Sussex Kelp Restoration Project

SEDIMENT SOURCES AND IMPACTS WORKSHOP SUMMARY REPORT

September 2021

Supported by players of PEOPLE'S POSTCODE LOTTERY

Awarded funds from POSTCODE PLANET TRUST

CONTENTS

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CONTEXT

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- The Sussex Sediment Sources and Impacts workshop, funded by the People's Postcode Lottery, brought together 40 stakeholders from over 25 organisations.
- 9 speakers - representatives from government agencies, their advisors, NGOs, universities, community groups and local authorities - shared insights, research and project overviews/learnings.
- 2 breakout sessions divided the audience into smaller groups for discussion and to answer the following questions:
    - In relation to sediment mitigation efforts, what data is available, what data is missing and what opportunities for collaboration exist between people and projects to produce or use data in the most effective way?
- Given the diversity of stakeholders, the complexity of the sediment issue and the need for robust evidence to underpin mitigation efforts, the workshop's focus was to review 'the data' and identify opportunities for future collaboration as a first step towards future action.
- The agenda and pre-workshop background including a table of sediment impacts, areas of research and map of sources is included in the Appendix.
- A recording of the workshop including the 9 presentations and feedback sessions (but excluding breakout rooms) can be found below.

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AIMS OF THE WORKSHOP

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To bring a diverse stakeholder group together to share concerns, knowledge and research

To acknowledge that sedimentation is a complex issue and enable a collective understanding of it

To identify the gaps in existing knowledge and research

To highlight where missing information might be found or how it might be created

To create new connections & collaborations between organisations, resources and projects

To direct next efforts where they might have the most value and impact

EXECUTIVE SUMMARY

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Key outcomes:

- Over 30 additional sources of information (not including unknown 'grey literature') relating to sediment sources and impacts were cited. These included:
  - a recently completed **MA on historical kelp** using satellite data from NASA
  - the Environment Agency's upcoming **Beneficial Use of Dredge Spoil (BUDS) paper** and **water quality database**
  - **marine monitoring datasets**, some going back to 1892, accessible from Cefas' data and publications portals
  - a **study on microplastics in Chichester Harbour** sediment from the University of Brighton
- 10+ examples of missing but necessary information were also cited. These included:
  - a broader **study to connect marine, terrestrial and riverine habitats** and
  - the need for **analysis of dredge spoil composition** including toxicology.
- A list of existing data and further data needed are catalogued in pages 18-21 of this report, with links to source material where possible, for ease of review.

EXECUTIVE SUMMARY CONT.

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Key outcomes:

- 10 opportunities for collaboration and communication were identified. Among these were:
  - a **scientific partnership** with sedimentation as one of many topics to be discussed on a quarterly basis,
  - **connecting coastal community groups** to achieve a single, louder voice that can be used to 'apply pressure' effectively
  - **working with the Crown Estate** to put a 'value' on kelp recovery and keep a 'listening ear' on dredge licensing
  - a collaboration between **The Wildlife Trusts' Shoresearch survey and Brighton Marina Group** to scientifically measure decline in rockpool condition
  - better co-ordination and **connection between land, sea and river management** (from source to sea) to determine where sediment is coming from and its apportionment
  - increased public awareness of **how to report dredging queries or concerns to the MMO.**

- The session also highlighted the need for a joined-up approach, with a strong focus on communications to keep momentum and co-ordinate efforts among stakeholders, as well as outwards, to galvanise the public.

EXECUTIVE SUMMARY CONT.

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Next steps

The workshop was planned as a stand-alone activity to assess the level of interest in the issues and identify potential areas for further research and collaboration. A number of opportunities and next steps were identified through the break out groups and post-workshop survey and these are listed on page 12 and 13 of this deck, with the key suggestions listed below.

