

# **Quantity Tables for Emission Permits**

**Thomas Olsen, Statistics Denmark**

**Outcome paper**

Outcome paper based on the conclusions reached at the  
15th meeting of the London Group on Environmental Accounting,  
Wiesbaden, Germany 30 November - 4 December 2009

## **Outcome paper: Quantity Tables for Emission Permits**

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### Contact information:

Thomas Olsen

Senior Adviser  
National Accounts - Environmental Accounts  
Statistics Denmark  
Sejrogade 11  
DK-2100

Phone: +45 39 17 39 17  
Direct: +45 39 17 38 28  
E-mail: [Tol@dst.dk](mailto:Tol@dst.dk)

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## 1 Background<sup>1</sup>

At the previous London Group meetings held in Brussels in September 2008 and in Canberra in April 2009, it was agreed that quantity tables on the physical stock and flow of emission permits<sup>2</sup> should be included in the revised handbook on National Accounting on Integrated Environmental and Economic Accounting (SEEA)

At the 15th meeting of the London Group held in Wiesbaden in November December 2009 a first draft of the proposed quantity tables on emission permits was discussed. This outcome paper is based on the conclusions reached at the meeting in Wiesbaden.

At the meeting it was decided to include quantity tables made up in number of permits as well as in monetary values.

*Two main purposes* The quantity tables for the emission permits serves two main purposes.

First of all, the tables account for all flows of permits within the national economy as well as between economies. That is from the creation of the permits by Government or the use of mechanisms, e.g. joint implementation (JI) or the clean development mechanism (CDM) to the trade with the permits and ultimately the surrendering of the permits.

The tables allow users to see, which industries holds the permits and they allow users to see how industries comply with emission targets laid down in emission trading schemes. Furthermore, it allows users to see how national economies comply with emission targets laid down in for instance the Kyoto protocol.

Secondly, the quantity tables, because of the close link with energy flow accounts and air emission accounts, allow users and modellers to analyse the energy input structure in the industries and hence, the industries' demand for permits. When the quantity tables are made up in monetary values, it allows users to analyse the effect of for instance changes in the permit price on the industries' decisions on which type of fuel to use.

*Outline* Section 2 contains a brief description of the quantity tables as well as the tables themselves.

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<sup>1</sup> During the work with this paper the author received comments from Statistics Netherlands. The author would like to express his thanks for those comments; it highly facilitated the work with the paper.

<sup>2</sup> In this paper, the terms emission permit, emission right and allowance are used synonymously. The term credits is used as umbrella for types of permits like Emission Reduction Units (ERUs), Certified Emission Reductions (CERs) and Assigned Amount Units (AAUs).

## 2 Quantity tables

The tables have been developed to be in line with energy accounts as well as air emissions accounts.

*Hybrid accounts* This facilitates a series of possible hybrid accounts, e.g. number of permits compared to emissions or value of permits compared to carbon taxes or other energy taxes. Hybrid accounts are not presented in this paper, but they are part of the proposed standard tables for volume 1 of the revised SEEA.

*Quantity tables* The quantity tables on the physical emission permits comprise information on the stock of permits as well as the flows.

The suggested set of tables consist of an account for the Governments stock of permits as well as a table containing information on the stock and the flow of permits by institutional sectors. In addition to this are a supply table and a use table. The supply table shows the origin of the permits whereas the use table shows what happens with the permits within a given time period. In addition to those tables, is a table containing information on both the stock and the flow of permits by industry.

It is important to emphasize that the tables should include information on the flow of all types of permits no matter what the origin of the permits are.

*Balance sheet of General Government* The balance sheet of general Government in the first table contain information on the Government's stock of permits as well as the number of permits the Government issues, buys, sells or surrender to international agencies like for instance the UNFCCC.

*Balance sheet by institutional sectors* The second table containing the balance sheet by institutional sectors comprises information on the opening stock and the closing stock of permits as well as the flows of the different types of permits by institutional sectors.

*Supply table* The supply table shows the supply of permits broken down by industries and type of permit. That is, whether the permits have been given to the industries free of charge or the industries have bought them or finally, if the permit originates from mechanisms like the Joint Implementation (JI) or Clean Development (CDM) mechanisms. Furthermore, the supply table includes imports. See table 3.

It is important to be aware that some of the permits might be traded several times, which leads to a double counting in the supply table. Therefore, it is important to confront the supply table with the use table to make sure that the totals equals.

