The spreadsheet developed at Middlesex University's Flood Hazard Research Centre

EU DG-ECHO Humanitarian Aid and Civil Protection
Flood-CBA 2

fhrc
Flood Hazard Research Centre

To begin your analysis please complete all relevant white cells

A. Enter the number of future floods that you will analyse: 5

Between 4 and 7 floods need to be entered

B. Enter the return

(e.g. starting at s

These must to be

C. The number and

that require ana

Please enter a br

D. Enter the discou

This should be en

#	
0	
1	Closing road and
2	Closing road and
3	Closing gaps, enh
4	
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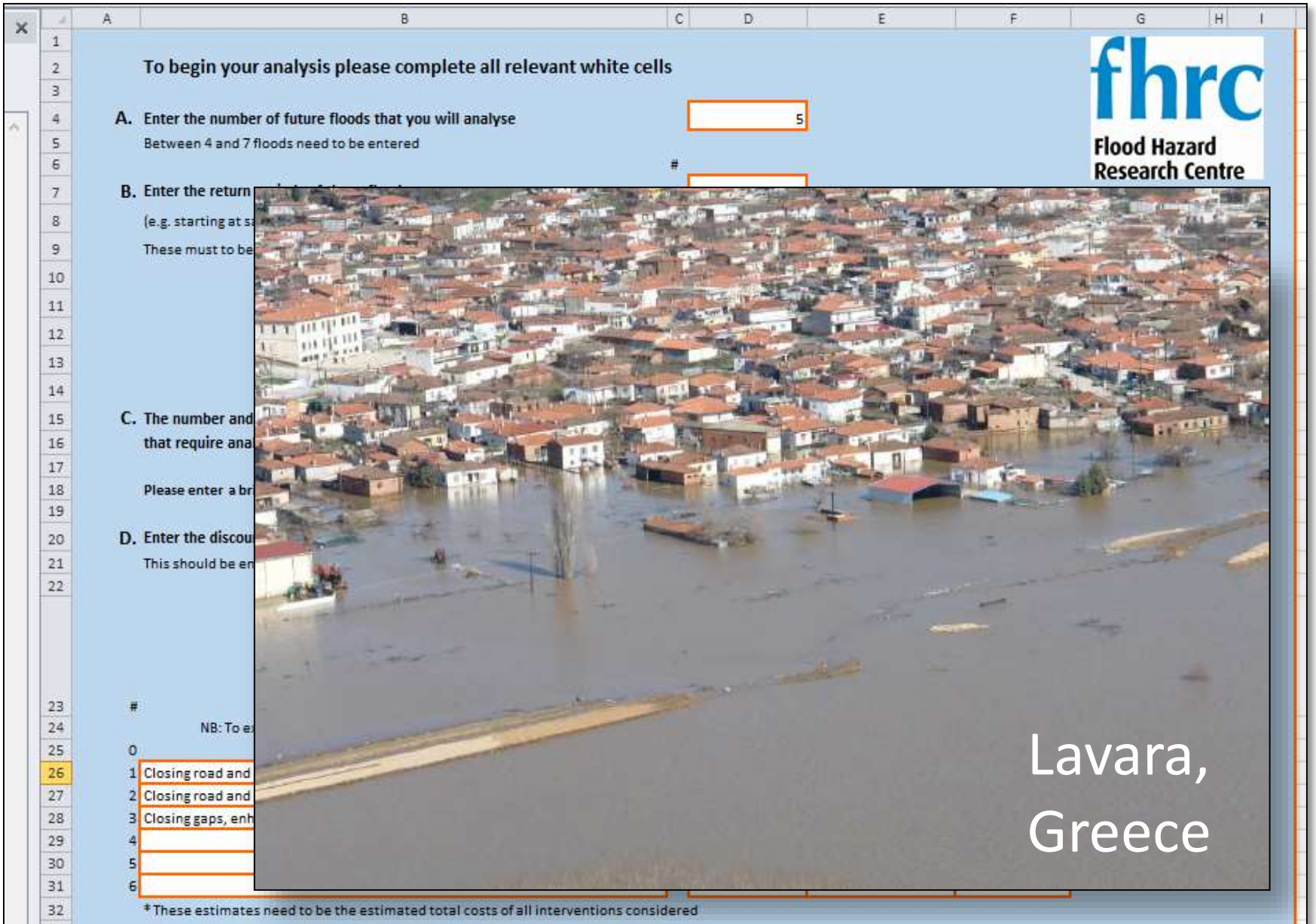
6	

NB: To e

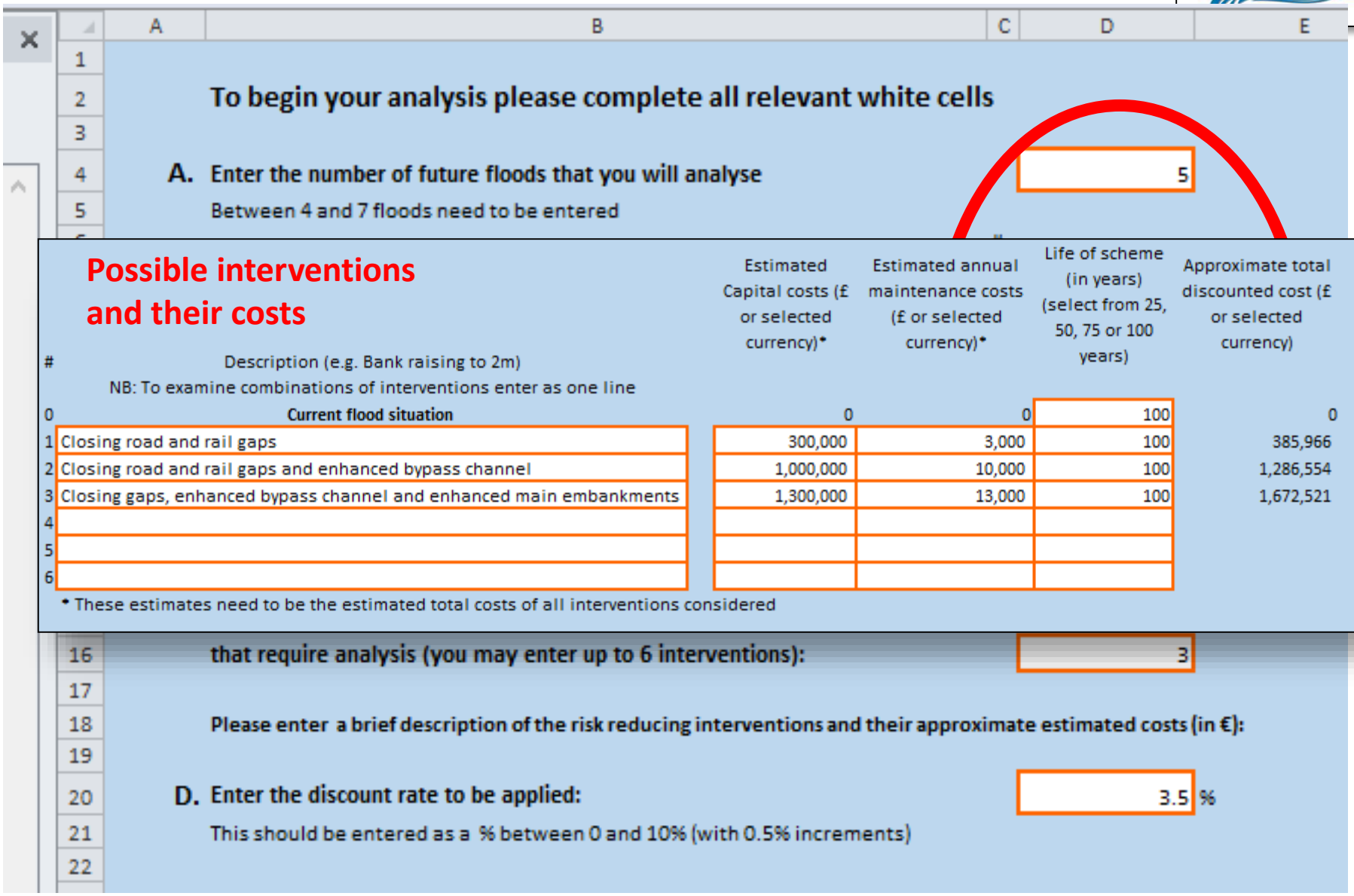
*These estimates need to be the estimated total costs of all interventions considered

