'The power of where'

DRIVES NEW ZEALAND'S SUCCESS

Land Information New Zealand
Toitū te whenua

Climate change, flood risk & policy setting: tales from the UK

Rob Deakin | Manager Resilience | LINZ

Key themes

- The impact of events
- How science can influence
- The importance of nationally consistent data
- The importance of nationally consistent methods
- How data, policy and legislation are linked

Towyn, 26 February, 1990

1991, National Sea Defence Survey

Land Information New Zealand
Toitū te whenua

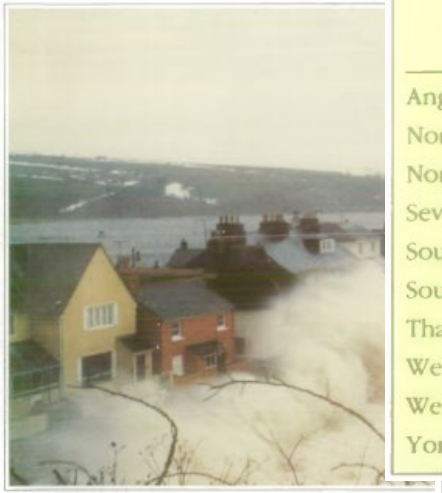


TABLE OF ALLOWANCES

Region	Tectonic or Isostatic Change mm/Year – Upward Movement of Land + Downward Movement of Land	IPCC Sea Level Change – "Business as Usual, Best Estimate" 1990 – 2030 180mm 4.5mm/Year Combined Effect of Climate Change & Tectonic Change
Anglian	1.5	6.0
Northumbria	–0.5	4.0
North West	–0.5	4.0
Severn Trent	0.5	5.0
Southern	1.5	6.0
South West	0.5	5.0
Thames	1.5	6.0
Wessex	0.5	5.0
Welsh	0.5	5.0
Yorkshire	0.5	5.0

Phase 1 Phase 2 Phase 3

GUARDIANS OF THE WATER ENVIRONMENT

1992 – 95, National Coastal Flood Risk Assessment

Land Information New Zealand
Toitū te whenua

Data \ Fai
Peak wa
Wave co
Seawall
Crest
Seawall co
Seawa
Toe
Beach
Beach le
Beach v

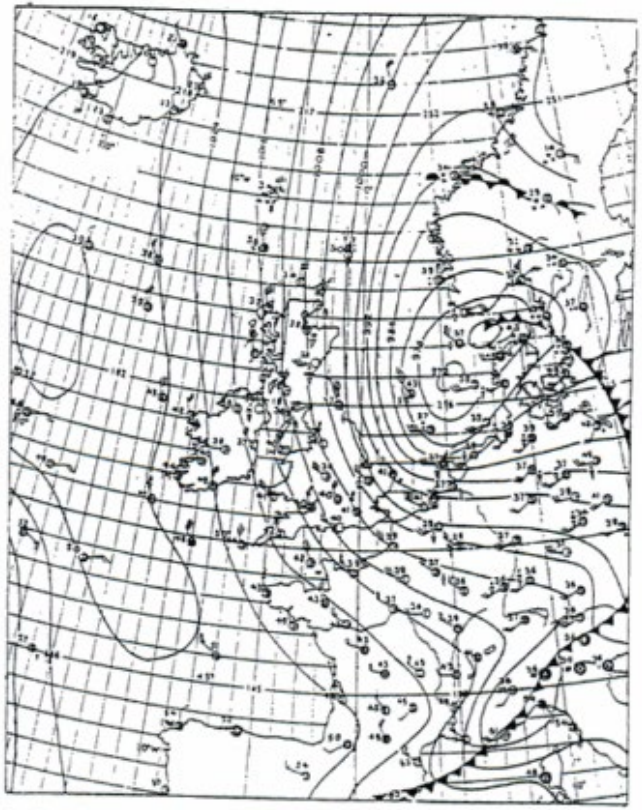


Figure 3: Surface pressure chart for 1800hours GMT January 31 1953.