*Use table* The use table shows the actual uses of the permits. That is, if the industries have surrendered the permit or if it has sold the permits. Another use is if the industries or the households have decided to cancel the permits so that it is no longer available for other, who later on would want to surrender the permits in order to offset their emissions. The use table also includes information on exports of permits as well as changes in inventories. See table 4.

*Balance sheet by industries* The fifth table comprises information on the opening stock and the closing stock of permits as well as the flows of the different types of permits. The table contains the same flows as can be seen in table 3 and 4. The table however, contains valuable information on each industry's stock of permits.

It should be mentioned that the terminology used in the tables presented here, is different from the terminology, which is normally used in the national accounts. For example, to be fully consistent with the national accounts terminology, the trade with of the permits should be referred to as an acquisition less disposals.

*Who can surrender permits?* It is only industries covered by an emission trading scheme (ETS) and Governments that can surrender permits. The Government can surrender permits to international agencies like the UNFCCC on behalf of industries and the households not covered by an ETS.

Other permits no longer available for the ETS due to the fact that they have been cancelled i.e. there has not been an emission are registered as a loss.

*Monetary values* In addition to the tables on the physical flows, five similar tables, where the flows are made up in monetary values, are suggested. The only difference to the tables on the physical flows is that the balance sheets in this case also contain information on the revaluations. See the tables 6 to 10.

Several market places for emission permits already exists and it is thus possible to obtain (daily, monthly or yearly) average prices, which can be used to calculate the values. Fluctuations in the

market price can be dealt with in the same way as fluctuations in the stock market are dealt with in the financial accounts of the national accounts.

Furthermore, the monetary tables are expected to support the implementation of the flow of permits in the national accounts.

*Other dimensions not reflected in the proposed set of tables*

The tables proposed below have been developed to be as simple and as general as possible. However, there are a few dimensions not reflected in the tables, which might be useful for analytical purposes and therefore could be included in national permit accounting systems.

First of all, it is very often the case that only a part of the economy is part of an ETS. Therefore, in order to be able to identify the proportion of the emissions covered by the ETS it would be very useful if it was possible to identify the share of each industry (or institutional sector), which is part of the ETS.

Secondly, a distinction between whether the permits originate from the primary or secondary market could also be of great analytical value.

## 2.1 Quantity tables made up in number of permits

Table 1. Balance sheet of General Government (year YYYY)

		Government
	Million CO2 permits (=million tonnes of CO2)	
<b>Permits issued by Government</b>		
<b>Permits to be allocated free of charge</b>	<b>2355</b>	
<b>Permits to be allocated via sale</b>	<b>987</b>	
<b>1 Opening stock</b>		<b>225</b>
2 Permits issued by Government to be allocated free of charge		2355
3 Permits issued by Government to be allocated via sale		987
4 Permits purchased by Government from other Government / Agents		241
5 Credits purchased by Government or generated via projects e.g. ERUs, CERs or AAUs		375
6 Government supply of permits allocated free of charge		2355
7 Government supply of permits allocated via sale		1169
8 Government supply of credits e.g. ERUs, CERs or AAUs allocated via sale		0
9 Permits owned by Government which are lost (cancelled permits)		0
10 Permits which are surrendered by Government e.g. to the UNFCCC		144
<b>11 Closing stock (=1+2+3+4+5-6-7-8-9-10)</b>		<b>515</b>

Please notice that the figures in the tables are fictions and serve an illustrative purpose only.

Table 2. Balance sheet by institutional sectors (year YYYY)