Lavara, Greece

The “menu” of basic data inputs



The “menu” of basic data inputs



To begin your analysis please complete all relevant white cells

A. Enter the number of future floods that you will analyse: 5

Between 4 and 7 floods need to be entered

Possible interventions and their costs

#	Description (e.g. Bank raising to 2m) NB: To examine combinations of interventions enter as one line	Estimated Capital costs (£ or selected currency)*	Estimated annual maintenance costs (£ or selected currency)*	Life of scheme (in years) (select from 25, 50, 75 or 100 years)	Approximate total discounted cost (£ or selected currency)
0	Current flood situation	0	0	100	0
1	Closing road and rail gaps	300,000	3,000	100	385,966
2	Closing road and rail gaps and enhanced bypass channel	1,000,000	10,000	100	1,286,554
3	Closing gaps, enhanced bypass channel and enhanced main embankments	1,300,000	13,000	100	1,672,521
4					
5					
6					

* These estimates need to be the estimated total costs of all interventions considered

that require analysis (you may enter up to 6 interventions): 3

Please enter a brief description of the risk reducing interventions and their approximate estimated costs (in €):

D. Enter the discount rate to be applied: 3.5 %

This should be entered as a % between 0 and 10% (with 0.5% increments)

The current flood situation: data inputs

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The current flooding situation (i.e. no new interventions)

Users are required to complete the white cells in the tables below

Floods

Return period of the future flood (years)	Residential Damages: Residential properties at risk (No.)	Residential Damages: flooding inside properties (cm)	Residential Damages: Damage per house	Residential Damages: Total Damage	Non-residential Damages: Non-Residential Properties at risk (No.)	Non-residential Damages: Mean depth of flooding inside properties (cm)	Non-residential Damages: MCM2013; p163 and Non-Residential Guidance Tab)	Non-residential Damages: Damage per m2	Non-residential Damages: Total Damage	Agricultural Losses: Type of Agriculture affected (select from list)	Agricultural Losses: losses per hectare	Agricultural Losses: hectares flooded	Agricultural Losses: Agricultural Losses	Any other possible losses?	TOTAL
2	20	40	24,334	486,689	5	40	200	390	390,004	Extensive arable	359	50	17,337		306,629
20	250	100	28,351	7,237,861	40	100	200	703	5,620,806	Extensive arable	359	277	99,371		12,958,039
50	300	120	30,083	9,024,318	40	120	200	801	6,404,210	Extensive arable	359	1200	430,488		15,859,616
100	380	140	31,880	12,114,493	60	140	200	878	10,531,734	Extensive arable	359	1240	444,838		23,091,125
1000	380	160	33,566	12,755,212	60	160	200	964	11,571,043	Extensive arable	359	1380	495,061		24,821,322

TOTAL RESIDENTIAL DAMAGES 41,631,172

TOTAL NON-RESIDENTIAL DAMAGES 34,517,864

TOTAL AGRICULTURAL LOSSES 1,487,635 - TOTAL OTHER

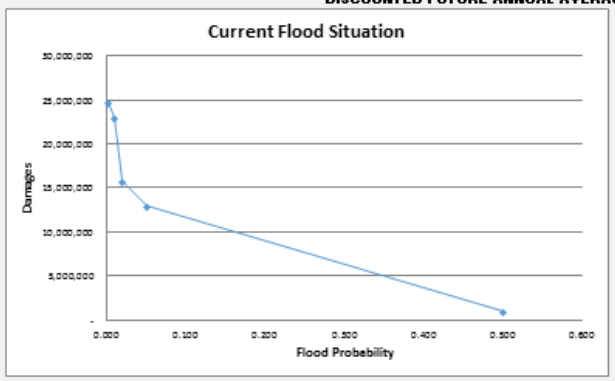
77,636,730 TOTAL LOSSES

Loss-probability calculation

Return Period	Exceedance Probability	Damages	Interval probability	Mean Damage	Interval Damage	Cumulative annual damages	Discounted Annual average Damages
2	0.500	306,629					
			0.450	6,332,334	3,119,550	3,119,550	89,392,041
20	0.050	12,958,039					
			0.030	14,408,827	432,265	3,551,815	101,778,773
50	0.020	15,859,616					
			0.010	19,475,370	194,754	3,746,569	107,359,523
100	0.010	23,091,125					
			0.009	23,356,223	215,606	3,962,175	113,537,805
1000	0.001	24,821,322					