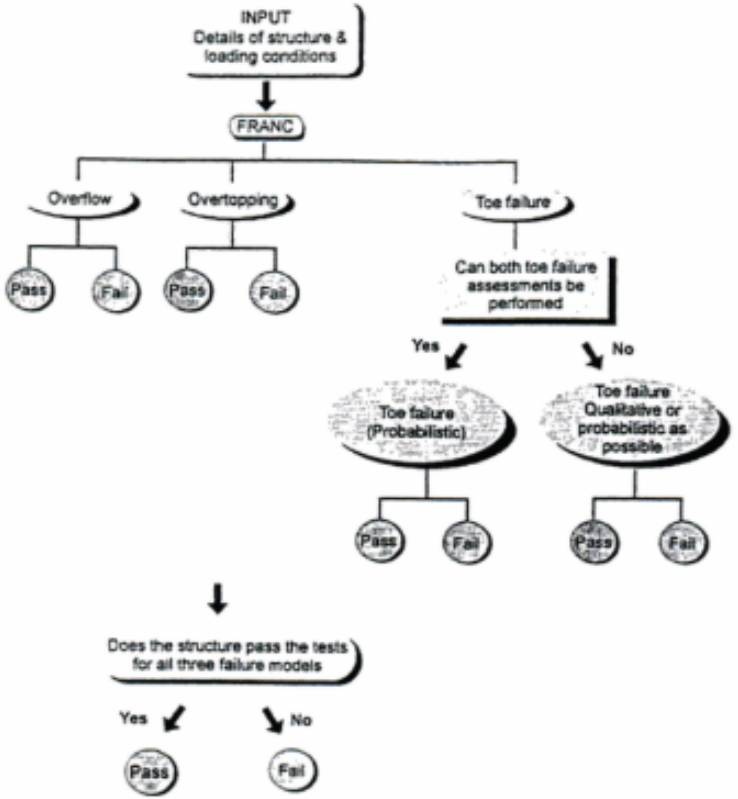


Figure 2: Decision tree for the risk assessment methodology.

Coast Protection Survey of England, 1993 - 94

1997, Spending Review

- Coastal property counts & probability bands
- Coarse fluvial floodplains and urban extents

2000, Comprehensive Spending Review

Land Information New Zealand
Toitū te whenua

Table 1 Summary of property at risk and estimated annual damages for England and Wales (AAD= Annual Average Damage)

England and Wales	Sea/Tidal Flooding	Coastal Erosion	Total
Total assets in risk areas:			
Residential properties (Nr)	1 026 000	113 000	1 139 000
Commercial/Ind properties (Nr)	74 000	9 000	83 000
Agricultural land (ha)	432 000	5 000	437 000
Capital value of assets (£m)	133 300	7 700	141 000
Damages	**£ millions/year**		
Do nothing damages:			
Property damage/loss	1 527.7	84.0	1 611.7
Agricultural losses	107.7	0.3	108.0
Traffic disruption	1.8		1.8
Total	1 637.2	84.3	1 721.5
AAD – current defences			
Property damage/loss	210.4	16.3	226.7
Agricultural losses	52.4	0.3	52.7
Total	262.8	16.6	279.4
Benefit of current defences	1374.4	67.7	1442.1

More time & data ☺

- Regional data fluvial on standards of protection
- National Address data
  - Residential
  - Non-residential

Annual Average Damage calculations:

- Property damage
- Agricultural losses
- Traffic disruption

\+ Write-off values

2001, Climate Change & Wales

Region	Current AAD (£ million)	Predicted AAD 10% Flood Flow Increase	Predicted AAD 20% Flood Flow Increase	% of current AAD 10% flood flow increase	% of current AAD 20% flood flow increase
Anglian	£55.02	£78.16	£111.70	142	203
Midlands	£50.23	£69.04	£98.52	137	196
North East	£47.29	£90.81	£111.70	192	236
North West	£19.22	£34.03	£45.05	177	234
Thames	£201.26	£213.83	£227.18	106	113
Southern	£15.51	£19.65	£25.71	127	166
South West	£28.90	£35.49	£44.06	123	152

Table 4.2 Predicted increase in AAD for fluvial flood areas (£ million)

Re-run:

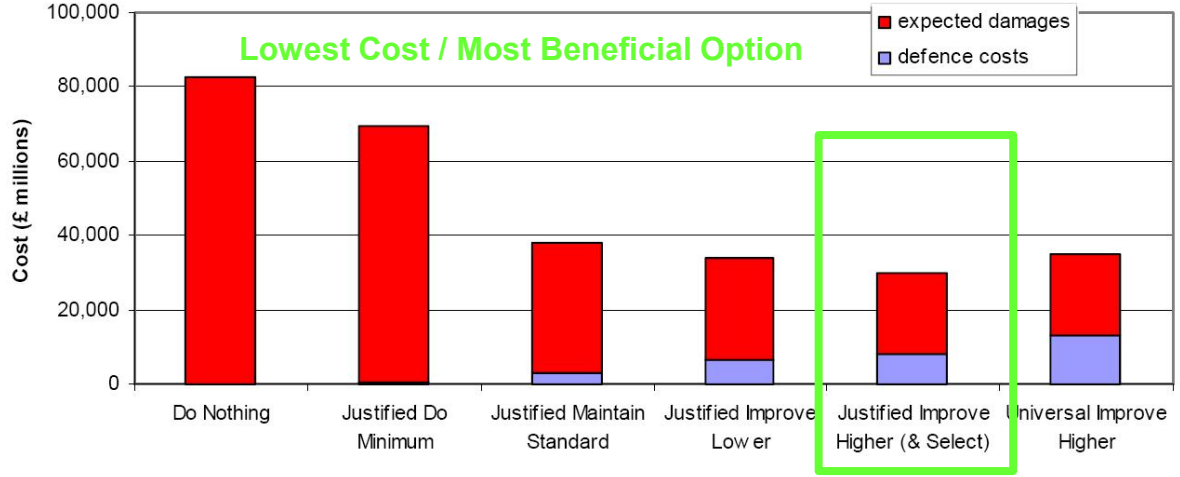
- Add in Wales
- To assess climate change impacts "Standard of Protection" adjusted for:
  - peak flood flow increase
  - sea level rise

