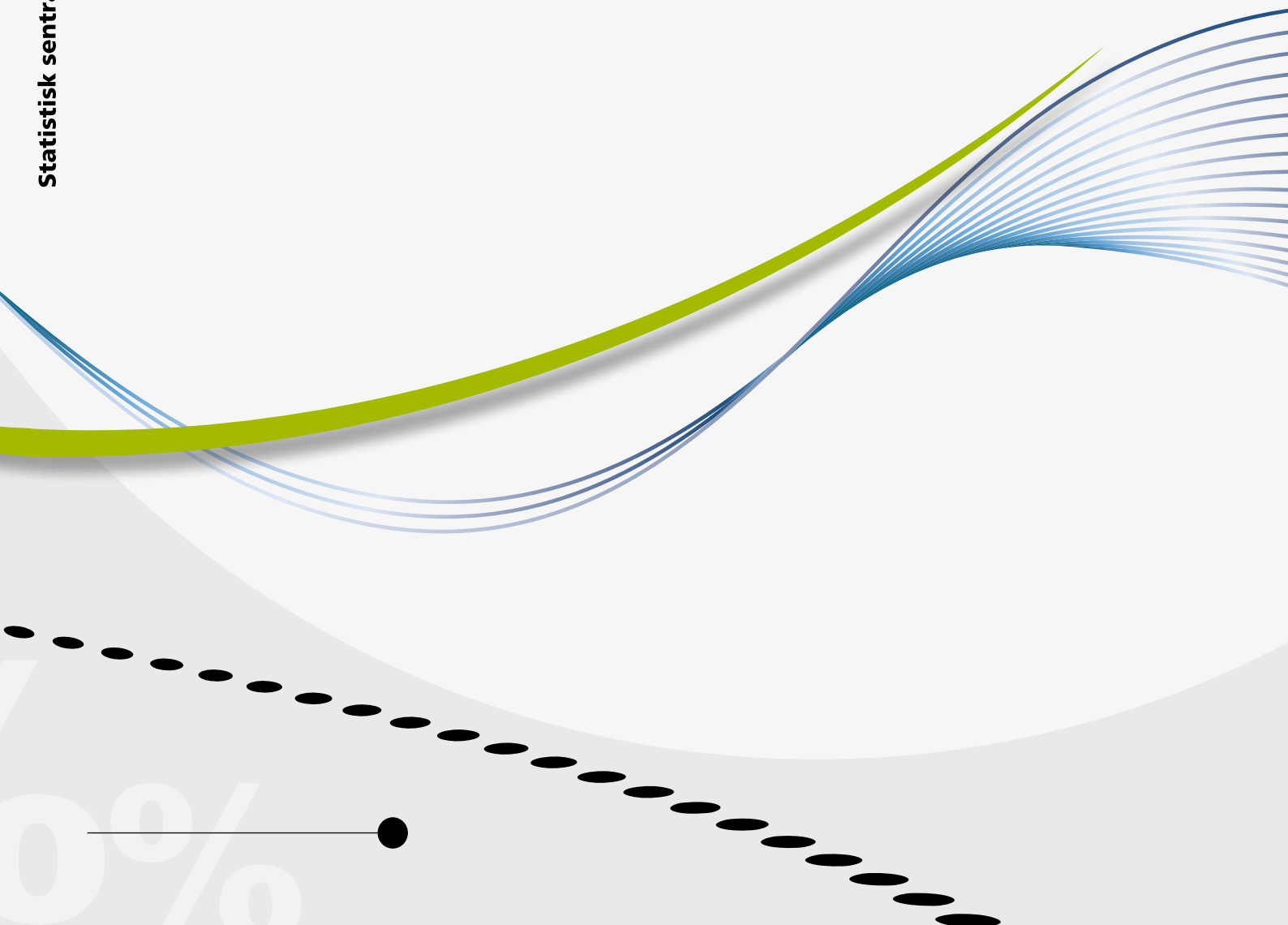
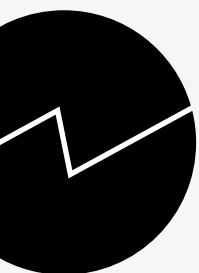


Håkon Torfinn Karlsen

The cost of participating in the greenhouse gas emission permit market



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Preface

The trade in greenhouse gas emission permits represents billions of euros each year. Still, economic statistics on the emission trading systems remains superficial. Reliable estimates on the cost of emission permits need to be developed, which take into account the variations across time, markets and groups of market participants.

