Jacobs Challenging today. Reinventing tomorrow.

Resilient Flood Risk Management

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Summary

- About me
- UK Flood Management
- The Asset Lifecycle
- Outcomes Focused Approach - (P13?)
- Some Current Thinking to deliver FCERM Outcomes
  - Asset Management approach
  - Natural Capital
  - Resilience to future shocks, carbon, natural capital,
  - Integrated regional regeneration
- Conclusions

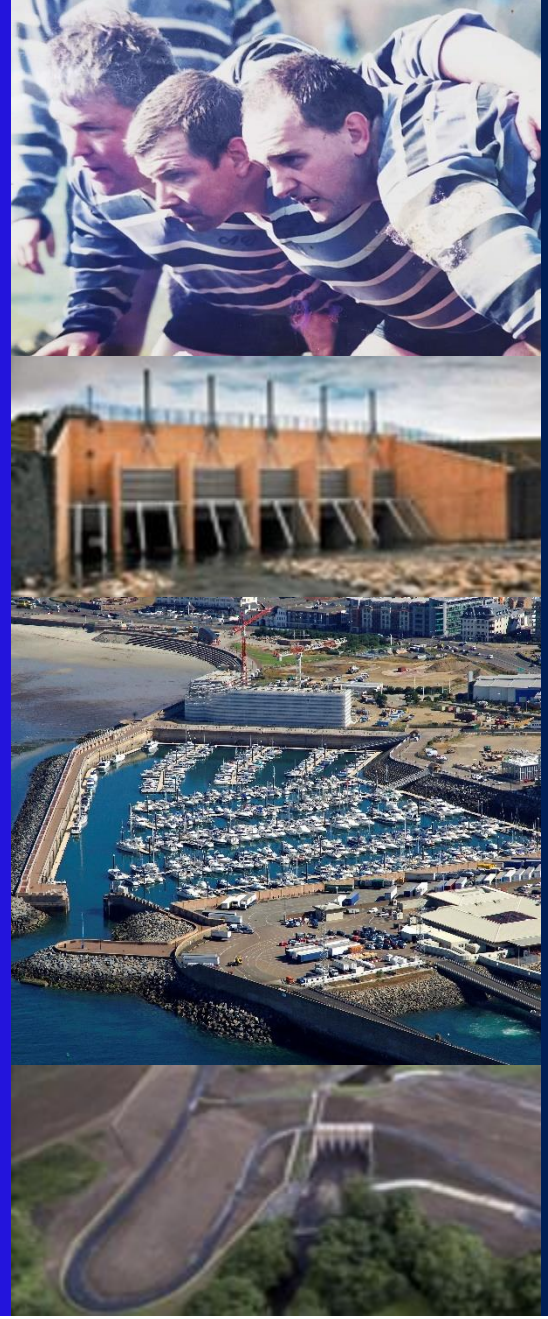
A little about me!

Dad, husband

- Graduated in Civil Engineering 1988!
- Worked for contractors, local authorities and consultancies
- Client Account Manager for Jacobs
  - (UK) Environment Agency
    - Grow Jacobs' business
- Water's edge specialist engineer
- Strategist/Economist