2004, CSR National Scenarios & Benefits

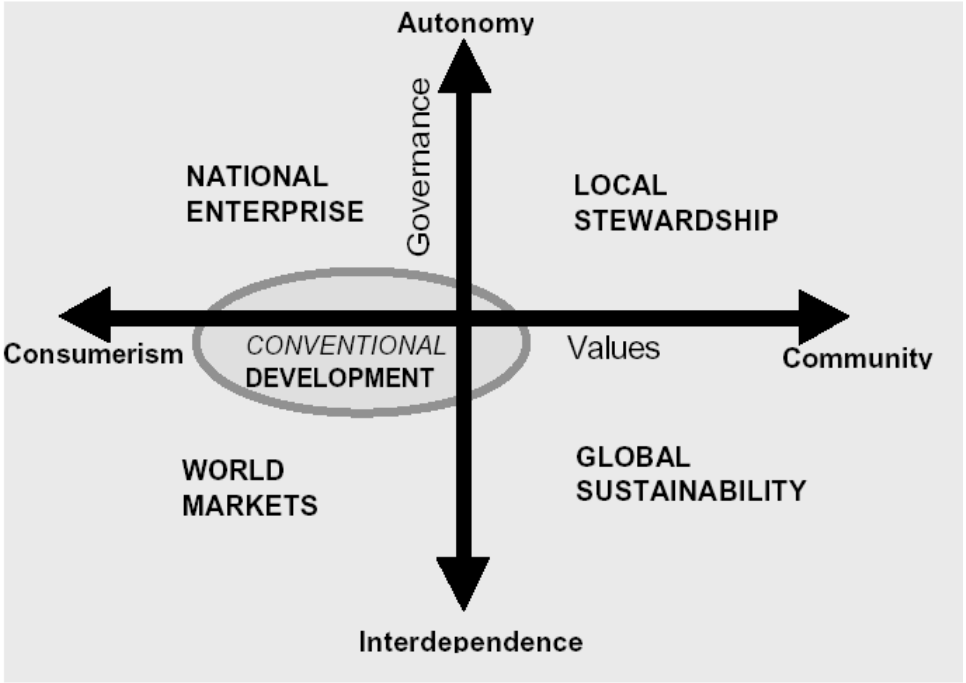
Land Information New Zealand
Toitū te whenua

Table 3 Expected costs and damages (£ billion) for different investment scenarios

	Do Nothing	Justified Do Minimum	Justified Maintain Current	Justified Improve Lower	Justified Improve Higher	Universal Improve Higher
PV100 flood defence cost	-	0.4	3.1	6.7	7.9	13.0
PV100 flood damages	82.7	68.9	35.2	27.2	22.1	21.8
Total PV100 flood costs	82.7	69.3	38.3	33.9	30.0	34.8



2004, Foresight Study – climate change scenario testing

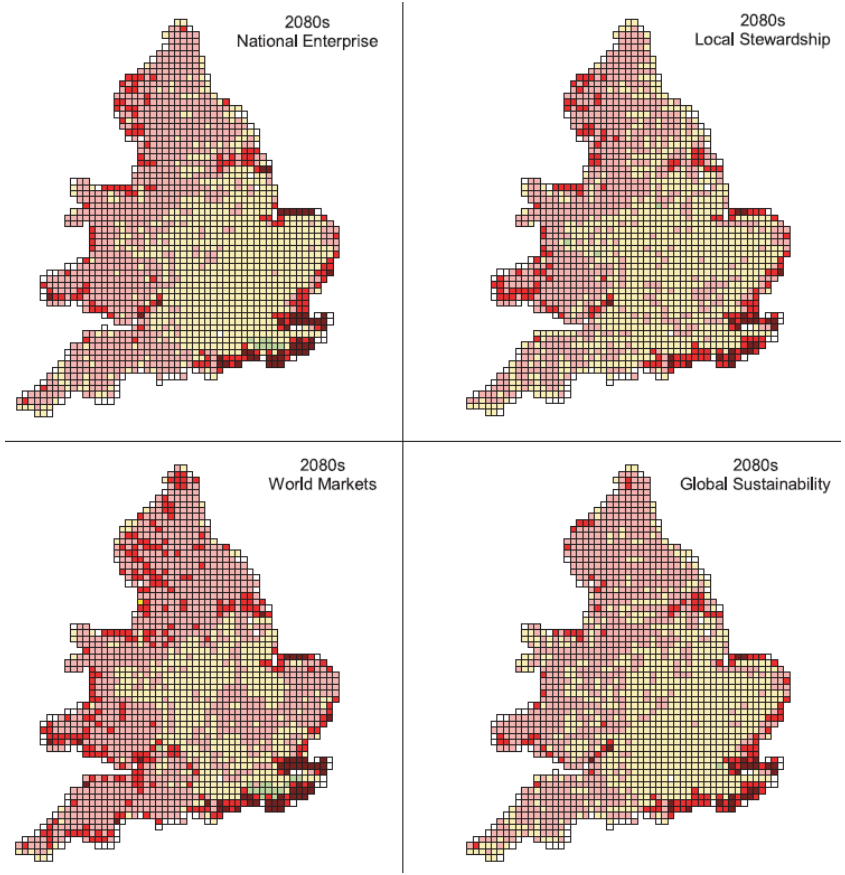


Four Foresight Futures for 2080
(from UK Climate Impact Programme)

