

POST-CONFLICT WEIGHTED SCORING MODEL DEVELOPMENT FOR SUDAN

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Abstract

The Army, as an agent of the nation, continues to engage regions of conflict. Multiple level engagements, especially after conflict has occurred, are exceptionally expensive, dangerous and poorly planned. The US is in a better position to engage if regions are identified prior to going into (or back into) conflict. Planned efforts to engage these regions will result in less expense in terms of money and people. A value focused approach was used to develop a weighted scoring model of post-conflict indicators in Southern Sudan. The development of post-conflict indicators proved challenging and was complicated by the lack of data to score indicators. Development of the indicators was assisted by a systemigram which illustrated the complex relationships between indicators. Validation of the weighted scoring model is ongoing but initial indications are positive. Continued development of indicator scoring is essential for successful use of the weighted scoring model in the future.

Keywords: Sudan, post-conflict indicators, value focused thinking, weighted value model

Introduction

Southern Sudan had been at civil war with the north since 1955 for various reasons to include religion, majority party tyranny, and conflict over oil. The second civil war ended in 2005 with the signing of the Comprehensive Peace Agreement (CPA). A promise outlined in the CPA was the opportunity for Southern Sudan to vote for their independence from the North. The referendum took place this January with 98 percent of votes in favor of separation. This is great news for the people of Southern Sudan and champions of democracy worldwide. However, Southern Sudan is plagued by many of its own internal problems and instability and the potential of civil war is a possibility. In support of the emergence of Southern Sudan and other countries worldwide, this research determined that the four main areas of focus in predicting civil war or the potential for conflict were security, social, economic, and governance. We developed more specific conflict indicators within each of these

functions and tried to model and understand their dependencies.

We developed two products; a systemigram and a weighted value model, which assisted in greater understanding of the conflict. Conflict in Sudan is far from a simple problem. There are many factors of influence, which in turn add or take away from the possibility of civil war. To understand the complexities better, a systemigram attempts to mitigate some of the confusion by providing a visual representation of the relationships and enables us to examine the links and interactions between elements of the system. The systemigram is also used to help develop our weighted value model. The intent of the systemigram is to show the relationships between the indicators which help validate our scoring methodology of the weighted value model. The weighted value model helps us understand the impact each indicator has on the whole system. It is a mathematical model that takes input data for each indicator and computes an overall value or score. The indicators are weighted based upon stakeholder input as to their level of importance and influence. The computed value provides an indication as to how likely Southern Sudan will go to civil war.

The goal of our research is to develop a workable tool for our major stakeholder - United States African Command (USAFRICOM). Their analysts will use this tool as a template, which can be modified for predicting conflict in other countries. We also plan to develop some fundamental understanding of the interdependencies of the functions and second order effects.

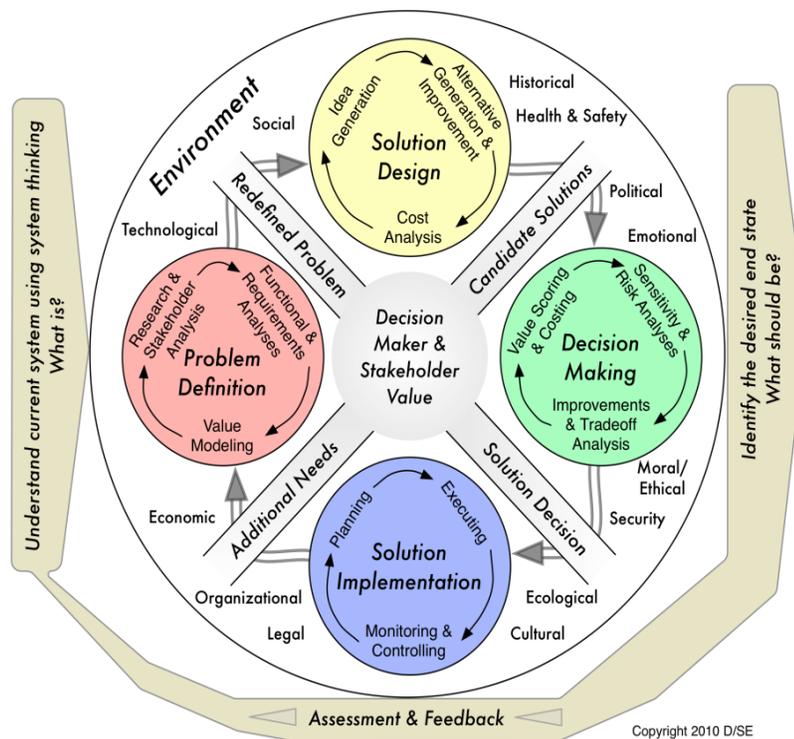
Research Methodology

The Systems Decision Process (SDP) is the organizational model that structured our work effort during this project. It is a comprehensive and proven method for problem solving and decision making. It is flexible enough to accommodate the needs of almost any problem and is shown in Exhibit 1 (Parnell et al., 2010).

