

Paying Back Carbon Debt – What Developed and Other Countries Owe Sri Lanka and the SAARC Countries

Introduction

Historically, the developed countries have consumed most of the carbon space and current estimates indicate the emissions have exceeded the carrying capacity of the earth. Climate change, currently being discussed in many world fora is largely attributed to carbon emissions. The most developed industrialized countries, except China and India accounted for 55% of the total emissions in 2004. The costs to the population and future generations and the environment have been enormous. Excess carbon emission not only reduces the space for carbon emission by low emitters, but also does irreparable damage to the environment, natural resources, income and employment, particularly of the low income, resource short and poor countries. Ironically, it is these countries which emit less carbon that suffer the most. Thus it is only fair that countries that developed at the expense of the carbon space of less developed countries compensate these low carbon using countries. High emitters or those who emit over and above the average levels taking up the carbon space of low emitters, should take responsibility for such excesses and compensate at least some of the cost of damages that they have caused as a consequence of excess use of carbon. It is necessary to devise an equitable system or methodology by which such compensation can be paid. Thus one may call it “payback time”.

This paper attempts to develop a methodology to estimate the payment that should be made within a given time period, by individual carbon emitters for their past excess emissions to low carbon emitting countries. The method is simple and easy to calculate provided that data is available for carbon emissions on a regular basis. Such data has been collected by various agencies and are published regularly. Using this data it was possible to determine how much each country emitting excessive carbon owed to every other country with below average or low levels of carbon emission.

Methodology

The methodology is based on grouping individual countries by carbon emission levels. These groups are either under or over utilizing carbon emissions. This division is based on annual global budget for CO₂ and the world population.

Estimation of Annual Carbon Budget for the Year 2000.

The Annual Global Budget has been fixed at 14.56 GT (14.56 x 10⁹t of carbon) for the entire period of the 21st Century (2000-2099)

World Population in 2004 = 6396 million

Annual cut off point for CO₂ in 2004 = [Global Carbon Budget/World Population]
= [14.56 x 10¹²/ 6396 x 10⁶] kg = 2276.4 kg

This works out to 2,276 kg per capita or 2.27 tons per capita per annum (2004). The value will change every year according to the global population estimates of each year.

Thus countries whose per capita emission exceeded this limit were considered as over-users of CO₂, while those countries which were below this level were considered under-users. The over-users are required to pay the under-users on the basis of total carbon emission as a proportion to total emission within the category, during a given period or a particular year. Such compensation should be paid for past over use of carbon, starting from the year when world carbon emission exceeded the Earth's carrying capacity, up to the year when a new global agreement is reached on limits of carbon emission by individual countries. This compensation should be paid by countries which cannot keep to their allotted limits, till such time as their emissions fall below such limits.

Sample calculation of the amount of carbon debt owed to Sri Lanka by USA

The following calculation illustrates the estimation of the amount that USA needs to pay Sri Lanka in 2004;

Carbon Overuse Factor (COF) "s" for USA = (Amount of CO₂ over-used / Total CO₂ emissions of all over-users) the value is a proportion that ranges from 0-1

$$\text{COF for USA in 2000 "s"} = 0.322$$

Sri Lanka – The amount under-utilized is equal to the allowable Emission = (2.26x Population) – (Total CO₂ emission of Sri Lanka)

$$= (2.26 \times 19.6 \text{ M}) - (11.534 \text{ M t}) = (44.609 \text{ Mt}) - (11.534 \text{ Mt}) = 33.075 \text{ Mt.}$$

(Mt= Million tons)

The amount USA owes Sri Lanka in 2004 = (s x Total amount of CO₂ underutilized by Sri Lanka) x (Cost of CO₂ which is estimated at US \$ 20/ton).

$$\text{Amount owed to Sri Lanka by USA} = (0.322 \times 33,075,600\text{t}) \times 20 = \underline{\underline{\text{US \$ 213 million.}}}$$

Thus the over-user will pay according to the amount of CO₂ emitted. The higher the amount of CO₂ emitted, the higher is the factor "s" of multiplication. In the sample, the COF "s" for USA is 0.322 or 32%. The amount of underutilization by Sri Lanka was 33 million tons and the amount of CO₂ utilized by USA was (0.32 x 33) or 10.6 million tons valued at US \$ 213 million, at the rate of US\$ 20 per ton. Thus USA owes Sri Lanka this amount in the year 2004. This is an equitable method for estimating the debt, since the country that emits a higher level of CO₂ pays more to each of the under-utilized country, in proportion to the total emission over and above the established allocated level of all over-utilizing country.

