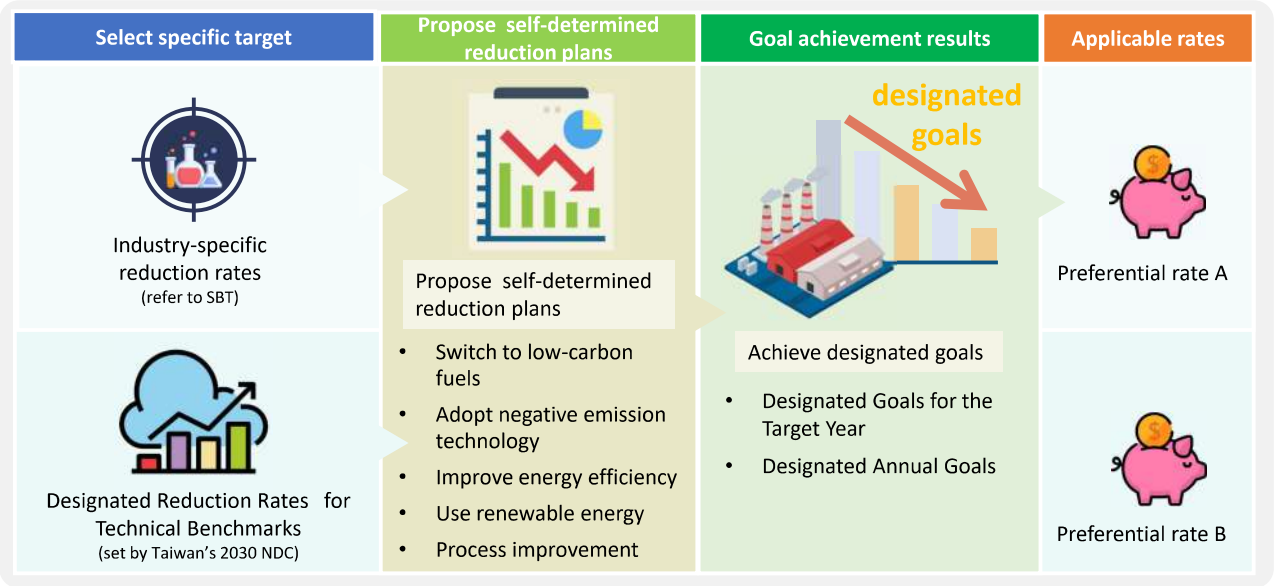
❸ *Designated Greenhouse Gas Reduction Goal for Entities Subject to Carbon Fees*

With 2030 as the target year, two designated reduction rates will apply to different preferential rates:

1) **Industry-specific designated reduction rate**: Using 2021 as the baseline year, this target is set with reference to international science-based targets (SBT) and qualifies for **Preferential Rate A**.
2) **Technology benchmark designated reduction rate**: Using 2018-2022 as the baseline years, this target considers the emission types of each source, including fuel types, processes, and electricity usage, and qualifies for **Preferential Rate B**.

Self-Determined Reduction Plans and designated goals

- Those who can effectively reduce greenhouse gas emissions and meet the targets designated by the central competent authority may propose Self-Determined Reduction Plans and apply to the central competent authority for approval of preferential rates.
- The target year of the specified target is 2030; two calculation methods are provided for enterprises to choose.



High Carbon Leakage Risk Identification

Objective Preventing carbon leakage risks and reducing the competitiveness challenges faced by regulated entities due to carbon fee policy

Approach Determine the eligibility of entities for **high carbon leakage risk discount** by considering:
(1) **industry classification** and (2) **maintaining the international competitiveness of industries**

Level 1：Industry Classification

- **Considerations and Conditions**

Referring to international practices, considering trade intensity and emission intensity, industries with a Carbon Leakage (CL) indicator exceeding a specified threshold are defined as **high carbon leakage risk industries**.

Eligibility applies through 2030 upon approval

Level 2：International Competitiveness Consideration

- **Considerations and Conditions**

Considering carbon leakage risks from **additional carbon costs** (e.g., US tariffs), regulated entities with **negative annual gross profit**, **high carbon fees relative to gross profit**, or **exposure to international dumping** may apply for a carbon leakage risk discount to protect their international competitiveness.

Subject to annual application and approval for that year

The entities should **submit and pass the review of self-determined reduction plan** to receive a carbon leakage discount to reduce carbon fee.

Taiwan's Carbon fees are a tool for reduction, not a financial tool

Enterprises

- No proposal of Self-Determined Reduction Plans → The carbon fee will only be levied on emissions over 25,000 metric tons CO_2e, and the Standard Carbon Fee Rate will apply.
- Proposal of Self-Determined Reduction Plans that meet Designated GHG Reduction Goal
  - at high carbon leakage risk → Carbon fee = emissions X emission adjustment coefficient value X preferential rate
    - Phase 1: 0.2
    - Phase 2: 0.4
    - Phase 3: 0.6
  - not at high carbon leakage risk → Carbon fee = (emissions - 25,000 metric tons CO_2e) X preferential rate

The Reduction Effectiveness of the Carbon Fee System

- The three regulations on carbon fees **provide businesses with a clear understanding that carbon emissions have a price**, and how they can reduce both their carbon emissions and carbon fee burden through Self-determined Reduction Plans.

Appendix 1

Industry-specific designated reduction rate

With 2030 as the target year using 2021 as the baseline year

42%

Iron & Steel 25.2%
Cement 22.3%

reference to SBTi

qualifies for **Preferential Rate A**

Appendix 2

Technology benchmark designated reduction rates

With 2030 as the target year Using 2018-2022 as the baseline years

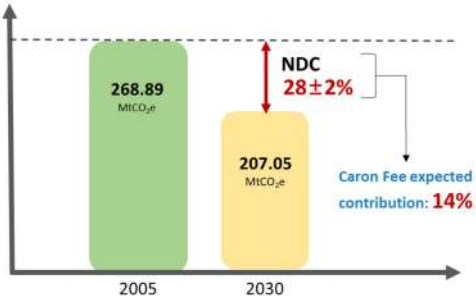
23%

considers the emission types of each source, including fuel types, processes, and electricity usage

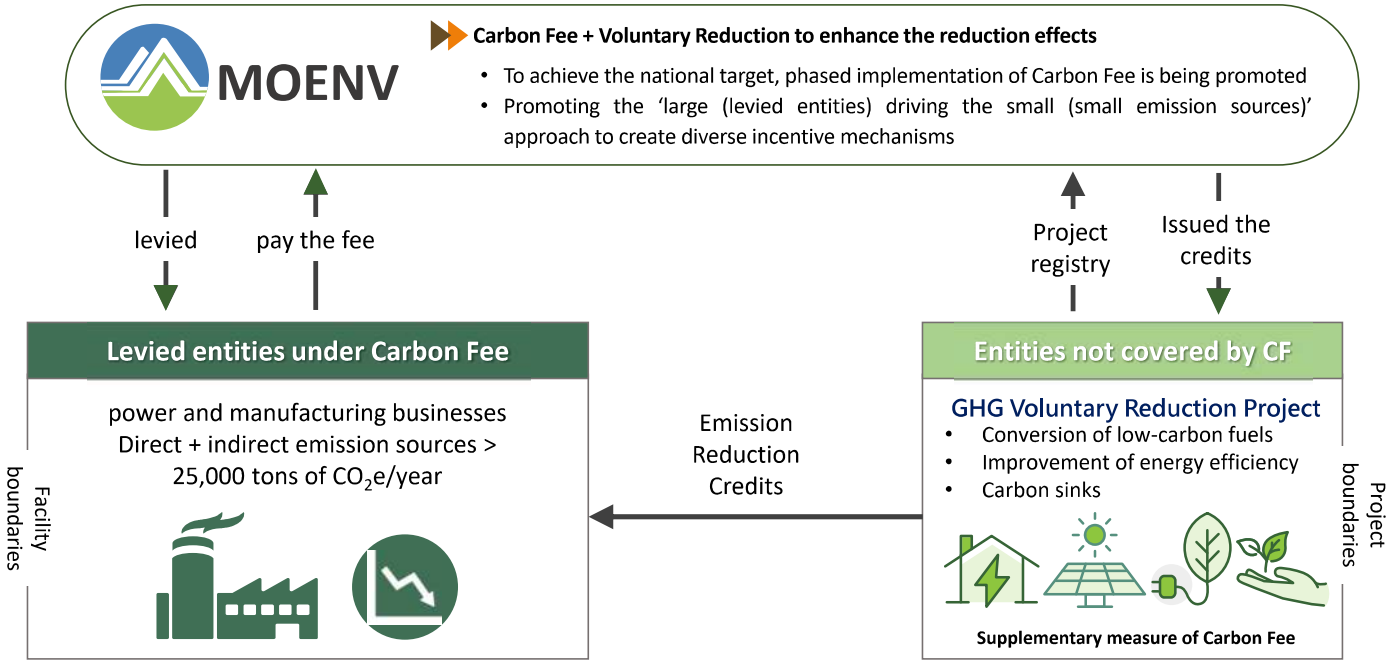
To achieve the 2030 Taiwan's NDC

qualifies for **Preferential Rate B**

- **If** all carbon fee collection entities submit **Self-determined Reduction Plans** and meets the **Designated Reduction Goal**, it is estimated that by 2030, **CO_2e emissions could be reduced by 37 million metric tons**, equivalent to **about 14% of the 2005 emission levels**.