Coordination of efforts to research and/or mitigate sediment inputs is not within the current resources of the Sussex Kelp Restoration Project. However, the Sussex Kelp Restoration Project Steering Group will review the following recommendations and identify any elements that the Project can progress with additional funding and capacity. The recommendations therefore do not currently have an owner and are addressed to the group at large.

Recommendations

- Create an **online repository** where relevant papers, presentations and data can be shared
- Appoint a **sediment lead** to maintain momentum and co-ordinate communications
- Develop a **shared plan** that details what everyone is working on and to what aim
- Create a **data map** that collates and overlays all relevant information
- **Prioritise further data and research** based on potential usefulness (to inform sediment mitigation efforts) versus the effort required to undertake them (cost/time)
- **Explore collaborations** and other opportunities as outlined on page 6
- Organise a **longer workshop** as a full-day, in-person event

ATTENDEES & STAKEHOLDERS

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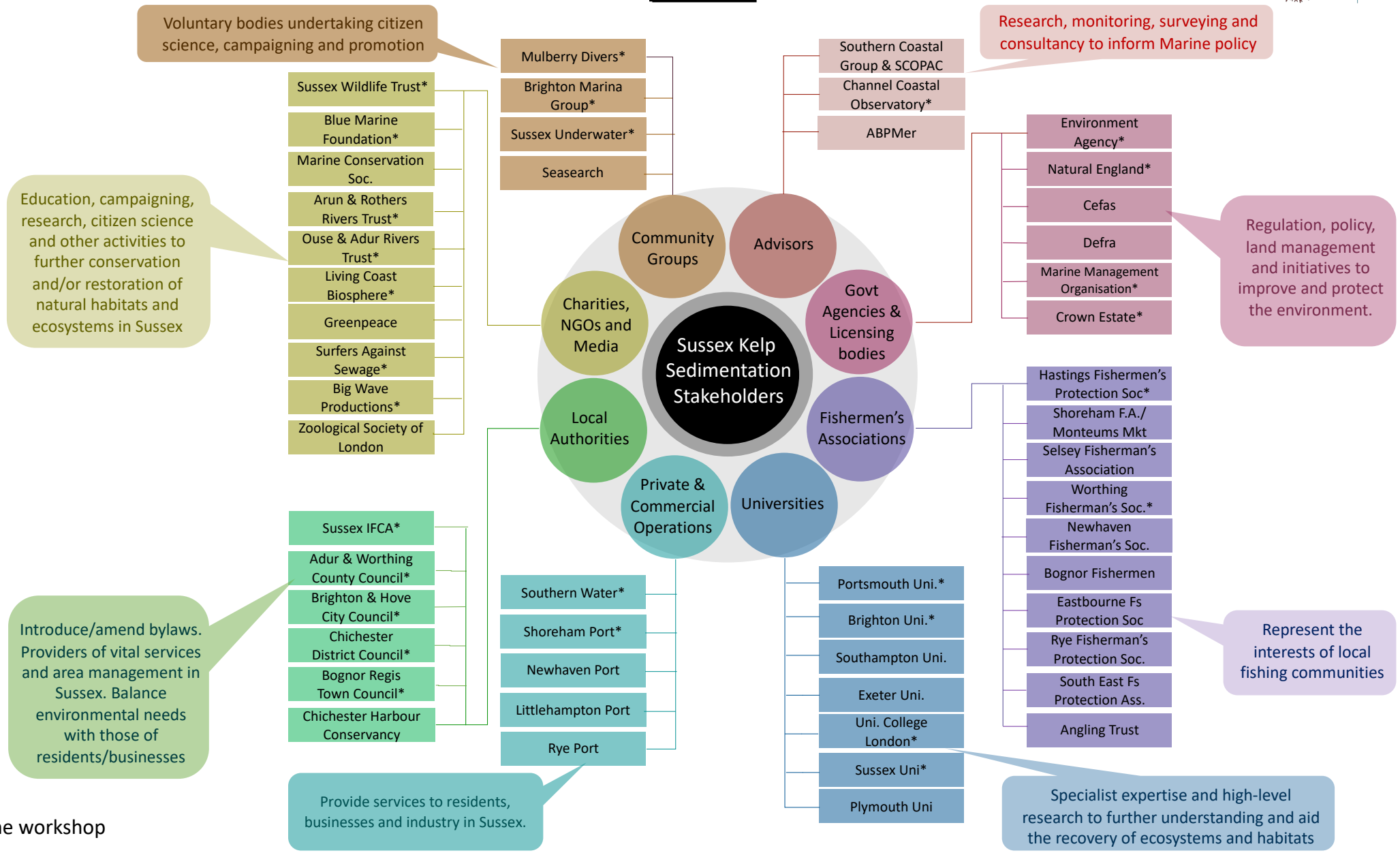

