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Carbon leverage: Investing Europe's carbon revenues in energy efficiency

Catharina Wiese, Richard Cowart, and Jan Rosenow

Introduction

Government officials, public policy researchers, and citizens all know that public goals are advanced not just through how the government taxes but, even more powerfully, by how the resulting revenues are spent. This reality should drive carbon policy too, but in many governmental circles the emphasis has been on carbon prices alone, with much less focus on how carbon revenues should be spent. This paper asserts that carbon revenues are at least as important as carbon prices if Europe's goal is to accelerate emission reductions to meet our Paris commitments at a pace that is both affordable and politically sustainable over the coming decades. Further, we conclude that the evidence is strong that strategically investing carbon revenue in low-cost carbon reductions through programmatic energy efficiency is one of the key strategies to achieve these critical objectives.

However, the evidence is also strong that investing in end-use efficiency is a difficult public policy objective to fulfil. End-use consumption and efficiency, by definition, occur in millions of dispersed locations and require decisions to be made by millions of businesses and households. Efficiency programs require skilful management, marketing, customer assistance, quality control, as well as monitoring and verification—all in addition to adequate funding. So, the huge reservoir of low-cost efficiency resources continues largely untapped while climate policy tends to focus on large-scale centralised resources that seem easier to manage—power plants and industrial facilities, in particular.

Nevertheless, successful energy efficiency programs around the world teach us that low-cost savings and low-cost emission reductions are achievable. And the International Energy Agency (IEA), along with many other experts, teaches us that end-use savings are absolutely essential to meeting decarbonisation goals. Indeed, as the IEA recently concluded, at least 35 percent of the

total emission reductions needed by 2050 to avoid drastic global climate disruption will need to come from improvements in end-use energy efficiency.[1] In Europe, estimates show that 76 percent of emissions reductions by 2030, in addition to those stated in the Intended Nationally Determined Contributions, can be achieved at least cost through energy efficiency measures.[2]

We begin with the unavoidable realisation that energy efficiency is, rightly, the "first fuel" and must be a major objective of climate policy. It is thus imperative that the principal tools of climate policy, including carbon-pricing tools, be aligned with the best techniques to deliver emission reductions via energy efficiency.

This paper examines how well we are doing in Europe on this topic and explores some of the options that would allow European decision-makers and Member States to do better. It is divided into four sections:

- In the first section, we look briefly at the trajectory of the emission trading system (ETS) today and the projected increase in carbon revenues now expected as a result of recent reforms.
- In the second section, we examine the nonprice barriers to end-use efficiency and the reasons why carbon pricing alone will be unable to deliver the savings that our economies, and the planet, need. Here we point out that carbon revenue recycling for efficiency should be a key complement to carbon pricing to deliver sustainable emission reductions.
- In the third section, we take a close look at the status of clean energy investments using ETS revenues across Europe in recent years, noting both the strong and weak aspects of this regime in different Member States.
- Finally, in the fourth section, we look again at the relationship between ETS revenues and end-use efficiency programs and discuss options for improving the link between them to advance the goals of both: a faster pace of emission reductions, a more energy-efficient economy, and a lower-cost pathway to meeting Europe's climate ambitions.

ETS revenues: A growing opportunity to drive emission reductions

EU ETS carbon revenues, i.e., revenues generated through the auctioning of EU carbon allowances, are likely to increase in the future. This is driven by the following changes within the EU ETS framework introduced with the most recent ETS reform[3] and the ongoing discussion on carbon floor prices in some Member States,[4] all of which have a major impact on the volume of carbon revenues:

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[1] International Energy Agency (IEA). (2018). *Perspectives for the Energy Transition: The Role of Energy efficiency*. Paris, France: International Energy Agency. Retrieved from: http://www.iea.org/publications/freepublications/publication/Perspectives%20for%20the%20Energy%20Transition%20-%20The%20Role%20of%20Energy%20Efficiency.pdf.

[2] IEA. (2015). *World Energy Outlook Special Report 2015: Energy and Climate Change*. Paris, France: International Energy Agency. Retrieved from: https://www.iea.org/publications/freepublications/publication/WEO2015SpecialReportonEnergyandClimateChange.pdf.

[3] The revised EU ETS Directive was adopted on 14 March 2018 and came into effect on 8 April 2018.

[4] See for example: Simon, Frédéric. (2018, March 22). France to push for EU carbon price floor and border tariff [Blog post]. Retrieved from: https://www.euractiv.com/section/energy/news/france-to-push-for-eu-carbon-price-floor-and-border-tariff/.

- The share of *free allocations* will reduce to 30 percent until 2026 and reduce to 0 percent by 2030 (for sectors not at risk for carbon leakage). A reduction in the number of allowances allocated for free increases the number being auctioned and, thus, has a positive effect on revenues generated through auctioning.
- The *Market Stability Reserve (MSR)* starts operating in January 2019 and the linear reduction factor (LRF) will increase from 1.74 to 2.2 percent annually from 2021. Addressing the imbalance between supply and demand in the EU carbon market and reducing the cap respectively, both the MSR and the LRF will increase the carbon price by increasing scarcity and reduce the total number of allowances available. The impact on revenues depends on the price increase opposed to the reduction in allowances available. Projected auctioning revenue developments show a future increase.[5]
- Discussions on introducing a carbon floor price (CFP) in some Member States—The direct price control mechanism of a CFP would ensure a certain price level and increase carbon revenues in the implementing states.

All of the above means that the volume of carbon revenues that EU Member States receive is increasing. Considering the growing amount of carbon revenues, it becomes ever more important to assess the use of carbon revenues and their potential contribution to speed up decarbonisation efforts. The carbon price alone will not be sufficient to meet the EU's emission reduction targets, neither in time nor at least cost. Recent quantitative analysis shows that without ambitious energy efficiency targets and a significant increase in energy efficiency investments, the EU will most likely miss even its current 2030 climate target of reducing greenhouse gas (GHG) emissions by 40 percent based on 1990 levels, let alone deliver on the commitments made in Paris.[6]

Strategically investing carbon revenues in end-use energy efficiency can yield multiple dividends from the EU ETS, including:

- Additional emission reductions from sectors both covered by, and outside, the ETS;
- Lower economic and societal decarbonisation costs, capturing a larger fraction of cost-effective emission reduction potential and reducing energy bills for end-users;
- Energy efficiency (and the resulting demand reduction) also delivers a wide range of so-called "non-energy" benefits to consumers and society. Among those are improvements in health, comfort, air quality, public housing and welfare costs, job creation, and economic growth; and
- Support for the political process to further tighten the EU ETS cap. An increase in the political will and social acceptance, as a result of the previous benefits, can enable more ambitious long-term decarbonisation targets.

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[5] Ecologic Institute and WWF. (2016). *Smart Cash for the Climate: Maximising Auctioning Revenues from the EU Emissions Trading System*. Retrieved from: https://www.ecologic.eu/sites/files/publication/2016/2596-smartcashforclimate-full-report_0.pdf.

[6] Rosenow, J., Graichen, J., and Scheuer, S. (2018). *Destination Paris: Why the EU's climate policy will derail without energy efficiency*. Retrieved from: http://www.raponline.org/knowledge-center/destination-paris-why-eus-climate-policy-will-derail-without-energy-efficiency/.