TOTAL ANNUAL DAMAGES 3,962,175

DISCOUNTED FUTURE ANNUAL AVERAGE DAMAGES 113,537,805



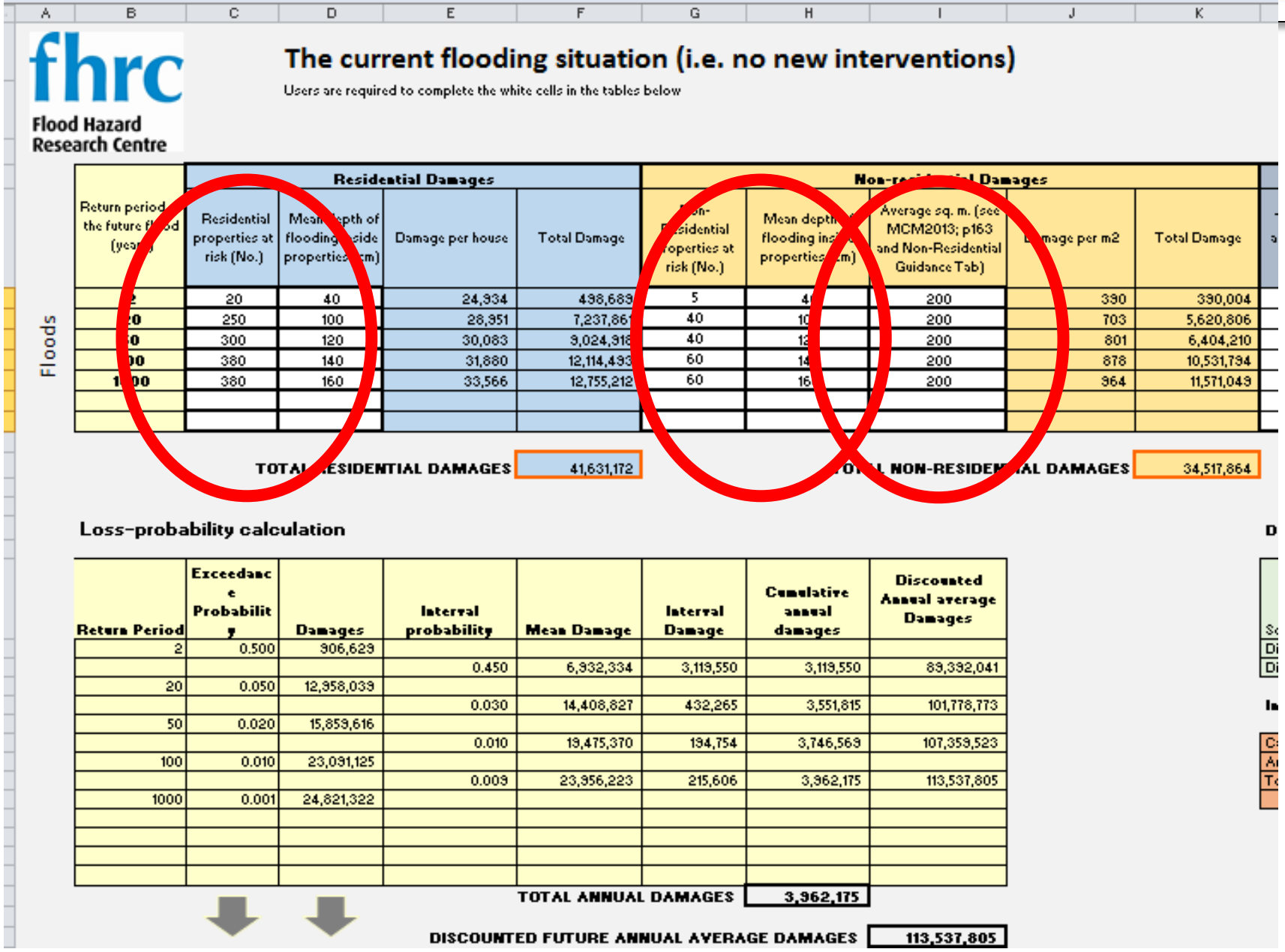
Discounting

Scheme Life		100 years
Discount rate		3.5 %
Discount factor		28.66

Intervention costs

Capital costs		
Annual Maintenance costs		
Total discounted maintenance costs		
	Total	

The current flood situation: data inputs



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The current flooding situation (i.e. no new interventions)

Users are required to complete the white cells in the tables below

Floods

Return period of the future flood (years)	Residential Damages: Residential properties at risk (No.)	Residential Damages: Mean depth of flooding inside properties (cm)	Residential Damages: Damage per house	Residential Damages: Total Damage	Non-residential Damages: Non-Residential properties at risk (No.)	Non-residential Damages: Mean depth of flooding inside properties (cm)	Non-residential Damages: Average sq. m. (see MCM2013; p163 and Non-Residential Guidance Tab)	Non-residential Damages: Damage per m2	Non-residential Damages: Total Damage
2	20	40	24,934	498,689	5	4	200	390	390,004
20	250	100	28,951	7,237,867	40	10	200	703	5,620,806
50	300	120	30,083	9,024,918	40	12	200	801	6,404,210
100	380	140	31,880	12,114,493	60	14	200	878	10,531,794
1000	380	160	33,566	12,755,212	60	16	200	964	11,571,049

