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**Treatment of Emission Permits
- Implications for the SEEA**

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Discussion paper: Treatment of Emission Permits – Implications for the SEEA

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1 Background

At the previous London Group meetings held in Rome in December 2007 and in Brussels in September 2008, it was decided that the London group should await the outcome of the discussion within the System of National Accounts (SNA) Advisory Expert Group (AEG) in relation to emission rights¹ and with the final decision of the AEG evaluate the impact on the current text in the SEEA.

It was also agreed that the way in which the London Group suggests describing the flow of permits, in terms of numbers of permits or in monetary values in the revised handbook on National Accounting on Integrated Environmental and Economic Accounting (SEEA) should not be too restricted by the final outcome of the update of the 1993 SNA.

At the meeting held in November 2008, the AEG discussed the treatment of emission permits once again. In brief, the outcome of the discussions was that emission permits should be recorded as taxes (see issue paper by Olsen, 2008). In the light of this the AEG confirmed that the atmosphere is not considered an asset in the SNA 2008.

In brief, the payment for the permits should be treated as pre-paid taxes with the taxes paid as the emissions take place and the permits are surrendered.

At the London Group meeting held in Brussels, it was recommended to also look at the recording of emission permits in the case in which the atmosphere is considered an asset, as it is the case in SEEA in order to identify the main difference between the treatments as assets compared to the treatment as taxes. This provides the background for this discussion paper.

However, several questions still remain about implications for measurement of government debt, whether taxes and subsidies should be imputed and how to record changes in the value of payments during the lives of the permits.

Therefore, it is important to be aware that OECD and Eurostat, in order to resolve those issues, have established a joint task force on emission permits in the national accounts. The work will take place during the second half of 2009.²

Outline Section 2 describes the treatment of emission rights in the SEEA 2003. Section 3 describes the treatment of emission permits following the recommendations of the AEG. Numerical examples are given in the annexes. Section 4 summarises the main points.

The London group is invited to give its view on;

- How to proceed?
- Does the London Group agree that the description of the monetary flows of the emission permits in the revised version of SEEA should follow the SNA 2008 and that the SEEA should be complemented with additional tables describing the physical flows?

¹ In this paper, the terms emission right, permit and allowance are used synonymously.

² The first meeting in the task force is scheduled to take place 2 – 3 July 2009.

2 Emission permits in SEEA 2003

2.1 Current text in the SEEA 2003

Assets The SNA 1993 does not deal with emission permits explicitly. However, emission permits could be seen as non-financial intangible non-produced assets, as part of the leases and other transferable contracts.

The description of emission permits in the SEEA 2003 is based on the SNA 1993. Cf. the text below.

From SEEA 2003

Property rights

§ 6.39. The 1993 SNA introduced a new category of assets called non-financial intangible non-produced assets among which is an item called leases and other transferable contracts. The characteristic of intangible non-produced assets is that they entitle their owners to engage in specific activities or to produce certain specific goods and services and to exclude other institutional units from doing so except with the permission of the owner. These attributes are what economists refer to as property rights.

§ 6.40. The leases themselves are not produced but are legal constructs designed to permit or inhibit certain actions. They may control, for example, who may use a piece of software, who may extract a natural resource and under what conditions, or which sports club has the services of a particular player.

§ 6.41. Not all leases represent assets. For example, the tenant of a house or apartment often is party to a lease which is a document spelling out the responsibilities of the landlord and the tenant and may be used as the basis for settling any disputes between them. Usually the lease itself will not have an economic value. However, if the rental payable on the house were fixed and the lease entitled the tenant to sub-contract his tenancy, the lease would acquire a value if the rental the tenant could charge exceeded the rental he had to pay the landlord.

Emissions permits

§ 6.53. Emissions permits designate the amount of specific emissions, for example greenhouse gases, that may be generated before triggering a penalty payment. As with fishing rights, the quantity of emission permitted is often based on historical patterns. Such permits may be used simply as regulatory mechanisms but more realistically by allowing the permits to be traded, and in particular to be traded internationally, they provide an incentive for a producer to reduce his emissions so that he may realise the value of the emissions permit by selling or leasing it.

Accounting entries for tradeable permits

§ 6.54. When a tradeable permit is issued, the unit issuing the permits (almost always Government) creates the asset and records this creation in its other changes in assets account. If the permit is sold (maybe by auction or maybe at a predetermined price), then the sale and purchase are recorded in the capital accounts of the two units involved. If it is issued free, but has a positive value, determined e.g. on markets or through net present value calculations, it is still recorded in the same way as sale and purchase in the capital account, but in addition a capital transfer of the same size is made from the issuer to the new owner of the permit. This transfer exactly cancels the acquisition of the permit so the lending or borrowing position of each of the two units is unaffected.

§ 6.55. Tradeable permits may be of infinite duration or for a fixed period. The value of a tradeable permit is determined in the market but it is assumed that the value is consistent with a net present value representing the value of the permit for

each of the years for which it is valid, suitably discounted. If the life length of the permits is fixed, as each year passes, the market value will decrease, reflecting the approach of the expiry date. This decrease in the value of the tradeable permit is recorded as disappearance of an intangible non-produced asset in the other changes in assets account.

