

Blood and Water:
Modeling Violence in the Middle East as Water Conflict

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The issues in the Middle East are a complex pastiche of competing social and political interests. Violence is reported daily, but the causes for violence are oft underreported. While the complexities of the wall, settlements, and Jerusalem are all sources of great tension, one potential factor which is widely overlooked in the press is the disparity between the availabilities of water to Israelis and Palestinians.

Israel provides ample water supplies for all Israeli citizens. Citizens of Gaza and the West Bank, however, are left with a degenerate infrastructure and limited resources, restricted by Israeli authorities. While the other rights claim by citizens of Gaza and the West Bank are certainly important, water is fundamental to life, and thus it is logical that limited water supplies should beget violence in a struggle for survival.

In order to describe this relationship between water and violence, let us examine each in turn. Water is a measurable thing, but a simple statement that absent water or limited water yields violence is practically absurd. The limited water supplies of the Mojave desert should incite a huge amount of violence, were this the case. However, we do not see vicious attacks breaking out across the Southwestern United States. We must therefore approach the topic with more nuanced modeling strategies. Water specifically has some obvious metrics which may be useful for this or later analyses. The most evident measure of water (with potential relationship to violence) is the amount of water provided to a population through public infrastructure per capita. In other words, the amount available from the tap to any member of the population in a given length of time.

Water availability also has some alternate measures which may prove enlightening. For instance, the average rainfall during the time period in question may help to offset fluctuations in violent responses. Violence, however, is a slightly trickier variable. There are numerous violent

acts available to the disenfranchised opponents of Israel. Launching home-made rockets indiscriminately over the border toward Israeli settlements and villages, suicide bombing, car bombing, kidnappings, or targeted killings are all considerations. Rocket-launching has become the de facto preference, with some significant advantages to a terrorist: Rockets have a demonstrably low probability of causing fatalities, but in concert with a number of other similar rockets can terrorize entire towns into Post-traumatic Stress Disorder. From a modeling standpoint, rocket launches are also an appealing metric for violence. Suicide bombing casualties, for comparison, will likely be a larger number, but all of these deaths (not to trivialize these) are incidental. No one selected that they should die (other than the bomber himself). The number of rockets launched, however, is entirely intentional.

A simple graph algebraic model of this phenomena can be seen in figure 1.

(Insert figure 1 here.)

Figure 1 represents the availability of water to citizens of the Gaza Strip and West Bank per capita as W . The output, V , is a simple count of rocket launches in a given time period. Because water is measured in volume (per capita) whereas violence is measured in a raw count of incidents, I have also included an operator of proportional transformation, a , which simply represents the conversion between water and acts of violence. The equation derived from this model is lackluster at best:

$$V = (W)(S) \tag{1}$$

The model fails to take into account a large number of potential factors—water is not the sole factor in the decision to commit violence by members of the West Bank and Gaza Strip

populace. Violence itself, for instance, begets violence. The Israelis respond to increased rocket attacks by further restricting border crossings, building new settlements, and fortifying the “fence,” any of which prompts more disenfranchised citizens of Gaza or the West Bank to launch rockets or don suicide vests. For these reasons, a more complex model with feedback is necessary, as seen in the example of figure 2.

(Insert figure 2 here.)

Here we have a slightly more interesting model. The original variables remain the same, but we also include a second operator of proportional transformation, b , representing the response of the Israelis to the attacks, and subsequent fluctuations in violence levels re-enter the loop as a multiplier to the original values. If the Israeli response is favorable to those in opposition of Israeli policy (e.g., close a settlement, increase water availability to Palestinians, etc.), this multiplier will decrease the total number of violent acts. If not (e.g. Israelis further constrict the water pathways to Palestinians, continue to fortify the wall, build or expand more settlements, etc.), this multiplier will increase the violence. The product of the feedback loop is this equation:

$$V = \frac{Wa}{1 - ab} \tag{2}$$

This, while a more complex approach, fails to take into account the passage of time. It is easy to conceive of an angry terrorist having his water cut off mid-shower, angrily walking towel-clad to his backyard and lighting the wick of a rocket pointed to the border. However, the process of building rockets and recruiting suicide bombers is a time-consuming one. For this

reason, the addition of a time-delay operator may generate a still more accurate model. Figure 3 is the graph algebraic depiction of just this.

(Insert figure 3 here.)

The output equation may now be written as a linear difference equation.

$$V_{t+1} = (a)(W) + (a)(b)(V_t) \quad (3)$$

The model is now predictive; given a period of time in which there is a measurable amount of violence and a reliable metric for available water, it can indicate a range of probable expectations for the number of violent incidents to be expected for the next iteration.

The potential for modeling conflict in this way is unlimited, and substantive applications are numerous. However, the usefulness of these analyses is limited to our ability to interpret this information. If water begets violence, what change can help prevent further violence from occurring? We can only hope to come closer to an answer with more research and more accurate analysis.

Figure 1: Simple, Linear System of Water Violence

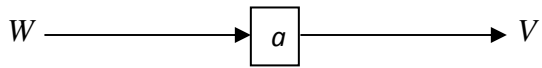


Figure 2: Simple System of Water Violence with Feedback

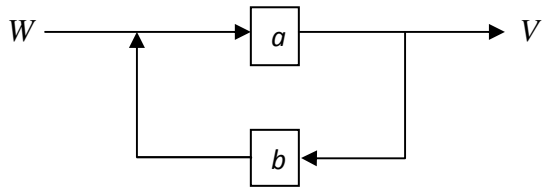


Figure 3: System of Water Violence with Feedback

