



Game Theory: Waterway Restrictions

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Objective: Enhance a company's incentives to 'go green' by abiding by waterway regulations

01 – Look at Policies



Designing a Utility Function:

- ✓ Observed current waterway policies
- ✓ Cultivated three targeted characteristics: *money, reputation, vitality*
- ✓ From these policies, formulated a weighting for each characteristic
- ✓ Created a probability for these weights, α
- ✓ Grouped variables and formed the utility

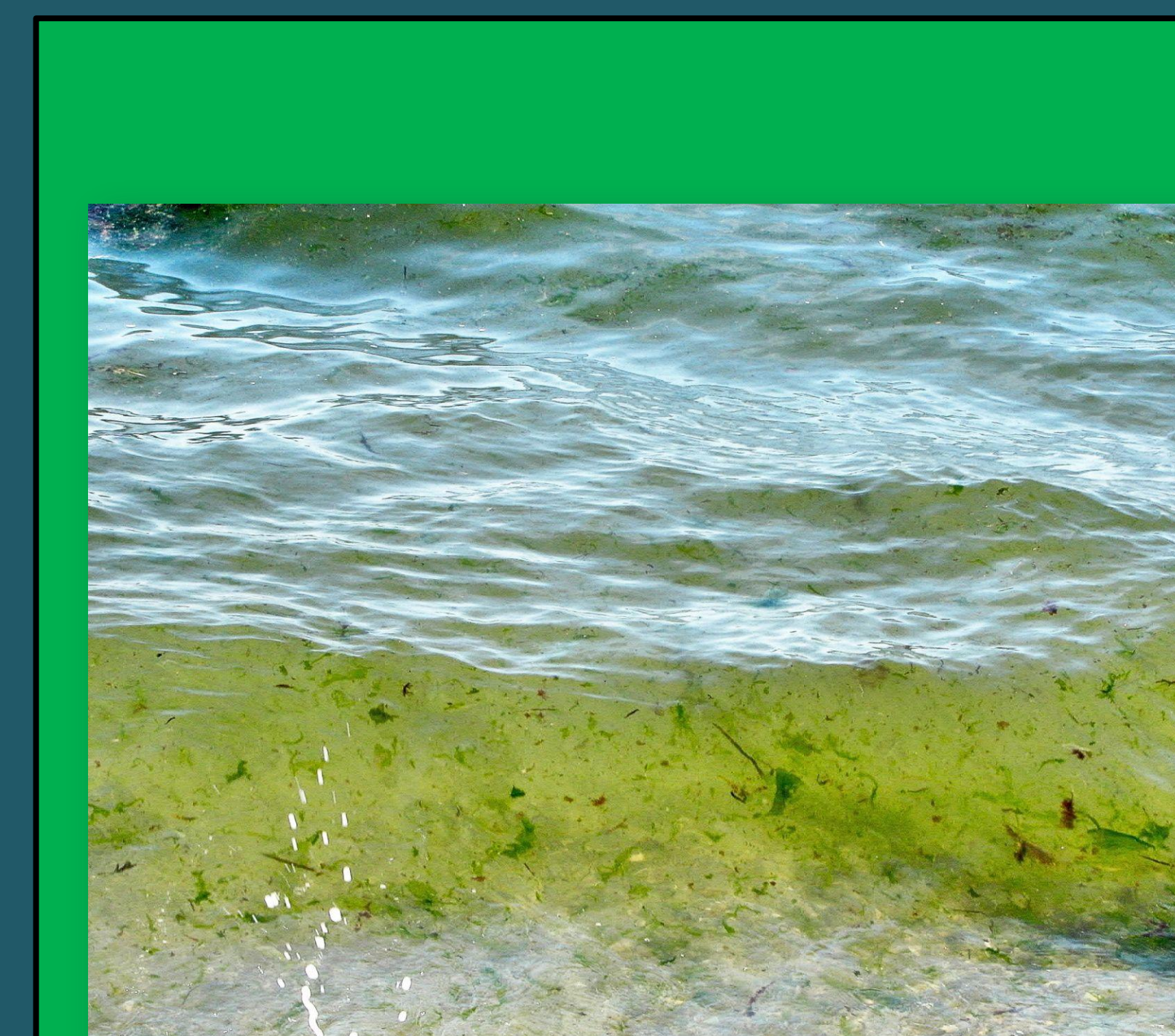


$$U(f) = \alpha[11M + 15pR + 7V]$$

M – the monetary gain
R – the reputation held
V – the vitality maintained

Keep in mind, this utility function is weighted from the policies' point of view. In other words, it represents the 'likelihood' of a penalty targeting a certain field.

03 – Review the Result



Observing the fallout :

- ✓ Viewed the business's decision
- ✓ Deciphered the pay-off matrix to understanding their choice

Business	Environment		
	Positive Change	No Change	Negative Change
Abide by Regulation	-2	-4	-4
Disregard Regulation	-1	-1	-4

In this instance, the business had a greater or equal utility if it disregards the regulation: this is called weak dominance.

02 – Consider a Choice



Building a Pay-off Matrix:

- ✓ Considered the players involved, the *business* Vs. the *environment*
- ✓ Since the environment cannot make a choice, conformed pay-off matrix to resemble a lottery
- ✓ Determined a range of choices/outcomes
- ✓ Filled in each decision block using the utility

In each column, an expected value is generated using the utility function. This value is the expected gain of the business.

Business	Environment		
	Positive Change	No Change	Negative Change
Abide by Regulation	-2	-4	-4
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04 – Analyze the Outcome



Forming a Suggestion:

- ✓ Overviewed the variables
- ✓ Considered early prevention vs. heavy fines and penalties
- ✓ Determined which characteristic is most cost-effective to target, *reputation* through media

Suggestion:

In order to discourage businesses from disregarding regulations, it is vital to address early prevention: businesses should have a stronger fear of getting caught.

Conclusion: Increase the perceived probability of being caught



References:

- [1] www.EPA.gov
- [2] R. Duncan Luce and H. Raiffa, Games and Decisions, New York: New York, 3rd Ed. (1958), pp. 2-6, 12-55
- [3] G. Owen, Game Theory, New York: New York, 2nd Ed. (1982), pp. 115-125
- [4] This work was supported by the National Science Foundation under grant #CNS-1063041.

Future Work:

- ❑ Conduct further research to help solidify the utility function
- ❑ Use this process to model a current example and form suggestions
- ❑ Modify the utility function to consider counties and integrate them into a whole

