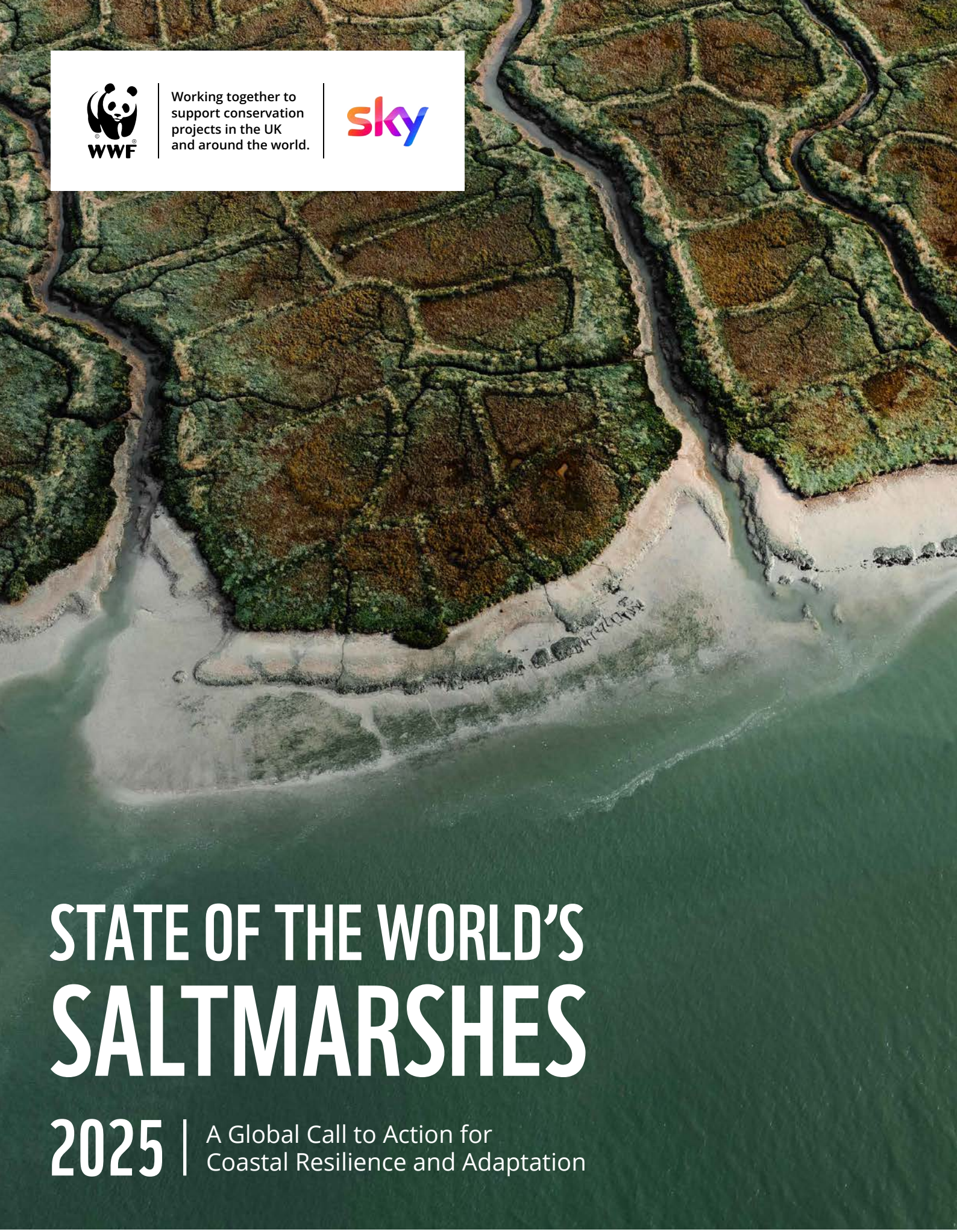

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STATE OF THE WORLD'S SALTMARSHES

2025 | A Global Call to Action for Coastal Resilience and Adaptation

In association with:

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RACE TO RESILIENCE

RACE TO ZERO

THE STATE OF THE WORLD'S SALTMARSHES 2025

Thomas Brook *(WWF)*, Maddie Millington-Drake, Aisling McGarrigle and Nicki du Plessis *(Blue Marine Foundation),* Angus Garbutt *(UKCEH)* and Kristina Rodriguez *(UN Climate Change High-Level Champions)*.

This report represents a truly collaborative effort, bringing together nearly 100 researchers and practitioners from institutions spanning more than 30 countries. We are especially grateful to Wetlands International and the Conservation Evidence Group at the University of Cambridge for their support and contributions to Section 4 (Scaling Solutions), for which the report draws heavily on their publication Restoration, Creation and Management of Salt Marshes and Tidal Flats[1]. And to Tom Worthington and colleagues for their foundational research on The Distribution of Global Tidal Marshes from Earth Observation Data[2], which underpins much of the results presented here.

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Disclaimer:

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STATE OF THE WORLD'S SALTMARSHES - 2025

1 Cutts V., Erftemeijer P.L.A., Gaffi L., Hagemeijer W., Smith R.K, Taylor N.G. & Sutherland W.J. (eds.) (2024) Restoration, creation and management of salt marshes and tidal flats: A collation of evidence-based guidance. Report of Conservation Evidence, Wetlands International and the World Coastal Forum. https://doi.org/10.52201/CGSCOL1/LCNC6109

2 Worthington, T. A., M. Spalding, E. Landis, T. L. Maxwell, A. Navarro, L. S. Smart, and N. J. Murray (2023) The distribution of global tidal marshes from earth observation data. bioRxiv DOI: 10.1101/2023.05.26.542433

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FOREWORD | UN CLIMATE CHANGE HIGH-LEVEL CHAMPIONS

MESSAGES FROM GLOBAL LEADERS IN CONSERVATION, CLIMATE, AND COASTAL RESILIENCE

Saltmarshes are vital yet undervalued coastal ecosystems - home to extraordinary biodiversity, protectors of coastal communities, and quiet allies in our efforts to address climate change. They provide critical habitat for fish, birds, and other wildlife, sustain local livelihoods, and store carbon in their soils for centuries. In short, they support life. However, these vital habitats face ongoing degradation, threatening their ability to support people and nature.

The State of the World's Saltmarshes Report, launched at the 3rd United Nations Ocean Conference, marks a turning point. It raises awareness of the ecological richness of saltmarshes and highlights their role as nature-based solutions - capable of safeguarding biodiversity, strengthening coastal resilience, and helping to meet climate goals. By clearly defining the importance of saltmarsh ecosystems, the report defines the current state of the world's saltmarshes and will pave the way for a well-structured and widely understood Saltmarsh Breakthrough.

The Saltmarsh Breakthrough, informed by this first-of-its-kind global assessment, offers a path forward to scale actions and investments to turn the tide on conserving and restoring these vital ecosystems. Aligned with the Kunming-Montreal Global Biodiversity Framework, the Paris Agreement, and the UN Decades on Ecosystem Restoration and Ocean Science, it brings together governments, the private sector, and communities to restore and protect these critical ecosystems.

As we work to implement the outcomes of COP28 and accelerate the integration of nature across climate and development agendas, saltmarshes remind us that the solutions we seek are already rooted in the natural world. Protecting them is not just an environmental priority - it is a moral and practical imperative.

As the High-Level Champion for COP28, and together with our partners from WWF, Blue Marine Foundation, and the UK Centre for Ecology & Hydrology, we are delighted to share with you this report and hope the findings provide both inspiration and challenges us to act now – to ensure saltmarshes are recognised as powerful natural allies in the fight against climate change and preserving biodiversity, for the benefit of people, nature, and climate.

Razan Khlifa Al Mubarak
IUCN President

EXECUTIVE SUMMARY

Saltmarshes are ecosystems of quiet resilience – productive powerhouses where land, rivers and sea converge. Too often ignored, these tidal wetlands are among the world's most underestimated allies, providing a vital mix of benefits for nature, climate and people alike.

This first *State of the World's Saltmarshes* report integrates saltmarshes into the broader blue carbon agenda – putting them at the heart of global efforts to tackle climate change, restore nature and build coastal resilience. It shows just how powerful these tidal wetlands are. From carbon sequestration to natural flood defence to fisheries support, saltmarshes are doing heavy lifting with little recognition. This report shines a light on what we have lost and continue to lose, where the biggest opportunities lie and what needs to change. It also looks at the political tools and funding mechanisms that can turn things around — if we act now.

WHAT IS A SALTMARSH?

Found in at least 120 countries – from Arctic coasts to tropical estuaries - saltmarshes are critical coastal and estuarine ecosystems that typically occur on the boundary between land and sea, where tides rise and fall, and saltwater meets soil. As used in this report, 'saltmarshes' refers to tidal marshes with these salt-influenced conditions, ranging from brackish (a mix of fresh and salt water) to highly saline.

These vibrant coastal wetlands are home to salt-tolerant plants (halophytes) and low shrubs that flourish on the upper edges of coastlines. They are distinct from mangroves, which grow as trees in primarily tropical zones, or seagrasses, which grow mostly underwater., The tidal rhythm of flooding and exposure shapes everything that lives there.

They tend to form on sheltered shorelines, like estuaries, lagoons and behind barrier islands — wherever calm waters allow sediment to settle and vegetation to take root. While most common in temperate regions, saltmarshes are also important and often underappreciated ecosystems in arid and tropical zones.

Importantly, saltmarshes don't stand alone. They are tightly connected to other ecosystems like seagrass meadows, shellfish reefs and tidal swamps and upland areas of coastal watersheds, forming part of a dynamic coastal mosaic that underpins biodiversity and resilience.

This report focuses specifically on saltmarshes due to their distinct ecological functions and their direct relevance to blue carbon services. Freshwater tidal marshes, while important, and also heavily impacted by human activities are not considered extensively within this assessment, except in cases where they are grouped with saltmarshes in broader tidal marsh research, policies or datasets.

This report is the result of a collaborative process involving over 70 researchers across more than 30 countries, from disciplines including oceanography, ecology, climate science, economics and more. Drawing from the latest science, expert insights and lived experience, this report paints a global picture of saltmarshes — their value, their threats and their future.

It aims to raise global awareness, consolidate knowledge and mobilise support — because saltmarshes deserve a seat at the table in climate, biodiversity and mitigation and adaptation efforts worldwide. It also looks at the political tools and funding mechanisms that can turn things around — if we act now, and if we centre the experience and leadership of coastal communities in decision-making.

