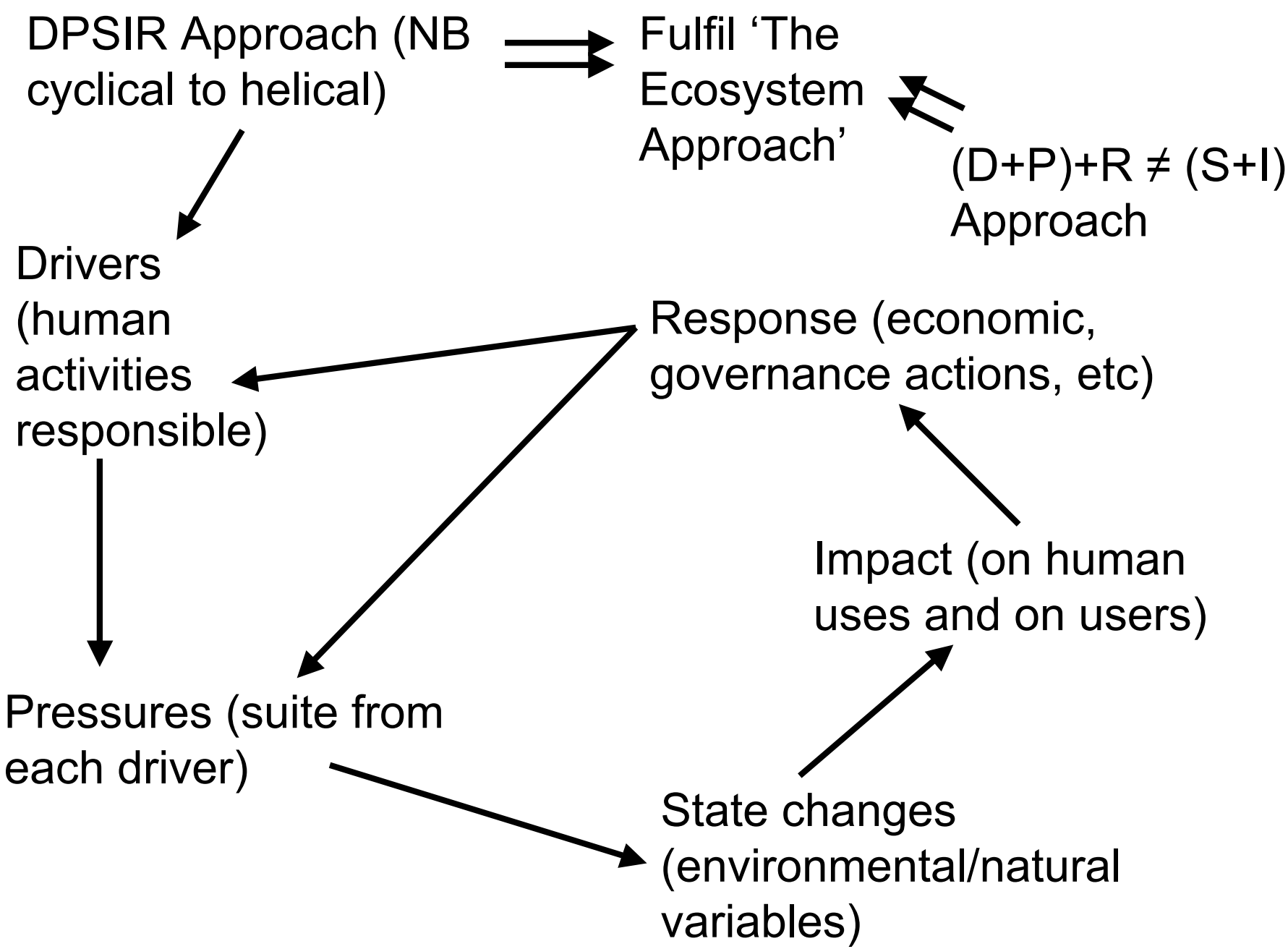
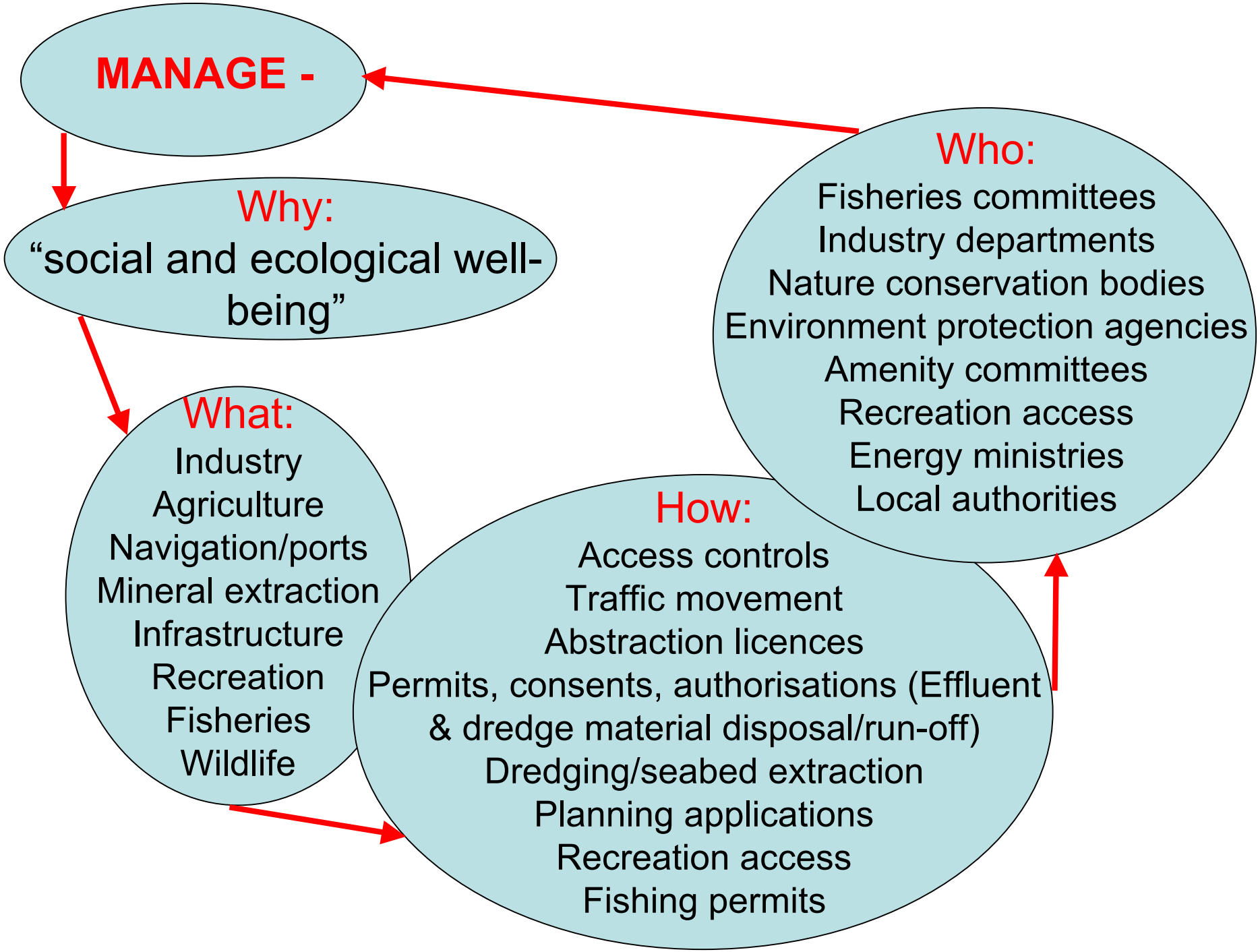