This report explores some approaches to providing estimates of the cost of greenhouse gas emission permits to the national economies, governments and the business sector. The work is a contribution to the development of a framework for environmental economic statistics, and has in part been financed by Eurostat.

Statistics Norway, 5 March 2014

Hans Henrik Scheel

Abstract

Cap and trade systems for emission permits have become an important tool for a cost efficient reduction of greenhouse gas emissions both in Europe and in several regions around the world, see the [Cesifo Dice report 4/2012](#). The current regional systems have introduced active markets for emission permits reducing the overall cost of emission reduction compliance. A greenhouse gas emission permit is a tradable right to emit one metric tonne CO₂-equivalents within a certain time frame, e.g. throughout 2008–2012 for the second Kyoto agreement period and the EU/ETS second period.

Firms and governments must acquire greenhouse gas emission permits in order to comply with international regulations and treaties. There is a growing national interest not only in the physical amounts, but also in the economics of the emission trading systems. This report explores some approaches to providing estimates of the cost of compliance for the national economies, governments and the business sector.

First, we provide an overview of the physical accounting of emission permits. Then we briefly describe Norwegian government and firm accounting practices, before turning to possible valuation approaches. Finally, we estimate the cost of compliance with the EU ETS regulation for firms and the Kyoto agreement for the Norwegian government and Norway as a nation.

For firms, we present an estimation procedure that concurs with several firms' accounting practice, the presumption being that permits are bought monthly at a December future contract: The accumulated cost to Norwegian firms for 2008–2012 is estimated to € 803 million.

The cost to the Norwegian government in order to comply with the restrictive national commitments for 2008–2012, is estimated at € 155 million. On the other hand, the government has sold EU ETS emission permits for € 346 million. The total cost to Norway comprises both the business cost and the government cost, and nets out at € 612 million for 2008–2012

Keywords

Environment, economic instruments, general government, climate, greenhouse gases, environmental accounting

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1 Background

Cap and trade systems with emission permits have become an important instrument for the reduction of greenhouse gas emissions. The current regional systems, in particular in Europe, and globally under the Kyoto agreement mechanisms, have led to active markets for emission permits. There is a vivid discussion on the effectiveness and efficiency of these systems, and therefore an increasing interest in statistics describing emission permits in monetary terms, supplementing statistics on physical amounts.

Statistics Norway already publishes some preliminary statistics on greenhouse gas emission permits, in physical terms, i.e. tonnes carbon dioxide equivalents¹. In this report we will illustrate different approaches to estimating the cost of the greenhouse gas emission permits systems, to the government and to the regulated sector. We focus on:

- The cost to Norwegian firms of complying with the European Emission Trading System.
- The cost to the Norwegian government of the Kyoto agreement and national policy exceeding the Kyoto obligations.
- The implicit subsidy value of emission permits that are allotted to firms for free.
- Greenhouse gas emission permits as an environmental economic instrument relative to environmental taxes

In this report, we will provide numerical examples of the first two applications.

In addition to greenhouse gas emitting entities and the governments, there are other private economic actors that trade and hold stocks of emission permits for commercial or other reasons, e.g. brokers, banks and individuals. These entities are among the most active players in the market. However, for the purpose of long to medium term statistics of emission permits, we will assume that they are intermediaries whose economic behaviour has no implications on how to value the emission permits.

It should be kept in mind that the cost to a firm or national government is not equal to the social or environmental cost of greenhouse gas emissions, neither in total nor on the margin. It is generally recognised that the marginal damage cost of greenhouse gas emissions exceeds the current market price for emission permits. The cost of compliance is thus the fraction that is internalised into the emitter's cost structure.

2 Emission permits requirements

A greenhouse gas emission permit is a tradable right to emit one metric tonne CO₂ equivalents. The permit is valid within a certain time frame, e.g. the second Kyoto agreement period, 2008–2012.

There are a number of different greenhouse gas emission permit categories. Each is relevant in one or more contexts. Table 1 summarises the most important emission permits, for whom they are relevant for and who has issued the permits.

Greenhouse gas emission permits are auctioned and traded in much the same way as bonds and commodities, in a variety of contractual terms such as “futures”. A number of commodity market places have included emission permits in their portfolio, and historical prices and traded volumes are available.

