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Working with water

Attributing risk to assets - examples from pilot projects

Dr Caroline McGahey

FRMRCII Workshop - 4th October 2011

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Overview

Introduction to risk-based modelling

Pilot site examples:

- Humber Estuary
- Great Eau Catchment
- Thames Estuary

Conclusions

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Why undertake risk-based modelling?

Models support rational decision making by:

- Providing an objective understanding of system behaviour
- Providing richer information (*drives down costs*)
- Promoting focused dialogue between stakeholders

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The traditional response to floods in the Thames
(picture courtesy: Rachael Hill, Environment Agency)

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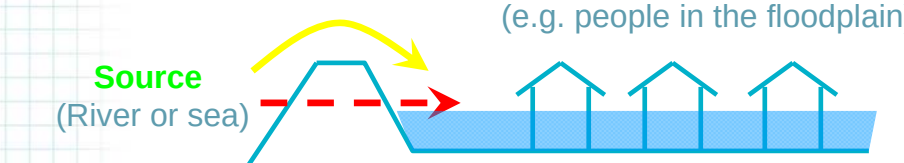
RASP risk-based methods
Risk Assessment for Strategic Planning

Pathway
(e.g. beach, defence and floodplain)

Receptor
(e.g. people in the floodplain)

Source
(River or sea)



(HR Wallingford, 2001)

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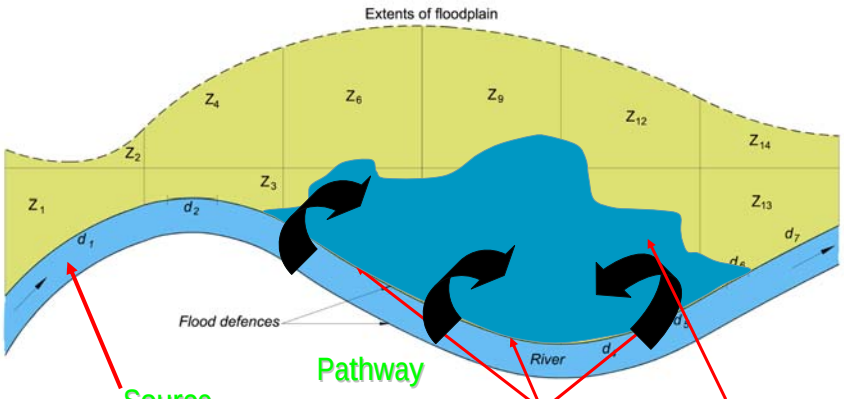
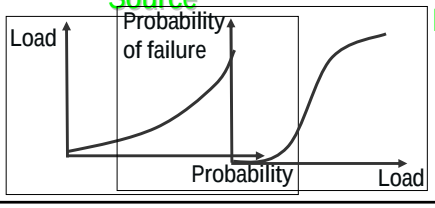
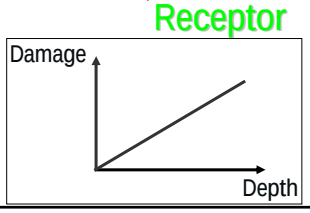
RASP risk-based methods
Risk Assessment for Strategic Planning

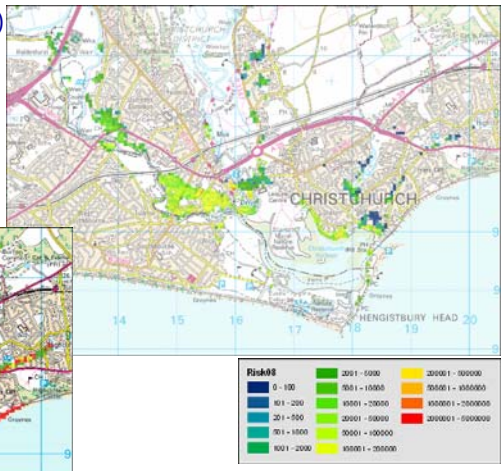






Example outputs
Probability of flooding and risk

Risk (£)



Probability of flooding

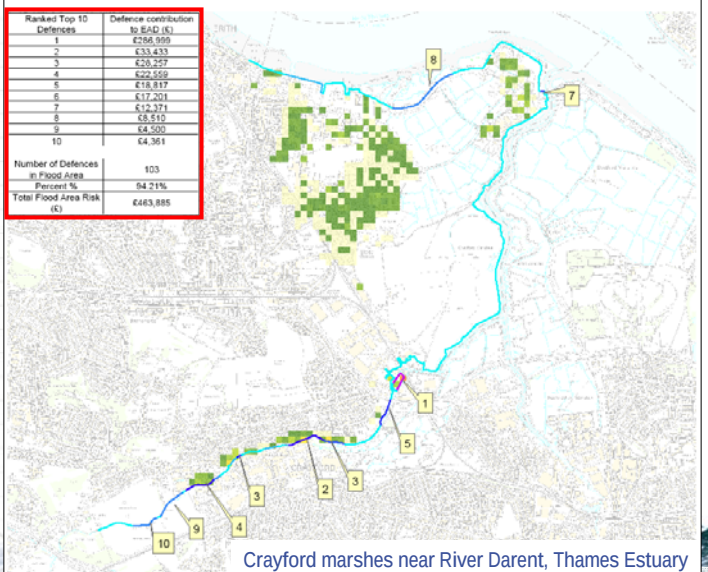
© HR Wallingford 2006

Example outputs
Risk attribution

Prioritise assets

Expected Annual Damage (P1 - 2005)

Ranked Top 10 Defences	Defence contribution to EAD (£)
1	£266,966
2	£33,433
3	£26,257
4	£22,559
5	£18,817
6	£17,201
7	£12,371
8	£8,510
9	£4,500
10	£4,361
Number of Defences in Flood Area	103
Percent %	94.21%
Total Flood Area Risk (£)	£463,885



