How much are you prepared to PAY for a forecast? Try it yourself !

By Louise Arnal (1)

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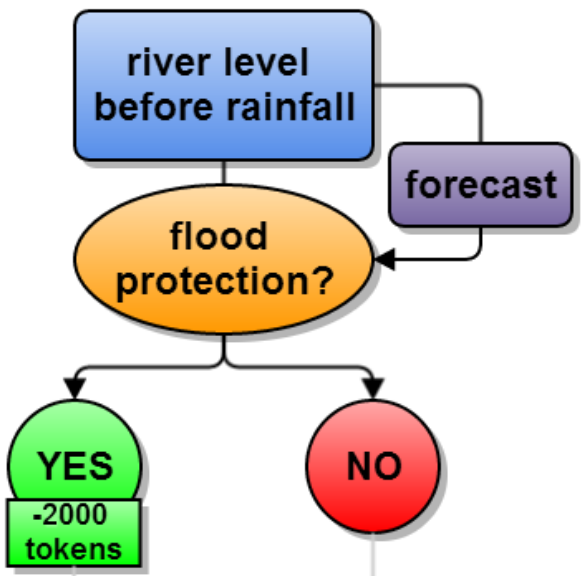
(1) ECMWF, (2) Red Cross/Red Crescent Climate Centre, (3) Irstea, (4) UNESCO-IHE

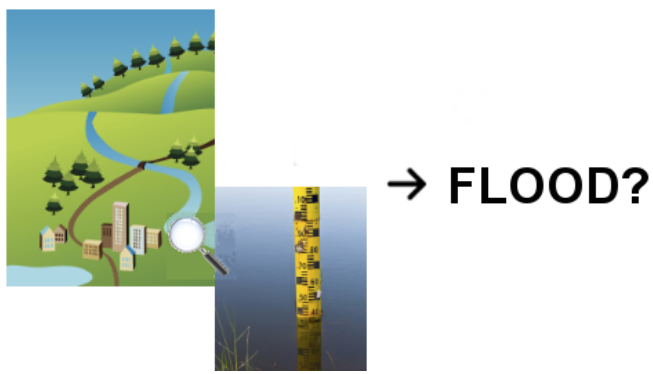
**This game is inspired by a "Red Cross/Red Crescent, Climate Centre" game, and is a contribution to the international Hydrologic Ensemble Prediction Experiment (HEPEX), www.hepex.org

- You are all candidates for the post of head of the flood protection team of your company
- This team is responsible for the flood protection within the Grande Basin, which is composed of three main tributaries:
  - The Blue River
  - The Yellow River
  - The Green River

▸ YOUR TASK

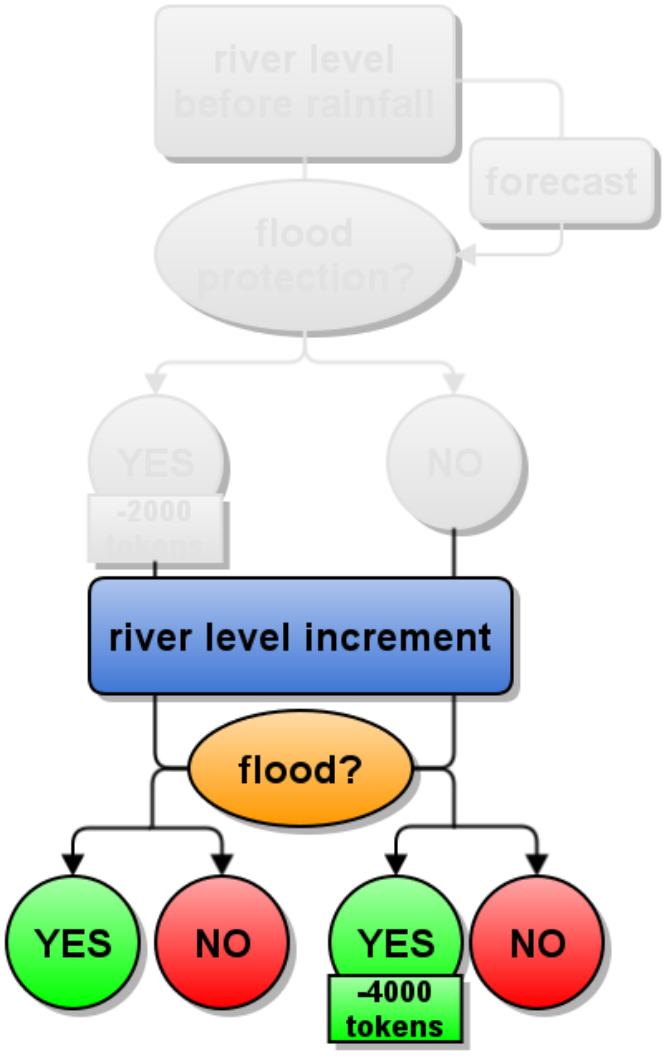
- Your task is to **manage the flood protection activities** of one of the tributaries
- You will be given a **river level** and a **forecast of the river level increment** to help you deciding if you **pay for a flood protection** or not
- If you decide to pay for a flood protection, it will cost you **2,000 tokens**