§ 6.56. For as long as they are valid, permits may be traded and any actual trading is recorded as before in the capital account. The market value of permits may rise and fall in response to changing supply and demand patterns, giving rise to holding gains and losses on the permits. These holding gains and losses are recorded in the revaluation part of the other changes in assets account.

§ 6.57. The introduction of tradeable permits aims to limit the production giving rise to environmental damage by legislative means, implemented *via* a capital market mechanism. While the existence of tradeable permits is expected to influence production behaviour, it does not show up in the production account but in other SNA accounts dealing with the acquisition of assets. Even when an annual licence is issued for the use of environmental assets, this would only feature in the production account if it were classified as a tax on production which, as indicated above, is unlikely to be the case. Instead it would be recorded as a payment of rent in the distribution of primary income account.

2.2 Recording as assets based on SEEA 2003

<i>Ecosystem assets</i>	The SEEA recognises three types of ecosystem assets; terrestrial ecosystems, aquatic ecosystems and atmospheric systems, c.f. § 7.75.
<i>Treatment as assets</i>	Since the atmosphere here is considered an asset, the permits should be recorded as assets. Based on the SEEA 2003, this section provides an example on how to do that.
<i>Permits are non-financial assets</i>	Trade with the allowances or grandfathering (sold at a price of zero) of allowances should be registered as trade with or a volume change in any other non-financial assets. The CO ₂ allowances should be treated as non-financial assets (AN.229). The texts in brackets refer to the relevant 1993 SNA / ESA code.
<i>Creation and issuance</i>	Initially, the permit is issued and thus created by the Government. This creation should be recorded in the Government's other changes in assets account (K.3).
<i>Grandfathering</i>	Even though the permit is grandfathered it still has a positive value because it could be sold on the market. Therefore, it should be recorded in the same way as acquisitions less disposals (sale and purchases) in the capital account (K.2). However, in addition a capital transfer (D.99) of the same size should be made from the Government (the issuer) to the new owner of the permit. This transfer exactly cancels the acquisition of the permit so the economic situation for the two units is unaffected, i.e. the net lending/net borrowing (B.9) is unaffected.
<i>Sold by the Government</i>	If the Government decides to sell the permits, maybe by auction, then the sale and purchase should be recorded in the capital accounts of the two units involved (K.2).
<i>Trade</i>	When the permits are traded this should be recorded as acquisitions less disposals in the capital account of the companies involved (K.2). The values of the permits may rise and fall in response to the supply and demand of the permits. These holding gains and losses on the permits should be recorded in the revaluation part of the other changes in assets account.
<i>Duration and losses</i>	Emission permits might have an infinite duration. However, if for instance, the allowances issued for a period are only valid for that period then, because the value of the allowances is determined on the market, the value of the allowances will decrease as the expiry date comes closer. This decrease in the value of the allowances should be recorded as disappearance of a non-financial asset in the other changes in assets account.

<i>Surrendering</i>	In order for the companies to meet the emissions of CO ₂ caused by the company within a given year an equal amount of allowances should be surrendered. Thus, the surrendered amount of allowances will then no longer exist. This surrendering of the allowances should be recorded in the industries' other changes in assets account (K.6).
<i>Government budget</i>	The Government budget is only affected by the extent to which the Government decides to buy and sell permits. This includes the funds the Government may decide to use in order to buy allowances abroad or in order to finance JI-projects (joint implementation) or CDM-projects (clean development mechanism).
<i>Balance of payments</i>	The balance of payments is also affected, since the allowances can be traded across country borders.
<i>Other effects on the national accounts</i>	Even though the tradeable CO ₂ emission allowances are expected to influence production behaviour, this, when the allowances are treated as assets, do not show up directly in the current accounts but only in the accounts dealing with the acquisition of assets.

However, the production account could be affected indirectly if the level of production changes or if the production method changes. The structure in the intermediate consumption (use of energy) could also change as a consequence of the introduction of tradeable emission allowances.

Annex 1 provides a numerical example showing the recording in the situation where all permits are auctioned.

3 Emission permits in SNA 2008³

Permits issued under an emission trading scheme (ETS) (or cap and trade scheme) are intended to limit emissions and be tradeable either domestically or both domestically and internationally. Their treatment is addressed in § 17.354 of the SNA 2008, which recommends that payments for emission permits should be recorded as taxes, and once acquired, as assets of the permit holder, valued at their market price.

From SNA 2008

§17.354 Governments are increasingly turning to the issuing of emission permits as a means of controlling total emissions. These permits do not involve the use of a natural asset (there is no value placed on the atmosphere so it cannot be considered to be an economic asset) and are therefore classified as taxes even though the permitted "activity" is one of creating an externality. It is inherent in the concept that the permits will be tradable and that there will be an active market in them. The permits therefore constitute assets and should be valued at the market price for which they can be sold.

If for instance, an economic policy concerning the emissions of greenhouse gases is raised because of the environment being a public good, the social optimum does not coincide with the market equilibrium. A market of emission permits is only feasible when taxation exists previously: Taxation is the generating fact; the market of permits is a mode of implementation.