	Institutional Sectors				Total
	S.11	S.12	S.13	S.14	
	Non-financial corporations	Financial corporations	General government	Household and non-profit institutions serving households	
	Million CO <sub>2</sub> permits (=million tonnes of CO <sub>2</sub> )				
<b>1 Opening stock</b>	<b>1083</b>	<b>50</b>	<b>225</b>	<b>5</b>	<b>1363</b>
<b>2 Allocated free of charge</b>	<b>2355</b>	<b>0</b>	<b>987</b>	<b>0</b>	<b>3342</b>
<b>3 Purchased</b>	<b>1165</b>	<b>0</b>	<b>241</b>	<b>0</b>	<b>1406</b>
<i>Of which free permits</i>	235	0	80	0	315
<i>Of which non-free permits</i>	930	0	161	0	1091
<i>Of which from ROW</i>	0	0	0	0	0
<b>4 Credits e.g. ERUs, CERs or AAUs</b>	<b>686</b>	<b>0</b>	<b>375</b>	<b>0</b>	<b>1061</b>
<i>Of which purchased</i>	211	0	375	0	586
<i>Of which from domestic projects</i>	375	0	0	0	375
<i>Of which from ROW</i>	100	0	0	0	100
<b>5 Sold – permits</b>	<b>304</b>	<b>35</b>	<b>1169</b>	<b>0</b>	<b>1508</b>
<i>Of which free permits</i>	200	35	0	0	235
<i>Of which non-free permits</i>	104	0	987	0	1091
<i>Of which to ROW</i>	0	0	182	0	182
<b>6 Sold - credits e.g. ERUs, CERs or AAUs</b>	<b>586</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>586</b>
<i>Of which to other residents</i>	586	0	0	0	586
<i>Of which to ROW</i>	0	0	0	0	0
<b>7 Losses (cancelled permits)</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>11</b>
<b>8 Surrendered in order to offset emissions</b>	<b>3612</b>	<b>0</b>	<b>144</b>	<b>0</b>	<b>3756</b>
<b>9 Closing stock</b>	<b>778</b>	<b>15</b>	<b>515</b>	<b>3</b>	<b>1311</b>



**Table 3. Supply of permits (year YYYY)**

	Industries by ISIC									Total output	Imports	Total supply
	A	B	C	D	E	H	K	O	(F-U)		Total	
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Water supply, sewerage, waste management and remediation activities	Transportation and storage	Financial and insurance activities	Public administration etc.	Other Industries			
<b>Emission permits</b>	Million CO <sub>2</sub> -permits (=million tonnes of CO <sub>2</sub> )											
<b>Total supply</b>	<b>375</b>	<b>79</b>	<b>0</b>	<b>211</b>	<b>0</b>	<b>0</b>	<b>25</b>	<b>3342</b>	<b>0</b>	<b>4032</b>		<b>4132</b>
Of which free permits								2355		2355		2355
Of which non-free permits		79					25	987		1091		1091
Of which credits e.g. ERUs, CERs or AAUs	375			211						586	100	686

Please notice that the figures in the tables are fictions and serve an illustrative purpose only.

Table 4. Use of permits (year YYYY)

	Use														Total use (trade, surrender and losses)	
	Intermediate Consumption, Industries by ISIC										Final consumption					
	A	B	C	D	E	H	K	O	(F-U)	Total	House- holds	Changes in inventories	Exports Total	Total final con- sump- tion		
Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Water supply; sewerage, waste management and remediation activities	Transportation and storage	Financial and insurance activities	Public administration etc.	Other Industries	Total Industries							
	Million CO <sub>2</sub> -permits (=million tonnes of CO <sub>2</sub> )															
<b>Permits</b>																
<b>Total use</b>	<b>0</b>	<b>533</b>	<b>754</b>	<b>2110</b>	<b>0</b>	<b>415</b>	<b>35</b>	<b>144</b>	<b>9</b>	<b>4000</b>	<b>2</b>	<b>-52</b>	<b>182</b>	<b>132</b>	<b>4132</b>	
Of which surrendered to offset emissions	0	481	854	1877	0	400	0	144	0	3756						
Of which sold permits	0	52	0	133	0	15	35	0	0	235						
Of which losses	0	0	0	0	0	0	0	0	9	9	2					

Please notice that the figures in the tables are fictions and serve an illustrative purpose only.

Table 5. Balance sheet by industries (year YYYY)