Crayford marshes near River Darent, Thames Estuary

© HR Wallingford 2006

Benefits of the RASP approach
Risk Assessment for Strategic Planning

Consistent approach

Cons

Cons

Provi

Utilis tudies

Dem iled
local modelling

A practical framework for progressively refining a risk assessment

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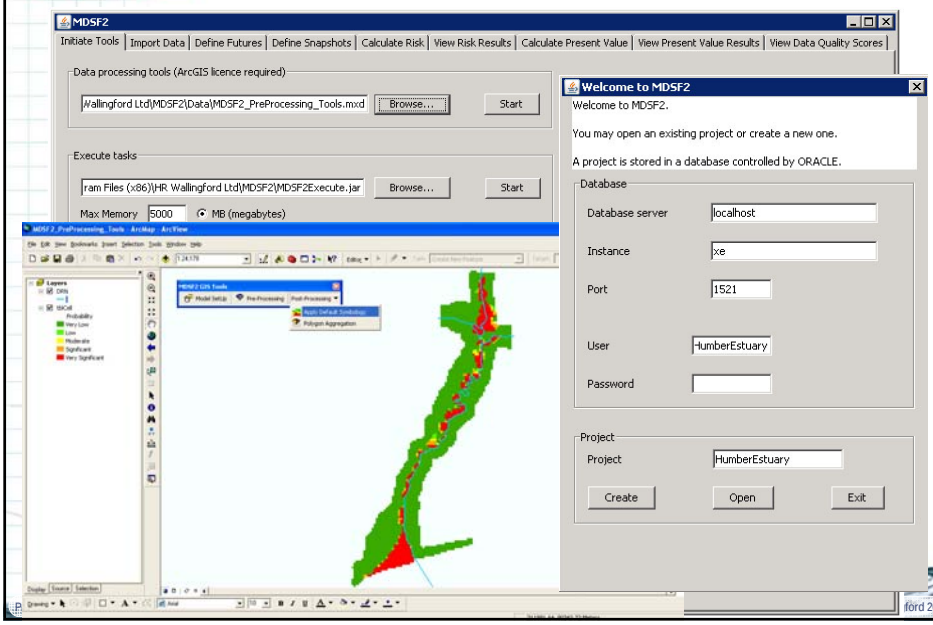
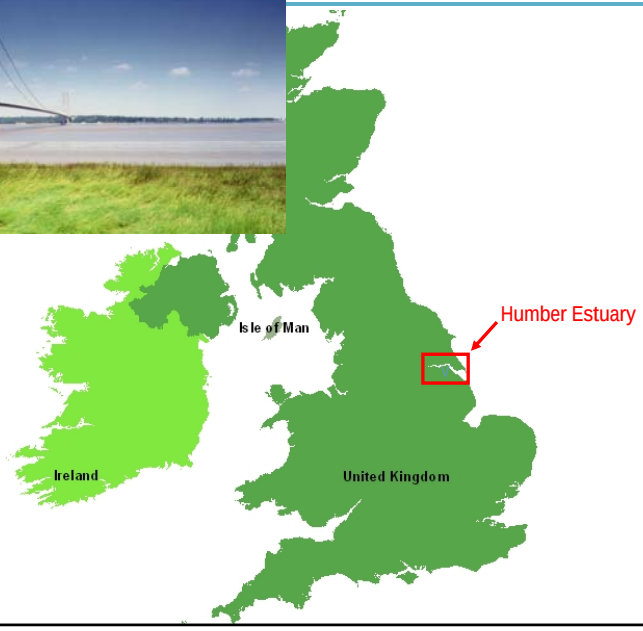
RASP now embedded in MDSF2
Modelling and Decision Support Framework 2



Humber Estuary
Pilot site



Humber Estuary
Loading conditions

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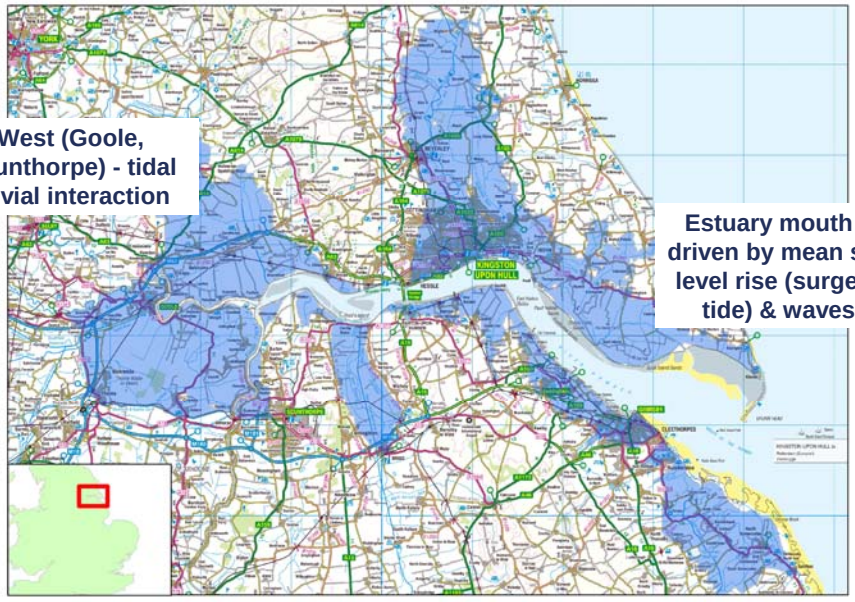