The economic case for carbon revenue recycling for energy efficiency

Recycling revenues generated through the auctioning of carbon allowances for energy efficiency programmes can make a powerful contribution to achieve decarbonisation targets cost effectively. Many economists would disagree with this proposition on the ground that the single best solution is simply to put a price on carbon, letting market forces to do the rest.[7] Defining the external societal costs of GHG emissions as the only market failure to address, a single carbon-pricing scheme such as the EU ETS would in theory properly internalise the externality and incentivise the most cost-effective mix of emission reductions. Following this theory, any policy on top of the EU ETS that reduces the demand for allowances (e.g., by improving energy efficiency) would impose additional societal costs but would not contribute to reducing EU carbon emissions since the emission level is set by the cap. Freed-up allowances would be banked for later use or sold to other emitters for a lower carbon price due to the demand reduction for allowances. The lower carbon price would furthermore hamper the capacity of the EU ETS to incentivise low-carbon investments.[8]

The European Union has, quite obviously, taken a different position, adopting a set of clean energy targets including targets for renewable energy and efficiency in addition to the ETS. We propose to align these policies more closely because there is compelling evidence that energy efficiency programmes can accelerate carbon reductions and more cost effectively achieve emission reduction targets. Considering that the whole point of carbon pricing is to achieve cost-effective emission reductions, it is logical to use the carbon revenues as well as the carbon price to drive end-use efficiency uptake across the economy.[9]

1. **Carbon revenue recycling for energy efficiency can help to achieve deeper cost-effective emissions reduction potential.** We must begin with an important but often overlooked fact that there remains in every EU Member State a large available reservoir of low-cost, efficiency savings potential and that capturing that potential could lower energy

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[7] For an economic discussion on first- and second-best theory in environmental policy see for example Bennear, L.S., and Stavins, R.N. (2007). Second-best theory and the use of multiple policy instruments. *Environmental and Resource Economics*, 37(1), 111–129.

[8] It is important to divide this critique into two parts. First, there is the question of whether efficiency programs and policies impose inefficient losses on society by mandating or encouraging actions that end-users would not choose under assumed perfect market conditions. Whether the outcomes of efficiency policies are cost effective or not depends on how well designed and implemented they are, but there is abundant evidence that many programmes and standards are, in fact, cost effective and that they are needed to overcome persistent market barriers to sensible efficiency investments by individuals and to achieve energy efficiency and climate targets. In this paper, we support spending for such programmes and monitoring and verification policies that would ensure that money is spent only on efficiency investments that are worth more than they cost.
The second question is whether efficiency programmes or any other carbon-reducing programme, such as a renewables mandates, are undesirable merely because they reduce emissions directly, reducing carbon prices but perhaps not reducing final emissions since they do not automatically reduce the cap. This paper argues that, in a cap regime, achieving low-cost reductions advances both equity and efficiency goals and, more importantly, creates the political opportunity to reduce the cap more rapidly than would be possible under conditions of higher carbon prices. A detailed discussion follows in section 4.

[9] Cowart, R. (2011). *Prices and policies: Carbon caps and efficiency programmes for Europe's low-carbon future*. eceee 2011 Summer Study. Retrieved from: https://www.eceee.org/library/conference_proceedings/eceee_Summer_Studies/2011/2-current-energy-efficiency-policies-on-stage-and-backstage/prices-and-policies-carbon-caps-and-efficiency-programmes-for-europes-low-carbon-future/; Rosenow, J., Cowart, R., Thomas, S., and Kreuzer, F. (2017). *Market-Based Instruments for Energy Efficiency: Policy Choice and Design*. Paris, France: International Energy Agency. Retrieved from: https://www.iea.org/publications/insights/insightpublications/market-based-instruments-for-energy-efficiency.html.

bills while also reducing carbon emissions.[10] How to capture that potential should be a major goal of climate policy.

By definition, nonprice barriers to energy efficiency cannot be overcome by a pricing policy alone; i.e., due to real-world constraints, carbon pricing cannot unlock all long-term, cost-effective energy saving and thus carbon emissions reduction potential. These nonprice barriers to energy efficiency include imperfect and asymmetric information, principal agent problems, behavioural failures, and limited access to capital. It is well established that in the markets for energy efficiency, market failures and barriers beyond the negative externality of energy production and consumption exist. Although a pricing instrument can internalise certain external societal costs, energy efficiency programmes that address behavioural, financial, and legal barriers to efficiency actions are needed in order to achieve a greater fraction of the cost-effective energy saving and emission reduction potential.[11] While there are many opportunities to invest carbon revenues to drive change,[12] energy efficiency policies provide opportunities that save more than they cost and certainly should be used first.[13]

2. **Carbon revenue recycling for energy efficiency can reduce the energy bill impacts of carbon pricing on energy end-users.** The EU allowance price paid by power generators has a disproportionate and negative effect on consumer energy bills. A calculation of the consumer cost per tonne of abatement in competitive power markets shows that the cost to consumers per tonne of carbon reduced can be several times greater than the market price of carbon allowances themselves.[14] The ratio will vary by circumstances, but across a number of power markets studied, the cost impacts are surprisingly high.[15] For example, across the EU as a whole, at a carbon price of 20 euros per tonne, the impact on the merit order of dispatch in wholesale power markets could yield a

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[10] The COMBI project, which particularly aimed at quantifying the multiple non-energy benefits of energy efficiency in EU Member States, recently confirmed this potential: e.g., Thema, J., Rasch, J., Suerkemper, F., and Thomas, S. (2018). *Multiple impacts of energy efficiency in policy-making and evaluation*. D8.2 Policy report on COMBI results. Retrieved from: https://combi-project.eu/wp-content/uploads/D8.2_COMBI_policy_report.pdf. Further information and the COMBI online tool can be accessed through the project's webpage: https://combi-project.eu/.

[11] Rosenow, J., Fawcett, T., Eyre, N., and Oikonomou, V. (2016). Energy efficiency and the policy mix. Special issue: Building Governance and Climate Change: Regulation and Related Policies. *Building Research & Information*, 44(5–6), 562–574.

[12] The policy mix for reaching decarbonisation targets cost effectively is not limited to energy efficiency policies but also includes, for example, renewable energy support, research and development for clean technologies, and others, which also overcome some of the limits to carbon pricing and the reliance on a single pricing instrument. Our emphasis on end-use efficiency in this paper is not intended to suggest that efficiency is the sole answer to the climate challenge; manifestly, it is not. Nor do we suggest that 100 percent of carbon receipts should be devoted to efficiency programmes; a carbon revenue recycling strategy might well include other compelling options, from accelerating fossil plant closures, to promoting renewable energy, electric vehicles, and low-emissions cement. However, the economic and societal cost advantages of energy efficiency and the need for funding to stimulate efficiency investments among millions of end-users make it a particularly important resource to utilise. These are principal justifications for the policies adopted by the EU and many other jurisdictions that call for investing in "Efficiency First."

[13] Governments and energy companies have created a large number of efficiency programmes and policies, including, e.g., building codes, appliance standards, mileage standards for vehicles, information programmes, energy efficiency obligations on suppliers, incentive payments to installers, retailers, and end-users, and low-cost financing techniques. Carbon revenues could be invested strategically to drive deliver via any or all of these types of instruments.

[14] Cowart, R., (2011).

[15] Cowart, R., Bayer, E., Keay-Bright, S., and Lees, E. (2015). *Carbon Caps and Efficiency Resources: Launching a "Virtuous Circle" for Europe*. Brussels, Belgium: Regulatory Assistance Project. Retrieved from: http://www.raponline.org/wp-content/uploads/2016/05/rap-carboncapsefficiencylaunchingvirtuouscircle-2015-jan.pdf.

cost to power consumers amounting to 248 euros per tonne of carbon actually avoided.[16] A study conducted by Cambridge Econometrics and the Energy Research Centre of the Netherlands[17] shows that greater support for investments in end-use energy efficiency would reduce energy demand much more than the impact of the carbon price alone, reducing both GHG emissions and consumer energy bills due to lower consumption and lower prices on wholesale power markets.[18]

Both rationales make clear why using carbon revenues to support complementary energy efficiency measures reduces the economic and societal costs of decarbonisation. Cost effectiveness is the principal goal of the EU ETS. However, although a carbon price can internalise the external societal costs of GHG emissions and incentivise some emission reductions, it does not tackle nonprice barriers for low or negative cost efficiency measures, and it raises energy bills to the detriment of consumers. Energy efficiency is a key to capturing the most cost-effective energy and emission reduction potential, while minimising rate and cost impacts. In order to ensure carbon efficiency, EU institutions and Member States should pay attention to how well they are doing in delivering these benefits to their economies and consumers. The strategic use of carbon revenues is one approach, which is assessed in the following section, analysing carbon revenue recycling in EU Member States.