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KEY TAKEAWAYS

Saltmarshes are now estimated to cover just under **53,000 km²** globally. This is but a fraction of their historic range.

The **Atlantic coasts of North America and Northern Europe** are the epicentre of saltmarsh extent, holding nearly 45% of the world's tidal marshes - the majority of which are saltmarshes. But this concentration comes at a cost — these are also some of the world's most developed and intensively used coastlines. Decades of drainage for agriculture, port infrastructure, transport networks and cities have left saltmarshes sparse and fragmented.

Globally, **these wetlands have already lost nearly half (46.4%) of their historical extent**. Between 2000 and 2019 alone, the world saw a **net saltmarsh loss of 1,453 km²** — an area twice the size of Singapore. Saltmarshes continue to disappear at a rate of 0.28% per year, which is faster than reported for mangroves.

However, the tide is beginning to turn. We're seeing a surge in restoration and conservation efforts — from managed realignment projects in Northern Europe, where sea defences are deliberately set back to allow tidal waters to re-flood low-lying land and restore natural marsh processes, to restoration-focused policies in China, the US and Australia. These efforts are not just symbolic; they are starting to add up. And globally, studies suggest that up to **2 million hectares (20,000 km²) of saltmarshes may be restorable** — where physical conditions and policy could enable effective recovery.

Momentum is building. With the right support, the next chapter for saltmarshes could be one of recovery and renewal – delivering carbon storage, storm protection, biodiversity, and coastal community resilience, all at once.

THE POWER OF SALTMARSHES

People:

For centuries, saltmarshes have supported local livelihoods and food security — **underpinning commercial fisheries** among other direct benefits to people. They buffer storm surges and flooding during high tides, protecting coastal infrastructure vital to communities. Indigenous Peoples and Local Communities (IPLCs) have long maintained deep cultural, spiritual and ecological relationships with saltmarsh ecosystems, drawing on traditional knowledge to manage and steward these landscapes.

Nature:

Saltmarshes support **globally significant birdlife, fish nurseries, and invertebrate populations, and plants adapted to saline environments.** Their productivity underpins entire coastal food webs, and their tight connection to seagrass beds, oyster reefs and other ecosystems makes them **essential links in maintaining the health and resilience of coastal ecosystems.**

Climate:

Saltmarshes are one of the world's most effective natural climate solutions — capturing and storing carbon in plants and long-lived soils below water or saturated conditions, known as blue carbon. Globally, saltmarsh soils hold around **1.44 gigatonnes of organic carbon** in the top metre alone - equivalent to 5.3 billion tonnes of CO_2e* – with much more stored deeper. But from 2000–2019, net saltmarsh loss released an estimated **326 million tonnes of CO_2e**, with further emissions from lost carbon burial potential. Restoring up to **2 million hectares** of saltmarsh could avoid and remove **36 million tonnes CO_2e each year** — offering meaningful carbon gains at scale.

* **CO_2e:** Carbon dioxide equivalent — a standard unit for measuring carbon footprints that expresses the impact of all greenhouse gases (including methane, etc) in terms of the amount of CO□.

THE BUSINESS CASE FOR SALTMARSHES

Saltmarshes may cover a relatively small footprint, but they deliver disproportionate economic benefits — especially in estuaries where human and natural systems are deeply intertwined. These ecosystems act as **natural flood barriers,** protecting property, transport corridors and infrastructure from rising tides and storm surges. In doing so, they help avoid billions in damages each year, making them a **"natural climate solution"** and **a valuable complement to hard engineering solutions** like seawalls.

Saltmarshes also play a critical role in **sustaining estuarine and nearshore fisheries,** supporting both commercial and subsistence harvests through their role as nurseries for shellfish and finfish. In working harbours and port estuaries, they also trap sediment and improve water quality.

Their presence boosts **property and insurance resilience,** especially in areas where coastal flooding is a growing concern. As sea level rise accelerates, saltmarshes offer an adaptable buffer — one that grows and shifts with the coastline, unlike static infrastructure.

In short, saltmarshes provide a suite of ecosystem services that reduce risk, generate economic returns and increase the resilience of coastal economies. Investing in their recovery is not just an environmental imperative. It's good business.

THE COST OF INACTION

Letting saltmarshes vanish is like letting your insurance policy lapse during storm season. Every year of delay is a missed opportunity - costing more in emissions, disaster recovery and biodiversity loss.

Many marshes can adapt to rising seas if they have space to migrate. But when blocked by development, they drown in place. This is the essence of coastal squeeze and it's playing out in estuaries worldwide.

Without bold policy shifts and real investment, saltmarsh loss could accelerate and the price of inaction will grow heavier.

A DEFINING DECADE FOR SALTMARSHES

Momentum for saltmarsh protection and restoration is building at a critical time. The 2020s are the designated UN Decade of Ocean Science for Sustainable Development and the UN Decade on Ecosystem Restoration – global efforts that call for urgent action to heal our oceans, restore degraded ecosystems and build resilience in the face of climate change.

Saltmarshes sit at the heart of these ambitions. They embody the principles of restoration and resilience, offering one of the clearest examples of how investing in nature-based solutions can deliver benefits across climate mitigation, adaptation, biodiversity, food security and disaster risk reduction. Their restoration also depends on inclusive approaches that recognise the rights, knowledge and stewardship of IPLCs, whose participation and leadership are vital to long-term success.

At the same time, the launch of the 2030 Ocean Breakthroughs by the UN Climate Change High-Level Champions identifies the urgent need for ocean-based climate action to accelerate progress toward global targets. Saltmarshes are an integral part of these Breakthroughs.

In a decade defined by opportunity and urgency to address climate change and biodiversity loss, saltmarshes cannot remain overlooked. The case for their recovery is not just compelling – it is essential. Investing in saltmarshes now is investing in a safer, healthier more resilient future for all.

In short, saltmarshes provide a suite of ecosystem services that reduce risk, generate economic returns and increase the resilience of coastal economies. Investing in their recovery is not just an environmental imperative. It's good business.

1 THE STATE OF THE WORLD'S SALTMARSHES

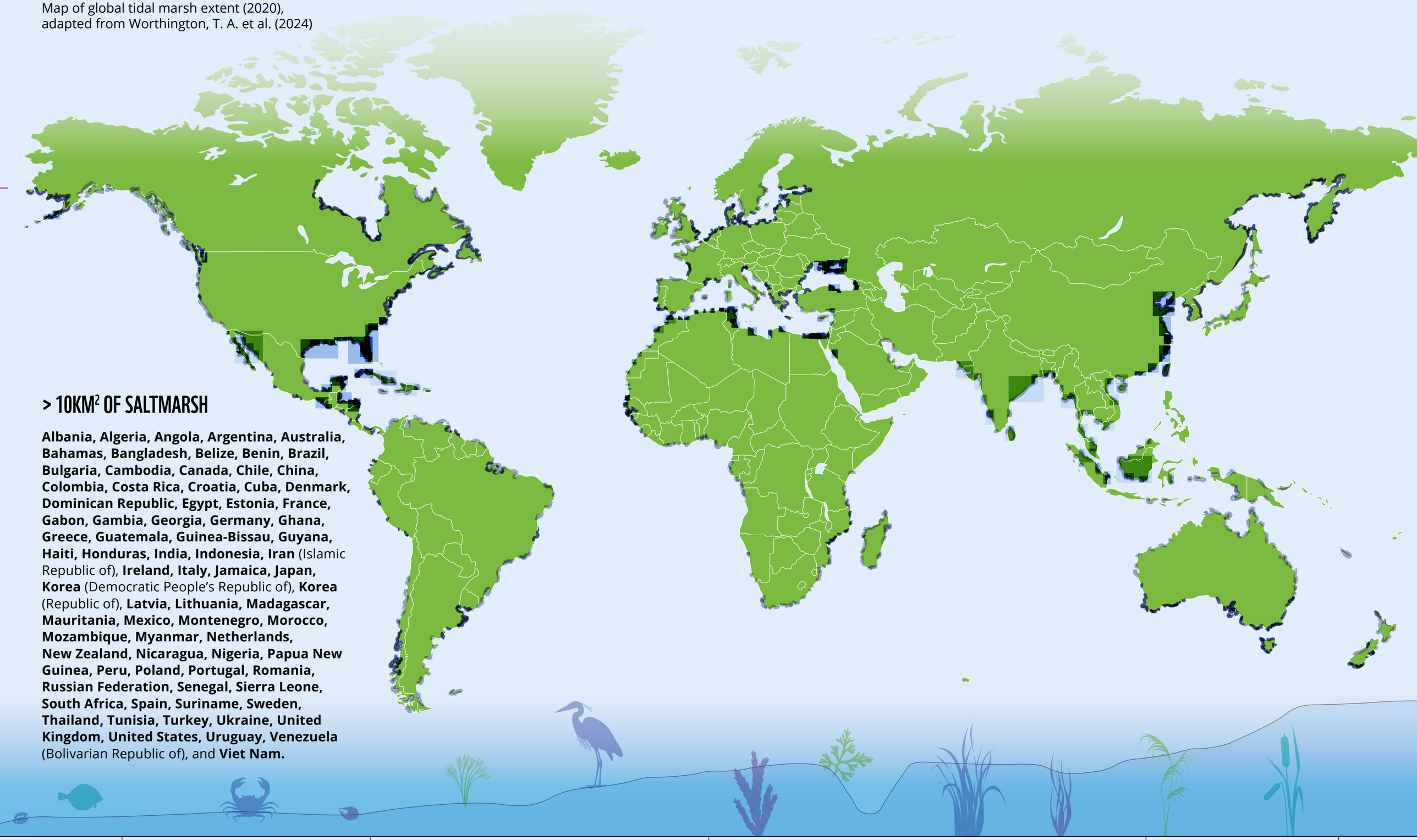
Saltmarshes are globally distributed ecosystems, most commonly found along temperate and sub-Arctic coasts. The global extent of tidal marshes - a broader classification that includes saltmarshes as well as freshwater tidal wetlands - in 2020 was estimated at 52,880 km², spanning over 120 countries (Figure 1)[3]. However, experts agree this figure is conservative; limitations in mapping tools mean many marshes - especially those in high latitude or tropical regions - are still missing from the global picture.

These findings are based on the same global mapping study conducted by Worthington et al. (2024), which serves as the source throughout this section.