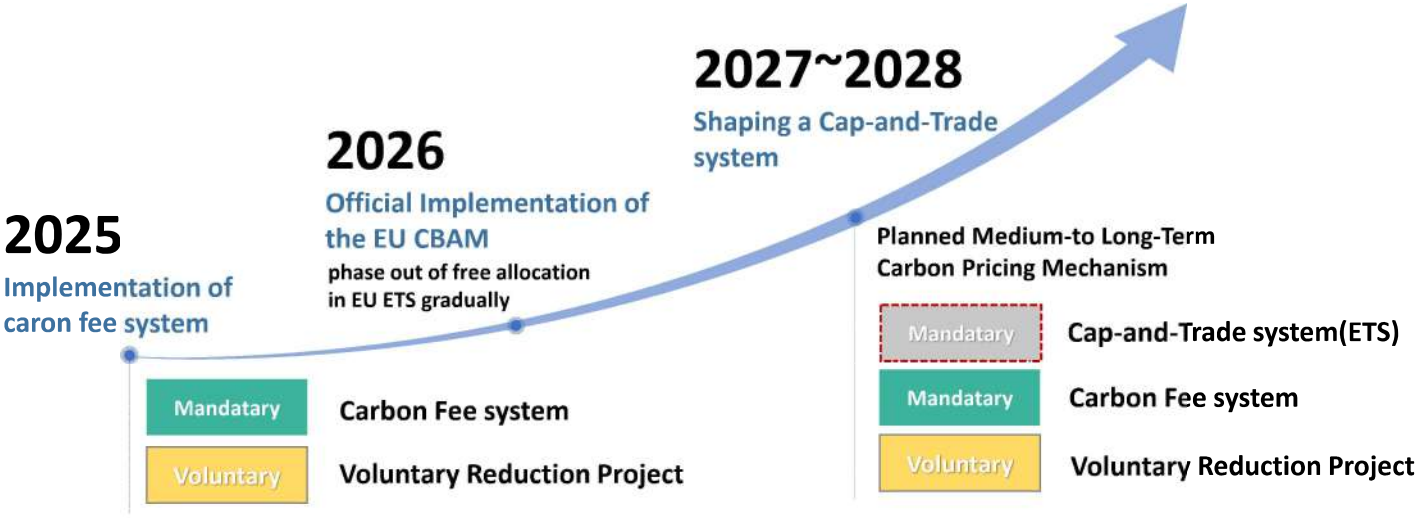
Carbon Pricing Mechanisms & Voluntary emission reduction mechanism



The prospects of carbon pricing in Taiwan

Aligning with international practices to promote domestic carbon pricing system

- **Implementation of Carbon fee system first, preferential rates to encourage substantial reductions**
- **If** all carbon fee collection entities submit **Self-determined Reduction Plans** and meets the **Designated Reduction Goal**, it is estimated that by 2030, CO_2e emissions could be reduced by 37 million metric tons, equivalent to **about 14% of the 2005 emission levels**.



環境部
Ministry of Environment

THANK YOU

International Carbon Action Partnership

TAIWAN DELEGATION VISIT TO ICAP

25 June 2025

AGENDA

1. About ICAP
2. Emisisons trading in the world
3. Selected ETS case studies
4. Q&A

1

ABOUT ICAP

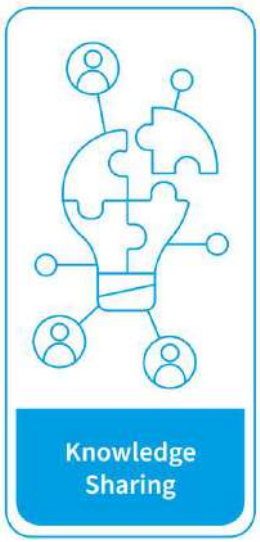
ABOUT ICAP

An international **forum** of **43 national & subnational** governments to **exchange** knowledge and experiences on emissions trading systems (**ETS**)

- Share **best practices** & learn from each others' experiences
- Facilitate **development and improvement** of carbon markets
- Explore the **role** of emissions trading in decarbonization

KNOWLEDGE SHARING

Sharing information about ETS and acting as a knowledge hub



- **ICAP Status Report and ETS Map**
- **ICAP News & ICAP Newsletter**
- **ICAP Website and social media**
- **ETS Briefs and educational materials**
- **Allowance Price Explorer**
- **Events:**
  - Regional Climate Summits
  - Innovate4Climate
  - COP

CAPACITY BUILDING

Building capacity and promoting readiness for ETS implementation

- **ICAP ETS Academy**
- **Regional training courses**
- **Advanced trainings**
- **In-country trainings**
- **Technical deep-dives**
- **Alumni activities**

TECHNICAL DIALOGUE

Promoting government exchanges on ETS design

- **Research and dialogues on key topics related to ETS design and implementation**
- **Recent work includes:**
  - ETS Scope expansion
  - ETS and net zero caps
  - ETS in the policy mix: companion policies
  - Offset use in ETS
  - Article 6 and ETS linking
  - ETS and Carbon Capture and Storage (CCS)
  - Integration of removals in ETS

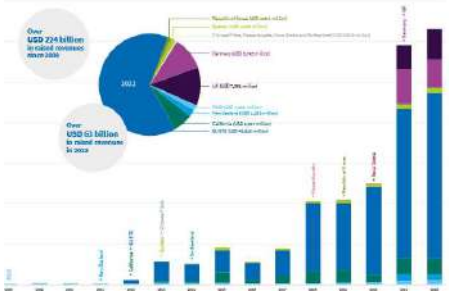
ADDITIONAL ICAP RESOURCES

ICAP Website & ETS Map

News

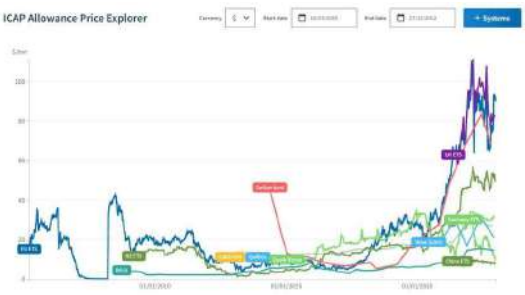
ETS Briefs

Infographics



Publications

Allowance Price Explorer



2

EMISSIONS TRADING IN THE WORLD

KEY TRENDS AND OUTLOOK

Momentum for ETS continues, particularly in emerging economies

- New ETSs are being developed and launched worldwide. Key G20 economies such as India, Brazil and Türkiye are leading the charge on the next generation of trading systems

Innovative system designs and use of offset credits are at the core of the next generation of ETSs

- Hybrid and intensity-based systems are shaping the next generation of ETS designs. The use of offset credits, predominantly domestic, is increasingly central in the design of new ETSs