West (Goole, Scunthorpe) - tidal fluvial interaction

Estuary mouth – driven by mean sea level rise (surge & tide) & waves

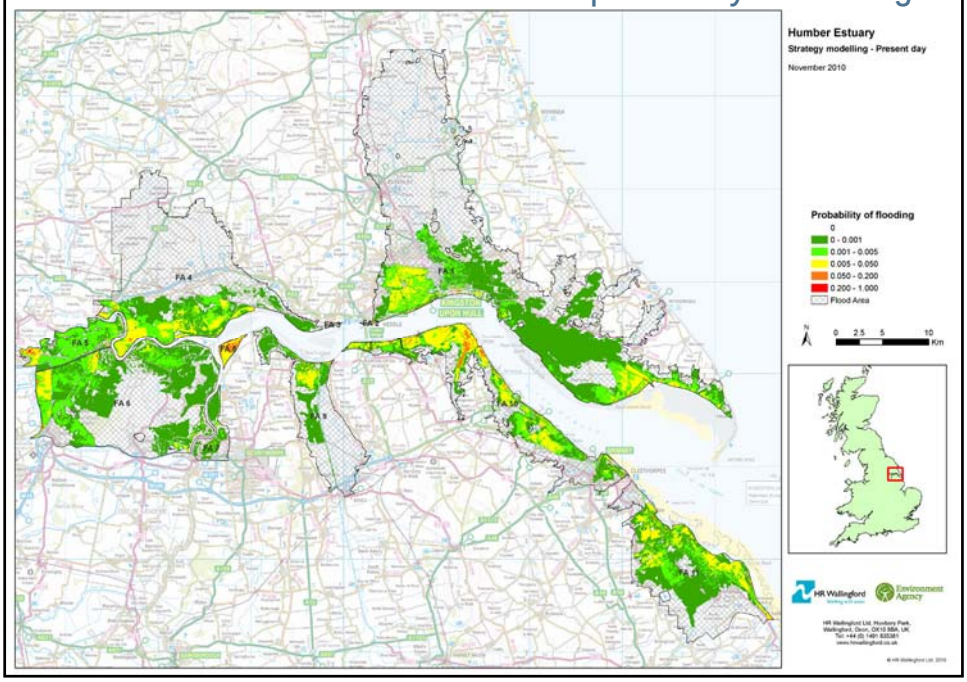
Humber Estuary
Example assets

235 km of hard and soft assets protect 90,000 ha of land from flooding.

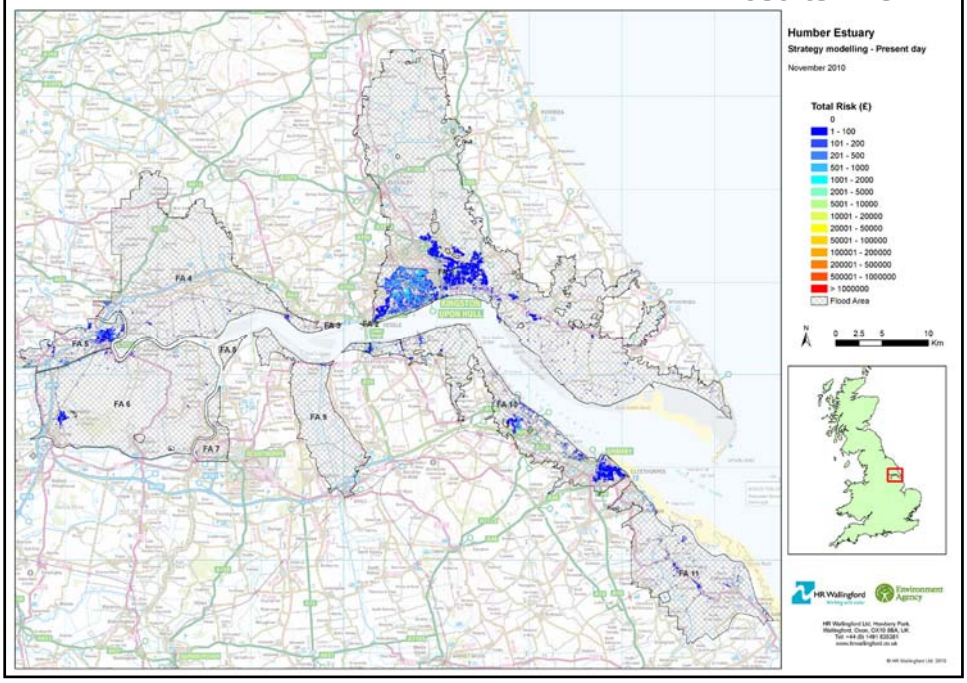
Total value of protected area is around £7 billion.