3 Worthington, T. A., M. Spalding, E. Landis, T. L. Maxwell, A. Navarro, L. S. Smart, and N. J. Murray. 2023. The distribution of global tidal marshes from earth observation data. bioRxiv DOI: 10.1101/2023.05.26.542433

FIGURE 1:

Map of global tidal marsh extent (2020), adapted from Worthington, T. A. et al. (2024)



> 10KM² OF SALTMARSH

Albania, Algeria, Angola, Argentina, Australia, Bahamas, Bangladesh, Belize, Benin, Brazil, Bulgaria, Cambodia, Canada, Chile, China, Colombia, Costa Rica, Croatia, Cuba, Denmark, Dominican Republic, Egypt, Estonia, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guinea-Bissau, Guyana, Haiti, Honduras, India, Indonesia, Iran (Islamic Republic of), **Ireland, Italy, Jamaica, Japan, Korea** (Democratic People's Republic of), **Korea** (Republic of), **Latvia, Lithuania, Madagascar, Mauritania, Mexico, Montenegro, Morocco, Mozambique, Myanmar, Netherlands, New Zealand, Nicaragua, Nigeria, Papua New Guinea, Peru, Poland, Portugal, Romania, Russian Federation, Senegal, Sierra Leone, South Africa, Spain, Suriname, Sweden, Thailand, Tunisia, Turkey, Ukraine, United Kingdom, United States, Uruguay, Venezuela** (Bolivarian Republic of), and **Viet Nam.**

Sea	Tidal	Low Marsh	Mid Marsh	High Marsh	Upland

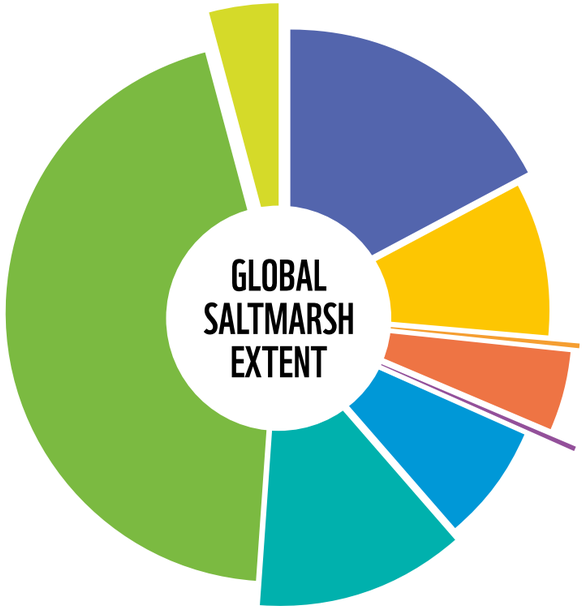
According to this study, the greatest extent of saltmarsh lies in the temperate Northern Atlantic, accounting for approximately 45% of the global total, with significant expanses in the United States (especially the Atlantic and Gulf coasts) (Figure 2). Northern Europe also contains a large proportion of saltmarshes, including the Wadden Sea region of the Netherlands, Germany and Denmark – the world's largest continuous area of saltmarsh at 4,000 km².

Saltmarshes are also found in southern Alaska and Russia's Sea of Okhotsk, along South America's Atlantic coast, particularly between southern Brazil and Argentina (3,060 km²), in South Africa, and across Australia, where over 13,000 km² of saltmarshes span temperate, dry and tropical coastlines.

Even on tropical zones — typically dominated by mangroves — saltmarshes find space, totalling 7,410 km², or roughly 15% of the global distribution. There are scattered patches in India and Sri Lanka, where they often coexist with mangroves in mosaic coastal systems, and along the coasts of the Arabian Gulf, from the UAE to Iran.

However identifying saltmarshes by remote sensing brings challenges.For example, the findings by Worthington et al. (2024), the only mapping study with globally consistent methods reported 50 km² in India, while another, specific to India, reported a more than a five-fold increase at 290 km² ([1,4]). This disparity highlights the challenge of consistently identifying saltmarshes in different regions of the world.

DISTRIBUTION OF SALTMARSH EXTENT BY REALM AND CLIMATE ZONE



Region	Sum of % global
Arctic	17.4%
Tropical Atlantic	9.1%
Tropical Eastern Pacific	0.2%
Indo-Pacific	4.8%
Temperate Southern Africa	0.2%
Temperate South America	7.2%
Temperate Northern Pacific	12.4%
Temperate Northern Atlantic	44.9%
Temperate Australia	3.9%
Southern Ocean	0.0%
Grand Total	**100%**

Figure 2: Global distribution of saltmarsh extent by marine eco-regions of the world[5].

4 Viswanathan, C., Purvaja, R., Jeevamani, J.J.J., Samuel, V.D., Sankar, R., Abhilash, K.R., Geevarghese, G.A., Muruganandam, R., Gopi, M., Raja, S. and Das, R.R., 2020. Salt marsh vegetation in India: Species composition, distribution, zonation pattern and conservation implications. Estuarine, Coastal and Shelf Science, 242, p.106792.

5 Spalding, M.D., Fox, H.E., Allen, G.R., Davidson, N., Ferdaña, Z.A., Finlayson, M.A.X., Halpern, B.S., Jorge, M.A., Lombana, A.L., Lourie, S.A. and Martin, K.D., 2007. Marine ecoregions of the world: a bioregionalization of coastal and shelf areas. BioScience, 57(7), pp.573-583.

The loss of saltmarsh extent over the last century has been shaped by profound human influence. As coastlines were transformed to feed, house and connect growing populations, saltmarshes were among the first casualties. They were drained, diked and reclaimed - turned into farmland, shrimp ponds, ports or cities – thereby losing their natural functions.

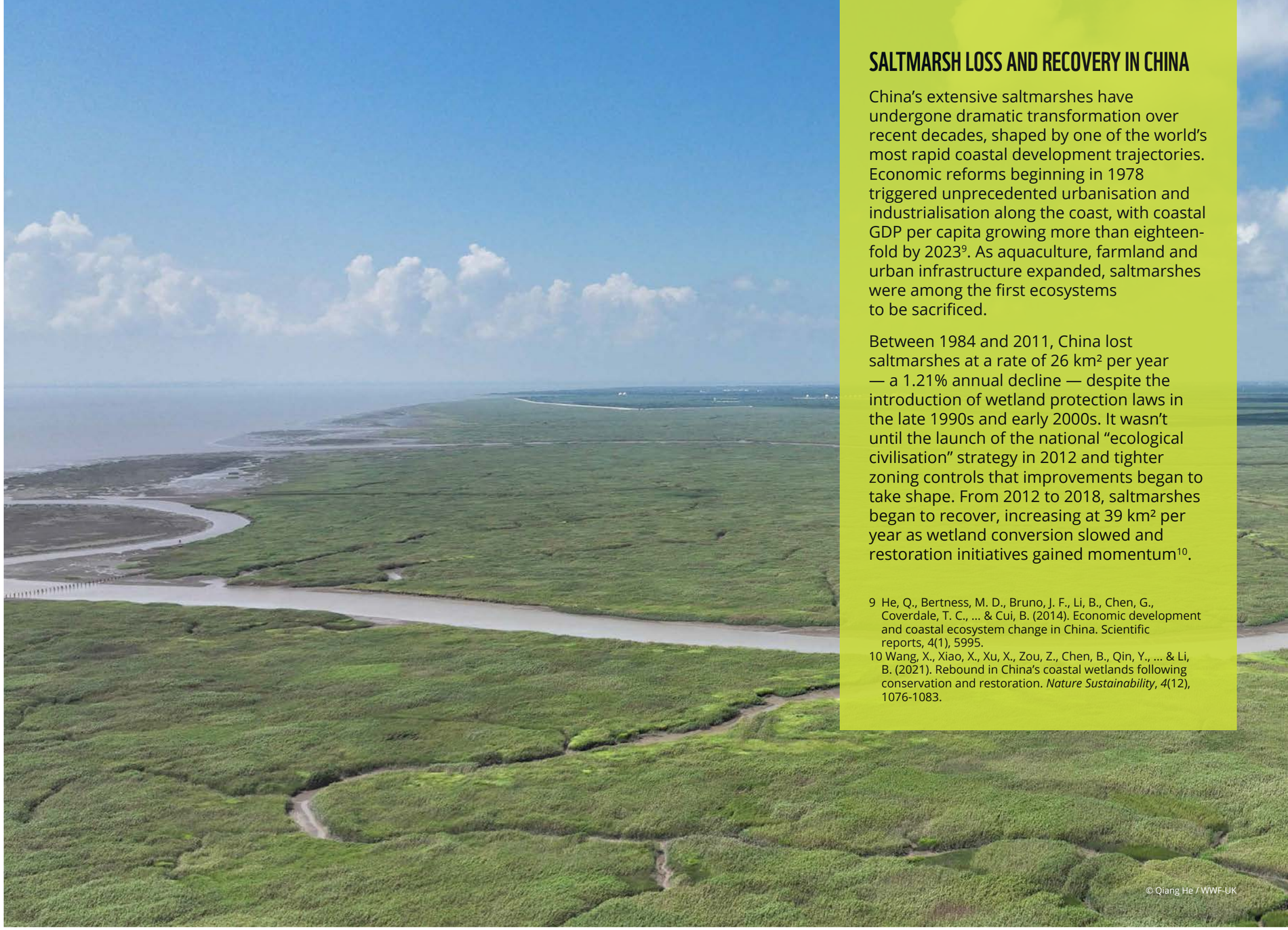
It's estimated that we've lost nearly half of the world's historical saltmarshes - and they are disappearing three times faster than forests[6]. That's two-thirds of this vital habitat erased from the map, with some areas, like the UK, experiencing even higher losses (85%)[7].

The pace of decline surged in the mid-20th century due to land reclamation. But by the 1990s, things began to change. The ecological value of saltmarshes - particularly their role in fostering biodiversity. in storing carbon and buffering storms - was gaining recognition. Landmark global frameworks like the UN Convention on Biological Diversity (CBD)[8] helped curb the rates of loss.

Yet the decline continues. Between 2000 and 2019, we lost a net 1,453 km² of saltmarsh—roughly two football fields every hour. North America experienced the largest net loss of any region in a this period (283 km2), largely due to hurricanes and resulting erosion, as well as land subsidence and a lack of sediment supply.

However, the picture is not entirely negative. In parts of the United States, northwest Europe, China and Australia, saltmarshes have shown signs of recovery. Gains in these regions reflect the positive effects of strengthened protection measures, targeted restoration efforts and improved coastal management policies.

Elsewhere, particularly along Arctic coastlines at high northern latitudes, warming is occurring three to four times faster than the global average. In recent decades, sea levels in these regions have also been rising at rates slightly above the global mean. This rapidly changing Arctic environment presents both opportunities and challenges for coastal ecosystems - with potential implications for the expansion or contraction of saltmarshes. However, the likelihood of new coastal wetlands emerging in this critical region remains uncertain.



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SALTMARSH LOSS AND RECOVERY IN CHINA

China's extensive saltmarshes have undergone dramatic transformation over recent decades, shaped by one of the world's most rapid coastal development trajectories. Economic reforms beginning in 1978 triggered unprecedented urbanisation and industrialisation along the coast, with coastal GDP per capita growing more than eighteen-fold by 2023[9]. As aquaculture, farmland and urban infrastructure expanded, saltmarshes were among the first ecosystems to be sacrificed.

Between 1984 and 2011, China lost saltmarshes at a rate of 26 km² per year — a 1.21% annual decline — despite the introduction of wetland protection laws in the late 1990s and early 2000s. It wasn't until the launch of the national "ecological civilisation" strategy in 2012 and tighter zoning controls that improvements began to take shape. From 2012 to 2018, saltmarshes began to recover, increasing at 39 km² per year as wetland conversion slowed and restoration initiatives gained momentum[10].

9 He, Q., Bertness, M. D., Bruno, J. F., Li, B., Chen, G., Coverdale, T. C., ... & Cui, B. (2014). Economic development and coastal ecosystem change in China. Scientific reports, 4(1), 5995.
10 Wang, X., Xiao, X., Xu, X., Zou, Z., Chen, B., Qin, Y., ... & Li, B. (2021). Rebound in China's coastal wetlands following conservation and restoration. *Nature Sustainability*, *4*(12), 1076-1083.

The accelerating loss of saltmarsh in certain regions underscores the climate sensitivity of saltmarsh ecosystems, with accelerating losses expected as storm intensity and frequency increase. The vulnerability of these habitats to both acute and chronic climate pressures makes consistent, high-resolution mapping and monitoring of saltmarsh condition more essential than ever. To guide effective management, protection and restoration, future mapping efforts must be done at both global (to track progress) and local-regional scales to aid individual conservation and restoration efforts. This must be inclusive of under-mapped tropical and high-latitude regions.

Equally important is distinguishing between changes in *extent* and *quality*. Gains in saltmarsh area, while encouraging on paper, can mask underlying ecological degradation such as the spread of invasive monocultures that displace native species and erode ecosystem functions.

6 UNFCCC (2021) *Wetlands disappearing three times faster than forests*. Available at: https://unfccc.int/news/wetlands-disappearing-three-times-faster-than-forests (Accessed: 5 May 2025).
7 Garbutt, A., Underwood, G. J. C., Harley, J., Boskova, K., Hardy, M.J., McGarrigle, A., Millington-Drake, M., Gamble, C., Debney A., zu Ermgassen, P.S.E., and Preston, J. (2024) (2024) Seascape Scale Restoration: Restoring our coastal habitats for nature and people. Blue Marine Foundation Report
8 The CBD is one of three Rio Conventions signed at the Rio Earth Summit in 1992. The CBD's mandate covers all life on earth. It's objectives are conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from genetic resources.

GLOBAL MANGROVE WATCH – A MODEL FOR THE SALTMARSH COMMUNITY?

The Global Mangrove Watch (GMW) is an online platform that provides the remote sensing data and tools for monitoring mangroves ecosystems. It gives universal access to near real-time information on the location and nature of changes to mangroves across the world, and highlights why they are valuable.

With hi-resolution information on topography, soil conditions and hydrology, GMW gives coastal and park managers, conservationists, policymakers and practitioners the evidence needed to pinpoint the causes of local mangrove loss and track restoration progress. It is a tool that can help mangroves be central to climate mitigation, adaptation and sustainable development plans and policies.

Why It Matters:

- *Consistency and transparency*: GMW offers a harmonised dataset that enables cross-country comparisons and supports international reporting under frameworks like the Ramsar Convention.
- *Decision support*: Governments, NGOs and coastal communities use GMW data to target restoration, assess conservation effectiveness and develop policies around blue carbon and climate resilience.
- *Global equity*: By including mangroves in developing countries and remote regions often missed by national mapping, GMW fills crucial data gaps and elevates global awareness.

What We Can Learn for Saltmarshes:

The success of GMW demonstrates how standardised, open-access and frequently updated habitat monitoring tools can transform conservation outcomes. A parallel initiative for saltmarshes could bring long-needed visibility, accountability and action to one of the world's most overlooked coastal ecosystems.

Protected Area Coverage and the 30x30 Target:

An estimated 45% (24,200 km²) of the world's 52,880 km² of remaining saltmarshes now fall within the boundaries of protected areas. This places saltmarshes on par with mangroves (42%) and ahead of coral reefs (32%) and tidal flats (31%) in terms of formal protection[11]. Such coverage likely reflects increasing recognition of the ecological and socio-economic importance of saltmarshes, and the integration of these systems into national conservation strategies.

On the surface, saltmarshes stand out as one of the few ecosystem types that globally have already surpassed the 30% protection threshold enshrined in Target 3 of the Kunming–Montreal Global Biodiversity Framework (30% protection of land, ocean and freshwater by 2030, also referred to as the 30x30 goal). However, this headline figure warrants critical interpretation. Target 3 extends beyond area-based metrics, requiring that protected areas be *effectively managed, ecologically representative, well-connected* and *equitably governed [*[12,13]*]*. For saltmarshes, there is limited evidence that these broader criteria are being systematically met.

Moreover, the 45% figure is based on *extant* marsh extent. When viewed through the lens of historical loss, the true picture becomes more sobering. In Europe, for example, 14 countries now report over 90% of their remaining saltmarshes within protected area networks, yet most of these countries have lost between 50% and 90% of their original cover[14]. A similar story holds in North America, where the United States and Canada together account for around 10,000 km² of protected saltmarshes, equating to 35% and 41% of their national totals, respectively — but where substantial historical loss has also occurred.

These findings reinforce the need to interpret progress toward 30x30 goal not only in terms of coverage but in terms of quality, connectivity, ecological function and persistence under sea-level rise. Restoration, invasive species control, and the recovery of degraded systems must feature prominently in saltmarsh conservation strategies going forward. Without this shift, there is a risk that saltmarshes will be counted among the 'success stories' of 30x30 while continuing to decline in ecological health and resilience.

11 Worthington, T. A., M. Spalding, E. Landis, T. L. Maxwell, A. Navarro, L. S. Smart, and N. J. Murray. 2023. The distribution of global tidal marshes from earth observation data. bioRxiv DOI: 10.1101/2023.05.26.542433 - and sources cited therein
12 Bell-James, J., Foster, R., Shumway, N., Lovelock, C.E., Villarreal-Rosas, J., Brown, C.J., Andradi-Brown, D.A., Saunders, M.I., Waltham, N.J. and Fitzsimons, J.A., 2024. The Global Biodiversity Framework's ecosystem restoration target requires more clarity and careful legal interpretation. Nature Ecology & Evolution, 8(5), pp.840-841.
13 Convention on Biological Diversity. (2022). *Kunming-Montreal Global Biodiversity Framework*. Available at: https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf
14 Airoldi, L. and Beck, M.W. (2007). *Loss, status and trends for coastal marine habitats of Europe*. In: Gibson, R.N., Atkinson, R.J.A. and Gordon, J.D.M. (eds.), *Oceanography and Marine Biology: An Annual Review*, Volume 45. CRC Press, pp. 345–405.

Under Pressure - The Ongoing Threats Facing Saltmarshes:

Saltmarshes are increasingly caught between a mix of intensifying pressures, from rising seas to political gridlock - that is, a lack of policy progress or action due to disagreement, inaction, or conflicting priorities among decision-makers.

Around the world, saltmarshes continue to be lost to land conversion. Despite decades of awareness, the reclamation of coastal wetlands for agriculture, aquaculture, ports and infrastructure remains widespread, especially in fast-developing areas of Asia and the Middle East. Coastal real estate is valuable and too often, that value is calculated without considering what is lost when saltmarshes disappear beneath concrete.

Climate change is a mounting and multidimensional threat. Sea-level rise, now accelerating, is outpacing the ability of some marshes to grow upward or migrate inland in some regions. In many areas, hard infrastructure such as sea walls, roads and buildings are preventing marshes from migrating inland, resulting in what is known as “coastal squeeze”. At the same time, upstream dams, levees and water diversions are sometimes cutting off the sediment marshes need to build elevation. Without this sediment, marshes can drown. This situation is worsened by increasingly frequent and intense storms, which can cause rapid and severe damage – such as the large-scale marsh loss in the southeastern United States due to hurricane-driven erosion.