TOTAL RESIDENTIAL DAMAGES: 41,631,172

TOTAL NON-RESIDENTIAL DAMAGES: 34,517,864

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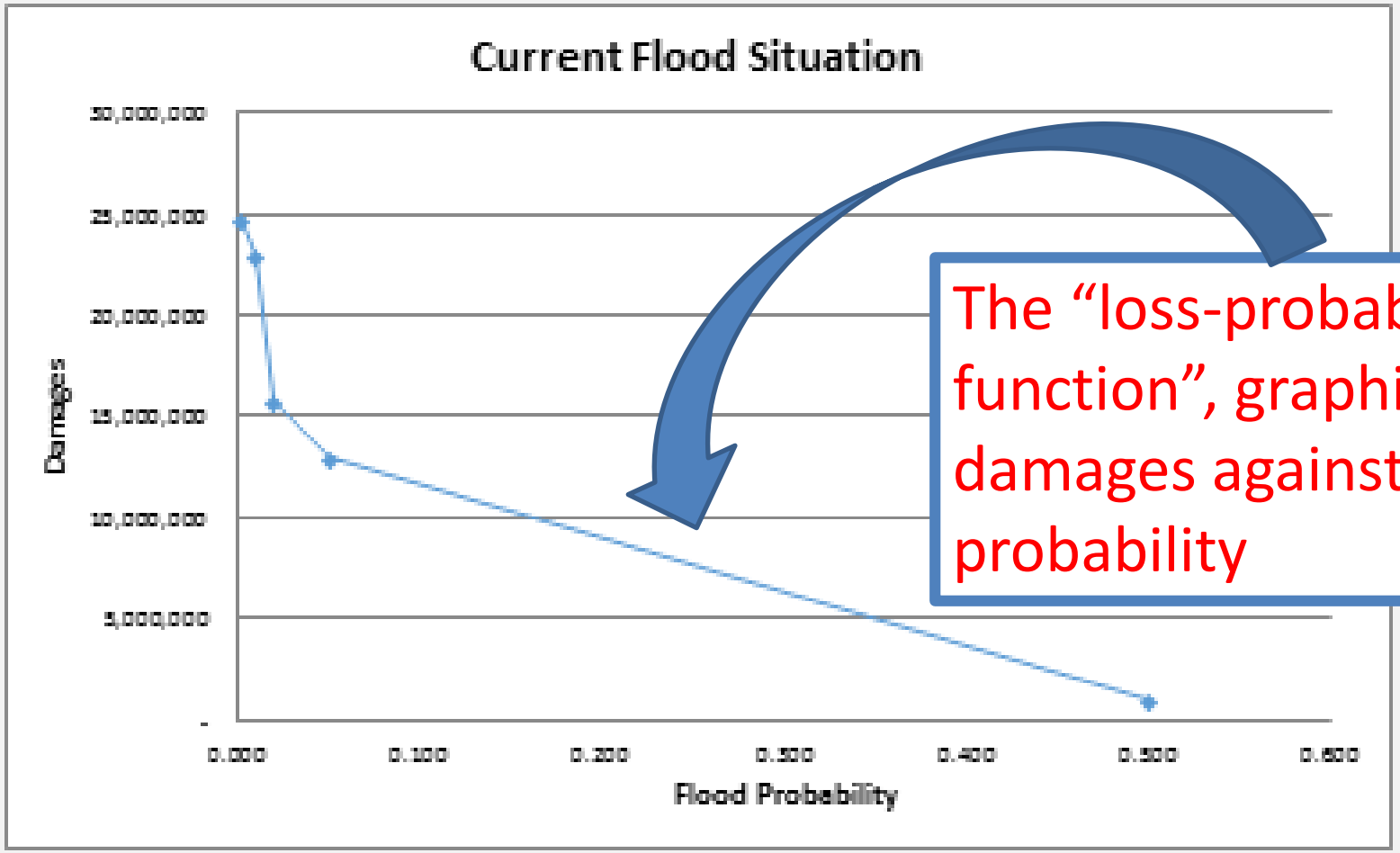
TOTAL ANNUAL DAMAGES: 3,962,175