¹ See for example: <http://www.ssb.no/natur-og-miljo/artikler-og-publikasjoner/fire-av-ti-klimavoter-gratis>

Table 1. The most important greenhouse gas emission permits

		Used by		Issued by	
		Nations (Kyoto obligations)	European firms (EU ETS)		
AAU	Assigned Amount Unit	X		United Nations (Kyoto)	
RMU	Removal units	X		United Nations (Kyoto)	Measures to increase greenhouse gas absorption in forests
CER	Certified Emission Right	X	X	United Nations (Kyoto)	Clean Development Mechanism
ERU	Emission Removal Unit		X	United Nations (Kyoto)	Joint implementation
EUA	European Amount	X	X	EU	

During the second term of the Kyoto agreement, 2008–2012, Norway's total emissions of greenhouse gases were 266.9 million tonnes CO₂ equivalents, while its obligation within the Kyoto agreement was a ceiling of 258 million tonnes.

Norway is a member of the EU Emission Trading System (EU ETS) which requires some firms in Norwegian industry, “the regulated sector”, to obtain and then hand over to the government² an amount of emission permits that corresponds to their emissions³. During 2008–2012, emissions from the regulated sector totalled 95.6 million tonnes CO₂ equivalents, approximately 36 per cent of the Norwegian greenhouse gas emissions.

Table 2. Norwegian emissions of greenhouse gases. 2008–2012. Million tonnes CO₂ equivalents

	2008	2009	2010	2011	2012	Total
Norwegian emissions	54.3	51.8	54.5	53.4	52.9	266.9
Of which in the regulated sector	19.3	19.2	19.3	19.2	18.5	95.6

Norway was assigned Kyoto emission permits, called Assigned Amount Units or AAUs, of 51.6 million tonnes per year, i.e. 258 million tonnes CO₂ equivalents in total. The interpretation is that if Norway emitted more than 258 million tonnes of greenhouse gases, it had to obtain additional emission permits to compensate for the excess emissions. Conversely, should Norway emit less, the surplus AAUs can be sold. The required amount of emission permits⁴ was therefore equivalent to 8.9 million tonnes (see table 3). In order to fulfil its obligations Norway had two options: Buy other industrialised countries' surplus of Kyoto allowances or reduce emissions in non-industrial countries through the special mechanisms set up in the agreement (the Clean Development Mechanism, CDM and Joint Implementation, JI).

The Norwegian policy has been to exceed the Kyoto target with 10 per cent, i.e. as if Norway was allotted 232.2 million AAUs rather than 258 million. Norway has abstained from the right to use existing forestry measures as valid emission reductions, which amount to 1.5 million tonnes a year.⁵ Also, Norway did not consider carbon dioxide captured and stored in the test facility at Mongstad as avoided emissions. Finally, additional permits were bought to compensate for international air travels by government employees in 2002-2011. As summarised in

² The technical term is to “surrender” an emission permit, meaning that the company has to hand over to the government the ownership of a number of emission permits corresponding to its greenhouse gas emissions in a certain period. The government effectively terminates these permits, which then are void and no longer available to the market. Similarly, the national governments must surrender national emission permits (AAUs) to the UN.

³ Norwegian firms may substitute 15 per cent of their EU ETS permit requirements (EUAs) with permits issued under the Kyoto Clean Development Mechanism (CDM) and Joint Implementation (JI).
Source: <http://www.lovddata.no/cqi-wif/ldles?doc=/sf/sf/20041223-1851.html#7-12>

⁴ As an emission permit is measured in tonnes of CO₂ equivalents, one permit is equal to one metric tonne.

⁵ Formally, Norway's cap on emissions in the Kyoto agreement was set to 50.1 million tonnes a year after deduction of 1.5 million tonnes which was the assumed effect of forestry measures already in place. Hence, the actual emission ceiling can be raised to 51.6 million tonnes (51.6 * 5 = 258 million tonnes for the five year period). The 10 per cent overfulfillment is however calculated from the 50.1 million.

table 3, Norway has therefore made itself accountable for 42.0 million AAUs, which is 33.1 million more than the 8.9 million required by the Kyoto agreement.