* = Attending the workshop

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SUMMARY FINDINGS

CHALLENGES & CONCERNS

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Harmful Dredging	The need to join things up	Missing information
• Dredging: what's being dumped, where, by whom? • The need for dredge licensing transparency and a review of current/future licenses given the ocean and climate emergencies. • Concerns about Marine Planning – that decisions are based on cost rather than environmental impact and that the process 'bakes in' already licenced activities, whether sustainable or not. • Concerns that a precautionary approach isn't being taken. Reports about illegal or harmful dredging and the detrimental impact on nature and catch haven't impacted licensing. • How to report concerns about dredging (e.g. if its happening in a protected area), and how concerns raised will be collated and tracked. • More research into beneficial use of dredge sediment (BUDS) is needed and to know if they are/when they will be considered in dredge planning.	• Not a joined-up approach currently; lots of disparate projects. • The challenge of linking up organisations, driving collaboration and making data available; strong communications are necessary to bridge the gap • There is a need to know what everyone is working on and having a shared plan. • Co-ordination of diaries and schedules is also key (as everyone is already busy) • Not just stakeholders but vital to communicate and share data with the public as well. The Importance of 'linking out' as well as in. • How data is shared also needs to be considered. Helping citizens understand the science and the data that is being shared.	• Analysis of dredged sediment & its movement. • Clear definitions of sediment based on composition e.g. organic, inorganic, toxic. • Analysis of the seabed and surfaces. • Are hydrocarbons & toxins leaking from historic shoreline industry (e.g. Black Rock Gas Works, landfills) as they are in Shoreham? • Getting access to Grey literature held within statutory organisations. • The impact of sedimentation on kelp is a big research gap, but not 'sexy' enough for funding. • Analysis of crustaceans to understand causes of death; whether there's enough to study. • The need for scientific data to back up anecdotal evidence before action can be taken e.g. rock pool decline. • A broader 360 approach that connects land, sea, rivers etc, (from source to sea) to determine where sediment is coming from and its apportionment. • Missing data from other animal/plant species impacted by sedimentation.

OPPORTUNITIES

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Improving Dredging

- MMO were present at the workshop to hear concerns first hand. They also provided information about licensing and contact details to report dredging issues and queries.
- Natural England are reviewing the Brighton Marina dredging contract next year.
- The right data can have an impact on licenses.
- Talks underway about undertaking dredge spoil analysis (Libby Darling of Brighton Marine Group & Ray Ward of Brighton Uni.)
- Beneficial Use of Dredged Sediment (BUDS) – EA's new paper is due in October. Other research exists, including RSPB recent study. On its website, the MMO endorses and enables alternative approaches to dredging.
- Is there potential to take advantage of an aggregate shortage in the building industry as an alternative to dumping aggregates in the sea?

Outreach

- In schools (CHASM/Mulberry Divers doing this).
- Stories like Brighton Marina are powerful and if shared, can help to spur action.