Established systems evolve and eye net-zero alignment

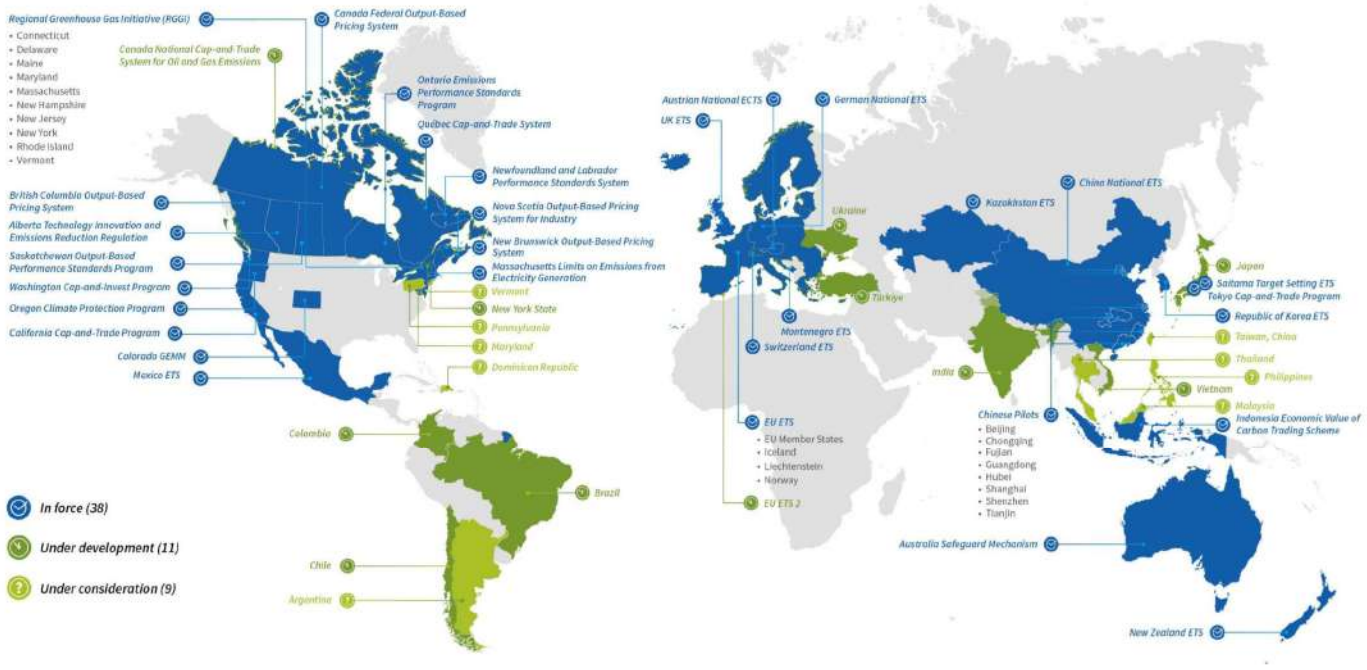
- Scope expansion and system reviews are the priority in many jurisdictions, with increasing attention to the integration of removals and the alignment process with net-zero targets

Challenges loom on the horizon

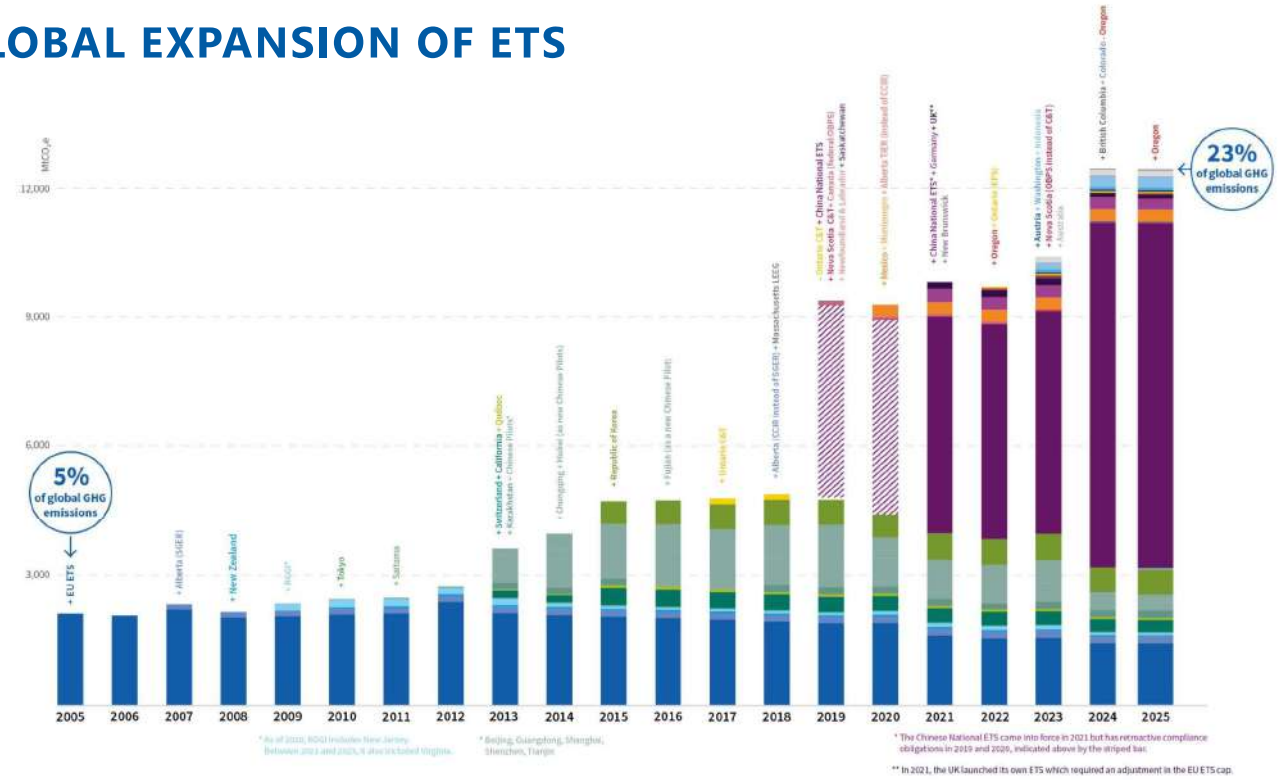
- Geopolitical and economic uncertainties pose risks to ETS stability and acceptability. Measures to support both covered entities and consumers, including through the use of revenues, will be key going forward

