

# Conference: Restoring Estuarine and Coastal Habitats in the North East Atlantic

## (REACH North East Atlantic)

Natural History Museum, London 16<sup>th</sup> July, 2019



## Introductions and Key Note

### Aims of the conference

The Restoring Estuarine and Coastal Habitats in the North East Atlantic conference (REACH) brings together experts from academia, government, NGOs and industry to recognise what we have lost, develop an understanding of what we can do and inspire the restoration of estuarine and coastal habitats.

### Introduction

Roger Proudfoot, as Environment Agency host, opened the first REACH conference and welcomed all of the attendees introducing the day ahead.

### Keynote speech from Emma Howard Boyd – Environment Agency Chair

Emma Howard Boyd, Environment Agency Chair, opened the conference with a stark message about the impacts of climate change and the huge challenge we face. Emma was optimistic about what we can and need to do and hoped the conference would act as a catalyst for change. She went on to say '*The 25 Year Environment Plan sets an ambition to deliver environmental net gain and to restore marine*

*biodiversity. This creates the space for everyone in this room to raise their ambition higher...together'.*

Emma closed by saying she hoped the conference would help to move the discussion about coastal habitats on from protection - to restoration and she wanted to achieve greater resilience for people and wildlife at the coast: restoring, enhancing, and protecting the benefits we receive.

### **Professor Pete Fox**

Pete spoke about the need for a joined up approach to achieve our restoration aims. The Marine Outcome System are all aligned through a common driver, the 25 Year Environment Plan, however it will take more than government to realise the goals it aspires to.

The whole of the restoration community needs to be working together, sharing ideas, knowledge and resources to achieve more and increase our resilience at the coast.

[Link to Presentation](#)

### **Minister Coffey**

Minister Coffey gave a key note speech and spoke with purpose about the estuarine and coastal environments and, as the only MP with coast in their constituency name, her passion for them, particularly for saltmarsh and its importance in protecting coastal communities from coastal flooding and for enhancing biodiversity. She spoke widely about the need to restore our coastal and estuarine habitats to help achieve the vision of the 25 YEP saying that –

*'Estuarine habitats are the unsung heroes' – Minister Coffey*

*'We need to focus on nature based solutions' and 'I want to focus on protecting saltmarsh' – Minister Coffey*

### **Sara Maclennan – Defra - Restoration and the 25 Year Environment Plan, Linking to outcomes and driving change**

Sara gave an inspiring presentation, illustrating how the 25 year plan is the key driver for change for restoring our marine environment but it will be challenging. Sara reminded us to keep asking why, to keep using the best evidence and to keep being bold in our actions and to keep on improving our understanding.

[Link to presentation](#)

## **Session 1 -The Past**

### **Chair: Matt Frost, Marine Biological Association**

#### ***Dr Mike Best – Saltmarsh, past present and future***

As saltmarsh provides so many important services (carbon sequestration, a 3D habitat to support biodiversity, social benefits, agricultural services and flood defence) it is a real surprise we have lost so much.

Using evidence from a wide range of historic sources from Anglo Saxon maps and aerial imagery from bombing raids up to modern day LIDAR mapping, Mike and his team had estimated how much salt marsh we have lost (84%) and explored how what we have left is functioning.

To adapt to future climate change scenarios saltmarsh can either develop vertically or horizontally and the key question was to what degree saltmarsh development could keep pace with sea level rise.

[Link to presentation](#)

#### ***Ralph Chami – A framework for evaluating carbon sequestration – the earth tech approach starting with cetaceans***

With Climate Change presenting the greatest existential challenge of our times, the International Monetary Fund (IMF) is calling for effective carbon pricing. Carbon pricing provides effective incentives – reducing energy consumption, mobilising private finance – but are there other earth-tech friendly approaches to reducing climate risk?

Ralph presented a financial framework for valuing nature in monetary terms, using cetaceans as an example of how to describe the benefits of nature in a language understood by policy makers and financiers. The challenge is to monetise those benefits identified by science.

Phytoplankton is responsible for every other breath' but how do we value our next breath?

Ralph explained that whales sequester carbon directly on their bodies and indirectly, as their poo fertilises the phytoplankton of the oceans and asked what is the financial value of the whale?

The whale could be considered as an International Public Good (sequestering Carbon, whale watching enjoyment) and needs to be declared as such. Policy action and a global fund for covering the cost of mitigation should be established.

Using the developed framework, it would cost \$13 per person per year to subsidise whales CO2 sequestration (at pre whaling numbers). It's time to Act!

[Link to Presentation](#)

**Tim Collins – Restoring the coast – what are we trying to conserve?**

We need to make space for change as our coastline moves, evolves & changes. We need to engage the public and find ways to sell this 'change'.

Through differing approaches over time, Tim illustrated how by embracing change we may have something more valuable or of greater interest. In order to reconcile change we can embrace that change and work with natural transitions or progress managed realignment.

In finding solutions now we must also recognise that we will need to change them over time. This requires an understanding of coastal processes and land use. Conservation sequence of accept and embrace. We need to develop a strategic planning approach with a 100 year time frame.

[Link to Presentation](#)

**Professor Callum Roberts – Conservation must overcome shifted environmental baselines to address 21<sup>st</sup> century problems**

European seas have experienced extraordinary change over the centuries. We need natural habitats but we see an intergenerational shift in the way we perceive the baseline.

Taking the example of the Dogger Bank, which has always been an extremely productive fishing ground, Callum documented the decline of the fish species (halibut, turbot, and sturgeon). Dogger Bank is now a SAC but has a conservation goal of 'maintain' habitat as it is now. Only 0.001% of waters around the British Isles are protected from fishing.

Around Europe, MPAs had fewer sharks and rays and more trawling than non MPAs!

So the question is what are the conservation goals to protect – geological features or species? How did we come to this 'mad' conservation policy which leads to the description, in great detail, of degraded habitats? Shifting environmental baselines have led to a lack of ambition in conservation objectives.

The solution is to withdraw the pressures, set recovery objectives and let the habitat respond.