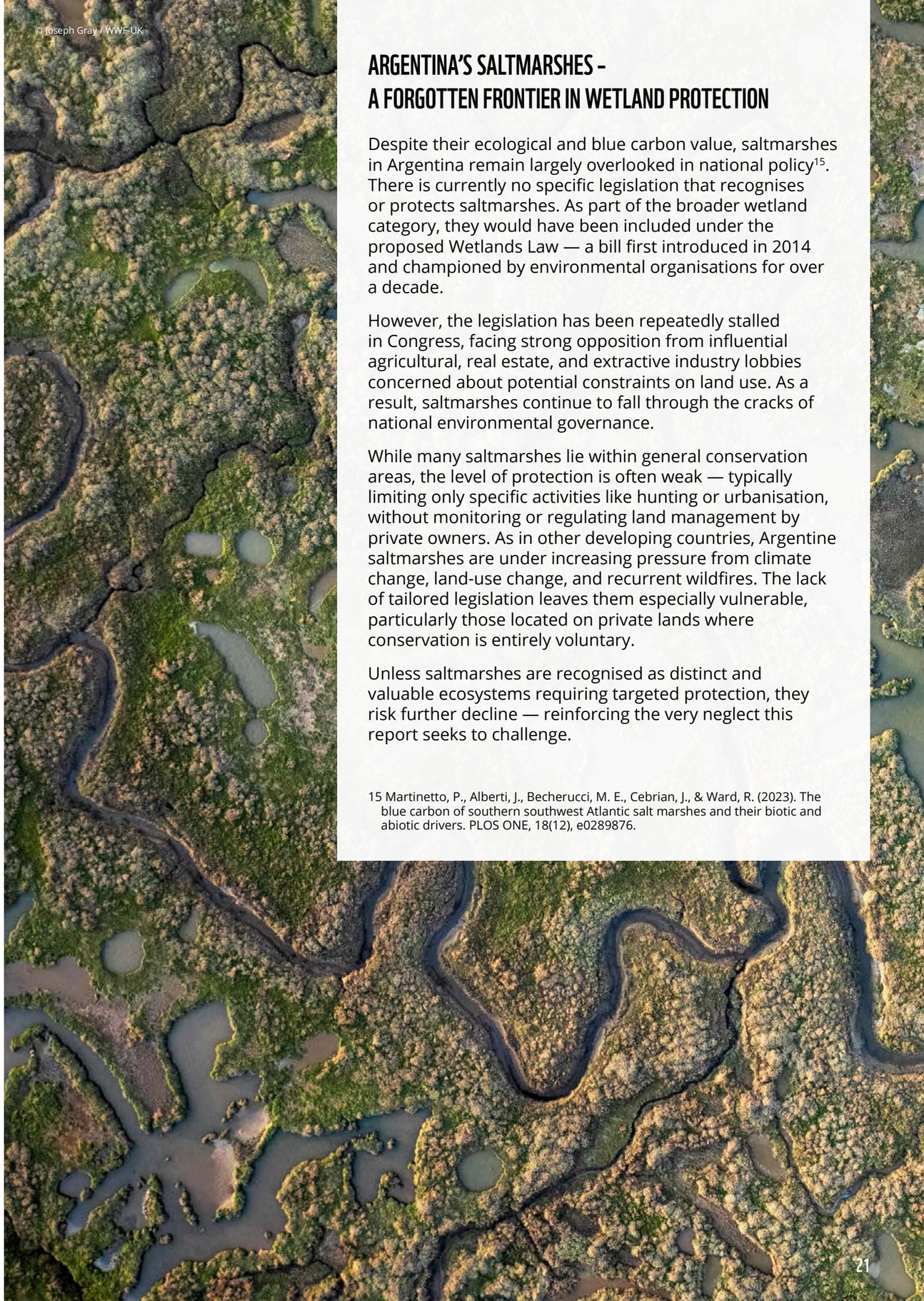
Even in places where marshes are expanding, ecological integrity can be compromised. Invasive species like *Spartina alterniflora* in East Asia and *Spartina densiflora* elsewhere have outcompeted native plants, reshaping entire ecosystems. Introduced with good intentions for coastal stabilisation, they now pose a serious challenge to native biodiversity and habitat quality, even within protected zones.

Pollution is another persistent problem. Nutrient runoff from agriculture and sewage feeds algal blooms and can lead to the die-off of vital marsh vegetation. Industrial waste compounds the pressure, altering soil chemistry and weakening the structural integrity of marshes. This is particularly problematic in regions like the Mediterranean and South America, where industrialisation and urban growth intersect with sensitive coastal ecosystems.

Inappropriate management can significantly reduce the habitat quality of saltmarshes for wildlife. For example, where saltmarshes are grazed it is crucial to take into account changing environmental conditions and other pressures when setting current stocking levels. In some cases what was seen as beneficial management in the past may no longer deliver the same results.

Governance gaps make these challenges harder to address. A large part of the problem is spatial. Saltmarshes fall between the cracks — spanning local, regional and national jurisdictions – and located in the ever-shifting intertidal zone. This is an area often missed in marine and terrestrial legislation, where jurisdiction and responsibilities are frequently unclear or inconsistently applied.

Saltmarshes are increasingly caught between a mix of intensifying pressures, from rising seas to political gridlock - that is, a lack of policy progress or action due to disagreement, inaction, or conflicting priorities among decision-makers.



ARGENTINA’S SALTMARSHES – A FORGOTTEN FRONTIER IN WETLAND PROTECTION

Despite their ecological and blue carbon value, saltmarshes in Argentina remain largely overlooked in national policy[15]. There is currently no specific legislation that recognises or protects saltmarshes. As part of the broader wetland category, they would have been included under the proposed Wetlands Law — a bill first introduced in 2014 and championed by environmental organisations for over a decade.

However, the legislation has been repeatedly stalled in Congress, facing strong opposition from influential agricultural, real estate, and extractive industry lobbies concerned about potential constraints on land use. As a result, saltmarshes continue to fall through the cracks of national environmental governance.

While many saltmarshes lie within general conservation areas, the level of protection is often weak — typically limiting only specific activities like hunting or urbanisation, without monitoring or regulating land management by private owners. As in other developing countries, Argentine saltmarshes are under increasing pressure from climate change, land-use change, and recurrent wildfires. The lack of tailored legislation leaves them especially vulnerable, particularly those located on private lands where conservation is entirely voluntary.

Unless saltmarshes are recognised as distinct and valuable ecosystems requiring targeted protection, they risk further decline — reinforcing the very neglect this report seeks to challenge.

15 Martinetto, P., Alberti, J., Becherucci, M. E., Cebrian, J., & Ward, R. (2023). The blue carbon of southern southwest Atlantic salt marshes and their biotic and abiotic drivers. PLOS ONE, 18(12), e0289876.

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2 THE ROLE OF SALTMARSHES IN CLIMATE & NATURE ACTION

The UN Framework Convention for Climate Change (UNFCCC) COP30 in Belem, Brazil, will mark ten years since the 2015 Paris Agreement. A poignant moment for the world to reflect on what has been pledged but also to take stock of how to translate these pledges into concrete action on the ground.

In recent years, ocean action has gained momentum at the UNFCCC with the annual Ocean and Climate Dialogue being established at COP27 in 2022. The first Global Stocktake of the Paris Agreement urged Parties to strengthen preservation and restoration efforts of ocean and coastal ecosystems for their essential role as greenhouse gas sinks and reservoirs, while also scaling up mitigation actions[16]. Parties were encouraged to integrate ocean-based actions into their national climate plans[17].

The Paris Agreement requires each Party to prepare, communicate and maintain successive Nationally Determined Contributions (NDCs) every five years, that it intends to achieve. Parties are required to pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions. To enhance the ambition over time, each successive NDC will represent a progression compared to the previous NDC and reflect its highest possible ambition.

As of October 2023, out of the 148 countries that have submitted new and/or updated NDCs, 97 have included coastal and marine nature-based solutions. 61 countries included reference to blue carbon ecosystems in the second-round of updated NDCs. However, the overwhelming focus was on mangroves. Saltmarshes, by comparison, remain in the shadows — less understood, less funded and less effectively managed.

The "sister convention" to the UNFCCC, the Convention on Biological Diversity (CBD) mandates the conservation and sustainable use of all life on Earth with no distinction between ocean and land biodiversity. The ocean and coastal ecosystems are integrated throughout the goals and targets of the Global Biodiversity Framework (2022)[18] although historically more attention has been given to terrestrial ecosystems.

Saltmarshes, mangroves and seagrasses are defined as actionable blue carbon ecosystems by the Intergovernmental Panel on Climate Change (IPCC). Other coastal wetland types, such as tide flats and forested tidal swamps, can also be important blue carbon ecosystems[19]. The sustainable management of these ecosystems refers to their conservation or restoration. The emissions reductions from these ecosystems can be measured via internationally recognised greenhouse gas (GHG) accounting methodologies. Therefore, Parties can include saltmarshes within national climate and biodiversity strategies as part of emissions reduction plans. These solutions can also help deliver on Sustainable Development Goal (SDG) 14: Life Below Water and Goal 13: Climate Action.

Blue carbon ecosystems were referenced in the second round of updated NDCs by 61 countries. However, the overwhelming focus was on mangroves. Saltmarshes, by comparison, remain in the shadows: less understood, less funded, and less effectively managed.

16 UNFCCC (2023) Decision 1/CMA.5
17 UNFCCC. (2023). Outcome of the first global stocktake. Decision 1/CMA.5.
18 Hazin, C., and Diz, D. (2024). Less Specific and More Comprehensive? An Analysis of How the Ocean Is Reflected in the Kunming-Montreal Global Biodiversity Framework. Ocean Yearbook Online, 38(1), 323-373.
19 Adame, M.F., Kelleway, J., Krauss, K.W., Lovelock, C.E., Adams, J.B., Trevathan-Tackett, S.M., Noe, G., Jeffrey, L., Ronan, M., Zann, M. and Carnell, P.E., 2024. All tidal wetlands are blue carbon ecosystems. BioScience, 74(4), pp.253-268.

BLUE THREAD: ALIGNING NATURE AND CLIMATE STRATEGIES

Both adopted at the 1992 Rio Earth Summit, the CBD and the UNFCCC are highly complementary. Despite the strong potential for alignment and cooperation, synergies between the two conventions remain insufficient, often undermining or slowing effective action on the ground.

A significant step was taken at COP16 in Cali, Colombia where Parties agreed to a landmark decision on biodiversity and climate change. Importantly, the CBD Executive Secretary in collaboration with the UNFCCC Secretariat are urged to 'explore opportunities for addressing the ocean-climate-biodiversity nexus in an integrated manner in order to achieve the goals of the Framework' and aim for enhanced policy coherence[20]. This is a critical step towards strengthening climate and biodiversity commitments to maximise synergies while minimising trade-offs.

The ocean and its coastal ecosystem provide an opportunity to advance the goals of both the Paris Agreement and the Global Biodiversity Framework. Blue Thread[21], a policy paper launched last year by the Ocean & Climate Platform and Blue Marine Foundation outlines key levers that could help strengthen this alignment while promoting ocean-based climate actions. These include finance, the mobilisation of non-state actors, technical support and capacity building and monitoring and reporting. The paper emphasises that this should be applied to all relevant frameworks (including Ramsar) to create a unified approach to ocean governance.

20 CBD (2024). Decision 16/22. Biodiversity and climate change. Available: https://www.cbd.int/doc/decisions/cop-16/cop-16-dec-22-en.pdf

21 Lecerf, M., Millington-Drake, M., and Picourt, L., (2024), Blue Thread: Aligning National Climate and Biodiversity Strategies, p1-13. Ocean & Climate Platform, Blue Marine Foundation.

The Ocean Breakthroughs

The Marrakech Partnership for Global Climate Action supports the implementation of the Paris Agreement by supporting collaboration between non-party stakeholders such as civil society, businesses and investors and national governments. Developed in partnership with the UN Climate Change High-Level Champions, the 2030 Breakthroughs are rooted in the theory of change responding to the question: "What must we achieve by 2030 to transform the way these sectors operate?". The Breakthroughs are an opportunity to engage non-state actors and government alike - all working towards a shared goal and vision. They also support global campaigns led by the Climate Champions, namely the Race to Resilience and Race to Zero, and their respective action agendas: the Sharm-El-Sheikh Adaptation Agenda and the 2030 Climate Solutions Agenda.

