Red Sun in the Morning: find an exit strategy.

Red sun at night, sailors' delight.
Red sun in the morning, sailors take warning.

Ten years ago hurricane Katrina had a devastating effect on the economies of several states, causing many deaths and much suffering. Comprehensive evacuation plans have been developed since then, but the authorities still want to improve their effectiveness. Your team has been hired by the Mississippi Emergency Management Administration (MSEMA) to review their current evacuation strategies.

Things to keep in mind: All hurricanes are assigned a category: from 1 (the weakest) to 5 (the strongest, like Katrina). The category and the location of landfall are first predicted about 4 days in advance. Predictions are revised using updated information 48 hours later, and the final (most accurate) predictions become available 24 hours ahead of the expected landfall. The category of the hurricane and the actual location of the landfall determine which counties will be flooded. In addition, driving conditions in surrounding counties might be seriously affected by the size of the hurricane.

Build a model to advise MSEMA on an optimal strategy: which counties should be ordered to evacuate, when, and where to. The first page of your manuscript should be a one page non-technical, executive summary for the governor of Mississippi. It should describe your main recommendations, the criteria you used to evaluate their effectiveness, and any caveats you believe are important to mention.

Time permitting, your model should also account for the fact that evacuations initiated in Louisiana, Alabama, and Mississippi affect each other. For example, a large portion of the New Orleans population will likely evacuate through Jackson, MS using highways 59 and 55. If the population of Jackson needs to evacuate, much of it will be directed North within MS or West toward Monroe, LA. Parts of coastal counties in MS will evacuate through Mobile, AL.

Despite these interdependencies, the decisions in each state are rarely made collaboratively. So, if you are a governor in one of these states and you order the evacuation later than the others, the population of your state might be at disadvantage since the roads will be already clogged by then. If the hurricane turns out to be stronger than expected, your constituents might end up stuck in traffic in affected areas. On the other hand, if you order the evacuation too early, this disruption carries a high economic cost – coastal areas generate much revenue for your state and early predictions about the expected hurricane strength/landfall time/location might be inaccurate.