

# Estimate of the Economic Cost of Armed Conflict: A Case Study from Darfur

*Hamid E. Ali\**



*Abstract:* The drums of war are beating at this moment in Darfur as the government of Sudan is engaged in brutal counter-insurgency tactics that have proved to be costly in terms of human and economic destruction. Although there has been much debate in many forums to try to settle the conflict in Darfur, there has been no study to calculate its economic cost. This study will be the first attempt to quantify the economic cost of the conflict. The war costs in Darfur will include the destruction of infrastructure, direct military spending attributable to the war effort, and the impact of the latter on export sector and capital formation. In addition, the human destruction—loss of life and income—must be taken into account. Our calculation has shown that the government of Sudan has spent \$24.07 billion which is equivalent of 162 percent of GDP on the war in Darfur. This includes \$10.08 billion in direct military expenses, \$7.2 billion in productivity lost by the IDPs, \$2.6 billion in lifetime earnings of the dead, and \$4.1 billion in infrastructure damage. While the country has spent only 1.3 percent and 1.2 percent of its budget on public health and education respectively for more than two decades, it can apparently afford to allocate 23 percent of GDP annually for war efforts in Darfur.

*Key words: war cost, Sudan, military expenditure and Darfur*

## 1. Introduction

According to the World Development Report (2011), the rising number of internally displaced persons (IDPs) in various countries, including Sudan, undermines recovery from violence, interrupts human development, and poses major challenges to meeting the Millennium Development Goals (MDGs). The drums of war are beating at this moment in Darfur as the government of Sudan is engaged in brutal counter-insurgency tactics that have proved to be costly in terms of human and economic destruction. The staggering carnage includes more than 300,000 killed, more than 3 million living as IDPS, three thousand villages torched, and millions of dollars worth of crops and livestock stolen by government and its militias. Beyond this, the psychological impact and the destruction of the country's social fabric and reputation cannot be quantified in dollar terms. The economic priorities of the country are completely misplaced. Sudan is a relatively poor country that spends far more lavishly on guns than butter. For more than two decades the government has spent only 1.3 percent and 1.2 percent of its budget on public health and education respectively. Darfur war costs are astronomically high for country like Sudan, it consumed greater proportion of the GDP in war efforts, as public policy issue that occupied the world community for more than 9 years, it worthy of reflection on the cost of this conflict to Sudan treasures.

In a seminal piece, (Brück & De Groot 2009, Bozzoli 2010 and De Groot 2010) summed up the literature on the global cost of conflict. These studies mostly focused on national income loss using diverse and inconsistent modeling techniques. Most studies express the economic consequences of war as a proportion of GDP. In many cases they include the effects that can be directly attributed to the conflict but exclude the indirect effects, which increase the burden of the conflict (Bozzoli et al. 2009). There are two methods of calculating cost of the war. One approach is to calculate the cost of replacing destroyed materials; this method includes direct and indirect costs of conflict based on economic theory or empirical evidence. The other approach is via modeling known as counter-factual analysis, based on what would

have happened to the economic growth and general welfare of a country in the absence of the conflict (de Groot 2010; Lingren 2006; FitzGerald and Spalding 1987; Abadie and Gardeazabal 2003; Lopez and Wodon 2005). With either approach it is difficult to measure the cost of conflict consistently across the board because every conflict is different (Bozzoli et al. 2008, Bozzoli et al. 2009). For example, in the case of Darfur, the conflict is between a province and a weak state that is teetering on the brink of failure. The data have censored and all matters related to conflict are classified, making it difficult to get any long dense time series to apply rigorous empirical testing in order to quantify the true cost of war. In spite of the lack of reliable data, it is hoped that the present study will be a start, and that future studies can build on it.

Although there has been much debate in many forums to try to settle the conflict in Darfur, there has been no study to calculate its economic cost. Collier (1999) argued that civil war affects growth through destruction of resources, disruption of infrastructure and social order, dissaving, and capital flight, and that the speed of postwar recovery is determined by the duration of the war. This study will be the first attempt to quantify the economic cost of the conflict. The war costs in Darfur will include the destruction of infrastructure, direct military spending attributable to the war effort, and the impact of the latter on export sector and capital formation. In addition, the human destruction—loss of life and income—must be taken into account. Indirect costs, including capital flight, the emigration of skilled labor, and lost educational opportunities for future generations, cannot be assessed due to insufficient data. This will be left for future research.