I love sport

Passionate about FCERM



Towyn – North Wales

Yarm – Cleveland

Elizabeth Marina – Jersey

Morpeth - Northumberland

Welcome

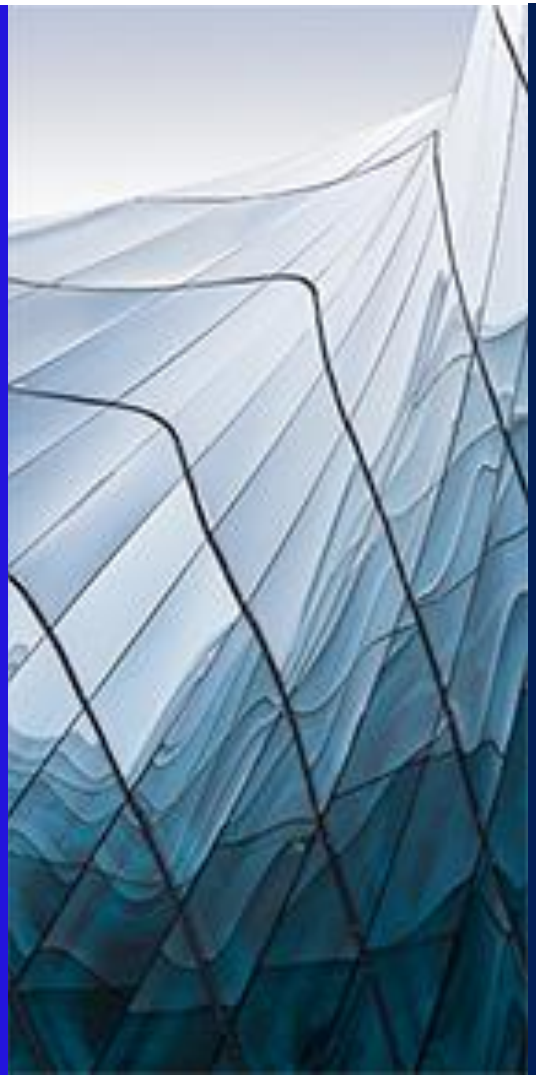
Challenging today.

Our unique approach to challenge what's accepted, using our expertise and knowledge to rethink the way we solve problems.

Reinventing tomorrow.

The outcome, from the innovations we build for our clients to the positive impact our solution have on the world.

To create a more connected, sustainable world.



Flood management in the UK

- England – Environment Agency
- Scotland – SEPA
- Natural Resources Wales
- Government funds FCERM £5.2bn / 6 years
- Local Authorities responsible for surface water & coastline
- Water companies for waste water and water supplu
- Rising sea levels and increased storminess
- 67M people – (dense, but focussed in cities)
- Funding allocated to spend on flood risk management

The Asset Lifecycle

Increasing focus on Asset Management and AM Delivery

Sometimes hand over an 'unsatisfactory' proudct

Some observations from the UK

- Tend to start with high-level plans
- This approach is predicated on flood benefits (ie flood damage avoided)
- Traditional approach and procurement led
- Crosses political boundaries!
- Sustainability dictated by planning rules

Drivers

- Economic efficiency / affordability
- Obtaining 3rd party funding
- Can 'justify' the spend
- Can "control" the spend

Operator not always happy with the product!

Sustainability where affordable

Procurement and contract dictates solution!