More specifically, the recording time of the tax payment should be determined when greenhouse gases are emitted. The tax is levied every year on the basis of an ex-post assessment by the Government of emissions generated by the firms' activities. Thus, all enterprises are subjected to this tax in proportion to their polluting activities.

In Europe, permits are issued by the government and primarily owned by firms (highly polluting industries), which are expected to pay to the Government, the amount of emission rights corresponding to emissions effectively generated by their activities. Therefore, the ex

³ It is important to emphasise that the description below is the authors' interpretation and that the outcome of the OECD-Eurostat task force might change it.

ante issuance of permits, if sold by government to firms, should be treated as the issuance of a financial asset, corresponding to the securitisation of future tax receipts. According to the SNA 2008, securitisation of future tax receipts is assimilated to the issuance of a financial asset.

In practice, the price of permits should be economically determined only under specific conditions. They must be thought of as real option values of costly changes of techniques, because of irreversibility, and as an alternative to the penalty paid when firms overstep the quotas fixed by the government.

3.1 Emission permits are taxes / assets

The emission permits are financial assets (F.3) which will be recognised by the Government as payment of the tax obligation incurred through emissions (D.29 - other taxes on production as the tax is linked with the firm activity): the financial asset is the counterpart of a pre-paid tax.

The recording time of the tax payment should be determined when greenhouse gases are emitted. At the end of the year, emissions are assessed and firms are expected to pay to the Governments the amount of allowances corresponding to emissions effectively generated by their activity. Diverse ways can be used by enterprises to obtain the necessary amount of permits: they may have been given freely or the result of auctioning by the Government; they could also have been bought on the market from other firms domestically or internationally. However, if at the end of the period, a firm cannot meet its payment obligations for emission allowances, it should be fined with a surcharge.

For example, in Europe the penalty was 40 Euros a ton of CO₂ from 2005 to 2007 and is 100 Euros from 2008 to 2012.

At auctions, a financial asset (F.3) is created in the books of the receiving firm and a liability created in the books of the Government. At the tax event, the firm use the permit to acquit its tax liability. It is only because the corresponding tax is due for payment in the future that the financial asset acquires a value on the market and can be bought by a firm, whether it is emitting greenhouse gases or not.

3.2 Suggestions for SNA 2008 on unresolved issues

As already mentioned, several unresolved issues related to the treatment of emission permits still exist. A few suggestions on these are given below.

Market price changes It is assumed here that all permits will be subject to payment. Then, the financial asset (F.3) has a face value at issuing (e.g. equal to the payment received for a security whose interests would be scheduled; analogy with the sale of a zero-coupon bond). Then, on the secondary market, the price of this title may vary between zero and the price of the penalty and this is recorded in the revaluation account. At permit surrender, the tax is recorded at an amount equal to the face value. The potential difference between the face value and the market value is recorded in the other changes in assets account, specifically in the revaluation account (example in annex 2.2).

Free permits The free allocation of permits (or at a price below market price) must be assimilated to a grant. The recording as a grant can be explained by the fact that the Government gives up its right to perceive part of taxes related to the greenhouse gases emissions. For this reason the recording time of the grant coincides with the one when the tax is due.

The abandonment by the Government of part of the tax collection is granted specifically to the firm that received the permit. Thus, it can be assimilated either to a tax credit, if the firm is actually liable for the ex-post tax (i.e. depending on the effectiveness of its greenhouse gases emissions), or to a subsidy if the enterprise is not.

In the final stage, a free (or below the market price) allocation of emission permits, i.e. an allocation without cash payment from the beneficiary firm, results from two simultaneous financial transactions. On one hand, the enterprise buys a security from the Government (F.3). On the other hand, it receives a loan (F.4) from the Government for the same amount since the security is given without a cash payment. When redemption time comes, i.e. when the tax is due, a tax credit (D.2) or a subsidy (D.3) granted to the firm that received a free (or below market price) allowance are simultaneously recorded. This transfer from the Government to the firm takes the form of debt forgiveness, by giving up its right for reimbursement of the loan (F.4), which it has been granted.

Initially, the United Nations (UN) or European Union (EU) is granting free quotas of emission rights to countries.

Implications for the measurement of government debt

Once again, this free allocation of emission permits can be interpreted as a double financial transaction. On one hand, the UN securitizes future fiscal debts (“rights to future tax”) vis-à-vis the States. On the other hand, as the securitization is done “freely”, the UN grants in parallel a loan to the States, with the same amount as the allocated quotas. At the end of this period of free allocation of quotas, the States are thus recording in their assets the securities (“emission rights”), which they can claim on the UN and in their liabilities a loan, which has been granted to them by the UN. See annex 2.

The States can allocate securities to their own enterprises (freely or not) only within the limits of these rights that can be claimed on the UN.