Status of carbon revenue recycling at the EU Member State level

This section provides insights into the status quo of carbon revenue recycling at the EU member state level.[19] Article 10(3) of the EU ETS Directive 2003/87/EC recommends that Member States should use at least 50 percent of auctioning revenues or the equivalent in financial value of these revenues for energy- and climate-related purposes. These purposes are specified in Art. 10(3) and Art. 3d(4) (for aviation allowances) and include a range of options: further GHG

[16] This result assumes nil price elasticity in the short run. At a carbon price of 40 euros per tonne and with a longer-term price elasticity for electricity included, the cost per tonne avoided drop to 184 euros. The calculations are based on results from a modelling study conducted by the Energy research Centre of the Netherlands: Sijm, J. P. M., Hers, S. J., Lise, W., and Wetzelaer, B. J. H. W. (2008). *The impact of the EU ETS on electricity prices. Final report to DG Environment of the European Commission*. No. ECN-E—08-007. Energy research Centre of the Netherlands ECN. Retrieved from: http://re.indiaenvironmentportal.org.in/files/e08007.pdf.

[17] Cambridge Econometrics and the Energy research Centre of the Netherlands (2013). *Investing EU ETS auction revenues into energy savings*. Retrieved from: https://www.ecn.nl/docs/library/report/2013/e13033.pdf. Note: Although the modelling time frame in the study was set to 2020, the analysis of interactions among cap reductions, carbon prices, emissions, and end-use energy efficiency are still relevant and provide meaningful results at all timescales.

[18] The wholesale power price is lower due to the demand reduction for energy and EU allowances. Both demand reductions have a lowering effect on the clearing price on competitive power markets.

[19] On union level, auctioning revenues are recycled (will be recycled following the recent ETS reform) through allocating EU allowances to the modernisation and innovation (former NER300) funds, which aim to support the transition to a low-carbon economy in the energy-intensive industry sectors and the power sector. However, a closer look at union-level carbon revenue recycling is beyond the scope of this study.

emission reductions in EU and third countries, the development of renewable energies, measures to increase energy efficiency, shift to low emission and public forms of transport, and administrative policy expenses.[20]

Since 2013, a mechanism for reporting on the use of auctioning revenues[21] requires Member States to report annually (for the first time by July 2014) on the amounts of revenue generated through the auctioning of allowances and the use of these revenues, or the equivalent in financial value. Member States shall specifically report the purpose and type of revenue use for energy- and climate-related programmes, domestic and international.[22] The following section assesses the national reports submitted by 31 July 2017, reporting the use of auctioning revenue for 2016.[23] In the assessment, we focus on the reported domestic use for energy efficiency investments, rank Member States that recycle their carbon revenues for energy efficiency, and provide further insights for three selected countries. The section concludes with a critical look at the analysed revenue data.

Assessment of the Member States' reporting on the use of 2016 auctioning revenues

In 2016, EU Member States received 3.79 billion euros through the auctioning of carbon allowances in the EU ETS. Altogether, the reporting shows that Member States used or plan to use 3.17 billion euros (83.5 percent) of the total amount of 2016 revenues or the equivalent in financial value for energy- and climate-related purposes. This relatively high share is consistent with the findings of reports on the use of carbon revenues from previous years.[24] However, it is worth noting that the calculation *includes Member States that do not earmark auctioning revenues for specific uses* but still report the equivalent in financial value used for energy and climate purposes from their national budgets.

Strictly speaking, these Member States do not *strategically invest* their carbon revenues, i.e., do not *recycle revenues* for energy and climate purposes. Drawing on our definition of carbon revenue recycling, Member States' reported strategic investments amount to 2.32 billion euros, equivalent to 61.3 percent of total 2016 revenues, shown in figure 1.

[20] Art. 10(3) and Art. 3d(4) of Directive 2003/87/EC provide a more detailed list of eligible purposes. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02003L0087-20140430&from=EN.

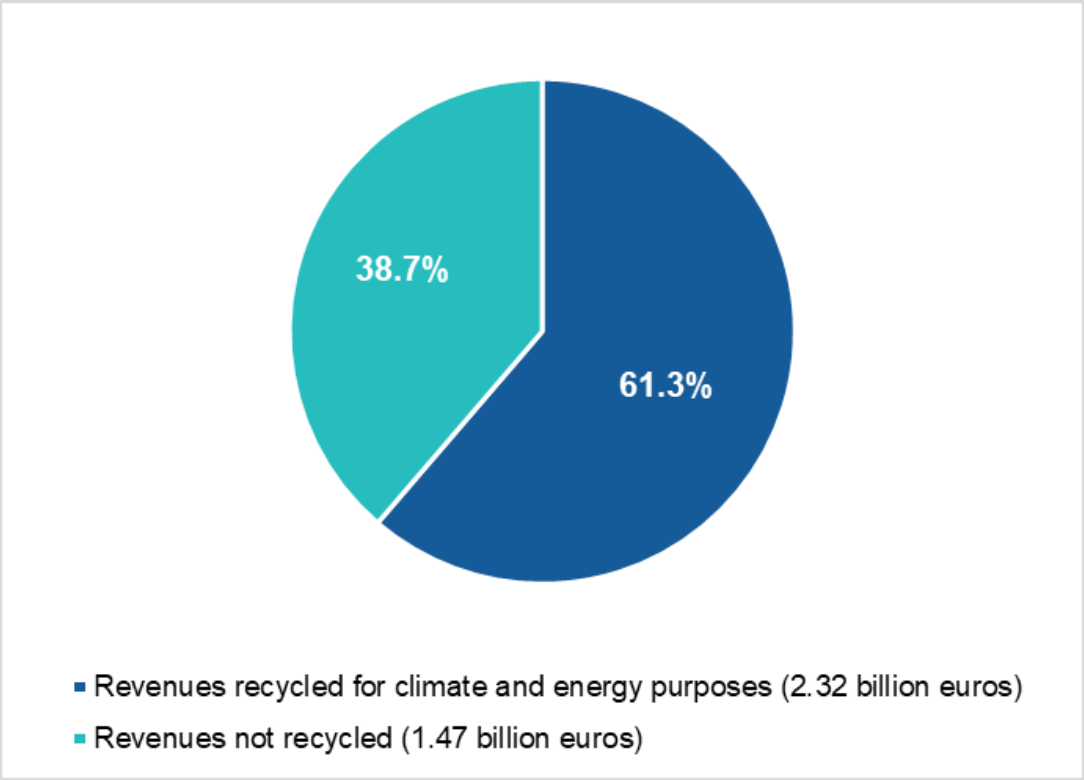
[21] Specified in Art. 17 of Regulation (EU) No 525/2013. Retrieved from: https://publications.europa.eu/en/publication-detail/-/publication/4bf8306c-dab2-4fa0-8c83-8d44d760b31f/language-en.

[22] International use comprises funding of multilateral (e.g., United Nations Framework Convention on Climate Change (UNFCCC) Green Climate Fund) or bilateral programme support.

[23] Member states submit their reports to the European Environment Agency's reporting obligations database (ROD), part of the European Environment Information and Observation Network (EIONET). Deliveries are available at: http://rod.eionet.europa.eu/obligations/698/deliveries.

[24] Ecologic Institute and WWF (2016); Le Den, X., Beavor, E., Porteron, S., and Ilisescu, A. (2017). *Analysis of the use of Auction Revenues by the Member States*. Retrieved from: https://ec.europa.eu/clima/sites/clima/files/ets/auctioning/docs/auction_revenues_report_2017_en.pdf.

