



HR Wallingford
Working with water

Eerste Nationaal Deltacongres

The limits of evidence:
making the most of what we know about deltas,
whilst recognising what we don't know

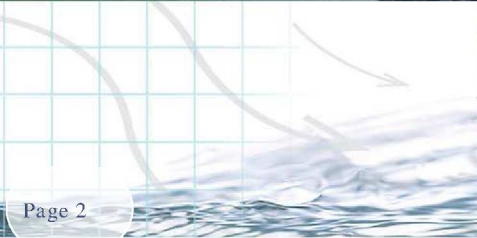
Ian Townend



Estuary & Delta Systems



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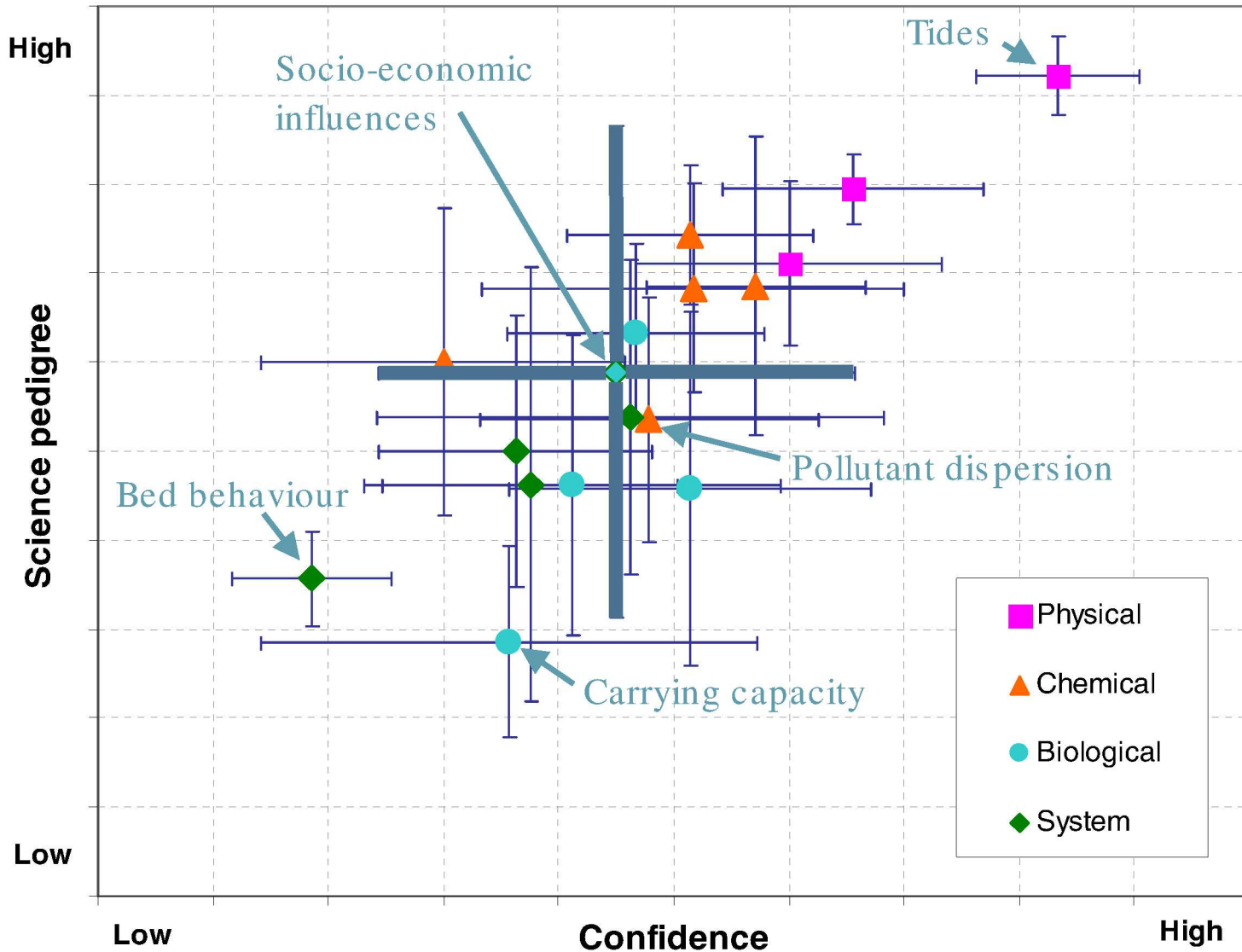