DISCOUNTED FUTURE ANNUAL AVERAGE DAMAGES: 113,537,805

The current flood situation: the result

TOTAL ANNUAL DAMAGES 3,962,17

DISCOUNTED FUTURE ANNUAL AVERAGE DAMAGES

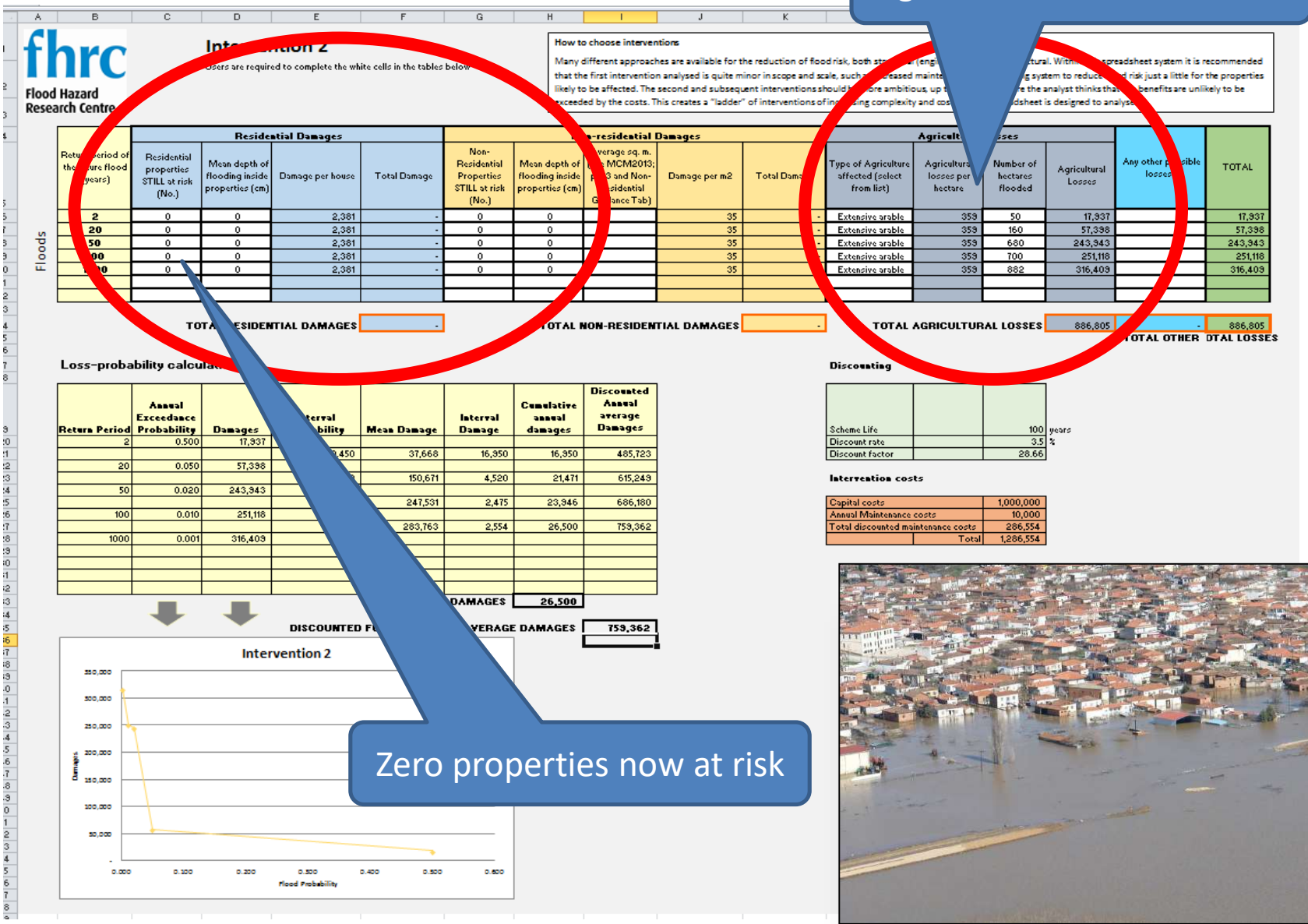


The “loss-probability function”, graphing damages against flood probability

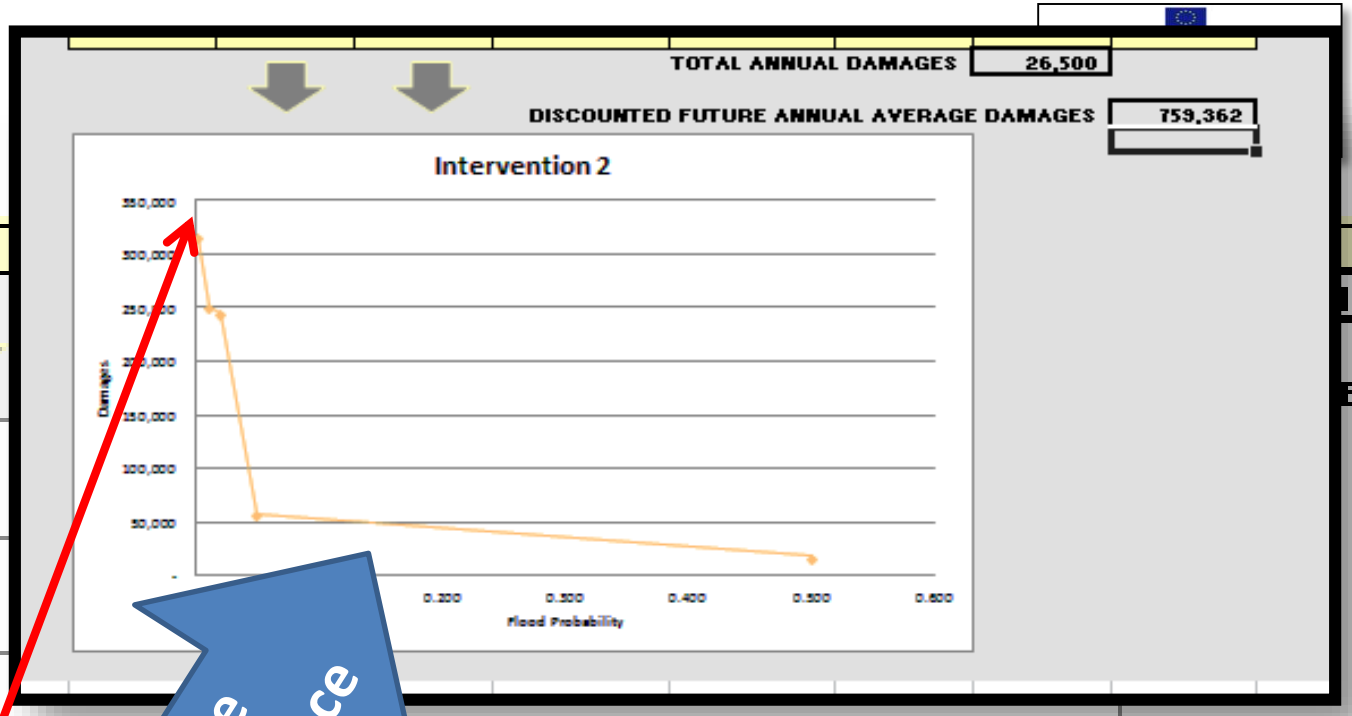
Intervention No. 2: data inputs

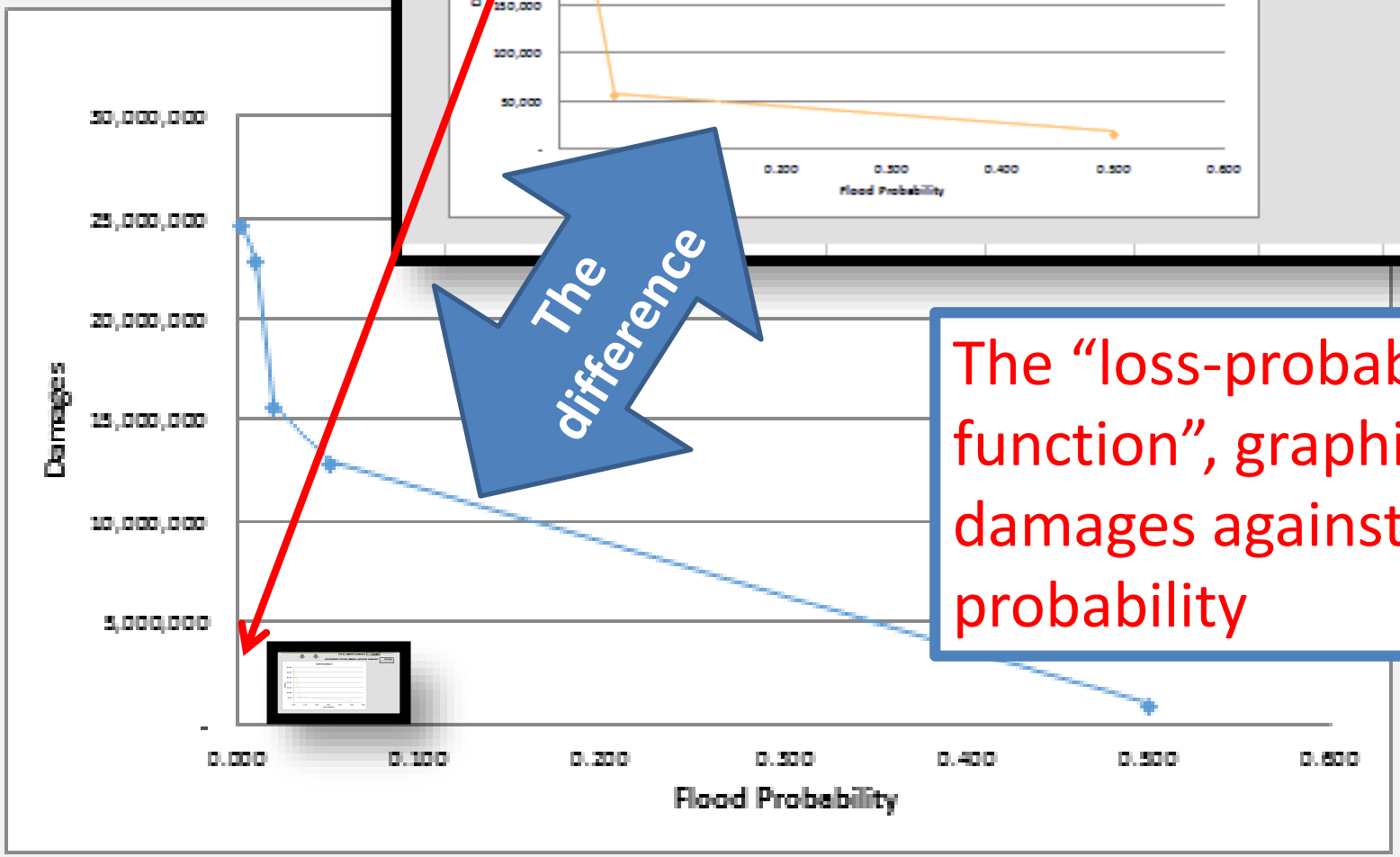
Agricultural land still at risk

Zero properties now at risk



The two graphs





The difference

The “loss-probability function”, graphing damages against flood probability

Summary results

EU DG-ECHO Humanitarian Aid and Civil Protection

Flood-CBA 2

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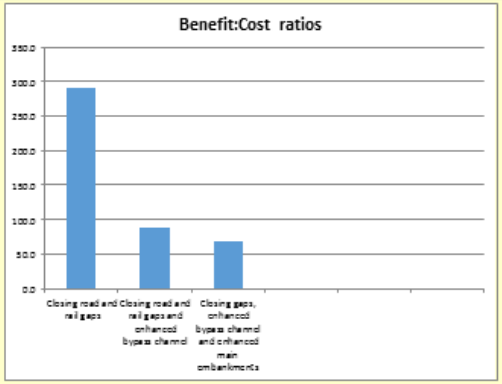
Summary Cost-Benefit Ratios

CURRENT FLOODING SITUATION	
Discounted future potential losses	113,537,805

INTERVENTIONS

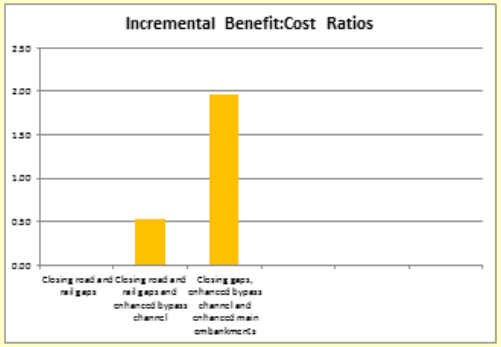
	Option(s)	discounted future potential losses	Benefit*	Approximate total costs**	Benefit:Cost ratio	Benefit minus costs	Incremental Benefit:Cost Ratio
#1	Closing road and rail gaps	1,230,703	112,307,102	385,966	291.0	111,921,135	
#2	Closing road and rail gaps and enhanced bypass channel	753,362	112,778,443	1,286,554	87.7	111,491,889	0.52
#3	Closing gaps, enhanced bypass channel and enhanced main embankments	-	113,537,805	1,672,521	67.9	111,865,284	1.97
#4							
#5							
#6							

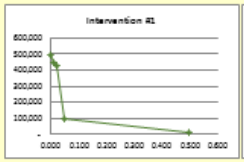
*The current situation discounted losses minus the post-intervention discounted losses