Concentrate on removing the threats!

[Link to Presentation](#)

**Questions and answers – from the floor**

**Question for Tim Collins and Callum Roberts** - Should conservation objectives move away from 'features' and move to the conservation of ecological processes

Tim Collins – We need to shift our approach but there are positives and negatives to consider.

Callum Roberts – Yes. We can't manage specific features in a changing world. Why protect a specific feature without the protection of the rest of the ecosystem

**Question for Callum Roberts** - The dominant discourse on conservation is around MPAs process and wording. Is this a distraction? Should we be considering a greater suite of tools and looking at whole area management?

Callum Roberts – The current process is mind numbingly futile. If done well, MPAs should be providing a strong foundation of conservation protection.

Mike Best – We need to develop the philosophy of considering a nested scale

**Question for Tim Collins** - When considering coastal change and management, we have only been focusing on the environmental impact in discussions today, but the three sustainability pillars (environmental, social, economic) all need to be considered.

Tim Collins – These are the conversations that we can't put off indefinitely and leave to future generations. The conversation may not be happening now but it's going to happen.

**Question for Ralph Chami** - Presenting nature in terms of economic interests is an approach liked by some and not others. When you talk to policy financiers are they considering the short or long term?

Ralph Chami – Policy makers are looking at their political life span, money tends to be in the here and now. So what's the benefit of talking in financial terms? If we talk about the environment, policy makers tend to glaze over but convert that information in to dollars and they make more informed, here and now messages. Convert environment value in to pounds and they get it!

**Question for Mike Best** - How do we balance environmental biodiversity with economics? E.g. if we assume that mangroves could be established on the south coast of England, and there are economics positives for doing this, what's to stop Policy putting mangroves in?

Mike Best – 'Saltmarsh can take on mangroves any day!'

### **Questions and answers – Slido**

**Question for Tim Collins** - Focus on function/form before habitats/species and embrace change. How can we marry this with the prescriptive HRA/compensation requirements we have?

**Question for Tim Collins** - You mentioned breach of an uneconomic seawall can be an efficient way to deliver saltmarsh. Can this work where a site is designated for freshwater interest?

**Question for Ralph** - Has there been any recent progress on valuation methods for intangible values i.e. cultural heritage, that you can recommend?

**Commenting on Callum's talk** - JNCC delivered new conservation advice in 2018 for 48 MPAs in UK waters and most of them have a restore conservation objective.

**Question for Sarah MacLennan.** - You asked if we have route to impact. Many benefits require other government departments. Defra need to be advocates with other departments to complete the chain.

Sarah MacLennan - Correct! The 25 Year Environment Plan set out Defra's ambition to work in partnership, recognising that species are mobile, marine environments are inter-connected and there are (positive and negative) consequences of actions by other Government departments, on sea and on land. To enable leadership and to oversee delivery at a strategic level, Defra will act as 'owner' of the 25 Year Environment Plan on behalf of government, working closely with other government departments.

**Question for Ralph** - The issues inherent in the financial sector surely pose a risk to any environmental fund. Is such risk built into environmental values?

**Question for Tim Collins** - Tim, looking at your slide of local people looking at the defend or not defend, it is all older people. How do we engage the young more?

**Question for Mike and Ralph** - How do we communicate the benefits of restoration? What language and mechanisms can we use to engage and EXCITE the public, policy makers & industry?

*Please see Annex 1*

**Challenge to Ralph** - Does the economic case mean that where there is no economic case, nothing can be done? If a marina has replaced a salt marsh what's the economic?

**Question for Callum** - How can this picture of a more productive marine environment be better communicated to industry who lobby so hard to prevent further restrictions?

**Question for Mike Best** - Can we be honest about the fterm benefit of salt marshes which provide a decreasing service with increasing surge and storm levels?

*Please see Annex 1*

**Question for Mike Best** - With salt marsh to be recreated on existing mudflat, the CO2 gain is only the increase over the mudflat sequestration. What is that?

*Please see Annex 1*

**Question for Mike Best** - Much of the intertidal and sub tidal has focussed on physical parameters like elevation. However, the sea grass talk listed water quality. Which is the primary issue?

*Please see Annex 1*

**Question for Mike Best** - Is it possible to restore seagrass beds with the current N loadings recorded around our coast and estuaries leading to opp Mac smothering?

*Please see Annex 1*

## **Session 2 – The Present**

### **Chair: Dr Julia Stigwart, Queens University**

#### **Rachael Hill, Environment Agency - Flood and Coastal Risk Management – what role for habitats?**

Rachael began summarising the Environment Agency's (EA) role, along with the systems, programmes and plans that they have in place. She reiterated the EA's role in assurance of appropriate spending and the role of relevant coastal groups, chaired by the EA or local authorities.

She continued to say that coastal schemes cover well over half of the capital investment undertaken for flood defence works. Outcome measures are very pragmatic, for example, including the number of households moved out of any flood probability category.

Rachael acknowledged there is a great deal still to do and she recognised that at present they are running to stand still!

Rachael went on to discuss further opportunities for restoration such as greening the grey, nature based solutions and net gain as well as the need to take opportunities where Flood and Coastal Risk Management options are not currently viable.

To date the Environment Agency's Habitat Creation Programme has realigned > 9000 ha with projected 600ha marsh and 300 ha mudflat to come

[Link to presentation](#)

#### **Colin Scott, ABPmer - Restoring saltmarshes with dredge sediment – recent advances in the Solent, the UK and globally.**

Colin began by summarising why optimal dredge reuse is not happening as much as it could, with a focus on consenting and impact concerns.

There are significant cost savings and benefits, but they need further exploration and elucidation e.g. Carbon trapping etc.

Colin went on to suggest there is a lack of strategic oversight – it is imperative that there is the formation of some strategic /centralised support. The Beneficial Use Working Group (BUWG) has been a useful forum, meeting every 6 months – this needs to keep happening but more needs to be done.