Input Variables:

- CO^2 Emissions
- Socio-economic development
- Pathways & receptors in floodplain
  - Demographics
  - Defence performance
  - Assets at risk

Relative Change 2000 – 2080s



Change in flood probability from 2000

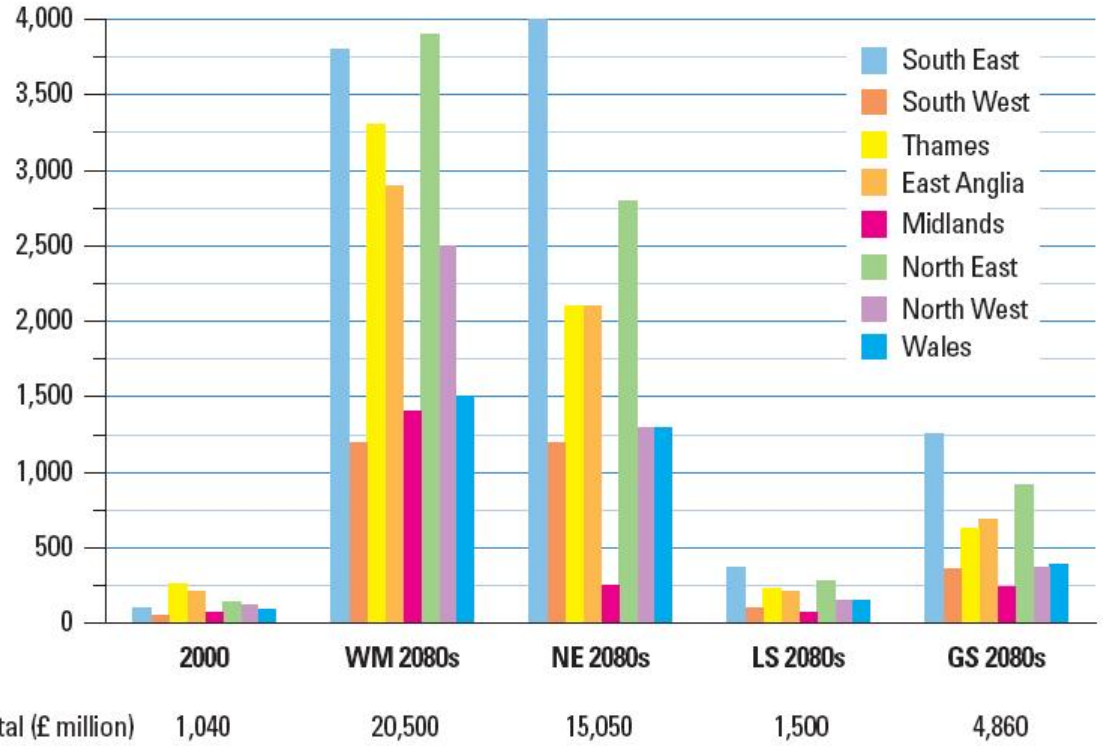
2080s Foresight scenarios
Change from present day (2002)

- Decrease (<-0.01)
- Negligible (-0.01 to 0.01)
- Low (0.01 to 0.05)
- Medium (0.05 to 0.3)
- High (>0.3)