Collaborations

- With the Crown Estate. if we can provide evidence that kelp recovery is being impacted, they can act as a 'listening ear' re licenses.
- With water companies who lose water through abstraction and hold data on water toxicology.
- Linking citizen science groups with projects & statutory orgs. Ensuring they are given a framework so data provided is robust & useful.
- With ferry companies/fishing boats/fishing associations: they have data/can do monitoring.
- Creating a scientific partnership that meets quarterly to discuss learnings incl. sediment.
- Connecting coastal communities together to have a single, louder voice. Collectively they can apply public pressure effectively.
- New financial collaborations to identify and secure funding opportunities.
- Between BMG and WT's Shoresearch survey to gather evidence of rock pool decline.
- With local authorities along the coast.
- With the public, via outreach programmes and roadshows to galvanise support, via access to info & a way for the public to feed info back.

Existing Research

- Enormous amount of data exists and is accessible, from the EA, Cefas, MMO etc. that can provide learnings. (30 + examples provided in this deck).
- Learnings from other protected areas can be applied: e.g. microplastics in Chichester harbour.

New connections

- Potential link with regenerative agriculture and soil health. The latter has greater funding opportunities.
- The role of seagrass and salt marshes in correcting issues.
- Identification of other drivers (and species impacted) to reduce harmful run-off
- Compare other designated areas with protected status. If they have been impacted by sediment it can help the byelaw area too.
- If we can identify sources of sediment, we can focus efforts and tackle via Natural Flood Management and other initiatives.

IDENTIFIED NEXT STEPS

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Actions to encourage collaboration	Strategic actions
• An online repository where data can be stored • Appointing a sedimentation lead • Creation of clear overarching goals • People across Academia, NGO and gov agencies working together to look at issues from a transdisciplinary perspective. • Creating a data map that collates and overlays all relevant information • Developing a shared plan that details what everyone is working on and to what aim. • Scheduled meetings • 360 communications to connect our organisations together, ensuring everyone is up to speed • Redo the workshop as a full-day, in-person event. This will allow time for questions after the presentations and to have meaningful discussion in the breakout groups	• The task is big and multi agency. One project can't cover all aspects of ecology, toxicology sediment movement and land-sea interface without investment. It may be that several PhDs covering different areas but united under one project might achieve this with supervision at statutory agency and academia level. • A focus upon priority areas of sediment impact that can be addressed rapidly. Namely a comprehensive evidence based assessment of the dredge material disposal arising from Brighton Marina and its impact upon the marine ecosystems within Beachy Head West MCZ and the surrounding nearshore area. In the intervening period, a cessation of the current inshore disposal of dredge material licensed at the site. • Monitoring/research to determine sources of sediment and pollution. • Source apportionment studies of where the sediment is coming from so that projects to mitigate this can be discussed. • More data collection on carbon drawdown and possible benefits of kelp in stopping coastal erosion, more “bottom up” contact with the dredging crews and companies to see if they have any suggestions to improve sediment dumping. • Compilations of regional sediment sources and dredging disposal sites found in the nearshore and terrestrial zones. Same for analysis of sediment content/contamination. • Combine lobbying of licences to move dredge disposal from sensitive sites

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POST WORKSHOP SURVEY RESULTS

POST WORKSHOP RESULTS

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13 respondents completed the survey.

The below is an anonymous overview of their responses.

- Feedback was positive, with all of respondents registering strongly agree or agree on questions relating to the purpose of the session, usefulness of pre-workshop information, that their views were heard, that they learnt something new.
- All but one found they were able to share their views and all but two felt they were able to make useful connections.
- Where negative results were recorded, length of time in the breakout rooms was a key issue, while another criticism was that the workshop didn't identify tangible outcomes.

The topic of most interest to respondents was: Research/data on impacts of sediment on marine life, fisheries and people

All respondents wanted to stay informed with SKRP progress, were open to be part of workings groups and attend other SKRP events.