Colin summarised by saying that a number of projects demonstrate proof of concept e.g. Lymington Project and It's time to expand. He suggested that there are lessons to be learnt from these projects and there is learning we can also take from the Marine Pioneer outputs, Net gain approaches and progress reports from projects such as the Solent Forums project: Beneficial Use of Dredging in the Solent (BUDS) Phase 3; Mersey; Horsey and Hole Bay.

Colin finished by asking for a more (increasingly localised) strategic approach to planning and licensing of beneficial deposit grounds, with an improved



understanding of costs and benefits and more freedom to learn by doing and for the community to communicate better.

[Link to presentation](#)

**Dr Bill Sanderson, Heriot-Watt University. Dornoch Environmental Enhancement Project (DEEP): Successes and Challenges.**

Bill provided an impressive multimedia presentation illustrating the power and impact of visual media in marketing restoration projects to stakeholders, the public and would-be future investors.

A summary of the [Dornoch Environmental Enhancement Project](#) (DEEP) project was provided with the strong roots and motivations of the Glenmorangie whiskey company in the project illustrated.

Bill went on to explain that native oyster habitats are one of, if not the most, imperilled marine habitats on earth with 85% of oyster reefs extinct (Beck et al, 2009).

The DEEP plan is to Restore Native European oysters to the Dornoch Firth (40ha) but its aims are wider and it is looking to assist in shifting the ambition of marine conservation so that it's not just about protecting the resources we have today but in restoring ecosystems to their full potential.

There are a number of challenges the project faces. These include: minimising invasive species spread; sourcing 4 million oysters, and; a need for 4000m<sup>3</sup> of waste shell requires development of the supply chain. The challenge is how to unlock these bottle necks and the DEEP project is at the forefront of doing that.

[Link to the presentation](#)

A series of videos show the progression of the project links below:

Initial introduction

<https://youtu.be/75ZEDLWJV40>

Initial pilot success

<https://youtu.be/dfqTqB-IQw>

Building a reef

<https://youtu.be/QSnPk41kIn0>

**Dr Richard Unsworth, Swansea University. Sowing the seeds of recovery for our British coasts – a story of hope.**

Richard began with a call to arms in seagrass restoration which he says presents significant potential for Carbon fixing and storage (up to 380 metric tons of carbon per hectare).

Widespread seagrass loss to wasting disease is short-sighted. A multitude of anthropogenic factors will have also influenced seagrass survival to get us to the current degraded situation. For example, poor water quality and land reclamation are the biggest causes of loss in the Humber (Green, Unsworth et al In Prep)

Richard went on to outline the other benefits that seagrass brings - 1ha seagrass = 100k litres Oxygen, filters nutrients from 200 people, habitat for 80k fish, Potential for 47,000 football pitches of habitat for fish with 10.6Mt of stored Carbon.

Despite these benefits there is no UK seagrass restoration at a meaningful scale with only trials having been conducted.

Richard illustrated the techniques that have been successful in testing up to now and the promising results going forward, to restore on a larger scale. He then went on to outline the vision of the project:

*Create the UK's first seagrass restoration demonstration site at Dale, West Wales.*

Richard finished off with a summary - the benefits are clear –restoration can happen, actively involving communities, without altering peoples' livelihoods and way of life: amongst pots, between moorings in recreational areas- embedded and structuring in our widely used coastal sites.

[Link to presentation](#)

**Steve Colclough, Institute of Fisheries Management. Fish in intertidal habitats.**

Steve illustrated the value of saltmarsh for fish communities. Inter-tidal feeding sites were identified as crucial to the survival and abundance of estuarine fish, particularly nursery stock.

He highlighted the significant loss of juvenile fish nursery grounds and while difficult to quantify this will have had a significant impact to stocks.

Steve used a wide range of examples of realignment sites throughout the UK and beyond to illustrate the importance the design. Design he suggested needs to consider safe fish access at a variety of scales while ensuring the appropriate connectivity.

Steve finished with a plea for a more holistic approach to intertidal habitat creation and some lateral thinking – small measures and additions can make major impacts to habitat productivity.

[Link to presentation](#)

## Question & Answers

**Question for Rachael Hill** - Extreme events are more common, we could assume a linear projection, and the future appears to be coming along quick. How are you factoring in extreme events into your planning – are there opportunities being taken?

Rachael Hill - We know extreme events are becoming the norm. We are considering extreme and unusual events as the norm Sea level. We realise that a lot of our earlier projections are proving wrong. We realise we need to use extreme events as a new baseline. At our recent Flood and Coast conference, Jon Englander (<https://www.johnenglander.net/>) gave a powerful presentation which made for worrying viewing. The key themes in our new national strategy have been about adaptation and resilience and building back with the future in mind – there is a real need to re imagine our coastline and how habitats can be factored in.

Build back better or in better places. All about resilience and adaptation – reimagine our coastline.

**Question for Bill Sanderson and Richard Unsworth** – It is interesting thinking about the loss of seagrass and oyster reefs. In light of the losses of saltmarsh and the 2000 ha of saltmarsh that has been created through compensation, an established line of funding. What will the line of funding be for Oyster and Seagrass restoration?

Bill Sanderson - There are a number of different business models – quality improvement will have a number of drivers e.g. resilience in water treatment, carbon sequestration – scenarios for carbon storage. Work done on horse mussels in the past showed significant whelk harvesting potential from the existence of healthy horse mussel beds – some more study could show some similar benefits from oyster reefs. Clear benefits will hopefully lead to investment.

Richard Unsworth - Current Seagrass restoration interest is driven philanthropically e.g. Sky Ocean Rescue, WWF. We are currently not seeing opportunities from government to match the ambition being talked about – climate change, biodiversity, and productive fisheries – a lot of boxes can be ticked for government to justify investment.

**Question for Bill Sanderson** - Do you think government buy-in is a key aspect?

Bill Sanderson - Government role should be to bring the funding streams together. Corraling! The Dutch have become very organised, working on the presumption of exclusion, also taking strong policy decisions such as ensuring opportunities are taken around wind farm sites. Environmental Impact Assessment – should presume improvement – wind farm sites doing some interesting experimental restoration work at sites in the UK

**Question for Colin Scott** - Beneficial reuse – it seems to be a really good idea, but we have a long history of industrial activity and contamination. How does your proposed work take this into account?