EMISSIONS TRADING IN NUMBERS

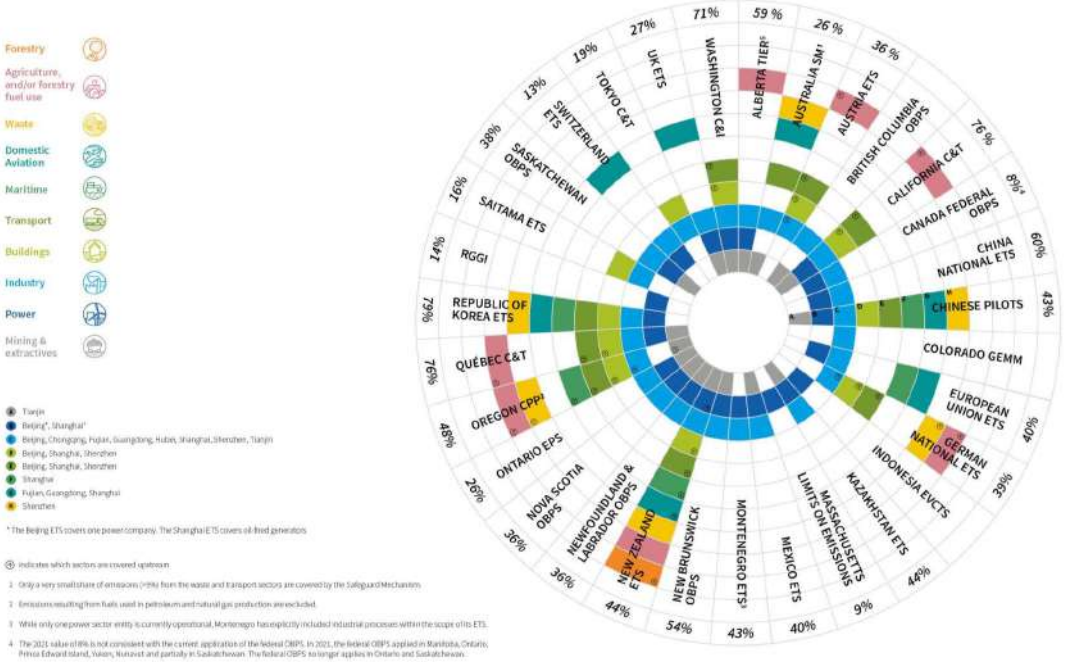
EMISSIONS TRADING WORLDWIDE



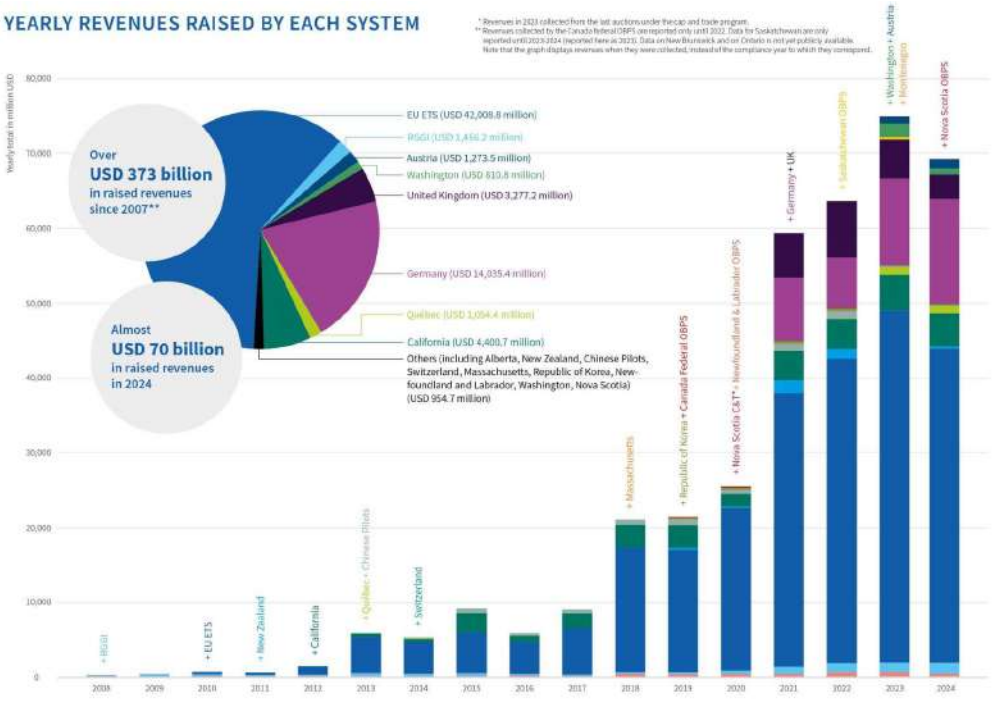
GLOBAL EXPANSION OF ETS



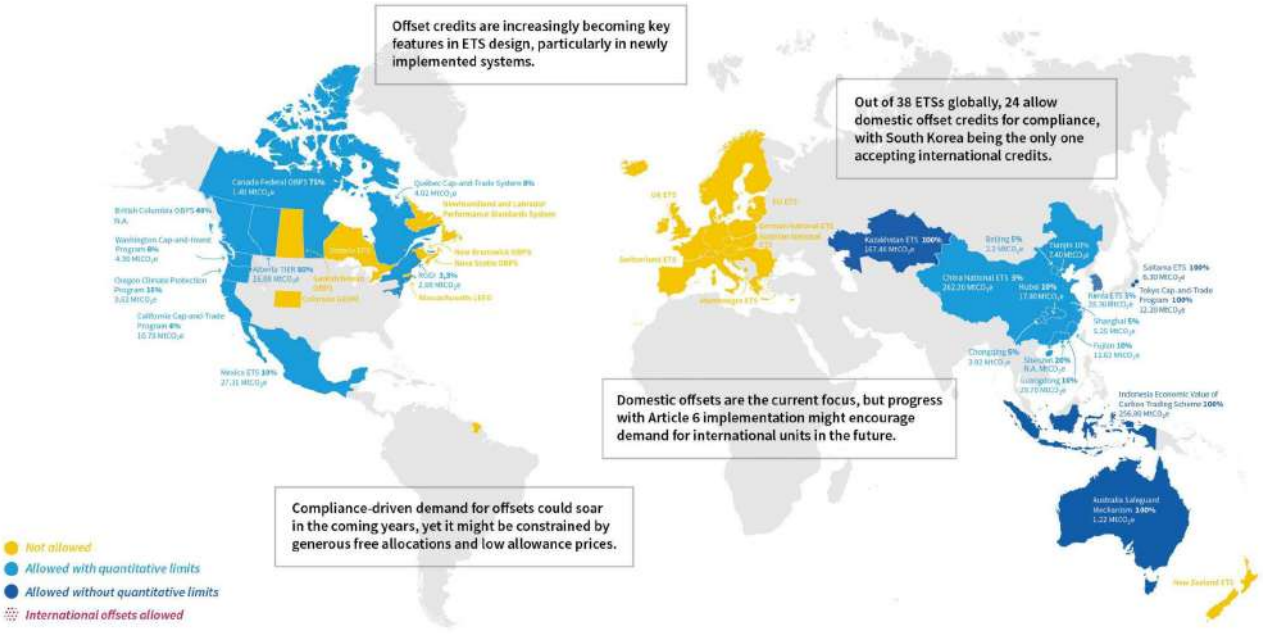
SECTOR COVERAGE



YEARLY ETS REVENUES



CARBON CREDITS USE IN ETS



3

SELECTED ETS CASE STUDIES

THANK YOU!

Lecture
Voluntary Carbon Market for Digital Solutions

Organised by the Taiwanese Ministry of Environment
Berlin, 2025

Luís Neves
GeSI CEO

About GeSI

Our North Star

Lead the MOVEMENT that
defines,
demonstrates and
takes ACTION

on the enabling role of digital solutions in sustainability.

Why do we need **GeSI**?

Dramatic changes in our politics.

Softening of regulatory requirements.

A competitive environment for sustainability organizations.

Need for more business outcomes for members: relevant, measurable impact.

Frame the promise of AI in sustainability as fundamentally central to the role of digital and the importance of GeSI as the market leader.

GeSI: Our role and position in the market

Active private sector voice in policy, across all geographies.

Serve as a door opener and business broker for members across vertical industries and sectors.

Elevate communications to feature GeSI members in action.

Credible, quantifiable impact and business outcomes for the exponential role of enabling technologies

GeSI has two decades of experience driving the sustainability agenda.

Cross Sector Engagement

convene industry, government and society for action on sustainability challenges

Private sector members represent over $3.4T+ of market capitalization.

100+ governmental and social sector partners

Strategic Partnerships

set the stage for policy with critical voices from global, regional and local organizations

UN Framework & Convention on Climate Change (UNFCCC)

European Green Digital Coalition

Taiwan Electrical and Electronics Manufacturers' Association

Research and Tools

publish credible, standard-making and evidence-based thought leadership

GeSI Smart Reports

ICT Sector Guidance

Sector Expansion

focus on the enabling role of digital solutions, not just the providers of digital

ICT and Technology Sectors

Adjacent Verticals
- Energy & Utilities
- Transportation & Logistics
- Connected Living

Policy Influencers
- Consortiums & Alliances
- Think Tanks & Global Nonprofits

GeSI is guided by six tactical principles.

1. MEMBER-CENTRIC PURPOSE
Put the member experience first and use their feedback as GeSI's North Star to align on vision, investments, offerings, and strategic priority setting.

2. DATA-DRIVEN DECISIONS
Leverage data, analytics and member feedback to rigorously monitor KPIs associated with offering impact (thought-leadership, events, and tool) to continuously assess program and asset ROI.

3. GLOBAL INDUSTRY AGGREGATOR
Act as an industry aggregator bringing together the diverse parties addressing ICT issues for SMEs, not-for-profits, large for- profits, academia, policy makers, and consumers.

4. OUTCOME-BASED PILOTS
Deploy agile principles in working groups with rapid ideation, piloting and roll-out of ambitious, yet tangible and pragmatic initiatives that will deliver real benefit to members.

5. COLLABORATIVE WORKING
Create a safe space for members to work together in non-competitive, joint collaborative teams, inspiring and learning from each other, to create the right solution for their sustainability challenges.

6. INNOVATIVE THOUGHT LEADER
Serve as a thought leader for the ICT sector, continuously pushing the agenda ahead through relevant research on behalf of the industry

The GeSI Portfolio: eight impactful initiatives.

1	**PROGRAMS** member-focused initiatives	AI with Purpose Circularity Scope 3 and ESG Reporting Water Digitalization Initiative (WDI)
2	**PLATFORMS** proprietary, scalable movements	Digital with Purpose (DWP) • Digital with Purpose Summits • Digital with Purpose Framework
3	**PARTNERSHIPS** cross-sector collaborations	European Green Digital Coalition (EGDC) UN Global Innovation Hub (UN GIH) Smart Cities

GeSI Partner Network Supporting Portfolio Implementation

Net Carbon Impact Assessment Methodology for ICT Solutions

- Deploy the EGDC's science-based methodology at scale to assess GHG emission reductions through ICT solutions across multiple sectors.

United Nations Global Innovation Hub Digital Solution for Cities Marketplace

- Develop a digital platform to create a marketplace for solutions addressing climate challenges and basic human needs.

Digital with Purpose (DWP) Performance Framework Certification and Summit

- Deploy an ESG certification framework to help companies improve impact performance and align with global reporting standards.

Voluntary Carbon Market for Digital Solutions

- Establish a mechanism to trade offsets from digital solutions with net-positive impact, based on the EGDC methodology.

Smart Cities Project

- Leverage digital technologies to develop smart cities that are more efficient and beneficial to citizens.

SMART Project on AI

- Conduct a comprehensive analysis of AI's enabling impacts, addressing challenges and considering social, environmental, governance, and policy aspects.