POST WORKSHOP RESULTS

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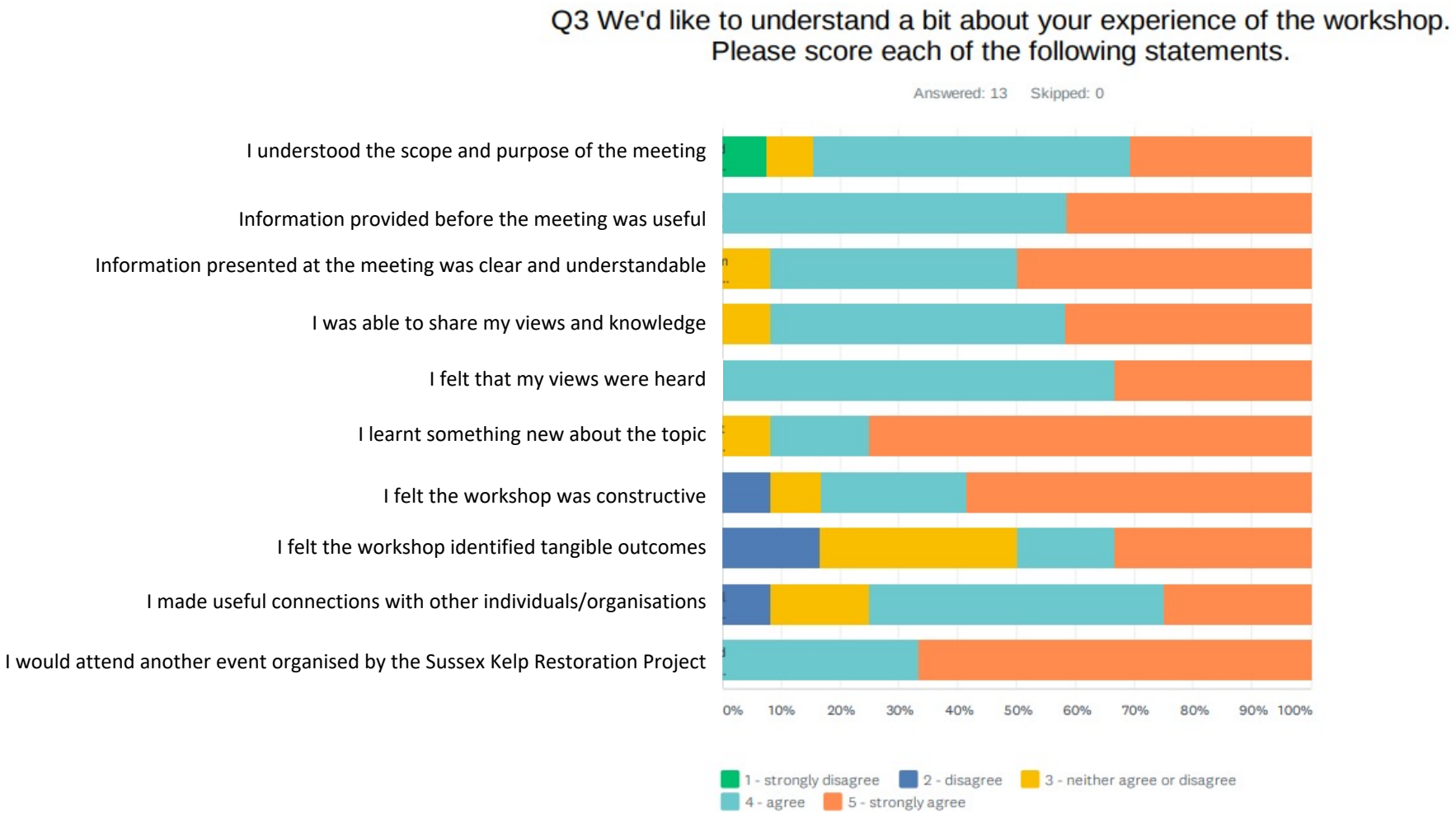

POST WORKSHOP RESULTS

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A sample of verbatim comments received:

“One of the most useful workshops I have attended recently in terms of the relevance of presentations and the commitment demonstrated by those attending”

"The breakout room timings were very tight for the number of participants. We would have benefitted from longer discussions. the representation was excellent however commercial and leisure fishing seemed not to be represented.”