Finally, if on a planetary level greenhouse gases emissions were ex-post consistent with the total amounts of allowances issued ex-ante by the UN, then the proposed recording system would lead to the following situation:

- Taxes paid by firms would correspond to their real levels of greenhouse gas emissions;
- Reductions in public deficits of States would correspond to amounts collected when auctioning emission trading rights;
- “Virtuous” countries (i.e. the ones that emit less greenhouse gases than was allowed by the UN) display Net lending equal to lower quantities of greenhouse gas emissions.

Conversely, “non-virtuous” countries exhibit Net borrowing equal to surpluses of emissions. In other terms, “virtuous” countries are financing transfers to “non-virtuous” ones.

3.3 Advantages and disadvantages related to types of assets

The annexes 2.1, 2.2, and 2.3 provide examples on how the national accounts aggregates are affected by the different ways of accounting for the permits. In those examples, four events are considered and examined for each way.

1. Allocation of emission permits by auction ;
2. Change in market price ;
3. Sale of permits by a firm ;
4. Surrender of permits.

In those events, different cases are examined depending on the type of asset which represents the prepaid tax / permit. All cases are not relevant for all types of assets.

Based on the discussion in the AEG (Harper, 2008), the table below summarises the main advantages and disadvantages related to three types of assets representing the permits.

	Non-financial asset	Financial asset	Mixed asset
Recorded as	Tax payment Non-financial asset created via Other Volume Changes (OVC)	Asset/liability pair created	Asset/liability pair created; Non-financial asset created via OVC when market price change
Advantages	Accrued treatment aligns with cash treatment in timing and value ; Only one double-entry event record in the books of Government ; Easy to implement	Tax receivable accrues more realistically with economic activity; The covered firm is seen as paying the tax; Follows SNA 17.342 Market prices are used for all stocks and flows.	Tax receivable accrues with economic activity; Tax receivable and cash receipts will match ; For allocation price >0, the covered firm is seen as paying the tax.
Disadvantages	Tax received is not related to the underlying activity ; The payer of the tax could not be the emitter.	Market price changes imply that the cash flows and accrue flows do not match nor tax receivable with cash receipts; No non-produced non-financial asset as discussed in the SNA	A decrease in market price may give rise to a non-financial asset with a negative value; As free permits will be non-financial asset ; its secondary trade would give the buyer a non-financial asset with liability to the Government; The allocation price of each individual permit would need to be recorded as secondary trades occur.

Source: Harper, 2008.

4 Main points and conclusion

Related to SEEA 2003 The current description of the emission permits in the SEEA 2003 entails that tradeable emission permits are treated as non-financial assets. Hence, it is only the asset account, which is affected by the recording of the emission permits. The current accounts and the gross operating surplus are not.

For analytical purposes, it is debatable how the asset accounts can be used to analyse the economic effect of the emission permits on the economy.

Related to SNA 2008 The recording based on the SNA 2008 entails that both the current accounts and the asset accounts are affected. How, and the extent to which the current accounts are affected depends on the type of assets which represents the permits.

Thus, it is recommended that the description of the monetary flows of the emission permits follow the SNA 2008.

Only monetary flows The main points outlined above only refer to the description of the monetary flows related to the emission permits. The link to the physical aspects, the use of energy and the associated air emissions are not mentioned. Therefore, another point is if and how the revised SEEA should link to the physical aspects of the emission permits. See issue paper by Olsen, 2008

Conclusion It is recommended that the description of the monetary flows of the emission permits in the revised version of SEEA follows the SNA 2008 and that SEEA is complemented with additional tables describing the physical flows.

5 Relevant documents

Eurostat: Carbon Trading Rights. Part C, Item 3.c – Other methodological issues. Financial Accounts Working Group. Luxembourg, 19-21 January 2009.

Harper, Peter: The Treatment of Emissions Trading Scheme (ETS) Permits in the Australian System of National Accounts, Background document to AEG paper SNA/M1.08/06 : Emission permits, November 2008

Heady, Chris: The Treatment of Tradable Emission Permits in the SNA, Background document to AEG paper SNA/M1.08/06: Emission permits, November 2008

Lenglart, Fabrice: Considerations on national accounts recording methods for Government management of Carbon trading rights, Background document to AEG paper SNA/M1.08/06: Emission permits, November 2008

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).

Tietenberg, T. H.: Transferable Discharge Permits and Global Warming from the Handbook of Environmental Economics edited by Daniel W. Bromley. PP. 317 – 352. Blackwell Publishers (1995).

United Nations et al.: Handbook of National Accounting – Integrated Environmental and Economic Accounting. ST/ESA/STAT/SER.F/Rev.1 (final draft). (2003).

United Nations et al.: System of National Accounts (1993).

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6 Annexes

Annex 1: Emission permits are treated as assets as in SEEA 2003

Annexe 1.