Table 3. Norwegian Kyoto permit requirements and policy. 2008–2012. Million permits

		Total 2008- 2012	Yearly average
A	National emissions	266.9	53.4
	Kyoto target (= 1 per cent more than emissions in 1990)	250.5	50.1
	Assumed absorption from forestry measures in place	+ 7.5	1.5
B	Kyoto obligation = AAUs issued	= 258.0	51.6
C	Net necessary AAU requirement	= A-B 8.9	1.8
	10% overfulfilment of Kyoto target	+ 25.1	5.0
	Abstention of accounting of forestry measures	+ 7.5	1.5
	Abstention from accounting of CCS at Mongstad TCM and Coverage of international air travels by government employees .	+ 0.5	0.1
D	Requirement of additional Norwegian self-imposed policy .	= 33.1	6.6
	Total AAU requirement	= C+D 42.0	8.4

Of the 258 million Kyoto permits (AAUs) issued by the UN, Norway was committed to convert 75 million into UE ETS permits (EUAs), i.e. 15 million each year. These permits have in part (34.8 million EUAs) been sold into the European permit market, generating a government income, and partly transferred for free to Norwegian businesses in the regulated sector. The latter practice is commonly referred to as “grandfathering” and totalled 40.2 million EUAs during 2008–2012.⁶

The net result for Norwegian firms in the regulated sector is shown in table 4.

Table 4. Emission permits acquisition in the regulated sector (million tonnes CO₂-eqv.)

	2008	2009	2010	2011	2012	Total
EUAs to be surrendered	19.3	19.2	19.3	19.2	18.5	95.6
Free allowance (grandfathered)	7.5	8.0	7.9	8.4	8.4	40.2
Net firm requirement	11.8	11.2	11.4	10.8	10.2	55.4

The overall number of EUAs is fixed. Norwegian firms have surrendered more EUAs than Norway has entered into the EU ETS market. The difference (95.6 less 75 million), is unavailable to firms elsewhere in Europe. This may technically be seen as Norwegian emission reductions, thus effectively reducing the number of permits needed by Norway as a nation⁷. In the final accounting with respect to the Kyoto agreement, the excess EUAs surrendered by Norwegian firms have indeed been converted back into AAUs. Table 5 shows what this implies for the permit requirement for the Norwegian government.

⁶ To a country, the free allowance amounts to the emission target in the Kyoto agreement. Hence, the AAUs corresponding to the Kyoto target are functionally equivalent to the grandfathered allowance for firms. In both cases, the free allowance emission permits may be traded between governments and firms respectively. Also, free allowances to firms may be considered an implicit subsidy and is a source of net income in the cases where actual emissions are less than the allowance.

⁷ See for example <http://www.regjeringen.no/nb/dep/fin/dok/regpubl/stmeld/2007-2008/stmeld-nr-1-2007-2008-3/7/3.html?id=482981> and <http://www.regjeringen.no/nb/dep/fin/dok/regpubl/stmeld/2009-2010/meld-st-1-2009-2010/3/8/4.html?id=579810>

Table 5. Norwegian permit requirements, 2008–2012

	Million permits (metric tonnes)	
AAUs required by Norwegian policy.....		42.0
EU ETS permits grandfathered to Norwegian firms	+	40.2
EU ETS permits sold to into the EU ETS	+	34.8
EU ETS permits surrendered by Norwegian firms	-	95.6
Number of emission permits to be acquired by the government	=	21.4

Source: National budget 2013.⁸

The 21.4 million emission permits had to be bought in the Kyoto approved international markets, mainly as CERs and ERU (governed by the CDM and JI Kyoto mechanisms respectively). However, as the government has also sold 34.8 million EUA permits as described above, the government is still a net supplier of emission permits. Table 6A summarises the accounting of physical greenhouse emission permits. The corresponding yearly averages of the totals are shown in table 6B.