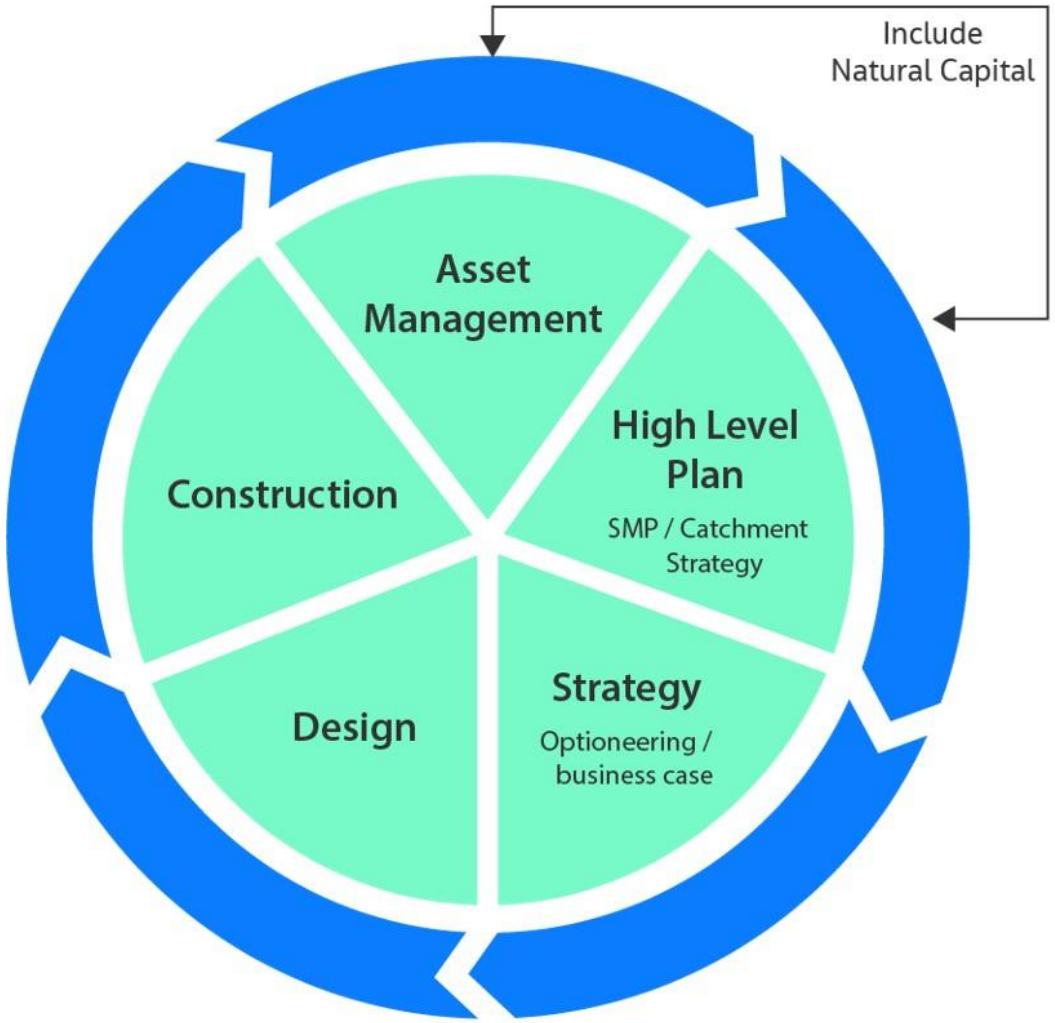
Current Challenges

- Sustainable solutions
- Resilient Solution
- Delivered using Net Zero Carbon
- Deliver efficiencies
- FCERM Strategy
  - Measure & enhance natural capital
- Integrated delivery (Multiple benefits)

Requires a new approach!

- Sustainable solutions cost more?
- What do we mean by resilience
- How will we achieve Net Zero?
- Contract – not conducive to P13 approach

Outcome Focused approach – (P13?)



- Need good data to make decisions
- AM informs High Level Plans
- Optimise intervention
- Supports programmatic and regional delivery
- Include environmental assets as 'assets"
- Understand Natural Capital in area
- Better stakeholder engagement
  - Wider benefits!

Asset Management & AM Deployment

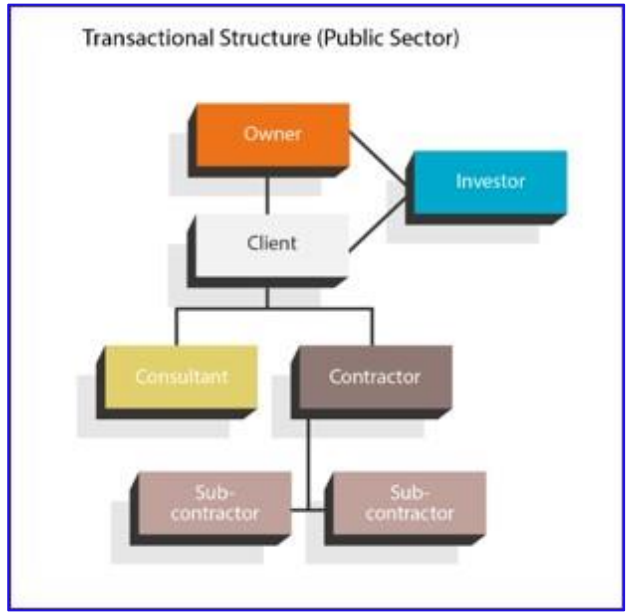
- Much more Outcome Focussed
- Supports P13 approach!