Risk Increases - Economic Damage

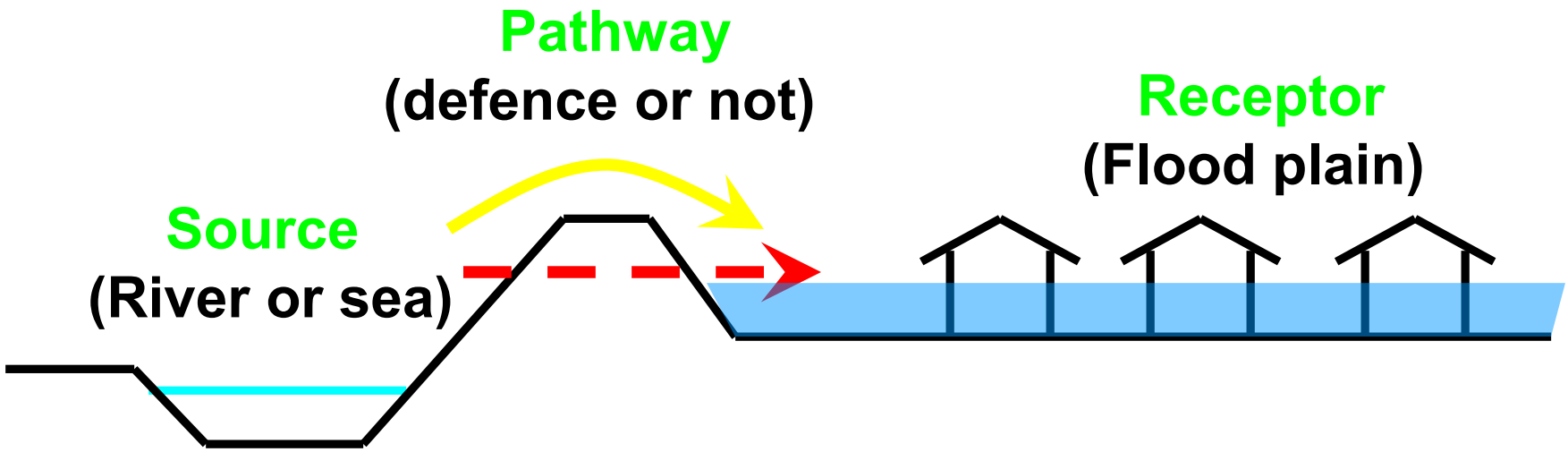
Land Information New Zealand
Toitū te whenua

Chart 4.4 **All Foresight Futures: Expected Annual Damage (£ million) – residential and commercial**



	2000	WM 2080s	NE 2080s	LS 2080s	GS 2080s
Total (£ million)	1,040	20,500	15,050	1,500	4,860

Flood Risk 101 – modelled objects



Risk = f (Likelihood x Consequence)

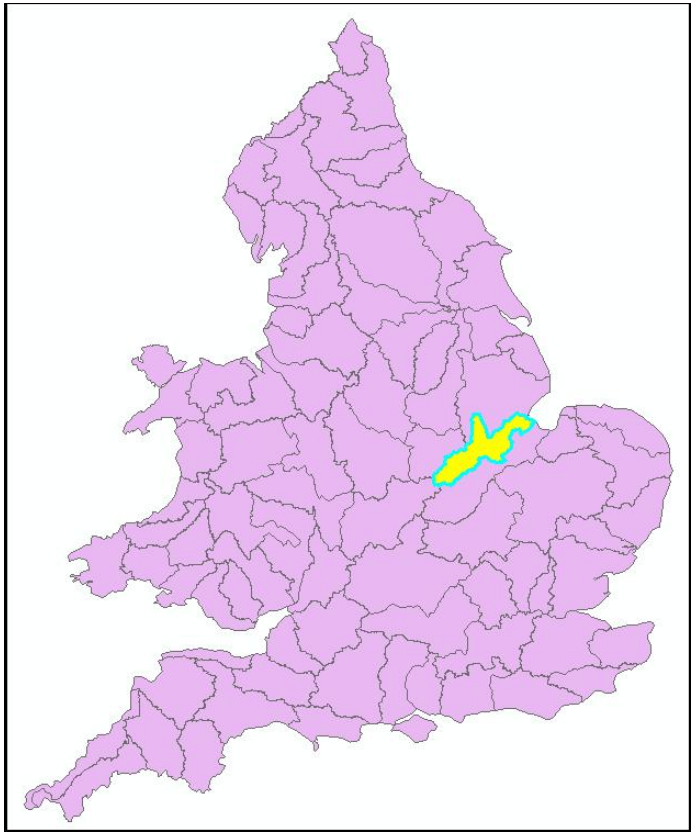
2004, Supporting National Geodata

- Source
  - Wave & water level
  - Flood level
  - National river network

- Pathway
  - National Flood & Coast Defence Database
  - National ifSAR (& local Lidar) DTM