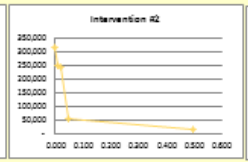


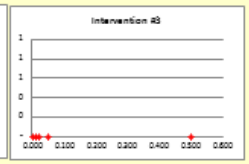
The incremental benefit:cost ratio

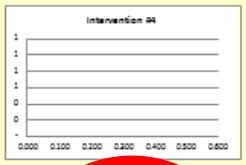
This statistic is an important one when evaluating the standard of protection provided by a particular flood risk reduction intervention. It assesses the extra benefits over and above the previous intervention, by flood return period standard, in relation to the extra costs that this more ambitious intervention requires. So an incremental benefit: cost ratio above 1.0 indicates that that intervention is superior to the previous one analysed in that it's costs do not exceed the extra benefits obtained. Other things being equal the analyst should pursue those interventions where the incremental benefit: cost ratio exceeds 1.0.

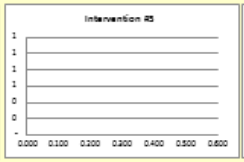


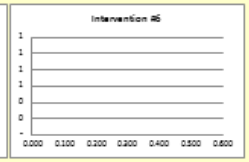


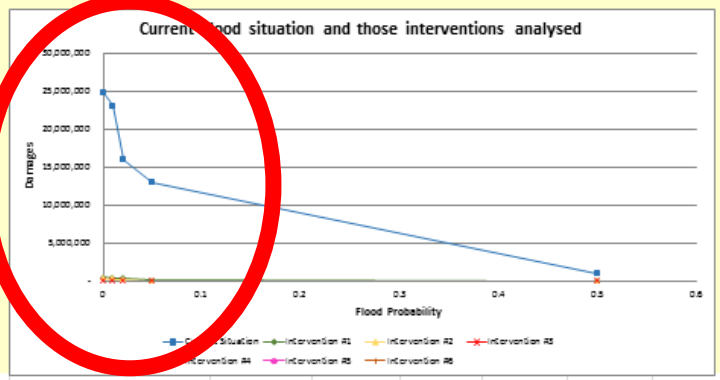












Summary results

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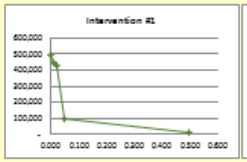
Summary

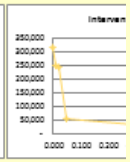
CURRENT FLOODING SITUATION	
Discounted future potential losses	113,537,805

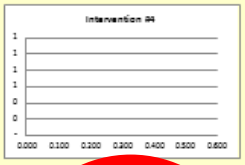
INTERVENTIONS

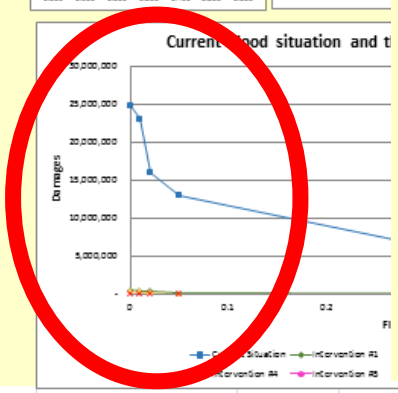
	Option(s)	discounted future potential losses	Benef
#1	Closing road and rail gaps	1,230,703	112,30
#2	Closing road and rail gaps and enhanced bypass channel	753,362	112,778
#3	Closing gaps, enhanced bypass channel and enhanced main embankments	-	113,53
#4			
#5			
#6			