Discussion of Findings

The Tables 1-3 provide data on the methodology of calculation and the results on the value of Debt owed to Sri Lanka by various countries. Since USA is the largest

emitter of CO₂, the largest payment is due from this country, followed by other large users of carbon, such as Russia, Japan, Germany, UK, Canada and Italy. The amount owed from the set of highest developed countries amounted to over US \$ 400 million in 2004. However, there are other costs that have not been included in this estimate.

These are the

costs of externalities caused by high carbon emission. Although, the emitting country also will suffer from adverse effects of high carbon emission including global warming, the poorer countries will be affected more due to the lack of resources to take mitigation measures, whereas the richer countries have adequate sources to reduce the impact as much as possible.

Furthermore, the current estimation has been attempted for the five year period 2000-2004 for which data was available. However, adverse impacts from high carbon emissions have been affecting populations for a considerable period, during which not much awareness or importance was placed on the harmful effects. Research on the impacts of carbon emissions is now being undertaken in a more scientific and regular basis and the results are showing that the impacts may be much greater than originally envisaged. It is unfortunate that the less developed countries, which are attempting to invest large amounts of capital to improve their economies and reduce poverty, will be required to reduce their emissions, when in fact they should be given a free hand in developing resources and investing in industries that would enable their economies to take off, many of which are high carbon emitting industries like thermal power, fertilizer production etc.

A payback system as described will also provide incentives to high emitting industries to reduce their carbon emissions. The repayment of carbon debt will enable many indebted countries to reduce their debts considerably. An analysis of borrowings and loans taken by the government and commercial credit in Sri Lanka is provided in Tables 4,5 and 6.

Table 1 The Amount Owed to Sri Lanka by Over-emitting Countries
2004 CO2 emissions
Environmentally Permissible CO2 level 2.28 Tons Per Capita

Country	Per capita CO2 emissions t	Population (Million)	Annual CO2 emissions t	Environmental permissible CO2 emissions t	Amount CO2 Emissions Over Utilized CO2 t	% Over-utilized /Total Over-utilized CO2 emissions (%)	Carbon Space of Sri Lanka used by Over-utilized Countries Tons	Value in US \$ of carbon used @ US\$ 20 / ton
	A	B	D= (AxB)	E = (2.27 x B) tons	F=(D-E)	G = (F/Tot F)	H= (Gx Tot under utilized by SL)	I = (Hx US\$20)
World	3.9	6,057	23,622,300,000	14,536,800,000	9,085,500,000			
Over Utilized Countries			Annex 1 Countries					
A 1 Developed Countries								
United States	20.6	293.6	6,049,435,000	668,233,600	5,381,201,400	0.18997	6,283,225	125,664,493
Russia	10.6	144.1	1,524,993,000	327,971,600	1,197,021,400	0.04226	1,397,672	27,953,439
Japan	9.9	127.6	1,257,963,000	290,417,600	967,545,400	0.03416	1,129,730	22,594,602
Germany	9.8	82.6	860,522,000	187,997,600	672,524,400	0.02374	785,256	15,705,125
UK	9.8	59.7	587,261,000	135,877,200	451,383,800	0.01593	527,047	10,540,939
Canada	20.0	31.9	639,403,000	72,604,400	566,798,600	0.02001	661,808	13,236,163
Italy	7.8	57.8	449,948,000	131,552,800	318,395,200	0.01124	371,766	7,435,323
France	6.0	60	373,693,000	136,560,000	237,133,000	0.00837	276,882	5,537,648
Australia	16.2	20.1	326,757,000	45,747,600	281,009,400	0.00992	328,114	6,562,271
Spain	7.6	42.5	330,497,000	96,730,000	233,767,000	0.00825	272,952	5,459,043
Netherlands	8.7	16.3	142,061,000	37,098,800	104,962,200	0.00371	122,556	2,451,130
Belgium	9.7	10.4	100,716,000	23,670,400	77,045,600	0.00272	89,960	1,799,207
Austria	8.6	8.1	69,846,000	18,435,600	51,410,400	0.00181	60,028	1,200,561
Finland	12.6	5.2	65,799,000	11,835,200	53,963,800	0.00191	63,009	1,260,190

