

coastal impacts of climate change

Peter Cowell
School of Geosciences
University of Sydney



impacts?

what

where

when

how much will it cost??



what are the impacts?

... insert long list here

...

...

or

ask Geoff Withycombe

his list is always the longest!!



e.g.

what will it cost to protect beaches

that protect properties

in SE Australia??



liability-risk / future cost (2100)

assuming offshore sand extraction...

becomes a permitted option (today's dollars)

**acceptable
level of risk**

cost to protect beaches that protect houses...

only existing
developed
beaches

existing
developed +
greenfield beaches

50%

≥\$3 billion

≥\$8.5 billion

10%

≥\$6 billion

≥\$15 billion

1%

≥\$9 billion

≥\$22 billion

sea change society

- fast-track development
- 40% NSW... reserve lands: dividend to government



next year's States Budgets (& every Budget to 2100) under maximum-growth policy...

acceptable risk	liability (unfunded??) each year to 2100
50%	\$ 85 million
10%	\$150 million
1%	\$220 million

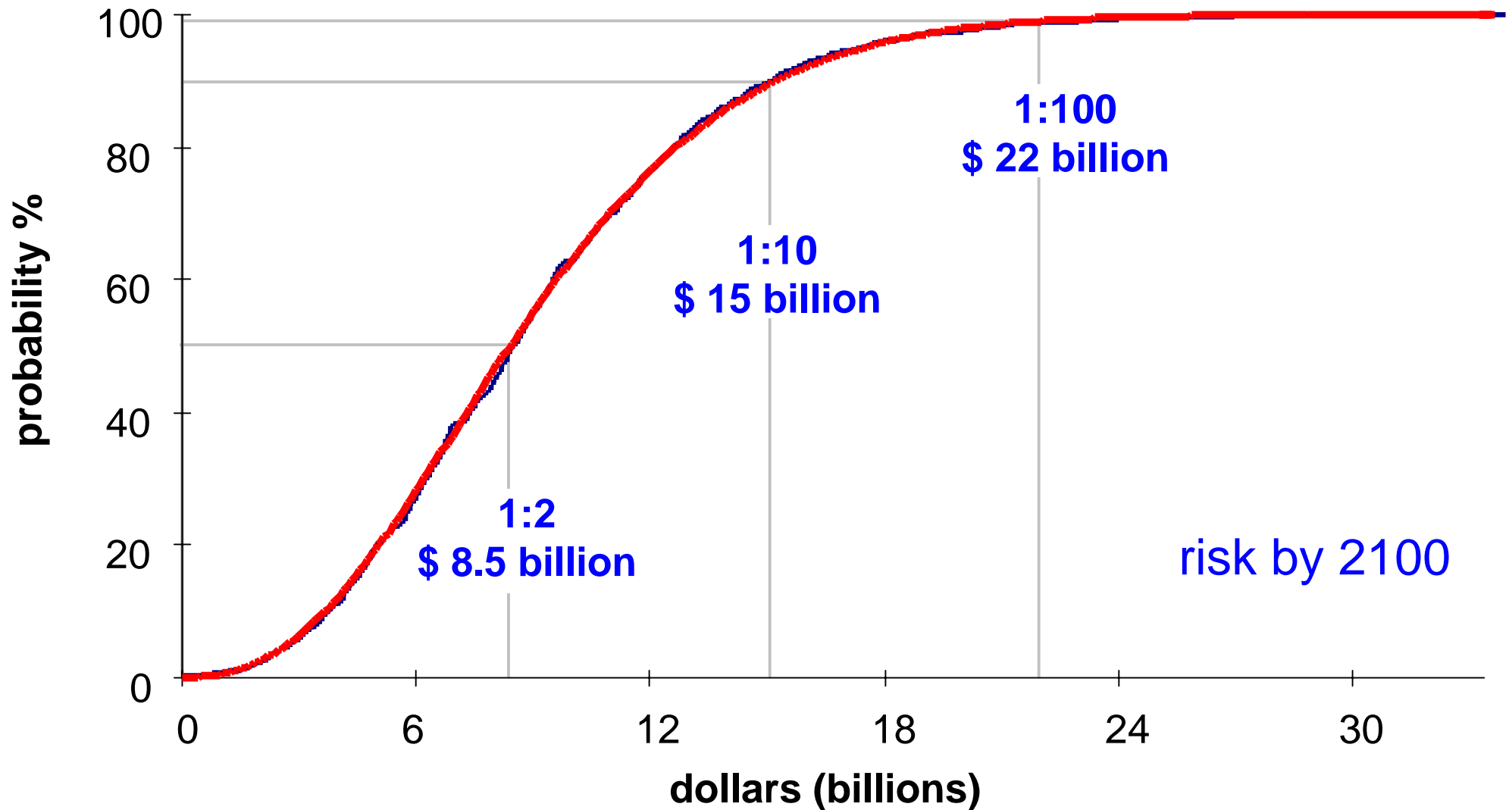
just for beaches that protect property

... what about other aggregated costs
due to impacts of climate change?



existing-developed + greenfield-beaches

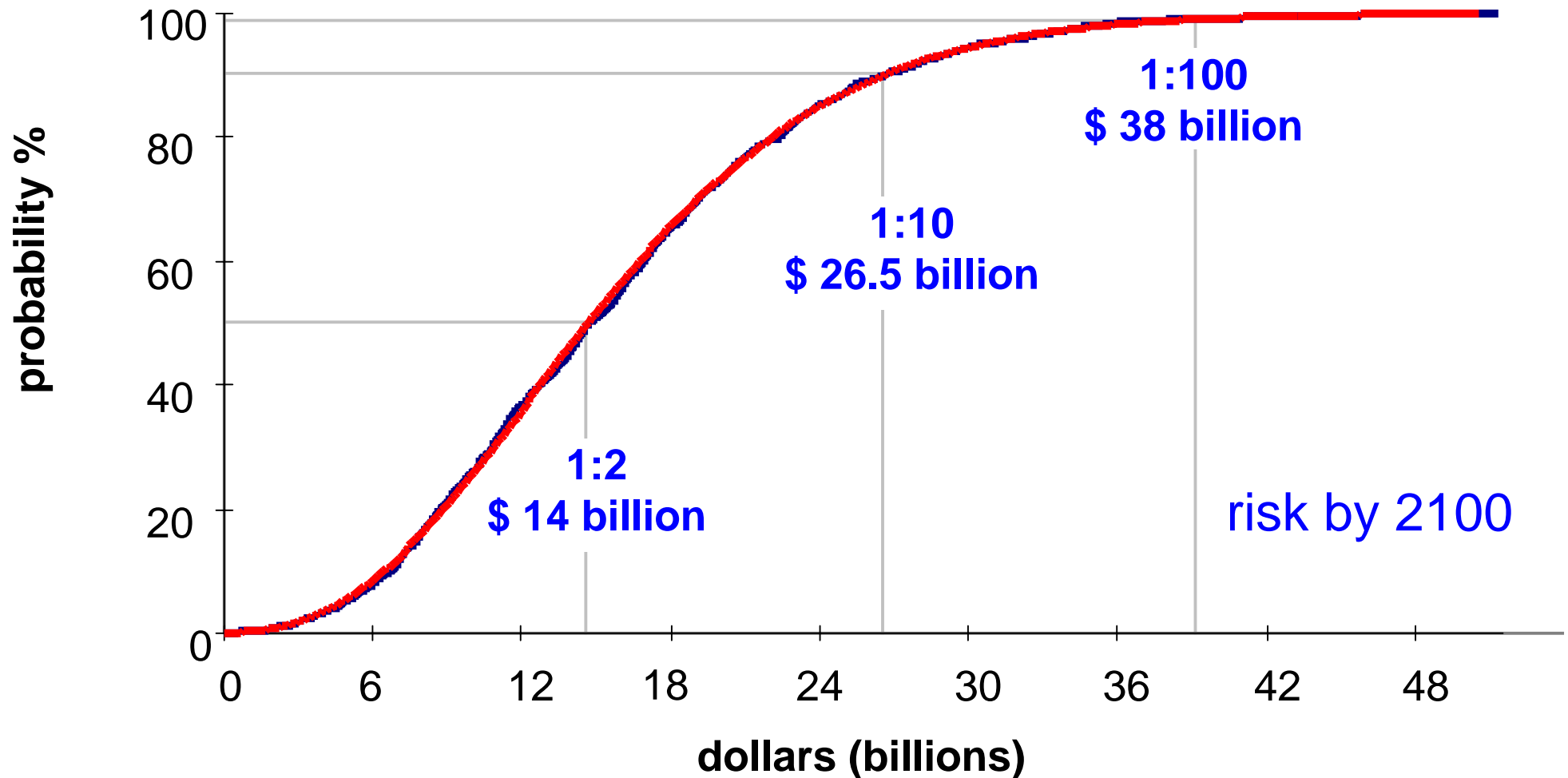
assuming offshore sand extraction in NSW



