

Strategic Multilayer Assessment (SMA)

Joint Staff/J39

Assessment of Strategic Implications of Population Dynamics in the Central Region

Integration Report: Black Swan Scenarios

Research Team Reports

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Ackerman, G.A., Wetzel, A., Clifford, D., Peterson, H., & Latourette, J. (February 2020). **Red teaming great power competition in the USCENTCOM AOR.** University of Albany Center for Advanced Red Teaming [Report](#).

Jafri, A., Kuznar, L. A., & Day, J. (February 2020). **VANE Modeling: Test & Findings.** NSI, Inc. Report.

Kuznar, L. & Day, J. (March 2020). **Hunting Gray Rhinos and Black Swans: Statistical and machine learning models of political stability and terrorism.** NSI, Inc. [Report](#).

Kuznar, L. A., & Kuznar, E. C. (March 2020). **Key factors in the USCENTCOM AOR: SME elicitations and background research.** NSI, Inc. [Report](#).

Kuznar, L. A., & Peterson, N. (March 2020). **SMA USCENTCOM panel discussion—Black Swans and Gray Rhinos in the USCENTCOM AOR: Vigilance against the unsuspected and keeping our eyes on the prize.** NSI, Inc. [Report](#).

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Black Swan Scenarios

At the request of United States Central Command (USCENTCOM), SMA initiated a study to understand the strategic implications of destabilizing population dynamics within the Central Region. The effort examined drivers of instability in the region emerging from radicalization, great power competition, state-level instability, and Black Swan scenarios. This report integrates the research conducted by the teams listed on the front cover in response to USCENTCOM's questions about Black Swan scenarios, as well as Black Swan issues in general.¹ This report is intended to be a succinct, easily navigable representation of the exceptional work by the collective team. Please click on the links embedded in the front page to go directly to the research reports.

Much is made of Black Swans by financiers, pundits, and national security experts (Bellomo, Herrero, & Tosin, 2013; Hunt, 2008). It is easy for such provocative and frightening concepts to become the flavor of the day without thinking through if they matter and, if they do, why. Dr. Claudio Cioffi-Revilla summed up the reason why we should be concerned with Black Swans: they matter because the aim of science in the service of national security is to achieve strategic excellence and not merely react to crises surprised and flatfooted. Further, strategic excellence will not be achieved without applying advanced scientific methods to understand problems like Black Swan surprises. LTC Thomas Pike stressed that warfighters must possess the technical skills to use these methods in order to achieve strategic success. This report integrates various SMA Black Swan research efforts as examples of the kinds of information, data, modeling, and thinking required to achieve strategic success in the USCENTCOM AOR. Examples of surprises that can be avoided and how to monitor them are given, and a range of potential Black Swans that could happen but cannot be predicted are reviewed. Each of the SMA Black Swan efforts also provide USCENTCOM with guidelines for thinking through Black Swan scenarios and recommendations as to what can be monitored and predicted, and these are highlighted at the conclusion of this report.

1. Black Swans vs. Gray Rhinos

Black Swans are sudden, unexpected surprises that are the result of non-linear interactions and rare events that by definition cannot be predicted (Taleb, 2007). In contrast, Gray Rhinos are trends for which there are available data that can be monitored and analyzed; they surprise us simply because we are not looking (Wucker, 2016). In both cases, there is a failure of imagination because their possibilities were not considered in the first place. This distinction is operationally significant. It is easy to label every surprise an inevitable Black Swan, but not every surprise has to be. Identifying avoidable surprises that we can actually anticipate (i.e., Gray Rhinos) enables operators to plan against them specifically. Identifying real Black Swans enables planners to contemplate true surprises and mitigate against a range of potential risks. This report will highlight both capabilities. Gray Rhinos will be treated first in order to demonstrate threats whose surprises can be eliminated, and the rest of the report will focus on the most elusive quarry, the unpredictable Black Swans.

¹ USCENTCOM Questions:

[B12] What effects will changing fossil fuel dependence have on great power competition in the region? Factors include emerging and drastic technological advancements as well as alternative sources from non-Middle East regions.

[B13] What if India and Pakistan engaged in a large-scale conventional fight? How might this affect great power competition and regional dynamics?

[B14] How might great power competition and regional dynamics change if another 9-11 scenario occurred that emanated from the Central Region?

[B14] (Revised) How might great power competition and regional dynamics change following the targeted killing of Qassem Soleimani?

[B15] How might regime changes in key regional countries change great power competition dynamics—Iran, KSA, Syria, etc.?