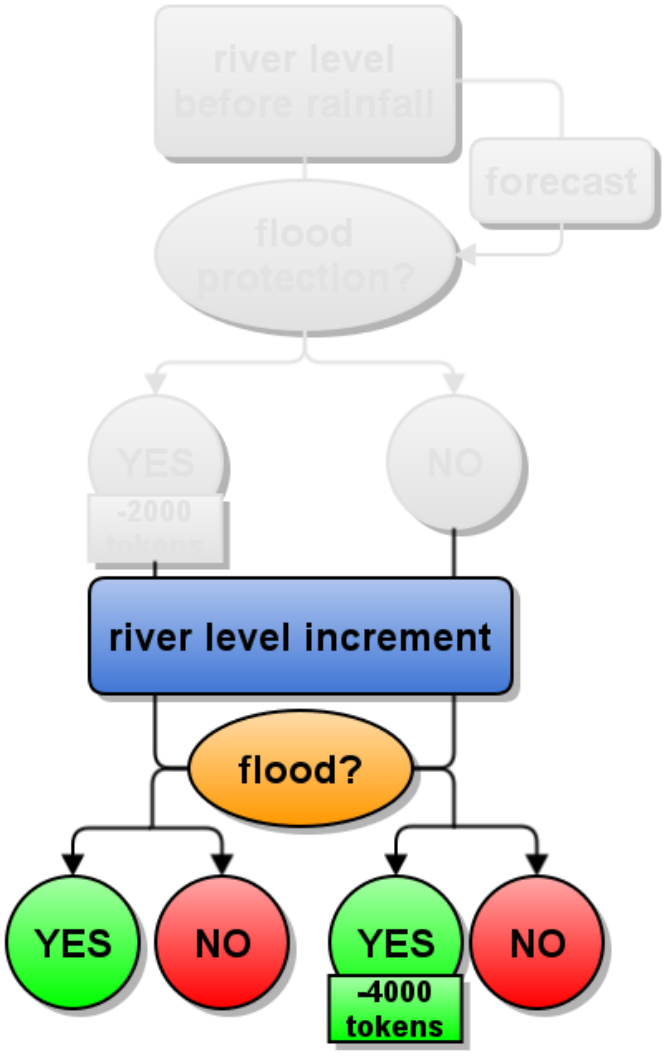




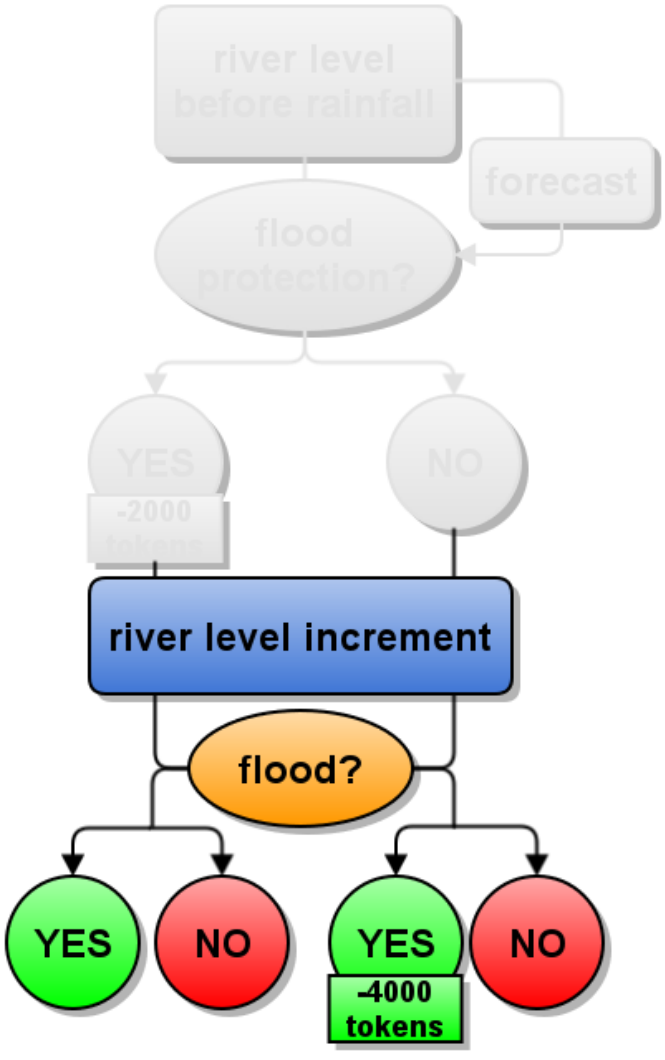
▸ NEXT

Figure from: 95744012/Nina Magradze/iStock; 161918756/Kraska/iStock; 453885795/konmesa/iStock