Problem Definition began in early January 2011 when we were tasked with developing a weighted scoring approach to post conflict indicators in Southern

Sudan for USAFRICOM. We conducted background research on US Policy to date, Darfur, the role of religion, the referendum, and the history of Sudan. We presented our findings and continued to research literature on Sudan. We began development of a comprehensive systemigram which allowed us to develop an initial scaffold of the weighted value model. After submitting our initial work and receiving feedback from USAFRICOM, we had our research statement clearly defined to create a tool for evaluating the likelihood of Southern Sudan falling into civil war.

Exhibit 1. The United States Military Academy Systems Decision Process



During *Solution Design*, we took our stakeholder analysis and enhanced our systemigram and value model through interviews with subject matter experts as well as stakeholders with a Sudan perspective. This proved critical to validating the model. Continued group collaboration, research, and tweaking of the model led to our finished product. Our project is unique and very specific which eliminated the alternative generation portion of this phase. We did not consider different decision analysis tools as possible alternatives.

The *Decision Making* phase is left to the analysts working for USAFRICOM. Time constraints, limited our work to the creation of the weighted value model. The future work in this area involves interpreting the output and determining the significance of specific

values. Sensitivity analysis is also a possible area of future work.

Solution Implementation is left to the USAFRICOM stakeholders. The weighted value model provides them the tools they required to analyze Southern Sudan. Expansion and implementation beyond this initial model is the decision of USAFRICOM.

Current System

Current systems do not tailor their models to a specific state. What may fit a certain conflict may not necessarily have a similar impact or relevance in other conflicts. For example, the issue of cattle raids is extremely important in Southern Sudan. However,

cattle raiding may not really be a problem or may not even exist in another nation. Our model addresses conflict indicators that are unique to Southern Sudan, providing us with the most accurate results possible.

Numerous tools exist which measure different statistics and compare them on a state-by-state basis after the fact. However, no tools provide anything that actually predicts conflict. Rather, they simply allow users to compare statistics against other states. Conversely, the weighted value model developed here should provide a value prediction of possible conflict before it occurs. It does it by giving a numeric value for each indicator which is then summed to provide an overall value which will indicate the likelihood of Southern Sudan going transitioning into civil war. The weighted value model uses indicators that were

developed specifically for Southern Sudan. Additionally, the indicators in the model are weighted according to their significance against each based on the variability of the scoring range and the stakeholder importance.

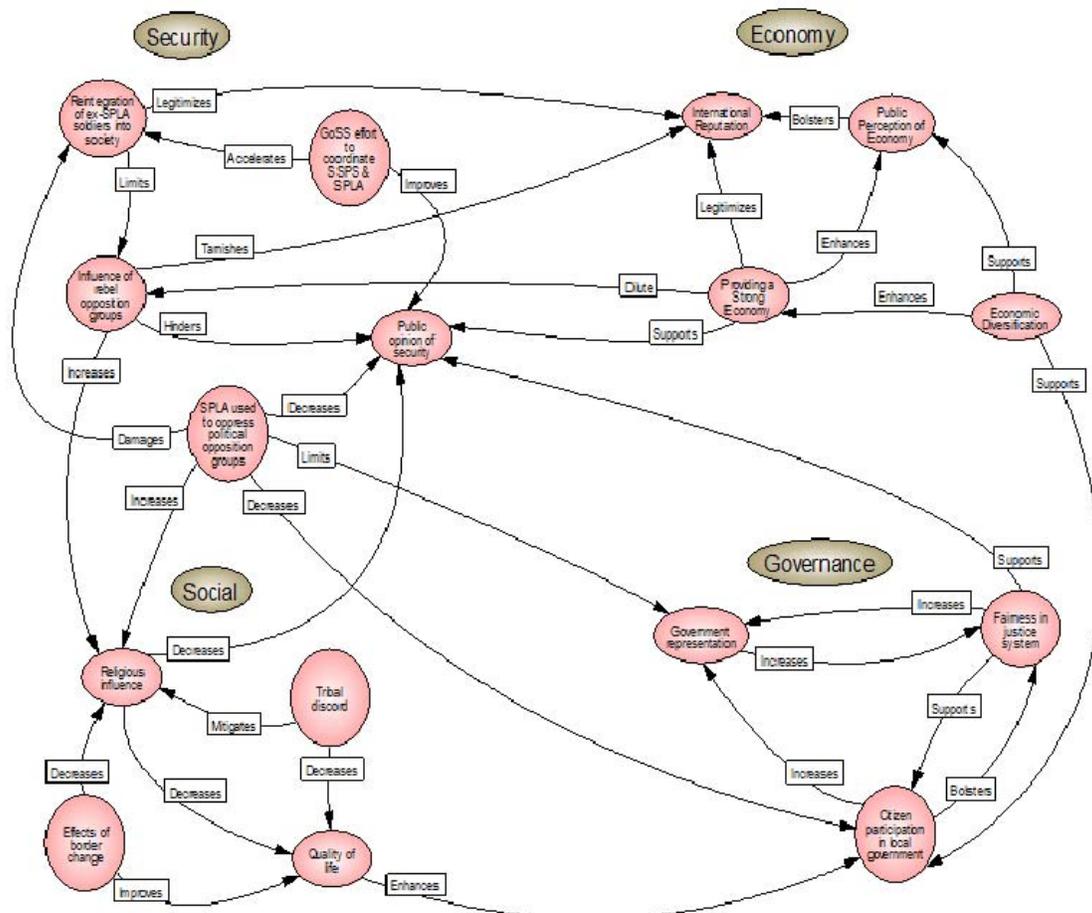
One major area where current models fail to provide clarification is in interactions between indicators. They view the different statistics and indicators as stand-alone separate entities. This is far from how real-world conflict indicators function. Our model addresses this oversight in the current system through the development of the systemigram. The systemigram shows a visual representation of the interactions between the functions of the system.