	Industries by ISIC									Households	Total	
	A	B	C	D	E	F	G	H	I	J	K	L
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Water supply; sewerage, waste management and remediation activities	Transportation and storage	Information and communication	Financial and insurance activities	Public administration etc.	Other Industries (F-U)	1. Total Industries A-U	2. Households
	Million CO <sub>2</sub> permits (=million tonnes of CO <sub>2</sub> )											
<b>1 Opening stock</b>	<b>15</b>	<b>135</b>	<b>278</b>	<b>411</b>	<b>0</b>	<b>244</b>	<b>50</b>	<b>225</b>	<b>0</b>	<b>1358</b>	<b>5</b>	<b>1363</b>
<b>2 Allocated free of charge</b>	<b>0</b>	<b>300</b>	<b>472</b>	<b>1183</b>	<b>0</b>	<b>400</b>	<b>0</b>	<b>987</b>	<b>0</b>	<b>3342</b>	<b>0</b>	<b>3342</b>
<b>3 Purchased</b>	<b>0</b>	<b>204</b>	<b>206</b>	<b>538</b>	<b>0</b>	<b>208</b>	<b>0</b>	<b>241</b>	<b>9</b>	<b>1406</b>	<b>0</b>	<b>1406</b>
<i>Of which free permits</i>	0	0	52	50	0	133	0	80	0	315	0	315
<i>Of which non-free permits</i>	0	204	154	488	0	75	0	161	9	1091	0	1091
<i>Of which from ROW</i>	0	0	0	0	0	0	0	0	0	0	0	0
<b>4 Credits e.g. ERUs, CERs or AAUs</b>	<b>375</b>	<b>0</b>	<b>121</b>	<b>100</b>	<b>0</b>	<b>90</b>	<b>0</b>	<b>375</b>	<b>0</b>	<b>1061</b>	<b>0</b>	<b>1061</b>
<i>Of which purchased</i>	0	0	21	100	0	90	0	375	0	586	0	586
<i>Of which from domestic projects</i>	375	0	0	0	0	0	0	0	0	375	0	375
<i>Of which from ROW</i>	0	0	100	0	0	0	0	0	0	100	0	100
<b>5 Sold – permits</b>	<b>0</b>	<b>131</b>	<b>0</b>	<b>133</b>	<b>0</b>	<b>40</b>	<b>35</b>	<b>1169</b>	<b>0</b>	<b>1508</b>	<b>0</b>	<b>1508</b>
<i>Of which free permits</i>	0	52	0	133	0	15	35	0	0	235	0	235
<i>Of which non-free permits</i>	0	79	0	0	0	25	0	987	0	1091	0	1091
<i>Of which to ROW</i>	0	0	0	0	0	0	0	182	0	182	0	182
<b>6 Sold - credits e.g. ERUs, CERs or AAUs</b>	<b>375</b>	<b>0</b>	<b>0</b>	<b>211</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>586</b>	<b>0</b>	<b>586</b>
<i>Of which to other residents</i>	375	0	0	211	0	0	0	0	0	586	0	586
<i>Of which to ROW</i>	0	0	0	0	0	0	0	0	0	0	0	0
<b>7 Losses (cancelled permits)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>9</b>	<b>2</b>	<b>11</b>
<b>8 Surrendered to offset emissions</b>	<b>0</b>	<b>481</b>	<b>854</b>	<b>1877</b>	<b>0</b>	<b>400</b>	<b>0</b>	<b>144</b>	<b>0</b>	<b>3756</b>	<b>0</b>	<b>3756</b>
<b>9 Closing stock (9=1+2+3+4-5-6-7-8)</b>	<b>15</b>	<b>27</b>	<b>223</b>	<b>11</b>	<b>0</b>	<b>502</b>	<b>15</b>	<b>515</b>	<b>0</b>	<b>1308</b>	<b>3</b>	<b>1311</b>

## 2.2 Quantity tables made up in monetary values

Table 6. Balance sheet of General Government (year YYYY)

		Government
	Billion (national currency)	
<b>Permits issued by Government</b>		
<b>Permits to be allocated free of charge</b>		
<b>Permits to be allocated via sale</b>		
<b>1 Opening stock</b>		
2 Permits issued by Government to be allocated free of charge		
3 Permits issued by Government to be allocated via sale		
4 Permits purchased by Government from other Government / Agents		
5 Credits purchased by Government or generated via projects e.g. ERUs, CERs or AAUs		
6 Government supply of permits allocated free of charge		
7 Government supply of permits allocated via sale		
8 Government supply of credits e.g. ERUs and CERs allocated via sale		
9 Permits owned by Government which are lost (cancelled permits)		
10 Permits which are surrendered by Government e.g. to the UNFCCC		
11 Revaluations		
<b>12 Closing stock (=1+2+3+4+5-6-7-8-9-10-11)</b>		

Please notice that the figures in the tables are fictions and serve an illustrative purpose only.