Figure 1: Use of 2016 auctioning revenues. Total revenues: 3.79 billion euro



The share of revenues not recycled for energy and climate purposes includes the use of auctioning revenues that Member States do not specify (0.54 billion euros) and all revenues from Member States that do not earmark (0.93 billion euros). These amounts are not strategically invested in energy and climate purposes but allocated to the national budgets. Also, the further assessment of revenue recycling excludes Member States that do not earmark. For 2016 revenues, Austria, Denmark, Finland, Luxembourg, the Netherlands, Poland, Sweden, and the United Kingdom report not to earmark carbon revenues for specific uses.[25]

All other Member States report to recycle some share of their total revenues for domestic or international energy- and climate-related purposes, ranging from 27 percent in Romania to 228 percent in Croatia.[26] Assessing the Member States' official reporting, a significantly larger share of recycled revenues is invested domestically (135.7 percent), while only a negligible share is spent for international use (0.6 percent). The assessment of domestically recycled revenues clearly illustrates the challenge of inconsistent reporting: Germany indicates to use 100 percent of its total 2016 revenues for energy- and climate-related purpose (0.85 billion euros); however, it reports the total spending of its national energy and climate fund as domestic use (1.60 billion euros). Thus, only 53 percent of the total spending is financed by carbon revenues.[27] In order to

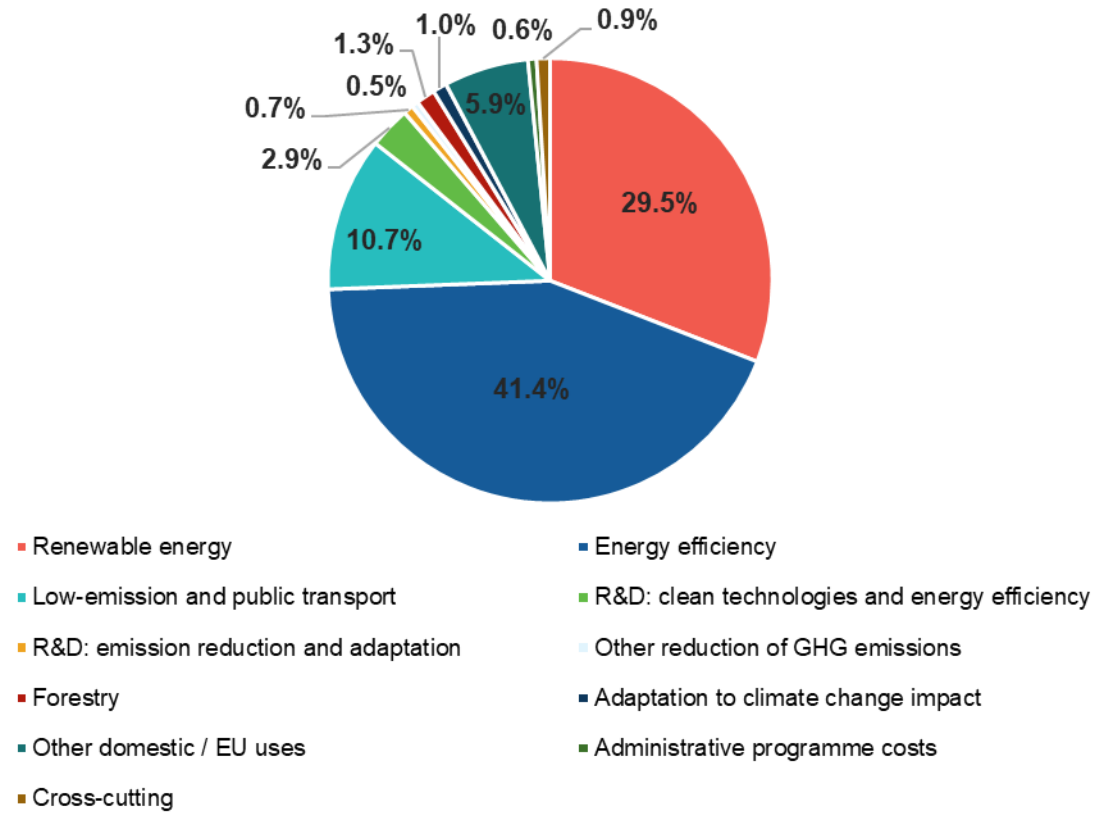
[25] From the official reporting, no further countries could be identified.

[26] Croatia, Malta, and Spain report to use a higher amount for energy- and climate-related purposes than their 2016 revenue. This difference might occur due to the use of carryover revenues from years before 2016. However, the reported data provides no further explanation.

[27] In general, there is, of course, nothing wrong with the German approach. Indeed, one of the main reasons to use carbon revenues to finance carbon reductions is to increase the rate of low-carbon investments beyond those that would have been made anyway, using other national revenues and programmes. Total spending on clean energy programmes can, and in most cases, definitely should, exceed carbon revenues received in a Member State.

reduce the distortive effect of Germany's reporting, we adjusted its domestic use, setting it equal to 100 percent total revenue in 2016, and applied the ratios of domestic types of use to this amount. Also, Hungary, Lithuania, and Slovenia show discrepancies in their reporting, with a higher amount presented as domestic use than the amount indicated to be used for energy- and climate-related purposes. However, the associated distortive effect for these nations is limited.[28] Figure 2 shows, on an aggregate level, how Member States use their auctioning revenues domestically as a share of the EU's total domestic use, distinguishing different types of use.

Figure 2: Domestic types of use as a share of total domestic use (2.4 billion euros)[29]



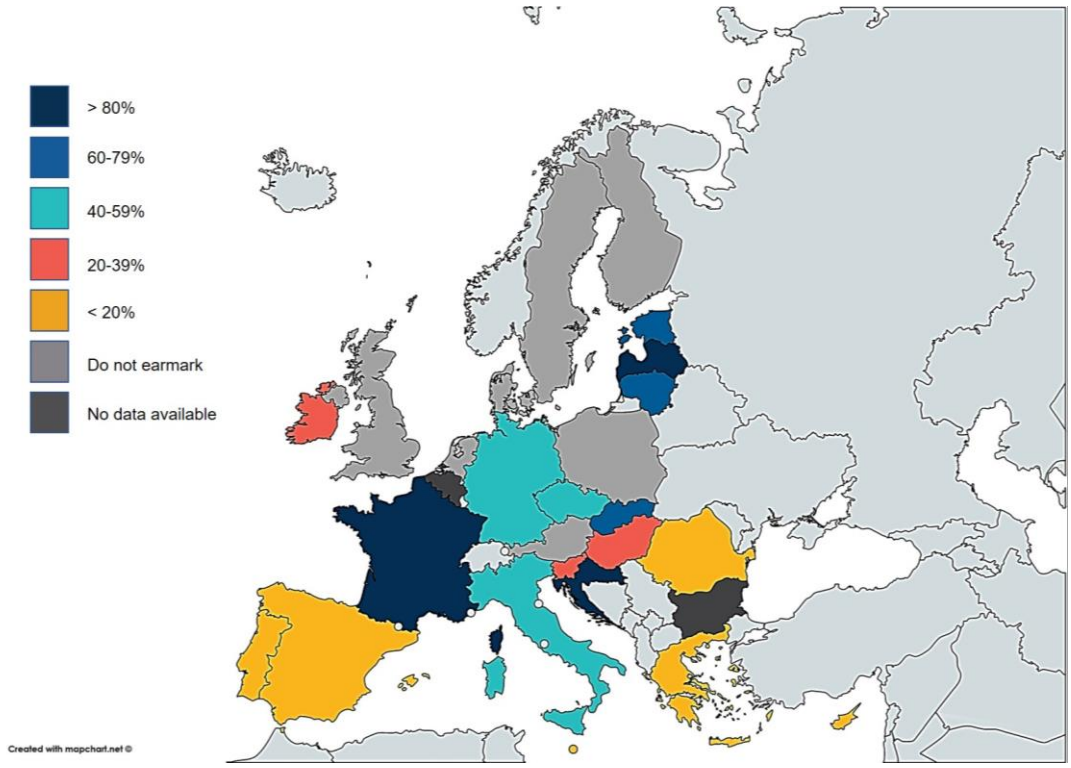
The largest share of total domestic use (41.4 percent = 1.0 billion euros) finances energy efficiency measures, followed by the promotion of renewable energy (29.5 percent = 0.71 billion euros) and the shift to low-emission and public forms of transport (10.7 percent = 0.26 billion euros). Putting it into perspective with total carbon revenues, these shares correspond to 26.2 percent, 18.6 percent, and 6.8 percent, respectively. Comparing them with analyses on the use of carbon revenues from previous years (see footnote 24), 2016 is the first year where the

[28] The analysis of domestic use (per type) required the following additional data processing: (1) Interpretation of committed versus disbursed spending on a country-by-country basis. Some Member States report both committed and disbursed amounts, with the disbursed amounts being included in the committed amounts, while other Member States report both amounts separately. (2) Where Member States report ambiguous domestic types of use or the reported type does not match the purpose of revenue use (i.e., specific programme support), we took a further look at the individual programmes, if provided, to categorise the member state's domestic use.