Several other points should be mentioned. First, this study is assessing the cost of the conflict while the conflict is still going on; the full cost of the war is therefore unobtainable and data are scarce. Second, despite the waves of political and economic crisis that Darfur has suffered, during the war years the government has managed to tap the oil reserves in order to fund the war machine. The limited economic growth that has taken place can be attributed

mostly to oil revenue; still, the economic growth would have been even higher without the conflict. Third, the war in Darfur has, perhaps paradoxically, created jobs and employment opportunities for the rest of the country. The African Union/UN hybrid operation in Darfur (UNAMID) was established in 2007. It provides employment for 3,000 locals and 26,000 military personnel. The hundreds of NGO personnel working on relief efforts are also boosting aggregate demand. Although the destruction of wealth from the war has been staggering, we will attempt to capture some of the benefits UNAMID is providing for the IDPs, such as health services and food.

The paper is organized as follows: Section 2 presents the cost of defense spending in the Darfur conflict. Section 3 presents the cost of human capital destruction. Section 4 discusses infrastructure damage and proxy estimates. Section 5 presents the total cost of the war and GDP counterfactual analysis. Section 6 presents concluding remarks.

## **2. The Cost of Defense Spending in the Darfur Conflict**

Before discussing the relationship between military spending and economic growth in Sudan, we must introduce the theoretical underpinning. There are three strands of arguments on defense vs growth. The first strand holds that military spending adversely effects economic growth. Proponents of this view include Deger and Sen (1983), Knight et al. (1996), Chan (1986), Roux (1996), Lim (1983), Fain et al. (1982), Maizds and Nissanke (1985), Grobar and Gnanaselvam (1993), Pradhan (2001), Arunatilake et al. (2001), and Ra and Singh (2005). Military expenditure is a burden for nations, because it crowds out investment (Dunne and Perlo-Freeman 2003; Bilmes and Stiglitz 2008; Smith 1977 and 1989; Lindgren 1984; Galvin 2003; Rodrik 2003). The second strand of argument holds that military spending is an instrument for fiscal expansion; it increases aggregate demand and hence employment and output (Benoit 1973 and 1978). Knight et al. (1996), in a study of 44 countries, provided ample evidence that military spending has a positive impact on growth. The third strand of

argument posits an absence of causal relationship between military spending and economic growth (Biswas and Ram 1986; Payne and Ross 1992; Kim 1996; Dakurah et al. 2001).

The first strand is the most relevant to the case of Sudan. Military spending is crowding out capital investment and impeding growth. It is important to note that defense spending in Sudan is camouflaged to maintain secrecy; no line-item breakdown is available and the budget is not subject to audit. The military owns hospitals and trading companies and is involved in commerce, consequently, military expenditures are underestimated. The military establishment is also involved in oil sector, from which it is able to extract sufficient funds for its spending.

Table 1: Military expenditures and exports (in millions of dollars)

<b>Year</b>	<b>Military expenditures</b>	<b>Estimated military expenditures in Darfur</b>	<b>Oil exports</b>	<b>Total exports</b>	<b>Non-oil commodity exports</b>	<b>Oil exports as percentage of total exports</b>
1997	206	—	46	596	550	7.7
1998	596	—	60	780	720	7.7
1999	1,068	—	276	1,807	1,531	15.3
2000	1,390	—	1,300	1,699	399	76.5
2001	873	—	1,370	1,699	329	80.6
2002	1,011	—	1,511	1,949	438	77.5
2003	773	0.00	1,994	2,542	548	78.4
2004	2,198*	1,352.71	1,226	3,778	2,552	32.5
2005	1,797	951.71	4,187	5,254	1,067	79.7
2006	2,113	1,267.71	5,087	5,700	613	89.2
2007	2,676	1,830.71	8,419	8,900	481	94.6
2008	3,228	2,382.71	11,106	11,700	594	94.9
2009	3,148	2,302.71	7,836	8,400	564	93.3
<b>Total</b>		10,088.29				

Source: World Bank 2011

\* The conflict started in 2003, and government mobilization and procurement started in 2004, as can be seen by the tripling of total military expenditures between 2003 and 2004.