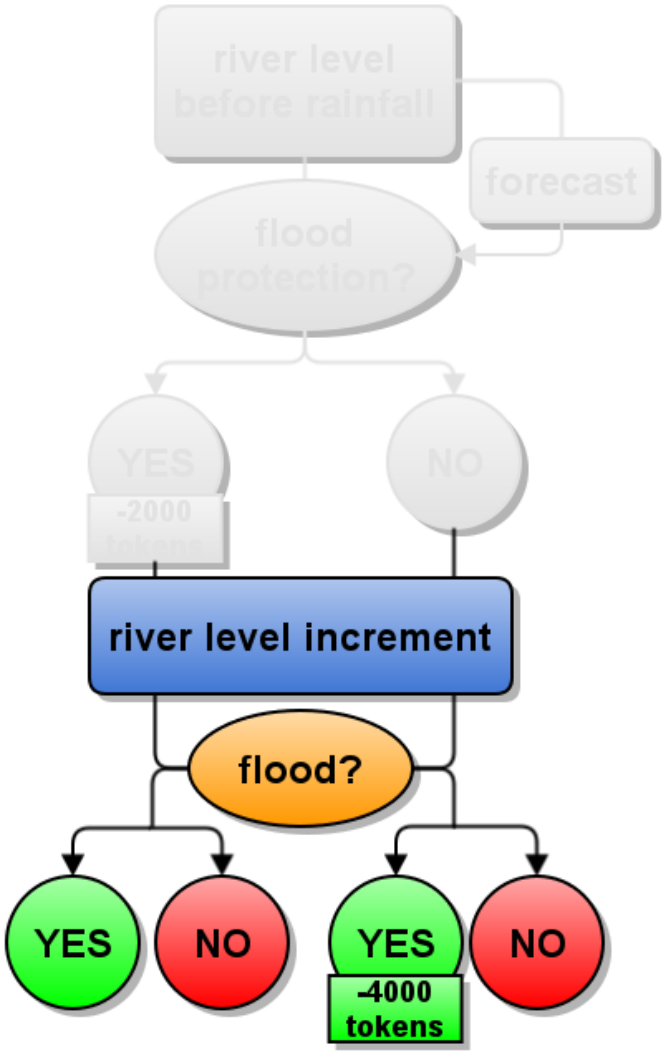

river level before rainfall
forecast
flood protection?
YES
-2000 tokens
NO
river level increment
flood?
YES
NO
YES
-4000 tokens
NO