“Evidence Based Policy”

- What constitutes robust evidence?
- Pitfalls along the way
- Art of the possible





Natural variability

- refers to the randomness observed in nature
 - referred to as: Aleatory (meaning to ‘gamble’); External; Inherent; Objective; Random; Stochastic; Irreducible; Fundamental; and Real World uncertainty

Knowledge uncertainty

- refers to the state of knowledge of a physical system and our ability to measure and model it
 - referred to as: Epistemic (meaning ‘knowledge’); Functional; Internal; Subjective uncertainty; and Incompleteness

- Theoretical idealisation (Navier-Stokes eqns)
- Simplifications (incompressible fluid, 1 or 2-D)
- Phenomenological parameterisation (turbulence closure)
- Discretisation in space and time (model and measurements)
- Adequacy of boundary conditions and constraints
(geology in morphological model)

⇒ Errors in model and measurements

Credible/valid - sound line of argument?

Transferable - can the specific be generalised?

Reliable - can the evidence be depended upon?

Objective - has residual bias been acknowledged?

Well founded - have the right question been posed?

+ an assessment of associated uncertainties

Classical Scientific Method

- Collate what is known, data collection, experiments and/or modelling, interpretation of results

Evidence to Inform Decision Maker

- Multiple strands of evidence
 - No single model to represent all aspects of delta behaviour
- Synthesis should aim to
 - differentiate between fact & interpretation
 - test findings against accepted knowledge
 - identify behaviour in a transparent way
 - recognise uncertainties
- Review whether conclusions are robust



Useful
tool?

Descriptive summary of behaviour:

- Captures complexity of interactions
- Covers range of space & time scales
- Identifies state changes:
 - Dynamic equilibrium or steady state; Transitional behaviour; Catastrophic switches
- Highlights sensitivity to change
 - natural and imposed

Simple enough to communicate clearly

- Will be limited by current understanding

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Where am I? > Home > News > Environment

From **The Sunday Times**

November 29, 2009

The great climate change science scandal

Leaked emails have revealed the unwillingness of climate change scientists to engage in a proper debate with the sceptics who doubt global warming

Jonathan Leake, Environment Editor

TIMES RECOMMENDS

140 COMMENT

The storm began happened," annoi devoted to criticis

"RC" said nothing anyone who click

There, on the mo a thousand or so director of the cli Anglia in Norwich

Jones is a key pl department's dat measurements h; warming.

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Dibden Bay: The new environmental battleground

By **Michael McCarthy**, Environment Correspondent

Monday, 15 January 2010

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Proposals to build a giant deep-water container port within the proposed New Forest National Park are expected to unleash one of the most bitter planning battles seen in Britain for years.

Proposals to build a giant deep-water container port within the proposed New Forest National Park are expected to unleash one of the most bitter planning battles seen in Britain for years.

Associated British Ports, the biggest ports business in the UK, wants to site more than a mile of shipping berths, an array of big cranes and a 500-acre terminal at Dibden Bay on the west side of Southampton Water, to form one of the largest dock

guardian.co.uk

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Environment > **Climate change**

Tibet temperature 'highest since records began' say Chinese climatologists

Average Tibet temperatures in 2009 increased 1.5C, with rises noted in both winter and summer at 29 monitoring sites

Jonathan Watts, Asia environment correspondent, and agencies guardian.co.uk, Friday 5 February 2010 13.31 GMT
Article history