As Table 1 shows, military expenditures in Sudan have been rising. Before the start of the Darfur conflict in 2003, the government was spending an average of \$845 million per year on military spending; since then, military spending has more than doubled. The increase in military spending over the last six years (2004–2009) is estimated to be \$10 billion (\$1.7 billion per year), directed to the war effort in Darfur. Table 1 provides ample evidence that Darfur has consumed the biggest share of military spending. After 2003, when the Darfur war

began, Southern Sudan was relatively at peace under United Nations observation, and military activities there ceased. During the same period, the government concluded peace agreements with neighboring countries, including Ethiopia and Eritrea, and the northern opposition, known as the National Democratic Alliances, all returned home under the auspices of a peace deal brokered by Egypt. Similarly, the conflict in eastern Sudan was concluded with a peace agreement in 2006. Finally, the magnitude of the devastation and the intensity of the war make it obvious that most of the country's military resources have been directed against Darfur.

The fact that military spending is linked to the oil industry through military-owned companies has destroyed the export sector by crowding out physical capital formation in civilian industries. For example, in 1999 oil exports constituted 15 percent of Sudan's total exports. Ten years later it had increased to 93 percent. Oil exports were crowding out non-oil-sector exports because the government directed its oil revenue toward military procurement and imports of military equipment rather than improving the non-oil export sectors. The substitution effect is dominating; the government is earning cheap money by selling oil instead of relying on manufacturing such as food processing and light industries. In early study, Ali (2010) found that, out of every dollar of oil revenue, the government was spending \$0.21 on the military. This policy caused non-oil commodity exports to contract; there is no significant change between the 1997 and 2009 levels. There was an short-lived spike in non-oil commodity exports in 2004, resulting from Sudan's sale of its telecommunication services provider to a foreign entity, but on average the value of government exports was in the range of US\$600 million.

### 3. The Cost of the Destruction of Human Capital

According to the World Bank World Development Report (2011), people in fragile conflict-affected states are more likely to be impoverished, miss out on schooling, and lack access to basic health care. These challenges have a long-term impact on lifetime earnings and hence on economic development. Earlier studies have identified, as one of the indirect costs of war, productivity losses due to capital flight and human destruction (Collier and Gunning 1995; Collier et al. 1999; Hoeffler and Reynal-Querol 2003). In this section we report the number of IDPs and the affected populations, calculate the number of villages burned and total deaths, then estimate the war's productivity cost.

Table 2 shows that, as of 2009, the conflict in Darfur has affected 1.5 million individuals in North Darfur, 1.9 million in South Darfur, and 1.2 million in West Darfur. It has displaced more than 0.5 million individuals in North Darfur, 1.4 million in South Darfur, and 1.2 million in West Darfur. The direct cost of the conflict is the loss of earnings of the IDPs. We will use the average counts of displaced persons for the period 2005–2009 to compute the lost earnings for the household. In addition we will compute the lost life earnings of the dead in Darfur.

Table 2: IDPs and Affected Populations in Darfur, 2005–2009

	North Darfur		South Darfur		West Darfur		Death and destruction	
	Affected	IDPs	Affected	IDPs	Affected	IDPs	Individuals	Villages
2005	725,736	393,755	824,346	603,719	854,388	662,302	64,162	2,767
2006	1,307,025	475,257	1,413,099	722,922	1,276,087	776,348	10,859	384
2007	1,355,594	461,399	1,546,173	862,385	1,263,956	779,226	5,468	89
2008	1,516,680	508,499	1,913,518	1,410,704	1,293,394	766,363	20,788	701
2009	1,518,064	508,499	1,913,518	1,410,704	1,283,124	746,912	-671	-141

Source: United Nation Office of Coordination of Humanitarian Affair (OCHA).

The affected populations reported in Table 3 have lost their livelihoods and almost all are living on food aid. The annual loss of earnings or productivity in Darfur started at \$100 million in 2003 at the beginning of the conflict. As the conflict expanded to encompass more areas in Darfur, the loss of productivity rose to \$1.8 billion in 2009. The total productivity loss for the period 2003–2009 reached a total of \$7 billion.