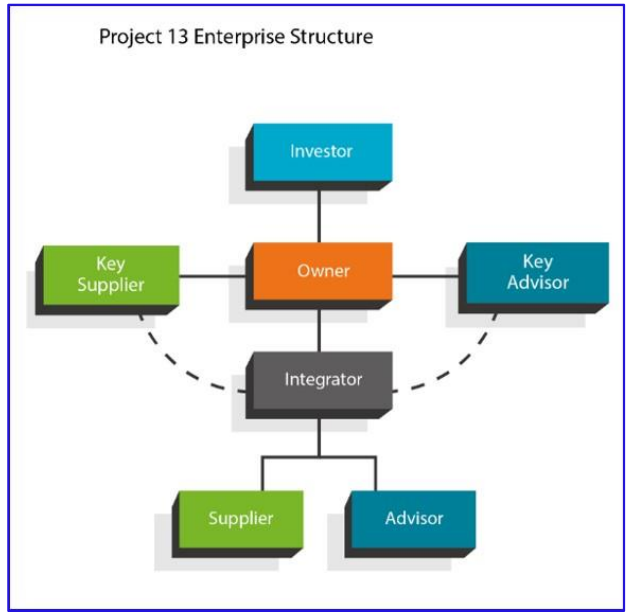
In the UK

- EA's 25 year Environment Plan
- FCERM Strategy – Draft
- Financing FCRM 'FSoD' (Treasury rules)

Project 13 – Delivering outcomes together

- We need to collaborate across the project
- Pay on outcomes
- Break out of our silos
  - Evaluate wider benefits
  - understand the sustainability premium
- Good data – smart thinking – define scope
- Measure carbon – understand latest techniques – optimise programme
- Collaborate with other infra-structure providers





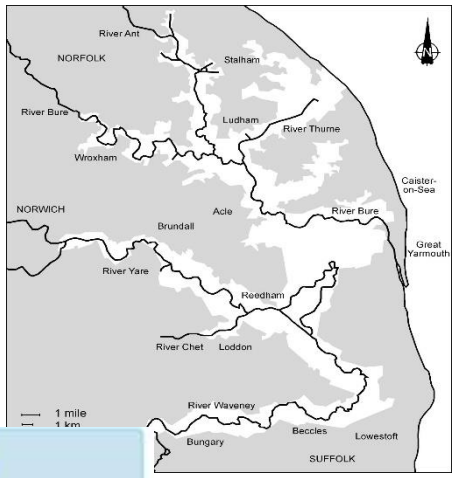
Example of approaches underway.

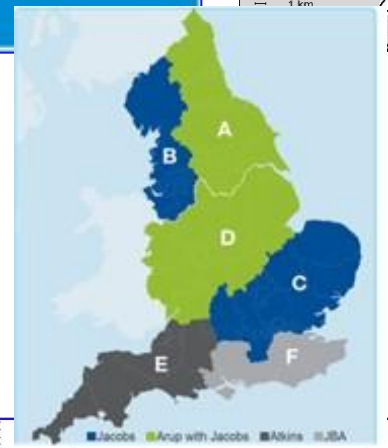
Nudging us towards a P13 approach

- FCRM Programmes
- Asset Management
- Adaptive pathways
- Innovation and digital delivery
- Natural capital