Events

- 1 permits are intangible non produced asset ; Quantity=10 ; Price=10
- 1.1 Appearance of AN22
- 1.2 general government sells permits to firm 1
- 2 Market price changes +20%
- 3 Firm 2 buys 48 to Firm 1 Quantity=4 ; Price=12
- 3.1 sale of the intangible non produced asset
- 4 Surrender
- 4.1 extinction of the intangible non produced asset

- F2 : currency and deposits
 AN22 : intangible non produced assets
 K3 : economic appearance of non produced assets
 K6 : economic disappearance of non produced assets
 K11 : nominal holding gains/losses
 K22 : acquisitions less disposals of intangible non produced assets
 B2 : operating surplus / mixed income
 B6 : disposable income
 B8 : saving
 B9 : net lending (+), net borrowing (-)
 Changes in net worth due to :
 B10.1 : saving and capital transfers
 B10.2 : other changes in volume assets
 B10.3 : nominal holding gains / losses
 Total B10 : changes in net worth

NON FINANCIAL ASSET											
Events	Firm 1			Firm 2			General Government				
	U	Current Accounts	R	U	Current Accounts	R	U	Current Accounts	R		
	B2	0		B2	0						
	B6	0		B6	0		B6	0			
	B8	0		B8	0		B8	0			
	ΔA	Capital Account	$\Delta L \& NW$	ΔA	Capital Account	$\Delta L \& NW$	ΔA	Capital Account	$\Delta L \& NW$		
1.2	K22/AN22	100	0 B8			0 B8	K22/AN22	-100	0 B8		
3.1	K22/AN22	-48		K22/AN22	48						
	B9	-52	0 B10.1	B9	-48	0 B10.1	B9	100	100 B10.1		
	ΔA	Financial Account	$\Delta L \& NW$	ΔA	Financial Account	$\Delta L \& NW$	ΔA	Financial Account	$\Delta L \& NW$		
1.1	F2	-100					F2	100			
3.2	F2	48		F2	-48						
			-52 B9			-48 B9			100 B9		
	ΔA	Other changes in volume of assets Account	$\Delta L \& NW$	ΔA	Other changes in volume of assets Account	$\Delta L \& NW$	ΔA	Other changes in volume of assets Account	$\Delta L \& NW$		
1.1							K3/AN22	100			
4.1	K6/AN22	-72	-72 B10.2	K6/AN22	-48	-48 B10.2			100 B10.2		
	ΔA	Revaluation account	$\Delta L \& NW$	ΔA	Revaluation account	$\Delta L \& NW$	ΔA	Revaluation account	$\Delta L \& NW$		
2	K11/AN22	20	20 B10.3			0 B10.3			0 B10.3		
	A	Changes in Balance Sheet	L & NW	A	Changes in Balance Sheet	L & NW	A	Changes in Balance Sheet	L & NW		
	AN22	0		AN22	0						
	AF2	-52		AF2	-48		AF2	100			
		Changes in net worth			Changes in net worth			Changes in net worth			
		0	B10.1		0	B10.1			B10.1		
		-72	B10.2		-48	B10.2		100	B10.2		
		20	B10.3			B10.3			B10.3		
		-52	B10		-48	B10		100	B10		

Annex 2: Recording in two countries

We assume that polluting rights have a constant market price: 1 trading right = 1 €

Period t=0

UN grant (freely) 200 paying rights to country C.
UN grant (freely) 100 paying rights to country C*.

U/ΔA		UN		R/ΔL		U/ΔA		GG		R/ΔL		U/ΔA		GG*		R/ΔL	
		F.3 ^{UN}	+ 300	F.3 ^{UN}	+ 200			F.3 ^{UN}	+ 100			F.4 ^{UN}	+ 200			F.4 ^{UN}	+ 100
F.4 ^{UN}	+ 300																

States GG and GG* sell to their respective enterprises E and E* polluting rights for 100 and 75 (the 125 other additional rights are supposed to be kept so as to deal with Households emissions).

U/ΔA		GG		R/ΔL		U/ΔA		E		R/ΔL	
F.2	+ 100					F.2	- 100				
F.3 ^{UN}	+ 200	F.3 ^C	+ 100	F.3 ^C	+ 100	F.3 ^C	+ 100				
		F.4 ^{UN}	+ 200								

U/ΔA		GG*		R/ΔL		U/ΔA		E*		R/ΔL	
F.2	+ 75					F.2	- 75				
F.3 ^{UN}	+ 100	F.3 ^{C*}	+ 75	F.3 ^{C*}	+ 75	F.3 ^{C*}	+ 75				
		F.4 ^{UN}	+ 100								

In fact, enterprise E emits only 50 of greenhouse gases, whereas enterprise E* emits 125. Under those conditions, E sells to E* 50 of polluting rights.

U/ΔA		E		R/ΔL		U/ΔA		E*		R/ΔL	
F.2	- 50					F.2	- 125				
F.3 ^C	+ 50					F.3 ^{C*}	+ 75				
						F.3 ^C	+ 50				

Period t=1

Enterprises E and E* pay their taxes to their respective Governments. They don't pay cash, but transfer securities representing polluting rights.

E transfers to GG: 50 securities representing polluting rights issued by GG.

E* transfers to GG*: securities representing polluting rights issued by GG * and 50 securities representing polluting rights issued by GG (which it had previously bought on the market from enterprise E).