could be worse... (default condition)

NO offshore-sand extraction

present Government policy in NSW



basis of first-pass cost forecasts

effects include...

- delivered cost of sand to nourish beaches
- sea level rise (SLR)
- sand lost offshore (some distance) due to SLR
- variation along coast in sea bed topography (mapped at 1:250 000 scale)

uncertainty



effects do not include... increased storm erosion in future
irregularities in seabed topography **coastal evolution**
sand lost to estuaries, dunes or alongshore



enough for planning & decisions?

No... also need the *numbers* on erosion risk

effects then also must include...

- sand lost to estuaries, dunes or alongshore
- increased storm erosion in future
- variation along coast in terrestrial topography
- rock reefs, strata & seawalls
- coastal evolution

eg... variable response to SLR

eg... seabed sand supply to beaches

uncertainty

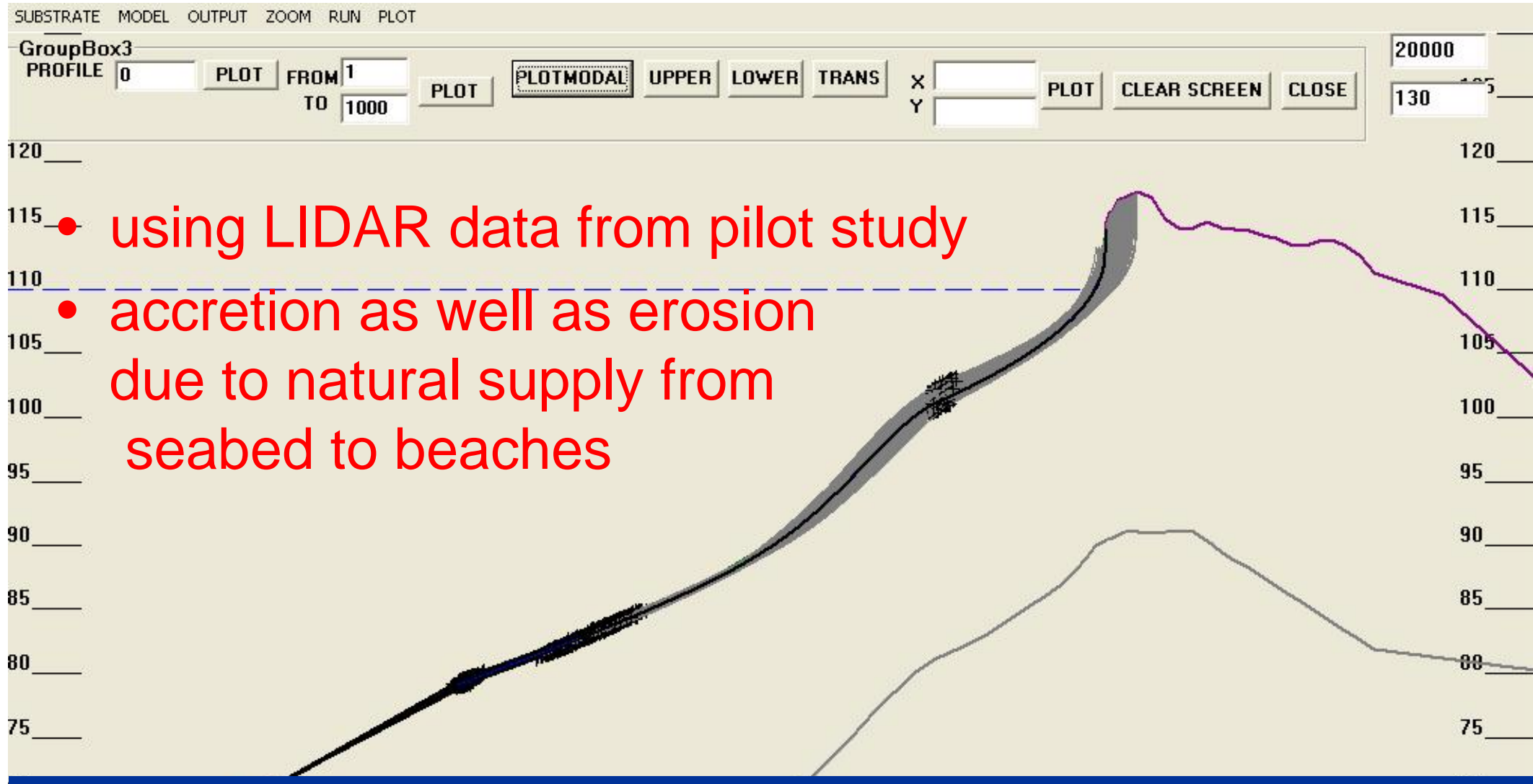


lidar

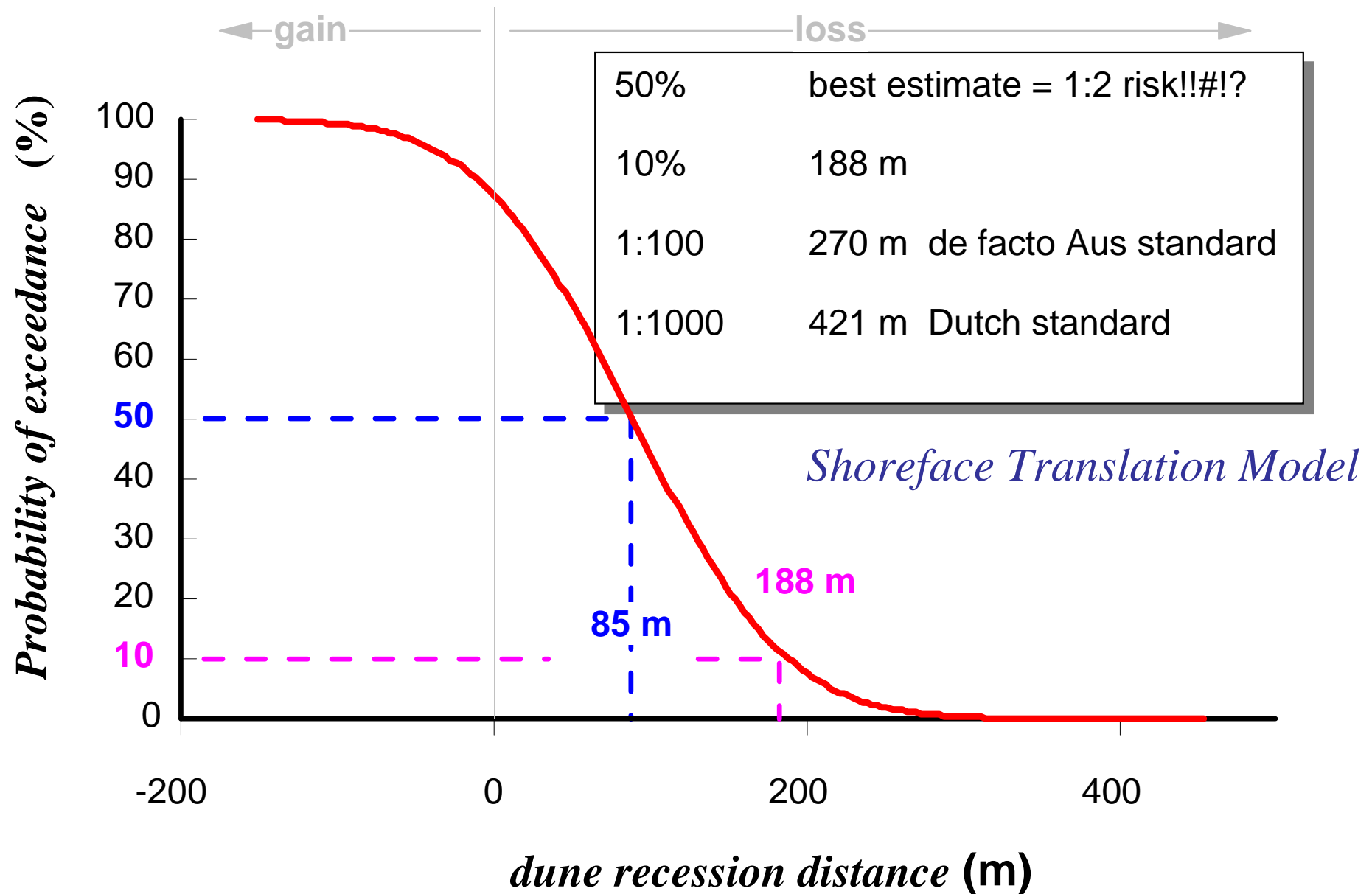


eg Lake Macquarie forecasts (all effects modeled)

Mike Kinsela



coastal Recession: Bundjalung



*Shoreface
Translation
Model*

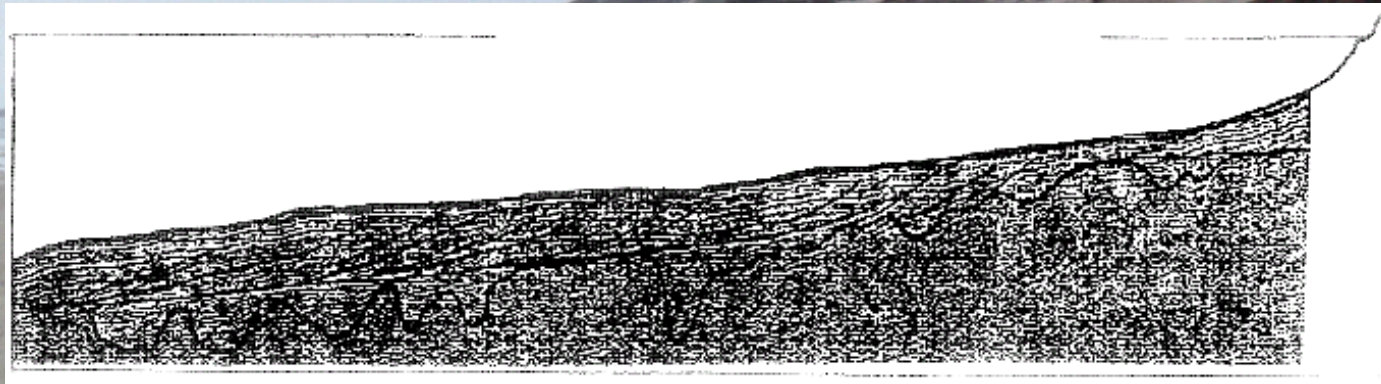
Coastal Recession: Bundjalung

Coastal change risk contours
10% risk-contour interval
99% to 1% risk-exceedance
envelope