2006

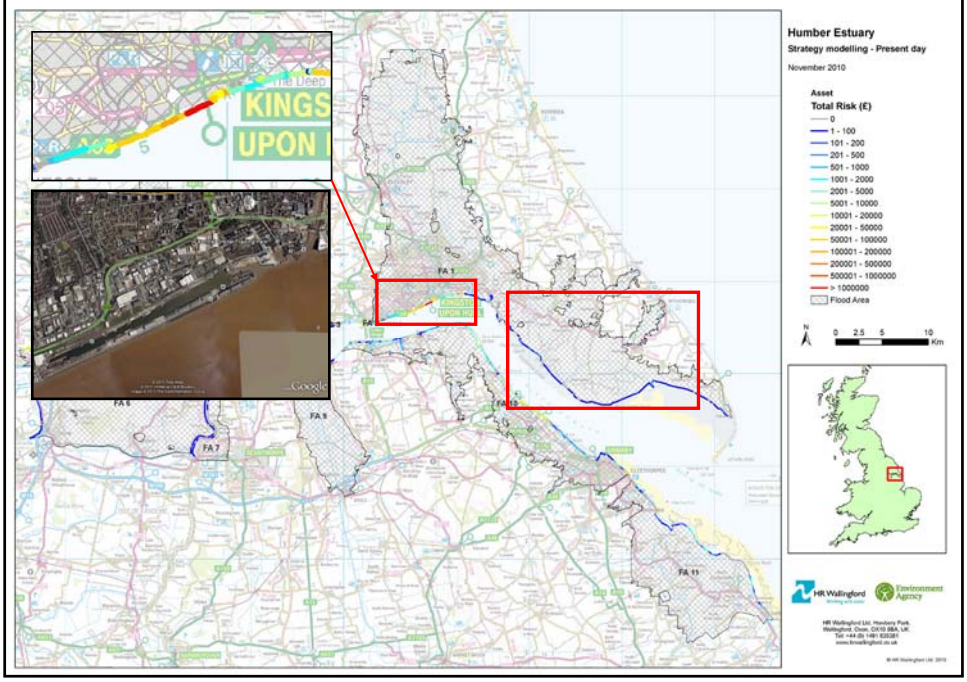
Results - probability of flooding



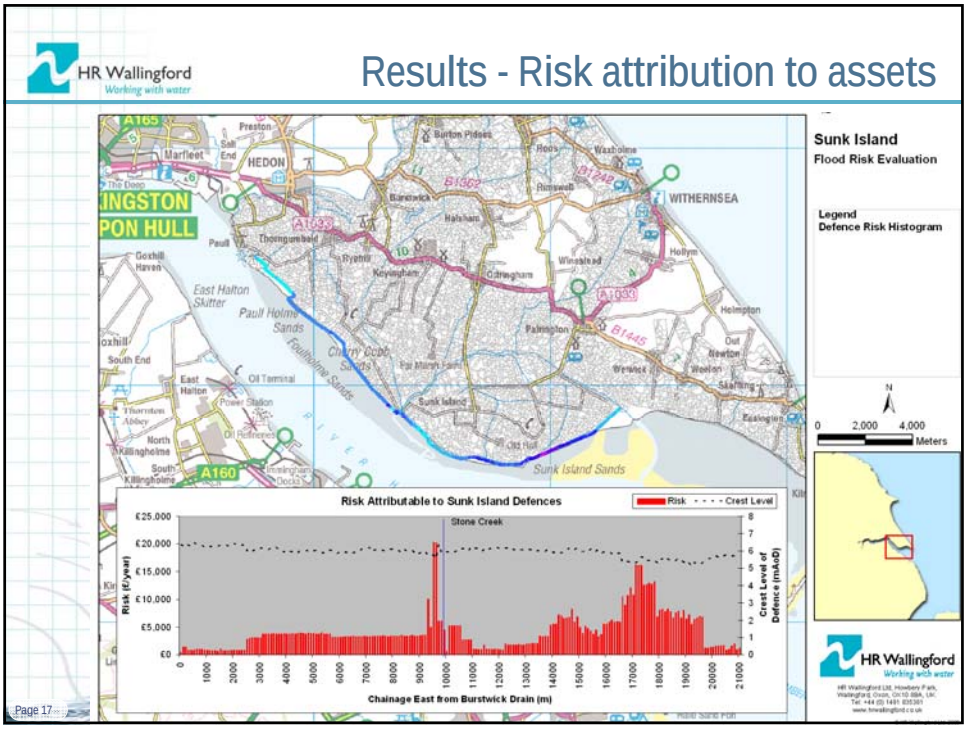
Results - risk



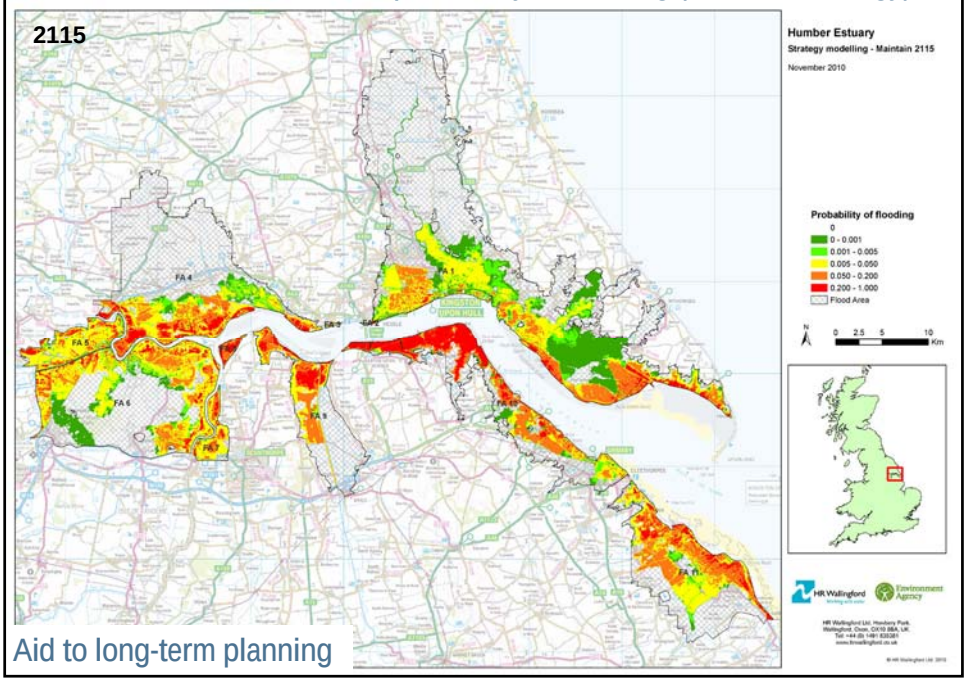
Results - risk attribution to assets



Results - Risk attribution to assets