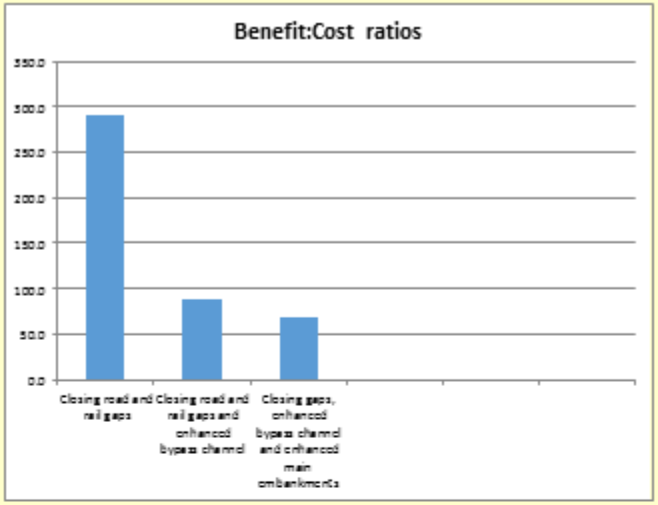
*The current situation discounted losses minus the post-interven











The incremental benefit:cost ratio

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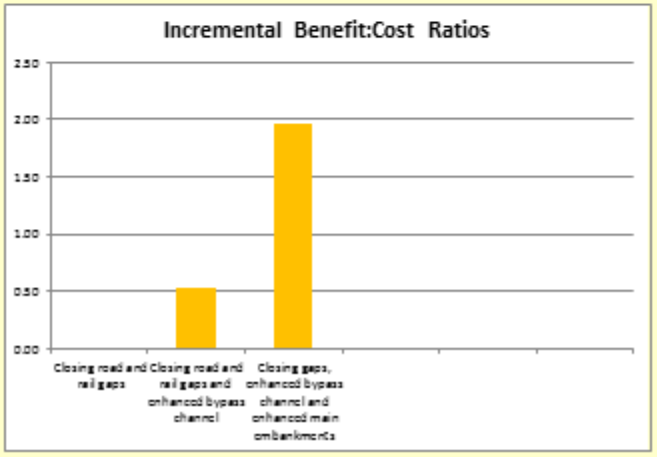
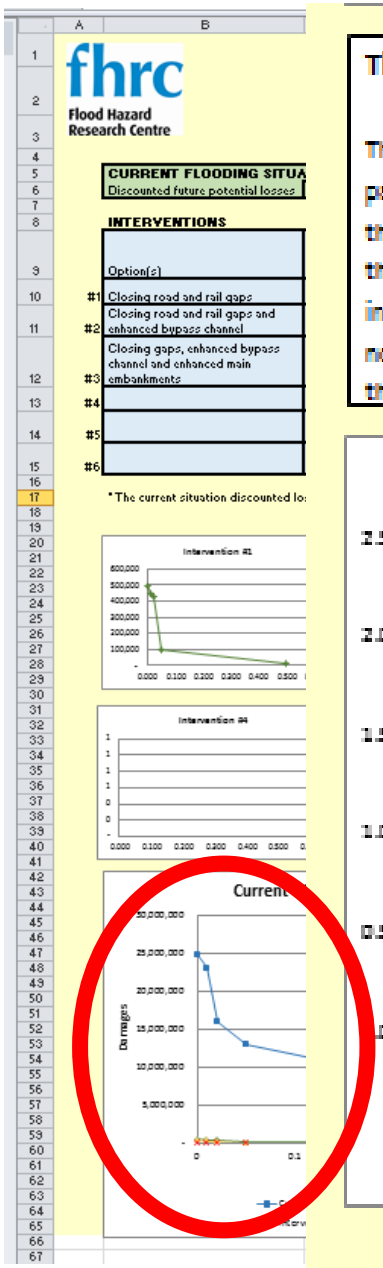


Summary results



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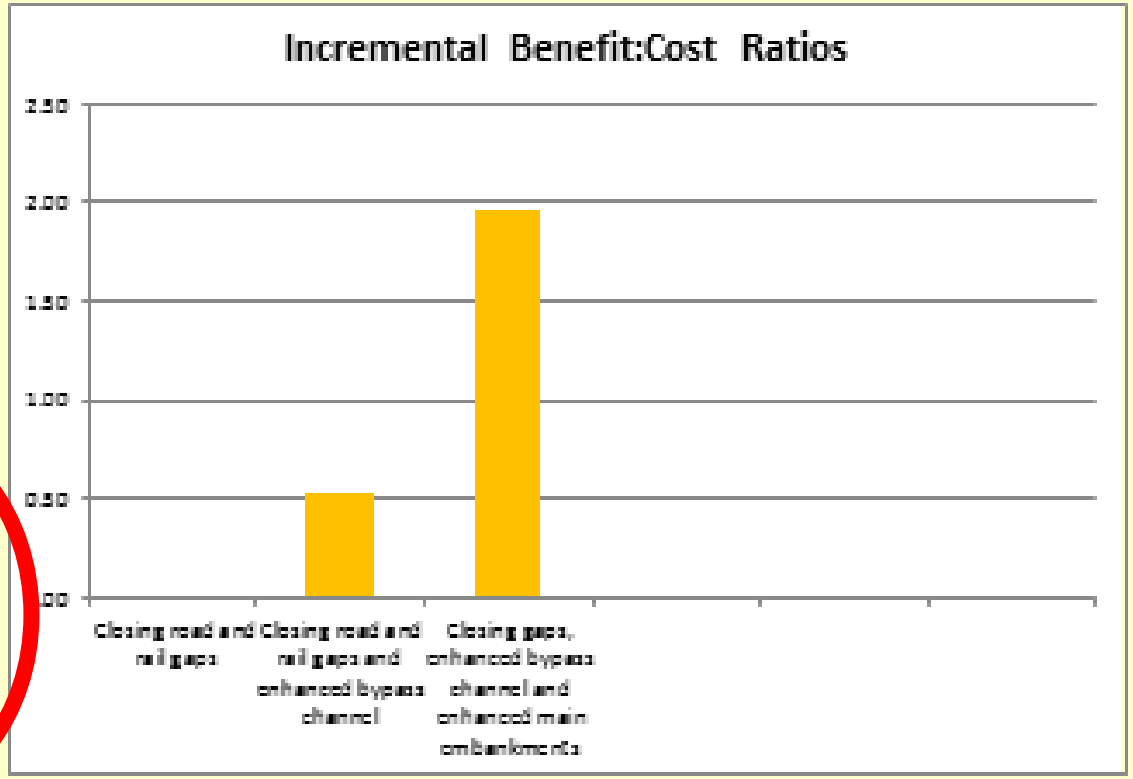

Summary results: Sensitivity analysis

The "base case"

#	Description (e.g. Bank raising to 2m) NB: To examine combinations of interventions enter as one line	Estimated Capital costs (£ or selected currency)*	Estimated annual maintenance costs (£ or selected currency)*	Life of scheme (in years) (select from 25, 50, 75 or 100 years)	Approximate total discounted cost (£ or selected currency)
0	**Current flood situation**	0	0	100	0
1	Closing road and rail gaps	300,000	3,000	100	385,966
2	Closing road and rail gaps and enhanced bypass channel	1,000,000	10,000	100	1,286,554
3	Closing gaps, enhanced bypass channel and enhanced main embankments	1,300,000	13,000	100	1,672,521
4					
5					
6					

* These estimates need to be the estimated total costs of all interventions considered

The changed assumptions

	NB: To examine combinations of interventions enter as one line			
0	**Current flood situation**	0	0	100
1	Closing road and rail gaps	850,000	75,000	25
2	Closing road and rail gaps and enhanced bypass channel	1,000,000	75,000	100
3	Closing gaps, enhanced bypass channel and enhanced main embankments	1,300,000	13,000	100
4				
5				
6				

Summary results: Sensitivity analysis

The "base case"

#	Description (e.g. Bank raising to 2m)
	NB: To examine combinations of interventions enter a
0	Current flood situation
1	Closing road and rail gaps
2	Closing road and rail gaps and enhanced bypass channel
3	Closing gaps, enhanced bypass channel and enhanced mai
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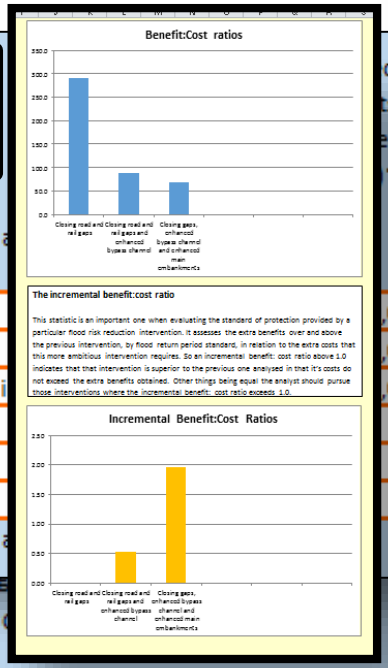

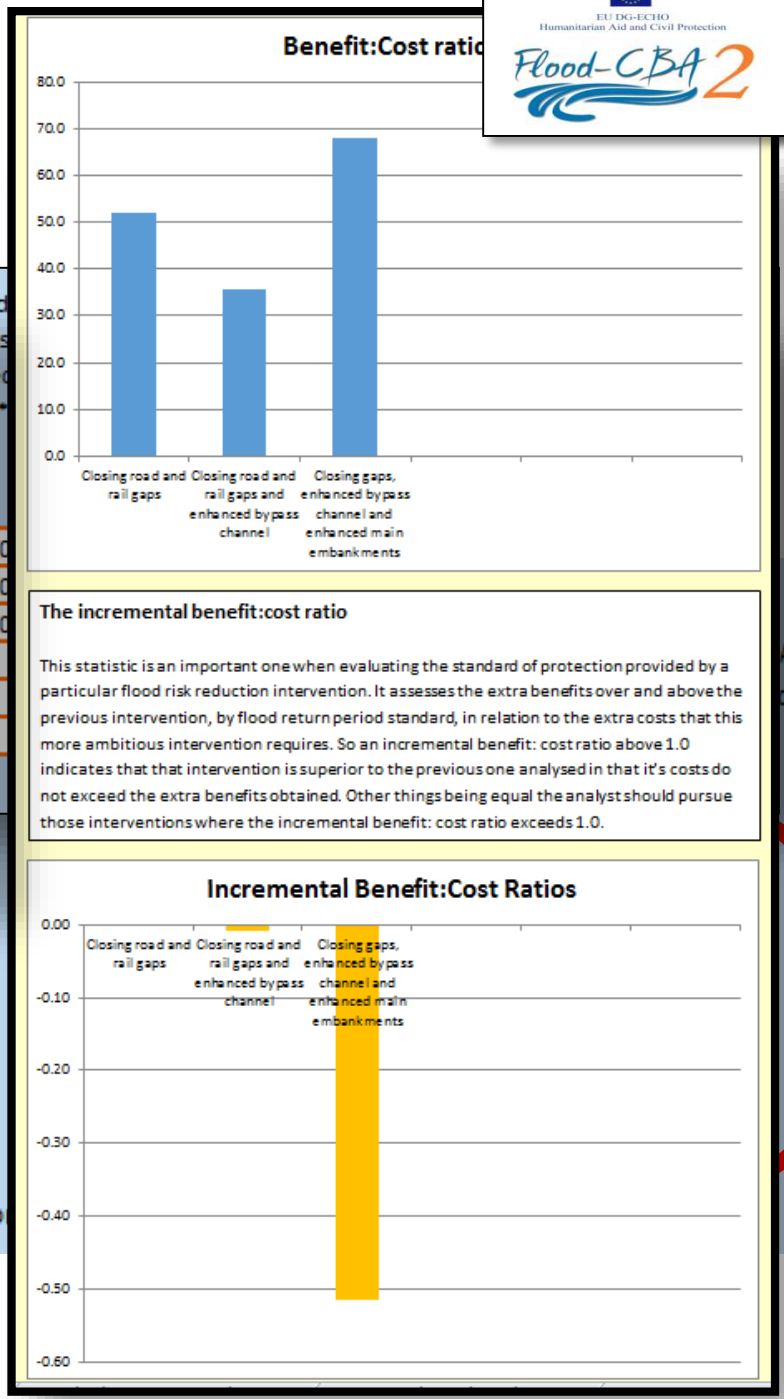

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4	
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6	

The changed assumptions

EU DG-ECHO
Humanitarian Aid and Civil Protection

Flood-CBA 2