Example fcerm programmes

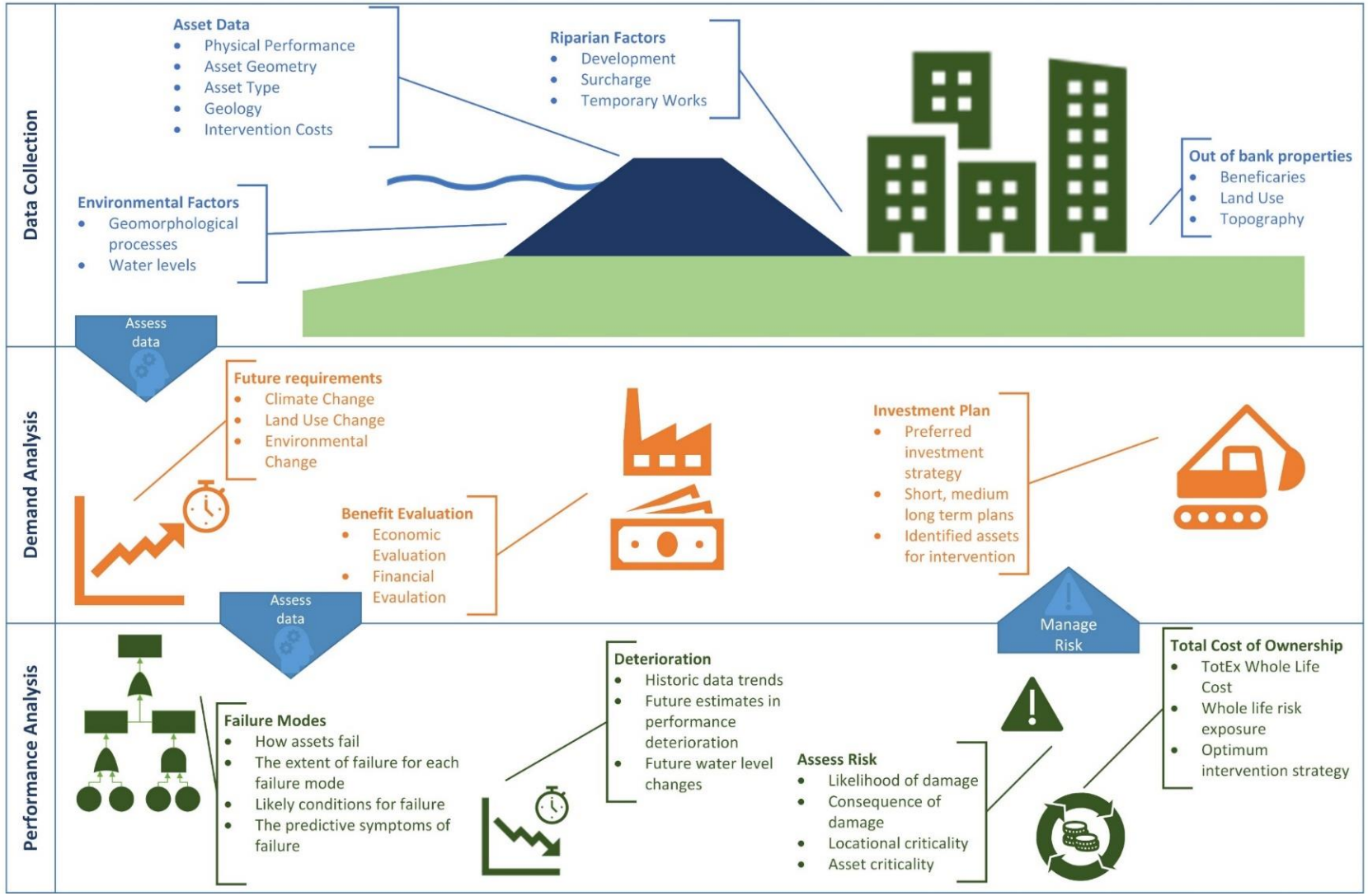
- Broadland
  - 20 yr PFI contractor – designer JV
  - Provide FCERM in East Anglia since 1997
  - Very successful – expensive to set up!
- NGSA
  - Integrated collaborating teams regionally
  - Good intent
  - Integrator / governance missing
- TEAM2100
  - 7+3 Year Asset Management Programme
  - Jacobs “Integrator” role
  - Contractor suppliers
  - Flood defences only





