

Questionnaire 5 - System Dynamics ‘Pen & Paper’ Test 2

Please answer the questions below. The questions require only a qualitative, not quantitative, answer. We remind you that this test is anonymous

Question 1: stocks & flows

[Allow approx 10 mins for this question (although you may finish sooner!)]

The county of Macondo has decided to manage their trout fishery sustainably. You are asked to make a recommendation on an upper limit on trout catches.

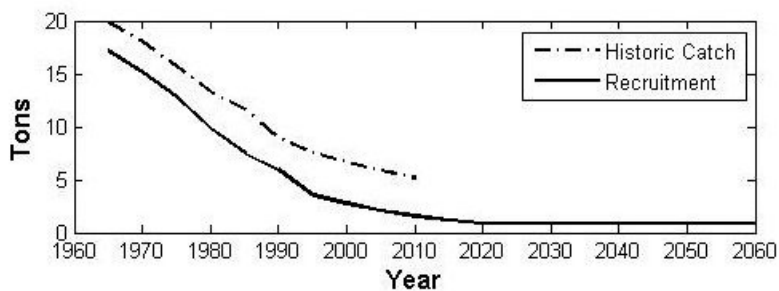


Figure 1

In Figure 1 the thick line shows the rate at which new trout are added to the lake (i.e. through birth and maturity of young trout): this is called the “recruitment rate”. Because the stock has been overfished for several years the expected recruitment rate in the future is low and it is not expected to rise. The dashed line shows the record of past catches. For the purpose of the exercise you can assume this data is fairly reliable and accurate.

A meeting of local residents and fishing community decided the fishery should be managed to keep the level of stock roughly at the current level and keep it stable in the coming future. Figure 2 shows the fish stock levelling out according to this policy. For the purpose of this exercise, please assume that the target stock level is sustainable and the policy decision is ecologically, socially and economically sound.

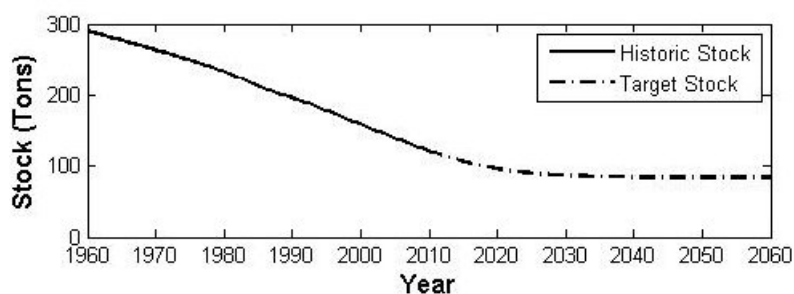


Figure 2

Please draw on Figure 1 your recommendation for the future trout catches. Do so by continuing the dashed line. Please provide an approximate trend: a precise numerical estimation is not necessary.

Please provide any comments or explanations here:

Question 2: Feedback loop

[Allow approx 10 mins for this question (although you may finish sooner!)]

You are asked to manage a newly developed tourist location which currently undergoes low tourism pressure and enjoys a healthy environment. For the sake of simplicity, the dynamics of this fictitious system can be interpreted in terms of the interaction between three components: a) the tourists, b) the environment and c) the tourist infrastructure. The expected relations between these components are very well known:

- More (less) tourist infrastructure leads to more (less) environmental degradation;
- More (less) tourists lead to more (less) environmental degradation;
- a healthier (worse) environment attracts more (less) tourists
- there is a natural positive feedback loop between tourist and infrastructure: more (fewer) tourists lead to more (less) tourism infrastructure and more (less) tourism infrastructure leads to more (fewer) tourists
- tourists are deterred by other tourists (tourists want peace and solitude to interact with Nature)
- Infrastructure degrades over time
- the environment has a natural recovery rate

You are need to design a management strategy aiming at achieving a long term ecological and economic sustainability of the location. *For the purpose of this exercise, economic and ecological sustainability implies ensuring that irreversible ecological damages as well as bankruptcy of the economic infrastructure are avoided.*

You have four management options:

- (a) Investment in infrastructure development in order to provide a satisfactory experience to most visitors and very little investment in advertisement in order to avoid mass tourism. (top right Figure 5)
- (b) Considerable investment in advertisement to ensure the location's popularity and a tax imposed on tourism infrastructure (the tax revenue is not given to tourists or tourism companies and nor is it invested in environmental protection – its sole role is to act as a disincentive to invest in tourism infrastructure). (bottom left Figure 5)
- (c) Considerable investment in advertisement to ensure the location's popularity; also regulations are imposed, requiring that the environmental impact of any existing infrastructure is halved (There is no restriction on building more infrastructure, but each new building or facility must meet the prescribed standard. These changes are government funded at no cost to companies or tourists). (bottom Figure 6b)
- (d) A media campaign aimed at increasing awareness of ecological value plus strict regulations on tourism infrastructure. (Top left Figure 6d)

Given the cause-effect relationships described previously, only one of the following interventions can produce the desired long term economic and ecological sustainability. Which one?

Also, please provide any comments or explanations here: