Climate Resilience and Adaptation – ICZM 2021 and beyond

Long term Integrated Coastal Zone Management (ICZM) for the Manhood Peninsula

Executive Summary

Climate Resilience and Adaptation – ICZM 2021 has been written to provide parishes, communities and environmental groups on the Manhood Peninsula with information and practical ideas about climate change issues affecting the peninsula. The document aims to:

- Highlight the issues that communities face in order to adapt and become more resilient to climate change
- Promote building on sites at lowest risk from flooding now, and those that will remain at low risk in future, or in a water compatible way.
- Promote development which is resilient to sea level rise and coastal change
- Ensure consideration is made for the appropriate life time of a development, taking into account coastal erosion, flooding, and whether/when homeowners may be willing to abandon property – 100 years or 300?
- Demonstrate the need to update existing long term Integrated Coastal Zone Management (ICZM) plans and policies for the coastal plain, including *Towards ICZM on the Manhood Peninsula* produced during the Coastal Change Pathfinder Project in 2011.
- Promote development that strengthens the area's economic, environmental and social resilience to climate change
- Promote development that strengthens the area's sense of place derived from tourism and food production, the major economic sectors on the peninsula.
- Ensure natural capital and nature based solutions are considered in relation to climate change resilience, mitigation and adaptation.

> *"Climate change will exacerbate the already significant exposure of the English coast to flooding and erosion. The current approach to coastal management in England is unsustainable in the face of climate change"*
> Committee on Climate Change, 2018.
> (.https://www.theccc.org.uk/publication/managing-the-coast-in-a-changing-climate/)

Introduction

The Manhood Peninsula is a prime example of a coastal area facing dynamic coastal and climate change together with an intractable transport problem due to its geography as a small, low-lying triangle of land on the south coast of England bordered by the open coast, two harbours of environmental significance locally, nationally and internationally, and the largest open coast managed realignment site in the UK. Long hours of sunshine, a mild climate, open landscape and big skies mean it has long been recognised as a desirable area to live, holiday, foster businesses and grow food. It has a thriving economy based on fishing, farming and tourism. The peninsula's tranquil and rural hinterland and its unique environmental qualities are identified as its greatest economic strength and asset in the wider context of the remaining built up south coast.

The Manhood is also a fragile environment. It has suffered from significant and increasingly frequent flood events, resulting in several events since 2012 where people have had to vacate their properties, and faces worsening flood risk in the near future. There is need for an updated and rigorous Integrated Coastal Zone Management plan addressing climate change, sea level rise, changes in rainfall patterns and temperature and its impact on the environment, settlements and business to ensure it has a sustainable future. Like the Manhood's original 2011 ICZM policy, an updated plan needs to include consultation with local parishes, and be capable of informing both parish Neighbourhood Plans and Chichester District Council's (CDC's) Local Plan Review.

The future of the Manhood Peninsula is affected by two things: the changing physical environment and human constraints. The environmental changes consist of rising sea-levels that also impacts the inland water table, changes in storm frequency and rainfall intensity.

Human constraints include:

- Mind Set - the still prevalent mind-set that we can beat the sea indefinitely, and local authorities can replace and enhance all defences in response to climate change.
- Financial – the UK does not have sufficient funds to defend the entire coastline, and insurance for homes likely to flood is declining.
- Perception – people like living by the coast and builders like building on flat land where people want to live. Continuing to build as normal in vulnerable coastal areas may lead to a perception that there is no risk. The Environment Agency and Local Authorities do not have duty to prevent coastal flooding and erosion, this is a permissive power.
- Social and environmental considerations - the loss of intertidal and coastal habitats with sea level rise. Future generations losing the opportunity to enjoy/engage/benefit from the coast
- Access – easily accessible coastal areas enable people to experience and benefit from 'blue health'. People need more opportunities to be assertive and educated on coastal processes, increasing the likelihood of public support for its protection. This approach results in bottom-up community led support for the marine environment and Marine Protected Areas (MPAs) using voluntary measures, and leaves people feeling more passionate about their coastline than ever.

The ease of access approach concurs with the Marine Plan South Objective 6 – 'To maintain and enhance inclusive public access to, and within, the south marine plan areas appropriate to its setting' (Marine Management Organisation 2018, South Inshore and South Offshore Marine Plan).

Existing coastal flood defences will not be sustainable indefinitely to sea level rise and there is insufficient flexibility in current planning policies to help the local community determine a socially, economically and environmentally favourable way forward to enable the peninsula to thrive for as long as possible as it transitions and adjusts to climate related changes. Constraints also include marine governance. The policy making area of the coastal zone is hugely complex due to the number of terrestrial and marine agencies and organisations involved. In turn this impacts on decision makers such as a planning authority. The complexity reflects why things sometimes don't run smoothly!

Changing Environment

As a forward thinking population we need to be aware of the key drivers for our changing environment, whether natural or man-made. These are:

- Climate change
- Existing hard defences restricting coastal roll back
- Excess nitrates and other nutrients

The consequences of the drivers are:

- Sea level rise
- Increased storm frequency and intensity
- A rising water table
- Increased ground water and surface water flood risk
- Coastal squeeze causing loss of coastal wetlands, shingle beach and contemporary sediment.
- The loss of coastal habitat for wildlife including wetland birds and migrating bird species.
- Problems caused by invasive species, and increasing numbers of non-native species
- Impacts on the intertidal zone and estuary environments from eutrophication

Without improved defences, sea-level rise and increased storm frequency will mean coastal flooding is set to occur more frequently and with greater severity. This will impact the social, economic and environmental aspects of our coast.