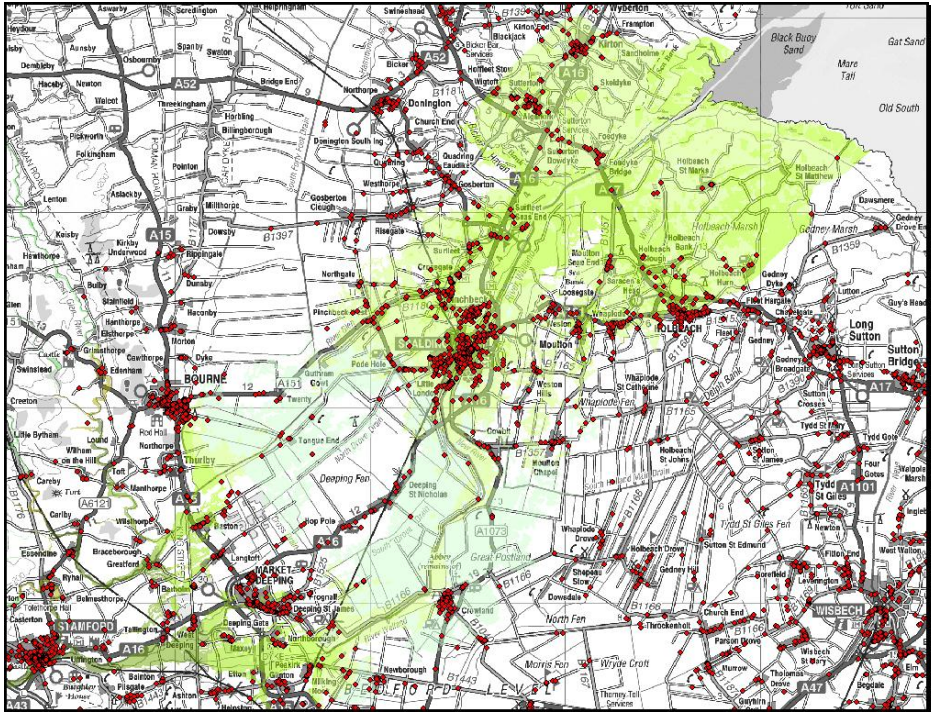
- Receptor
  - Properties – National Property Data Set
  - Population – Census & Office National Statistics
  - Agricultural – Land classification & Agric. census
  - Cultural & Heritage sites
  - Infrastructure – Ordnance Survey topographic data

National Flood Risk Assessment



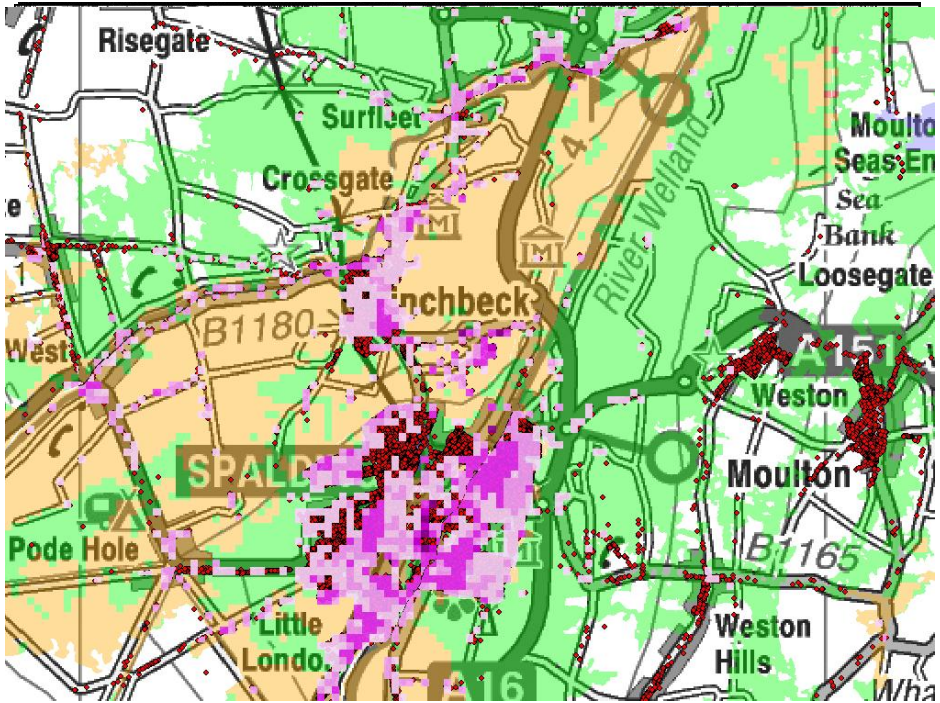
- National Assessment
  - England
  - Wales
- Projects run
  - 2004
  - 2005
  - 2006
  - 2008 - onwards
- Model run based on 85 individual catchments
  - fluvial
  - coastal
  - tidal

Glen & Welland - Input Data Sets



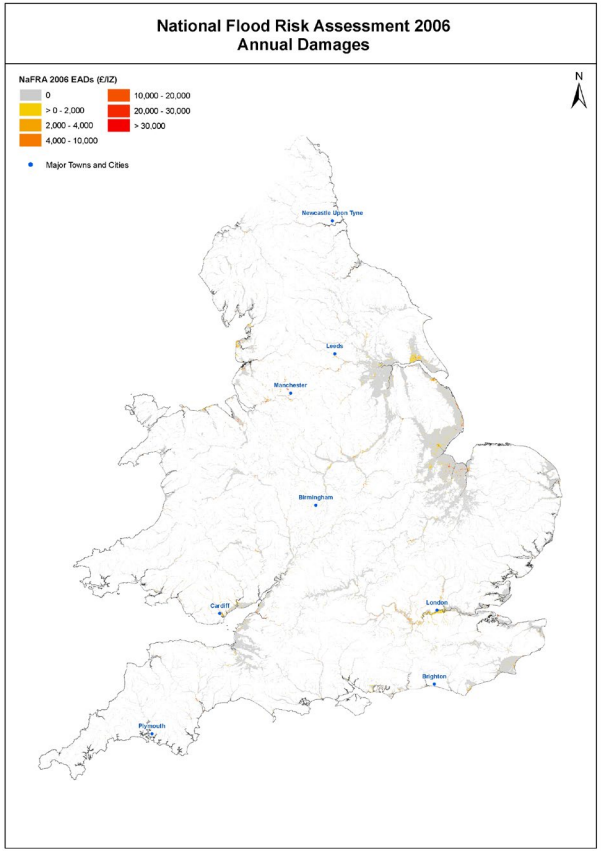
- Water levels
- Defences
  - Type
  - Condition
  - Crest level
- Terrain model
- Risk receptors
  - Property
  - People
  - Infrastructure
  - Environment
  - Heritage & culture