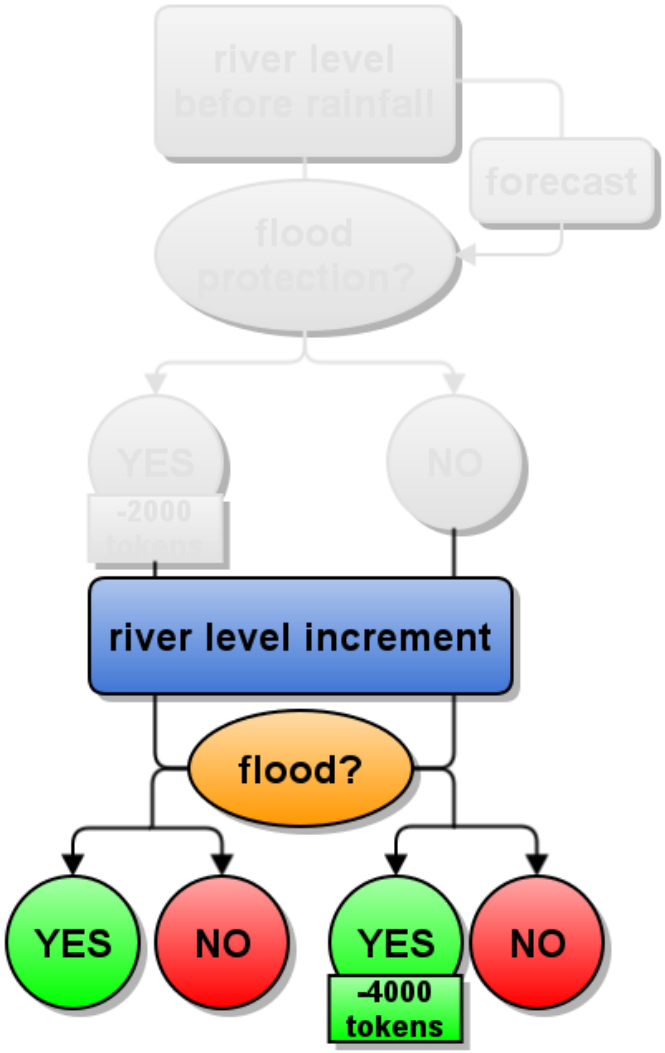
- You will then be given the actual amount of **river level increment** due to rainfall in the catchment



- You will then be given the actual amount of **river level increment** due to rainfall in the catchment
- If: river level before rainfall + river level increment after rainfall $\geq$ **90cm**, then flood occurs



- You will then be given the actual amount of **river level increment** due to rainfall in the catchment
- If: river level before rainfall + river level increment after rainfall $\geq$ **90cm**, then flood occurs
- If you **had paid for flood protection**, you do not pay anything else than the flood protection



- You will then be given the actual amount of **river level increment** due to rainfall in the catchment
- If: river level before rainfall + river level increment after rainfall $\geq$ **90cm**, then flood occurs
- If you **had paid for flood protection**, you do not pay anything else than the flood protection
- If you **had not paid for a flood protection**, **and** there is a flood, you have to pay **4,000 tokens**

Before you start, you are informed that:

- Your initial purse is 20,000 tokens
- The river level before rainfall varies between 10 and 60cm
- The level increment after rainfall varies between 10 and 80cm
- If river level before rainfall + river level increment after rainfall $\geq$ 90cm a flood occurs

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

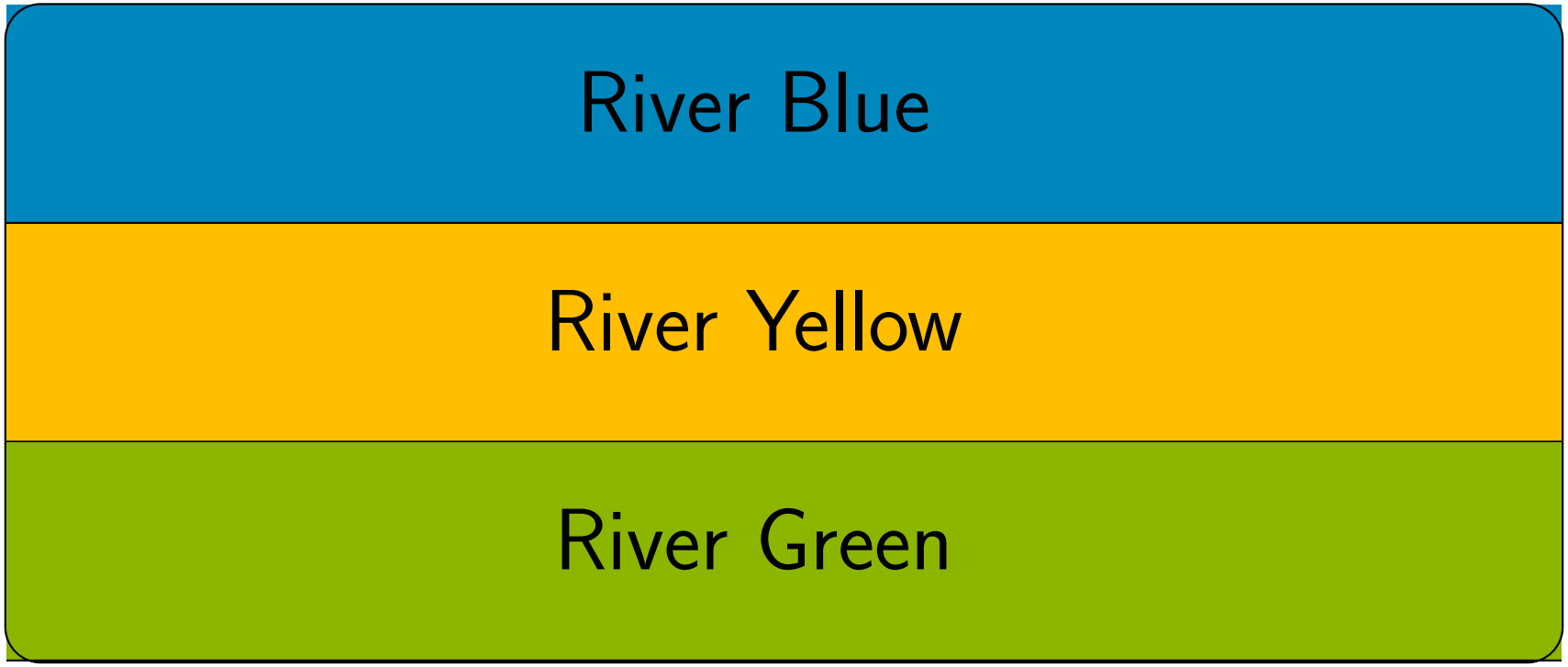
- Your duty is to make decisions, case by case, on paying for flood protection or not, in order to lose as little money as possible, while keeping inhabitants safe
- The candidate with the largest amount of money in purse at the end of the game will be hired as head of the flood protection team