2. What Was Done

This report integrates six research efforts that address Black Swans and Gray Rhinos in the USCENTCOM AOR. Subject matter experts on water and climate issues, migration, and sectarianism were interviewed and further literature research was done on illicit networks including drugs, looted antiquities, and human trafficking (Kuznar & Kuznar, 2020). Statistical models were built to identify driving factors for political instability and terrorism in the region (Kuznar & Day, 2020). Machine learning techniques were applied to identify tipping points and the effects of extremes in unemployment and climate change (Jafri, Kuznar, & Day, 2020; Kuznar & Day, 2020). The University of Albany conducted a Red Teaming simulation of regional dynamics and great power competition following the killing of Qassem Soleimani (Ackerman, Wetzel, Clifford, Peterson, & Latourette, 2020). Finally, four regional specialists with expertise in complex systems commented on the research and how to think about Black Swans in the USCENTCOM AOR in a panel format (Kuznar & Peterson, 2020). This report will primarily refer to these studies, but each report cited contains much more supportive evidence, expert elicitation, and literature review upon which this report's conclusions are based.

3. Identifying the Gray Rhinos First

The statistical modeling of political instability and terrorism, subject matter expert interviews, and background research identified factors that can be monitored to avoid Gray Rhino surprises in the Central region. This information is valuable in its own right, but also helps analysts to contemplate what the truly unpredictable Black Swans in the region may be.

Corruption emerged as the most destabilizing factor in the region. General political corruption drove political instability in the statistical models, and literature reviews found that illicit activities were enhanced by instability and recursively helped to undermine stability by furthering corruption, creating a positive feedback loop of increasing corruption and instability. Weak democracy was consistently associated with political instability in the statistical models, and several subject matter experts noted that weak governance in the region combined with other challenges, such as climate change, lead to political instability.

Water vulnerability is a looming problem in the region. Subject matter experts pointed out that most of the region relies on groundwater in fossil aquifers, which is a dwindling resource. The drying up of these resources ultimately will create profound impacts on food production and the survivability of the region's populations. Surface water is concentrated in several major river systems of which just four states (Turkey, Kyrgyzstan, Tajikistan, Afghanistan) have the ability to control flows, creating the possibility for interstate conflict to erupt in the region. Statistical models confirmed the strong association of water vulnerability with instability in the region. Furthermore, Middle Eastern countries are dependent on food imports because of their arid environments and dwindling water resources. Therefore, droughts in food producing countries such as Russia and China have profound impacts on food insecurity in the region and have contributed to major upheavals such as the Syrian civil war (Gleick, 2014, 2017; Johnstone & Mazo, 2013). The impact of threats to the food supply were reinforced in statistical models in which food insecurity emerged as a major factor leading to political instability.

Subject matter experts stressed that migration in the region is most clearly induced by war and possibly also climate change. Migration is a major driver of regional instability with the added ability to extend destabilizing effects beyond the Central region to places like Europe. Countries with large refugee populations can use them

as political pawns to further destabilize international relations, as Turkey has done with respect to the European Union recently.

Statistical models demonstrated that poverty per se was *not* related to instability as often assumed. Instead, the models demonstrated that countries where inequality between members of the upper class (generally upper 10%) was particularly pronounced were less stable. These inequalities cause intense competition between elites who may have the ability to orchestrate coups or use grievances among the larger population to challenge regime control.

Subject matter experts and statistical modeling indicated that religious and ethnic sectarianism are *not* destabilizing factors in the region. Subject matter experts noted that after the US invasion of Iraq in 2003, ethnic and religious divisions became more politically important leading to the establishment of ethnic political orders, but failures of these regimes to deliver goods, services, and economic prosperity to the population has eroded the salience of ethnic divisions. The youth appear especially dissatisfied, and there is a growing generational political divide throughout the region.

Statistical modeling indicated that repressive measures by states are a dominant factor in fomenting political violence from non-state actors as a reaction to state repression. The impact of war was measured by per capita battle deaths, and this also had a very strong association with terrorism, although the causal linkage is unclear. Finally, the combination of youth bulges and high unemployment was associated with terrorism, implying that the unemployed and the young are particularly vulnerable to radicalization, a finding consistent with radicalization studies (Cragin, Bradley, Robinson, & Steinberg, 2017; Kelly, 2019; Kuznar, Jafri, & Kuznar, 2019).