[29] Total domestic use is adjusted for Germany's inconsistent reporting, it is still marginally higher than the total amount of revenues recycled due to inconsistencies in Hungary's, Lithuania's and Slovenia's domestic revenue use, as introduced above. The sum of shares does not amount to 100 percent because Belgium only provides its total domestic use without specifying purpose and types of use and Bulgaria's reporting, which is locked for public view at ROD/EIONET. The total domestic use of 2016 revenues in Bulgaria is available at: http://www.maximiser.eu/ets-tool/.

largest share of carbon revenues supports energy efficiency measures. This increase mainly happened due to Germany reporting specific domestic types of use for the first time in 2016 and 53 percent of Germany's reported spending on energy- and climate-related purposes supporting energy efficiency programmes. Germany is not the only country devoting a large share of their domestically recycled revenues to increase energy efficiency. Figure 3 shows a map that ranks EU Member States according to their share of domestic use recycled for energy efficiency.[30]

Figure 3: Map illustrating the share of domestic revenue use recycled for energy efficiency in EU Member States (created with mapchart.net)



France, Latvia, Croatia, Estonia, Lithuania, Slovakia, Italy, Germany, and the Czech Republic report to use between 50 and 100 percent of their auctioning revenue to support energy efficiency measures.

Latvia reports an increase in its share of total carbon revenues recycled for climate and energy purposes from 0.1 percent in 2013 to 55 percent in 2016, with 97 percent of its domestic use funding the National Emission Allowances Auction Instrument, which cofinances a financial support scheme for energy efficiency. Germany reports the highest 2016 auctioning revenue of all EU Member States, and thus with a high share promoting energy efficiency measures, it contributes significantly to the total reported use for energy efficiency (with adjustment, 45.0 percent). In the Czech Republic, revenue recycling is a well-established practice. The Czech New Green Savings Programme has been funded by auctioning revenues since its programme launch in 2013, and auctioning revenues are considered a major source for energy efficiency

[30] Note: The map ranks Member States specifically regarding their domestic revenue use for energy efficiency. Spain, Portugal, Greece, and Malta are ranked low; however, they recycle a large share of their total revenues for domestic renewable energy programmes.

finance in the Czech Republic. Drawing on these exceptional revenue-recycling cases and the availability of evaluations of the Member States' funded energy efficiency measures, we provide further insights for Latvia, Germany, and the Czech Republic.

Table 1: Member States' revenue recycling for energy efficiency

Member State	Total 2016 revenues (1,000 euros)	Recycled revenues — Domestic use (1,000 euros)	Share of domestically recycled revenues for energy efficiency	Recycling channel
France	234,684	234,684	100%	**Habiter Mieux:** implemented by the National Agency for Housing, provides financial support for thermic renovations specifically to low-income households. The programme focuses on the reduction of fuel poverty through energy efficiency improvements in private housing.[31]
Latvia	11,502	7,419	97%	**National Emission Allowances Auction Instrument:** cofinances open tender schemes for energy efficiency improvements in public buildings (culture and education sector).[32]
Croatia	20,259	46,147	88%	**Environmental Protection and Energy Efficiency Fund:** promotes the implementation of energy efficiency measures, provides financial support for energy efficiency retrofits of residential and commercial buildings, and finances projects that improve the energy efficiency of public lighting and in the industry sector.[33]
Estonia	23,611	12,150	77%	**Grant measure:** with the major aim to increase the energy efficiency of public sector buildings (e.g., kindergartens) through targeted investments in renovation activities and renewable energy use.[34]

[31] Further information (in French) is available on the website of the National Agency for Housing: http://www.anah.fr/ (accessed 29 June 2018).

[32] Odyssee-Mure. (2017a). *LV26 Low Energy Buildings: Reduction of GHG Emissions, 2016-2019* (Emission Allowances Auction Instrument). Retrieved from: http://www.measures-odyssee-mure.eu/public/mure_pdf/tertiary/LV26.PDF. See also Odyssee-Mure (2017b). *LV27 Energy Efficiency in Public (Culture & Education Sector) Buildings: National Emissions Allowances Auction Instrument, 2016–2020*. Retrieved from: http://www.measures-odyssee-mure.eu/public/mure_pdf/tertiary/LV27.PDF.

[33] Further information is available at the fund's website: http://www.fzoeu.hr/en/energy_efficiency/ (accessed 29 June 2018).

[34] Odysee-Mure. (2017c). *EST 36 Grant for improving energy performance and introduction of renewable energy in houses of municipally owned kindergartens*. Retrieved from: http://www.measures-odyssee-mure.eu/public/mure_pdf/tertiary/EST36.PDF.

Member State	Total 2016 revenues (1,000 euros)	Recycled revenues — Domestic use (1,000 euros)	Share of domestically recycled revenues for energy efficiency	Recycling channel
Lithuania	20,837	67,546	71%	**Multi-apartment building renovation (modernisation) programme:** implemented by the Housing Energy Efficiency Agency (BETA) receives the largest proportion of recycled revenues. The programme provides financial support for energy efficiency renovations in multi-apartment residential buildings.[35] A smaller proportion supports renovation activities in public buildings financed through the Lithuanian Environmental Investment Fund (LAAIF).
Slovakia	65,047	35,559	70%	Revenues are used for a programme that promotes energy efficiency in existing public buildings. The programme is implemented by the Slovakian Environmental Fund; however, no further details on the recycling channel are provided.
Italy	411,701	118,058	59%	The distribution of 2016 revenues was not decided at the deadline of reporting. The use of auctioning revenues reported in 2016 declares the spending of 2014 auctioning revenues; 59 percent of the domestic use are recycled for energy efficiency improvements in public administration buildings, energy management systems, information provision, and the national energy efficiency fund. However, the reporting only refers to the national, legislative directive to improve energy efficiency instead of concrete recycling channels.

[35] Further information (in Lithuanian) is available on the programme's website: http://atnaujinkbusta.lt/ (accessed 29 June 2018).

Member State	Total 2016 revenues (1,000 euros)	Recycled revenues — Domestic use (1,000 euros)	Share of domestically recycled revenues for energy efficiency	Recycling channel
Germany	850,388	1,605,451	53%	**Energy and Climate Fund (EKF):** 53 percent of this fund is used to support various energy efficiency programmes: the KfW support scheme in the building sector, energy-saving measures implemented through the *Energieeffizienzfond* (energy efficiency fund), the tender scheme STEPup! for the support of industrial energy-saving investments, and the *Anreizprogramm Energieeffizienz* (energy efficiency incentive programme) for the replacement of heating and ventilation systems.[36]
Czech Republic	117,958	117,374	50%	**New Green Savings Programme:** a financial support scheme designed to promote energy savings in single-family and multifamily buildings (only in November 2016 the Czech government approved to also include public sectors buildings), focusing on the renovation of existing buildings, construction of new buildings with low-energy standard, and utilisation of low-emission or renewable sources for heating. **EFEKT Programme:** a financial support scheme designed to promote energy-saving measures and renewable energy sources among small customers (public or private business), focusing on energy efficiency improvements, energy management, and awareness raising through education.[37]

[36] Further information (mainly in German) is available on the programmes' websites: https://www.kfw.de/inlandsfoerderung/Privatpersonen/index-3.html, https://stepup-energieeffizienz.de/ and http://www.bafa.de/DE/Energie/Heizen_mit_Erneuerbaren_Energien/Anreizprogramm_Energieeffizienz/anreizprogramm_energieeffizienz_node.html (accessed 29 June 2018).

[37] Ministry of Industry and Trade. (2017). *Update of the National Energy Efficiency Action Plan of the Czech Republic*. Retrieved from: https://www.mpo.cz/assets/en/energy/energy-efficiency/strategic-documents/2017/11/NEEAP-CZ-2017_en.pdf.