Asset Management

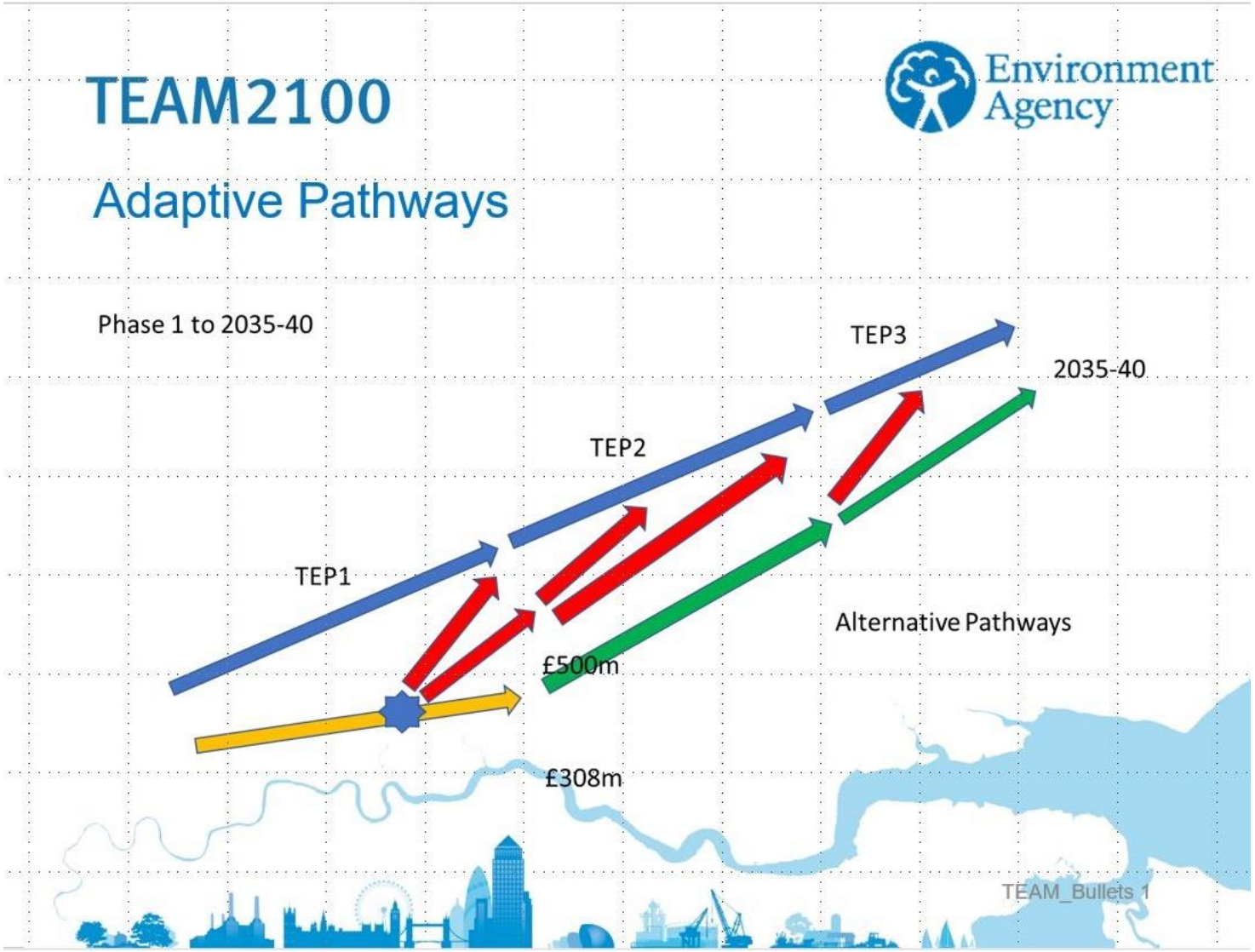
- Good data
- Understand need
- Monitor performance
- Refine
- Supports smart, strategic thinking
  - Optimise spend
  - Reduce WLC
  - Contribute to NZC
  - Provides resilience



Current UK rules tend to promote “fix & Fail”

Adaptive Pathways

- We need flexibility
- Asset Management gives you this.
- Uncertain change
- Change in risk
- Changes in funding
- Can include engineering solutions (wider foundations to allow raising!)
- Christchurch example



Innovation – evolving techniques

- Smart Sensors – remote, Neural Networks etc
- Advance Survey techniques
- 3D topography, HD aerial, 4K HD videos etc
- Lifecycle modelling
  - Investment scenarios
  - Deterioration models
  - Develop trends
  - Statistical Model of possible outcomes
- Increased used of digital technology
  - Cloud computing
  - Machine learning
  - Design in a day!