To summarize, the weighted value model developed here has enhanced current models by providing a comprehensive relational approach to the development of a predictive model versus an after-the-fact model.

Exhibit 2. Southern Sudan Systemigram

Systemigram

Upon completion of our literature research and stakeholder analysis, we broke our conflict into four functions: security, economic, social, and governance. These functions serve as broad topics of interest by which specific indicators are developed. Although these four functions do provide us a basic understanding of the problem, they not clearly or distinctly show how each element relates to other elements. While attempting to model all relationships between security, economy, social and governance sectors of Southern Sudan, we needed a tool to help construct those relationships in a clear manner. We used a systemigram (Exhibit 2) to help us understand the relationships between each of the functions. By specifically identifying the most important elements within each of the four sectors, the relationships became much more understandable. There are two primary users for this tool; our team, who is researching the individual post-conflict indicators, and



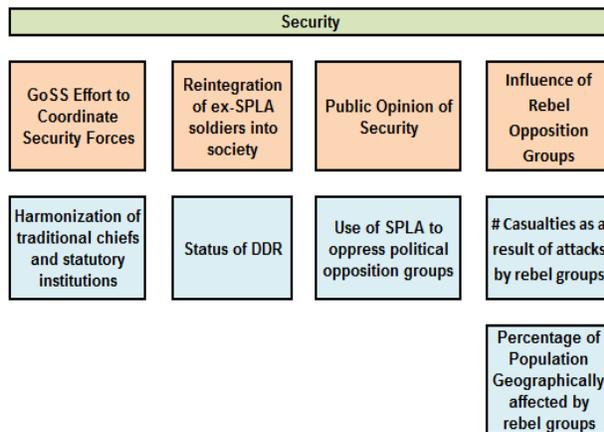
the USAFRICOM analysts who will refine our indicators and the weighted value model. The benefit of the systemigram is that the client can easily search for how nodes are interconnected and influence each other.

Security Function

The security objective focuses on the functions of security force coordination, reintegration of soldiers (SPLA – Sudan People’s Liberation Army), public opinion and rebel group influence (Exhibit 3).

Security in Southern Sudan is an exceptionally important factor for the population. The people of Southern Sudan do not care “how” security is achieved just as long as it “is” achieved. Scott Feil (2002) contends that international efforts can be used effectively to coordinate the large-scale efforts to stabilize a nation by enforcing rules and cease-fires as well as reintegration of military forces back into society, and reconstruction of security institutions. The Government of Southern Sudan (GoSS) needs to be involved in that process so the population will view the new government as legitimate.

Exhibit 3. Security Indicators



A critique of recent post-conflict reconstruction efforts has been “ad hoc” and “unsystematic”. The United Nation’s policy’s towards post-conflict reconstruction is based on interstate conflict and not “intrastate” conflict. The UN recognizes that half of all peacekeeping operations fail after 5 years and there is no clear idea of what success or failure actually mean, nor an appropriate timeframe. Post-Conflict Peace Building (PCPB) is realistically analyzed as a highly ambitious venture. The ideas of social engineering, human security, and piecemeal social engineering are new and relevant to the success of these PCPB environments. Social engineering is the effort to influence social behaviors on a large scale whereas piecemeal social engineering attempts to influence

social behavior on a smaller scale. While both are related the approaches are different in scale. There is a basic assumption that a sophisticated social engineering approach is needed with PCPB operations. But when it is applied at a large scale it is not highly successful. There is a gap in PCPB operations (development) between security and social engineering. Therefore, the concept of human security can help bridge this gap with the use of piecemeal social engineering and provide a more consistent approach to PCPB (Krause and Jutersonke, 2005).