The Ocean Breakthroughs address solutions in five key sectors - marine conservation, shipping, ocean renewable energy, aquatic food systems and coastal tourism. They set positive turning points for ocean sectors to ensure a net-zero, resilient and healthy planet by 2050 in line with the Global Biodiversity Framework's vision to live in harmony with nature. Each Breakthrough is underpinned by scientific knowledge, effective governance and management, the inclusion of people impacted by and dependent on the ocean and adequate resourcing.

Saltmarshes can be used by countries to achieve both their climate and biodiversity targets. For example, saltmarshes would support solutions focused on combating the effects of sea-level rise, as well as achieving significant enhancements in biodiversity[22].

As attention grows from countries to include ocean-based measures in national climate strategies, it is critical to integrate, where possible and feasible, saltmarsh ecosystems as a nature-based solution in efforts to enhance national climate strategies and commitments. Saltmarsh ecosystems offer both mitigation and adaptation purposes, and socioeconomic benefits for coastal communities.

22 Magnan, A.K., Billé, R., Gemenne, F., Halimi, A., Kervarec, F., Spencer, T., and Thomas, S. (2018) *Ocean-based measures for climate action*. Policy Brief No. 06/18. Paris: IDDRI. Available at: https://www.iddri.org/en/publications-and-events/policy-brief/ocean-based-measures-climate-action

3 THE MANY BENEFITS OF SALTMARSHES

Saltmarshes deliver critical ecosystem services that underpin climate resilience, biodiversity goals and human livelihoods. Recognising their value is essential for informed decision-making at every level - from policy to investment.

They **buffer against climate impacts**, absorbing wave energy, reducing erosion and sequestering carbon often at rates faster than terrestrial forests. As such, they are indispensable allies in the race to a net-zero world and in slowing the pace of change to help communities adapt.

They are **biodiversity strongholds**, home to rare and migratory species, nurseries for fish and vital stopovers for birds, linking land, sea and sky in webs of life that few other ecosystems can rival.

And they are **lifelines for people** protecting coastal communities from floods, filtering water, providing food, supporting local economies and offering places of connection, culture and wellbeing.

Taken together, the many benefits of saltmarshes make a compelling case that needs to be communicated, recognised and acted upon — from government planning to investors and insurers, through to NGOs and local communities.

Saltmarshes are entwined with local traditions, art and heritage

From tidal reedbeds immortalised in Chinese ink paintings to the Celtic fishing traps in Britain's marshy estuaries, saltmarshes have long shaped the cultures of the coast. These dynamic landscapes are more than ecological and climate powerhouses — they are deeply human spaces, interwoven with memory, identity and survival.

CULTURAL SIGNIFICANCE OF JUNCUS KRAUSSII

The saltmarsh rush *Juncus kraussii* (*ncema*) holds deep cultural and economic value in South Africa, especially in KwaZulu-Natal. It is harvested for crafting traditional sleeping mats (*amacansi*), baskets, beer strainers, and other household items. Strong yet flexible, it is prized in Zulu customs - *amacansi* made from *ncema* are commonly used in ceremonies and as gifts.

Across the world, saltmarshes are sites of story and song, shaping the lives and livelihoods of millions of people. They provide wild foods, materials for thatching and crafts, grazing land for traditional herders and underpin vital fisheries. In some places, marshlands also have spiritual significance, liminal places where land, sea and sky meet. And more recently, they are symbols of resistance, where communities have reclaimed identity, access or sustenance in the face of displacement or environmental change.

Saltmarshes also support health and wellbeing - globally through climate and water regulation, and locally by offering opportunities for recreation and connection to nature. Yet their remoteness and shifting nature can make them harder to access, often excluding those who could benefit most. Inclusive approaches like nature-based social prescribing have shown promise, with one site in Somerset, UK reporting improved mental health, increased physical activity, and stronger social ties[23].

23 Knight-Markiegi, Adam. 2023. 'Social Return on Investment (SROI) Evaluation of Blue Prescribing at WWT Steart Marshes'. https://www.wwt.org.uk/uploads/documents/2023-03-07/wwt-sroi-of-blue-prescribing-evaluation-final-report.pdf.

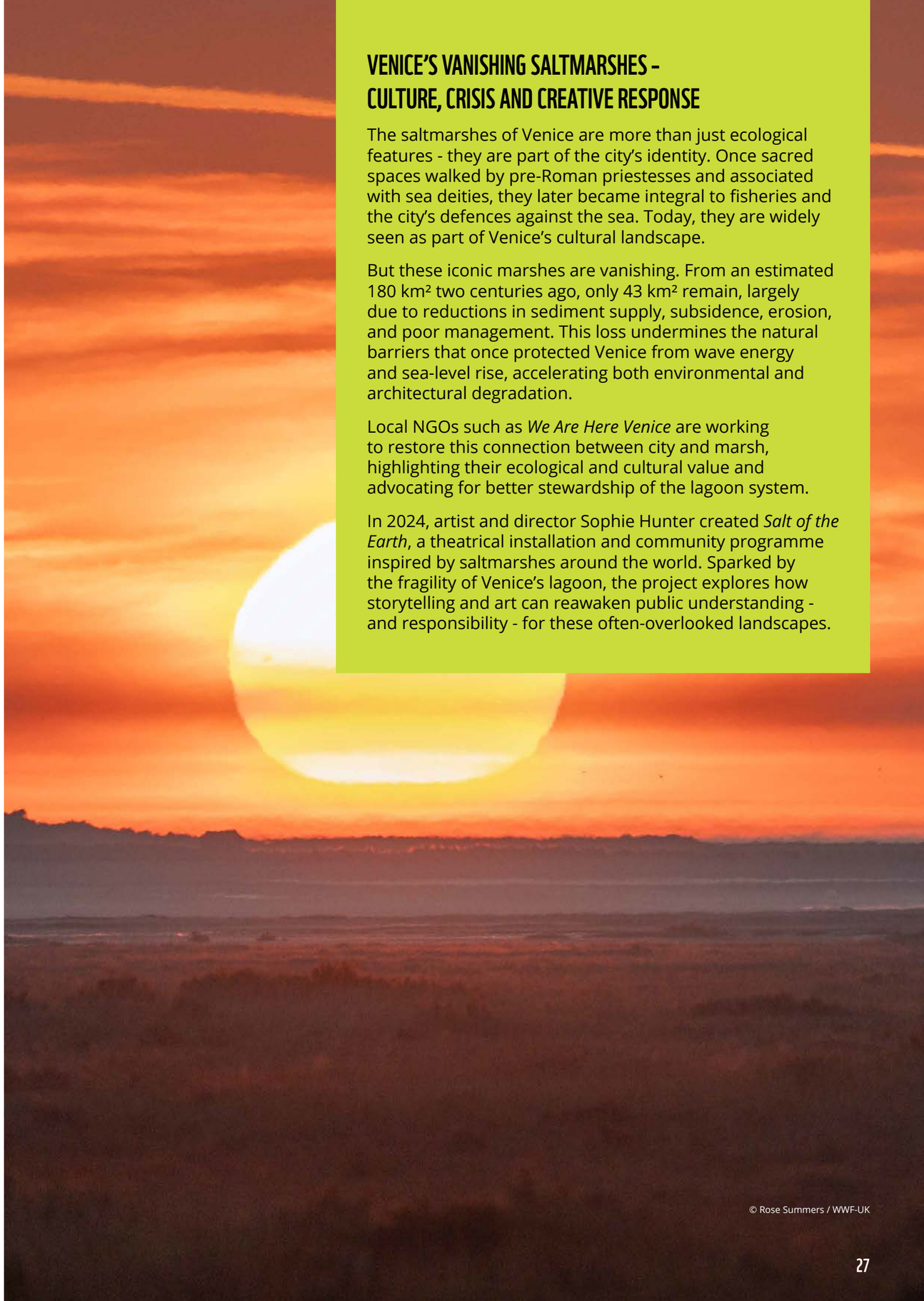
VENICE'S VANISHING SALTMARSHES - CULTURE, CRISIS AND CREATIVE RESPONSE

The saltmarshes of Venice are more than just ecological features - they are part of the city's identity. Once sacred spaces walked by pre-Roman priestesses and associated with sea deities, they later became integral to fisheries and the city's defences against the sea. Today, they are widely seen as part of Venice's cultural landscape.

But these iconic marshes are vanishing. From an estimated 180 km² two centuries ago, only 43 km² remain, largely due to reductions in sediment supply, subsidence, erosion, and poor management. This loss undermines the natural barriers that once protected Venice from wave energy and sea-level rise, accelerating both environmental and architectural degradation.

Local NGOs such as *We Are Here Venice* are working to restore this connection between city and marsh, highlighting their ecological and cultural value and advocating for better stewardship of the lagoon system.

In 2024, artist and director Sophie Hunter created *Salt of the Earth*, a theatrical installation and community programme inspired by saltmarshes around the world. Sparked by the fragility of Venice's lagoon, the project explores how storytelling and art can reawaken public understanding - and responsibility - for these often-overlooked landscapes.



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HALOPHYTES – THE UAE'S SECRET INGREDIENT FOR CLIMATE-RESILIENT CUISINE

Salt-tolerant plants, known as halophytes, have long sustained coastal communities. For millennia, they have been foraged for food, medicine, and fuel - eaten cooked, pickled, fermented, and raw, as documented in ancient texts from around the world. While their role in traditional diets is well established, it is only in recent decades that scientists have begun to explore their potential for large-scale cultivation in saline and degraded landscapes.

In the UAE, saltmarsh ecosystems are being reimagined not just as vital habitats for biodiversity and climate resilience, but as powerful drivers of cultural innovation and sustainable livelihoods. Through the 'Nature-based Solutions for Climate, Biodiversity and People' project, Emirates Nature - WWF and partners are unlocking the potential of halophytes[24] such as *Salicornia sinus-persica* and *Arthrocaulon macrostachyum, as food sources.*

By partnering with local farmers and leading chefs, halophytes are being brought into the culinary spotlight, creating new market opportunities and inspiring alternative income streams. This approach demonstrates that protecting saltmarsh habitats can go hand in hand with strengthening community resilience and revitalising cultural connections to the coast.

The widespread occurrence of salt-affected soils in arid, semi-arid, and coastal regions is a growing challenge for global food security, severely limiting conventional crop yields. As freshwater resources become scarcer and arable land comes under increasing pressure, salt-tolerant plants such as halophytes offer a powerful solution. By thriving where traditional crops cannot, halophytes present an opportunity to diversify food systems, strengthen resilience and support the development of more sustainable, climate-adapted diets for the future.