Table 7. Balance sheet by institutional sectors (year YYYY)

	Institutional Sectors				Total
	S.11	S.12	S.13	S.14	
	Non-financial corporations	Financial corporations	General government	Household and non-profit institutions serving households	
	Billion (national currency)				
<b>1 Opening stock</b>					
<b>2 Allocated free of charge</b>					
<b>3 Purchased</b>					
<i>Of which free permits</i>					
<i>Of which non-free permits</i>					
<i>Of which from ROW</i>					
<b>4 Credits e.g. ERUs, CERs or AAUs</b>					
<i>Of which purchased</i>					
<i>Of which from domestic projects</i>					
<i>Of which from ROW</i>					
<b>5 Sold - permits</b>					
<i>Of which free permits</i>					
<i>Of which non-free permits</i>					
<i>Of which to ROW</i>					
<b>6 Sold - credits e.g. ERUs, CERs or AAUs</b>					
<i>Of which to other residents</i>					
<i>Of which to ROW</i>					
<b>7 Losses (cancelled permits)</b>					
<b>8 Surrendered to offset emissions</b>					
<b>9 Revaluations</b>					
<b>10 Closing stock</b>					

**Table 8. Supply of permits (year YYYY)**

	Industries by ISIC										Total output	Imports	Total supply
	A	B	C	D	E	H	K	O	(F-U)	Total			
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Water supply; sewerage, waste management and remediation activities	Transportation and storage	Financial and insurance activities	Public administration etc.	Other Industries				
<b>Emission permits</b>	Billion (national currency)												
<b>Total supply</b>													
Of which free permits													
Of which non-free permits													
Of which credits e.g. ERUs, CERs or AAUs													

Please notice that the figures in the tables are fictions and serve an illustrative purpose only.

**Table 9. Use of permits (year YYYY)**

Use															
	Intermediate Consumption, Industries by ISIC										Final consumption			Total use (trade, surrender and losses)	
	A	B	C	D	E	H	K	O	(F-U)	Total	Households	Changes in inventories	Exports		Total final consumption
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Water supply; sewerage, waste management and remediation activities	Transportation and storage	Financial and insurance activities	Public administration etc.	Other Industries	Total Industries			Total		
Billion (national currency)															
<b>Permits</b>															
<b>Total use</b>															
Of which surrendered to offset emissions															
Of which sold permits															
Of which losses															

Please notice that the figures in the tables are fictions and serve an illustrative purpose only.

**Table 10. Balance sheet by industries (year YYYY)**

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	Industries by ISIC										Households	Total
	A	B	C	D	E	H	K	O	(F-U)	A-U		
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Water supply; sewerage, waste management and remediation activities	Transportation and storage	Financial and insurance activities	Public administration etc.	Other Industries	1. Total Industries		
	Billion (national currency)											
<b>1 Opening stock</b>												
<b>2 Allocated free of charge</b>												
<b>3 Purchased</b>												
<i>Of which free permits</i>												
<i>Of which non-free permits</i>												
<i>Of which from ROW</i>												
<b>4 Credits e.g. ERUs, CERs or AAUs</b>												
<i>Of which purchased</i>												
<i>Of which from domestic projects</i>												
<i>Of which from ROW</i>												
<b>5 Sold – permits</b>												
<i>Of which free permits</i>												
<i>Of which non-free permits</i>												
<i>Of which to ROW</i>												
<b>6 Sold - credits e.g. ERUs, CERs or AAUs</b>												
<i>Of which to other residents</i>												
<i>Of which to ROW</i>												
<b>7 Losses (cancelled permits)</b>												
<b>8 Surrendered to offset emissions</b>												
<b>9 Revaluations</b>												
<b>10 Closing stock (9=1+2+3+4-5-6-7-8-9)</b>												



## Relevant documents

Le Laidier, Sylvie. Olsen, Thomas: Treatment of Emission Permits – Implications for the SEEA. Discussion paper prepared for the 14th meeting in the London Group on Environmental Accounting. Canberra, 27 – 20 April 2009.

Olsen, Thomas: Emission Permits. Issue paper prepared for the 13th meeting in the London Group on Environmental Accounting. Brussels, 30 September-3 October 2008.

Olsen, Thomas: Integrated Environmental and Economic Accounts for Tradeable Carbon Dioxide Emission Permits. Paper prepared for the Conference on Climate Change and Official Statistics, Oslo, 14-16 April 2008.

Statistics Denmark: Integrated Environmental and Economic Accounts for Tradeable Carbon Dioxide Emission Permits – Denmark 2005 (2006).

Olsen, Thomas: Quantity tables for Emission Permits. Issue paper prepared for the 15th meeting in the London Group on Environmental Accounting. Wiesbaden, 30 November-4 December 2009.