Output Model Results



- Flood Likelihood
  - Probability
  - Category
- Risk
  - Probability X Consequence
- Economic Damage

National Output Model Results



- Flood Likelihood
  - Probability
  - Category
- Risk
  - Probability X Consequence
- Economic Damage

By2009:

- Floodplains of England & Wales:
  - 11 % of land
  - 1.7 million ha
  - 2.6 million properties
  - 4.6 million people
  - £221 bn asset value at risk

  - > 40,000 km of river channel
  - 27,500 km of defences
  - £240 m spent in 2001
  - £350 m spent in 2003/4
  - £650 m spent in 2007/8
  - £800 m by 2010

With Surface Water:

- 5.5 million properties
- 1 in 6

2007 Floods

- *June + July, 2007:* 13 Dead; 7,000 rescued; 50,000 properties flooded; £3 billion insured losses

Pitt Review – some key recommendations

- Establishing a cabinet committee to address the risk of flooding.
- Adopting a long-term approach to flood risk management, with priority given to adaptation and mitigation
- Establishing a National Resilience Forum to facilitate emergency planning at a national level.
- A presumption against building in high flood risk areas.
- Action to ensure the resilience of critical infrastructure such as power, water and transport(in particular dams and reservoirs).
- A wider brief for the Environment Agency, taking a national overview of all flood risk.
- A 'step change' in the quality of flood warnings
- Providing better information, awareness and advice.
- Removing the automatic right to connect surface water drainage from new developments to the sewerage system.
- Local authorities leading on the management of local flood risk.

https://www.designingbuildings.co.uk/wiki/Pitt_Review_Lessons_learned_from_the_2007_floods

Pitt Review – some recommendations (5/92)

- 16: Local Authorities should collate and map the main flood risk management and drainage assets (over and underground), including a record of their ownership and condition.

- 17: All relevant organisations should have a duty to share information and cooperate with local authorities and the Environment Agency to facilitate the management of flood risk.

- 51: Relevant government departments and the Environment Agency should work with infrastructure operators to identify the vulnerability and risk of assets to flooding and a summary of the analysis should be published in Sector Resilience Plans.

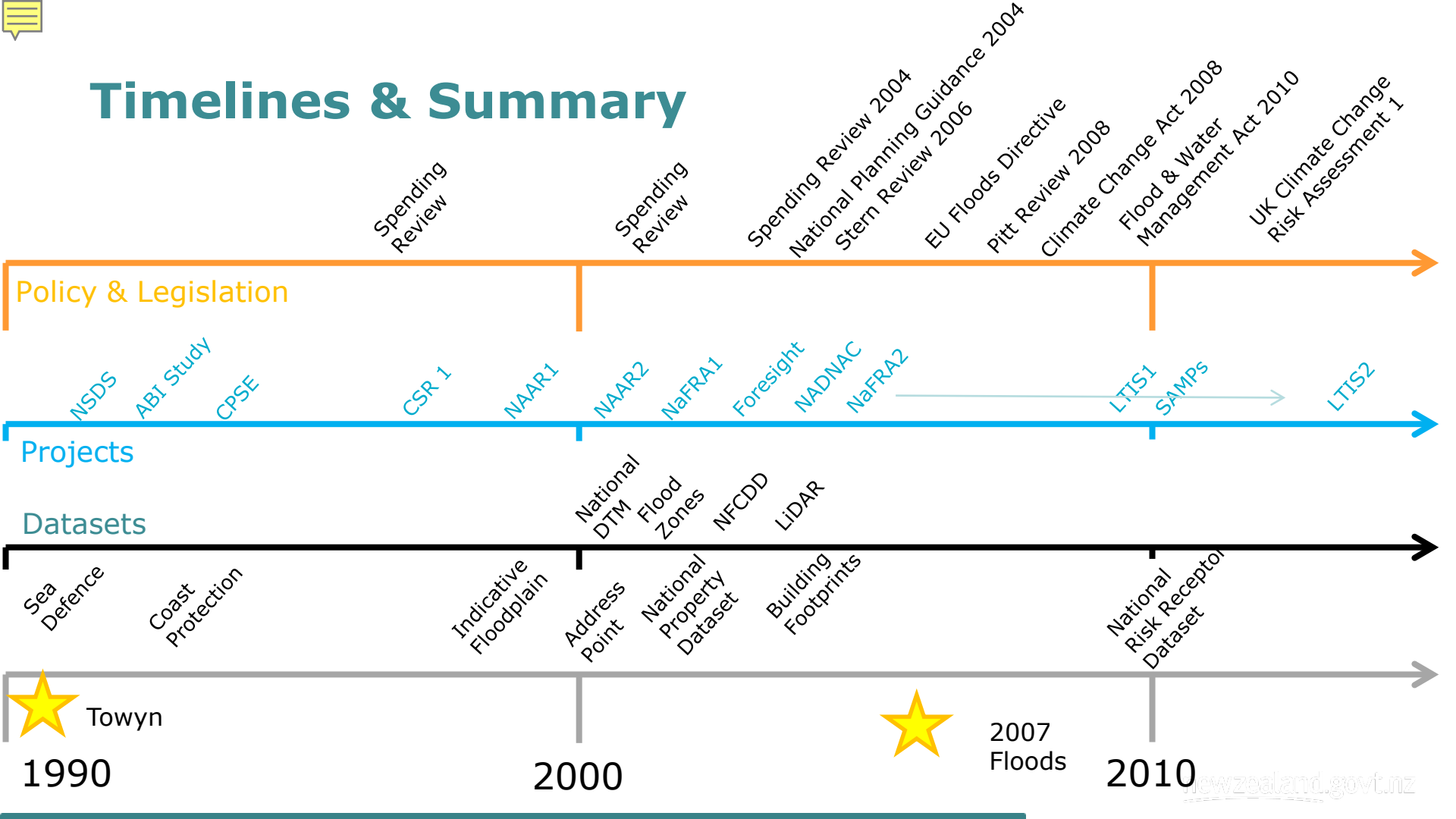
- 55: The Government should strengthen and enforce the duty on Category 2 responders to share information on the risks to their infrastructure assets, enabling more effective emergency planning within Local Resilience Forums