Cooperation for COP30 in Brazil

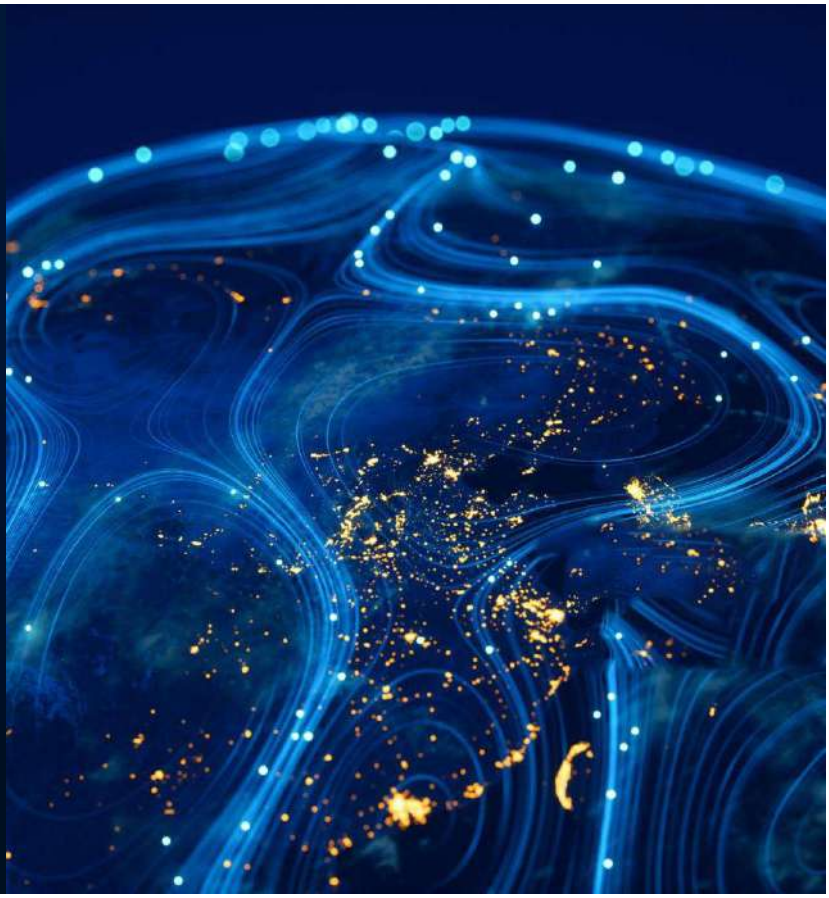
- Establish a pavilion at COP30 to share with partners and showcase collaborative efforts in sustainability.

GeSI Members - $4T+ of Market Capitalization

GeSI Partners

GeSI Offices

Brussels
Washington DC
Lisbon
Singapore

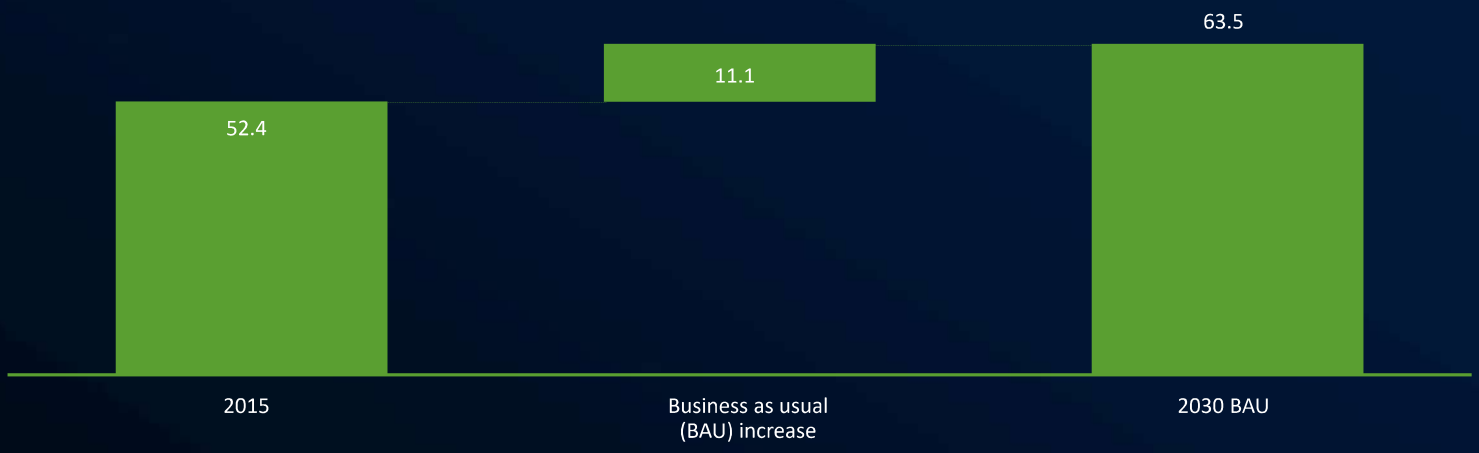


Setting the Scene

ICT Solutions for 21st Century Challenges

The world is not on track: under business as usual, CO_{2e} emissions will continue to grow

CO_{2e} emissions forecast (Gt CO_{2e})



Historically each 1% of growth in GDP equated to a 0.5% increase in CO2e emissions

Source: WRI, IPCC, World Bank, GeSI, Accenture analysis & CO2 models

ICT can decrease global carbon emissions, stimulate economic growth and deliver benefits to society

SMARTer 2030 report main Findings

- ICT has the potential to enable a 20% reduction of global CO_{2e} emissions by 2030, holding them at 2015 levels
- At the same time, ICT can reduce the consumption of scarce resources

ICT is good for growth. An assessment of eight economic sectors* shows that it could generate:

- Over 6 trillion USD in new revenues in 2030
- Close to 5 trillion USD in cost savings in 2030, including 2.3 trillion USD from energy efficiency

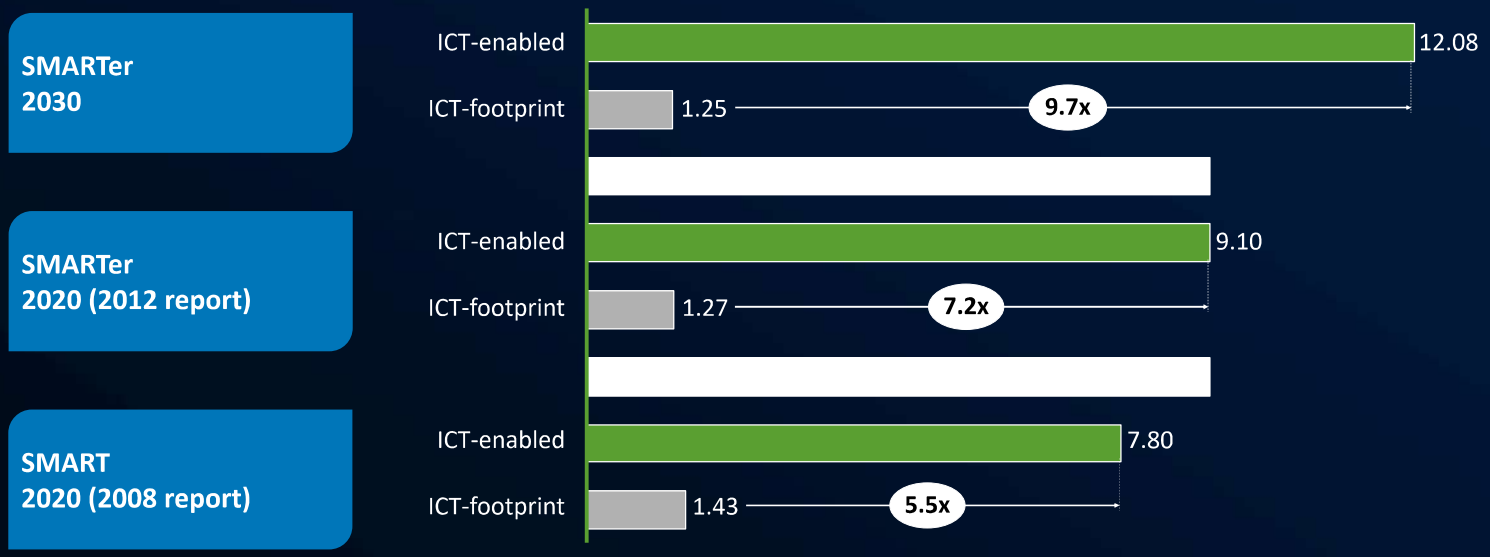
* Energy, food, health, learning, buildings, mobility & logistics, work & business, manufacturing

ICT could connect 2.5 billion previously unconnected people to ICT services by 2030, enabling a total of:

- 1.6 billion people connected to e-health
- 0.5 billion e-learning participants

ICT could realize a benefit 9.7 times higher than its own emissions in 2030, while its own footprint is expected to fall

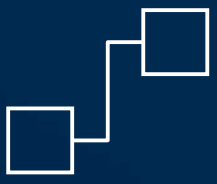
ICT benefits factor in 2020 and 2030 (Gt CO_{2e})



Source: Source: WRI, IPCC, GeSI, SMARTer2020, Accenture analysis & CO2 models

ICT enables improved customer centricity and new business models building on increased digital density

Context 2015 – Main changes compared to SMARTer2020 in 2012

Improved user centricity	New business models	Increased digital density
		
ICT is now genuinely putting people at the center, allowing for more compelling service offerings that "deliver it all": better experience, reduced cost, improved sustainability	The business case for ICT-enabled business is now stronger than ever. Digital disruptors have grown into multibillion dollar businesses, far beyond what seemed possible in 2012	Internet access and smartphone ownership are at much higher levels and the number of connected devices is expected to grow to 100 billion by 2030