The book, *Measuring Progress in Conflict Environments (MPICE): A Metrics Framework*, is a collection of outcome-based goals, indicators, and measures of stability in conflicted areas. MPICE’s outlook on security establishes that in order to have a safe and secure environment, you must diminish the drivers of conflict and strengthen institutional performance. Under these two goals, MPICE establishes a total of 115 potential indicators. MPICE provided us a broad range of indicators, of which we would be able to analyze and determine which, if any, were appropriate for use in Southern Sudan. Ultimately, we tailored some of their indicators to apply to the situation in Southern Sudan (Agoglia et al., 2010)

The general understanding of post-conflict environments led us to non-governmental organizations (NGOs) such as the United States Institute of Peace (USIP) and the United States Agency for International Development (USAID) that actively do humanitarian work in Sudan. The director for Sudan inside USIP is Jon Temin. Jon Temin’s online resources began to paint a picture for us of the security situation in Southern Sudan: in the South, the Referendum does not seem to be the end of struggle. Logistically and administratively, independence is a major task to maintain stability. Although Southern Sudan declared independence, it faces issues of internal security. There were approximately 2,500 violent deaths within Southern Sudan in 2009. How the SPLA handles this conflict internally is unknown. There are high expectations that life will improve dramatically following the declaration of independence; however, the government is young, and progress will take time. Violence along the border region will still be prominent and small skirmishes have the potential to escalate into larger, uncontrollable conflicts (Temin, 2011).

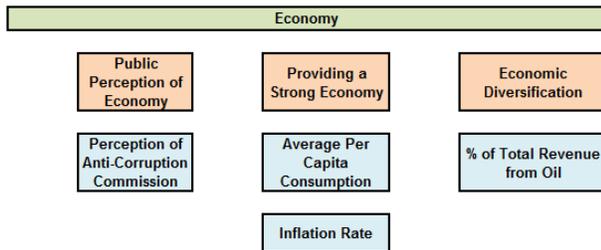
A greater understanding of post-conflict indicators and the situation in Southern Sudan led us to a personal interview with Jon Temin. This interview directed us towards an independent research project known as Small Arms Survey located in Geneva, Switzerland. One of the most useful resources for the security section of our research, Small Arms Survey has an

international expert staff that serves as the principal international source of information on armed conflict. Small Arms Survey has a branch dedicated to Sudan known as the Sudan Human Security Baseline Assessment (HSBA). HSBA is a research project to objectively track the security and stability of Sudan and provides reports as well as quantitative data. This is precisely what we needed to accomplish our project. HSBA's reports on rebel groups, the status of Disarmament, Demobilization and Resettlement (DDR) in Southern Sudan and the SPLA allowed us to develop the five security indicators (GIIDS, 2011)

Economic Function

The economic functions that are most relevant for Southern Sudan are public perception of the economy, providing a strong economy and economic diversification (Exhibit 4). Understanding the country's economic fundamentals and background are critical to understanding the economic factors that may cause a country to fall into civil war. Sudan historically was an agrarian society based in subsistence farming and included crops such as cotton, and gum. Additionally, Sudan exported domestic animals such as camels, goats and sheep. With the discovery of large oil reserves, the petroleum industry emerged as a major source for economic growth and revenue. Sudan has tried several times, since achieving independence, to implement measures to address the economic turmoil. The public perception of the economy is very poor as inflation continues to deteriorate gains. In recent years the government focus has been on stabilizing the economy (Abadi and Ahmed, 2006).

Exhibit 4. Economic Indicators



There are two economic classes in Southern Sudan: the rich and the poor. This is a major challenge as the perception of economy is regarded as very poor due to the distribution of wealth between these two groups which leaves the majority of the population without solid economic viability. The majority of the people view this as a significant factor to their harmony and well being (Dau, 2011).

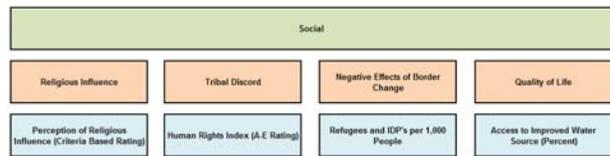
One of the major economic needs in Sudan is capital. To increase capital Sudan must enhance business

interest in the country. Sudan is currently ranked as one of the last countries when it comes to ease of doing business. Therefore, major reform is need is on all fronts in order to develop a thriving and diversified economy (Denu-G, 2011). Diversification is needed as the current percentage of GDP coming from oil is at 98%. Several approaches have been suggested to diversify the economy. One method is unique and would allow money to flow directly to where the poverty is greatest. At a micro level, the development of Home Based Enterprises (HBE) is a method to tackle the extreme poverty, but much more effort in this area is needed. With an oil based economy which has extreme poverty, money from oil revenue can be invested by the government toward establishing HBEs to allow more money to flow into the lowest economic levels (Ibrahim, 2002).