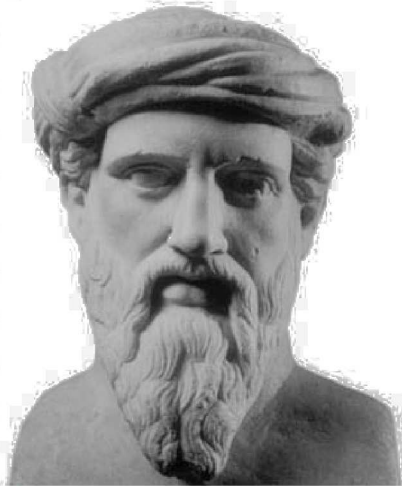
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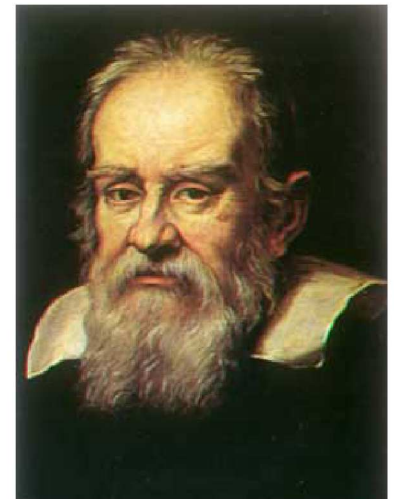
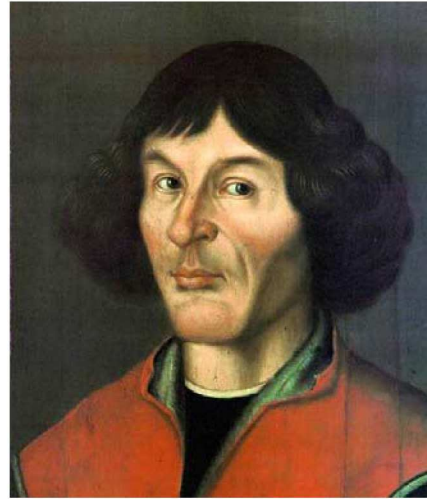
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By becoming an Organ donor you could save a life.





The world is round?

Earth goes round
the sun?