DPSIR Approach (NB cyclical to helical)
Fulfil 'The Ecosystem Approach'
(D+P)+R ≠ (S+I) Approach
Drivers (human activities responsible)
Response (economic, governance actions, etc)
Impact (on human uses and on users)
Pressures (suite from each driver)
State changes (environmental/natural variables)

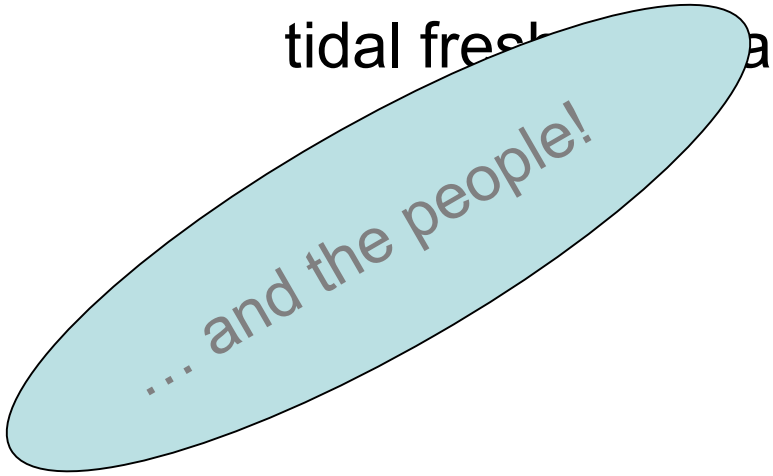

MANAGE -
Why:
"social and ecological well-being"
What:
Industry
Agriculture
Navigation/ports
Mineral extraction
Infrastructure
Recreation
Fisheries
Wildlife
How:
Access controls
Traffic movement
Abstraction licences
Permits, consents, authorisations (Effluent & dredge material disposal/run-off)
Dredging/seabed extraction
Planning applications
Recreation access
Fishing permits
Who:
Fisheries committees
Industry departments
Nature conservation bodies
Environment protection agencies
Amenity committees
Recreation access
Energy ministries
Local authorities

Coastal, Marine and Estuarine Habitats:

Primary aim – protect the natural environment, habitats, populations:

seagrass beds
saltmarsh
mudflats
estuaries
subtidal mud bed
biogenic reefs
sandy beach

reed beds
lagoons
sandflats
sand dunes
subtidal sandbanks
freshwater run-off
tidal fres areas



Human needs for/uses and abuses of estuaries:

fisheries (potting, trawling, etc.)
telecommunications cables
urban areas, infrastructure
alternative energy generation (wind, tidal, wave)
conventional energy generation (nuclear, coal, oil, gas)
land claim
coastal defence
navigation/shipping
safety (lifeboats/coastguards)
ports/harbours
dredging/spoil disposal
aggregate extraction
industry (petrochemical, food, etc.)
oil and gas exploration/extraction
barrages (amenity, safety)
wildlife, conservation
military uses
recreation/tourism
water abstraction
aquaculture
agriculture
waste discharge
education, research

Manage:

- to protect critical processes
- to protect critical areas and species
- for the production of ecological and economic goods and services

And?