Social Function

The main social indicators in Southern Sudan are religious influence, tribal discord, negative effects of border change and quality of life (Exhibit 5).

Exhibit 5. Social Indicators



The influence of the religion in Southern Sudan cannot be understated. Exhaustive literature on the Sudan focuses particular emphasis on the many religious divisions created as a consequence of the confrontation between Islam and Christianity. Islamists have dominated the Sudanese government since 1989 and has supported open oppression of religious freedom. Apostasy, conversion of Muslims to another religion, is punishable by death and covert persecution of Christians is common. The government refuses construction of Roman Catholic churches and openly supports security forces attacks on Christian churches and schools (International Crisis Group, 2002). The effects of this effort by the Islamists have been dramatic. During the past 27 years, with over 2 million casualties, there are more casualties than in Angola, Bosnia, Chechnya, Kosovo, Liberia, the Persian Gulf, Sierra Leone, Somalia and Rwanda combined. With a total population of 45 million, that is approximately 4.4% of the total population. Additionally, more than 29 million (64% of the total population) were left homeless which places traumatic pressure on different regions within Sudan as well as surrounding countries (Martin, 2002). Finally, the religious competition is not evenly matched with over

70% of the Sudanese population Muslim and less than 30% Christian. The imposition of Sharia Law across the Southern Sudan created a clear distinction between the religions with Muslims at the top, the Christians and remaining others at the bottom (Vale, 2011).

Another important social indicator is tribal discord. Tribal discord is also understood as racial conflict. Some insist that the underlying challenges in Sudan are racially based and are the main factor in determining conflict whereas religion is added as an additional component to the race issue (Makau, 2004). There is also a historical slavery conflict between the north and the south based upon tribal/racial lines. Finally, the institutions of marriage and work are cut along racial lines as well. Arabs marry southern girls regardless of race and religion whereas Arabs will not allow their daughters to marry Southern men regardless of race and religion (Yokwe, 2011).

The effects of border change have a tremendous impact on the population mainly due to the impact of refugees. In particular, the Abyei region of Southern Sudan is disputed between the North and South which includes the historical grazing areas of several different tribes as well as rich oil reserves. Just recently, the North has pushed into Abyei to claim more territory which has displaced the Agok people and forced them south (Fink, 2011).

The quality of life indicator for Southern Sudan is manifested in the concept of “water access”. Tribes have been fighting each other for centuries over grazing land, water points and land. Water as a quality of life indicator is very telling and provides great insight to how the people are feeling (Riaka, 2010). The primary source of water in Southern Sudan is boreholes and small wells, which makes the conflict over water more important, as these are limited and produce small amounts of water at any given location.

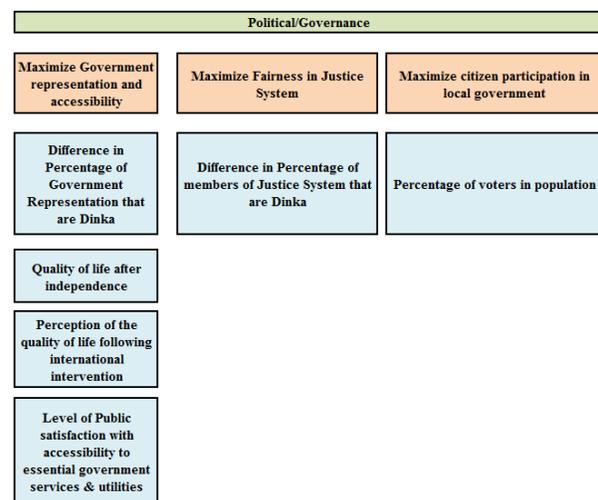
Governance Function

As a brand new government, the GoSS has many challenges it must address, both immediately and in the long run. The most important aspects pertain to more of the short-term challenges, as the nation needs to stabilize their situation in order to gain the trust, respect, and reputation of both its citizens and the rest of the world. These indicators include maximizing representation and accessibility in and to the government, fairness in the justice system and citizen participation in local government (Exhibit 6).

Prior to the passing of the Referendum, people of Southern Sudan had high hopes and expectations for their new government. After the referendum, if their new government does not deliver on those promises, the faith of the people in the government will greatly deteriorate and the morale will diminish. A major problem in Southern Sudan is limited access to

government information. This is especially true for the more volatile regions such as Unity and Darfur. One resultant problem from limited access is the difficulty acquiring numeric data for regional statistical analysis. Outright censorship of the domestic media also complicates the situation. Corruption and the security deterioration in Southern Sudan are the resultant negative aspects of limited access. This is extremely troubling for Southern Sudan’s citizens, since they deserve open access to information if they are to live in a democracy. If they don’t trust the government, they will not participate in the government thus exacerbating the fragile new government’s legitimate position (Temin, 2011).