“I feel Sussex Bay is a great project, we need more data on kelp value to coast erosion and wave power reduction as was mentioned by the EA . I feel we are only scratching the surface at moment on the benefits of kelp on carbon draw down etc.”

”I think we probably could have had more structured aims to the break out groups as to the way forward”

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DATA SOURCES

EXISTING DATA I

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Marine

- Anecdotal evidence from Worthing Fisherman that kelp and fish are coming back within the Trawler exclusion zone.
- Anecdotal evidence from divers, free divers and snorkellers about how kelp and the seabed have changed over the years.
- Lobster potting study at Lyme Bay. This project (funded by Blue Marine Foundation) manipulated potting densities to assess changes in benthic and mobile assemblages in response to increasing potting pressures.
- Reports on the submarine wreck in Chichester Harbour going back 15 years or so – these show changes to animals found there from sediment
- Study on historical kelp using satellite imagery from Landsat Science (NASA) – subject of a recently completed masters by Jennifer Mc Shane.
- Microplastics in Chichester Harbour – several paper look at evidence of materials used in boat manufacturing appearing in sediment and the impact on local oysters. Study by Brighton University and Dr Corina Ciocan, Marine toxicologist.
- Environment Agency have several data sets of relevance and are involved in a number of relevant projects:
  - Kelp monitoring tool for natural capital
  - National LIDAR Programme and bathymetry maps
  - Benthic invertebrate surveys also include seabed particle size
  - Shellfish and fish data sets
  - Seagrass and saltmarsh extent data sets available
  - European Natural Oyster Habitat Restoration handbook
- CEFAS data portal – searchable database of 2089 metadata records, with 5675 data sets available to download. These include the salinity of the ocean (recorded at Eastbourne) from 1892 to present day and strategic wave monitoring
- CEFAS publications portal –searchable database of scientific papers, including a study on crabs and pathogens
- An interactive map of the Sussex marine environment by Sussex IFCA, showing biodiversity, geodiversity and archaeological features off the coast. Data feeding into this map looked at the dynamic natural movement of sediment over veneer, and variations within seasons

EXISTING DATA II

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Marine continued

- Historic satellite images might show how sediment plumes have changed over time.
- Adur & Worthing Council Report featuring historical kelp data

Dredging

- Information from the MMO relating to dredging:
  - Marine Licensing Definitions – including Mean High Water Springs and Normal Tidal limit
  - Dredging activites - including types of dredging and guidelines such as Maintenance dredge protocol and Regional environmental assessments
  - Review of Marine Licenses (2016) - a study to identify where it may be appropriate to amend the MMO's approach to the imposition of Marine Licence conditions. Details how licenses are granted, that the process is iterative and can be reviewed.
  - Accelerated licensing criteria – incl. need to meet environmental concerns and provide physical &chemical characteristics of dredged material
  - Contact information for all licensing queries: **marine.consents@marinemanagement.org.uk**
- Cefas - lots of relevant data as they test sediments for MMO dredge spoil dumping licences and approve/set conditions for these activities.
- Beneficial uses of dredge sediment (BUDS) – reports from:
  - Cefas - various papers including this one Beneficial Uses of Dredged Material: Yesterday, Today and Tomorrow (2003)
  - RSPB - Precipitating a SEA Change in the Beneficial Use of Dredged Sediment (2019)
  - Science Direct - Development of macrofaunal communities on dredged material used for mudflat enhancement: a comparison of three beneficial use schemes after one year (2004)
  - MMO - Alternative use of dredge material in the north east, north west, south east and south west marine plan areas (2019) and Use of beneficial dredged materials in the South Inshore and South Offshore Marine Plan Areas (2014)

EXISTING DATA III

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Dredging continued

- MMO take a marine spatial planning approach; this considers the compatibility of different activities in the marine space.
- Maintenance of navigational dredging and seasonality - The depth required to allow ships to pass needs to be consistent all year round, so there is a requirement to be able to dredge at any time of year, especially after storms or floods. Mark Hayes, Shoreham Port Authority.