- to prevent prosecution and
- to look after shareholders

Therefore:

Manage for both ecology and economy (reason)

Using both technology and administrative bodies (tools)

Within both laws and governance (drivers)

For both society and politics (drivers)

Hence we need:
Drivers for management
Tools for management
Endpoints/Outcomes of management

Hence to get sustainable and successful management we need to harmonise within and between:

- sectors
- stakeholders
- regulators
- mediums
- estuaries
- regions
- countries
- outcomes
- implementation

Things to be managed (and by whom):

- Habitats (nature conservation agencies)
- Environmental quality (EPA-type organisations)
- Water space usage (port authorities)
- Navigation (port authorities)
- Infrastructure (municipalities/federal state)
- Energy extraction (private companies)
- Biological extractions (fisheries bodies)
- Estuarine water extraction (private energy companies)
- Upstream water abstraction (water supply companies)
- Land space usage (municipalities/federal state)
- Erosion and flooding control (EPA, municipalities etc)
- Industry (EPA and private companies)
- Recreation and tourism (agencies)

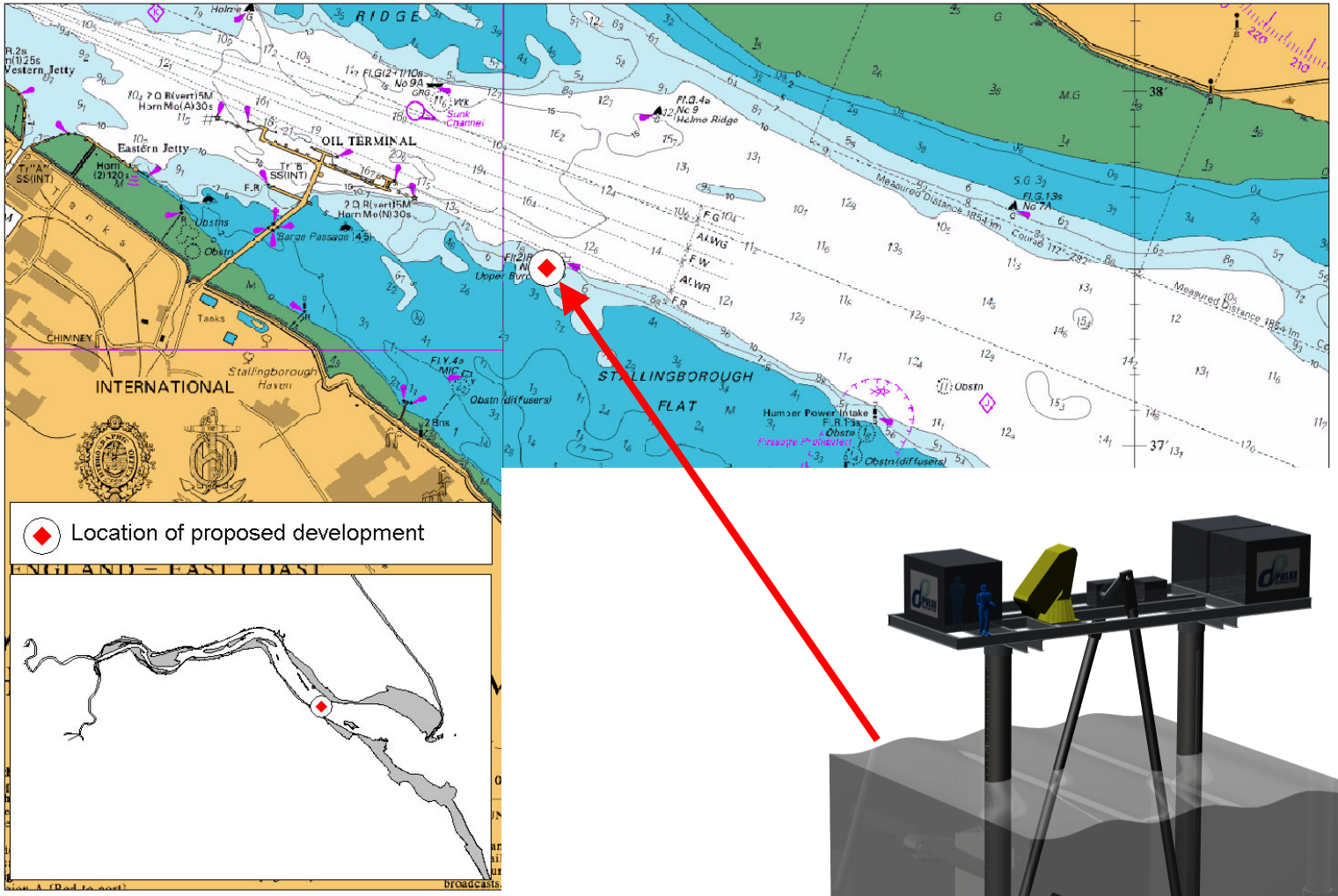
Interest Features - EMS

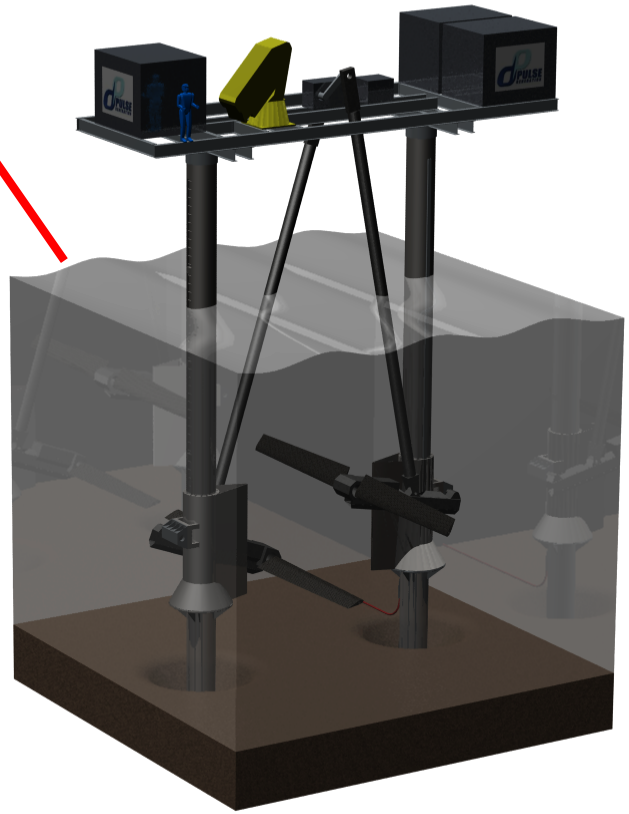
- Estuary (as a whole)
- Intertidal mudflats
- Subtidal sandbanks
- Saltmarsh
- Brackish lagoons
- Grey dunes

Interest Features - Species

- Lamprey
- Shad (Allis & Twaite)
- Migratory fishes (salmonids, eels)
- Marsh Harrier
- Bittern
- Breeding birds
- Grey seals