4. Gray Rhino Indicators to Watch

The research findings identified drivers of political instability and terrorism that can be monitored, allowing anticipation of and planning against these Gray Rhinos. Political instability can be anticipated by monitoring water vulnerability and food insecurity within the region, and droughts in food producing countries outside of the region. Open source data, law enforcement, and diplomatic sources can monitor corruption and illicit activity as important contributors to instability. Open source data on the strength of democracy and diplomatic sources can signal when democracies weaken or autocracies become weakly democratic, indicating an increase in political instability. Open source data on wealth distributions, diplomatic and, perhaps, intelligence sources can monitor the amount of infighting and competition that is happening within the upper and ruling classes of Central region countries, since this variable is a key indicator of impending instability. Terrorism in the region can be anticipated through open source data on youth bulges and unemployment, the impact of war, and both open source data and diplomatic sources can monitor the use of state terror.

5. How Black Swans Emerge

Machine learning techniques and the Black Swan panelists identified several ways that true Black Swan events may come about. Non-linear effects occur when an activity perceived to be small creates a disproportionately large effect, often due to unknown or underappreciated relationships within and across a system. One panelist used the example of Tunisian Mohamed Bouazizi's self-immolation in 2010, the effect of which was magnified by social media and sparked the Arab Spring. Many of the subject matter experts and panelists pointed to the potential for interactions between variables to lead to unexpected surprises. This makes sense mathematically since interactions are modeled as multiplications between variables, which by definition create non-linear

effects. One example would be the interaction of water vulnerability with poor governance, which prevents a state from mitigating stresses felt by the population. Such stresses can lead to migrations, which further stress the political system, as happened in Syria prior to its civil war, or to elite challengers who mobilize popular support because of frustrations with a government's incapacity, as Muqtada al Sadr has recently done in Iraq.

It is important to have some sense of what thresholds or tipping points may drive a system from one state (stable equilibrium) into another (unstable disequilibrium). Changes in a variable may have little effect until a critical threshold is reached. Climate experts interviewed warned that water vulnerability and heat are already chronic problems, but that their gradual increase may not be obvious to governments and people in the region. However, countries like Egypt, Yemen, Syria, and Iraq are reaching critical thresholds that could incapacitate production, potentially leading to economic crises and perhaps additional mass migrations. Finally, genuinely rare events, such as major droughts or damaging floods, are impossible to predict with precision and therefore can cause Black Swan events. The Russian and Chinese droughts of 2010 that spiked Middle Eastern food prices are an example, as is the recent outbreak of the Covid-19 coronavirus.

6. Black Swan Examples

Collectively, subject matter experts, models, and the University of Albany's Red Team simulation generated a number of potential Black Swans, some of which have already been mentioned. This list is not definitive or exhaustive, but illustrates the range of potential Black Swans that might erupt in the USCENTCOM AOR.

Complexity researchers have identified war as a product of non-linear interactions in elite competition (Bellomo et al., 2013), and research in this project has confirmed that elite competition is associated with political instability (Kuznar & Day, 2020). Severe weather events and associated spikes in food prices or hunger have already been cited as examples of rare events. An economic crisis brought on by a pandemic, drought, or crossed heat or water thresholds could spark intense elite competition that has the potential to bring about rapid and perhaps unexpected regime changes. Such crises may also spark mass migrations, as has been the case with drought and violence in Central America (Kuznar, Kuznar, & Aviles, 2019).

Populations, states, and the entire USCENTCOM AOR is a complex system of systems. Variables do not exist in isolation, and their interactions can lead to unexpected results rapidly. The case of weak governance and water vulnerability has been mentioned. Youth bulges and high levels of unemployment appear to be fueling unprecedented protests throughout the region today. The interaction of these trends with violent government crackdowns might very well spawn new non-state violent actor movements or reinvigorate old ones. The point is that these events should never be analyzed in isolation but instead as events within a connected system that could alter the behavior of the system in unexpected ways. Thinking this way allows us to consider new possibilities and avoid surprise due to the "failure of imagination" that seemingly isolated events could lead to large changes like toppling regimes.

The analysis of tipping points demonstrated that extremes of corruption can tip states into instability, and extremes of state terror may spawn non-state political violence (terrorism) in response. The case of state terror may be susceptible to Black Swan-like precipitating events like regime overreaction or repressive crackdown, directed by impulsive regional leadership as cited by the Red Teaming effort. The Red Teaming also showed high potential for deception and disinformation to push political situations over their tipping points into instability.

7. Complexity Theory Thinking

Perhaps the most important takeaway from the SMA Black Swan effort is how to think about the systems that generate Black Swan events and differentiating the Gray Rhinos we can anticipate from the Black Swans we need to imagine and try to mitigate. The SMA research efforts cited provide a list of Gray Rhino drivers USCENTCOM could monitor in its AOR such as corruption, water availability, food insecurity, elite competition, youth bulges, and unemployment. The important next step is to identify how these destabilizing factors may relate to one another in ways that amplify their impacts. They also identify how non-linear and butterfly effects in some of these variables, interactions between them, thresholds, rare events, and impulsive leaders can spark dramatic changes. A fitting concluding point is that the capabilities necessary for modeling Gray Rhinos and Black Swans need to be placed in the hands of the appropriately trained analysts and planners to understand population dynamics in modern conflict.