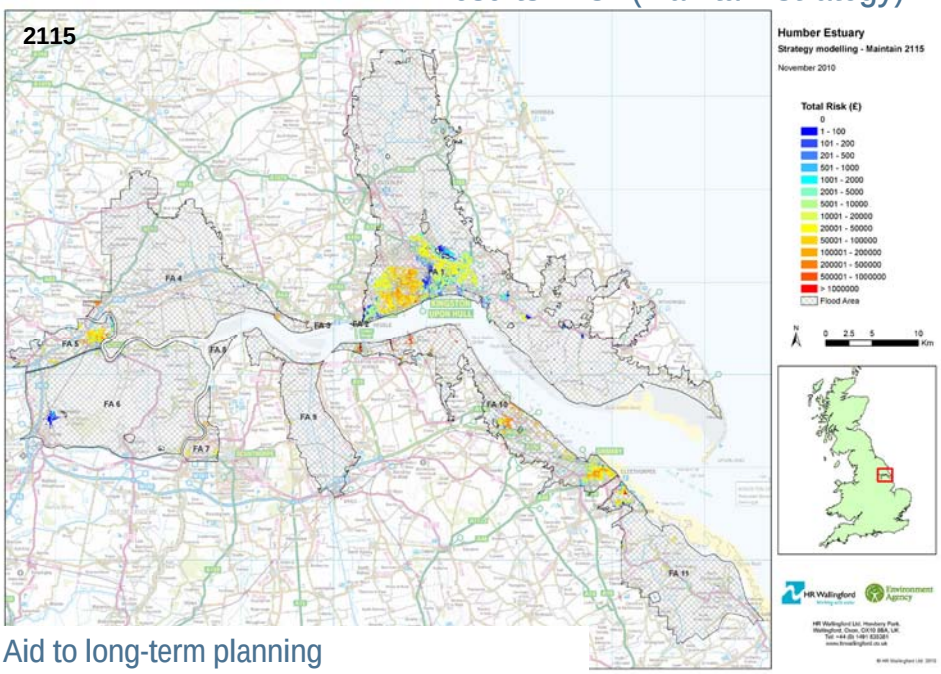


Results - probability of flooding (maintain strategy)



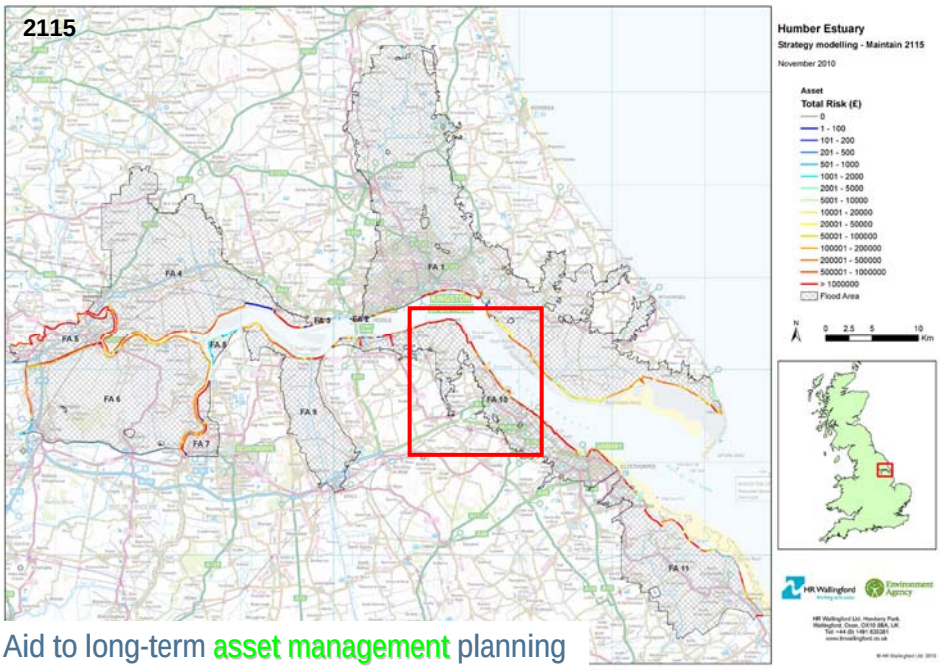
Aid to long-term planning

Results - risk (maintain strategy)



Aid to long-term planning

Results - risk attribution (maintain strategy)