U/ΔA		GG	R/ΔL	U/ΔA		E	R/ΔL
		D2	+ 50	D2	+ 50		
F.2	+ 100			F.2	- 50		
F.3 ^{UN}	+ 200	F.3 ^C	+ 50	F.3 ^C	0		
		F.4 ^{UN}	+ 200				

U/ΔA		GG*	R/ΔL	U/ΔA		E*	R/ΔL
		D2	+ 125	D2	+ 125		
F.2	+ 75			F.2	- 125		
F.3 ^{UN}	+ 100	F.3 ^{C*}	0	F.3 ^{C*}	0		
F.3 ^C	+ 50	F.4 ^{UN}	+ 200	F.3 ^C	0		

The States are now paying their taxes to the UN.

The State GG pays 150 in taxes (100 for Households emissions, 50 for enterprise E emissions); by transferring 150 out of the 200 emission rights it claims on the UN. At the same time, the UN gives up the claim of 200 they hold on it (a grant commitment had been made to its benefit in $t=0$, since polluting rights had been allocated freely). The tax paid by GG being inferior to the amount of debt forgiveness from UN, this abandonment is recorded as tax credit for 150 and as subsidy for 50.

The State GG* pays 150 (25 for Households emissions, 125 for enterprise E* emissions), by transferring 100 emission rights it claims on the UN as well as 50 rights issued by the State GG, which State GG* has got back when enterprise E* has paid its tax. At the same time, the UN gives up the claim of 100 they hold on it (a grant commitment had been made to its benefit in $t=0$, since polluting rights had been allocated freely). The tax paid by GG* being superior to the amount of debt forgiveness from UN, this abandonment is entirely recorded as tax credit.

U/ΔA	UN	R/ΔL	U/ΔA	GG	R/ΔL	U/ΔA	GG*	R/ΔL	
	D2	+ 50		D2	+ 50	D2	+ 50	D2	+ 125
	D3	- 50	D3	-50					
			F.2	+ 100		F.2	+ 75		
	F3 ^{UN}	+50	F3 ^{UN}	+ 50		F3 ^{UN}	0		
F.3 ^C	+ 50			F.3 ^C	+ 50	F.3 ^C	0	F.3 ^{C*}	0
F.4 ^{UN}	0		F.4 ^{UN}	0	F.4 ^{UN}	0		F.4 ^{UN}	0

Ex post, it appears that the UN and State GG have reciprocal claims for the same amount, which thus cancel each other.

U/ ΔA	UN	R/ ΔL	U/ ΔA	GG	R/ ΔL	U/ ΔA	GG*	R/ ΔL		
	D2	+ 50			D2	+ 50	D2	+ 50	D2	+ 125
	D3	- 50	D3	-50						
			F.2	+ 100			F.2	+ 75		

Result:

Enterprise E has paid 50 in taxes. $B9 = -50$

Enterprise E* has paid 125 in taxes. $B9 = -125$

Taxes paid by enterprises correspond to their greenhouse gas emissions.

The State GG has received 50 in taxes from E and 50 in subsidies from the UN. $B9 = +100$

The State GG* has received 125 in taxes from E* and paid 50 in taxes to the UN. $B9 = +75$

The reductions in Government public deficits correspond to the amounts that the States have collected in $t=0$ when auctioning.

The country C displays net lending. $B9 = -50 + 100 = +50$

The country C* displays Net borrowing. $B9 = -125 + 75 = -50$

The country C is displaying a Net lending balancing item for, ex post, it has emitted less greenhouse gases than was allowed by the UN. Conversely, the country C displays a Net borrowing balancing item for, ex post, it has emitted more greenhouse gases than was allowed by the UN.*

The UN perceived 50 in taxes and paid 50 in subsidies. $B9 = 0$.

Everything happens as if the country C, which is polluting more than expected, had financed a transfer to country C, which is less polluting than expected.*

Annex 2.1: Emission permits are treated as taxes with a non-financial asset representing the tax / permit

Annexe 2.1

Events

1 Allocation of emission permits by auction ; Quantity=10 ; Price=10

1.1 Payment of the tax

~~1.2 prepayment of the tax~~

1.3 Appearance of AN22

2 Market price changes +20%

3 Firm 2 buys 48 to Firm 1 Quantity=4 ; Price=12

~~3.1 sale of the financial asset~~

3.2 sale of the intangible non produced asset

4 Surrender

~~4.1 surrender of the permit for the tax payment~~

~~4.2 holding loss : securities value = emission value~~

4.3 extinction of the intangible non produced asset

D29 : other taxes on production

F2 : currency and deposits

F3 : securities other than shares

AN22 : intangible non produced assets

K3 : economic appearance of non produced assets

K6 : economic disappearance of non produced assets

K11 : nominal holding gains/losses

K22 : acquisitions less disposals of intangible non produced assets

B2 : operating surplus / mixed income

B6 : disposable income

B8 : saving

B9 : net lending (+), net borrowing (-)