Denmark	9.8	5.4	52,956,000	12,290,400	40,665,600	0.00144	47,482	949,643
Sweden	5.9	9	53,033,000	20,484,000	32,549,000	0.00115	38,005	760,100
Norway	19.1	4.6	43,149,000	10,469,600	32,679,400	0.00115	38,157	763,146
Ireland	10.5	4.1	42,353,000	9,331,600	33,021,400	0.00117	38,557	771,132
New Zealand	7.7	4.1	31,570,000	9,331,600	22,238,400	0.00079	25,966	519,322
Switzerland	5.4	7.4	40,457,000	16,842,400	23,614,600	0.00083	27,573	551,460
Total A 1 Dev	13.11	994.5	13,042,412,000	2,263,482,000	10,778,930,000	0.64509	21,336,634	426,732,672
Total Other A1	7.0	176.5	1,240,762,000	401,714,000	839,048,000	0.05021	1,660,875	33,217,508
Annex 2	4.7	2092.9	9,854,805,000	4,763,512,734	5,091,292,266	0.30470	10,078,091	201,561,820
Tot Annex 1 and 2	7.4	3263.9	24,137,979,000	7,428,708,734	16,709,270,266	1.00000	33,075,600	661,512,000

Country	Per capita CO2 emissions t	Population (Million)	Annual CO2 emissions t	Environmental permissible CO2 emissions t	Amount CO2 Emissions Under Utilized CO2 t	Total all under-utilized CO2 emission countries	Total Value of under utilized CO2 emission (US\$)	Total Value of all countries under utilized CO2 emission (US\$)
Sri Lanka	0.6	19.6	11,534,000	44,609,600	33,075,600	4,019,813,201	661,512,000	80,396,264,013

. Sources: Human Development Report 2007/8, UNDP; Key World Energy Statistics – 2007, International Energy Agency

Table 2 Carbon Space Used by Over-Utilized Countries

Over Utilized Annex 1 and 2 Countries						
Country	Carbon Space of Sri Lanka used by Over-utilized Countries					Total
Year	2000	2001	2002	2003	2004	2000-2004
A 1 Developed Countries						
United States	14,240,178	13,671,340	12,811,286	11,907,841	11,907,841	64,538,485
Russia	3,048,414	2,921,726	2,738,350	2,716,017	2,716,017	14,140,524
Japan	2,520,888	2,396,449	2,302,490	2,141,835	2,141,835	11,503,496
Germany	1,672,193	1,681,508	1,530,807	1,445,437	1,445,437	7,775,381
UK	1,180,335	1,140,341	1,057,599	1,150,668	1,150,668	5,679,610
Canada	1,187,352	1,131,311	1,166,127	980,659	980,659	5,446,110
Italy	803,133	774,585	756,730	720,464	720,464	3,775,377
France	595,352	627,365	579,722	543,754	543,754	2,889,947
Australia	848,360	868,981	788,651	729,276	729,276	3,964,544
Spain	501,574	496,220	517,067	481,619	481,619	2,478,100
Netherlands	284,267	275,503	286,910	241,876	241,876	1,330,433
Belgium	213,703	188,385	115,954	145,564	145,564	809,171
Austria	115,400	122,126	115,722	168,576	168,576	690,401
Finland	110,399	118,772	124,168	122,431	122,431	598,202
Denmark	93,275	94,098	89,416	129,852	129,852	536,493
Sweden	68,832	72,240	86,715	98,279	98,279	424,345
Norway	94,281	111,216	152,888	75,531	75,531	509,447
Ireland	90,230	93,255	81,146	74,667	74,667	413,966
New Zealand	66,877	68,484	64,578	56,150	56,150	312,239
Switzerland	7,794	70,007	61,912	60,657	60,657	261,026
Total A 1 Dev	27,742,836	26,923,915	25,428,239	23,991,154	23,991,154	128,077,298
Total Other A1	2,155,749	2,142,140	2,018,573	1,953,965	1,953,965	10,224,392
Annex 2 Countries	6,087,015	6,052,345	7,329,188	8,717,681	8,717,681	36,903,910
Tot Annex 1 and 2	35,985,600	35,118,400	34,776,000	34,662,800	34,662,800	175,205,600