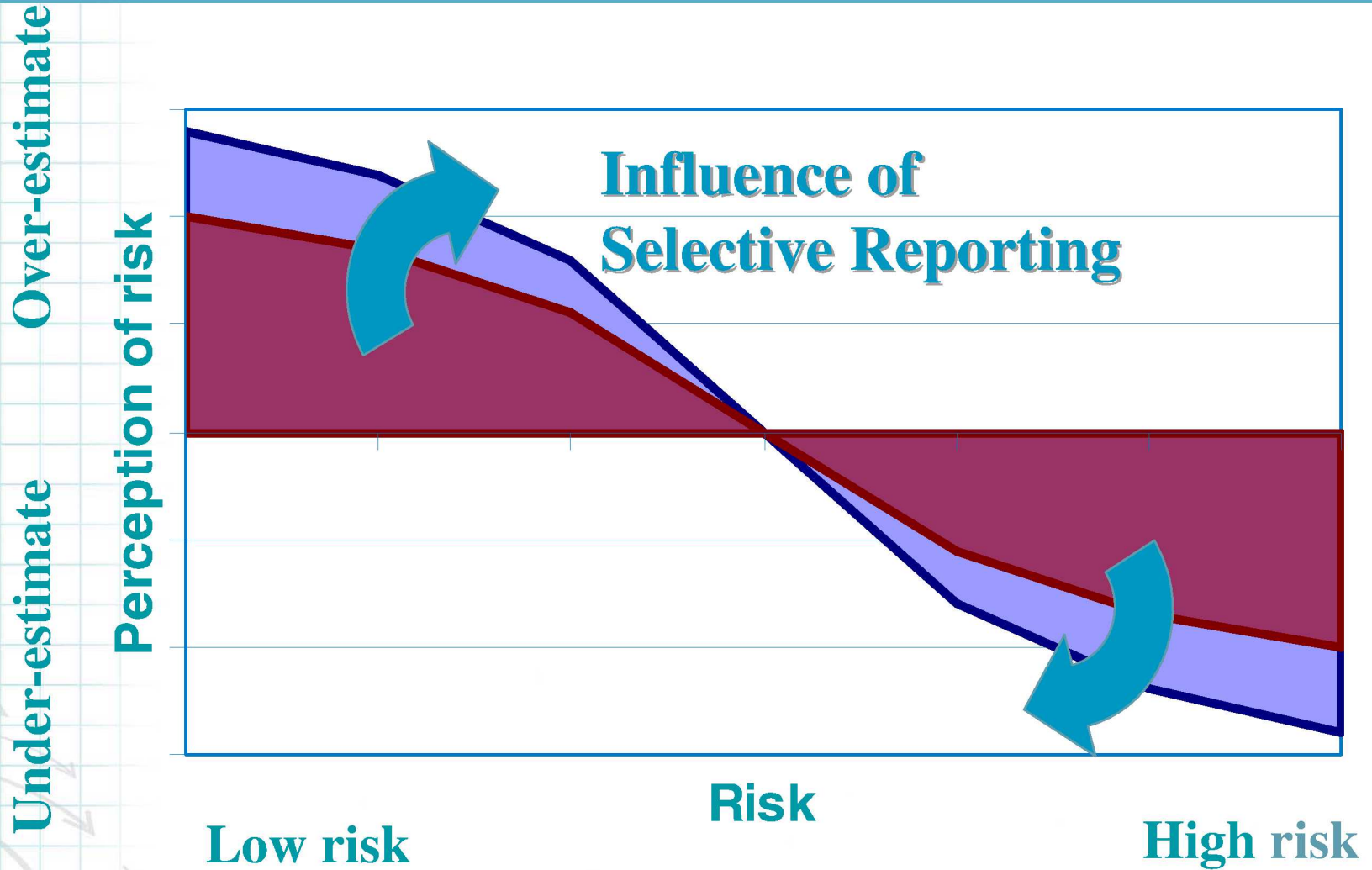
Public evaluation of risk

- weight different sources, and
- allegiance of messenger

Selective reporting

- “It is the Historian who decides what facts to give the floor to and in what order and context” E H Carr
- **NO.** Every report does this

Trust to tell truth (in 2000)	%
Doctors	89
Teachers	88
Clergymen or priests	86
Television news readers	75
The Police	70
Man or woman in the street	58
Civil servants	52
Trade Union officials	40
Government scientists	38
Business leaders	35
Politicians generally	19
Government Ministers	17
Journalists	10



Professor Philip Stott has proposed the Sensibility Index (**S**)

$$S = \frac{W^2}{E} \pm I$$

loved by public

W = Words worth Romanticism (daffodils)

E = Evidence from Enlightenment Science (bacons)

I = Economic Impact (hayeks)