Table 3: Productivity Loss in 2005 Constant Dollars

	<b>GDP per capita</b>	<b>Affected population</b>	<b>Number of families</b>	<b>Lost income</b>
2003	1,492	410,000	68,333	101,984,722
2004	1,537	1,600,000	266,667	409,978,661
2005	1,601	2,604,470	434,078	694,949,908
2006	1,744	4,196,211	699,369	1,219,399,990
2007	1,879	4,365,723	727,621	1,366,920,073
2008	1,990	4,923,592	820,599	1,633,230,390
2009	2,193	4,914,706	819,118	1,796,325,043
Total				7,222,788,786

Source: World Development Indicators, World Bank, 2011

An early study by Steidel (2005) counted 3,408 villages in Darfur: 1,173 in North Darfur, 1,100 in South Darfur, and 1,135 in West Darfur. The Amnesty International report (2004) shows that 44 percent of the villages in Darfur were burned. As the conflict progresses, more villages are burned, but at decreasing rates, as virtually no villages are left to be torched. In this study we have estimated the number of villages burned as of 2009, using the IDPs as an inference point. In the estimation process we assumed that a population of 670 for each village and a 3 percent growth rate per year from 2005–2009. As shown in Table 2, our calculation has shown the number of villages destroyed is 3380 far less than Steidel estimates

of 3, 408 from 2003 – 2004. Our estimates present the lower bound of destroyed villages. The 2,767 villages shown as destroyed in 2005 is a cumulative figure for the years 2003 to 2005. Also we have shown that in 2009, there a negative death and destructions, it is shown that there is 141 villages were built and 671 survivor, but in reality there were displacement of IDPS in 2009 in areas of Mahjeria in Darfur as movements engaged in internal fighting. Overall, our inference of the number of destroyed villages from the IDP population is sensible and reflects the reality that fewer villages were burned in 2009, as reported by different UN organizations and UNIMAID.

We also estimated the loss of lifetime earnings for the deceased in the Darfur conflict. We used conservative estimates of five to twenty-five years for lifetime earning ranges, given the life expectancy in Sudan of 58.5 years, as reported in World Development indicators, and our lack of information on the demographic characteristics of war casualties. As a per capita income figure for Sudan, we used the 2003 figure of \$399.02, when the conflict started, based on US constant dollars in 2000 as reported by the World Bank.<sup>1</sup>

There is considerable debate among various researchers as to the number of casualties in the Darfur confluct.. Table 4 shows maximum and minimum estimates from four sources: Coebergh 2006, Guha-Sapir et al (2005). (CRED)<sup>2</sup>, Reeves (2005), and the U.S. State Department 2005 and Hagan (2005). In addition, US Government Accountability Office (GAO) (2007) issued a report assessing the strengths and weaknesses of each report based on experts' opinion of methods of estimating, objectivity, and sufficiency of reporting. Though the experts gave the highest overall confidence rating to the CRED estimates, we are not sure of the extent to which professional bias was a factor in this selection, since the majority of the experts are from the health industry. In this study we are not qualifying which author is more reliable, we use mean of total aggregate of those who were killed in war. In addition, we will

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<sup>1</sup> Sudan's annual economic growth was 5.1% when the conflict started, so we discounted the future value of the earnings by 5.1 percent so as to leave the individual just as well-off as in 2003.

<sup>2</sup> The Centre for Research on the Epidemiology of Disasters (CRED).

update the count of the war dead to include the period from 2005 to 2009, since most of these studies are limited to the period between 2003 and January 2005. As shown in Table 2, the number of war dead for the four-year period of 2005 to 2009 is 100,606. This number has been added to the data reported by the previous authors. If we aggregate all the data for 2003–2005 from the different authors (227,786 deaths) and include our updates for 2005–2009 (100,606), the total number of deaths is 328,392, as shown in Table 4.

The figures for lifetime earnings in the absence of war are generated using different lifetime earning schemes that range from five to twenty-five years. Given the life expectancy in Sudan, we have chosen the conservative estimates of fifteen and twenty years of life earnings. Applying these to the total number of deaths, the total productivity loss, on average, is 1.966 billion dollars and 2.621 billion dollars respectively.