Sources: Human Development Report 2007/8, UNDP; Key World Energy Statistics – 2007, International Energy Agency

Table 3 Value of Sri Lanka's Carbon Space Utilized by Other Over-Utilizing Countries.

Over Utilized Annex 1 & 2 Countries						
Country	Value in US \$ of Sri Lanka Carbon Space Used by Other Countries @ US\$ 20 / ton					Total
Year	2000	2001	2002	2003	2004	2000-2004
A 1 Developed Countries						
United States	284,803,550	273,426,792	256,225,730	238,156,818	125,664,493	1,178,277,384
Russia	60,968,274	58,434,530	54,767,003	54,320,340	27,953,439	256,443,585

Japan	50,417,760	47,928,973	46,049,798	42,836,695	22,594,602	209,827,827
Germany	33,443,857	33,630,169	30,616,131	28,908,734	15,705,125	142,304,015
UK	23,606,698	22,806,811	21,151,979	23,013,356	10,540,939	101,119,783
Canada	23,747,038	22,626,226	23,322,547	19,613,190	13,236,163	102,545,164
Italy	16,062,661	15,491,709	15,134,606	14,409,281	7,435,323	68,533,580
France	11,907,041	12,547,310	11,594,434	10,875,080	5,537,648	52,461,513
Australia	16,967,198	17,379,627	15,773,014	14,585,525	6,562,271	71,267,635
Spain	10,031,481	9,924,396	10,341,344	9,632,387	5,459,043	45,388,651
Netherlands	5,685,344	5,510,067	5,738,202	4,837,522	2,451,130	24,222,265
Belgium	4,274,065	3,767,697	2,319,089	2,911,290	1,799,207	15,071,347
Austria	2,307,995	2,442,522	2,314,444	3,371,528	1,200,561	11,637,051
Finland	2,207,987	2,375,445	2,483,360	2,448,622	1,260,190	10,775,605
Denmark	1,865,503	1,881,964	1,788,310	2,597,041	949,643	9,082,462
Sweden	1,376,640	1,444,808	1,734,293	1,965,574	760,100	7,281,416
Norway	1,885,617	2,224,330	3,057,756	1,510,622	763,146	9,441,471
Ireland	1,804,605	1,865,109	1,622,928	1,493,343	771,132	7,557,117
New Zealand	1,337,531	1,369,678	1,291,557	1,123,005	519,322	5,641,094
Switzerland	155,878	1,400,133	1,238,247	1,213,131	551,460	4,558,848
Total A 1 Dev	554,856,722	538,478,295	508,564,772	479,823,086	426,732,672	2,508,455,547
Total Other A1	43,114,976	42,842,805	40,371,468	39,079,296	33,217,508	198,626,053
Annex 2 Countries	121,740,302	121,046,899	146,583,760	174,353,618	201,561,820	765,286,400
Tot Annex 1 and 2	719,712,000	702,368,000	695,520,000	693,256,000	661,512,000	3,472,368,000
Outstanding Debt of Sri Lanka at end of 2008						12,318, 000,000

Sources: Human Development Report 2007/8, UNDP; Key World Energy Statistics – 2007, International Energy Agency

Table 3, shows that highly developed economies owe a carbon debt of US\$ 2.5 billion, which is roughly equal to about 25% of the outstanding debt at the end of 2008.