Aid to long-term asset management planning

Results provide insight into physical processes
Risk attribution 2085

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Great Eau
Pilot site

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Great Eau

Exploring management options

Vegetation management

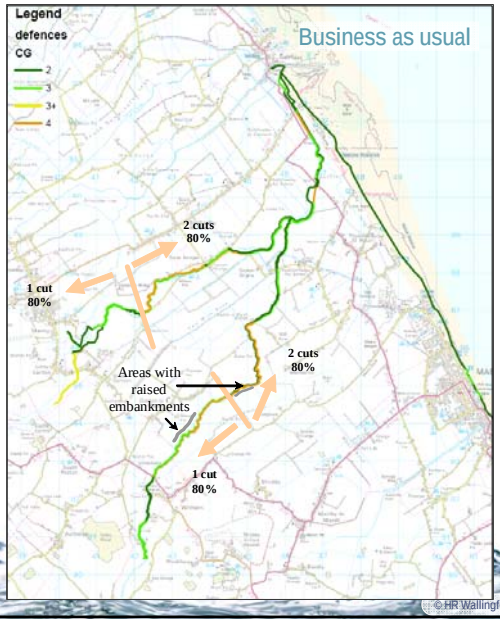
1) Do Nothing

2) Business as usual

1 cutting - 15/9
2 cuttings - 15/07 and 15/10

3) Increased maintenance

Cutting 95%
In the upper reach: 2 cuts



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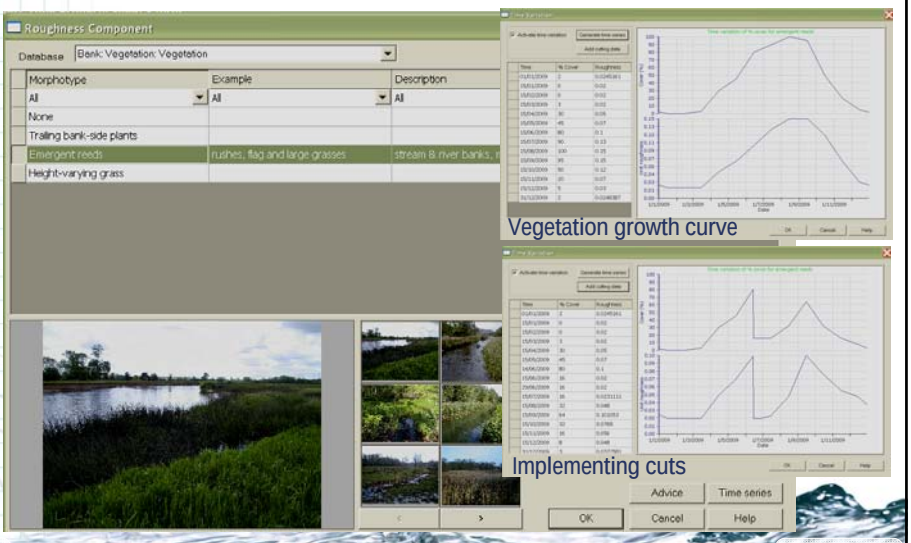
Great Eau

Modelling maintenance options

Conveyance and Afflux Estimation System (CES-AES)



Vegetation growth curve

Implementing cuts

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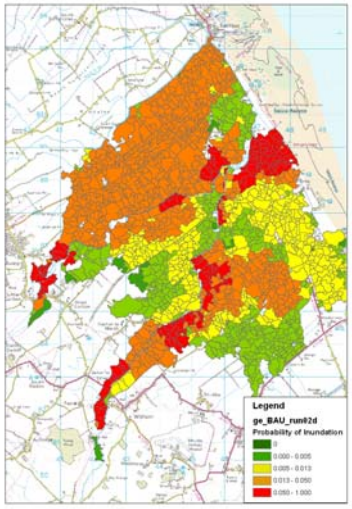
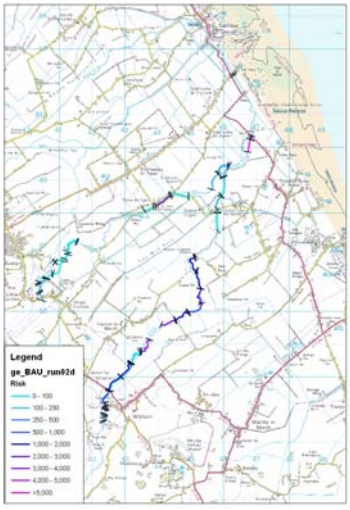
Great Eau
Business as usual

Overtopping + Breaching



Probability of flooding



Risk attribution

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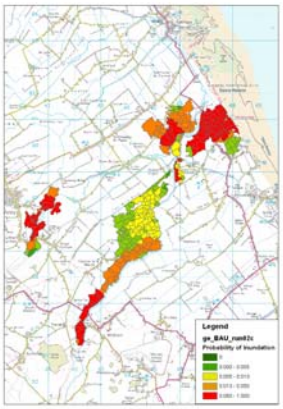
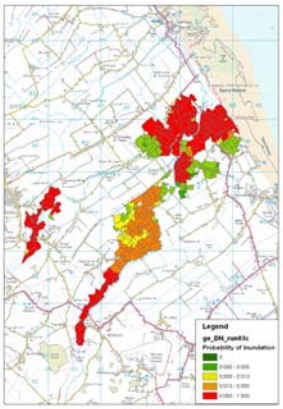
Great Eau
Probability of flooding