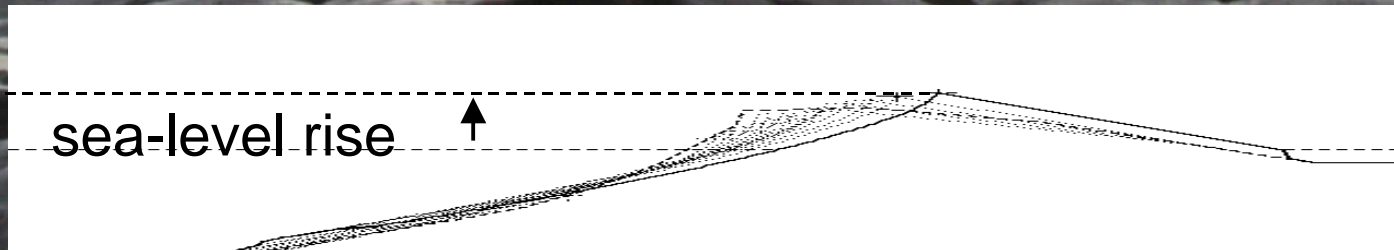


coastal erosion and sea level

- geological data from the modern continental shelves record coastal response to sea level rise

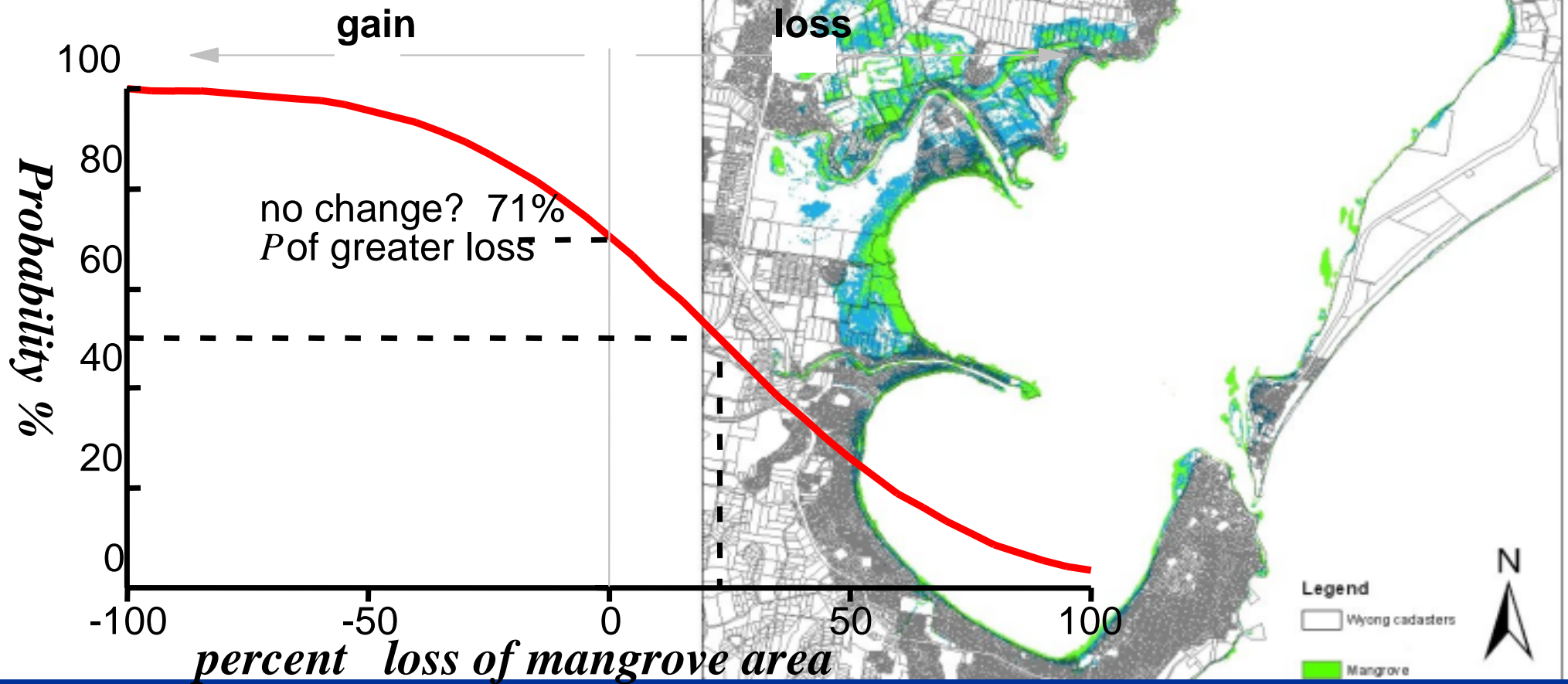


- model erosion reflecting geological evidence



forecast for estuarine waterfront impacts

- sea level rise
- sedimentation



do we need to know everything before we can say something???

No... but we do need to manage the uncertainty
ie, forecast the risk (probability estimates)

Can we ever know everything???

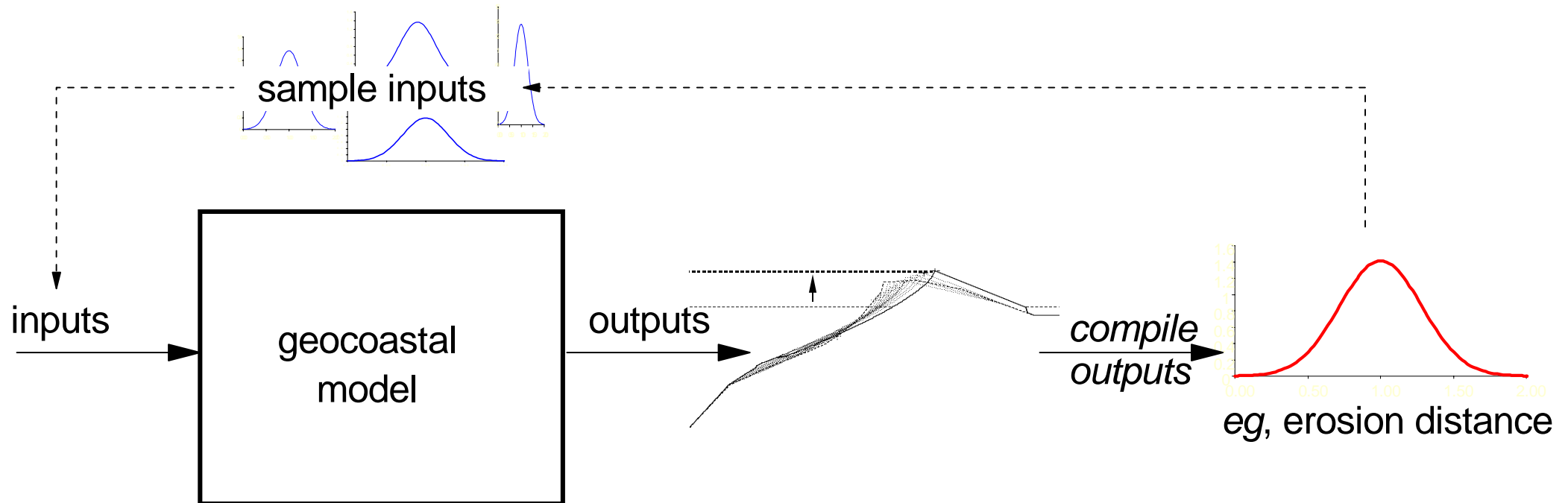
No... intrinsic limits to knowledge!

*eg, using hydrodynamic and morphodynamic models
for long-term prediction*



To manage uncertainty...

- apply probabilistic modeling methods
- forecast impact magnitudes as risk



why is local government crying out in futility for the *numbers*?

- Local Government don't/can't have the capability and resources
 - State Government won't/can't give the *numbers*
 - State agencies emasculated by loss of expertise over recent decades have vestiges of expert staff, but no longer have the resources
 - paralysis... political fear (popularism rules)
 - Federal Government???
- exhort Local Government to “plan better for climate change”
- agencies have the resources but not
- ... the expertise
 - ... administrative experience in planning