Exhibit 6. Governance Indicators



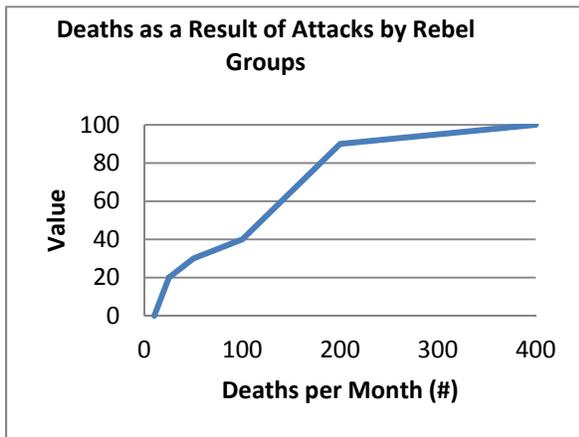
Finally, the justice system is a major component of any government. The perception of the justice system as fair and just is critical to the survival of the government and a larger extent civil society. Representation of minority groups within the judiciary will go a long way to ensure, in the eyes of the people, that there is fairness in the process and therefore the government (Temin, 2011).

Value Measures and Swing Weight Matrix

One of the more difficult aspects of the weighted value model is the development of the value measures for each indicator. The value measures were developed based upon best and worst case outcomes provided by stakeholders. For example, under the Security function, the indicator, “Deaths as a Result of Attacks by Rebel Groups”, is identified as a major contributor and important indicator. With the existence of rebel groups clashing with government forces, the conflicts produce casualties. Because of the unavailability of a breakdown of casualties by type (civilians, armed combatants, men, women, children, etc..) we chose to

base this indicator solely on the number of casualties. This indicator has both strengths and weaknesses. The strengths are that it is a quantifiable measure that directly shows an impact on the population, is already tracked by Small Arms Survey, can be adjusted monthly, and can be updated once more sophisticated statistics are collected. The weaknesses are that it does not show a breakdown of the casualties by type. Also, a single event may cause more casualties in a specific region, and this is also not shown by this indicator (Dau, 2011).

Exhibit 7. Security Value Measure Example



After identifying the number of casualties as an indicator, we developed a scale that translated raw data (deaths per month) into a universal value scale (100 indicating most likely to go to conflict, 0 indicating least likely). In order to determine the values for this

Exhibit 8. Swing Weight Matrix

		Level of Importance								
		High			Moderate			Low		
Variation	High	# Casualties as a result of attacks by rebel opposition group (by month)	Sw	Mwt	Quality of life after independence	Sw	Mwt			
			100	0.1042	50	0.0521				
	Moderate	Status of DDR	85	0.0885	Inflation rates	45	0.0469	Perception of Anti-Commission on Corruption	20	0.0208
		% of total revenue from oil	80	0.0833	Harmonization of SPLA, SSPS, and traditional Boma Chiefs	45	0.0469	Percentage of Judiciary that are Dinka	15	0.0156
		Refugees and IDP per Capita	80	0.0833	Perception of the quality of life following international intervention/assistance	45	0.0469			
	Low	Human Rights Index	65	0.0677	Percent Population with Access to improved Water Source	40	0.0417	Use of SPLA to oppress political opposition groups	10	0.0104
		Percentage of population geographically affected by rebel groups	60	0.0625	Percentage of voters in population	40	0.0417			
		Per Capita Consumption	60	0.0625	Perception of Religious Influence	35	0.0365			
		Level of public satisfaction with accessibility to essential government services and utilities	55	0.0573	Percentage of government representation (Dinka)	30	0.0313			

scale, we researched current and recent wars to determine what kind of casualties a modern war produces. Looking at the statistics of the war in Afghanistan, the beginning of the war (2006) saw a casualty rate of 404 deaths per month (a combination of civilian, Taliban, ANA, and coalition forces). We also looked at the current data in Southern Sudan from 2010, which translated to approximately 76 deaths per month. Due to the current instability of Southern Sudan, we identify approximately 130 deaths as the midway mark. Because Afghanistan is undoubtedly a nation at war, we used 400 as the extreme “100” value (Exhibit 7). If Southern Sudan reaches this number, it will be classified as fighting a civil war (GIIDS, 2011). Likewise we conducted similar analysis for the remaining 18 indicators.

Once the metrics are developed we determined the level of importance, assigned weights and then normalize those weights (Exhibit 8). We use a swing weight matrix to assign weights at different levels in the value hierarchy. To assign weights, any swing weight technique can be used, e.g. balance beam or value increment to assess the remaining weights. The swing weight matrix technique (Parnell et al., 2010) is used in this research. Global swing weights are obtained by normalizing the weights as shown using the formula identified in equation (1) below.

$$w_i = \frac{f_i}{\sum_{i=1}^n f_i} \quad (1)$$

Where f_i is the un-normalized matrix swing weight corresponding to value measure i .