% probability
science is correct

All scaled over range 1-5

% population affected

0 – Action imperative

Action impossible - 10

Stepping Stones to end objective

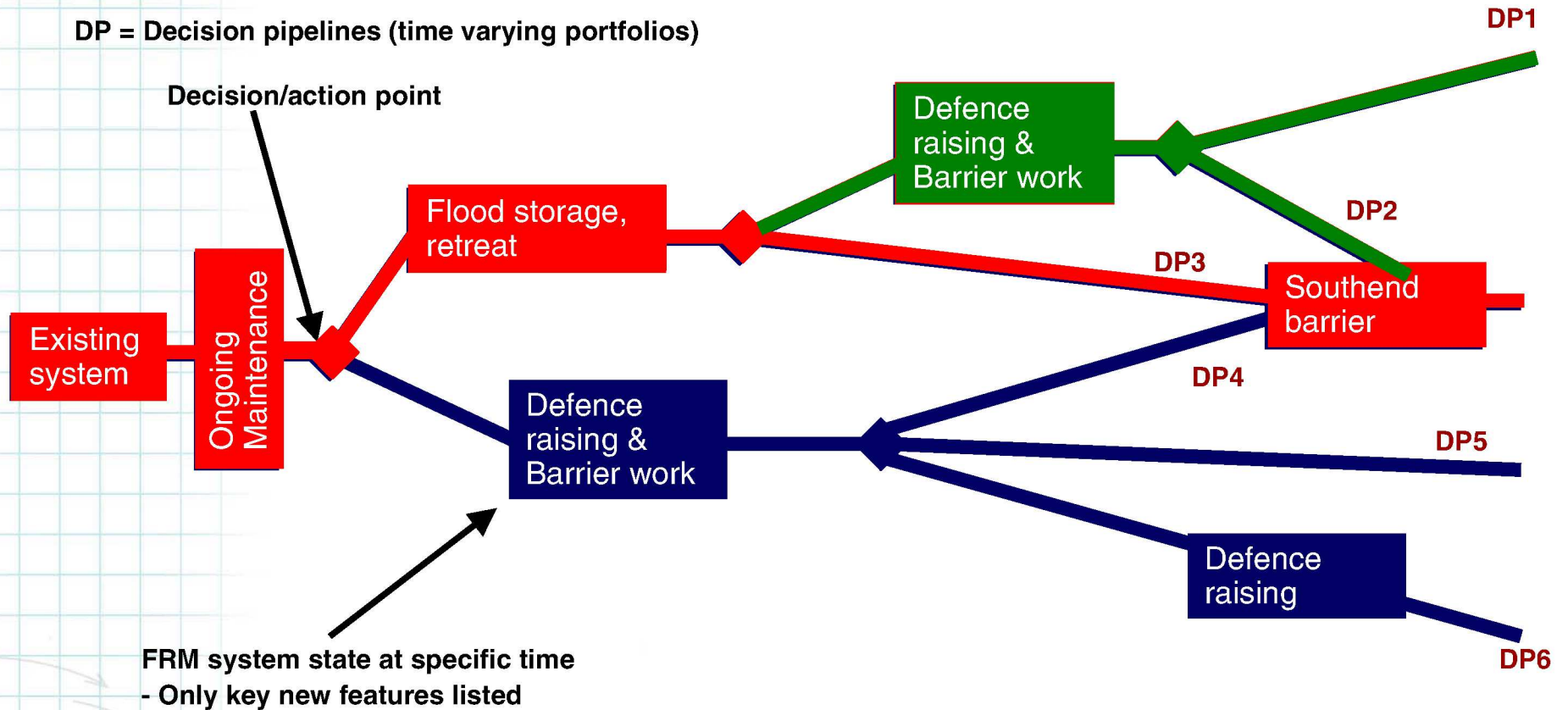


Creating the breaches for Wallasea Island managed re-alignment



DP = Decision pipelines (time varying portfolios)

Decision/action point



2008

2050

2100

Time

Robust evidence

- synthesis & conceptual model
- influence of bias (messenger, reporting, etc)
- have to make decisions with incomplete knowledge

Art of the possible

- conflicting information and interests
- public and political acceptability
- staged approach to desired objective
- build in flexibility to adapt as knowledge improves