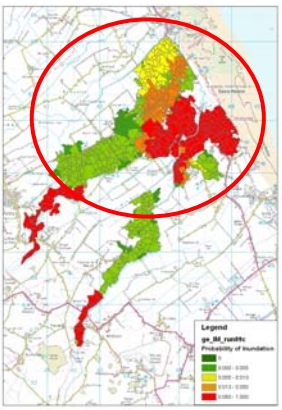
Overtopping only



Business as Usual



Do nothing



Increased maintenance

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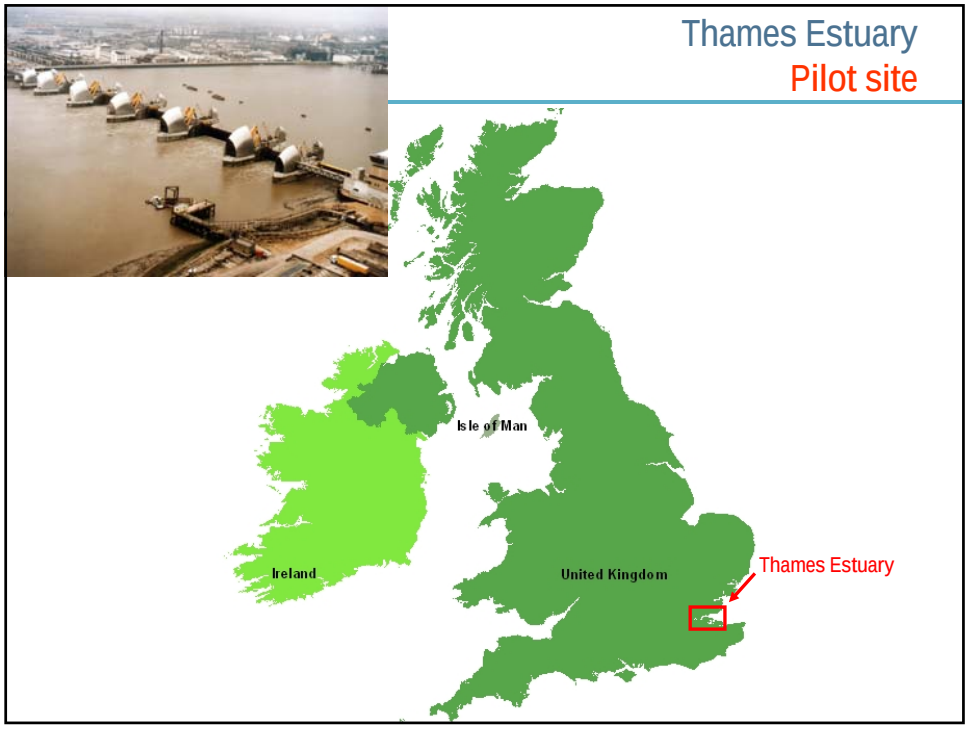
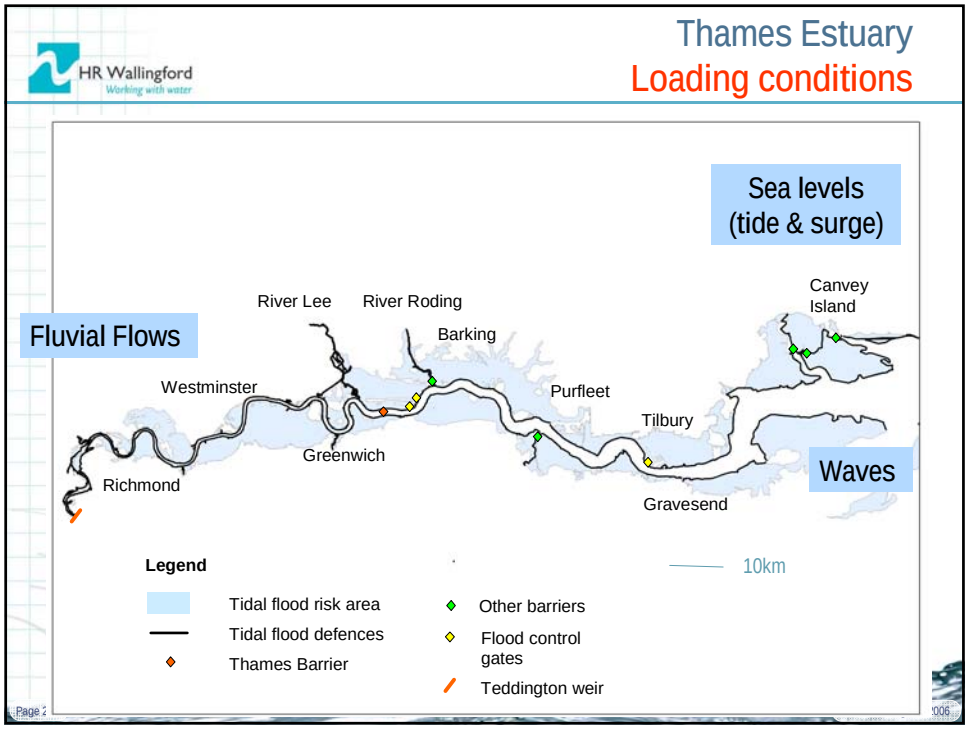

Thames Estuary
Pilot site
Isle of Man
Ireland
United Kingdom
Thames Estuary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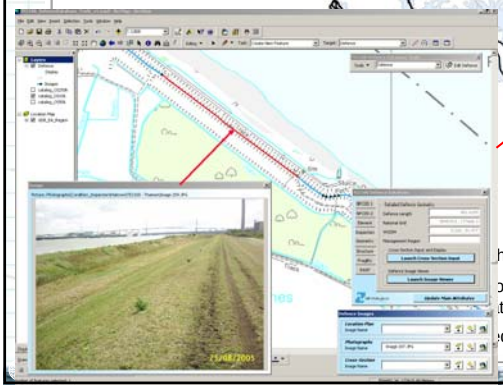
Thames Estuary
Loading conditions
Sea levels
(tide & surge)
Fluvial Flows
Waves
River Lee
River Roding
Barking
Canvey
Island
Westminster
Purfleet
Tilbury
Greenwich
Richmond
Gravesend
Legend
Tidal flood risk area
Tidal flood defences
Thames Barrier
Other barriers
Flood control
gates
Teddington weir
10km

Thames Estuary
Example assets



River Lee
River Roding
Barking
Purfleet
Tilbury
Gravesend

her barriers
od control
tes
ddington weir

10km

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Thames Estuary
Example receptors