Immingham (plus Hull, Goole, Grimsby) –
Largest Ports Complex in UK





Design Plan of the Pulse Stream 100 Device (prototype) at high water

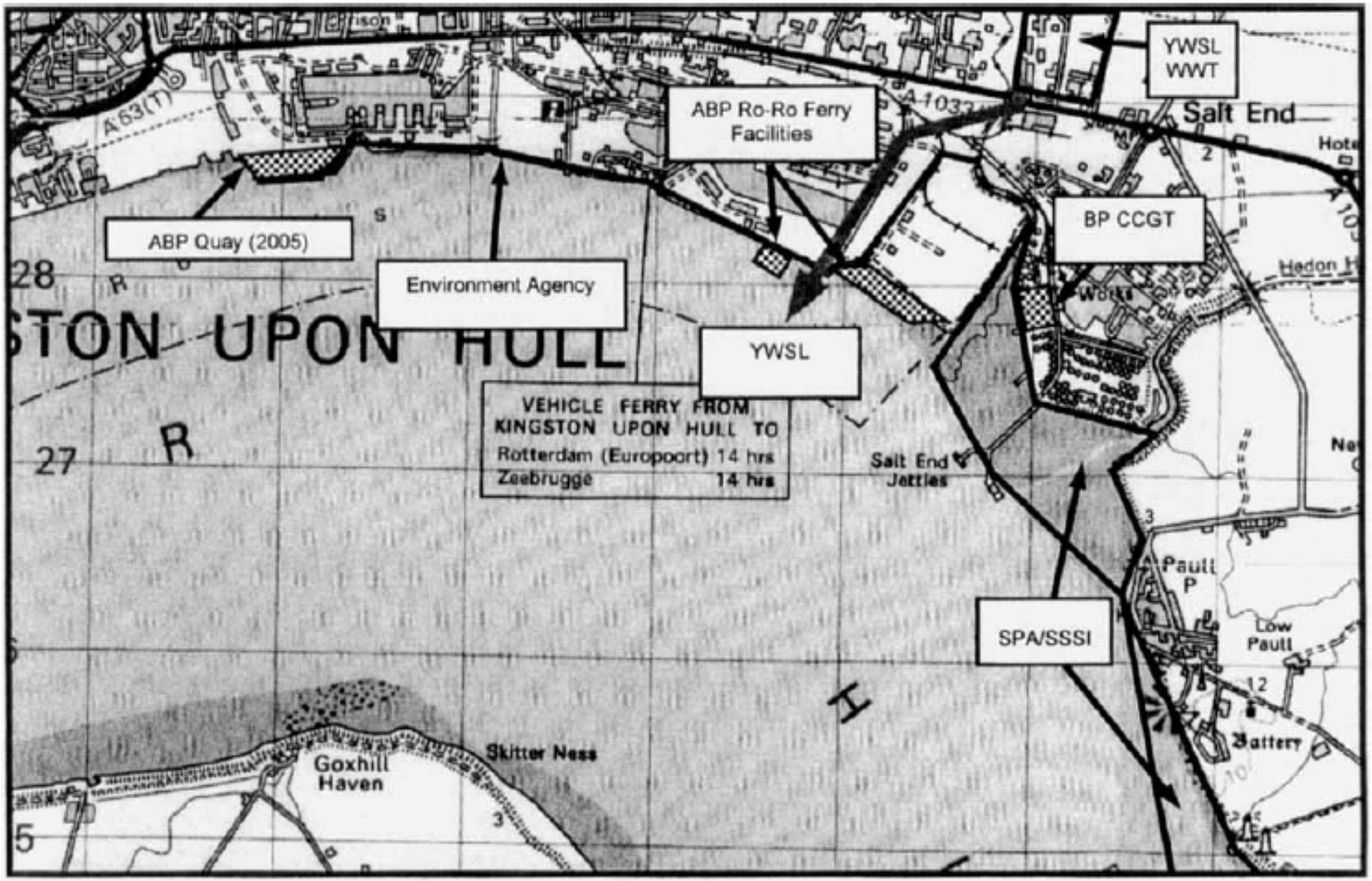


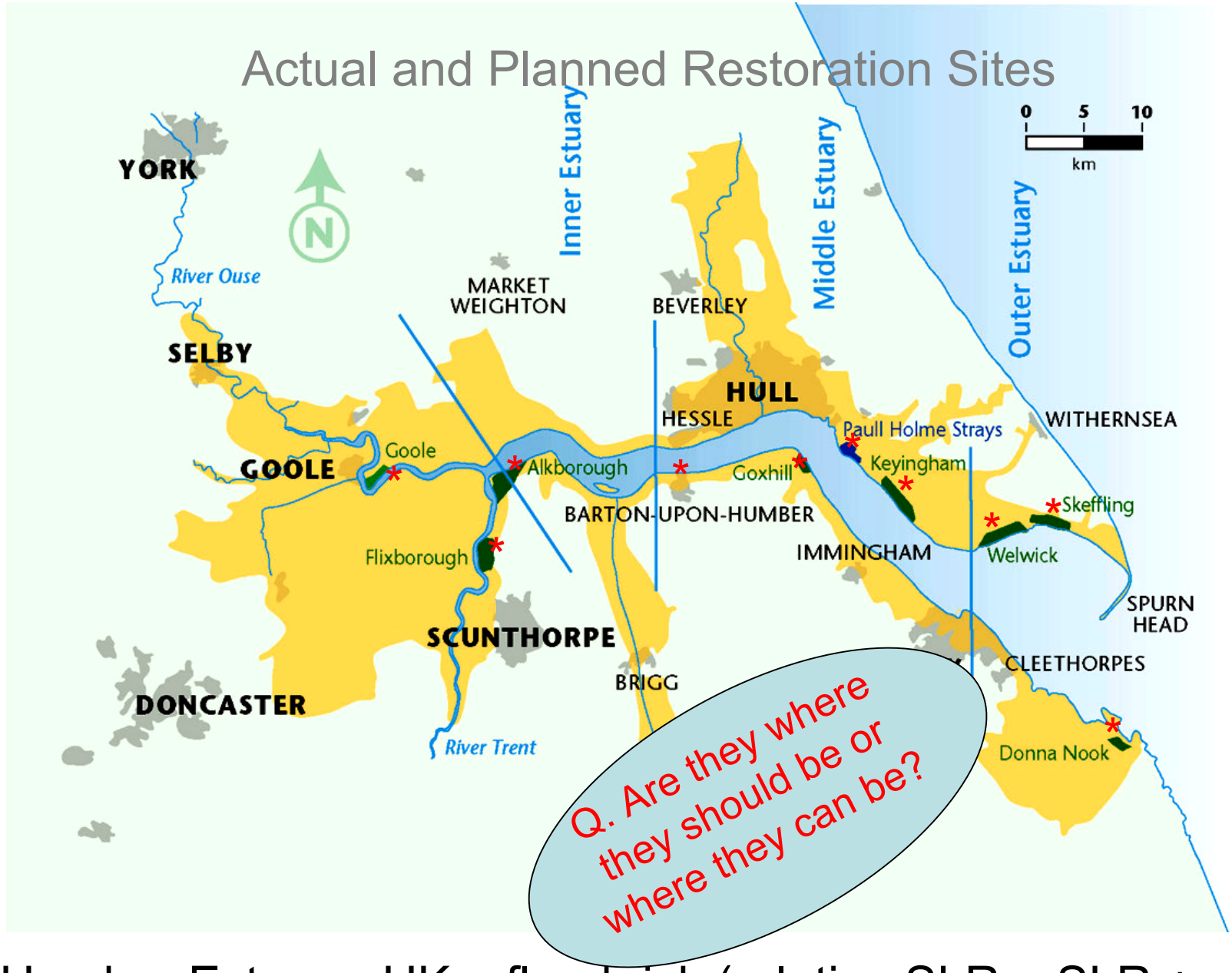
Fig. 1. Location of developments in Salt End area of Humber Estuary

Cumulative Impacts? (Conlan JCIWEM 2000)

The Humber Estuary – Uses and Users per Sector (✓ Low to ✓✓✓ High)

Activity	**1**	**2**	**3N**	**3S**	**4N**	**4S**	**5N**	**5S**	**6**	**7**
Agricultural diffuse inputs	✓✓	✓✓		✓	✓✓	✓	✓✓✓	✓	✓✓	✓✓
Amenity & recreation			✓✓	✓✓	✓	✓	✓	✓	✓✓✓	✓✓✓
Angling					✓✓	✓✓	✓	✓✓	✓✓✓	
Archaeology		✓	✓✓✓	✓						