Table 4: Death Estimates Based on Reported Figures and Life Earnings after discounted Present Value

	Coebergh Estimates		CRED		Hagan et al Estimates	Revees Estimates	Estimates US Department of State		Average
	Low	High	Low	High			Low	High	
2003-2004	218,449	306,130	118,142	134,000	396,563	370,000	98,000	181,000	227,786
Ali's estimates 2005-2009	100,606	100,606	100,606	100,606	100,606	100,606	100,606	100,606	100,606
Total	319,055	406,736	234,606	218,748	497,169	470,606	198,606	281,606	328,392
5 Year Life-earning (million \$)	\$637	\$811	\$468	\$436	\$992	\$939	\$396	\$562	655
10 Year Life-earning (million \$)	\$1,273	\$1,623	\$936	\$873	\$1,984	\$1,878	\$792	\$1,124	1,310
15 Year Life-earning (million \$)	\$1,910	\$2,434	\$1,404	\$1,309	\$2,976	\$2,817	\$1,189	\$1,685	1,966
20 Year Life-earning (million \$)	\$2,546	\$3,246	\$1,872	\$1,746	\$3,968	\$3,756	\$1,585	\$2,247	2,621
25 Year Life-earning (million \$)	\$3,183	\$4,057	\$2,340	\$2,182	\$4,960	\$4,695	\$1,981	\$2,809	3,276

## 4. Infrastructure Damage and Proxy Estimates

Outside donors and the Sudan government have launched programs of refugee education, water, health, nutrition, food, protection, rule of law, and rehabilitation of infrastructure to alleviate suffering and restore the affected areas to normal condition. Actual data to estimate the damage to the infrastructure are lacking. An alternative measure is to use the humanitarian recovery and development data to estimate the damage. The government of Sudan is notorious for denying access to affected areas to humanitarian organizations for political reasons, enforced in some areas by the military and the government paramilitary forces. Therefore, the actual value of infrastructure damage is certainly underestimated.<sup>3</sup>

The United Nations and its partners began collecting data on the affected population only after 2004, so there are no systematic data for the years 2003 and 2004. The missing data years were the times when the government was intensely engaged in military tactics to defeat the rebel movements, and gruesome human-rights abuses were committed during that period. The organizations only began to operate toward the end of 2003; therefore, we use 2005 data for 2004, which greatly underestimates the cost of the war. The 2009 figures from the UN do not represent actual expenditures, but rather the required expenditures for recovery and humanitarian assistance—\$1 billion. We have used instead the actual 2008 expenditures of \$700 million, which is the most conservative estimate. The average rehabilitation expenditure per capita affected population is \$175. As shown in Table 5, the total expenditures of the donors and the government on humanitarian assistance, recovery, and development for the years 2004–2009 is \$4.1 billion.

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<sup>3</sup> For details on underestimation of war damage, see Arunatilake et al. 2001.

Table 5: UN and Partners, Darfur Work Plan Funding

	<b>Affected population</b>	<b>Humanitarian/early recovery (in dollars)</b>	<b>Recovery and development (in dollars)</b>	<b>Total rehabilitation expenditures (in dollars)</b>	<b>Per capita rehabilitation expenditures (in dollars)</b>
2003	————	————	————	————	————
2004	2,604,470	678,240,563	0	678,240,563	260
2005	2,604,470	678,240,563	0	678,240,563	260
2006	4,196,211	798,858,438	2,160,902	801,019,336	191
2007	4,365,723	555,054,447	0	555,054,447	127
2008	4,923,592	713,239,488	189,325	713,428,813	145
2009	4,914,706	713,239,488	189,325	713,428,813	145
<b>Total</b>		4,136,872,987	2,539,552	4,139,412,535	175

Source: UN and Partners Work Plan for Sudan and OCHA

In 2003 the genocide and atrocities of the government of Sudan were at their peak. We will extrapolate the 2004 data to cover 2003, because the OCHA started recording data on Darfur contributions by donor only in 2004; there are no data available for prior years.