Without significant investment the result is likely to be increases in the rate of coastal erosion and the potential for flooding in low lying communities on the Manhood Peninsula due to houses and sea defences built too close to the sea. The Chichester coastal plain needs to be prepared for this future and take action now.

Climate Change

The vulnerability of the peninsula to climate change was recognised more than two decades ago when the area was the subject of an Anglo-Dutch workshop comprising experts in coastal and water management and planning.[1] The workshop, which involved significant community input, led to the formation of the Manhood Peninsula Partnership (MPP).[2] As a result of Going Dutch and the MPP, the community has begun to confront the challenges it faces in a proactive manner. Most notably, the Dutch recommended a realignment of the coast to create a softer sea defence and additional wetland habitat, which would enhance the area's important green tourism sector while still providing flood defence to vulnerable properties.

Following extensive consultation on the 2008 Pagham to East Head Coastal Defence Strategy, and Shoreline Management Plans (SMPs) for both North Solent and Beachy Head to Selsey Bill, managed realignment became the adopted solution for Medmerry. The subsequent Medmerry Managed Realignment Scheme, now RSPB Medmerry, successfully

[1] Going Dutch
[2] The MPP comprises ……

fulfilled all three of these important social, economic and environmental ambitions and has been largely embraced by the community.[3]

The North Solent SMP policy recommends a Hold the Line approach, but this does not mean that public funding is secured or guaranteed. The Beachy Head to Selsey Bill SMP also recommends a Hold the Line approach, but also states it is not unreasonable to assume that future policy-makers will be more inclined to resist investing considerable sums in protecting property in high risk areas, such as the coast, if there are substantially cheaper options, such as constructing new properties further inland.

The MPP has also worked closely with the FLOW Project and the community to improve drainage in the area by enhancing the peninsula's existing rifes and ponds and increasing its wildlife supporting water storage capacity.

But a long term strategy is needed to ensure the peninsula and its communities can continue to thrive for future generations by adapting to changing conditions instead of trying to maintain a *status quo.* This document aims to provide the basis for an updated ICZM approach to ensure the area is as resilient and adaptable as possible to predicted sea level rise and other climate change impacts.

In my lifetime I have played cricket, grown onions and caught prawns, on the same spot.'
(George Woodland – retired Second Coxswain, Selsey RNLI, 2011)

Local Plan

Included in the current Chichester Local Plan Key Policies (2014-2029) is an integrated Coastal Zone Management policy for the Manhood Peninsula (Policy 22, page 127).
It reflects the views expressed 10 years ago well, but it is not thought sufficiently robust in the face of accelerating climate change and its consequences. The policy was derived following public consultation and comments on *Towards ICZM on the Manhood Peninsula*, an integrated coastal zone management document produced as part of the Coastal Change Pathfinder project in 2011.

Also included in Chichester Local Plan Key Policies (2014-2029) are policies for strategic development in Selsey and East Wittering & Bracklesham. Similarly these could be more robust on the matters of climate change and carbon neutrality. According to Natural England, there is potential for Coastal Change Management Areas (CCMAs) to be proposed with the right evidence.

The forthcoming Local Plan Review acknowledges climate change in the Strategic Flood Risk Assessment documents, and draft policy S18 sets out an approach to Integrated Coastal Zone Management for the Manhood Peninsula. Towards ICZM has been included in the documents associated with the Local Plan Review 2035.

[3] Medmerry also won …name awards.

South Marine Plan

The South Marine Plan policies are also significant with respect to projects and activities impacting the marine environment. Objective 7 asks for the following to be considered when discussing Climate change, Infrastructure and Biodiversity. The objective should be:

To support the reduction of the environmental, social and economic impacts of climate change, through encouraging the implementation of mitigation and adaptation measures that:

- avoid proposals' indirect contributions to greenhouse gas emissions
- reduce vulnerability
- improve resilience to climate and coastal change
- consider habitats that provide related ecosystem services

However it is important to ensure a whole-plan approach is taken, and that policies are not considered in isolation. A complete list of objectives and policies can be found in South Marine Plan + Technical Annex .

Incoming Legislation

Other relevant legislation includes the Environment Bill to be introduced later in 2021 and the Fisheries Act 2020. There is also a need to work with the Shoreline Management Plan refresh in the SCOPAC and Southern Coastal Group region to ensure the Plans are up to date, reliable and visible.

Planning

Recent directives from government agencies surrounding the planning process and risk management have changed markedly for areas particularly vulnerable to the impact of climate change, particularly flood risk and rising sea levels.

The 2020 Flood and Coastal Erosion Risk Management Strategy

The Environment Agency states that:

- *This Strategy's long-term vision is for: a nation ready for, and resilient to, flooding and coastal change – today, tomorrow and to the year 2100.*
- *This Strategy is seeking to better prepare us for 2°C warming in global temperatures as well as planning for higher scenarios, such as a 4°C rise in global temperatures.*
- *We need to both limit future climate change as well as adapt to the climate change that now cannot be stopped*
- *It is therefore important that risk management authorities are planning for the impacts of sea level rise to ensure today's flood and coastal erosion protection infrastructure is resilient to tomorrow's climate.*
- *As a nation we need to be 'climate ready' so that we are resilient to future climate hazards and potential economic shocks that impact our prosperity.*

- *This Strategy calls for the nation to embrace a broad range of resilience actions including better protection to flooding and coastal change.*
- *We frame resilience in terms of the capacity of people and places to plan for, better protect, respond to, and recover from flooding and coastal change. This includes making the best land use and development choices, protecting people and places,*

responding to and recovering from flooding and coastal change whilst all the time adapting to climate change. This aligns with the description of resilience in the government's Flood and Coastal Erosion Risk Management Policy Statement which describes actions to better protect the country grouping together the protect and plan, and actions to better prepare the country, grouping together the respond and recover elements (Defra, 2020e).

- *Climate change is already changing our weather and increasing our risks of flooding and coastal change. The government's 25 Year Environment Plan (Defra, 2018) states that current global commitments under the Paris agreement are insufficient to limit the average temperature rise this century to well below 2°C above pre industrial levels. We need bold and transformative action if we are to become a climate resilient nation. We need to be able to plan to adapt to a range of climate change scenarios, including higher scenarios such as a 4°C rise in global average temperatures.*
- *Cover all sources of flooding and coastal erosion: The Environment Agency's updated National Flood Risk Assessment, due in 2024, will support improvements to the evidence base for fluvial, coastal and surface water flooding*
- *Local people and local partners should be at the heart of making local choices about the best combination of resilience actions for achieving greater flood and coastal resilience in the places in which they live and work.*
- *Be adaptable to future climate risks: Planning and adapting to future climate risks is crucial to making sure places remain resilient to future flooding and coastal change over the longer term. This means looking out to 2100 and beyond to ensure we are resilient to future climate hazards.*

To be better prepared for climate change we need to take action now, so we are ready for the impacts and can make sure the places people live and work in are safe and resilient to future flooding and coastal change. The Committee for Climate Change (2019) and Organisation for Economic Co-Operation and Development (2019) have highlighted the importance of adaptation to rising sea levels and flood and coastal risks. Both indicate that the longer-term costs to society of not pursuing adaptation will be far greater than the costs of investing in resilience and adaptation today. Adapting now to a changing climate is in our economic self-interest.

— local land use and development choices by accounting for a range of climate futures and reducing economic damages from flooding and coastal change

Between now and 2050 risk management authorities will help coastal communities

Adaptation to future flooding and coastal change also needs to account for the impacts to habitats and natural landscapes. This is important because we know that the current pattern of protected habitats cannot be sustained exactly as it is, due to climate change. For example, in some places along the coast, freshwater habitats protected by coastal defences may change into salt-water habitats as the sea rises. Risk management authorities and Natural England should work together to develop innovative approaches to conservation that enable adaptation to sea level rise and a changing climate.
It is therefore essential to continue to avoid inappropriate development in areas at high risk of flooding and coastal change.

Natural England note: If given space to roll back, coastal habitats can respond to climate change. The issue is freshwater habitats constrained behind sea walls, and development. There is a need to identify a long term vision of where these fresh water habitats will be, and to restore our estuaries and wetlands.

The government's National Planning Policy Framework makes clear that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk.

On the coast, the government's National Planning Policy Framework is equally clear about reducing the risk from coastal change by avoiding inappropriate development in vulnerable areas and not exacerbating the impacts of physical changes to the coast.

Natural England note: much of the coast is already Hold the Line in this area of the south coast – see SMP11 and SMP12. This results in more defences and higher defences with the gradual loss of coastal habitats in front of these defences - see the SMP that clearly states we will lose these wetlands and beaches. Where these are internationally important there is a requirement to compensate for these losses elsewhere – so they may still be lost to the local community, other sites not designated will not be compensated and are still highly important sites to people and nature. Look at some of the East Sussex (Broomhill) / Kent coastal defences – there is no beach at high tide, this is inevitable for some of our Sussex beaches if the current line is held.

Local planning authorities are encouraged to embed local shoreline management plan policies in their spatial plans. They are also encouraged to identify coastal change management areas where rates of shoreline change are significant over the next 100 years, taking account of climate change. Coastal Change Management Areas (CCMA) should make provision for any vulnerable properties and infrastructure that may need to be relocated at a future point. This could include supporting roll back of the coastline or development facing the threat of coastal erosion. The Environment Agency will support coast protection authorities in updating and maintaining shoreline management plans and will advise planning authorities on the designation of coastal change management areas.

The government's National Planning Policy Framework recommends that local planning authorities identify places which are, or are expected to be in future, unsustainable. This could include places subject to coastal erosion or disruptive or hazardous flooding. It is therefore important that risk management authorities work closely with local planning authorities to ensure spatial plans take an adaptive approach to planning for future climate risks.

The Shoreline Management Plan refresh is currently underway. A decision needs to be made regarding whether the policies are appropriate and whether there is a need for a CCMA on the Manhood Peninsula.

"*There is no doubt that many of the climate change scenarios are extremely challenging to our flood defence role. Southern Region is dominated by its coastline. Climate change will make it extremely difficult to maintain standards of defence against both flooding and erosion.*"
(https://ukcip.ouce.ox.ac.uk/wp-content/PDFs/SE_summary.pdf)

Turning a Negative into a Positive

There are ways in which this can be achieved. We **can** secure a future for the Manhood Peninsula and the Chichester coastal plain in the face of sea level rise. The community working with Chichester District Council and the Environment Agency has already shown the

international community how it can make difficult decisions and turn a negative situation into a positive one through Medmerry– Europe's largest open coast realignment scheme.[4] Medmerry Nature Reserve is not only a more sustainable sea defence than the previous shingle bank it now attracts many migrating and breeding birds, among the rarest in the UK, as well as local and international human visitors.

The Medmerry scheme is the first site in the region to offer large-scale provision of compensatory habitat. An issue in the wider region of The Solent was the loss of environmentally important coastal habitat as a result of coastal squeeze. The impacts of development and flood defence infrastructure around the large, urbanised areas of Southampton and Portsmouth caused wetland and intertidal habitats to be lost to the sea.

The scheme was designed to provide the local community with sustainable flood and coastal protection (to a 1 in 100 year standard), as well as provide amenity value for visitors and locals.

The scheme at Medmerry is one of the largest UK managed realignment projects and the first on any notable size to be undertaken on an open coast. It is also unique because it is the first scheme in the UK to be created by excavating a breach through a mobile shingle barrier.

Taking a long term view of the coastal plain and adapting accordingly will help alleviate the consequences of sea level rise and tidal surge as well as hinterland flood risk from rising water tables and surface water flooding. Measures can transform a low lying area at risk from change into a thriving place for the natural environment, communities and businesses. However we need to carefully consider what is right for us.

What needs to be considered?

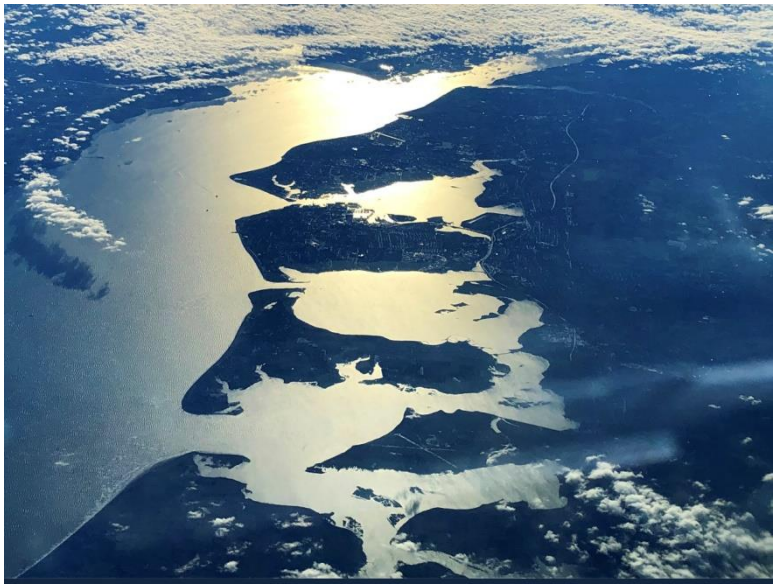
- Recognition of Natural Capital - wetlands, farmland, and biodiversity need to be fully explored when assessing the best use/allocation of land. Development on the coast needs to be assessed against the subsequent loss of vital wetland capacity, wildlife habitat and, in the short to medium term, prime farmland; the cost and social devastation of regular property flooding and the risk of locking future generations into costly and technically difficult flood and erosion defences.
- Communication of risk - the need to ensure that current and future residents understand the current and future risk for them.
- Timescales – should planning for vulnerable locations be concerned with the future of communities for one, two, three or four generations? Are we building homes for 100 years or communities for several centuries?
- The importance of the peninsula's recreational and ecotourism economy.

[4] http://epc.sagepub.com/content/33/5/1024.short
http://jwcc.iwaponline.com/content/6/1/25
https://link.springer.com/chapter/10.1007/978-94-007-0785-6_14
https://www.tandfonline.com/doi/abs/10.1080/17567505.2017.1317081
https://www.icevirtuallibrary.com/doi/abs/10.1680/cm.61149.263
https://www.icevirtuallibrary.com/doi/abs/10.1680/cm.61149.283

Portsmouth – an urban version of the Manhood Peninsula

Before considering the future of the Manhood Peninsula, it is worth examining the dilemma now facing Portsmouth, an urbanised peninsula, close to and almost identical in topography to the Manhood Peninsula.

The photograph below shows (from top to bottom) the peninsulas of Gosport, Portsmouth, Hayling Island, Thorney Island and the Manhood Peninsula.



The image clearly shows their vulnerability to future catastrophic flooding from climate change induced sea level rise due to being flat and low lying. While Portsmouth is already heavily built up, the others less so, particularly Thorney Island and the Manhood.