Source: International Energy Agency, More Data Less Energy, 2014

ICT offers further environmental benefits across the sectors beyond CO2, from better yields to reduced consumption of scarce resources

+900 kg crop yield increase per hectare from Smart Agriculture

-25 billion oil barrels saved across all sectors analyzed

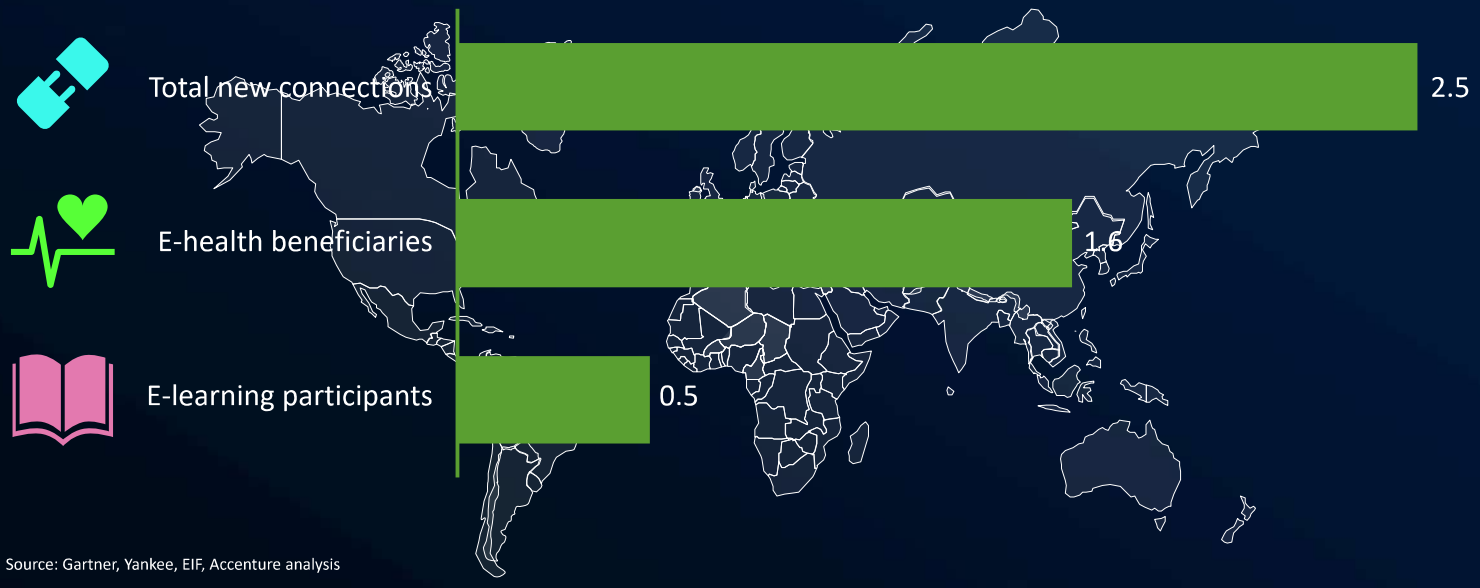
-135 million cars reduced from total installed base

-300 trillion liters of water saved across all sectors analyzed

Source: WRI, IPCC, Gartner, FAO, GeSI, Accenture analysis & CO2 models

ICT will connect 2.5 billion more people thereby making a broad range of benefits available

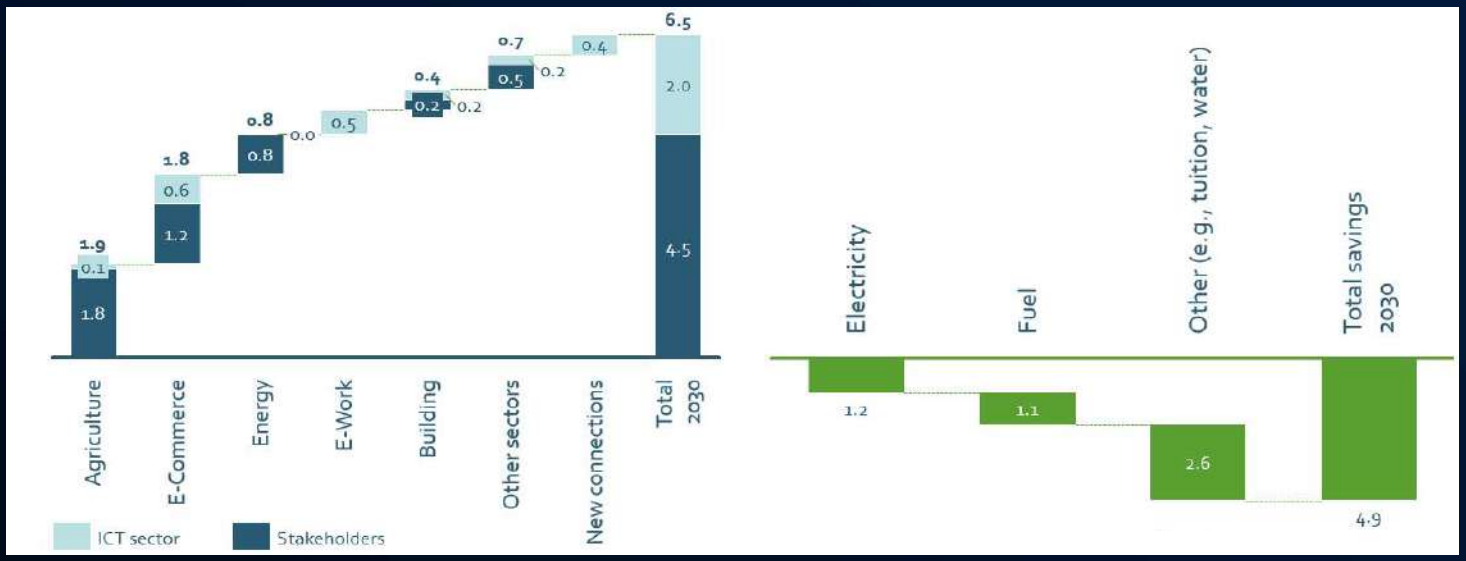
New ICT connections 2015-2030 (billion connections)



Source: Gartner, Yankee, EIF, Accenture analysis

ICT is good for growth and could deliver over $6 trillion in revenues and close to $5 trillion USD in cost savings

ICT-enabled revenues and cost savings p.a. (2030, USD trillion)



Source: WRI, IPCC, Gartner, FAO, GeSI, Accenture analysis & CO2 models

More recent studies show an even greater potential – notably if we consider AI's opportunities

- AI and digital solutions could help avoid 5–10% of global greenhouse gas emissions by 2030- equal to the EU's total annual emissions.
- Key sectors for impact: Energy, industry, transport, and agriculture offer the largest opportunities for AI-driven emissions reductions.
- AI-enabled efficiency: In Europe, AI can boost large building energy efficiency by 20–40%, directly cutting emissions.
- Generative AI's economic potential: Could add €1.2 trillion to Europe's economy in a decade while supporting climate goals.
- Unlocking impact requires policy action: Investment in digital infrastructure, open data, and cross-sector partnerships is essential to realize these avoided emissions.
- AI's climate benefits depend on responsible deployment: Policies must ensure energy-efficient AI and data centers to maximize net avoided emissions.

Source: Google. *The AI Opportunity for Europe's Climate Goals - a Policy Roadmap.* March 2025.

To fully realize ICT's potential, stakeholder action is required with policy action as a key priority

Prioritised policy action areas

National CO2 targets	Investment incentives in infrastructure deployment	Fair, balanced & consistent regulatory approach
Set national CO2 targets and recognize ICT solutions as an effective and necessary tool to decrease carbon emissions while enabling continued economic growth and sustainable living	Create investment incentives in infrastructure deployment to connect the unconnected and enable more people across all income segments to have access to ICT solutions	Establish a fair, balanced and consistent regulatory approach to ICT solutions that promotes innovation and investment, protects intellectual property rights and ensures consumer privacy and security

Source: WBSD, We mean business coalition, UN, GeSI

Prospect

Navigating the future of Voluntary Carbon Markets: trends, challenges and opportunities

Long-term outlook for VCMs

Navigating the future of Voluntary Carbon Markets: trends, challenges and opportunities

Market Growth Potential

- Projections suggest significant growth, with BloombergNEF estimating annual demand for carbon offsets could reach 5.9 billion tons by 2050, potentially creating a market valued at over $1.1 trillion annually (Source).

Shift Towards Quality

- There's a clear transition from low-quality to high-quality carbon credits, reflecting a growing emphasis on credibility and impact (Source).

Technological Advancements

- The rise of technical Carbon Dioxide Removal (CDR) credits, such as BECCS and DACCS, is driving market value despite lower volumes (Source).

