

Modelling London's Water Futures

How to start

Go to the water futures tool and navigate to the role playing game webpage, or follow the link:

<https://webapps.bgs.ac.uk/Water-Futures-Education/role-playing.html>

Begin by introducing yourself to the Water Futures East London (WFEL) model. You can do this by going through the interactive guide or by watching the WFEL introduction video. Both resources firstly, tie in the model and concepts learned in class and secondly explain WFEL menu options in detail.

From the role-playing game you can access the WFEL model or by following this link: <https://is.gd/Pqbpv>

Finally go to the model tab, and prepare to start modelling

Modelling

On the role playing game webpage, read "your task" section in detail.

Task 1

Your first task is to check if the current system can provide enough water for the city in the future.

Your teacher should assign a climate scenario to you.

You need to:

- under 'River Flows' click on 'Near Future Climate Change Scenario'
- Type the number of climate scenario you were assigned to into the climate scenario realisation
- under Demand for Water click on 'High Demand for Water'
- Click on "No Change" plan
- Then click the Green 'run model' button

Next you need to revisit the role playing webpage and watch running the model video. To perform calculations, you will need the counting sheet, attached at the end of this document.

Your task is to count **the number of years** that have a **particular restriction happen** (note that it is not important how many times a restriction happened, once or fifty times, you count year as having a restriction, for example R1 happen).

To understand why we are counting years and not each restriction watch understanding model outputs video on the role playing webpage.

Note. We do not need to know how many times restrictions R1 happened over the years, we want to know the number of years that R1 happened at least once. It is the same for R2, R3, and R4. The 'No Change' plan will be the most time consuming, the rest of the plans should be much easier to count. Also, if restriction R4 happens, this means that R3, R2, and R1 already happened before it. So, if you see restriction R4 happen in a year, you can immediately tick that R1, R2 and R3 also happened. This should speed up counting.

Once the counting is done, now is the time to bring together your team of engineers. You can open the excel spreadsheet and put all counting results in for the "no change" plan, to see if the plan will pass according to the assigned criteria.

- Restriction R1 – once in 5 years
- Restriction R2 – once in 10 years
- Restriction R3 – once in 20 years
- Restriction R4 – never

Task 2

Your second task is to repeat the same steps as in task one but this time for each of the plans.

Understanding the “once in” restriction criteria

The “once in” restriction criteria is called restriction annual frequency. To calculate the restriction annual frequency, you divide the number of years you counted that a restriction happened with the total number of years you run the model for. To calculate the total modelled years you need to consider that each person on the team modelled 30 near future years, from 2020 to 2049, which makes: 30 times the number of people on the team and equals total modelled years.

Now that we have our restriction annual frequency from the model, we can look at legislation and see if the plan passed according to the recommendations

- R1, should happen at most once in 5 years. We can compute R1 permitted annual frequency, which is 1 divided by 5, and equals 0.2
This means that for a plan to pass based on R1 permitted annual frequency, its annual frequency should be less than 0.2.
- R2 should happen at most once in 10 years. R2 annual frequency should be less than $1/10 = 0.1$
- R3 should happen at most once in 20 years. R3 annual frequency should be less than $1/20 = 0.05$
- R4 should never happen. Since “never” is not a number, we need to approximate it with the closest thing. If we say once in 500 years, this will have exceptionally low annual frequency of $1/500 = 0.002$ which we will accept as having low probability of happening in next 30 years. R4 annual frequency should be less than 0.002.

To help your team decide if a plan passes the regulation based on annual frequency, we created an excel spreadsheet. In the excel spreadsheet, each member of your team will need to input results of counting for their climate change scenario and annual frequencies will be automatically calculated.

Note. If the annual frequency is close to being fulfilled but slightly over the permitted value, it will be coloured yellow, if it passes it will be green and if it fails it will be red. You can choose a plan that has all the restrictions in either green or yellow.

Homework

Answer the two questions set in the task:

1. Clients are interested to know can the current system provide enough water for the city in the future (particularly in the case of the high increase in water demand)?
2. If not, what are some options and alternative sources of water London could use to supply its citizens with enough drinking water?

Prepare a short report. Include the annual frequency calculations and your team reasons for your final decision. Make sure to include discussion on plans financial cost, social contribution, and environmental impact.