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Groups

- For a more efficient management of the Grande Basin, you are divided into 3 groups
- You are nonetheless working independently!



Flood protection=-2000 tokens; flood without protection=-4000 tokens

- In the envelope you have a worksheet and a forecast set
- Let's do a trial round together before you start playing

TRIAL ROUND

Do not write on your worksheet for now!

NEXT

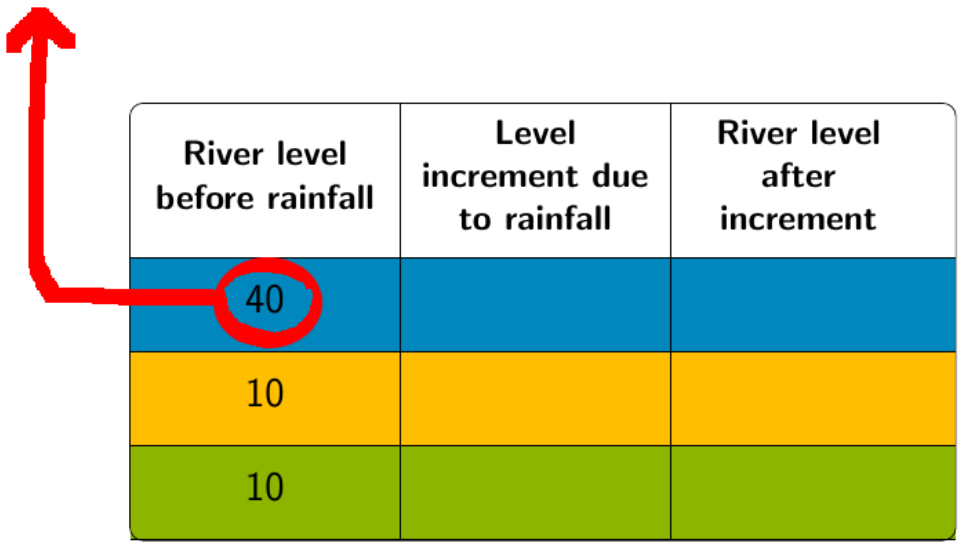
- First, you are given the river level before rainfall
- Check the value corresponding to your assigned river

River level before rainfall	River level increment	River level after increment
40		
10		
10		

NEXT

- You then write this number down on your worksheet (e.g.: in this trial round, we have been assigned the 'Blue River')

Round	Case	River level before rainfall (10-60)	Flood protection?	River level increment (10-80)	River level after increment	Flood? ($\geq$ 90)	Tokens spent	Purse (20,000)
	1	40	Yes ☐ No ☐			Yes ☐ No ☐		

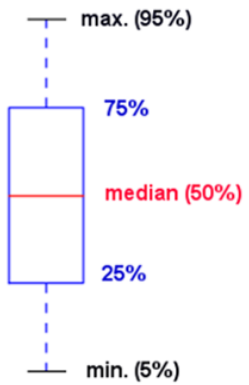


NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

- You then pick up your forecast set which will present each forecast of river level increment after rainfall as a boxplot