Colin Scott – it becomes a whole different ball game if dredged material is contaminated. 95% of dredging is low contamination– for the most part the sediment has just come off marshes or locally from the previous winter – this is all suitable for local redistribution.

**Question for Bill Sanderson** - We had a difference of opinion in Essex on what is appropriate culture to lay oysters. Is it approached differently in Scotland?

Bill Sanderson - We are still having discussions on this. The ideal culture is oyster shell. We also try to use the heaviest shell, scallop, but we don't have large volumes available. We cannot continue using these for scaling up - so there has to be something else. The last option is crushed concrete which is not a popular thought.

Richard Unsworth - Policy and processes have to change – we appear to be pushing every agency as hard as we can – out of their current boundaries. To be fair to individuals they are trying their best but they don't have procedures for dealing with improving the marine environment. The system assumes you are endangering the marine environment. I understand why these systems are in place but they need to now flex to these new projects coming online.

Bill Sanderson - In Restoration the end justifies the means. In Habitats Directive – we focus too much on “maintain” - we need to think how we make restoration work within these structures. At the moment we let “maintain” get in the way of “improve”.

Rachael Hill - Big challenge – our approach needs to be quicker than the climate change that is happening. All across the salty 6 we need to look at how we build in restoration. Challenges from an FCRM perspective is putting net gain on top of current work. It's challenging because the processes and framework are not there to support it – we need to change that.

### **Questions from Slido**

**Question for Rachael Hill** - Will habitat restoration become an EA outcome measure rather than just habitat creation?

Roger Proudfoot: The Environment Agency as you have heard are working on a cross Defra group initiative to consider restoration. The EA is working internally to consider what outcome measures can be reported to assess our performance in restoring habitat.

**Question for Steve Colclough** - How do we manage the impacts to UK coastal fish stocks from significant infrastructure projects (NNB) when the impacts are measured against ICES SSB for an area?

**Anon** - Is there a plan to include all intertidal BAP habitats in FCRM habitat compensation calculations not just N2K sites?

**Question for Colin Scott** - Great work, but the BUDS experience surely highlights an inability of regulations to iterate. Is there hope for the 25YEP if change is this hard to come by?

**Question for Bill Sanderson** - How would the oysters be harvested in the future?

Bill Sanderson - They won't. The Dornoch has two nature conservation orders that prevent extraction of anything except the blue mussels, for which there is a royal charter to the tain common good fund that gives them historic rights since the 1600's. There won't be a native oyster fishery in the Dornoch, but it is always possible that they may seed the wider Moray Firth eventually.

**Question for Steve Colclough** - How advanced do you think ecosystem service evaluations currently are for intertidal fish nursery ground estimations?

**Question for Bill Sanderson** - Oyster restoration talks all seem to mention 20,000 oysters. What is the reason and how had this number been arrived at?

For us it was about a scale of operation that we could manage at this time. The supply chain is also very restricted, so larger numbers are not readily available. More of a coincidence than anything that our numbers match up.

**Alexandra Cunha** - Complementing Callum's talk - JNCC delivered new conservation advice in 2018 for 48 MPAs in UK waters and most of them have a restore conservation objective.

**Question for Rachael Hill** - Is there a plan to include all intertidal BAP habitats in FCRM habitat compensation calculations not just N2K sites?

## **6 X 3 Minute Presentations**

**Alexandra Cunha, Joint Nature Conservation Committee/Centro de Ciencias do Mar. Open coast seagrass restoration in Portugal. Large scale seagrass transplants.**

Alexandra provided an overview of work in this high profile BIOMARES, JNCC project. The site is a marine park with a number discontinued activities that will support seagrass recovery.

Key points from the experiments and work: Scale matters => large plots are more successful, Understanding threats is key. Handling expectations from teams and the public was a challenge. Note - Most of the data relates to only one year of monitoring.

[Link to presentation](#)

**Alison Debney, Zoological Society of London. Restoring native oysters in the Essex estuaries.**

Alison outlined the collaboration between oystermen, government, conservation NGOs and academia with an aim for the oysters stock to be self-sustaining.

Alison provide an overview of the work being undertaken in the 2km<sup>2</sup> 'restoration box' where they are piloting Oyster restoration strategies by tackling substrate deficiency by improving the seabed by adding cultch.

In this box they have created "mother oyster sanctuary". These oysters are 'no-take' and will act as a source of spat for the oyster bed restoration and wider-MCZ

[Link to presentation](#)

**Jacob Kean-Hammerson, Blue Marine Foundation. Solent Oyster Restoration Project; restoring oyster populations in a crowded marine environment.**

Jacob started by outlining the project partners - Southern IFCA, Local Authorities, University of Portsmouth, and local industry and then identified the 3 key actions in the strategy. These are: to restore using brood-stock cages to increase breeding success; sea bed restoration, and; community engagement.

Jacob summarised the successes and challenges of the project so far: 12 Restoration sites with 69,000 oysters restored. 1 billion larvae released with 2 acres of no-take. Reliable and bio secure supply is a big challenge, legislation and licensing processes are not designed for restoration

[Link to presentation](#)

**Sean Ashworth, Sussex Inshore Fisheries Conservation Authority. Sussex kelp forest restoration: enhancing fish habitats and biodiversity.**

Sean quickly summarised his organisations role - Key is for sustainable fisheries out to 6nm including tasks such as fisheries management in MCZs. He reiterated the point made earlier in the day - shifting baselines are a serious challenge for fisheries and conservation management. Do we want to restore? Yes, and Kelp forests are a key habitat which will make our fisheries better. There is strong evidence that there were dense kelp forests off the coast of West Sussex. Mapping from as far back as 1987 suggests significant work is required to return forests to their former extents.