Domestic discharges	✓	✓	✓✓✓		✓✓✓		✓✓✓	✓✓✓		✓✓
Dredged-material disposal								✓✓✓	✓✓✓	
Dredging			✓✓		✓✓✓		✓✓✓		✓	
Fin-fisheries	✓	✓					✓✓	✓✓	✓✓	✓✓
Flood defence	✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Freshwater input	✓✓✓	✓	✓✓		✓					
Industrial area		✓	✓✓✓	✓	✓✓✓	✓✓		✓✓✓		
Industrial discharges		✓	✓✓✓	✓	✓	✓		✓✓✓		
Land-claim	✓		✓	✓✓	✓✓✓	✓	✓✓✓		✓✓✓	
Military Defence										✓✓✓
Nature conservation	✓✓✓	✓	✓	✓✓✓	✓✓✓	✓✓	✓✓✓		✓✓✓	✓✓✓
Navigation	✓	✓	✓✓✓		✓✓✓		✓✓	✓✓	✓✓✓	✓✓
Port activity	✓✓		✓✓✓		✓✓✓			✓✓✓		
Power generation	✓					✓✓✓	✓✓	✓✓✓		
Shell-fisheries					✓		✓✓✓	✓✓✓	✓✓✓	✓✓
Water abstraction	✓					✓✓		✓✓		
Wildfowling	✓✓✓	✓								