The use of auctioning revenue for energy efficiency in Latvia, Germany, and the Czech Republic

Latvia

The **National Emission Allowances Auction Instrument** (EAAI) cofinances two open tender schemes for public building renovations, one of them focusing on buildings that are protected architectural monuments. The first open tender for protected public buildings (culture and education sector) was announced in February 2016 and approved two large-scale and seven small-scale projects. The total project costs amount to approximately 16.8 million euros (around 8.87 million euros financed through the EAAI), and the projects' implementation is expected to deliver emission reductions of 454 tonnes of CO2 annually. The second open tender for public low-energy buildings was announced in March 2016 and will fund one new construction and six renovation projects with total project costs amounting to 47.2 million euros (approximately 23 million euros total EAAI financing).[38] The implementation of these projects is expected to deliver 0.115 PJ annual energy savings from 2019, drawing on the efficiency requirements within the tender process.[39]

Germany

The largest proportion of financial resources allocated to the **Energy and Climate Fund** and invested in energy efficiency programmes in Germany (approx. 83 percent) contributes to the KfW support programme Energy-efficient Refurbishment.[40]

Evaluations of efficiency programmes partially funded by auctioning revenues in Germany directly support the conclusion that carbon revenue recycling for efficiency can deliver energy costs savings to families and businesses, increased domestic employment, and carbon emission reductions—much of which is in addition to the emission reduction impacts of the ETS regime itself.

In 2016, the refurbishment programme allocated financial support to modernise around 276,000 dwellings. The supported refurbishment projects delivered 1,662 GWh annual end-use energy savings[41] and GHG emission reductions amounting to 615,838 tonnes of CO2 equivalent per year. Annual heating costs to consumers will be reduced by approximately 144 million euros; considering total lifetime energy savings, heating cost savings are expected to reach 5.5

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[38] In total, 31.87 million euros shall be financed through the EAAI. Yet, in 2016 Latvia reports to allocate only 7.19 million euros of auctioning revenues to the EAAI. The higher cofinancing of building energy efficiency might draw on expected future revenues, however, this does not become clear in the policy description.

[39] Odyssee-Mure, (2017a) and (2017b).

[40] According to Germany's official reporting, auctioning revenues largely support building refurbishments. Within the programme Energy-efficient Construction, KfW also supports the energy-efficient construction of new dwellings. This programme supported approximately 73,000 building projects in 2016. With that number of supported construction projects, the programme reached a share of around 50 percent of all new residential constructions in Germany. The end-use energy savings of the supported construction projects in 2016 amount to 425 GWh per year and GHG emissions reductions are estimated to add up to 182,289 tonnes of CO2 equivalent annually: Institut Wohnen und Umwelt and Frauenhofer IFAM (2018). *Monitoring der KfW-Programme „Energieeffizient Sanieren" und „Energieeffizient Bauen 2016*. Retrieved from: https://www.kfw.de/PDF/Download-Center/Konzernthemen/Research/PDF-Dokumente-alle-Evaluationen/Monitoringbericht_EBS_2016.pdf.

[41] End-use energy savings cover different energy sources including natural and liquid gas (115 GWh/a), oil (1322 GWh/a), coal (78 GWh/a), biomass (-80 GWh/a), electricity (232 GWh/a) and district heating (-4 GWh/a). For biomass and district heating energy end-use increased, especially due to the shift in heating energy source. Because building renovation programmes deliver savings across multiple fuel types, this assessment converts all savings to a common metric (GWh/a) using each fuel's energy content.

billion euros (discounted net present value over 30 years assumed average lifetime for the applied energy savings measures). The total investment stimulated by the programme—10.1 billion euros, including value-added tax—are estimated to deliver 115,000 person-years of employment[42] and, taking into account second order investment effects outside the building industry, a net turnover of 15.1 billion euros. Of the total investment sum, 1.6 billion euros return directly back to the national budget through value-added tax.[43] It is worth noting that this tax revenue is equal to the total amount allocated to the Energy and Climate Fund from all sources in 2016.[44]

Czech Republic

The Czech **New Green Savings Programme**, which is estimated to provide 700 million euros in funds to owners of single-family or multifamily houses, is in its entirety financed through auctioning revenues (phase 3 auctions, 2013–2020). The financial support scheme for investments in energy-efficient building infrastructure is estimated to deliver 650 TJ energy savings for every 38 million euros invested.[45] Referring to the programme's subsidy rate, it is expected that every Czech crown (CZK) spent in the programme initiates an additional investment of two to three crowns by building owners. Thus, the public investment returns to the national budget through value-added tax, income tax, and social and health insurance of the workers. Indeed, a 1 million CZK public investment in enhanced energy efficiency in buildings is expected to induce 2.13 to 3.59 million CZK growth of gross domestic product, on average 2.06 additional persons employed, mainly in small- and medium-sized enterprises in the construction sector, and 720,000 CZK in total tax revenues.[46]

In 2016, the **EFEKT Programme** paid out 81.55 million CZK in subsidies (50 million financed through carbon revenues) supporting 188 energy-saving projects for increasing the energy performance of public lighting, replacing heating systems, providing energy audits, introducing energy management systems (ISO 50001), and supporting education- and awareness-raising measures. The payments initiated a total investment sum of 146.28 million CZK. The improved energy performance of public lighting and the replacement of heating systems delivered direct energy savings of 13,896 GJ per year and an annual reduction of 3,596 tonnes of CO2. The average cost per GJ saved amounts to 7870 CZK[47] (ca. 305 euros), 3880 CZK supported through state subsidies.[48]

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[42] Person-year = Employment of one person for one year with the average weekly working hours of the respective industry.

[43] Institut Wohnen und Umwelt and Frauenhofer IFAM, (2018).

[44] The German experience thus reveals that, although treasury departments might be reluctant to "lose" income by dedicating auctioning revenues to efficiency programmes instead of to general funds, in relatively short order those carbon revenues could well be replaced or exceeded by taxes received due to the positive economic activity stimulated by the efficiency programme.

[45] Hrbek, J. (2018). New Green Savings Programme. [PowerPoint slides]. Retrieved from: http://c4eforum.net/panel-sessions.

[46] Zámečník, M., and Lhoták, T. (2012). *Should the government invest in energy efficiency of buildings? Macroeconomic impact assessment* [Executive Summary]. Retrieved from: http://www.buildup.eu/en/practices/publications/should-government-invest-energy-efficiency-buildings-macroeconomic-impact. The full report is available in Czech. Retrieved from: https://sanceprobudovy.cz/.

[47] These costs are expected to decrease in the future of the programme, due to changes in the programme design. Until 2016, structural investments related to public lighting improvements were eligible for programme support, which will not be the case from 2017. In general, the programme aims to focus on information, education and awareness raising measures, for which the energy saving impact is difficult to measure.

[48] Ministry of Industry and Trade. Vyhodnocení: Státního programu na podporu úspor energie a využití obnovitelných *a druhotných zdrojů energie za rok 2016* [Research and development: A permanent programme to support energy efficiency gains and the use of innovative technologies and secondary energy springs for 2016]. Retrieved from: https://www.mpo-efekt.cz/upload/62d0d69c2bcb052223969e1a31d35403/vyhodnoceni-statniho-programu-2016.pdf (in Czech).

Latvia, Germany, and the Czech Republic recycle their auctioning revenues for energy efficiency programmes and thus reap some of the potential multiple dividends of the EU ETS to further abate GHG emissions and to lower the economic and societal costs of energy consumption. It is not possible with the data reported to the Commission by Member States to say whether the use of auctioning revenues for energy efficiency in these countries and other Member States has led to *additional* programme support and incremental energy efficiency investments, as it would require a counterfactual without the revenue income stream. Although we have not done so here, it should be possible to estimate the additional impact of auctioning revenues on efficiency programmes by comparing trends in funding levels before and after the revenues were assigned to certain programmes and by studying their political and administrative histories. There are two important issues to consider. First, auctioning revenues will not be reducing emissions or lowering the burden of energy bills if they are merely replacing other funding sources for efficiency programmes. Second, decision-makers should not assume that carbon receipts alone will be adequate to finance all of the cost-effective efficiency investments that will need to be undertaken to meet Europe's climate and social goals. In fact, total spending on programmatic efficiency measures should often be higher than the carbon revenues in a particular jurisdiction.[49] Looking at the domestic carbon revenue use in Latvia, Germany, and especially the Czech Republic, the auctioning income stream makes an essential contribution to their respective recycling channels.[50]

A critical look on the auctioning revenue data

The assessment above uses the EU Member States' official reporting on the use of 2016 auctioning revenues. As mentioned before, the reporting is mandatory; however, it is the Member States' own responsibility to report, and there is no external verification of the reported numbers. Thus, the assessment requires some degree of reliance on the Member States' submissions. For Latvia, Germany, and the Czech Republic, we could find and use further information on the recycling channel, while for other Member States that recycle revenues for energy efficiency, only limited information on the exact use and/or the effectiveness of the support is available.