Table 4 Outstanding Debt and Forecast of Debt Service Payment on Existing Portfolio (US \$ Million)

Country	Outstanding Debt as of 2008	Debt Service Forecast Based on Past Debt						
		Actual 2007	2008	2009	2010	2011	2012	2013
Bilateral								
Japan	3690.6	210.7	230.2	308.2	306.4	311.5	313.2	316.0
Germany	490.7	43.1	45.1	44.1	37.8	33.9	29.1	29.1
China	246.4	3.6	7.1	10.6	9.5	23.8	22.3	22.0
USA	493.0	53.0	52.1	51.3	40.5	39.8	39.2	38.0
Canada	611.9	5.3	5.1	5.0	3.9	3.9	3.9	3.9
Denmark		1.2	4.2	6.0	5.6	5.6	5.6	5.6
France		11.4	11.9	11.7	7.9	8.4	7.7	7.5
India		6.4	7.1	14.8	14.3	13.0	11.3	11.2
Kuwait		5.2	4.7	4.5	4.7	4.8	4.8	4.7
Netherlands		6.5	5.5	4.4	1.7	0.9	0.0	0.0

Saudi Fund		0.9	1.4	1.0	1.2	1.2	1.2	1.2
Other Bilateral		0.1	0.6	1.5	1.5	1.5	2.2	0.0
Total	5532.6	347.4	375.0	463.1	435.0	448.3	440.5	439.2
Multilateral								
ADB	2845.0	87.7	110.9	130.8	141.5	153.5	158.8	161.5
World Bank	2340.5	66.5	72.2	77.5	80.2	88.0	91.1	94.5
IFAD	245.5	3.0	3.1	3.0	3.5	3.5	3.5	3.4
Eur Inv Bank		5.1	7.4	10.9	10.2	14.8	18.2	17.8
Nordic Dev Bank		0.3	0.4	0.6	0.7	0.8	0.8	0.8
OPEC Fund		2.4	2.7	2.7	2.7	2.6	2.5	2.5
Total	5431.0	165.0	196.7	225.5	238.8	263.2	274.9	280.5
Market Borrowings	739.1	97.1	188.0	159.8	53.8	200.5	547.3	4.8
Export Credits	615.9	36.4	43.4	40.1	51.7	57.2	72.7	70.9
Total	1355.0	133.5	231.4	199.9	105.5	257.7	620	75.7
Grand Total	12318.6	657.0	811.7	896.0	787.3	975.8	1342.5	805.3

Source: Department of External Resources

Note : Exchange rate as at 31st December 2008(Rs 113.1398 = 1 US\$) has been used for the calculation of future debt services.

In terms of loans taken, Japan has been the source of credit of over 60% of the bilateral credit obtained by Sri Lanka. Other important sources include the high emission countries like USA, Germany and China. Although China is still in the under-utilized country category, substantial carbon emissions due to heavy industrialization may result in China also falling into the over-utilized category in the near future. Credit from multilateral lending agencies has made up to almost half of the total debt portfolio of the country.

Table 5 Debt Service Payments 2008-2013 (US\$ million)

	Actual	Actual	Actual	Forecast Based on Past Debt				
	2006	2007	2008	2009	2010	2011	2012	2013
Total Outstanding Debt			12,318.6	11,673.0	11,120.4	10,366.9	9,233.3	8,582.4
Principal Repayments			581.5	645.6	552.6	753.5	1,133.6	650.9
Interest Payments			230.2	250.4	234.7	222.3	208.9	154.4
Total Debt Service			811.7	896.0	787.3	975.8	1342.5	805.3

Source: Department of External Resource

Note : Exchange rate as at 31st December 2008(Rs 113.1398 = 1 US\$) has been used for the calculation of future debt services.

The country is highly indebted as can be observed in Tables 4 and 5. Debt service payments alone are estimated at about US\$ 1 billion annually. Market borrowing and export credit also add up to about US \$ 1 billion .

