



Carbon for Monetary Debt Swap

Providing a foundation for a climate deal by financially accounting
for historic emissions

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1 Introduction

One of the obstacles in global climate negotiations is the historic responsibility for greenhouse gases in the atmosphere: how can under-emitting countries be compensated for the prior emissions of the industrialised world? In the following proposal we introduce the notion of 'carbon debt.' We value this carbon debt in monetary terms i.e. monetise carbon, and relate this to economic debt (also known as the slightly derogatory term of 'third world debt'.)

The result provides an approach to compensate under-emitting countries for the historic emissions of the industrialised world by annulling part or all of the existing economic debt. We refer to this as a carbon for monetary debt swap.

This simple way of addressing two otherwise intractable political problems could make a significant difference to the upcoming climate negotiations in Copenhagen. In the short outline that follows we describe a concept that may have significant ramifications for helping the twin problems of agreeing a climate change solution and relieving global southern countries of debt induced poverty.

2 Carbon debt / credit

Using global carbon cycle data from Nasa (see <http://nasascience.nasa.gov/earth-science/oceanography/ocean-earth-system/ocean-carbon-cycle>), we can approximate that the natural processes in our global system absorb approximately 2.44 tonnes of CO₂ per person per year¹. We call this the 'balance point.'

A country's 'carbon debt' or 'carbon credit' is the difference between this figure of 2.44 tonnes of CO₂ per person per year and its actual per capita emissions².

As an example, if a country's per capita emissions were 10 tonnes of CO₂ per person per year, then the country is accumulating a carbon debt of $(10 - 2.44) = 7.56$ tonnes of CO₂ per person per year. For a country whose emissions were only 2 tonnes of CO₂ per person per year, they would accumulate a carbon credit of 0.44 tonnes of CO₂ per person per year.

3 Monetising carbon debt / credit

Given the emergence of a global market for carbon dioxide credits we can now attribute a financial value per tonne of CO₂. This financial value can provide a market-based value for the environmental cost of each tonne of CO₂ emitted. At the date of writing, the market value of CO₂ according to the EU Emissions Trading Scheme (EU ETS) is €13.34³, which equates

¹ According to NASA, the land, soils and oceans absorb approximately 4 billion tonnes of carbon (C) per year. Using the conversion factor of 44/12 this equates to 14.6 billion tonnes of CO₂ per year. Using the assumption of 6 billion people on our planet, this equates to 2.44 tonnes CO₂ per person / per year.

² For this analysis we have used data as defined by CDIAC (see <http://cdiac.ornl.gov/>)

³ From www.pointcarbon.com on 24th June 2009

to \$18.58⁴ / tonne CO₂. Hence, we can monetise carbon debt and credit figures by using the following equation:

$$\text{Monetised value of carbon debt / credit} = (\text{carbon debt / credit}) \times (\$ \text{ price of 1 tonne of CO}_2)$$

4 Establishing global carbon debt / credit numbers

Politically, the world formally acknowledged climate change and their responsibility at the Rio summit in 1992. Hence, it seems a reasonable assumption to use this as the starting point from which responsibility for emissions is agreed upon for calculating the cumulative carbon debt / credit of each country.

We have used publicly available emissions & population data⁵. The table below shows the cumulative carbon debt / credit for the countries with the largest cumulative carbon debts and credits between 1992 and 2007, using the 'balance point' of 2.44 and a value of \$18.58 per tonne of CO₂ in order to generate a monetised value for the carbon debt / credit.