Regulatory Support

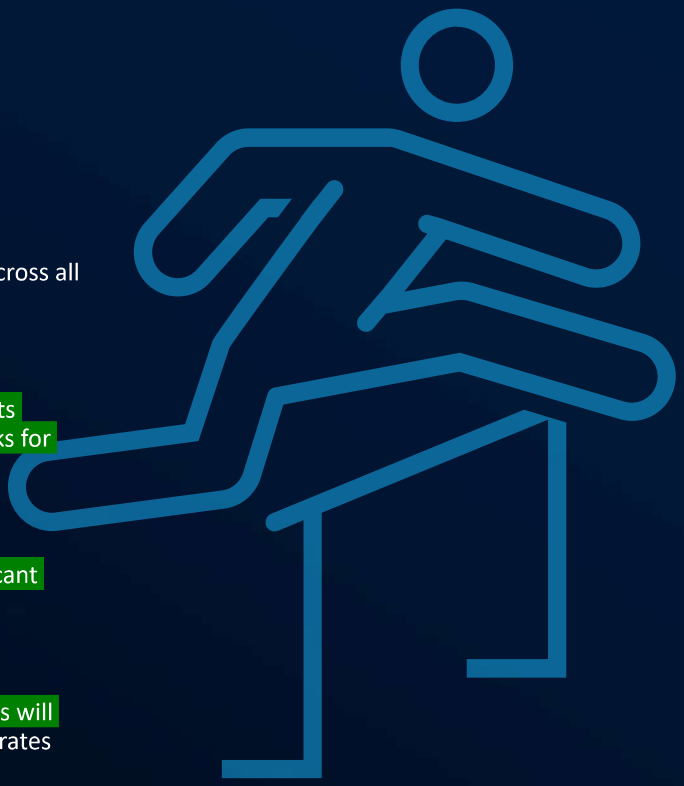
- Upcoming guidance and regulations are likely to support VCMs, with national and supranational organizations working to promote market-wide standards (Source).

Corporate Demand

- Increasing corporate net-zero commitments are expected to drive demand for carbon credits (Source).

Challenges

Navigating the future of Voluntary Carbon Markets:
trends, challenges and opportunities



Market Volatility

- The market experienced a decline in 2023, with prices slumping across all categories of carbon credits (Source).

Credibility Concerns

- High-profile studies have pointed to systemic problems with credits generated from nature-based projects, leading to reputational risks for companies (Source).

Standardization Issues

- Lack of standardization, integrity, and transparency remain significant challenges (Source).

Supply-Demand Imbalance

- Forecasts indicate that long-term global demand for carbon credits will exceed supply without drastic changes to new project origination rates (Source).

Current Attempts to Improve VCMs

Navigating the future of Voluntary Carbon Markets:
trends, challenges and opportunities

Integrity Standards

- Organizations like the Science Based Targets initiative and the Voluntary Carbon Credit Integrity Initiative are working to tackle credibility challenges (Source).

Financial Market Oversight

- Increased oversight by financial market regulators is expected to improve market integrity (Source).

Government Initiatives

- For example, the U.S. Department of Energy's Voluntary Carbon Dioxide Removal Purchase Challenge aims to create a public leaderboard for voluntary carbon removal purchases (Source).

Concept

Proposition: a Voluntary Carbon Market for digital solutions

Voluntary Carbon Market for Digital Solutions

Current Status of Carbon Markets

Verified Carbon Standard (VCS)

- Operated by Verra, this is a cornerstone of voluntary carbon trading, providing a trusted platform for certifying carbon credit projects.

The Gold Standard

- Initiated by a coalition led by the World Wildlife Fund (WWF), this standard certifies projects that contribute to both emissions reduction and sustainable development.

The Climate Action Reserve (CAR)

- Based in the United States, this organisation serves as both a standards developer and registry operator for carbon offset projects.

Global Voluntary Carbon Market

- While not a single entity, this refers to the overall international marketplace for voluntary carbon credits, which reached a market value of nearly $2 billion in 2021.

London Stock Exchange (LSE) Voluntary Carbon Market

- The LSE has proposed a new market designation to increase transparency and regulatory frameworks for global voluntary carbon trading.

All these trade carbon saved from the same sources & solutions

Forestry and Land Use
- Reforestation and afforestation projects
- Forest conservation (REDD+) initiatives

Renewable Energy
- Solar, wind, and hydroelectric power projects
- Biomass energy generation

Energy Efficiency
- Industrial process improvements
- Building efficiency upgrades

Waste Management
- Landfill methane capture
- Waste-to-energy projects

Agriculture
- Regenerative agriculture practices
- Methane reduction in livestock management

Carbon Capture and Storage (CCS)
- Direct air capture technologies
- Industrial CCS projects

Transportation
- Electric vehicle initiatives
- Fuel efficiency improvements

Voluntary Carbon Market for Digital Solutions

Concept

To launch a Voluntary Carbon Market mechanism to trade off-sets resulting from the application and deployment of digital solutions which generate a net-positive impact

Core Principles and Standards

- Core Carbon Principles (CCPs) and taxonomy of attributes for high integrity and market liquidity.
- Standardized contracts for carbon credits to enable efficient trading.

Regulatory Framework

- Clear regulatory framework, even though voluntary markets are not strictly regulated.
- Aligned with international initiatives like the Voluntary Carbon Market Integrity initiative (VCMI) to ensure quality and clarity.

Project Development Processes

- Procedures for project design, feasibility studies, and methodology selection.
- Systems for monitoring, reporting, and verification (MRV) of emissions reductions.

Market Infrastructure & Mechanisms

- Systems for Monitoring, Reporting, and Verification (MRV) to streamline data collection and processing.
- Transparent pricing mechanisms based on factors such as quality, and risk.
- Platforms for trading tokenized carbon credits to improve liquidity and market access.

Transparency and Credibility

- Systems in place for radical transparency into the carbon credit supply.
- Differentiated credit supply based on project types, risk levels, and co-benefits.

The untapped potential of digital technologies to save carbon emissions

Global Enabling Sustainability Initiative

PARIS CLIMATE AGREEMENT SIGNING CEREMONY — 22 APRIL 2016

ANCHORAGE

- Article 6.2: Enables countries and other actors to engage in cooperative approaches through the transfer of Internationally Transferrable Mitigation Outcomes (ITMOs).
- Article 6.4: Establishes a global carbon market overseen by the United Nations, where reduction or removal credits called Article 6.4 Emission Reductions Units (A6.4ERs) can be traded.
- Article 6.8: Creates a non-market framework for countries to support other countries without trading carbon credits.

Digital Technologies

- Net-positive impact of the deployment of digital technologies

A strong and recognised global methodology (EGDC)

The partnership with the UNFCCC-UGIH

Potential trading providers

EUROPEAN GREEN DIGITAL COALITION

UNFCCC

Global Enabling Sustainability Initiative

Why and How is this Market Different?

Technology solution provider → Buyers of carbon credits created by technology solution providers → Offsetting "cashed out" on buyers' side

Technological solutions to mitigate/avoid carbon emissions

What will we make different?

PROVIDERS NEED TO BE ABLE TO CLAIM THE IMPACT OF SOLUTIONS

What will we make different?

OUR MARKET INCENTIVISES THE ENABLER/ DEVELOPER OF SOLUTIONS FOR CARBON OFFSETTING

BENEFITING THOSE WHO ACTUALLY PROVIDE ADDITIONALITY

- Additionality in carbon markets defines that a carbon offset initiative must result in greenhouse gas (GHG) emissions reductions or removals that would not have occurred without the incentive provided by the sale of carbon credits;
- Additionality ensures that the project delivers genuine, measurable environmental benefits beyond what would have happened under a "business-as-usual" scenario;

WHAT IS THE PROBLEM, THEN?

- Current VCMs do not allow the very providers of solutions that generate additionality to claim the offsets produced by their solutions;
- Our proposition acknowledges that additionality was only possible because those solutions were produced by companies who should then be able to claim those credits;
- This would generate further incentives to develop, apply and scale up the use of digital solutions to sustainability.

Credibility by Design

EGDC's standardized, science-based approach to quantifying the climate impact of digital solutions could form the foundation for a credible and effective voluntary carbon market.

Credit Generation

- EGDC's standardized approach to quantify the net carbon impact of ICT solutions used to generate carbon credits based on the emissions avoided or reduced by implementing digital technologies.

Project Validation

- EGDC's rigorous assessment process, including defining baselines and calculating effects, could serve as a framework for validating digital solution projects in the carbon market.

Additionality Demonstration

- By comparing the emissions in reference and enabled scenarios, the methodology helps demonstrate additionality - a crucial concept in carbon markets.

Quality Assurance

- The methodology's emphasis on uncertainty analysis and critical review enhances the credibility of the calculated impacts, which is essential for high-quality carbon credits.