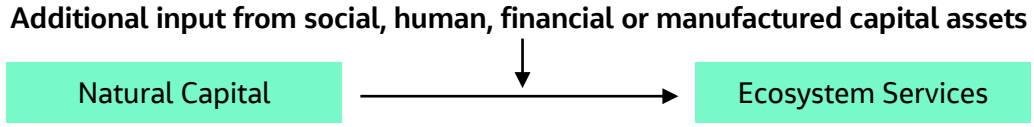
Natural Capital – Ecosystem Services

Regional understanding of natural assets

Quality, character, extent

Supports strategic / programmatic approach

- Good base line
- Treat Natural Capital as an Asset
- Include with Asset Management approaches
- Identify Opportunities and enhancement
- Support Net Zero
- Support Resilience and adaptive approaches



Definition

Natural capital is *'the sum of our ecosystems, species, freshwater, land, soils, minerals, our air and our seas. These natural elements that bring value to people and the country at large. They do this in many ways but chiefly by providing us with food, clean air and water, wildlife, energy, wood, recreation and protection from hazards'.*

Ecosystem services are *'functions and products from nature that can be turned into benefits with varying degrees of human input'*[2].

As such, the relationship between natural capital and ecosystem services can be considered as follows:

[1] Defra (2019) 25 Year Environment Plan. Available online: https://www.gov.uk/government/publications/25-year-environment-plan [Last Accessed: 10 December 2019]
[2] Natural Capital Committee (2017) How to do it: A Natural Capital Workbook. Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/608852/ncc-natural-capital-workbook.pdf Last Accessed: 06 December 2019.

Assessment of UK fcrm against P3 Principles

Pillar	Performance	Comment
Capable Owner	OK	EA – promotes collaboration and does define its Outcomes
Governance	Fair to poor	Still focussed on price & wrong contract
Integration	Fair	Relying on collaboration, rather than using formal integrator
Organisation	OK	Right suppliers Right Behaviours Still barriers between funtions
Digital Transformation	OK	Good aspiration, no real motivation to transform (commoditised business)

Five Pillars	Principles
Capable Owner	○ Owner develops Enterprises built on long term business to business (b2b) relationships ○ The Enterprise is set up to deliver: - Clearly articulated customer outcomes - Long term asset performance
Governance	○ Value is defined at outcome level (through baselines, benchmarks or affordability) ○ The Enterprise is rewarded for outcome performance ○ Risk allocation is aligned with capability and where possible jointly owned ○ The commercial arrangements provide the potential for sustainable returns ○ There are clear incentives and opportunities for investment
Integration	○ The Integrator brings together capabilities that deliver effective solutions through production systems ○ The Integrator enables a platform approach to delivery ○ Supply systems are organisationally and commercially aligned with the outcomes to be delivered ○ The Enterprise has a common and committed approach to health, safety and wellbeing
Organisation	○ The integrated Enterprise is aligned with the outcomes to be delivered ○ Supplier capability is engaged early in developing solutions ○ The Enterprise integrates the required capability in high performing, collaborative teams
Digital Transformation	○ The Enterprise digital transformation strategy enables an integrated digital approach to asset management and delivery. ○ The Enterprise effectively integrates engineering and digital technology to deliver intelligent solutions ○ Data and information are recognised and treated as digital assets that enable customer outcomes

Conclusions

- We have well defined processes
- Must change to overcome our biggest challenges
- Must build upon:
  - Increased effective asset management
  - Introducing adaptive opportunities
  - Innovative techniques & digital capabilities
  - Understand the assets better, including the natural assets
- If you do this across a region
  - Economies of scale
  - Increased opportunities to promote sustainable & resilient solutions
- We are moving towards this, but have some way to go!

Thank You!

- Any Questions?