Table 6A. Physical emission permit accounting, 2008-2012. Million permits

	Norwegian emission account	Industry - the regulated sector	Norwegian government	
Emissions	266.9	95.6	266.9	tables 2 and 3
Kyoto obligation = AAUs issued	-258.0		-258.0	table 3
Requirement of additional Norwegian self-imposed policy	33.1		33.1	table 3
Free allowance (grandfathered)		-40.2	40.2	table 4
EU ETS permits sold to into the EU ETS			34.8	table 5
EUAs surrendered by the regulated sector			-95.6	table 2
Total emission permit requirement	42.0	55.4	21.3	tables 3 ,4 and 5
EU ETS permits sold into the EU ETS			-34.8	table 5
Permits bought - net total	42.0	55.4	-13.4	table 5

Table 6B. Yearly averages: Physical emission permit accounting, 2008- 2012. Million permits

	Norwegian emission account	Industry - the regulated sector	Norwegian government
Emissions	53.4	19.1	53.4
Kyoto obligation = AAUs issued	-51.6		-51.6
Requirement of additional Norwegian self imposed policy	6.6		6.6
Free allowance (grandfathered)		-8.0	8.0
EU ETS permits sold to into the EU ETS			7.0
EUAs surrendered by the regulated sector			-19.1
Total emission permit requirement	8.4	11.1	4.3
EU ETS permits sold into the EU ETS			-7.0
Permits bought - net total	8.4	11.1	-2.7

⁸ <http://www.regjeringen.no/nb/dep/fin/dok/regpubl/stmeld/2012-2013/meld-st-1-20122013/3/7.html?id=703506>

3. Estimating costs 2008 - 2012

In this chapter, we will provide numerical examples of historical permit cost estimates for the regulated sector and the government. The estimates are then used to create a measure of the cost of complying with EU ETS and the Kyoto protocol obligations respectively.

Emission permits can be traded as other securities such as bonds and shares. A conceptually simple and available measure of the immediate value is the spot market price (often also called “over the counter” price), where payment and delivery is executed immediately after the trade has taken place.

However, many entities in the regulated sector and in the government generally do not consider their portfolio of emission permits to be completely liquid assets. Nor do they actively trade permits for short term arbitrage. As emission permits must be surrendered each year, permits in stock cannot be viewed as a short term investment opportunity of a financial surplus. The cost view rather than market value is also relevant to the national accounts which in the future will have to include a measure of the cost of emissions in the regulated sector.

Some, if not most, firms in the Norwegian regulated sector do not buy their permit requirement on the spot market. They typically buy permits at regular intervals and in future contracts with delivery and payment in December of the year of emissions⁹. The spot market price can therefore not be used without reservation as a measure of the (statistical) cost.

Throughout this document we will use a VAT rate of 25 per cent, and an exchange rate of NOK 8.00 to the Euro.

3.1. Government costs

The Ministry of Finance is responsible for the legal and financial interactions with the EU Emission Trading System (EU ETS) and the Norwegian obligations towards the Kyoto agreement. The Ministry purchases mainly AAUs and CERs¹⁰, but not EUAs, in order to meet the national commitments. The permits are either obtained directly by the Ministry itself or through the World Bank and the Nordic Environment Finance Corporation fund (NEFCO). The Ministry also holds some EUAs, which is a result of being allotted 15 million EUAs per year, with an obligation to donate permits to Norwegian firms in the regulated sector and to sell through auctions.

In the state accounts, the Ministry publishes both an estimate of market value, as of the last trading date in December, and acquisition cost of its stock of emission permits. Naturally, these figures develop over time as shown in table 7. The table shows the development for the second Kyoto period. The year 2008 is omitted from the table as the markets for emissions permits were largely not established until mid 2009.

⁹ In some cases the amount of grandfathered permits exceed emissions. This implies that the firm has received an unintended net subsidy, with a distributional effect as not every emitting firm receives this transfer.

¹⁰ The Ministry is authorised to sell CERs and ERUs, but has yet to do so.

Table 7. Norwegian Government. Unit value and cost of emission permits

	2009	2010	2011	2012	Unit
Accumulated number of permits held on 31. December	750 299	1 931 740	6 071 929	9 311 000	metric tonnes
Market value incl. VAT	10 737 500	28 687 500	30 012 500	1 675 980	euro
Unit market value incl. VAT - last trading day of December	14.30	14.85	4.94	0.23	euro
Government unit cost excl. VAT	11.10	11.14	6.97	7.28	euro
Government unit cost incl. VAT	13.88	13.93	8.71	9.10	euro

Source: Ministry of Finance.

The unit cost is derived from the cost of the portfolio of emission permits obtained and held by the Ministry, i.e. excluding the permits held through the World Bank and NEFCO. The figures state the average unit cost of paid and delivered¹¹ permits, including overhead costs as well as the occasional up front payments to facilitate CDM project development. We have used the stated unit cost also as an estimate for the permits held by the World Bank and NEFCO.