[Link to presentation](#)

**Zahra Ravenscroft, Environment Agency. Design of our Tyne – funding through innovation.**

Zahra began by outlining the Tyne's strong history of industry on its shores. In the 90s as the industry closed, the slow process of remediation. Up until recently there has been very little restoration or enhancement in the estuary. In 2008 the EA commissioned a feasibility study for the estuary. It involved detailed engagement and workshops. There are 3 clear aims – strong strategic, influential partnership, estuary

edge and corridor focus to realise the multiple benefits that restoration can bring. But investment is required! - focus on the business areas. In April this year the EA launched a design challenge in the business area. We taking the opportunities to trial novel and innovative approaches.

[Link to presentation](#)

**Dr Ken Collins, University of Southampton. MARINEFF coastal enhancement project.**

Ken summarised work done on MARINEFF Coastal Enhancement Project and RECIF, a project aiming to give added value to marine resources and by-products (empty shells) including developing innovative construction materials for artificial reef.

The key question: Coastal Engineering is regular and featureless. Can we significantly increase biodiversity and productivity with novel solutions? A number of structures were described that were adapted from previous projects and applications. Verti-pool trials will be scaled up to test optimum biodiversity arrangements and concrete mixes will be tested for robustness and longevity

[Link to presentation](#)

## **Session 3 – The Future**

### **Chair: Professor Colin Moffat, Marine Scotland, Scottish Government**

#### **Professor Colin Moffat**

Colin opened the 3<sup>rd</sup> session asking - what can we achieve? As Sir David Attenborough said, “We are at a unique stage in our history. Never before have we had such an awareness of what we are doing to the planet, and never before have we had the power to do something about that. Surely we all have a responsibility to care for our Blue Planet. The future of humanity and indeed, all life on earth, now depends on us.”

#### **Aisling Lannin – MMO – Marine Pioneer: Using a natural capital approach for saltmarsh Restoration**

Aisling outlined the background that underpins the Marine Pioneer approach and explained how the pioneers were designed to test ways to deliver the 25 YEP.

Aisling went on to highlight the main themes of the work applying natural capital approach to the marine environment and looking at sustainable funding along with sharing the lessons learnt.

Exploring the Natural capital approach has led to a number of opportunities:

It encourages you to have a **place based vision** – this approach really worked in pioneer

It encourages **Partnership delivery** – you need everyone from every discipline to support you

It works at a number of different scales.

But it isn't the whole answer, and not the only tool in the box. It requires a fundamental culture and behaviour change – big challenge. Institutions are setup to maintain – need step change to restore.

Aisling went on to identify some highlights from the projects in Suffolk and Devon.

#### **Suffolk:**

These are very engaged communities used to working in very novel ways. The project has been working to build an understanding. Working together – consensus management key to delivery. Have to be able to support and see the value of all contributors.

#### **Devon:**



In Devon the Natural Capital approach not necessarily very useful. The project was focusing on a much more integrated approach. The shared place based vision is vital!

There was a lot of using previous experience – not re-inventing the wheel – taking expertise with us. A need for a lot of self-reflection – societal and political culture embedding in how we do our work. Need to embrace, being more adaptive

Aisling finished off with a number of recommendations:

- Placed Based Plans (break down silo planning and funding)
- Transparent and Shared System to identify priorities and investable projects
- Blend delivery across partners
- Blend finance across partners
- Foundation/Trust
- Evaluation and feedback
- Public funds – impact funds coming
- Green finance strategy

[Link to Presentation](#)

### **Clementine Chirol - *Queen Mary University London* - Improving the science-base: design and evolution of creek networks in restored saltmarshes.**

Clementine began by explaining that creek networks are integral to natural system functions but they are very difficult to map or monitor, how do we approximate these complex shapes?

Clementine continued by explaining that in more recent schemes creek design had become more complex but even in these more sophisticated designs are still nowhere near the natural design and functionality.

#### **Recommendations:**

- Managed Realignment (MR) schemes tend to be much flatter than natural creeks – correlated to lack of vegetation (vegetation needs bumps and hollows)
- Added small scale topography into sites – leads to increase in vegetation and more natural looking creek structures
- Changes in topography promote vegetation
- MR sites with altered sediment will struggle to develop natural-looking creeks, and to support diverse plant communities (even if they have good level of topography).

[Link to Presentation](#)

### **Tiziana Luisetti - CEFAS – The past, present and potential future of estuarine and coastal habitats in the East Coast of England: (Gitarno Greily SP)**

Tiziana highlighted the work that had been undertaken on saltmarsh valuation in the east of England – 4 case study's:

### **Blackwater Estuary – possible MR schemes:**

- Economist analysed potential trade-offs via cost-benefit analysis.
- Possible scenarios identified. 3 PT Scenario, Deep Green Scenario (Env Protection, Extended Deep Green (focused on salt marsh restoration)
- Criteria to identify MR areas: max area of intertidal habitat, present land use of the area, infrastructure avoidance, size, shape, land elevation and proximity to intertidal habitats
- Net present value calculated (see equation on slide)
- Cost and benefit considered (benefits: flood defence, carbon storage, fish production, composite environmental benefit. Costs = capital realignment, maintenance cost, agricultural land lost
- In shorter term (general policy decision horizon) then the Deep Green scenario has highest NPV but in longer term scale EDG has significantly higher NPV.

### **Humber Estuary:**

- Can we apply findings from Blackwater to the Humber – benefit transfer?
- Recognition of socio-ecological system complexity leads to need for careful consideration when using benefit transfer. Issues of scale also impact on willingness to pay.
- Not possible to directly benefit transfer from one site to another. Need to be corrected for socio-economic and scale.

### **Deben Estuary – part of marine pioneer:**

- 3 aims: 1 Update values from Blackwater estuary, 2. Understand if benefit transfer to east of England saltmarsh. 3. Can this study be directly used for natural capital accounting framework
- Resident preference study (see slide for results)
- 9 hypothetical realignment projects from small scales restoration to large scale restoration (with or without access)
- Large scale projects **with** public access have a high willingness to pay but if you remove public access, willingness to pay falls to £0. **People really want to connect.**

### **Beyond Blue Carbon:**

- Considered 3 ecosystems. Restoration scenario gives benefit in terms of carbon storage which is lower than avoided costs of removing existing areas of saltmarsh. **Conserving saltmarsh more economical than restoring.**

[Link to Presentation](#)

**Penny Nelson - World Wildlife Fund – Sustainable finance for marine management**

Penny outlined the work she has been doing with an aim of improving effectiveness and sustainable management of MPA's and develop tools and approaches to share more widely. The study has focussed in the North Devon and Outer Hebrides study areas and the project has 3 main work areas, 1. Engaging communities, 2. MPA Governance, 3. Sustainable Funding/mechanisms.