A swing weight matrix is used to assign weights

based upon the importance of the value measure to the decision makers/stakeholders and the range of the value measure. Note that value measures are typically placed in the right cell depending upon their

decision under consideration. The definition of importance and variation is different for each decision and requires thoughtful analysis. The task is similar to defining two constructed scales. Variation may be easier to discuss as the impact of the value measure

Exhibit 9. Input Matrix – Initial Best Case Scenario

Indicator (Range of Input)	Input (Raw Data)	Relative Score (out of 100)
Security		
Casualties per Month as a Result of Attacks by Rebel Groups (# between 0-400)	0	0
Percentage of population geographically affected (%) (0-100)	0	0
Perception of Effectiveness of Reintegration (Drop-Down Menu)	DDR completed; no issues outstanding; no armed groups pose threat	0
Use of SPLA to oppress political opposition groups (Drop-Down Menu)	No	0
Harmonization of Boma chiefs, SSPS, SPLA (Drop-Down Menu)	All three groups work towards same goal	10
Economy		
Percent of Total Revenue from Oil (0-100)	0	0
Inflation Rates (0-100)	0	0
Perception of anti-commission corruption (Drop-Down Menu)	Effective	0
Average Per Capita Consumption (SDG) (# between 0-150)	150	0
Social		
Perception of religious influence (Drop-Down Menu)	Motivates, unites, and encourages peace; powerful figureheads	0
Human Rights Index (Drop-Down Menu)	A	0
Refugees and IDP per Capita (0-250)	0	0
Percent Population with Access to Improved Water Source (0-100)	100	0
Governance		
Percentage of government representation Dinka (0-100)	0	0
Quality of life after independence (Drop-Down Menu)	Extremely Satisfactory	0
Perception of Quality of Life Following International Intervention (Drop-Down Menu)	Extremely Satisfactory	0
Level of public satisfaction with accessibility to essential government services and utilities (Drop-Down Menu)	Extremely Satisfactory	0
Percentage of voters in population (0-100)	100	0
Percentage of Dinka Judiciary members (0-100)	0	0

TOTAL LIKELIHOOD OF CIVIL WAR 1

importance and variation. Variation is difficult to ascertain because we routinely make intuitive judgments about importance without the impact of the actual variation of the value measure range for the

range on the decision. Our final Swing Weight Matrix (Exhibit 8) shows all of indicators together with relative and normalized weights. The indicators are grouped by both row and column. They are given a relative weight from 0 – 100 based on the relative

Exhibit 10. Input Matrix – Current Sample Data

Indicator (Range of Input)	Input (Raw Data)	Relative Score (out of 100)
Security		
Casualties per Month as a Result of Attacks by Rebel Groups (# between 0-400)	76	35
Percentage of population geographically affected (%) (0-100)	0.08	53
Perception of Effectiveness of Reintegration (Drop-Down Menu)	Implementation largely completed with remaining 25% coming through DD process; institutional arrangements and government policy support continued progress	20
Use of SPLA to oppress political opposition groups (Drop-Down Menu)	Yes	100
Harmonization of Boma chiefs, SSPS, SPLA (Drop-Down Menu)	Interference of SPLA with criminal justice matters	50
Economy		
Percent of Total Revenue from Oil (0-100)	93	93
Inflation Rates (0-100)	11.7	94
Perception of anti-commission corruption (Drop-Down Menu)	Somewhat effective	50
Average Per Capita Consumption (SDG) (# between 0-150)	100	30
Social		
Perception of religious influence (Drop-Down Menu)	Population realizes Church efforts	33
Human Rights Index (Drop-Down Menu)	E	100
Refugees and IDP per Capita (0-250)	123	92
Percent Population with Access to Improved Water Source (0-100)	70	45
Governance		
Percentage of government representation Dinka (0-100)	13	13
Quality of life after independence (Drop-Down Menu)	Very Satisfactory	20
Perception of Quality of Life Following International Intervention (Drop-Down Menu)	Satisfactory	20
Level of public satisfaction with accessibility to essential government services and utilities (Drop-Down Menu)	Unsatisfactory	50
Percentage of voters in population (0-100)	65	3
Percentage of Dinka Judiciary members (0-100)	50	55

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variation and importance. By row, the indicators are grouped by level of variation in the indicator value scale from low to high. By column, the indicators are grouped by relative importance to the overall model as determined by the stakeholders. The user can easily modify the relative weights and adjust them to suit any new information that is gathered. These cells are directly linked to the user data input page and will modify the final score.

Input Matrix

After completing the value measures and development of the swing weight matrix, the final weighted value model is developed using an input matrix which calculates the "Total Likelihood of Civil War". The Input Matrix is what the end users see whenever they open the Weighted Value Model Excel document. It provides an upfront view of all the indicators, grouped by sector. At the bottom is the final score for the *Total Likelihood of Civil War*.