Sectors:	1 – Tidal rivers to Broomfleet	Sector 2 – Broomfleet to Hessle	Sector 3 – Hessle to River Hull
Sector 4 – River Hull to S Killingholme	Sector 5 – S Killinholme to Cleethorpes	Sector 6 – Spurn Bight (N shore)	7 (Cleethorpes to Donna Nook (S shore)



Humber Estuary, UK – flood risk (relative SLR = SLR + isostatic rebound)(* MR sites)

Source: Environment Agency

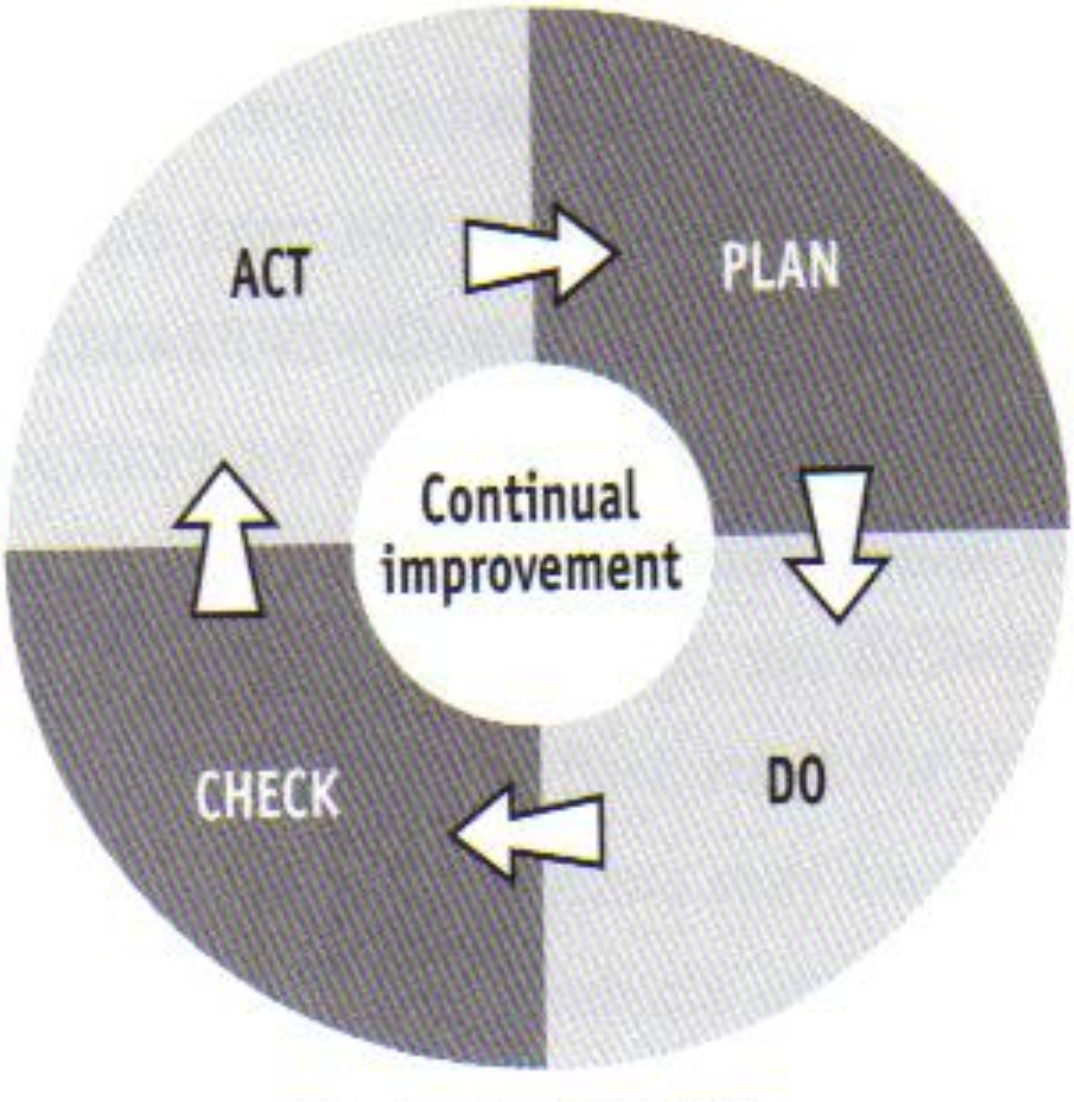
Estuarine Interlinked or Conflicting Management Initiatives, e.g. The Humber