The presentation focused on sustainable finance and North Devon.

26% of UK waters designated as MPAs but lack funding. Depending on dwindling GiA. Solution to develop innovative finance mechanisms for long term sustainable funding.

How to supplement GiA not replacing GiA

Penny teamed up with Environmental Finance – together they developed a shared vision (see slide) and all MPAs get access. The team identified 6 options and then 3 were discounted. There was 1 clear winner – look into developing Blue Impact Fund. Highly replicable, scalable and enhances local economies and increases resilience.

Penny described the Blue Impact Fund – A large pot of money that you invest into marine and coastal business that generates financial returns and positive environmental benefits. She then went on to explain the types of businesses that fund would invest into: middle organisations between environmental focus and commercial focus.

North Devon funding gap calculated at £1.1m (each MPA on average receiving £44K) Cost £200K per MPA to be really effective. North Devon has a challenging environment. One of highest deprivation rates. Relatively small populations, dwarfed by tourist visitors (6.3 million). Significant proportion of income received by tourism. How to make most of it?

**Example of investment projects (Eco friendly wildlife tours, citizen science diving to support MPA management, seaweed production, mussel farms) etc.**

The Projects very much on smaller scale and this presents a real challenge from an investment perspective – **investors like to invest big amounts of money.**

The project looked further afield to see if large scale investment was possible. They have spoken to 80 stakeholders, reviewed 50 opportunities, analysing funding needs (what size of investment, when will we see benefits, - pipeline of projects), started to build business case, implementing Blue Impact fund.

Any surplus of money is invested into MPA management

Invested projects start to pay back investors, surplus invested into marine management

Other sources of funding incl. Offsetting payment, carbon credits, marine improvement district. No golden bullet need jigsaw of funding we can depend on.

[Link to presentation](#)

## Questions and Answers

**Question** - Real Money not theatrical economics. There is a wonderful model of place based funding multiple benefits derived by multiple pots of money and multiple stakeholders, (Partnership funding). Very pragmatic way of delivery.

Happy to build on this model, please pass Penny the details (Bob Earll). Figures mind-blowing to marine scientists but figures finance industry use are a different scale.

**Question for Clementine Chirol** - Creek networks in saltmarsh were you able to detect a system for establishing creeks from nothing (i.e. flat mudflats)

Clementine Chirol - Elevation pressures, less room to evolve naturally. PHD incomplete no hydraulic modelling but would be interesting. Lots of parameters, e.g. sediment availability, tidal range, elevation, topography, sediment structure etc. Lots of which we don't have data for.

**Question for Penny Nelson** - How finance model is transferable to other environments. What about wider marine space and estuaries (not just MPAs). You have wealthy strip – premium of sea view, but never translated. Section 106 – community benefit – why can't this include maintenance and management of benefit that creates there premium.

Penny Nelson - Agree – require patchwork of different mechanisms. Need to look at different options that don't have premiums etc.

Some similar mechanisms exist on land but not on marine.

Aisling Lannin - In order to make payments work in that way need shared delivery framework that allows good governance and decision making on where money is spent etc. Exists in pockets but don't have mechanisms/frameworks yet. Good governance really important to financial sector. Need robust transparent system.

**Question for Aisling/Penny** - What is it you are doing / needs to be done to translate your work into Business as Usual operational?

Capacity building key, getting out there and investing time with people who are interested in what we are doing and understanding from them what they need from us to help them deliver. Long time frames

Looking to trial and implement in North Devon – practical project, looking to learn and transfer lessons. Huge stream of work looking at Governance arrangement – how to make applicable across UK and wider:

Role of economics very important at local scale – understand value of ecosystem services flow and how value can be embedded into coherent and international framework of natural capital accounting – scalable.

### **Questions from Slido**

**Question for Clementine Chirol** - To generate gradations of suitability of land for realignment, do you agree a simple assessment would factor how recent realignment has taken place?

Clementine: According to existing guidebooks from the UK and the US, assessment of suitability of land for realignment should consider, in addition to socioeconomic considerations (see Figure 1 in the presentation):

- whether saltmarsh was present in the proposed site in the recent past;
- whether realignment can be expected to have major adverse impacts on the surrounding estuary or coast, that are not mitigated by an overall plan;
- whether the site can be converted to intertidal (via breaching a flood defence);
- whether the elevation profile is adequate for saltmarsh development, or can be levelled to a suitable elevation profile.

Recent research projects have expanded these recommendations by considering, among other factors: seed availability (Leggett et al., 2004), presence of remnant creek networks (Chirol, 2018) and soil structure (Brooks et al., 2015). These factors remain challenging to include in a suitability assessment due to the lack of easy-to-measure indicators. In the absence of an exhaustive list of suitability indicators, we still need to learn from experience: we can draw lessons from how previous managed realignment sites have evolved to predict what may happen to future schemes with similar starting conditions, and infer best practice.

**Question to Tiziana** - How credible is WTP? How can it be applied in reality?

Tiziana - In many occasions, the economic valuation of ecosystem services relates to services that are non-marketed. Therefore, methods relying on market prices – where actual values and decisions can be directly observed – cannot be used. This is particularly true at the local scale, as it is the case for the saltmarsh valuation presented (e.g. the Deben estuary). In all these cases, methods resulting in a WTP are usually the only suitable option. WTP values obtained from such methods (e.g. choice experiments) are generally considered reliable and robust in capturing the economic value of environmental goods as they are grounded in economic theory. However, the reliability of the WTP value obtained crucially depends on the robustness of the study developed. Choice experiments, for example, are a very flexible tool and in each phase of their development they can be amended to aim at the most reliable and credible WTP possible. Therefore, every effort is made to mitigate the hypothetical nature of the choice experiment presented. There is also the possibility to collect other data to test for the robustness of the WTP results obtained. In the case of the Deben estuary valuation, for example, we carefully considered the biophysical characteristics of the area and the possible actual

restoration options, we took into account the appropriate sample and the experience of respondents with saltmarshes in the area.