Regional Delivery

Impact of Effective Maintenance

- Significantly reduce WLC by up to 40%
- increases the life of an asset

Timely investment

- 30% reduction in WLC by investing at the right time

Portfolio Risk

- The Portfolio risk 2 orders of magnitude greater than the project risk

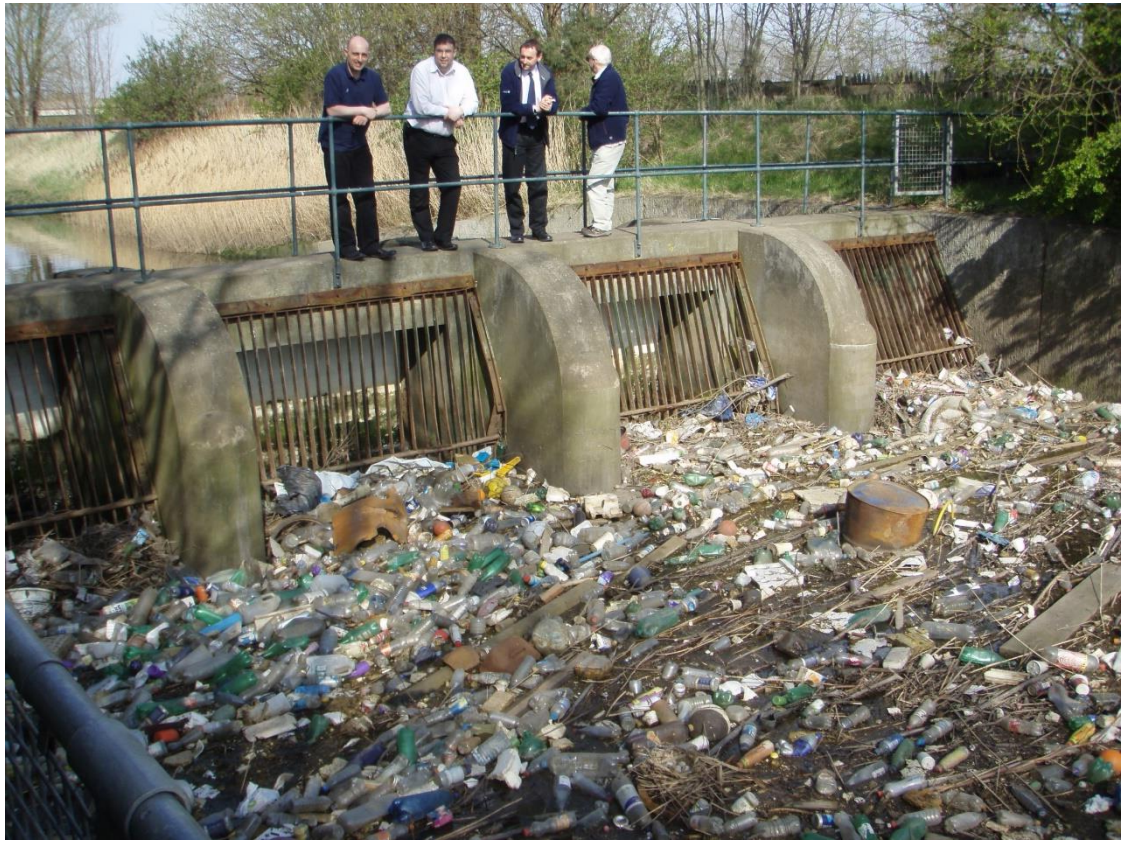
Some Examples

- Broadlands (PFI)
- TEAM2100 – Asset Management Programme
- 'NGSA' Integrated Delivery Teams – aspire to combine Capital and revenue work

So 15 years on where are we?

- 180 km of flood banks strengthened to date (100% complete by end of 2016)
- 55 km of floodbank setback from river edge (100 % by end of 2016)
- 22 km (90 %) of erosion protection to date

Project Management - Clear objectives and deliverables with a defined start and finish date



Asset Management

- Increasingly, work is being delivered programmatically across a region
- Need good data
- Optimise expenditure (and carbon and resilience) by intervention timing

  …BUT

- 'FSoD' – business case based on fail and fix (to maximise benefits & budget!)
- Opportunities to:
  - optimise spend by timely intervention
  - incorporate environmental assets (carbon offsetting / Insetting)
  - introduce adaptive approaches and (resilience)

Analysis toolbox: Identification examples and ideas

- Clusters of risk
  - Identifying communities that remain at risk through risk cluster analysis
  - Based on the 'communities at risk' method developed for EA Midlands
  - Recently applied nationally as part of the Long-term investment scenarios 2019 project to identify potential future temporary barrier deployment locations
- NFM opportunities
  - Using 'Working with Natural Processes' evidence base for high-level prioritisation of catchments for NFM opportunities
  - Based on a national analysis of NFM investment as part of the Long-term investment scenarios 2019 project
- Integrated delivery opportunities
  - Assessing national and local authority infrastructure investment plans to potential opportunities for integrated delivery