Urban and Land

- Grey literature – held by large organisations such as MMO, Local Authorities, Crown Estate etc.
- Data in the public domain on sediment and toxins in the water – Southern Water can help direct to these.
- Environment Agency reports:
  - Water quality database -This database has coastal, river and sewage discharge water quality. It is freely downloadable.
  - Restoring Estural and Coastal Habitats - Project between Natural England and Environment Agency on restoring estuarine and coastal habitat plan working with partners to show where different habitats can be improved and made more resilient focusing on seagrass, saltmarsh, oysters and kelp.
  - Flood and coastal risk management work to explore passive and active kelp restoration to support sustainable protection of the shoreline.
- Brighton University's MAPOMiC study (looking into the occurrence of accelerated low water corrosion (ALWC) infestations), showed that sedimentation can be impacted by legacy land-based buildings such as the old coal power station in Shoreham.

FUTURE DATA SOURCES

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- The Solent Forum – Beneficial use of dredging in the Solent project (BUDS) (phase 3, Licencing and Operating System of Beneficial Use Dredgings due March 2022.
- Environment Agency - Beneficial Use of Dredge Sediment – report coming out in October.
- Mulberry Divers aim to collate historic diver experiences and create a photographic library of old and current kelp dive sites (Anya Frampton has more details).
- Natural England is doing a condition assessment at Pagham Harbour next year. This will look at nutrient impacts from waste-water treatment works.
- CHASM research in the pipeline:
  - Research on the sediment impact on Lobster. This output has been delayed due to Covid restrictions limiting time in labs.
  - Monitoring of sediment coming in and out of Medmerry, Pagham and Chichester. This report, in collaboration with the University of Brighton, focuses on sediment from water treatment plants, agriculture and dredging. Students are looking at pollutants within sediments and lobsters. CHASM report due to be published soon and further data analyses underway.
- Acoustic telemetry (using sound to collect information about fish movements) is being used in a pilot study with Chichester Harbour – Professor Alex Ford.
- Funding for a new PhD is close to being signed off. It will look at contamination and the implications for the health of the coastal habitat – especially salt marshes and the extent and impact of fibre glass. Dr Corina Ciocan, Brighton University.

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APPENDIX

AGENDA

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TIME	ITEM	DURATION
3pm	Introduction	10 minutes
3.10pm	Presentations: • Sources and impacts – Sam Fanshawe, BLUE • Environmental Toxicology studies in the Solent – Professor Alex Ford, University of Portsmouth • Sedimentation Impacts on Essential Fish Habitat – Dr Mark Tupper, University of Portsmouth • Sediment and dredging: Beachy Head West at Ovingdean Gap - Libby Darling, Brighton Marina Group • Issues at Beachy Head West MCZ – Sarah Dobson, Living Coast Biosphere • Response to Brighton Marina sediment dredging and disposal – Andrew Coleman, Surfers against Sewage • What does kelp do to Flood and Coastal Erosion Risk Management - Peter Currell/Uwe Dornbusch, Env. Agency • CHASM Overview – Jane Cunningham, Chichester District Council • CHASM Report Year 1 - Dr Charlie Thompson, Channel Coastal Observatory (pre-recorded)	40 minutes
3.50pm	Breakout question 1 • Thinking about your areas of interest, has any data not been mentioned that will help to inform sedimentation mitigation efforts?	25 minutes
4.15pm	Comfort break	5 minutes
4.20pm	Feedback session (2 minutes x 5 groups)	10 minutes
4.30pm	Breakout question 2 • How might we work together to use or produce data that informs future sedimentation mitigation efforts?	15 minutes
4.45pm	Feedback session (2 minutes x 5 groups)	10 minutes
4.55pm	Next steps and close	5 minutes