## 5. Total War Cost and GDP Counterfactual Analysis

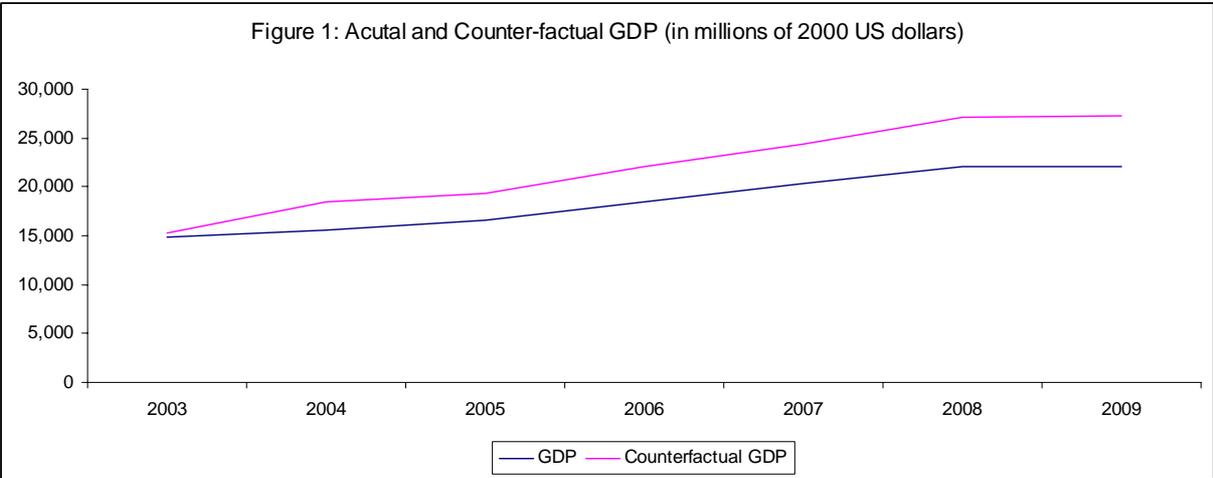
As shown in Table 6, the government of Sudan has spent \$24.07 billion on the war in Darfur. This includes \$10.08 billion in direct military expenses, \$7.2 billion in productivity lost by the IDPs, \$2.6 billion in lifetime earnings of the dead, and \$4.1 billion in infrastructure damage. In this study we have excluded the crowding-out of capital, the emigration of skilled labor, and the education lost for future generations. The Sudan economy could have grown faster without the war. To calculate the counter-factual analysis we have started with the GDP based on 2000 US constant dollars and added the war cost for each year from 2003 to

2009. The war cost started at a level of 3 percent of GDP and reached 24 percent in 2009, when the economy lost at least one-quarter of its value in destroyed goods. Figure 1 shows the clear divergence of the actual and counter-factual GDP, with no sign of convergences as the war is prolonged.

Table 6: War cost as percentage of GDP (in millions of 2000 US dollars)

	<b>GDP</b>	<b>Darfur war cost % GDP</b>	<b>Counterfactual GDP</b>	<b>Total rehabilitation expenditures (in dollars)</b>	<b>Darfur military expenditures</b>	<b>Lifetime earnings</b>	<b>Productivity loss</b>	<b>Total war cost</b>
2003	14,820.63	3.21	15,297.04	0.00	0.00	374.43	101.98	476.41
2004	15,578.51	18.07	18,393.87	678.24	1,352.71	374.43	409.98	2,815.36
2005	16,564.42	16.30	19,263.75	678.24	951.71	374.43	694.95	2,699.33
2006	18,434.41	19.87	22,096.98	801.02	1,267.71	374.43	1,219.40	3,662.56
2007	20,307.83	20.32	24,434.95	555.05	1,830.71	374.43	1,366.92	4,127.12
2008	22,002.15	23.20	27,105.95	713.43	2,382.71	374.43	1,633.23	5,103.80
2009	22,002.15	23.57	27,189.05	713.43	2,302.71	374.43	1,796.33	5,186.90
Total	—	—	—	4,139.41	10,088.29	2,621.00	7,222.79	24,071.49

Source: GDP data, World Bank 2010, OCH



## 6. Conclusion

This paper calculates the cost of the Darfur war from limited data, conveying the magnitude of the death and destruction in dollar terms. These numbers are underestimated, but this study can be used as a baseline for future research, since hitherto no serious attempt has been made to assess the economic cost of the war. The conservative estimate of \$24 billion US (2003–2009) is a huge amount of resources for Sudan—162 percent of GDP. While the country has spent only 1.3 percent and 1.2 percent of its budget on public health and education respectively for more than two decades, it can apparently afford to allocate 23 percent of GDP annually for war efforts in Darfur. There is no economic reason to continue a war that consumes 16 to 23 percent of GDP, in a society that lacks the means to provide the basic entitlements of education, food, health, and shelter. The first step for recovery from the war is to stop the war. It is clear that Sudan is a poor country, with an abundance of resources when it comes to war but meager when resources ought to be directed to human capital, clean water, and a better health system. As a matter of public policy, the country should now put itself into position to recover from war and trade the guns for butter by establishing mechanisms for good governance, democracy, and empowerment of the international system, to keep future wars from occurring.

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*\* American University in Cairo, School of Global Affairs and Public Policy, Department of Public Policy and Administration, Egypt, Cairo*

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