Changes in B10.1 : saving and capital transfers

net worth due B10.2 : other changes in volume assets

to : B10.3 : nominal holding gains / losses

Total B10 : changes in net worth

~~X-X~~ non relevant for this case

NON FINANCIAL ASSET												
Events	Firm 1			Firm 2			General Government					
	U	Current Accounts	R	U	Current Accounts	R	U	Current Accounts	R	U	Current Accounts	R
1.1	D29	100									100	D29
	B2	-100						B6	100			
	B6	-100						B8	100			
	B8	-100										
	ΔA	Capital Account	$\Delta L \& NW$	ΔA	Capital Account	$\Delta L \& NW$	ΔA	Capital Account	$\Delta L \& NW$	ΔA	Capital Account	$\Delta L \& NW$
3.2	K22/AN22	-48	-100 B8	K22/AN22	48	0 B8					100	B8
	B9	-52	-100 B10.1	B9	-48	0 B10.1		B9	100		100	B10.1
	ΔA	Financial Account	$\Delta L \& NW$	ΔA	Financial Account	$\Delta L \& NW$	ΔA	Financial Account	$\Delta L \& NW$	ΔA	Financial Account	$\Delta L \& NW$
1.1	F2	-100						F2	100			
3.2	F2	48	-52 B9	F2	-48	-48 B9					100	B9
	ΔA	Other changes in volume of assets Account	$\Delta L \& NW$	ΔA	Other changes in volume of assets Account	$\Delta L \& NW$	ΔA	Other changes in volume of assets Account	$\Delta L \& NW$	ΔA	Other changes in volume of assets Account	$\Delta L \& NW$
1.3	K3/AN22	100										
4.3	K6/AN22	-72	28 B10.2	K6/AN22	-48	-48 B10.2					0	B10.2
	ΔA	Revaluation account	$\Delta L \& NW$	ΔA	Revaluation account	$\Delta L \& NW$	ΔA	Revaluation account	$\Delta L \& NW$	ΔA	Revaluation account	$\Delta L \& NW$
2	K11/AN22	20	20 B10.3			0 B10.3					0	B10.3
	A	Changes in Balance Sheet	L & NW	A	Changes in Balance Sheet	L & NW	A	Changes in Balance Sheet	L & NW	A	Changes in Balance Sheet	L & NW
	AN22	0		AN22	0							
	AF2	-52		AF2	-48			AF2	100			
		Changes in net worth			Changes in net worth				Changes in net worth			
		-100	B10.1		0	B10.1			100		B10.1	
		28	B10.2		-48	B10.2						B10.2
		20	B10.3			B10.3						B10.3
		-52	B10		-48	B10			100		B10	

Annex 2.2: Emission permits are treated as taxes with a financial asset representing the prepaid tax / permit

Annexe 2.2

Events

1	Allocation of emission permits by auction ; Quantity=10 ; Price=10	D29 : other taxes on production
1.1	Payment of the tax	F2 : currency and deposits
1.2	prepayment of the tax	F3 : securities other than shares
1.3	Appearance of AN22	AN22 : intangible non produced assets
2	Market price changes +20%	K3 : economic appearance of non produced assets
3	Firm 2 buys 48 to Firm 1 Quantity=4 ; Price=12	K6 : economic disappearance of non produced assets
3.1	sale of the financial asset	K11 : nominal holding gains/losses
3.2	sale of the intangible non produced asset	K22 : acquisitions less disposals of intangible non produced assets
4	Surrender	B2 : operating surplus / mixed income
4.1	surrender of the permit for the tax payment	B6 : disposable income
4.2	holding loss : securities value = emission value	B8 : saving
4.3	extinction of the intangible non produced asset	B9 : net lending (+), net borrowing (-)
		Changes in B10.1 : saving and capital transfers
		net worth due B10.2 : other changes in volume assets
		to : B10.3 : nominal holding gains / losses
		Total B10 : changes in net worth
××	non relevant for this case	

FINANCIAL ASSET												
Events	Firm 1				Firm 2				General Government			
	U	Current Accounts	R		U	Current Accounts	R		U	Current Accounts	R	
4.1	D29	60			D29	40					100	D29
	B2	-60			B2	-40						
	B6	-60			B6	-40				100	B6	
	B8	-60			B8	-40				100	B8	
	<u>ΔA</u>	<u>Capital Account</u>	<u>ΔL & NW</u>		<u>ΔA</u>	<u>Capital Account</u>	<u>ΔL & NW</u>		<u>ΔA</u>	<u>Capital Account</u>	<u>ΔL & NW</u>	
			-60	B8			-40	B8			100	B8
	B9	-60			B9	-40			B9	100		
			-60	B10.1			-40	B10.1			100	B10.1
	<u>ΔA</u>	<u>Financial Account</u>	<u>ΔL & NW</u>		<u>ΔA</u>	<u>Financial Account</u>	<u>ΔL & NW</u>		<u>ΔA</u>	<u>Financial Account</u>	<u>ΔL & NW</u>	
1.2	F2	-100							F2	100		
1.2	F3	100								100	F3	
3.1	F2	48			F2	-48						
3.1	F3	-48			F3	48						
4.1	F3	-60			F3	-40				-100	F3	
			-60	B9			-40	B9		100	B9	
	<u>ΔA</u>	<u>Other changes in volume of assets Account</u>	<u>ΔL & NW</u>		<u>ΔA</u>	<u>Other changes in volume of assets Account</u>	<u>ΔL & NW</u>		<u>ΔA</u>	<u>Other changes in volume of assets Account</u>	<u>ΔL & NW</u>	
			0	B10.2			0	B10.2			0	B10.2
	<u>ΔA</u>	<u>Revaluation account</u>	<u>ΔL & NW</u>		<u>ΔA</u>	<u>Revaluation account</u>	<u>ΔL & NW</u>		<u>ΔA</u>	<u>Revaluation account</u>	<u>ΔL & NW</u>	
2	K11/AF3	20							K11/AF3	20		
4.2	K11/AF3	-12			K11/AF3	-8			K11/AF3	-20		
			8	B10.3			-8	B10.3			0	B10.3
	<u>A</u>	<u>Changes in Balance Sheet</u>	<u>L & NW</u>		<u>A</u>	<u>Changes in Balance Sheet</u>	<u>L & NW</u>		<u>A</u>	<u>Changes in Balance Sheet</u>	<u>L & NW</u>	
	AF2	-52			AF2	-48			AF2	100		
	AF3	0			AF3	0			AF3	0		
		<u>Changes in net worth</u>				<u>Changes in net worth</u>				<u>Changes in net worth</u>		
			-60	B10.1			-40	B10.1			100	B10.1
				B10.2				B10.2				B10.2
			8	B10.3			-8	B10.3				B10.3
			-52	B10			-48	B10			100	B10