As for the application of WTP values, this is primarily within a cost-benefit analysis framework. WTP value can be compared to the cost of restoration projects, so to compare societal benefits and costs, and informing policy makers on different alternative projects. WTP can also be used as a baseline reference value for environmental fees, taxes, and payment for ecosystem services.

## **Roger Proudfoot Summary:**

What a day: thank you for coming along. Next Steps. 4 key areas we need to be thinking about going forward.

The 'salty six' are committed to supporting restoration. Looking to organise workshop in the autumn wider than just government bodies to start to develop a collaborative programme focussing initially on some of the blockers for restoration to see how we can work together to achieve more. Big thank you to the sponsors, the 80 organisations represented today and each and every one of the 170 delegates. There is a lot of passion and commitment in the room so make sure you look after your own wellbeing, we can only do so much as individuals but working together we can achieve so much more.

### **Next steps:**

- Continue to develop the network, relationships and knowledge - REACH 2
- Development of best practice guidance, learning from the current projects underway
- Develop and shape a programme and funding
- Establish pilot restoration projects

### **Serious of Webinars to follow in November.**

**'Coming together is the beginning, staying together is progress and working together is success!' Henry Ford**

### **REACH Comms round up**

#### **Twitter**

Over 100 tweets using #restoringestuariesandcoasts from 64 different Twitter users  
Nearly half a million impressions for #restoringestuariesandcoasts (number of times it's displayed on a Twitter users feed)

Over 150,000 unique Twitter accounts reached using #restoringestuariesandcoasts (1000x more people than were at the conference!)

Social media support from EA, JNCC, NE accounts, Emma Howard Boyd's account, EA Exec Directors

Reach Defra Blog - <https://deframedia.blog.gov.uk/2019/07/16/restoring-estuarine-and-coastal-habitats-conference/>

Emma's speech - <https://deframedia.blog.gov.uk/2019/07/16/restoring-estuarine-and-coastal-habitats-conference/>

Welsh Government and Port of London Authority used the conference discussions on Twitter to announce new projects and guidance (PLA Estuary Edges <http://pla.co.uk/Estuary-edges-guidance-for-developers-goes-online> and Welsh Government (Swansea University seagrass restoration project)

There's also been a few uses of the hashtag outside of the conference so hopefully that will continue.

## Annex 1

### **Can we be honest about the flood risk benefit of salt marshes which provide a decreasing service with increasing surge and storm levels?**

Salt marshes are increasingly valued for their role in coastal defense, as they reduce the impact of waves and erosion on shorelines and engineered coastal defenses behind salt marshes. Yet the response of salt marsh margins to extreme hydrodynamic forcing is complex and currently not well understood.

It is understood that rare surge and storm events are no longer 1:100 years but more like 1:10 years and the intensity of the event may be greater, so we have to re-consider our current engineering assumptions. The protection offered by saltmarsh may be less under these circumstances but I'm not aware if the work has been done to quantify it.

There are a number of projects and groups currently studying the effect of extreme events on Saltmarsh:

1. Leonardi et al (2015) collated a large dataset of salt marsh lateral erosion rates collected around the world, and determined the general response of salt marsh boundaries to wave action under normal and extreme weather conditions. They found that, as wave energy increases, salt marsh response to wind waves remains linear, and there is not a critical threshold in wave energy above which salt marsh erosion drastically accelerates. Looking at local historical data they showed that, salt marshes seem more susceptible to variations in mean wave energy rather than changes in the extremes.

Leonardi, N.; Ganju, N. K.; and Fagherazzi, S. (2015)

A linear relationship between wave power and erosion determines salt-marsh resilience to violent storms and hurricanes. *64–68 | PNAS | January 5, 2016 | vol. 113 | no. 1*

2. Priestas et al (2015) in a high resolution study looked at the relationship between lateral erosion of salt marshes and wind waves ia a specific site(Hog Island Bay, Virginia USA) with high-resolution field measurements and aerial photographs. They confirm the existence of a linear relationship between long-term salt marsh erosion and wave energy, and showed that wave power can serve as a good proxy for average salt-marsh erosion rates. At each site, erosion rates were consistent across several temporal scales, ranging from months to decades, and are strongly related to wave power. However the erosion rates vary in space and weakly depend on the spatial distribution of wave energy.

Priestas, A.M.; Mariotti, G.; Leonardi, N.; and Fagherazzi, S. (2015)



Coupled Wave Energy and Erosion Dynamics along a Salt Marsh Boundary, Hog Island Bay, Virginia, USA *J. Mar. Sci. Eng.* **2015**, 3, 1041-1065; doi:10.3390/jmse3031041

3. There is a growing body of work under the RESIST (UK) ( 'Response of Ecologically-mediated Shallow Intertidal Shores and their Transitions to extreme hydrodynamic forcing in UK settings) project. This has been led by Kate Spenser and Iris Möller, utilizing the Large Wave Flume (Großer Wellenkanal) at the Coastal Research Centre in Hannover. A giant mesocosm and wave generator subjects strips of saltmarsh to different wave and storm pressures. The project aims to understand how soil type (silty to sandy) and biology (complexity of marsh structures) affect the resistance of exposed salt marsh areas to the eroding forces of waves and tides; as well as to develop methods for mapping such resistance and its variability across space to allow prediction of marsh loss in different areas of the marsh, for any given set of sea level, wave and tide conditions. The original project aims were to quantify:
  - effects of extreme wave-forcing on seedling survival of different pioneer species
  - erosion processes and rates under extreme forcing;
  - marsh clifflet response to high energy wave conditions;
  - marsh plant breakage under extreme conditions; and
  - protection provided by novel artificial stabilisation as a restoration measure

The early results from this are published in:

Spencer, T., Möller, I., Rupprecht, F., Bouma, T., van, W. B., Kudella, M., Paul, M., et al. (2015). Salt marsh surface survives true-to-scale simulated storm surges. *Earth Surface Processes and Landforms*, 41 543-552. <https://doi.org/10.1002/esp.3867>

Recently Moller (2019) has addressed many of the concerns around the scientific confidence in the variability of wave dissipation over coastal wetland surfaces and lack of certainty around the future existence of coastal wetlands by suggesting the application of:

... a logical approach in which existing science is used to estimate the “minimum functionality” of a coastal landform (in this case coastal wetlands) with respect to a particular desired effect (in this case wave dissipation)...