The Facing Up To Rising Sea Levels study by the Institute of Civil Engineers (ICE) examined the options available to Portsmouth to cope with sea level rise this century.[5]

The Options

The options considered in the report were:

Retreat

- designating parts of the lower lying edges of the city for salt marsh creation to compensate for existing salt marsh that will be lost to sea level rise
- creation of a salt-marsh sheep farm
- confining new development to the hills and higher land to the north of the city, where homes would be safer and insurable
- relocating the M27, part of the main east/west trunk road linking Southampton to Eastbourne, further north on higher ground
- finding new uses for existing buildings liable to flood, residents moving to upper floors, adaptations made to cope with more frequent and severe flooding
- revitalising the frontage to the south of the city as a public beach
- defending the naval base and ports from the rising sea for national security reasons
- Hayling Island becomes a ‘water based’ island with an appropriate economy
- Continuing sea defences are recognised as being time limited

[5] ICE document

Defend

- Building tidal gates to protect the harbour from tidal surges
- Constructing a new high and wide sea wall around the city, publicly and privately funded, and comprising high value residential and commercial units with maintenance programs put in place for a 200 year liability, ensuring long-term underwriting of properties.
- Creating public space in front of and behind the new sea wall.

Attack

- To attack is to advance and step seaward of the existing coastline. There is massive development potential to be gained by building out onto the water. This further reduces the need to sprawl into the countryside and ensures the sustained social and economic vitality for communities.

The ICE study points out the extreme and costly measures UK coastal cities must get ready to take to prepare for sea level rise expected from this century onwards. The UK is far behind countries like China, which is already spending billions on climate change mitigation in its coastal cities and relocating millions of people inland to new cities on higher ground[6]

Chichester is in a more fortunate position in that its coastal plain is much less developed than Portsmouth. But as pressure for development grows, it is imperative that the risks and opportunities of climate change are incorporated into planning policies as soon as possible. Inappropriate development on the low lying hinterland will lock future generations into costly, or possibly prohibitive, coastal defence costs or exposure to catastrophic flooding.

Future Options for the Manhood Peninsula

The communities of the Manhood have already accepted a process of managed retreat for part of the peninsula following extensive public consultation since 2001, resulting in the Medmerry coastal realignment scheme. That decision was part of a decade long consultation process in which the communities and local councils determined that the protection of the coast through managed retreat and the creation of saltmarsh and freshwater wetlands, and the legal requirement for the Environment Agency (EA) to compensate for habitat losses elsewhere, presented a long term sustainable option which reinforced the area's environmental based economies of food production and tourism.

New climate change flood risk maps prepared by the EA and CDC highlight sites likely to suffer from tidal inundation by 2115, such as those surrounding East Wittering and Bracklesham. Development is directed to areas at lowest risk (Flood Zone 1), but there are currently no minimum Finished Floor Levels (FFLs) to account for sea level rise beyond the lifetime of the development (100 years). It should be recognised that flood maps surrounding the coastal communities will be subject to further changes in the future.

[6] https://climateadaptationplatform.com/adapting-to-floods-by-creating-sponge-cities-in-china/

The question CDC, local communities and parish councils must address is how to plan for the most resilient and sustainable short, medium and a long term future of the area for at least 100 years.

In Portsmouth there is a significant sea wall along the entire coastal frontage, and pumps are used to drain surface water from the island. Without these, communities such as those on the Manhood Peninsula, must learn how to live with and adapt to increasing water tables and flood risk.

Holding the line is the preferred option under the current shoreline management plan, and may work for the coastal communities on the Manhood Peninsula for the current generation. As a result, the peninsula communities are not expecting to face the prospect of relocation or abandonment in the near future, like some coastal communities in the UK. However, it is necessary for parish councils and CDC to help prepare for the short, medium and long term futures of their communities.

Natural England note: significant habitat loss has already taken place in Chichester Harbour as a result of the Hold the Line approach. This habitat needs to be compensated for elsewhere or the natural environmental losses will be permanent. The issue of habitat loss is happening now and needs to be addressed as soon as possible. It is important to consider the matter holistically because the impacts on communities reach further than the loss of housing.

Optimum land use

Before examining the best methods and materials for flood resilience construction, planners and communities need to ascertain what would be the best use of land on the peninsula and other parts of the low lying coastal hinterland - economically, environmentally and socially.

Wetlands

Chichester's coastal plain is the last significant stretch of undeveloped coastal hinterland between Southampton and Eastbourne, containing internationally important areas of wetland in Chichester, Medmerry and Pagham Harbours.

Wetlands are one of the ecosystems most under threat globally and in the UK both from coastal development and sea level rise. These biodiverse habitats are also one of the most effective for CO2 sequestration. As a result, wetlands have a huge natural capital as a vital resource globally.

Leaving space for Chichester's wetlands, and associated species, to migrate inland and to merge with one another is probably one of the most important and sustainable land use functions of the area.

Making space for water is not only good for biodiversity and CO2 absorption, it also provides important flood mitigation which is of huge social and economic benefit to the local communities. Allocation of the land for the future migration of wetlands will also benefit the green/outdoor/natural tourism economy which already forms a major part of the area's revenues and employment.

Natural England note: with reference to Chichester Harbour Condition Assessment – the intertidal habitat within the site is currently (2021) in unfavourable declining condition due to coastal squeeze, inappropriate coastal management and water quality.

Future coastal squeeze losses must legally be compensated for but this does not need to be within the Harbour. If no land is made available it will be created elsewhere as it was with Medmerry. However the important Chichester Harbour habitats will decline together with all the benefits and services they provide.

Chichester Harbour Condition Assessment: http://publications.naturalengland.org.uk/publication/5535304204419072

The UN Millennium Ecosystem Assessment determined that environmental degradation is more prominent within wetland systems than any other ecosystem on Earth. Wetlands are one of the most effective carbon sinks on Earth. They reduce the intensity of waves, storm surges, and tsunamis, shielding the 60 per cent of the global population who lives and works along coastlines from flooding, property damage and loss of life.

In 2016, the UK government funded the establishment of the 'Blue Forests' initiative in Madagascar run by British organisation, Blue Ventures (https://blueventures.org/conservation/blue-forests/) .

The aim of the project was to reduce deforestation of mangroves habitat, create new sustainable livelihoods, support community health and women's empowerment and increase climate resilience in coastal communities. So why is the UK government condoning building on low lying coastal hinterlands that will be needed in the future for wetland migration/conversion, and failing to recognise the role that coastal habitats have with regard to climate change mitigation in the UK?

Wetlands play an irreplaceable role in regulating the global climate, maintaining the global hydrological cycle, protecting the ecosystem diversity, and safeguarding human welfare. Wetland ecosystems can not only bring indirect services to human beings, but also bring direct economic values to human beings. The value per ha of wetland ecosystem services ranks first among all kinds of ecosystems, and the total values of wetland ecosystem services account for 47% of the values of the global ecosystem. Therefore, it is one of the most important and productive ecosystems.

Davidson estimated that wetlands around the world had degraded by about 87% since 1700 in data existing regions, and the degradation mainly occurred in the 20th and early 21st centuries. The OECD (Organization for Economic Co-operation and Development) and Ramsar have both estimated that the world had lost 50% of its wetlands since 1900.

Ramsar Sites are wetland reserves. The Ramsar Convention Secretariat reported a 35% reduction of global wetlands with data available between 1970 and 2015.

REACH states that over time ‘we have witnessed and 85% decline in the area of saltmarsh and 95% decline in the area of native oyster reefs. With the loss of these habitats comes the loss of the valuable benefits and services they would provide our society.’ (https://ecsa.international/reach/rememare-and-latest-updates)

Since most of the services provided by wetland ecosystems have not been traded in the economic market, the value of wetland ecosystems continues to be neglected or underestimated by stakeholders, government, and public. Wetlands not only contain the value of biodiversity and as habitats for plant animal and fish species, but also can bring many environmental services or functions. Thus, wetland policy has begun to shift from encouraging development to protecting and rational utilization.

Marine/coastal wetlands are most affected by pollution and climate change, which may be due to the economic development of coastal cities and sea level rise caused by climate warming

A new Natural England Report on carbon sequestration by habitat states that *achieving ‘net zero’ greenhouse gas (GHG) emissions by 2050 is a statutory requirement for the UK and England. It will require major changes in the way we manage the land, coast, and sea, alongside decarbonisation of the energy, transport and other sectors. The natural environment can play a vital role in tackling the climate crisis as healthy ecosystems take up and store a significant amount of carbon in soils, sediments and vegetation*.[7]

Chichester District already has two important Ramsar Sites, Chichester and Pagham Harbours and the potential for further designations such as Medmerry. However, predicted sea level rise means that the future integrity of its wetlands needs to be recognised in Local Plans going forward by allowing space for creation, expansion, migration and merger of coastal wetlands in the district. Space to roll back under sea level rise is also needed.

Farmland and Fishing

Food production, through agriculture, horticulture and fishing, is, along with tourism, the major economic sector on the peninsula and coastal plain. Maintaining as much land as possible for growing food, and maintaining healthy seas for fish, will help the environmental, economic and social resilience of the community as it adjusts and transitions with rising sea levels. Farmers have managed the drainage of this low lying area, maintaining and digging ditches and ponds, for centuries. As ground water and sea levels rise and rainfall intensify, farmers will help the area adjust and can provide land for future wetland migration as is needed.

7

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6571829/
https://freshwaterhabitats.org.uk/news/uk-government-taken-to-court-over-unprotected-wetlands/
https://www.dur.ac.uk/research/news/item/?itemno=35217
https://www.nature.com/articles/s41467-018-05080-0#Fig1
http://publications.naturalengland.org.uk/publication/5419124441481216

Natural England note: Farmers are important for the provision of land, but it is not only farmers who can provide this land. There are opportunities for lots of different types of landowners to explore rolling back the defences. Sometimes this might be on a small scale, it doesn't always have to be large Medmerry style projects. For example, individual land/property owners can choose to build defences further back when they reach the end of their life if there isn't scope to remove them entirely.

Recreational Capacity

The natural landscape and environmental qualities of the peninsula and the fact that it is the last unurbanized hinterland between Southampton and Brighton gives it a unique status as a visitor attraction. The Dutch workshop recognised the huge potential of the peninsula for outdoor recreation and tourism as a countryside/coastal holiday destination within easy reach of major conurbations such as London and Portsmouth. This is one of the fastest growing forms of tourism globally and has been successfully pursued by the local community and included in successive destination strategies for the peninsula. As a result, it now represents the largest economy in the area supporting thousands of jobs, shops, restaurants, water sport businesses, camping sites etc

Wetlands, farming, fishing, aquaculture and tourism will symbiotically enhance the area's ability to cope with climate change providing it with more opportunity than risk in the short to medium and long term.