Overall, the quality of reporting improved since the introduction of the mandatory reporting scheme, with more Member States specifying their use of auctioning revenues. The following concerns should still be mentioned:

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[49] The experience in the nine states comprising the RGGI cap-and-trade scheme in the northeastern United States is instructive. In 2007, before RGGI auctions began, spending on programmatic energy efficiency for electricity and natural gas totaled $581.5 million across the nine RGGI states: American Council for an Energy-Efficient Economy (ACEEE). (2009). *The 2009 State Energy Efficiency Scorecard*. Retrieved from: https://aceee.org/research-report/e097. When carbon auctions began at the end of 2008, RGGI carbon receipts added about $125 million per year to these efficiency programs: RGGI, Inc. (2016). *The investment of RGGI Proceeds through 2014*. Retrieved from: https://www.rggi.org/sites/default/files/Uploads/Proceeds/RGGI_Proceeds_Report_2014.pdf. With positive experiences across the region, total energy efficiency spending has grown rapidly, and in 2016 totalled over $1992 million: ACEEE. (2016). *The 2016 State Energy Efficiency Scorecard*. Retrieved from: https://aceee.org/research-report/u1606. RGGI auction revenues devoted to efficiency totalled $240 million in 2016, providing only about one-eighth of total programme spending across the RGGI region.

[50] Le Den et al. (2017) consider the relative importance of auctioning revenues and find that compared to other sources of EU funding for energy efficiency, i.e., the European Structural and Investment Funds, auctioning revenues play a minor role (looking at 2013–2015 data). However, they also find that in several Member States auctioning revenues made an important contribution to specific energy efficiency programmes.

- Although the level of detail has improved over time, it still varies among Member States. Different inconsistencies exist, most often the summation of reported domestic and international use yields an amount higher or lower than the amount reported to be used for energy- and climate-related purposes. For domestic and international use, Member States shall distinguish between committed funds and funds actually disbursed for use and provide a definition for both. However, most Member States do not provide the required definition and different Member States apply it differently. All in all, there is a need for more transparent and granular reporting. More importantly, for the European mandate to use ETS revenues to accelerate the clean energy transition to be meaningful across the EU, it should also include a requirement for independent monitoring and verification of the reported uses.
- Slovakia and Germany report to use, respectively, 28 and 15 percent of total domestic use for electricity price compensation to energy-intensive industry at risk for carbon leakage. This counts as a climate- and energy-related purpose, although certainly decreasing the beneficiaries' motivation to reduce their energy consumption. It would be far better to use the revenues to improve energy efficiency at such firms, which would improve their competitiveness and aid modernisation, while also reducing emissions. Unless such process improvements are simply not feasible, using carbon revenues to subsidise continued emissions, rather than reducing emissions, should not be eligible to count as use for climate and energy purposes.[51]
- The recently released economic report of Germany's energy and climate fund (for 2017) shows that a large fraction of money (approximately 40 percent)[52] committed to support energy and climate programmes was not disbursed for actual use. This case shows that the use of carbon revenues for energy efficiency programmes faces the common barriers for a successful implementation, not only in Germany. The provision of financial resources is one important step; however, it does not solve the challenge to overcome all other barriers to energy efficiency. Recycling carbon revenues is a means to an end, not an end in itself, and requires further engagement to achieve energy demand reductions, sustainably and cost effectively. There is a huge body of experience and research showing how public funds can be leveraged to inspire deep energy savings, and one lesson is quite clear: simply making funds available for efficiency measures will not necessarily lead to savings actions being implemented by families, firms, and public agencies.

Despite these general concerns, the assessment of revenue recycling at the EU member state level provides valuable insights on the status quo of auctioning revenue use within the EU ETS. The arguments in favour of revenue use for energy efficiency require a discussion of the interactions between the ETS and energy efficiency improvements, which follows in the coming section.

[51] This position is also emphasised by the WWF MaxiMiser Project: Ecologic Institute and WWF (2016).

[52] Zeitung für Kommunale Wirtschaft (2018, April 20). Mittel des EKF werden nicht abgerufen. Retrieved from: https://www.zfk.de/politik/deutschland/artikel/mittel-des-ekf-werden-nicht-abgerufen-2018-04-20/.

Discussion on interactions among the EU ETS, revenue recycling, and energy efficiency improvements

Recent reforms to the ETS at the EU level are addressing the historic imbalance between supply and demand in the carbon market and reducing the overall cap (MSR and LRF, respectively). These reforms are intended to increase future carbon prices and the incentive to reduce emissions. What impact will these reforms have on carbon revenues? In the first instance, lowering the number of allowances available in the system would, all else equal, lower total available revenues. On the other hand, a tighter market should increase carbon prices for each tonne sold, and the gradual elimination of free allocations will also tend to drive up total auction receipts. Projections indicate that total auctioning revenues across the EU might increase up to 20 billion euros per year before 2030.[53]

What is the likely impact of higher expected revenues on end-use efficiency? If Member States were to continue to devote the same fraction of auctioning revenues to efficiency programmes as reported in 2016, higher revenues would increase the amount of revenues recycled for energy- and climate-related purposes and increase the income stream available for energy efficiency programme support.

Figure 4: Linkage among the EU ETS carbon price, carbon revenues and energy efficiency within the ETS sectors

Source: authors' illustration.

The interaction between the EU ETS and improved energy efficiency, expecting higher (and ideally incremental) carbon-funded support for complementary energy efficiency measures, is more complex and often debated among researchers and policy advisers.[54] If energy efficiency programmes have the effect of lowering demand for allowances by reducing energy consumption and generation (covered by the ETS, i.e., electricity), they will reduce carbon prices. Freed-up allowances are sold to other emitters or banked for later use, meaning that the efficiency programmes would not achieve emission reductions under the cap-and-trade system but only reduce the price and thus the cost to businesses and consumers of complying with the cap. Critics sometimes complain that efficiency lowers carbon prices and dampens the incentive mechanism of the ETS. This "waterbed effect" is commonly used to argue against the implementation of complementary measures and thus carbon revenue recycling. However, since the overriding rationale of carbon cap-and-trade systems, in contrast to carbon taxes, is to uncover low-cost, efficient reduction pathways—and success in doing so intentionally lowers allowance prices—it is inconsistent with the foundations of cap-and-trade theory to seek high

[53] Ecologic Institute and WWF (2016).

[54] This debate is not limited to energy efficiency improvements, but even more established with respect to increased adoption of renewable energy sources and starts to include policy changes on the national level, e.g., coal-phase out proposals: Ecofys. (2016). *The waterbed effect and the EU ETS: An explanation of a possible phasing out of Dutch coal fired power plants as an example*. Retrieved from: https://www.ecofys.com/files/files/ecofys-2016-the-waterbed-effect-and-the-euets.pdf.

carbon prices instead of seeking low-cost attainment pathways. Supporting this logic, it is essential to return to first principles: any action taken to reduce emissions within a cap-and-trade system will implicitly reduce pressure on the carbon price without reducing the cap. This underlying mechanism is indeed the whole point of cap-and-trade regimes—to uncover the lowest-cost opportunities to lower emissions and therefore to lower the price of carbon. In other words, the waterbed effect is an essential design feature of a cap-and-trade regime. It is illogical to criticise companion policies, such as efficiency programmes, simply because they may reduce carbon prices under a cap.