24 Emirates Nature–WWF (2025) *Halophytes: Nature-based Solutions in Coastal and Arid Landscapes*. Available at: https://www.emiratesnaturewwf.ae/sites/default/files/doc-2025-03/Halophytes_book_portrait_light%20new.pdf

Climate Regulation & Carbon Storage

Saltmarshes are among the planet's most efficient natural systems for locking away carbon, storing it in both the hardy vegetation aboveground and the dense, organic-rich soils beneath. This form of carbon storage, known as *blue carbon*, refers specifically to the carbon captured by coastal and marine ecosystems like saltmarshes, but also within mangroves and seagrasses.

Like all photosynthesising ecosystems, saltmarsh plants absorb carbon dioxide and convert it into biomass, building leaves, stems, roots and rhizomes. As these plants grow, die back, and regrow in seasonal cycles, they contribute steadily to the marsh's carbon stock in the soil, and to removals from the atmosphere.

Saltmarsh plants also trap organic matter carried in by the tides from other ecosystems — fine sediments, decaying material and detritus — some of which gets buried and contributes to the marsh's long-term carbon bank. In doing so, saltmarshes not only store carbon from within but also capture material from neighbouring habitats and river inflows. This ecological connectivity enhances their role in the wider landscape[25], supporting carbon storage while also increasing the system's resilience to pressures such as climate change and invasive species across multiple trophic levels[26].

25 Carpenter, S., Stamoulis, K.A., Mateos-Molina, D., Pittman, S.J., Antonopoulou, M., Das, H.S. and Evans, C., 2024. Interconnectivity can be as important as habitat type in explaining carbon stocks in the coastal lagoons of arid regions. Science of The Total Environment, 951, p.175504.

26 Oliver, T.H., Heard, M.S., Isaac, N.J.B., Roy, D.B., Procter, D., Eigenbrod, F., Freckleton, R., Hector, A., Orme, C.D.L., Petchey, O.L., Proença, V., Raffaelli, D., Suttle, K.B., Mace, G.M., Martín-L´opez, B., Woodcock, B.A., Bullock, J.M., 2015. Biodiversity and resilience of ecosystem functions. Trends Ecol. Evol. 30, 673–684. https://doi.org/10.1016/j.tree.2015.08.009.

Productive 'blue carbon' ecosystems

Saltmarshes are remarkably productive carbon stores (Figure 3). What sets them apart from many terrestrial ecosystems is their ability to lock carbon into anoxic and waterlogged soils where decomposition happens very slowly. This prevents carbon from being released back into the atmosphere, allowing it to accumulate in layers of carbon-rich sediment that can persist for centuries, even millennia.

While the *overall* global mitigation potential of blue carbon ecosystems is smaller than that of terrestrial forests - due to their more limited spatial extent - the *per-hectare* carbon burial rates of saltmarshes are among the highest of any natural ecosystem[27]. Their true value lies not only in this rapid accumulation, but in their dual role as nature-based solutions that support both climate *mitigation* and *adaptation*.

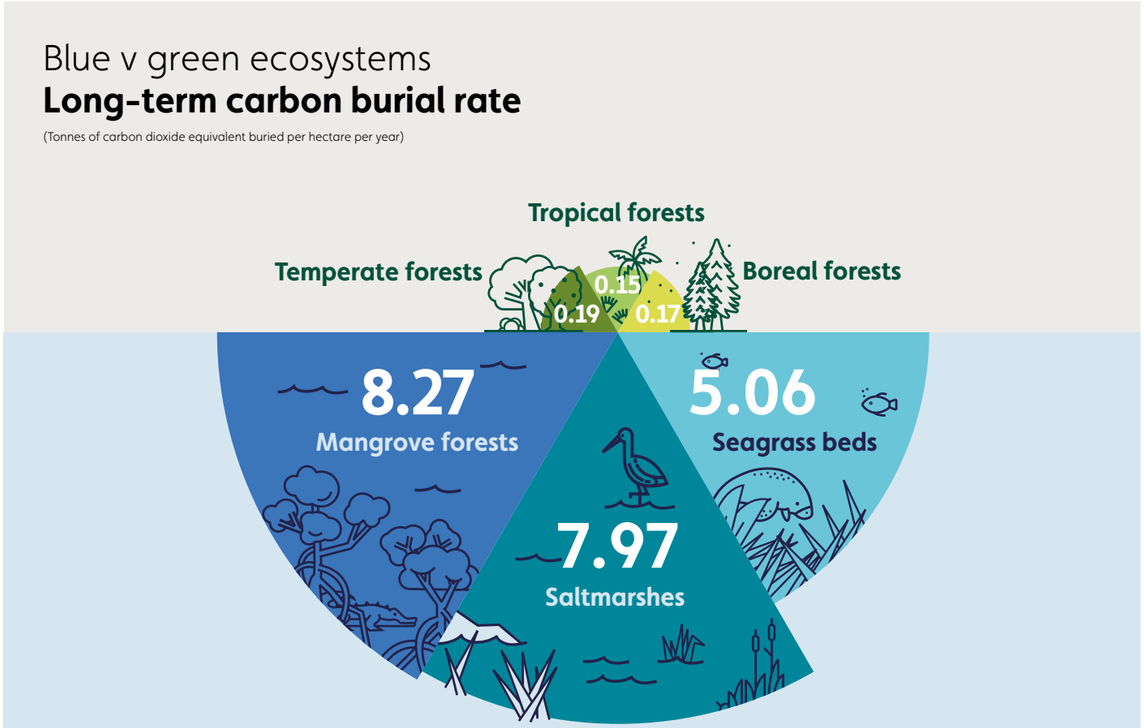

FIGURE 3: Annual carbon burial rates in blue carbon ecosystems, including saltmarshes, far exceed those of terrestrial forests. © WWT images 2023.

27 Mcleod, E., Chmura, G.L., Bouillon, S., Salm, R., Björk, M., Duarte, C.M., Lovelock, C.E., Schlesinger, W.H. and Silliman, B.R., 2011. A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO2. *Frontiers in Ecology and the Environment*, *9*(10), pp.552-560.

The top metre of saltmarsh soils holds an estimated 1.44 gigatonnes (Gt) of organic carbon globally and, in many places, much more lies beneath, reflecting thousands of years of slow accumulation[28]. On average, saltmarsh soils store around 268 tonnes of carbon per hectare in the top metre of soil[24].

These global estimates provide an essential benchmark for understanding the climate mitigation potential of saltmarshes. However, they also highlight the importance of improving the underlying data, particularly through site-specific fieldwork and refined regional estimates. In South America, for example, some values have been influenced by indirect calculations and the inclusion of ecosystems like peatlands, which can skew national-level figures[29]. Expanding in situ measurements worldwide will help ensure that carbon accounting reflects the true variability of saltmarsh systems across regions.

The top metre alone holds an estimated 1.44 gigatonnes tonnes (i.e., 1.44 billion metric tonnes) of organic carbon globally and, in many places, much more lies beneath.

The maximum carbon mitigation potential from restoring saltmarshes is 36 million tonnes (Mt) CO_2e per year[30]. With an estimated 2 million hectares of saltmarshes available for restoration worldwide[31], investing in their restoration represents a powerful, scalable solution to help remove CO_2 from the atmosphere. Saltmarshes also tend to have lower methane emissions than freshwater wetlands[32]. Since methane is a powerful greenhouse gas, restoring them may have greater climate cooling impacts.

28 Maxwell, T.L., Spalding, M.D., Friess, D.A., Murray, N.J., Rogers, K., Rovai, A.S., Smart, L.S., Weilguny, L., Adame, M.F., Adams, J.B., Austin, W.E.N., Copertino, M.S., Cott, G.M., Costa, M.D.P., Holmquist, J.R., Ladd, C.J.T., Lovelock, C.E., Ludwig, M., Moritsch, M.M., Navarro, A., Raw, J.L., Ruiz-Fernández, A.C., Serrano, O., Smeaton, C., Van de Broek, M., Windham-Myers, L., Landis, E. and Worthington, T.A., 2024. Soil carbon in the world's tidal marshes. *Nature Communications*, 15(1), p.10265.

29 Martinetto, P., Alberti, J., Becherucci, M.E., Cebrian, J., Iribarne, O., Marbà, N., Montemayor, D., Sparks, E. and Ward, R., 2023. The blue carbon of southern southwest Atlantic salt marshes and their biotic and abiotic drivers. Nature Communications, 14(1), p.8500.

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31 Macreadie, P.I., Costa, M.D., Atwood, T.B., Friess, D.A., Kelleway, J.J., Kennedy, H., Lovelock, C.E., Serrano, O. and Duarte, C.M., 2021. Blue carbon as a natural climate solution. Nature Reviews Earth & Environment, 2(12), pp.826-839.

32 Arias-Ortiz, A., Wolfe, J., Bridgham, S.D., Knox, S., McNicol, G., Needelman, B.A., Shahan, J., Stuart-Haëntjens, E.J., Windham-Myers, L., Oikawa, P.Y. and Baldocchi, D.D., 2024. Methane fluxes in tidal marshes of the conterminous United States. Global change biology, 30(9), p.e17462.

The High Cost of Saltmarsh Loss: From Carbon Sinks to Carbon Sources

When saltmarshes are degraded through pollution, coastal development or erosion, they don't just lose their function; they begin to unravel. Decades, even centuries, of stored carbon can be released. With their soils disturbed or damaged, saltmarshes could shift from being carbon sinks to carbon sources - contributing to the very emissions they once helped to absorb and bury.

Globally, coastal wetlands have already lost an estimated 46.4% of their area - a loss with serious climate implications[33]. From 2000 to 2019, net saltmarsh loss totalled 1,453 km² - an area twice the size of Singapore - at a global rate of 0.28% per year[34]. These losses resulted in emissions of approximately 16.3 Mt CO_2e per year[35], with added losses in foregone carbon burial from those areas degraded. These annual figures add up quickly and proportionally represent higher rates of annual net loss to other threatened coastal habitats, such as mangroves (0.20% loss each year).

This makes protecting intact saltmarshes one of the most effective immediate actions we can take - not just to prevent future emissions, but to safeguard the deep, irreplaceable carbon they already hold. By restoring degraded or lost saltmarshes, we can reawaken their role as nature-based climate solutions, helping to draw carbon back from the atmosphere over time, and hold on to it safely in their sediments.

From 2000 to 2019, net saltmarsh loss totalled 1,453 km² - an area twice the size of Singapore- resulting in 326 Mt CO_2e emissions

33 Davidson, N.C., 2014. How much wetland has the world lost? Long-term and recent trends in global wetland area. Marine and Freshwater Research, 65(10), pp.934-941.