BLUE-2



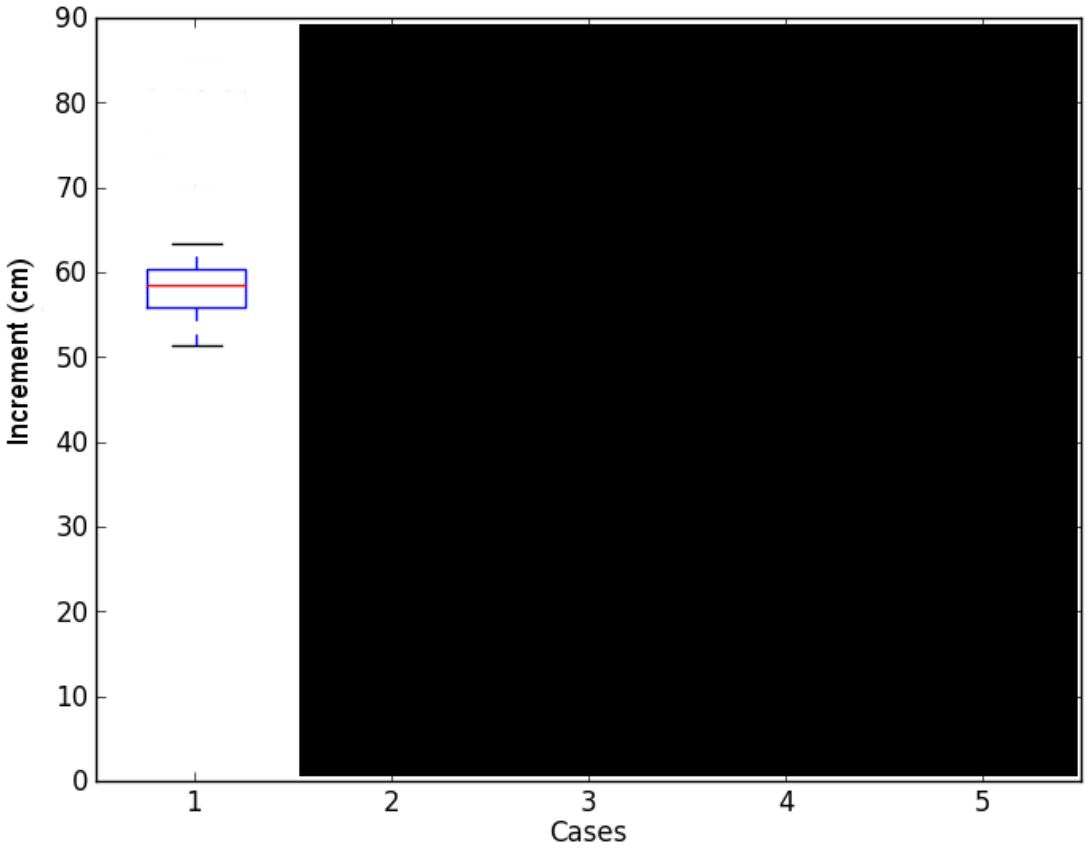
ECMWF

PULL HERE

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

- When you pull the first page, this is what you will see
- You can use this forecast to make a decision



NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Flood protection?

- You decide if you want to buy a flood protection or not
- You write it down on your worksheet, together with the tokens spent

Round	Case	River level before rainfall (10-60)	Flood protection?	River level increment (10-80)	River level after increment	Flood? ($\geq$ 90)	Tokens spent	Purse (20,000)
	1	40	Yes ☑ No ☐			Yes ☐ No ☐	-2,000	

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

- Once you have made your decision, the observed river level increment will be communicated
- If the river level after increment $\geq$ 90cm, flood occurs

River level before rainfall	River level increment	River level after increment
40	60	100
10	10	20
10	70	80

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

- You then complete your worksheet, calculating the remaining money in your purse
- This is the end of one case, we are now going to play 5 cases

Round	Case	River level before rainfall (10-60)	Flood protection?	River level increment (10-80)	River level after increment	Flood? ($\geq$ 90)	Tokens spent	Purse (20,000)
	1	40	Yes ☑ No ☐	60	100	Yes ☑ No ☐	-2,000	18,000

▸ NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

ROUND 1

It's your turn to play!

- Take your worksheet and your forecast set
- Check your River name
- Write down your occupation and mark the correct option for the number of years of work experience you have
- And let's start!