The market value in 2009 through 2011 was estimated by the Ministry, using BlueNext CER spot price per 31. December and an average of prices for acquired AAUs. For 2012 no market value was published. The Ministry's suggested unit market value estimate for all types of permits at the end of 2012, is the price of ICE "CER future daily", i.e. the spot market price, at the last trading day of December 2012.

The Norwegian net requirement is 21.4 million emission permits (AAUs and CERs – see table 5), but only 9.3 million is held by the Ministry at the end of 2012. The difference amounts to "monitored volumes": Emission reductions from projects that are yet to be ratified as CDM projects by the UN. These permits will be delivered throughout 2013.

Using the unit cost from table 7, the cost to the Norwegian government of 21.4 million emission permits € 155 million VAT exclusive.

3.2. Accounting practices of firms

The International Financial Reporting Standards does not provide clear guidelines for emission permits, and accounting practices will probably vary among firms. From a few selected interviews, we find no evidence that Norwegian firms in the regulated sector actively engage in speculative trading with emission permits. At least some firms buy permits, on a monthly basis to cover last month's emissions, i.e. the number of permits that need to be surrendered next spring. The future contract for delivery and settlement in December of the current year appears to be the preferred contract¹². The firm enters the cost of the transaction as current expenses. This implies that the stock of permits (in the firm's possession or for delivery in December) is not shown as assets in the balance sheets.¹³

Alternatively, firms that are a part of a larger industrial group where trading in emission permits is centralised, a debt provision is made that covers the expected accumulated deficit of emission permits, using the December future as reference. In at least one case, the accumulated debt provision is recalculated monthly using the latest available price. Hence, no record is kept on historical costs.

¹¹ Not to be confused with "surrendered" which means that the permit is settled against emissions in a particular year.

¹² Possibly due to this, the December future seems to have become the most "liquid" contract in the market. Liquid in this context means that it has the largest volumes on offer and demand, and therefore is less prone to short term price fluctuations. There are considerable transaction costs to the average firm in trading actively on the emission permit market in relatively small volumes, even using banks or brokers. This may further explain the periodic trading pattern.

¹³ Another way to see this is that any stock of permits that matches past emissions, assuming the above trading pattern, has its counterpart in a short term liability with necessarily the same value. How a surplus of permits in stock (emission are less than the number of permits) is reflected in firm accounting has not been clarified.

We may therefore conclude that the December future contract price is more relevant for estimating costs to the business sector than the spot price on an arbitrary date. Firms trade mainly EUAs as opposed to the government that to a large extent buy CERs directly from the emission reduction projects. Therefore, the cost estimates made for the latter in table 6 cannot be applied to firms. These costs will be estimated in the next chapter. Also, that in general it is not possible to extract cost information using e.g. the structural statistics surveys.

3.3. The cost to firms

Norwegian firms in the regulated sector, including the oil and gas extraction industry which did not receive any free allowance, have surrendered emission permits equivalent to 95.6 million tonnes of CO₂ in the period 2008 through 2012, of which 40.2 million tonnes were grandfathered (see table 4).

The trading places provide statistics on a daily weighted price, as well as a “settlement price”. The latter is an average of prices during the final minutes of each trading day.¹⁴ Table 8 shows these prices of future contracts for delivery in December at the Intercontinental Exchange (ICE).

Table 8. ICE December future prices. 2008–2012. Yearly averages. Euro excl. VAT

	2008	2009	2010	2011	2012
Average of daily settlement price	22.66	13.37	14.48	13.39	7.50
Average of daily weighted price	22.69	13.40	14.47	13.38	7.48

As table 8 illustrates, these averages prices are very close.

In table 9, we combine table 4 and table 8 to show the accumulated cost to the Norwegian regulated sector using December futures at ICE, under some simplifying assumptions:

- Firms do not buy a permit in excess of their emission requirements (no speculation).
- Therefore, their trading pattern is not influenced by government auctions of emission permits or announcements of policy change.
- Only EUAs are bought, thus we ignore a possible optimisation between CERs and EUAs.
- There is no preferred trading day, and that the number of permits bought by Norwegian firms combined, are therefore assumed to be evenly distributed. The average price will then be the average of the daily prices¹⁵

Table 9. Cost of EU ETS to Norwegian firms. 2008–2012. Million Euros excl. VAT

Calculation method	2008	2009	2010	2011	2012	Total
Average settlement price	267.28	150.25	165.01	144.36	76.40	803.30
Average daily weighted price	267.59	150.65	164.93	144.27	76.19	803.64

The cost of EUAs to Norwegian firms can be calculated using either average. The volumes involved are not large enough to warrant a preference of one price estimate over the other.