Annex 2.3: Emission permits are treated as taxes with a mixed asset representing the prepaid tax / permit

Annexe 2.3

Events

1 Allocation of emission permits by auction ; Quantity=10 ; Price=10

~~1.1 Payment of the tax~~

1.2 prepayment of the tax

1.3 Appearance of AN22

2 Market price changes +20%

3 Firm 2 buys 48 to Firm 1 Quantity=4 ; Price=12

3.1 sale of the financial asset

3.2 sale of the intangible non produced asset

4 Surrender

4.1 surrender of the permit for the tax payment

4.2 holding loss : securities value = emission value

4.3 extinction of the intangible non produced asset

D29 : other taxes on production

F2 : currency and deposits

F3 : securities other than shares

AN22 : intangible non produced assets

K3 : economic appearance of non produced assets

K6 : economic disappearance of non produced assets

K11 : nominal holding gains/losses

K22 : acquisitions less disposals of intangible non produced assets

B2 : operating surplus /mixed income

B6 : disposable income

B8 : saving

B9 : net lending (+), net borrowing (-)

Changes in B10.1 : saving and capital transfers

net worth due B10.2 : other changes in volume assets

to : B10.3 : nominal holding gains /losses

Total B10 : changes in net worth

~~XX~~ non relevant for this case

MIXED ASSET												
Events	Firm 1			Firm 2			General Government					
	U	Current Accounts	R	U	Current Accounts	R	U	Current Accounts	R			
4.1	D29	60		D29	40				100	D29		
	B2	-60		B2	-40							
	B6	-60		B6	-40		B6	100				
	B8	-60		B8	-40		B8	100				
	ΔA	Capital Account	$\Delta L \& NW$	ΔA	Capital Account	$\Delta L \& NW$	ΔA	Capital Account	$\Delta L \& NW$			
3.2	K22/AN22	-8	-60 B8	K22/AN22	8	-40 B8			100 B8			
	B9	-52		B9	-48		B9	100				
			-60 B10.1			-40 B10.1				0 B10.1		
	ΔA	financial Account	$\Delta L \& NW$	ΔA	financial Account	$\Delta L \& NW$	ΔA	Financial Account	$\Delta L \& NW$			
1.2	F2	-100					F2	100				
1.2	F3	100							100	F3		
3.1	F2	40		F2	-40							
3.1	F3	-40		F3	40							
3.2	F2	8		F2	-8							
4.1	F3	-60		F3	-40				-100	F3		
			-52 B9			-48 B9			100 B9			
	ΔA	Other changes in volume of assets Account	$\Delta L \& NW$	ΔA	Other changes in volume of assets Account	$\Delta L \& NW$	ΔA	Other changes in volume of assets Account	$\Delta L \& NW$			
1.3	K3/AN22	0										
4.3	K6/AN22	-12		K6/AN22	-8							
			-12 B10.2			-8 B10.2				0 B10.2		
	ΔA	Revaluation account	$\Delta L \& NW$	ΔA	Revaluation account	$\Delta L \& NW$	ΔA	Revaluation account	$\Delta L \& NW$			
2	K11/AN22	20										
			20 B10.3			0 B10.3				0 B10.3		
	A	Changes in Balance Sheet	L & NW	A	Changes in Balance Sheet	L & NW	A	Changes in Balance Sheet	L & NW			
	AN22	0		AN22	0		AF2	100				
	AF2	-52		AF2	-48		AF3	0				
	AF3	0		AF3	0							
		Changes in net worth			Changes in net worth			Changes in net worth				
			-60 B10.1			-40 B10.1				B10.1		
			-12 B10.2			-8 B10.2				B10.2		
			20 B10.3			0 B10.3				B10.3		
			-52 B10			-48 B10				B10		