PLAY

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 1

- Write the river level before rainfall on your worksheet
- Check your forecast and make your decision: flood protection?

River level before rainfall	River level increment	River level after increment
20		
40		
50		

▸ COUNTDOWN

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 1

River level before rainfall	River level increment	River level after increment
20		
40		
50		

5

Case 1

River level before rainfall	River level increment	River level after increment
20		
40		
50		

4

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 1

River level before rainfall	River level increment	River level after increment
20		
40		
50		

3

Case 1

River level before rainfall	River level increment	River level after increment
20		
40		
50		

2

Case 1

River level before rainfall	River level increment	River level after increment
20		
40		
50		

1

Case 1

River level before rainfall	River level increment	River level after increment
20		
40		
50		

▸ DATA

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 1

- Here is what actually happened
- Complete your worksheet and update your purse

River level before rainfall	River level increment	River level after increment
20	80	100
40	10	50
50	10	60

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
50		
30		
30		

▸ COUNTDOWN

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
50		
30		
30		

5

Case 2

River level before rainfall	River level increment	River level after increment
50		
30		
30		

4

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
50		
30		
30		

3

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
50		
30		
30		

2

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
50		
30		
30		

1

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
50		
30		
30		

DATA

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
50	30	80
30	20	50
30	50	80

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 3

River level before rainfall	River level increment	River level after increment
60		
50		
60		

▸ COUNTDOWN

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 3

River level before rainfall	River level increment	River level after increment
60		
50		
60		

5

Case 3

River level before rainfall	River level increment	River level after increment
60		
50		
60		

4

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 3

River level before rainfall	River level increment	River level after increment
60		
50		
60		

3

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 3

River level before rainfall	River level increment	River level after increment
60		
50		
60		

2

Case 3

River level before rainfall	River level increment	River level after increment
60		
50		
60		

1

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 3

River level before rainfall	River level increment	River level after increment
60		
50		
60		

DATA

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 3

River level before rainfall	River level increment	River level after increment
60	30	90
50	10	60
60	80	140

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
20		
60		
10		

▸ COUNTDOWN

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
20		
60		
10		

5

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
20		
60		
10		

4

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
20		
60		
10		

3

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
20		
60		
10		

2

Case 4

River level before rainfall	River level increment	River level after increment
20		
60		
10		

1

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
20		
60		
10		

DATA

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
20	80	100
60	20	80
10	50	60

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
50		
40		
50		

▸ COUNTDOWN

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
50		
40		
50		

5

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
50		
40		
50		

4

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
50		
40		
50		

3

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
50		
40		
50		

2

Case 5

River level before rainfall	River level increment	River level after increment
50		
40		
50		

1

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
50		
40		
50		

DATA

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
50	30	80
40	50	90
50	80	130

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

How did it go?

How was your forecast set?
How was your performance as a decision-maker?

Please, fill in the questions on your worksheet and let's move to Round 2

NEXT

ROUND 2

 Good news: you are going to be a decision-maker again!

 Bad news: the forecasting centre that was offering you the forecasts now decided that you have to pay if you want to have access to them

- If you do not pay, you will not have any forecast set
- There is a limited amount of X licenses, which are of course single-user, they cannot be shared!
- We will now sell these X licenses, valid for the entire second round

▸ BID

Flood protection=-2000 tokens; flood without protection=-4000 tokens

How much are you willing to pay?

- Write it down on your worksheet

Round	Case	River level before rainfall (10-60)	Flood protection?	River level increment (10-80)	River level after increment	Flood? (≥ 90)	Tokens spent	Purse (.....)
Bid: ..... tokens. Did you buy a probabilistic forecast set? YES / NO ***If yes, deduce the money you payed for it here:***								
2	1		Yes ☐ No ☐			Yes ☐ No ☐		
	2		Yes ☐ No ☐			Yes ☐ No ☐		
	3		Yes ☐ No ☐			Yes ☐ No ☐		
	4		Yes ☐ No ☐			Yes ☐ No ☐		
	5		Yes ☐ No ☐			Yes ☐ No ☐		

▸ AUCTION

Flood protection=-2000 tokens; flood without protection=-4000 tokens

AUCTION

NEXT

Figure from: 153178496/ayzek/iStock

Flood protection=-2000 tokens; flood without protection=-4000 tokens

- If you have bought a forecast set:
  - use it and don't let your neighbour see it
  - remember to substract the amount you paid for it from your purse
- If you have not bought a forecast set, you will have to make your decisions without any forecast
- In any case, do not forget to transfer your remaining purse to Round 2