¹⁴ This is to calculate each trader's balance of permits bought versus sold during the day. If the balance shows a larger value bought than sold, the trading place will generally require a financial guarantee from its client. Rather than using the price of the last transaction of the trading day, this ensures that the price is not too strongly influenced by a single deal or manipulation attempt.

¹⁵ $Cost = \sum p \frac{V}{n} = \frac{1}{n} V \sum p = V \bar{p}$

However, as not only prices fluctuate daily, so does the trading volume. We have investigated whether a simple assumption on the trading pattern will have a marked influence on the total cost estimate. We assumed that the Norwegians trade their emission permits in the same daily pattern as the rest of the market:

$$\frac{V_{Norway}^{daily}}{V_{Norway}^{total}} = \frac{V_{market}^{daily}}{V_{market}^{total}} \quad \text{This means that: } Cost = \sum \bar{p}V_{Norway}^{daily} = \frac{V_{Norway}^{total}}{V_{market}^{total}} \sum \bar{p}V_{market}^{daily}$$

The calculations show that this had a minimal influence on the above estimates (less than € 0.5 million on total costs). We can therefore conclude that a total of € 803 million is a robust cost estimate for Norwegian firms participating in the EU ETS during 2008 – 2012. The average unit cost is therefore € 14.5 (see table 6A).

3.4. The cost to Norway

Norway's participation in the EU ETS requires the government to auction EUA permits into the market. The sales revenue, € 346 million¹⁶, compensates for the expenses relative to the national policy commitments (€ 155 million). The net government cost of participating in the EU ETS and Kyoto agreement in 2008–2012 is therefore negative: A surplus of € 191 million surplus. As the cost to Norwegian firms has been estimated at € 803 million, the net cost to the Norwegian economy can therefore be estimated at € 612 million as shown in table 10.

Table 10. Norwegian national cost of compliance. 2008-2012. Million Euro excl. VAT

	Total cost
Net firm permit cost	803
Cost of permits bought by the government	155
Income from auctioned EUA permits	-346
National cost	612

In the calculations, we have also assumed that CERs and AAUs corresponding to the national emissions in 2008-2012 are surrendered simultaneously at the end of December 2012. However, the actual settlement for the Norwegian government with respect to the Kyoto agreement is in 2015.

¹⁶ Source: Meld. St. 3 (2012–2013) - Statsrekneskapen 2012 (State accounts 2012). Ministry of Finance, 2013.

4. Conclusions

There is no definite answer to the best estimation procedure for the value of a greenhouse gas emission permit. The purpose of the analysis will largely determine which valuation procedure is most relevant. One such purpose is to provide an estimate of national, governmental and private sector cost of compliance to the emission trading systems and national commitments.

This document has attempted to give some insight into how these figures may be calculated. The information will hopefully be a useful input to the ongoing work on economic instruments statistics in the environmental domain.

Firms will primarily have to surrender EUAs rather than the CERs that are available to the government. Also, firms have to surrender permits every year. Estimating firm cost using government unit cost or unit market value therefore seems inadvisable. In order to avoid a more or less arbitrary spot market quote as unit value, we have pointed at the “monthly acquisition” practice by some firms. However, other trading behaviour and accounting practices may exist as we have not performed an extensive survey of accounting practices among firms. For the second Kyoto period, i.e. 2008–2012, the estimate of cost of compliance for Norwegian firms using a uniform trading assumption and two readily available price estimates give similar results, i.e. € 803 million.

The final cost to the government is not available before the beginning of 2014, possibly later depending on the final issue of CERs. For statistical purposes and for providing more immediate figures, one can use the average unit cost of issued emission permits held by the government, which is published in early spring the year after the emissions took place. This estimates the total cost to the Norwegian government at € 155 million. However, the expenditure is offset by the income from auctioning parts of the 75 million EUAs issued by Norway as a member of the EU ETS. This income was € 346 million (€ 433 million with VAT included), meaning that the government had a net income of € 155 million in 2008–2012. The national cost of the regulated sector and government combined

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