- 90: All upper tier local authorities should establish Oversight and Scrutiny Committees to review work by public sector bodies and essential service providers in order to manage flood risk, underpinned by a legal requirement to cooperate and share information.

Post-2007

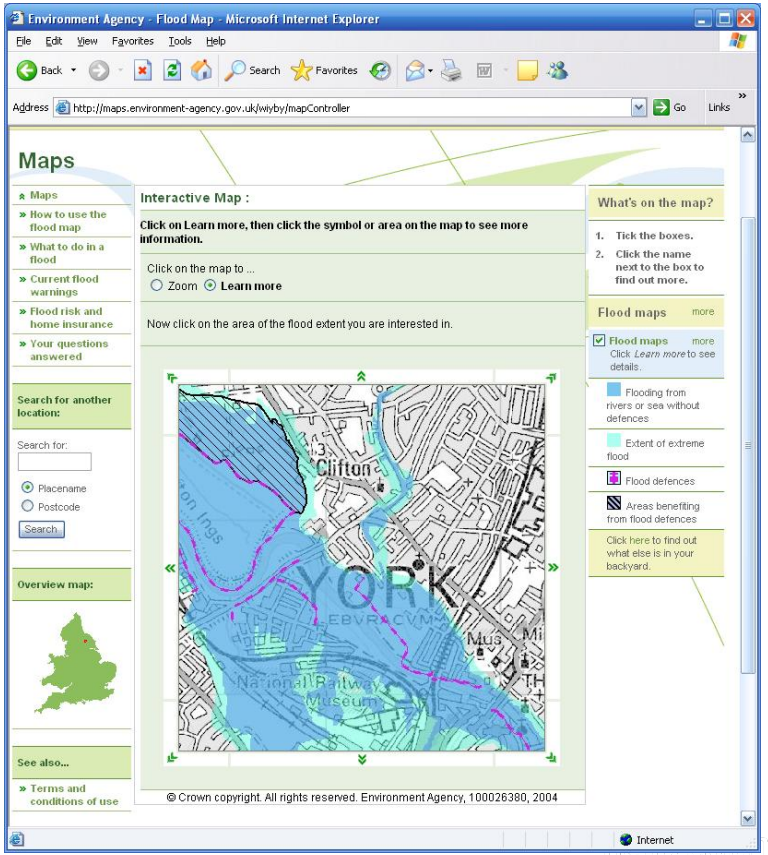
- Pitt Review: recommendations accepted
- 2007 EU Floods Directive
- Flood and Water Management Act 2010
  - Clear leadership & responsibilities
  - Need for Local Flood Risk Assessments
  - 5-year review cycle

Timelines & Summary



What does national risk assessment deliver?

- Disseminate information (Government, insurers, public)
- Develop benefit / cost cases for national investment strategy
- Scenario testing to inform policy
  - Consistent data & method = rapid development
  - Possible interventions
  - Climate change impacts
- Improved data



‘The power of where’

DRIVES NEW ZEALAND’S SUCCESS

Land Information New Zealand
Toitū te whenua

Thank you

Rob Deakin | rdeakin@linz.govt.nz