Research funding constrained in the short-term

Regarded as a mature science

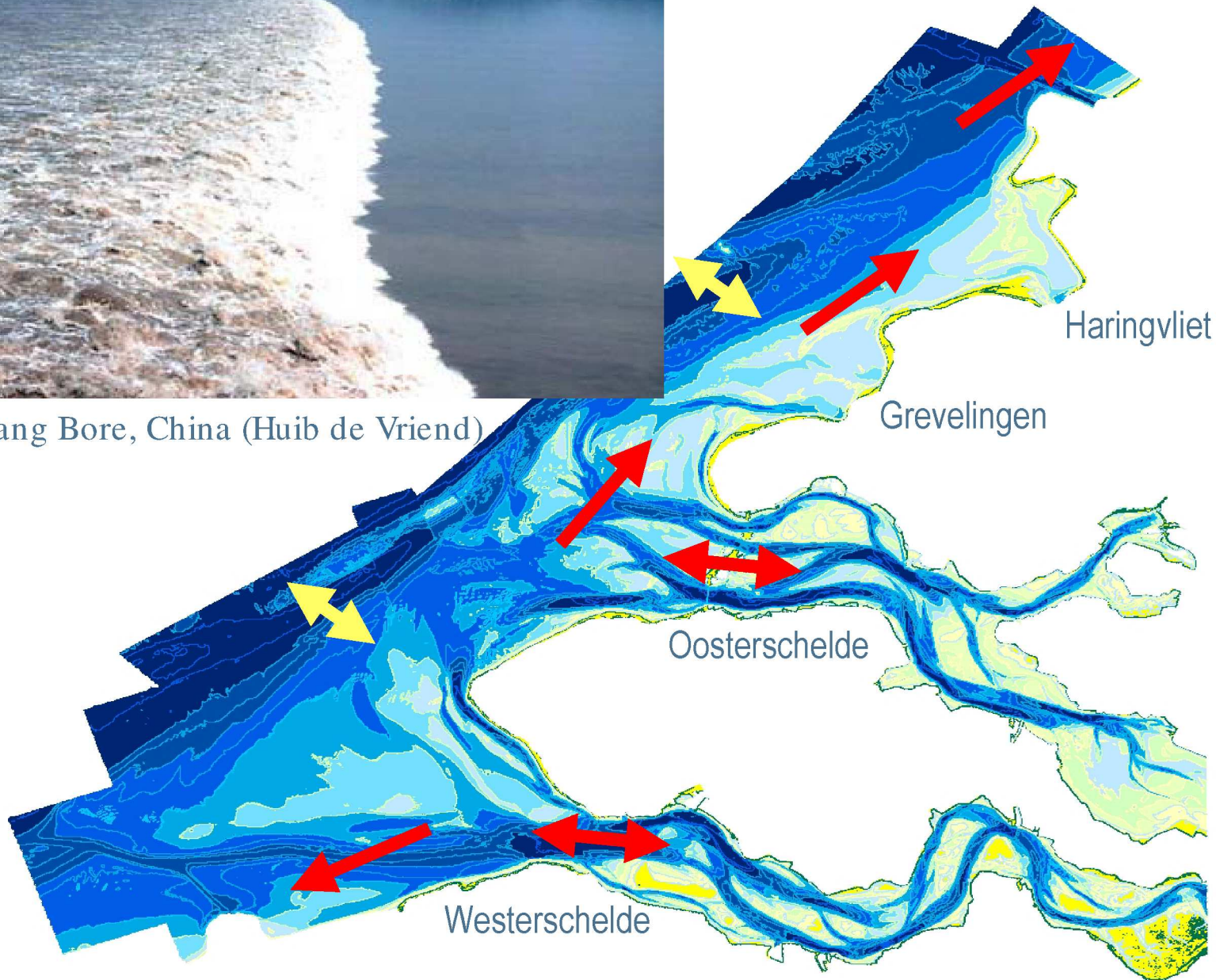
Still have some fundamental research needs

- Sediment transport
- Shelf to shore exchanges
- Biological feedback and influence on morphology
- Basis of dynamic equilibrium
- Carrying capacity

Good field data from experiments AND long-term monitoring is imperative



Qiantang Bore, China (Huib de Vriend)



Haringvliet

Grevelingen

Oosterschelde

Westerschelde

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“Tides”

There are some coasts
Where the sea comes in spectacularly
Throwing itself up gullies, challenging cliffs,
Filling the harbours with great swirls and flourish,
A theatrical event that people gather for
Curtain up twice a day. You need to know
The hour of its starting, you have to be on guard.



There are other places
Places where you do not really notice
The gradual stretch of the fertile silk of water
No gurgling or dashings here, no froth no pounding
Only at some point the echo may sound different
And looking by chance one sees ‘Oh the tide is in’.

Tides by Jenny Joseph, Selected Poems, 1992