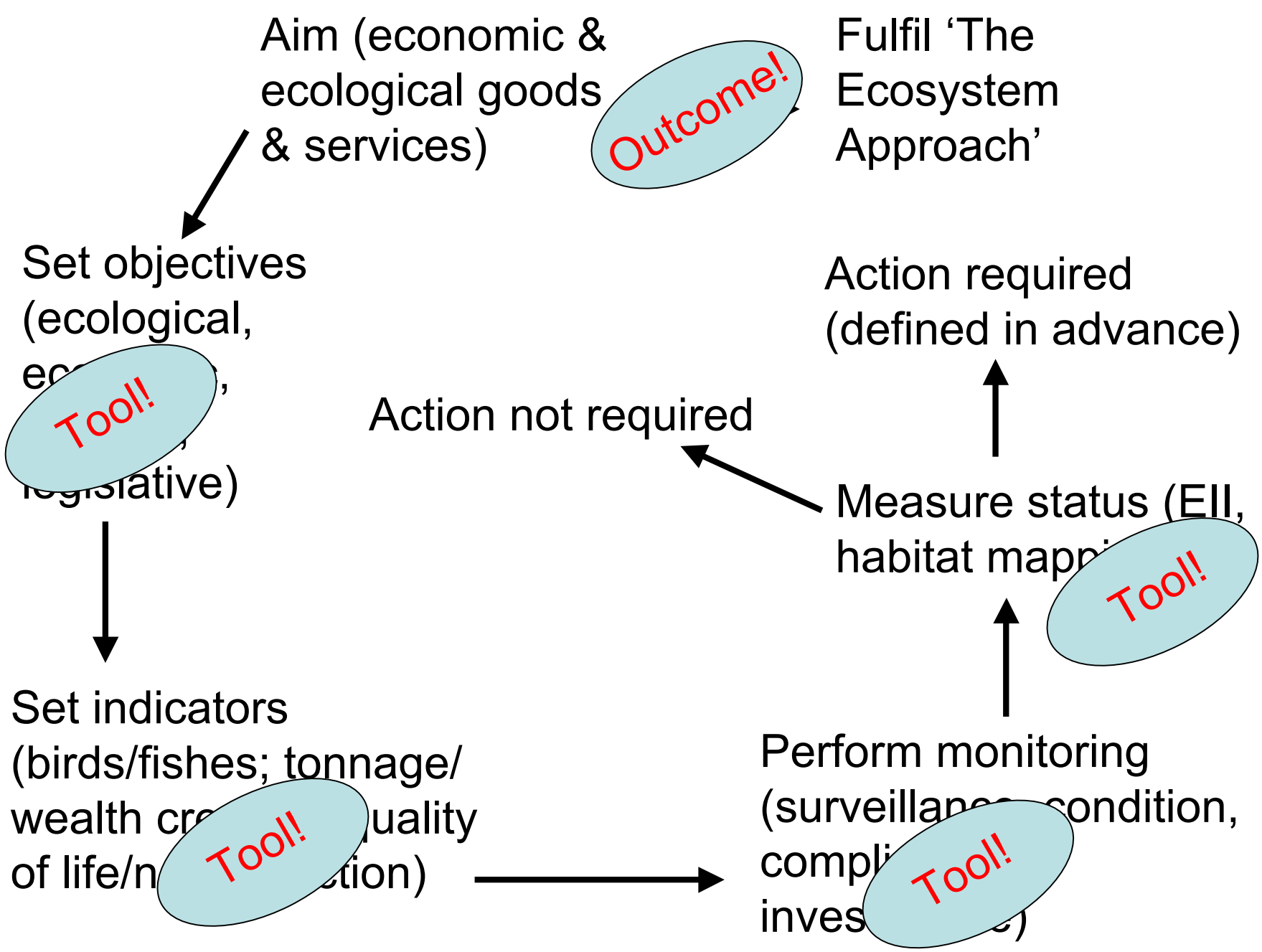
- **Conservation** - *Humber Management Plan & Reg. 33 (CHaMP - Coastal Habitat Management Plan)*
- **Re-creation** - *Flood & coastal defence, Managed Realignment*
- **Flood Protection** - *Shoreline Management Plan (SMP), CHaMP, Managed Realignment*
- **Economic Activity (e.g. Ports & Industry)** - *Review of consents, Port Development Plans & 3-D modelling*
- **Integrated Coastal Zone Management (ICZM)** - *Humber Estuary Relevant Authorities Group (HERAG) & Coastal Observatory*

Humber - policies and plans linked matrix

		Conservation	Re-creation	Flood Protection	Economic Activity (e.g. Ports & Industry)	Integrated Coastal Zone Management (ICZM)
A	Ecological aspects	✓	✓			✓
B	Management practices / Decision Tools	✓	✓	✓	✓	✓
C	Communication strategies	✓		✓		✓
D	Policy implementation	✓	✓	✓	✓	✓
E	Estuary vision / trajectory	✓			✓	✓

Basis of an Environmental Management System (from Hyde and Reeve, 2005, Essentials of Environmental Management)