Coast Protection / Coastal Squeeze

If land is allocated to building it should be accompanied by significantly increased commitment and resources to protect the area from rising sea levels. This is the conclusion of the HRA consultants employed by CDC, who state that no development should take place in areas which would require new defences in the future. (see 3.36 below).

In Chichester District, the planning authority's consultants produced an assessment of the local plan policies.
https://www.chichester.gov.uk/media/30918/Habitat-Regulations-Assessment-Chichester-Local-Plan-Review/pdf/Chichester_Local_Plan_Review_HRA_Issue_V2_9_Nov_2018_(2).pdf
Habitat Regulations Assessment: Chichester Local Plan Review Chichester District Council Project number: 60549754November 2018 (AECOM Infrastructure & Environment UK Limited)

The HRA assessment on Coastal Squeeze notes that:

3.32 Rising sea levels can be expected to cause intertidal habitats (principally saltmarsh and mudflat) to migrate landwards. However, in built-up areas, such landward retreat is often rendered impossible due the presence of sea walls and other flood defences.
3.33 In addition, as development frequently takes place immediately behind the sea wall, flood defences often cannot be moved landwards to accommodate managed retreat of threatened habitats. The net result of this is that the quantity of saltmarsh and mudflat adjacent to built-up areas will progressively decrease as sea levels rise. This process is

known as 'coastal squeeze'. In areas where sediment availability is reduced, the 'squeeze' also includes an increasingly steep beach profile and foreshortening of the seaward zones.
3.34 The North Solent Shoreline Management Plan (SMP) units for Chichester and Langstone Harbours indicate that there will be a combination of 'Hold the Line', 'Managed Realignment' and 'Adaptive Management' strategies. An HRA of the draft plan indicated that Hold the Line will have no effect on habitats behind the defences, whilst Managed Realignment is likely to "have a significant detrimental effect resulting in loss of designated terrestrial habitats including coastal grazing marsh, saline lagoons and grasslands." Managed Realignment is proposed in the short term for part of Chichester Harbour. Although Hold the Line is the preferred approach for the majority of the shoreline, the SMP notes that further studies on Chichester and Langstone Harbours may lead to revision of this for significant lengths of shoreline in the inner harbours.
3.35 The South Downs SMP (ie the Beachy Head to Selsey Bill SMP) *for areas fronting Pagham Harbour identifies a mix of Hold the Line and Managed Realignment strategies. The SMP states that a Managed Realignment strategy is being adopted to maintain the integrity of the harbour with its nature conservation value as a primary consideration.*

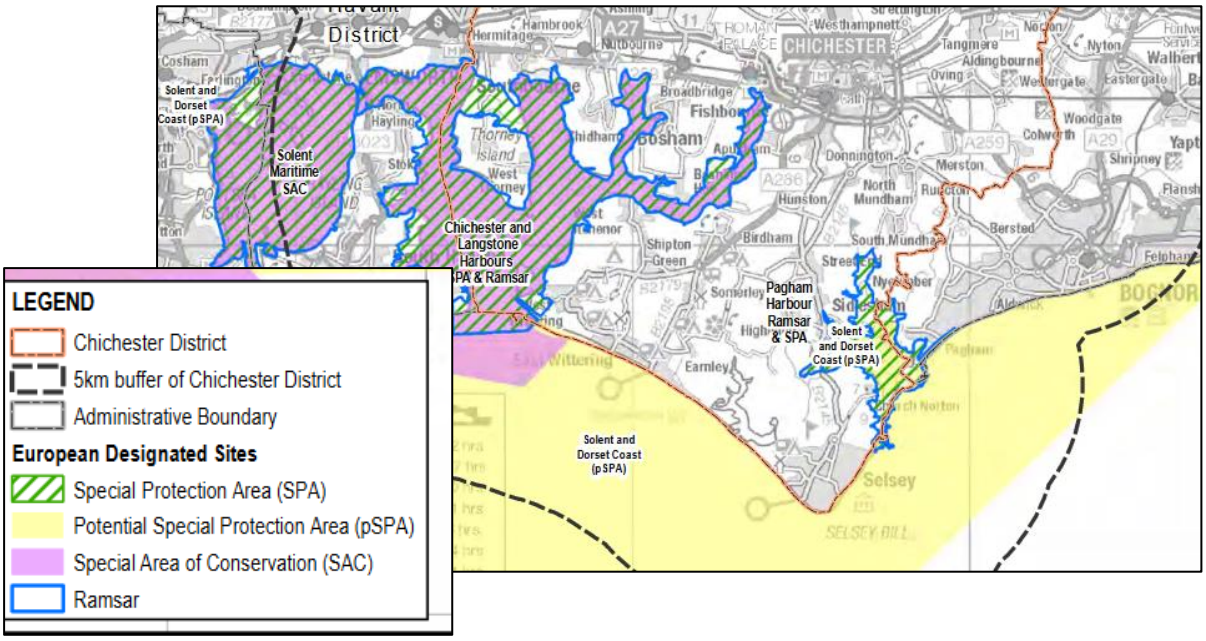
Natural England note: *Natural England advice is to work with coastal processes where possible and therefore NAI, allowing sites to roll back under sea level raise and create coastal habitats where they are important, freshwater habitats behind the sea wall. The agreed approach with EA and DEFRA is that these are maintained in-situ where that is sustainable to do so otherwise they are compensated for in a more sustainable location.*

3.36 In order to conclude that development in the Local Plan area would not lead to a significant adverse effect as a result of coastal squeeze, it will be necessary to conclude that the Local Plan would not require the SMP (or resulting Coastal Strategy) policies for the frontage to be altered and would not be situated in such a position as to require new defences in currently undefended parts of the coastline or locate development in areas planned for managed realignment in the SMP or the Environment Agency Regional Habitat Creation Programme."