In Exhibit 9, the matrix is populated with the data that yields the lowest score (out of 100) for the likelihood of civil war. This will result in a score of 1, since this would be the best case, lowest likelihood data. All the sample values are at the most optimistic/extreme ends of the input ranges. This results in a very low likelihood of conflict.

In Exhibit 10, the matrix is populated with the most current data as of this writing, which yields a score of 51. Exactly what that score means is undetermined. USAFRICOM is taking the model from this research to refine and develop an understanding of the numeric results from this weighted value model.

Conclusions

Development of indicators to predict the likelihood of a country to go to civil war is unique. Much research has focused on the post conflict analysis with little on a predictive measuring tool. This research and resulting weighted value model provide a good attempt at trying to identify appropriate and applicable indicators, their relative importance and value measures in order to determine if a country will go to civil war. The indicators were determined after extensive research and interviews with a number of stakeholders. In particular, the interview with John Dau provided great insight into the values and perspectives of the people of Sudan. This insight provided for more accurate indicator selection and value measure development. The final weighted value model provides a clear, concise and easy to use tool to make an assessment of current conditions in Southern Sudan. Additional research is needed to assess the values with the overall number generated by the model.

References

- Abbadi, Karrar A.B. and Adam E. Ahmed, "Brief Overview of Sudan Economy and Future Prospects for Agricultural Development," Khartoum Food Aid Forum, 6-8 Jun 2006.
- Agoglia, John, Michael Dziedzic, and Barbara Sotirin. *Measuring Progress in Conflict Environments (MPICE): A Metrics Framework*. United States Institute for Peace Press, 2010. Pp 1-7.
- Dau, John, Personal Interview, The Lost Boys of Sudan, Washington, D.C., 25 Mar 2011.
- Denu-G, Berhanu, "An Agenda for Institutional Reforms in Sudan/South Sudan," *Sudan Economy Research Group Discussion Papers*, Institute for World Economics and International Management, Discussion Paper No. 39, Bremen, Germany, Apr 2011, pp.63.
- Feil, Scott, "Building Better Foundations: Security in Post-conflict Reconstruction." *Washington Quarterly* 25, no.4 (Autumn 2002).
- Fick, Maggie, "South Sudan Threatens to Retaliate Against North in Border Dispute," *The Christian Science Monitor*, 24 May 2011.
- Graduate Institute of International and Development Studies (GIIDS), "Sudan Human Security Baseline Assessment," *Small Arms Survey*, The Graduate Institute of International and Development Studies, <http://www.smallarmssurveysudan.org/index.html> (cited May 2011).
- Ibrahim, Badr-El-Din, "The Role of Home Based Enterprises (HBE's) in Alleviating Sudanese Urban Poverty and the Effectiveness of Policies and Programs to Promote HBE's," *Sudan Economy Research Group Discussion Papers*, Institute for World Economics and International Management, Discussion Paper No. 34, Bremen, Germany, Dec 2002, pp.36.
- International Crisis Group, *God, Oil and Country: Changing the Logic of War in Sudan*, Brussels: IGC Press, 2002, p 93-98.
- Krause, Keith and Oliver Jutersonke, "Peace, Security and Development in Post-conflict Environments," *Security Dialog*, December 2005, vol. 36, no. 4447-462.
- Makau, Mutua, "Racism at the Root of Sudan's Darfur Crisis", *The Christian Science Monitor*, 14 July 2004.
- Martin, Randolph, "Sudan's Perfect War", *Foreign Affairs* (Mar/Apr 2002), Vol. 81, No. 2: 111
- Parnell, Gregory S., Patrick J. Driscoll, and Dale L. Henderson, *Decision Making in Systems Engineering and Management*, Second Edition, New York: John Wiley and Sons, (2010), p. 17.
- Riaka, Lago G., "Analyzing Tribal Conflicts in Southern Sudan and GOSS Failure in Dealing with the Problem", *Sudaneseonline.com*, 3 Feb 2010,

http://www.sudaneseonline.com/en216/publish/Articles_and_Analyses_12/Analyzing_tribal_conflicts_in_southern_Sudan_and_GOSS_failure_in_dealing_with_the_problem_By_Lago_Gatjal_Riaka_USA_printer.shtml (cited May 2011)

Temin, Jon, Personal Interview, US Institute of Peace, Washington, D.C., 16 Feb 2011.

Vale, Richard J., "Is the Sudan Conflict Best Understood in Terms of Race, Religion, or Regionalism?" e-International Relations, WordPress, <http://www.e-ir.info/?p=8854>, (cited May 2011)

Yokwe, Eluzai M., "Conflict Resolution in the Sudan: A Case Study of Intolerance in Contemporary African Societies", Department of Linguistics and African Languages, University of Nairobi, Kenya, <http://archive.lib.msu.edu/DMC/African%20Journals/pdfs/africa%20media%20review/vol11no3/jamr011003006.pdf> (cited May 2011).