Round	Case	River level before rainfall (10-60)	Flood protection?	River level increment (10-80)	River level after increment	Flood? (≥ 90)	Tokens spent	Purse (.....)
Bid: ..... tokens. Did you buy a probabilistic forecast set? YES / NO *If yes, deduce the money you payed for it here:*								
2	1		Yes ☐ No ☐			Yes ☐ No ☐		
	2		Yes ☐ No ☐			Yes ☐ No ☐		
	3		Yes ☐ No ☐			Yes ☐ No ☐		
	4		Yes ☐ No ☐			Yes ☐ No ☐		
	5		Yes ☐ No ☐			Yes ☐ No ☐		

Let's play!

▸ PLAY

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 1

- Write the river level before rainfall on your worksheet
- Check your forecast and make your decision: flood protection?

River level before rainfall	River level increment	River level after increment
20		
30		
50		

▸ COUNTDOWN

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 1

River level before rainfall	River level increment	River level after increment
20		
30		
50		

5

Case 1

River level before rainfall	River level increment	River level after increment
20		
30		
50		

4

Case 1

River level before rainfall	River level increment	River level after increment
20		
30		
50		

3

Case 1

River level before rainfall	River level increment	River level after increment
20		
30		
50		

2

Case 1

River level before rainfall	River level increment	River level after increment
20		
30		
50		

1

Case 1

River level before rainfall	River level increment	River level after increment
20		
30		
50		

▸ DATA

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 1

- Here is what actually happened
- Complete your worksheet and update your purse

River level before rainfall	River level increment	River level after increment
20	80	100
30	80	110
50	30	80

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
60		
10		
10		

▸ COUNTDOWN

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
60		
10		
10		

5

Case 2

River level before rainfall	River level increment	River level after increment
60		
10		
10		

4

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
60		
10		
10		

3

Case 2

River level before rainfall	River level increment	River level after increment
60		
10		
10		

2

Case 2

River level before rainfall	River level increment	River level after increment
60		
10		
10		

1

Case 2

River level before rainfall	River level increment	River level after increment
60		
10		
10		

▸ DATA

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 2

River level before rainfall	River level increment	River level after increment
60	20	80
10	80	90
10	80	90

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 3

River level before rainfall	River level increment	River level after increment
40		
50		
60		

▸ COUNTDOWN

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 3

River level before rainfall	River level increment	River level after increment
40		
50		
60		

5

Case 3

River level before rainfall	River level increment	River level after increment
40		
50		
60		

4

Case 3

River level before rainfall	River level increment	River level after increment
40		
50		
60		

3

Case 3

River level before rainfall	River level increment	River level after increment
40		
50		
60		

2

Case 3

River level before rainfall	River level increment	River level after increment
40		
50		
60		

1

Case 3

River level before rainfall	River level increment	River level after increment
40		
50		
60		

▸ DATA

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 3

River level before rainfall	River level increment	River level after increment
40	30	70
50	20	70
60	20	80

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
50		
40		
40		

▸ COUNTDOWN

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
50		
40		
40		

5

Case 4

River level before rainfall	River level increment	River level after increment
50		
40		
40		

4

Case 4

River level before rainfall	River level increment	River level after increment
50		
40		
40		

3

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
50		
40		
40		

2

Case 4

River level before rainfall	River level increment	River level after increment
50		
40		
40		

1

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
50		
40		
40		

DATA

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 4

River level before rainfall	River level increment	River level after increment
50	30	80
40	60	100
40	20	60

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
60		
60		
30		

▸ COUNTDOWN

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
60		
60		
30		

5

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
60		
60		
30		

4

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
60		
60		
30		

3

Case 5

River level before rainfall	River level increment	River level after increment
60		
60		
30		

2

Case 5

River level before rainfall	River level increment	River level after increment
60		
60		
30		

1

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
60		
60		
30		

DATA

Flood protection=-2000 tokens; flood without protection=-4000 tokens

Case 5

River level before rainfall	River level increment	River level after increment
60	10	70
60	20	80
30	80	110

NEXT

Flood protection=-2000 tokens; flood without protection=-4000 tokens

How did it go?

How much did you lose in Round 2?
Did you do better than in Round 1?
Was it worth buying the forecasts?

Please, fill in the questions on your worksheet

THE END

The candidate with the largest final amount of money in purse is hired as head of the team.

Congratulations!

Thank you for your participation!

Figure from: 156279982/Nastco/iStock