Gravesend

Commercial centre of the UK - £250b annual contribution

10km

Legend

- Tidal flood defences
- Thames Barrier
- Flood control gates
- Teddington weir

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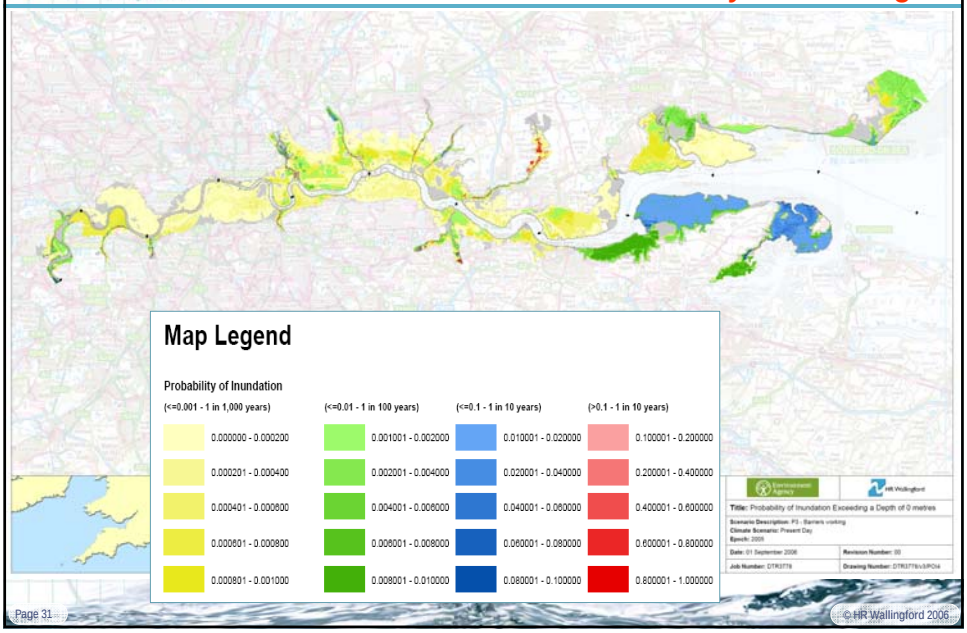
Thames Estuary
Probability of flooding



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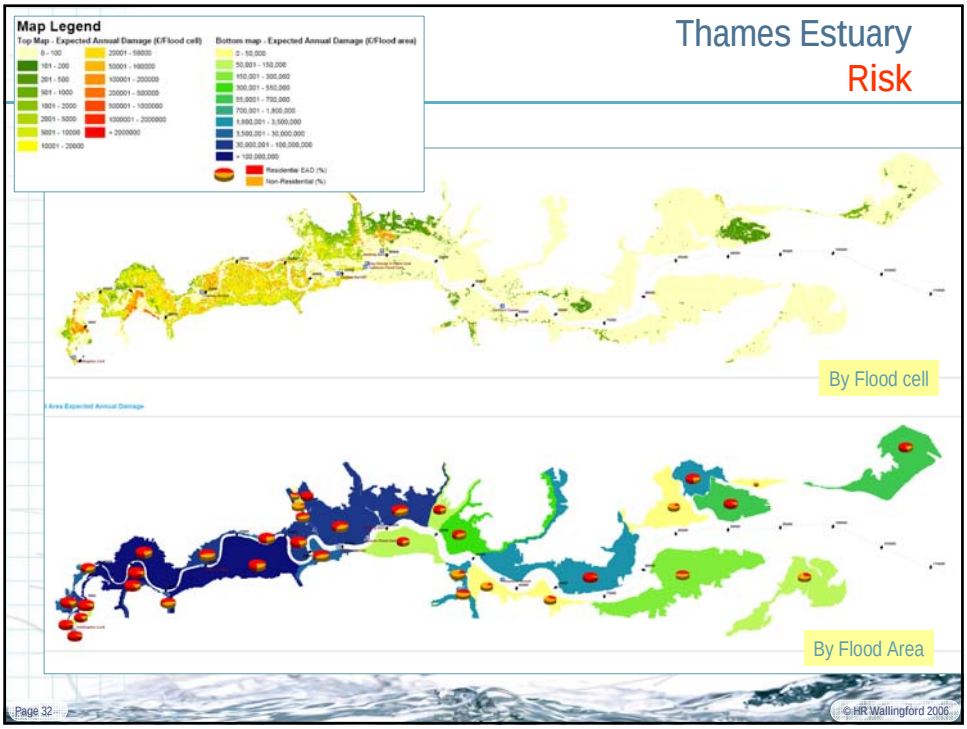
Thames Estuary
Risk



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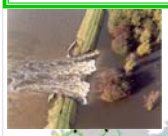
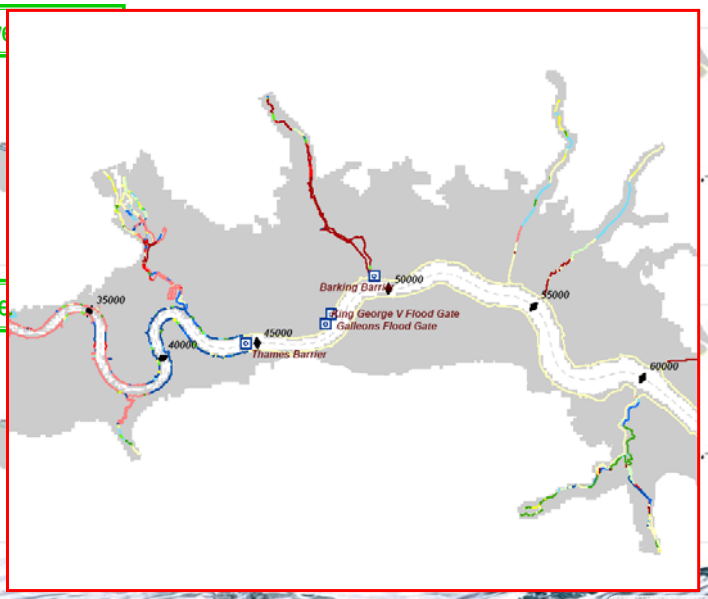
Thames Estuary
Risk attribution

Contribution from ove

Contribution from bre





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Conclusions

Flood risk system is complex

Asset managers require structured support to make sense of this

A system-based approach helps as it:

- Considers the system as a whole
- Considers asset performance
- Helps to prioritise data gathering activities
- Provides “rich” unbiased evidence to help justify asset management spend (maintenance, strengthening, raising)
- Provides a powerful tool for “what-if scenario” modelling (e.g. asset deterioration, long-term options)

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Attributing risk to assets - examples from pilot projects

Many thanks!

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