Emphasising the economic case of carbon revenue recycling for energy efficiency in section 2, we have already argued why complementary measures are needed to achieve low cost emission reductions through end-use energy efficiency because a large reservoir of end-use efficiency improvements will remain untapped if we rely solely on pricing instruments to capture them. How can we use this knowledge to accelerate progress towards emission reductions at affordable societal costs, which are the real goals of climate programs?

There are a variety of structural solutions to the happy challenge posed by the power of carbon revenue recycling:

- One possibility is to use carbon revenues to invest in end-use efficiency improvements in sectors not covered by the ETS. For example, some jurisdictions use carbon revenue to improve thermal efficiency in buildings and add insulation to homes, reducing energy consumption of natural gas, fuel oil, or district heat systems that are largely outside the ETS or other cap scheme. Both the German KfW support and the Czech New Green Savings Programme incentivise building efficiency improvements, to name just two EU examples. In this way, the cap-and-trade scheme can drive reductions even outside, and in addition to, the reductions mandated by the cap. This approach is especially useful when it would be impracticable or politically infeasible to bring those sectors into the cap regime.

Figure 5: End-use efficiency improvements outside the EU ETS

Source: authors' illustration.

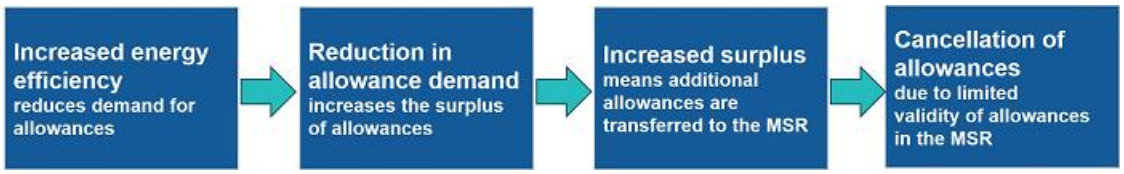
- Another approach, which we have termed the "virtuous circle," is to use success in carbon revenue recycling, which lowers energy bills along with emissions, to support the political process to tighten the cap further in later rounds of cap administration. This approach has notably succeeded in the nine states comprising the RGGI cap-and-trade scheme in the northeastern United States,[55] and it could help to drive lower cap levels in Europe and elsewhere, as well. The recent ETS reform, increasing the LRF and introducing the MSR, are both long-needed improvements to the system, but they are only a starting point.

[55] Acadia Center. (2017). *Outpacing the Nation: RGGI's environmental and economic success*. Retrieved from: https://acadiacenter.org/document/outpacing-the-nation-rggi/.

Ideally, the cap should reflect changing circumstances and market conditions.[56] Successful carbon revenue recycling could increase the political will and wider social acceptance for more ambitious, long-term decarbonisation targets within the ETS.

- European decision-makers have recently created a third pathway to connect carbon revenue recycling and allowance reductions via the MSR, which is intended to address the large amount of surplus allowances built-up in the EU ETS.[57] From 2019 to 2028, the MSR is expected to take in approximately 1.8 billion allowances (additional to the initial transfer of unallocated and back-loaded allowances from phase 3). Moreover, these allowances are limited in their validity, and a substantial amount, up to 2.4 billion, is expected to be cancelled in 2023.[58] With the MSR in operation, complementary measures, which reduce the demand for allowances, increase the current surplus, of which a large proportion will eventually be cancelled. Thus, freed-up allowances and finally emissions are not simply shifted in space and time, as supposed by the waterbed effect argument, but added to the existing surplus of allowances on the EU carbon market.[59] The cancellation mechanism and the MSR in general are intended to retire many of those surplus allowances, increase the carbon price, and reduce overall emissions.[60]

Figure 6: Interaction between the EU ETS and complementary energy efficiency measures, taking into account the MSR mechanisms



Source: authors' illustration, adapted from https://sandbag.org.uk/2017/11/23/no-waterbed-effect/.

The three options in figure 6 show that carbon revenue recycling for energy efficiency has the potential to reinforce the EU ETS. Complementary, carbon-funded energy efficiency measures, additional to the main carbon pricing instrument, can lead to further emission reductions in ETS and non-ETS sectors, at lower costs for consumers and society. Beyond that, energy efficiency improvements provide multiple non-energy benefits and, finally, the opportunity for tighter cap regulation. The EU ETS can yield multiple dividends from carbon pricing, but in

[56] For a detailed discussion on options for dynamic cap adjustments and its benefits, see: Cowart, R., Buck, M., and Carp, S. (2017). *Aligning Europe's Policies for Carbon, Efficiency, and Renewables: Creating a "Virtuous Cycle" of Performance and Emissions Reduction*. Retrieved from: https://sandbag.org.uk/wp-content/uploads/2017/06/rap-cowart-buck-carp-aligning-europe-policies-virtuous-cycle-2017-june-1.pdf.

[57] See also Sandbag. (2017). *An agenda for strategic reform of the ETS: What's the future for EU carbon pricing?* Retrieved from: https://sandbag.org.uk/wp-content/uploads/2017/12/Strategic-Reform-of-the-ETS-2017-Sandbag-1.pdf.

[58] See Marcu, A., Alberola, E., Caneill, J-Y., Mazzoni, M., Schleicher, S. P., Stoefs, W., Vailles, C., and Vangenechten, D. (2018). *2018 State of the EU ETS Report*. Retrieved from: https://www.ictsd.org/themes/climate-and-energy/research/2018-state-of-the-eu-ets-report.

[59] Sandbag. (2016). *Puncturing the waterbed myth: The value of additional actions in cutting ETS greenhouse gas emissions*. Retrieved from: https://sandbag.org.uk/wp-content/uploads/2016/12/Waterbed_report_A.pdf.

[60] The ability of the MSR to absorb the impact of complementary policies on the supply and demand imbalance, and the carbon price effect are however still uncertain and rely on potential adjustments after the MSR reviews scheduled for 2021 and 2026. The opposite MSR mechanism to release allowances to the market when a lower threshold of allowances in circulation is reached is not expected to be utilised before 2030 (Marcu et al., 2018).

order to realise those benefits, the strategic use of carbon revenues needs to be accelerated in all Member States.

Conclusions

It takes only a moment's reflection to realise that carbon pricing regimes—whether cap-and-trade mechanisms, floor prices, or carbon taxes—offer decision-makers two opportunities to reduce emissions, not just one. Carbon prices can deliver important signals to investors and energy users, but carbon revenues can also be a powerful tool in the energy transition.

One of the most powerful ways to use carbon revenues is to invest them in cost-effective energy efficiency programmes. Support for complementary energy efficiency measures can yield multiple dividends because energy efficiency improvements help to deliver cost savings and emissions reductions, reduce the upward pressure on consumer energy bills, and realize the energy and non-energy benefits of end-use efficiency.

Furthermore, in practical political terms, the multiple dividends can be substantial. To succeed, carbon programmes must deliver savings sustainably over decades of progress—and in modern democratic societies, this requires sustained political support. Public support will be much easier to maintain when the consumer costs of carbon pricing are moderate, and the programme is seen to deliver costs savings to end-users, not just higher prices across the board.

In the EU ETS, the potential to use these benefits is to a large extend still untapped. Some Member States recycle their auctioning revenues for energy- and climate-related programmes. However, the fundamental understanding that both the carbon price and the strategic use of revenues can help to achieve the EU's decarbonisation targets cost effectively is limited. The analysis of the Member States' use of auctioning revenues shows that in 2016, 61.3 percent of total revenues are strategically invested for energy- and climate-related purposes and no more than 26.2 percent in energy efficiency programmes.

To further establish revenue recycling, EU Member States need to become aware of the multiple dividends they could achieve. The energy efficiency programmes partially funded by carbon revenues in Latvia, Germany, and the Czech Republic directly illustrate that carbon-funded energy efficiency improvements deliver energy savings and GHG emissions reductions, cost savings to consumers, tax revenue to the national budgets, employment, and economic growth. Thus, in expectation of a future increase in EU ETS auctioning revenues, making the case for their strategic use becomes ever more relevant.

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Rue de la Science 23
B – 1040 Brussels
Belgium

+32 2 894 9301
info@raponline.org
raponline.org