References Cited

- Ackerman, G. A., Wetzel, A., Clifford, D., Peterson, H., & Latourette, J. (2020). *Red Teaming Great Power Competition in the CENTCOM AOR*. Albany, New York: Center for Advanced red Teaming, University of Albany.
- Bellomo, N., Herrero, M. A., & Tosin, A. (2013). On the Dynamics of Social Conflicts: Looking for the Black Swan. *Kinetic and Related Models*, 6(3), 459-479. doi:10.3934/krm.2013.6.459
- Cragin, K., Bradley, M. A., Robinson, E., & Steinberg, P. S. (2017). *What Factors Cause Youth to Reject Violent Extremism? Results of an Exploratory Analysis in the West Bank*. RAND Corporation, Santa Monica, California
- Gleick, P. H. (2014). Water, Drought, Climate Change, and Conflict in Syria. *Water, Climate, and Society*, 6, 331-340.
- Gleick, P. H. (2017). Water Resources, Climate Change, and the Destabilization of Modern Mesopotamia. In D. Reed (Ed.), *Water, Security and U.S. Foreign Policy*: Taylor & Francis.
- Hunt, C. (2008). Black Swans. In N. Chesser (Ed.), *Anticipating Rare Events: Can Acts of Terror, Use of Weapons of Mass Destruction or Other High Profile Acts Be Anticipated? A Scientific Perspective on Problems, Pitfalls and Prospective Solutions* (pp. 60-64). Arlington, VA: Office of the Secretary of Defense: Defense Research and Engineering (DDRE) & Rapid Reaction Technology Office (RRTO), Strategic Multi-Layer Assessment.
- Jafri, A., Kuznar, L. A., & Day, J. (2020). *VANE Modeling: Test & Findings*. Arlington, Virginia: Strategic Multilayer Assessment (SMA) Periodic Publication, OSD/ASD (R&E)/RSD/RRTO.
- Johnstone, S., & Mazo, J. (2013). Global Warming and the Arab Spring. In C. E. Werrell & F. Femia (Eds.), *The Arab Spring and Climate Change*. Washington, D.C.: Stimpson Center Center for American Progress.
- Kelly, L. (2019). *Evidence on the Indirect Contribution of Humanitarian Activities to Deradicalisation of Countering Violent Extremism (CVE); and the Risks in Linking such Objectives or Activities*. K4D: University of Manchester.
- Kuznar, L. A., & Day, J. (2020). *Hunting Gray Rhinos and Black Swans: Statistical and Machine Learning Models of Political Stability and Terrorism*. Arlington, Virginia: Strategic Multilayer Assessment (SMA) Periodic Publication, OSD/ASD (R&E)/RSD/RRTO.
- Kuznar, L. A., Jafri, A., & Kuznar, E. C. (2019). *Dealing with Radicalization in IDP Camps*. Arlington, Virginia: Strategic Multilayer Assessment (SMA) Periodic Publication, OSD/ASD (R&E)/RSD/RRTO.

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- Kuznar, L. A., & Kuznar, E. C. (2020). *Key Factors in the CENTCOM AOR: SME Elicitations and Background Research*. Arlington, Virginia: Strategic Multilayer Assessment (SMA) Periodic Publication, OSD/ASD (R&E)/RSD/RRTO.
- Kuznar, L. A., Kuznar, E. C., & Aviles, W. (2019). *Inequality, Risk Sensitivity, and Grievance in Context*. Arlington, Virginia: Strategic Multilayer Assessment (SMA) Periodic Publication, OSD/ASD (R&E)/RSD/RRTO.
- Kuznar, L. A., & Peterson, N. (2020). *SMA CENTCOM Panel Discussion - Black Swans and Gray Rhinos in the CENTCOM AOR: Vigilance Against the Unsuspected and Keeping Our Eyes on the Prize*. Arlington, Virginia: Strategic Multilayer Assessment (SMA) Periodic Publication, OSD/ASD (R&E)/RSD/RRTO.
- Taleb, N. N. (2007). *The Black Swan: The Impact of the Highly Improbable*. New York: Random House.
- Wucker, M. (2016). *The Gray Rhino: How to Recognize and Act on the Obvious Dangers we Ignore*. New York: St. Martin's Press.