Möller I (2019) Applying Uncertain Science to Nature-Based Coastal Protection: Lessons From Shallow Wetland-Dominated Shores. *Front. Environ. Sci.* 7:49. doi: 10.3389/fenvs.2019.00049

**With salt marsh to be recreated on existing mudflat, the co2 gain is only the increase over the mudflat sequestration. What is that?**

Bare mudflat tends to have a limited capacity to store carbon; benthic diatoms on the surface and bacteria in the sediment can fix carbon, but it tends to be cycled through respiration and other metabolic activities. The exact amount of carbon stored depends on the amount of organic matter within the sediment and occasionally on the amount of carbon in shells (as calcium carbonate). However carbon stored increases with increasing amount of vegetation cover and research suggests (eg Adams et al 2012) that intertidal vegetated areas immediately next to bare mudflats have at least twice the percentage of carbon. The matter is further complicated by fluxes of N<sub>2</sub>O and CH<sub>4</sub> which are significant greenhouse gases and offset some of the carbon fixing sequestration. Although very small amounts are involved compared to terrestrial and freshwater habitats intertidal mudflats tend to produce more than other marine habitats.

Adams, C.A.; Andrews, J.E.; and Jickells, T. (2012). Nitrous oxide and methane fluxes vs. carbon, nitrogen and phosphorous burial in new intertidal and saltmarsh sediments. *Science of the Total Environment* 434 (2012) 240–251

**How do we communicate the benefits of restoration? What language and mechanisms can we use to engage and EXCITE the public, policy makers & ind.?**

I think this could be a work shop in itself!

It's all about how we package the message "Framing" in the social science jargon. Know your audience and anticipate their reactions. We must disentangle facts from people's identities and/or social groups. So rather than talk about science (or economics) talk about things that are important to them – fishing, flooding, farming, their family's future, health & wellbeing, their bank account or jobs.

We tend to filter information in a way that affirms our already-held beliefs so we need to provide 'inspiration' with any 'information' using appropriate metaphors, images, and stories, reflecting on where we were in the past and where we could be in the future, emphasising *risks* rather than *uncertainties*.

We need concrete examples rather than abstractions – a whale is worth \$2m or, a hectare of saltmarsh can fix the yearly output from your household (substitute local flooding, heatwaves etc as appropriate).

Social and psychological sciences tell us that to get action you must have trusted knowledgeable "Messengers" who are consistent with the message and the group they are trying to influence. Scientists working in relevant fields are generally deemed credible and trusted as information sources but, they are not the most

trusted or most appropriate source with every audience and message. For instance, if climate change is framed as a moral issue, religious or community leaders may have greater persuasion; or if taking action on climate change is seen as an economic issue, it may be most credibly conveyed by a business person; or if climate change is framed as a national security issue, spokesmen from the intelligence or military services may be appropriate. Social media and celebratory commentators tend to impact younger audiences.

This will be very old news to professional communicators but we need a better understanding the audience and this will help identify the most appropriate framings, messengers, and messages that will most powerfully resonate with different people and inspire action.

**Much of the inter and subtidal has focussed on physical parameters like elevation. However, the sea grass talk listed water quality. Which is the primary issue**

There is probably not a primary issue that we can generalise to seagrasses and in most cases it is a complex interaction of pressures.

Recent reports on the status of seagrass habitats in the UK suggest that whilst activities which decrease water clarity or quality for example:

- aquaculture,
- coastal development,
- dredging and
- spoil disposal
- eutrophication,

negatively impact the health or productivity of seagrass; improvements in water quality through improved sewerage treatment and national regulations from Urban Waste Water Treatment Directive and Water Framework Directive have started to reduce or remove these pressures. However, continued direct physical pressures e.g.:

- boat anchoring,
- propeller scarring,
- dredging and destructive fishing methods such as beam trawling

on seagrass beds are increasingly resulting in losses and fragmentation of many beds. These are very visible pressures.

Seagrass growth, distribution and function are regulated by a number of physical (light, hydrology, geology and temperature), chemical (salinity, oxygen/anoxia, nutrients – not enough or too much) and biological (competition, disease, impact of epiphytes and grazer balance) factors. Climate change and ocean acidification have the potential to influence each of these factors (eg increased temperature exacerbates the impact of short term anoxia on seagrass; increased storminess may disrupt and uproot seagrass beds as with the massive loss from the Torbay beds).

Different pressures change different aspects of the seagrass plant, patch and landscape configuration, with knock on effects on the provision of different ecosystem services.

**Is it possible to restore seagrass beds with the current N loadings recorded around our coast and estuaries leading to opp Mac smothering?**

Yes.

We have many intertidal seagrass beds where we do not see opportunistic macroalgal smothering – the requirements for opp mac and seagrass are not identical. Quite often in subtidal beds the epithetic algae are limited by grazing or light. Moreover there is some mesocosm work that suggests seagrasses can adapt to high nutrient ratios better than intertidal opp mac can adapt to the lower light levels.

That is not to say that there are no areas where opp mac and seagrass overlap and some smothering is seen, but at the moment they are a limited number of sites. In some sites the seagrass seems to happily grow through the algae, but in others the seagrass is smothered and damaged.

We still need to be vigilant with respect to opportunists that may damage restoration sites.