Country	Emissions quota, 1992 – 2007 (tonnes CO ₂)	Actual emissions, 1992 – 2007 (tonnes CO ₂)	Carbon debt / credit	Carbon debt / credit (tonnes CO ₂)	Financial value of carbon debt / credit (\$)
United States	10,962,410,528	88,588,978,030	Debt	-77,626,567,502	-1,442,301,624,187.2
Russia	5,712,439,365	24,388,365,526	Debt	-18,675,926,161	-346,998,708,071.38
Japan	4,942,029,129	18,917,555,490	Debt	-13,975,526,361	-259,665,279,787.38
Germany	3,203,519,627	13,183,452,023	Debt	-9,979,932,396	-185,427,143,917.68
Canada	1,187,165,896	7,948,117,731	Debt	-6,760,951,835	-125,618,485,094.3
United Kingdom	2,282,002,582	8,854,364,031	Debt	-6,572,361,449	-122,114,475,722.42
China	48,650,195,063	53,621,879,401	Debt	-4,971,684,338	-92,373,895,000.04
Republic of Korea	1,804,895,426	6,503,312,948	Debt	-4,698,417,522	-87,296,597,558.76
Australia	734,503,245	5,297,357,475	Debt	-4,562,854,230	-84,777,831,593.4
Italy	2,249,056,360	6,776,276,759	Debt	-4,527,220,399	-84,115,755,013.42
Philippines	3,044,972,812	1,199,748,913	Credit	1,845,223,899	34,284,260,043.42
Dem. Rep. of Congo	1,971,421,619	31,424,034	Credit	1,939,997,585	36,045,155,129.3
Vietnam	3,014,851,907	833,286,501	Credit	2,181,565,406	40,533,485,243.48
Brazil	6,737,419,351	4,513,601,353	Credit	2,223,817,998	41,318,538,402.84
Ethiopia	2,381,899,491	92,044,015	Credit	2,289,855,476	42,545,514,744.08
Pakistan	5,401,594,618	1,600,986,794	Credit	3,800,607,824	70,615,293,369.92
Nigeria	4,693,865,007	818,901,228	Credit	3,874,963,779	71,996,827,013.82
Indonesia	8,583,244,413	4,615,150,572	Credit	3,968,093,841	73,727,183,565.78
Bangladesh	5,014,000,542	482,402,977	Credit	4,531,597,565	84,197,082,757.7
India	38,416,810,578	17,321,490,802	Credit	21,095,319,776	391,951,041,438.08

⁴ From <http://finance.yahoo.com/q?s=eurusd=x> on 24th June 2009

⁵ Carbon emission data from US Department of Energy's Carbon Dioxide Information Analysis Center (CDIAC) for the United Nations Statistics Division from 1992 to 2007, and population data from Penn World Table (PWT) 6.1. 1992 – 2003. Population data for 2003 to 2007 has been inferred using 2003 numbers with zero growth.

In summary, for all countries for which we have emissions and population data^{4&5}, and using the balance point of 2.44¹ combined with a value of CO₂ / tonne of \$18.58^{3&4}, we can make the following observations:

- Between 1992 and 2007, under-emitting countries generated a carbon credit valued at approximately \$1.295 trillion
- Over the same period, over-emitting countries generated a carbon debt valued at approximately \$3.9 trillion. [*Note that the value of over-emitting countries' carbon debt is 3 times greater than the value of the under-emitting countries credit.*]

5 Carbon debt vs. monetary debt

To put the figures derived above into context, the current value of economic debt is \$2.5 trillion, which is more likely to be held by the under-emitting countries. This is almost equivalent to the monetised value of their carbon credit and less than the value of the over-emitting countries carbon debt.

6 Conclusion

As a result of this brief investigation, three courses of action are possible:

1. By international treaty the World could set up a means of accounting for the value of carbon debt and so arrange for the transfer of \$3.9 trillion (calculated carbon debt of over emitters) into a climate change adaptation fund for use in those countries hardest hit by climate change, and
2. The carbon credit of the under-emitting countries could be transferred into country-specific climate change adaptation funds compensating them to a value of \$1.295 trillion.
3. The carbon credit of the under-emitting countries could be accounted for in consideration of existing monetary debt, compensating for \$1.295 trillion off the outstanding total of \$2.5 trillion. The residual (\$1.205 trillion) could be compensated for by the partial annulment of the over-emitting countries' carbon debt.

Whilst gaining consensus for options 1 & 2 may prove difficult, the case for option 3 is highly compelling.