This assessment suggests that no housing developments should be planned without first considering the impact of short, medium and long term strategies for coastal management and how to ensure maximum flexibility for managing the coast in the future.

These habitat assessments underscore national planning policy's precautionary policies. Chichester District Planning Processes needs to ensure future development will not rupture wildlife corridors and links between the existing wetland sites and the protected higher land on the South Downs.

There are also other issues identified with respect to coastal squeeze and inappropriate coastal management (See Natural England IPENS paper – coastal defences that reduce sediment and work against coastal processes exacerbate this). Coastal squeeze also affects shingle beaches resulting in their ultimate loss if sediment cannot keep pace with sea level rise. This is turn affects the amenity and attractiveness of the area to residents and holiday visitors, reducing the economic potential and sustainability of the area.



New Housing

When housing is built, its design and materials should reflect future flood risk, whether ground water, fluvial, coastal or surface water flooding. This is important to protect future and existing residents and to create an understanding amongst residents about flood risk. Continuing to build housing estates in the normal manner can create a sense of false security, and conflict with flood warning messages from the Environment Agency.

Alternative Housing Options

When housing cannot be located in areas of lowest risk, there are examples of how building practices can manage the residual risk. There are many examples of floating, lifting houses or homes built on stilts, as well as floating neighbourhoods that could be investigated or trialled as options.[8]

Alternative Housing Options	
	https://www.google.co.uk/amp/s/www.lincolnshirelive.co.uk/news/local-news/futuristic-house-stilts-can-lift-667141.amp

	https://www.google.co.uk/amp/s/www.newyorker.com/tech/annals-of-technology/a-floating-house-to-resist-the-floods-of-climate-change/amp
	https://www.alisonbrooksarchitects.com/project/salt-house/
	https://www.architecturaldigest.com/story/bjarke-ingels-plan-floating-cities-un

Recommendations

To promote sustainable development that is resilient to sea level rise / coastal change by:

1. Raising awareness of climate change and its impacts by encouraging residents and authorities to think about the best form of land use to make the area more resilient socially, economically and environmentally. Use Coastal Change Management areas where appropriate within the planning system to raise this awareness. http://publications.naturalengland.org.uk/publication/6167783398440960
2. Actively promoting resilient building practices by building in the most suitable locations using appropriate drainage systems, building methods, materials and designs.
3. Understanding options for adaptation including “retreat”, and timescales in which nature and communities can thrive for future generations.
4. Providing evidence that can support sustainable development through the Local Plan.
5. Providing parishes with ideas and information to include in their individual responses to the Local Plan for Chichester District and other documents or consultations.

6. Consider mechanisms that don't lock in the need for more flood defences because of those already present. This is to address the issue whereby Planning Authorities are unable to turn down development where investment in defences has already been made.
7. Work with nature and coastal processes to both sustain and restore nature, and also the services it provides – erosion provides much needed sediment (a combination of a lack of sediment on the south coast and isostatic adjustment means the south is more at risk from sea level rise), while beaches and wetland habitats contribute to coastal defence. Shingle beaches, particularly on the open coast, protect sea walls from being undermined.

Conclusion

The communities of the peninsula have already engaged in 20 years of consultation with CDC, WSCC, EA and other stakeholders on environmental, economic and social strategies for increasing the area's resilience to climate change.

There is a demand for development on the Manhood Peninsula. We must take all opportunities through the planning process to create sustainable communities by identifying risk, locating development in areas of lowest risk, and building resilient developments in the face of climate change and the increased potential for flooding. Development should enhance the area's sense of place and support its main economies.

The future needs to be based on a strategy that will allow the peninsula to be as adaptable and resilient as possible in the decades ahead, supporting a strong visitor and food growing economy based on land use that will create an environment best able to absorb both CO2 and rising sea levels while minimising the risk to residents, wildlife and ecosystems.

'Plan your future as well as your sea defences' By looking ahead and maximising your potential, you will increase the importance of protecting your area but you will also be able to judge better what type of coastal management is preferable for your economy and environment.'
(Going Dutch II, 2008)

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- Jane Cunningham, MPP Project Officer – author *Towards ICZM 2011*; Coastal Officer and integrated coastal zone management lead during the Coastal Change Pathfinder Project 2011
- Paul Bedford, Chairman of the Surface Water Issues and Solutions (SWISh) subgroup of the Manhood Peninsula Partnership
- Chichester District Council – Coastal Engineers; Planning Policy
- Environment Agency – Coastal Engineers; FCRM Maintenance.
- Parishes on the Manhood Peninsula:
    - Apuldram Parish Meeting; Birdham PC; Donnington PC; Earnley PC; East Wittering PC; Sidlesham PC; West Itchenor PC; West Wittering PC;
- Natural England
- Marine Management Organisation
- RSPB
- National Trust

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