SEDIMENTATION CRIB SHEET

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Sources

Natural
- Tides (onshore/offshore transport)
- Storms
- Rainfall leading to erosion/land run-off
- Changing weather patterns/ Climate Change
- Floods
- Rivers (steam bank)
- Estuaries
- Erosion of soils & cliffs
- Scour
- Restricted circulation of water in some areas (e.g. in Bays)
- Decomposing organic matter
- Inorganic biogenic material

Man-made
- Dredging & disposal of dredged material
- Maintenance dredging (frequent/smaller)
- Capital dredging (rarer/larger disposals)
- Beach nourishment/Sandscaping
- Aggregate dredging
- Trawling
- Farming/industrial/domestic discharges
- Run-off from urban and/or coastal development and construction e.g. roads, bridges, tunnels, harbours, residential buildings
- Windfarm construction
- Loss of habitats acting as sediment sinks/filters e.g. Saltmarsh, oyster beds

Impacts

To Water/Topography
- Increased turbidity (cloudiness)
- Reduced water depth
- New marine features e.g. sandbars
- Resuspension of seabed sediments
- Increased nutrient /contaminant loads
- Eutrophication (colonisation of algae)
- Slime on seabed
- Seascapes becoming flatter

To Kelp
- Reduces light required for photosynthesis (affects distribution, depth & abundance)
- Interferes with reproductive processes (e.g. with gametophyte development)
- Smothers and clogs kelp germlings
- Overgrazing of larger kelps as smaller species are scoured/smothered
- Increased susceptibility to disease

To Marine Animals
- Smothers nurseries/shelters (e.g. fills up holes where lobsters hide)
- Increases competition for shelters & vulnerable time spent to find shelter
- Potential 'choking'
- Prevents larval attachment/smothers larvae
- Reduces resilience (e.g. clogs gills, disease)
- Reduced/delayed growth rates
- Increase in silt-tolerant organisms

To Humans
- Decline in catch of commercial species
- Reduced natural/biodiversity/recreational value for residents/visitors/recreational pursuits

Areas of research

In Water
- SPM* levels/sediment size/particle composition
- Evidence of contaminants & pathogens
- Spatially/SPM level direction
- Dispersion into water (speed/distance & direction and max distance it can travel)
- Influence of tide/currents/water flows
- Turbidity
- Water quality (e.g. increased chlorophyl, declined O^2)
- Water depth
- Wave height
- Levels of SMP Pre/post the 2021 Bylaw

Kelp
- Susceptibility to impact of sedimentation based on duration/frequency/severity/ composition

Animal
- Susceptibility to impact of sedimentation based on duration/frequency/severity/ composition

Weather
- Weather patterns/seasonal changes
- Impact of elevated rainfall levels
- Historic episodes and trends (e.g. storms)

*SPM = Suspended particulate matter

Landscape
- Shoreline data/measurements
- Sediment pathways to and from rivers
- Erosion sites and rates
- Land composition and uses

Anecdotal evidence from users
- Interviews with fishermen
- Interviews with divers

Man-made
- Movement of trawler-generated SPM outside bylaw
- Trends in dredging/type/composition and type of dredged material
- Distance of dredging sites from kelp beds
- Aggregate extraction/disposal sites
- Impacts of coastal developments
- Windfarm construction
- Analysis of domestic/farming/industrial impacts

Other
- Matching particles with sources
- Proportion of fine sediment reaching coast
- Duration/frequency/severity of impacts
- Impact of multiple stressors at the same time e.g. aggregate dredging + storm
- Interactions between stressors (causing additive or synergistic effects)
- Impact of increased biofiltration in inshore waters e.g. native oysters
- Impact of natural remediation (return of salt marshes)

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Sediment Impacts: Dredging sites, rivers and population density