Table 6 Comparison of Foreign Debt of Sri Lanka in Relation to Carbon Debt

Country	Total Outstanding Foreign Debt as at 2008 (US \$ Million)	Value in US \$ of Sri Lanka Carbon Space Used by Other Countries @ US\$ 20 (2000-2004) (US \$ M)	Value of Carbon Used as a Percentage of Government Debt (%)
Japan	3690.6	209.8	5.7
Germany	490.7	142.3	29.0
China	246.4	0	0.0
USA	493.0	1178.3	239.0
Other	611.9	1942	317.4
Total	5532.6	3472.4	62.8
Multilateral			
ADB	2845		
World Bank	2340.5		
Other	245.5		
Market Borrowings	739.1		
Export Credits	615.9		
Total	6786		
Grand Total	12318.6	3472.4	28.2

Source: Department of External Resource

Note : Exchange rate as at 31st December 2008(Rs 113.1398 = 1 US\$) has been used for the calculation of future debt services.

A comparison of Carbon Debt with actual borrowings from bilateral agencies shows that carbon debt of USA is about two and half times that of total borrowing from USA. Thus we do not need any credit from USA if our due carbon debt is paid. The carbon debt has been estimated for 5 years only. This figure could increase substantially if the figures for carbon debt are worked out for longer periods.

**Table 7 - Carbon Space of SAARC Countries Utilized by Other Countries
(Million Tons of Carbon)**

Year	Sri Lanka	India	Pakistan	Bangladesh	Nepal	Bhutan	Maldives	Total (SARC)
2000								
Total Annex 1 Developed Countries	27.7	1,014.2	185.6	233.4	40.9	1.5	0.16	1,503.5
Total Annex 1 Other Countries	2.2	78.8	14.4	18.1	3.2	0.1	0.01	116.9
Total Annex 2 Countries	6.1	222.6	40.7	51.2	9.0	0.3	0.04	330.0
Total Annex 1 and 2 Countries	36.0	1,315.6	240.8	302.8	53.0	2.0	0.21	1,950.3
2001								
Total Annex 1 Developed Countries	26.9	1,004.6	187.1	234.2	41.9	1.5	0.00	1,496.2
Total Annex 1 Other Countries	2.1	79.9	14.9	18.6	3.3	0.1	0.00	119.0
Total Annex 2 Countries	6.1	225.8	42.1	52.6	9.4	0.3	-0.22	336.1
Total Annex 1 and 2 Countries	35.1	1,310.4	244.0	305.5	54.7	2.0	-0.22	1,951.4
2002								
Total Annex 1 Developed Countries	25.4	874.8	172.1	199.3	39.1	1.4	0.00	1,312.2
Total Annex 1 Other Countries	2.0	69.4	13.7	15.8	3.1	0.1	0.00	104.2
Total Annex 2 Countries	7.3	252.2	49.6	57.4	11.3	0.4	-0.32	377.9
Total Annex 1 and 2 Countries	34.8	1,196.4	235.3	272.5	53.5	1.9	-0.32	1,794.2
2003								
Total Annex 1 Developed Countries	24.0	825.4	160.6	208.8	38.3	1.3	0.19	1,258.5
Total Annex 1 Other Countries	2.0	67.2	13.1	17.0	3.1	0.1	0.02	102.5
Total Annex 2 Countries	8.7	299.9	58.3	75.9	13.9	0.5	0.07	457.3
Total Annex 1 and 2 Countries	34.7	1,192.6	232.0	301.6	55.3	1.9	0.27	1,818.4
2004								
Total Annex 1 Developed Countries	21.3	754.5	151.6	180.1	34.7	1.3	0.00	1,143.5
Total Annex 1 Other Countries	1.7	58.7	11.8	14.0	2.7	0.1	0.00	89.0
Total Annex 2 Countries	10.1	356.4	71.6	85.1	16.4	0.6	-0.07	540.1
Total Annex 1 and 2 Countries	33.1	1,169.6	235.0	279.2	53.7	2.1	-0.07	1,772.6
2000-2004								
Total Annex 1 Developed Countries	125.4	4,473.5	856.9	1,055.8	194.9	7.1	0.35	6,714.0
Total Annex 1 Other Countries	9.9	354.2	67.8	83.6	15.4	0.6	0.03	531.6
Total Annex 2 Countries	38.3	1,356.9	262.3	322.2	60.0	2.2	-0.50	2,041.4
Total Annex 1 and 2 Countries	173.6	6,184.6	1,187.1	1,461.6	270.3	9.8	-0.12	9,286.9