Sector-Specific Applications

- The complementary sector-specific methodologies for energy, construction, smart cities, agriculture, transport, and manufacturing allow for tailored assessments in these key areas.

Policy Alignment

- The methodology's alignment with EU Taxonomy criteria could help ensure that credits generated are compliant with evolving regulatory frameworks.

Key Considerations

Common Areas of Concern and How This VCM Approach Addresses Them

How our approach tackles Scope 3?

- Digital solutions can accurately measure and report the emissions reductions they enable across supply chains, providing a more precise picture of Scope 3 impacts.
- By allowing suppliers to claim carbon credits, this VCM encourages the development and deployment of more effective digital solutions for emissions reduction.
- Digital platforms can automate the tracking and reporting of emissions reductions, making it easier for companies to account for their Scope 3 emissions.

How our approach ensures credibility?

- EGDC's methodology provides a consistent, science-based framework for assessing the net carbon impact (footprint – handprint) of ICT solutions across different sectors. This standardization allows for more reliable and comparable results, which is crucial for establishing credibility in carbon markets.

How it contributes to mitigation (which should come before compensation)?

- Net Impact Methodology allows for a comparison to a scenario where no digital solution is deployed, credibly calculating the mitigation value of individual digital solutions.

How do we differentiate our approach from the low-quality carbon compensated X high carbon footprint emitted?

- Data transparency is imbued in product design – there's a real capability to assess the quality of the carbon emitted x compensated.
- EGDC's methodology addresses directly the net impact (footprint minus handprint), already offering perspective on the true quality of the impact of a given solution.

Structure

How a Voluntary Carbon Market for Digital Solutions Would Work

Sellers of Credits

Innovators Driving Digital Climate Solutions

Technology companies and digital solution providers would be the primary sellers of these credits. They would develop and implement digital technologies that demonstrably reduce greenhouse gas emissions across various sectors.

Market:
The Digital Solutions Hub
(by GeSI and UNGIH)

Project developers who utilize digital technologies to enhance the efficiency and effectiveness of traditional carbon offset projects (e.g., forest conservation, renewable energy) could also generate and sell these credits.

Deutsche Telekom

Smart grids

- Provides ICT infrastructure for smart grid solutions that optimize energy distribution and reduce electricity losses in urban areas.

SIEMENS

Smart infrastructure for cities

- Intelligent building management systems that optimize energy use and reduce emissions in urban developments, which helps cities model and plan sustainable infrastructure investments.

AT&T

Connected car solutions

- Supplies network connectivity and telematics platforms for connected vehicles, enabling real-time route optimization and fuel efficiency improvements, thus reducing emissions.

TRM

Circular economy and waste reduction

- IBM Environmental Intelligence Suite, which uses AI to help companies predict and respond to climate risks, optimize resource use, and divert waste from landfills (aiming for 90% diversion by 2025).

DELL

Sustainable device design and recycling

- All packaging is made from recycled or renewable materials, and Dell offers global recovery services to recycle old equipment, supporting a circular economy.

Buyers of Credits

Forward-thinking Entities Embracing Tech-enabled Sustainability

Companies seeking to offset their emissions and meet sustainability goals would be the main buyers. This includes large corporations with ambitious climate commitments that are looking for innovative ways to achieve their targets.

Market:
The Digital Solutions Hub
(by GeSI and UNGIH)

Governments and organizations aiming to support the development and scaling of emissions-reducing digital technologies might also purchase these credits.

Carbon credits for offsetting emissions

- In 2024, Shell was the world's largest user of carbon credits, retiring 14.1 million credits to claim "carbon neutral LNG" and progress toward climate targets.

Carbon credits for net-zero targets

- Microsoft was the second-largest buyer of carbon credits in 2024, using offsets to work toward its goal of becoming carbon negative by 2030, despite rising emissions from data center expansion.

Carbon credits for emissions reduction

- Woodside Energy used 1.4 million credits in 2024 to offset emissions as part of its sustainability strategy.

Carbon credits for sustainability

- Engie retired 2.1 million credits in 2024, supporting its climate commitments.

Carbon offset partnerships

- Amtrak worked with TerraPass to offer carbon offset options for travelers and to offset corporate emissions.

Mechanism Operation

Leveraging Digital Infrastructure for Transparent and Efficient Carbon Trading

Project Development

- Companies would develop digital solutions that reduce emissions in sectors like energy, materials, and mobility.

Measurement and Verification

- Advanced digital technologies such as IoT sensors, satellite imagery, and AI would be used for real-time monitoring and verification of emissions reductions.

Credit Issuance

- Once verified, the emissions reductions would be converted into digital carbon credits, each representing one tonne of CO_2 equivalent reduced or avoided.

Trading Platform

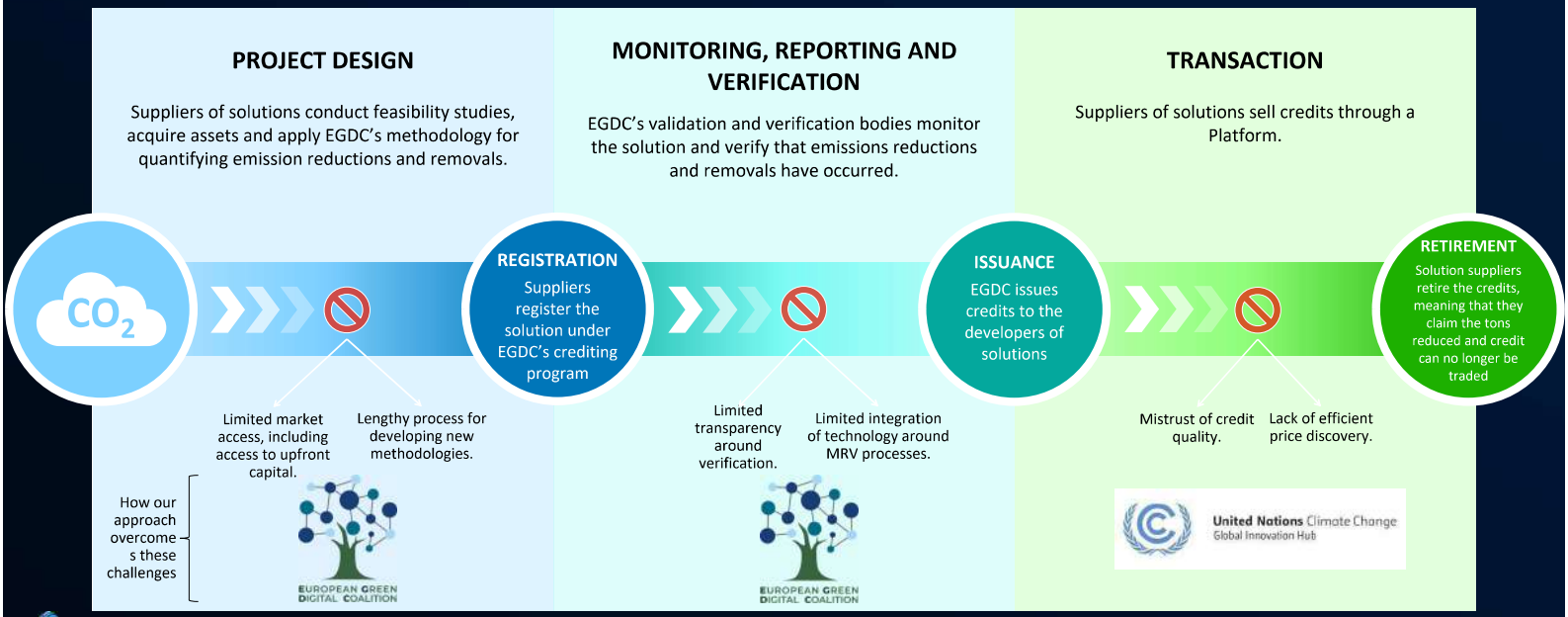
- Credits would be traded on digital platforms, potentially utilizing blockchain technology for increased transparency and efficiency.

Retirement

- Buyers would purchase and retire credits to offset their own emissions or support climate action.

Life of a Carbon Credit

The Process of Developing and Bringing Carbon Credits to Market under GeSI and UGIH's VCM (considering potential challenges)



Unique Aspects

Real-time Verification

- Digital solutions enable near real-time verification and issuance of credits, increasing market efficiency.

Enhanced Transparency

- Blockchain and other digital technologies could provide greater transparency in credit generation and transactions.

Scalability

- Digital solutions have the potential to scale rapidly, potentially leading to significant emissions reductions in high-emitting sectors.

Innovation Incentive

- This market would create additional incentives for companies to develop and deploy emissions-reducing digital technologies.

Next Steps

1. Present concept to a select group of users or stakeholders. Collect data and insights.
2. Evaluate the outcomes, identify strengths, weaknesses, and areas for improvement.
3. Iterate and refine concept. Pilot one specific area to test implementation.

Thank you !

GeSI