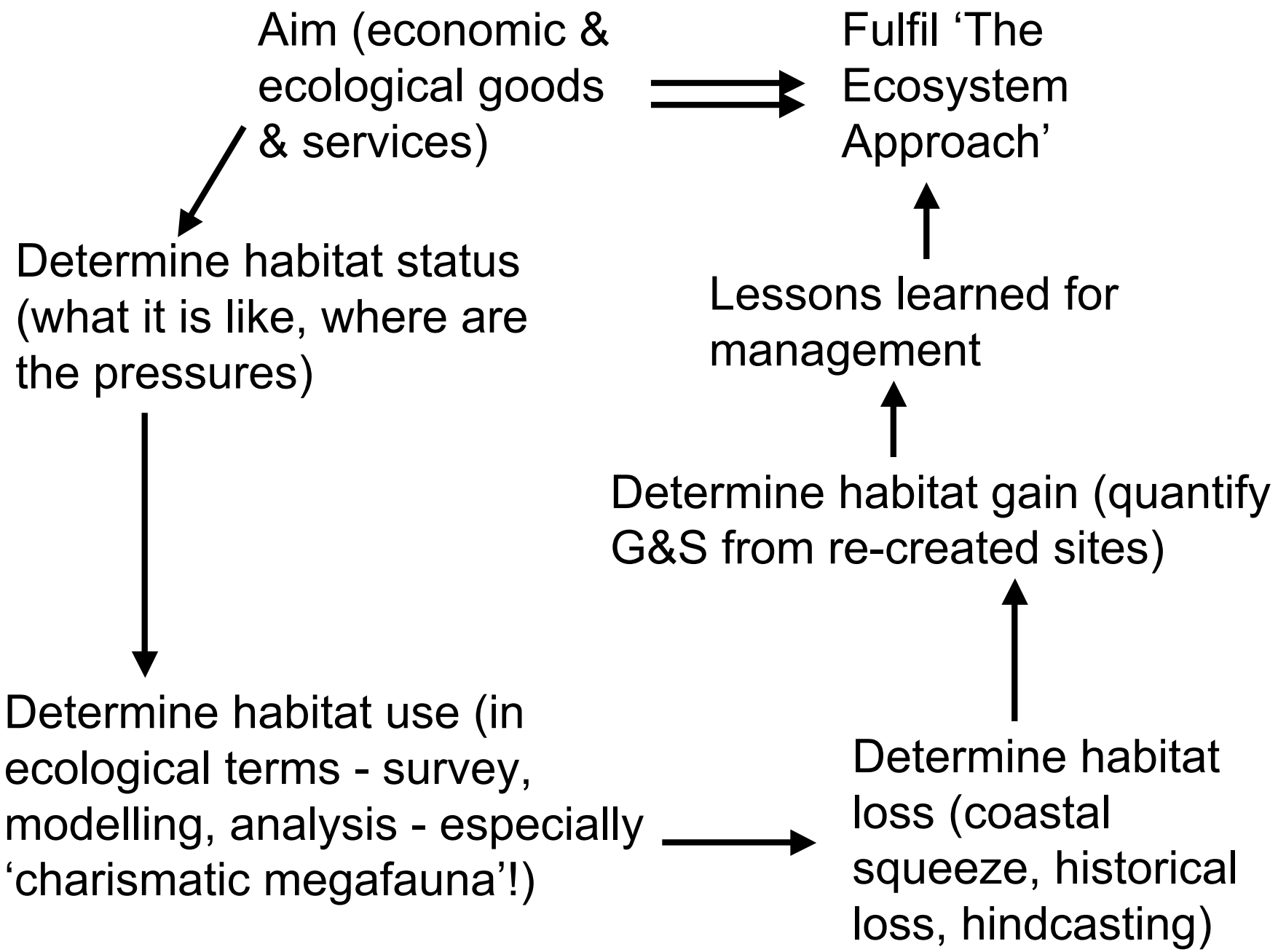

Aim (economic & ecological goods & services)
Outcome!
Fulfil 'The Ecosystem Approach'
Set objectives (ecological,
Tool!
Action required (defined in advance)
Action not required
Measure status (EII, habitat mapp
Tool!
Set indicators (birds/fishes; tonnage/ wealth cr uality of life/n tion)
Tool!
Perform monitoring (surveillan condition, compli
Tool!
inves

Objectives - need to be set and to know when they have been met: hence SMART

- **S**pecific
- **M**easurable
- **A**chievable / **A**ppropriate / **A**ttainable
- **R**ealistic / **R**esults focussed / **R**elevant
- **T**ime-bounded / **T**imely

P.E.S.T analysis (modified)

- The organisation of an environment can be analysed by conducting a P.E.S.T analysis.
- This is a simple analysis of an environment's *Political, Economical, Social and Technological* organisation.


Aim (economic & ecological goods & services)
Fulfil 'The Ecosystem Approach'
Determine habitat status (what it is like, where are the pressures)
Lessons learned for management
Determine habitat gain (quantify G&S from re-created sites)
Determine habitat use (in ecological terms - survey, modelling, analysis - especially 'charismatic megafauna'!)
Determine habitat loss (coastal squeeze, historical loss, hindcasting)

Our Vision for the Humber

On a clear day you will see from the top of the Humber Bridge's towers:

- An unpolluted estuary
- A healthy fishery
- Thriving wildlife with an expanded inter-tidal habitat
- Flood defences that provide an assured level of protection in harmony with the estuary's natural processes
- Prosperous ports, industry and agriculture, which have minimised their environmental impacts and benefit from the diverse and healthy Humber
- A landscape with outstanding archaeological and historic features enhanced by the Environment Agency's activities
- A tourist economy that benefits from the Humber but is sensitive to its wildlife and historic riches
- A vibrant community that understands, cares for and enjoys the Humber.

7 tenets for sustainable and successful environmental management – that actions must be:

- Environmentally/ecologically sustainable
- Technologically feasible
- Economically viable
- Socially desirable/tolerable
- Administratively achievable
- Legally permissible
- Politically expedient

‘Joined-up Environmental Thinking’:

- *Ecological Integration*: habitat integrity, fit-for-purpose;
- *User/Use Integration*: move from sectoral approach;
- *Management Integration*: WFD / HSD / IMO(PSSA) / OSPAR(Annex V) / BAP / WBD / ICES / ICZM / MSFD;
- *Monitoring Integration*: joint programmes for cost-effectiveness;
- *Environmental Integration*: from site-based to wider study (sites influencing and being influenced by events remote from the site);
- *Scientific Integration*: responses to multiple stressors at several levels of biological organisation.