Sources: Human Development Report 2007/8, UNDP; Key World Energy Statistics – 2007, International Energy Agency

Table 7 provides data on the carbon space of SAARC countries utilized by developed and other countries. Over the five-year period 2000-2004, over 6.7 billion tons of carbon emissions allocated to SAARC countries but not utilized were utilized by developed nations. A further 531 million tons were consumed by other Annex 1 countries and 2 billion tons consumed by Annex 2 countries that over-utilized their quota.

Table 8 - Value of SAARC Carbon Space Utilized by Other Countries (@ US\$ 20 / ton)
(US \$ Million)

Year	Sri Lanka	India	Pakistan	Bangladesh	Nepal	Bhutan	Maldives	SARC Total
2000								
Total Annex 1 Developed Countries	555	20,283	3,712	4,669	817	31	3	30,070
Total Annex 1 Other Countries	43	1,577	288	363	64	2	0	2,337
Total Annex 2 Countries	122	4,452	815	1,024	179	7	1	6,600
Total Annex 1 and 2 Countries	720	26,312	4,815	6,056	1,060	40	4	39,007
2001								
Total Annex 1 Developed Countries	538	20,092	3,742	4,684	838	30	0	29,924
Total Annex 1 Other Countries	43	1,599	298	373	67	2	-4	2,376
Total Annex 2 Countries	121	4,517	841	1,053	188	7	0	6,727
Total Annex 1 and 2 Countries	702	26,207	4,881	6,109	1,093	39	-4	39,027
2002								
Total Annex 1 Developed Countries	509	17,497	3,442	3,986	783	28	0	26,244
Total Annex 1 Other Countries	40	1,389	273	316	62	2	-6	2,077
Total Annex 2 Countries	147	5,043	992	1,149	226	8	0	7,564
Total Annex 1 and 2 Countries	695	23,929	4,707	5,451	1,071	39	-6	35,885
2003								
Total Annex 1 Developed Countries	480	16,508	3,211	4,175	766	26	4	25,171
Total Annex 1 Other Countries	39	1,345	262	340	62	2	0	2,050
Total Annex 2 Countries	174	5,999	1,167	1,517	278	10	1	9,146
Total Annex 1 and 2 Countries	693	23,851	4,640	6,032	1,107	38	5	36,367
2004								
Total Annex 1 Developed Countries	427	15,090	3,032	3,602	693	27	0	22,871
Total Annex 1 Other Countries	33	1,175	236	280	54	2	-1	1,779

Total Annex 2 Countries	202	7,128	1,432	1,701	328	13	0	10,803
Total Annex 1 and 2 Countries	662	23,392	4,700	5,584	1,075	42	-1	35,453
2000-2004								
Total Annex 1 Developed Countries	2,508	89,470	17,139	21,116	3,897	27	7	134,164
Total Annex 1 Other Countries	199	7,083	1,357	1,672	309	2	-12	10,611
Total Annex 2 Countries	765	27,138	5,247	6,445	1,199	13	2	40,808
Total Annex 1 and 2 Countries	3,472	123,691	23,742	29,233	5,405	42	-2	185,583

Sources: Human Development Report 2007/8, UNDP; Key World Energy Statistics – 2007, International Energy Agency

Table 8 provides data on the value of carbon allocated to SAARC countries consumed by developed and other countries. The total value of the carbon utilized by developed and other countries over the period 2000-2004 estimated at the prevailing market rate of US \$ 20 per ton is US \$ 185 billion. Developed countries accounted for US\$ 134 billion, or 72% of the total amount owed to SAARC countries as carbon debt for this period.

Conclusion

In conclusion, there is evidence that developing countries can substantially improve their economies and reduce poverty, without recourse to aid and credit if the developed nations are required to repay their carbon debts, rather than giving them aid. It is the only equitable solution to reduce carbon emissions and as well as reduce poverty and improve the livelihoods of a substantial proportion of humanity.