34 Murray, N.J., Worthington, T.A., Bunting, P., Duce, S., Hagger, V., Lovelock, C.E., Lucas, R., Saunders, M.I., Sheaves, M., Spalding, M. and Waltham, N.J., 2022. High-resolution mapping of losses and gains of Earth's tidal wetlands. Science, 376(6594), pp.744-749

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Coastal Resilience and Disaster Risk Reduction

Saltmarshes are increasingly recognised as vital components of nature-based climate adaptation strategies, offering cost-effective coastal protection that complements or replaces engineered infrastructure. Saltmarshes act as horizontal levees, naturally buffering coastlines by slowing water movement, dissipating tidal energy and trapping sediment.

Recent global analyses confirm this: saltmarshes reduce wave heights[36] by an average of 40% and coastal flooding by nearly 47%, with up to 38% reductions in infrastructure damage during extreme weather events[37]. These natural defences perform best when saltmarshes are healthy, expansive and intact.

Globally, coastal wetlands including saltmarshes, provide storm protection services valued at an estimated USD $447 billion per year (2015 prices), while saving approximately 4,620 lives annually[38]. In England and Wales alone, saltmarshes contribute an estimated GBP £2.05 billion in flood mitigation benefits.[39]

Their buffering capacity is particularly pronounced in well-established marshes, where vegetation structure and sediment accumulation raise marsh surfaces relative to sea level over time[40]. As a result, older and healthier saltmarshes are generally more effective at protecting inland areas during extreme weather events.

During Hurricane Sandy in 2012, coastal wetlands across the northeastern United States are estimated to have prevented over USD $625 million in flood damages, with significant savings recorded in New Jersey alone[41]. Areas with intact marshes experienced over 10% less damage on average compared to adjacent regions where wetlands had been lost or degraded. Healthy saltmarshes also reduced erosion and lowered flood depths, demonstrating their vital role as living coastal defences.

However, the effectiveness of saltmarshes as nature-based coastal defence solutions is not uniform. Their protective function depends on factors such as marsh width, vegetation density, elevation relative to sea level and the degree of wave exposure. Therefore, maintaining healthy, expansive marshes and restoring degraded ones is crucial for maximising their protective value.

"Pointing out that the 'horizontal levees' of coastal marshes are more cost-effective protectors against hurricanes than constructed vertical levees and that they also store carbon that would otherwise be emitted into the atmosphere implies that restoring or recreating them for this and other benefits is only using our intelligence and ingenuity, not betting against it"

– Robert Constanza[42]

Professor of Ecological Economics at the Institute for Global Prosperity (IGP) at University College London (UCL)

36 Shepard, C.C., Crain, C.M. and Beck, M.W., 2011. The protective role of coastal marshes: a systematic review and meta-analysis. PloS one, 6(11), p.e27374.
37 Rowland, P.I., Duarte de Paula Costa, M., Macreadie, P.I. and Wartman, M. (2025) 'Review of methods for quantifying the benefits of coastal wetlands in absorbing and buffering extreme weather event impacts on coastal infrastructure', Ecosystem Services, 73, 101722. https://doi.org/10.1016/j.ecoser.2025.101722
38 Costanza, R., Anderson, S. J., Sutton, P., Mulder, K., Mulder, O., Kubiszewski, I., Wang, X., Liu, X., Pérez-Maqueo, O., Martinez, M. L., Jarvis, D., & Dee, G. (2021). The global value of coastal wetlands for storm protection. Global Environmental Change, 70, 102328.
39 Office of National Statistics: Saltmarsh flood mitigation in England and Wales, natural capital: 2022
40 Van Wijnen, H.J. and Bakker, J.P. (2001) 'Long-term surface elevation change in salt marshes: a prediction of marsh response to future sea-level rise', Estuarine, Coastal and Shelf Science, 52(3), pp. 381–390. https://doi.org/10.1006/ecss.2000.0759
41 Narayan, S., Beck, M.W., Wilson, P., Thomas, C.J., Guerrero, A., Shepard, C.C., Reguero, B.G., Franco, G., Ingram, J.C. and Trespalacios, D., 2017. The value of coastal wetlands for flood damage reduction in the northeastern USA. Scientific Reports, 7, p.9463. doi:10.1038/s41598-017-09269-z
42 Costanza, R., De Groot, R., Sutton, P., Van der Ploeg, S., Anderson, S.J., Kubiszewski, I., Farber, S. and Turner, R.K., 2014. Changes in the global value of ecosystem services. Global environmental change, 26, pp.152-158.

Biodiversity

Saltmarshes carry an outsized biodiversity value. These dynamic, shifting ecosystems are home to a remarkable cast of species uniquely adapted to the rhythms of salt and tide. Because they are constantly shaped by the ebb and flow of the sea, saltmarshes favour specialists: creatures able to survive and thrive amid daily floods, saline soils and seasonal extremes. From the hidden world of invertebrates living in the mud to great flocks of migratory birds crossing continents, saltmarshes underpin vital webs of life across the globe.

Living in these wetlands demands extraordinary adaptations. Many estuarine organisms must tolerate not only high salinity but also dramatic environmental changes, from regular submergence under tidal waters to exposure to air and sun at low tide. Mobile creatures like fish and some invertebrates move with the tides, but for plants and less mobile organisms, survival requires special strategies: burrowing deep into mud, developing larger underground structures or evolving physiological salt tolerance. Halophytic plants and microscopic algae are the primary producers of these habitats, building dense mosaics of salt prairies and shrublands that increase habitat complexity and support greater biodiversity than nearby unvegetated mudflats.

For marine species, saltmarshes are an irreplaceable nursery. Juvenile fish such as yellowfin bream and mullet in Australia's coastal marshes, or sea bass in the saltmarsh creeks of Europe, depend on these habitats to breed, shelter and grow. In Mont Saint-Michel Bay in France, over 100 fish species move between intertidal flats and marshland, their young protected by the dense, fibrous vegetation from larger predators that arrive on higher tides[43].

In North America, the saltmarshes of the southeastern United States, from Georgia to Louisiana, are vital nurseries for commercially important species like blue crabs, shrimp and red drum. These fisheries, worth billions of dollars annually, depend on the shelter and rich feeding grounds that saltmarshes provide for juvenile fish and crustaceans during their most vulnerable stages.

The wetlands' soft sediments teem with life. Invertebrates like amphipods, isopods, shrimps, crabs, and molluscs — critical to the marine food web, find refuge here. These creatures not only support fish but also provide essential food for larger predators such as otters, which thrive along saltmarsh fringes.

"Breeding Grounds of Resilience"

Saltmarshes are among the most productive nursery habitats on Earth.

The biodiversity of saltmarshes extends far beyond the marine realm. Saltmarshes are home to small mammals, reptiles and an astonishing variety of insects. In Argentina, for instance, wild guinea pigs graze on saltmarsh vegetation, shaping plant diversity through their foraging. Marsh reptiles — from terrapins and sea turtles to saltmarsh snakes and, in certain areas, alligators — move amid the tall grasses and seek shelter in tidal pools. Even during high tides, saltmarsh spiders exhibit extraordinary adaptations: clinging to tall grasses or trapping bubbles of air in their hairs to survive underwater until the tides recede.

Saltmarshes also once supported even larger mammals. Fossil records and historical accounts reveal that species like the European bison, wild horse, marsupials and moose occupied and visited saltmarsh ecosystems before human alteration of coastlines. Today, saltmarshes continue to provide vital habitat for semi-aquatic mammals like otters, while their ecological history offers a glimpse into the richness these habitats once supported — and, in some places, still do.

Birds, however, are the most visible testament to the richness of saltmarsh biodiversity. While some birds are resident specialists, saltmarshes act as both breeding grounds and vital migratory pathways. In the northern hemisphere, saltmarshes provide winter refuge for vast flocks of geese — including snow geese, pink-footed geese, barnacle geese and brent geese — who feed on the nutrient-rich plants to build body mass for their long migrations.

FUEL FOR FLIGHT: THE GLOBAL IMPORTANCE OF SALTMARSHES FOR MIGRATORY BIRDS

Every year, billions of migratory birds cross the planet, following ancient aerial highways known as **flyways**. These epic journeys, stretching from the Arctic tundra to southern continents, rely on a network of critical stopover habitats — and saltmarshes are among the most important.

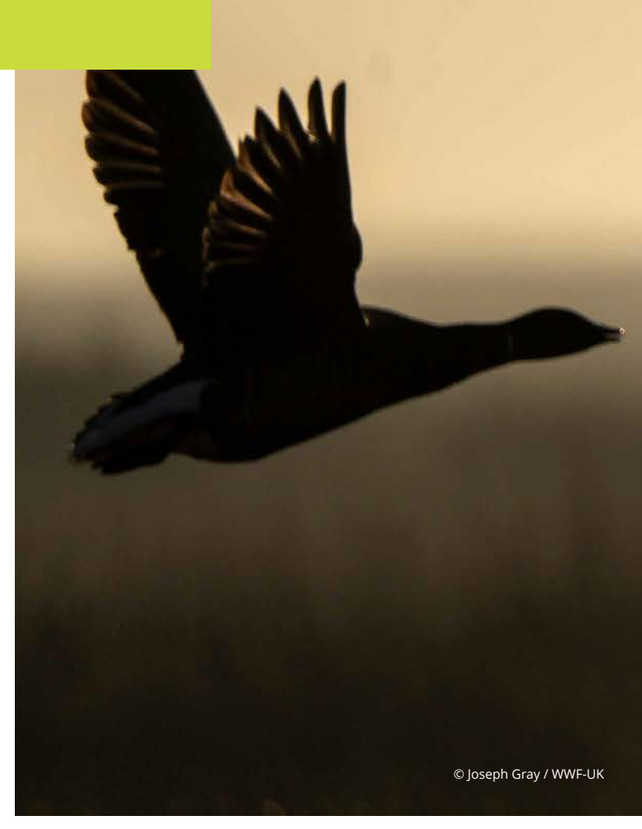
From the **East Atlantic Flyway** in Europe and Africa to the **East Asian–Australasian Flyway** spanning Siberia, China, Australia, and beyond, saltmarshes and tidal flats offer safe havens where birds can rest and refuel. In the Yellow Sea region of East Asia, vast coastal wetlands comprising interconnected saltmarshes, tidal flats and artificial wetlands support millions of migratory shorebirds, providing crucial stopover and wintering habitat in the East Asian-Australasian Flyway. Species like the critically endangered spoon-billed sandpiper depend on these shrinking wetlands to rest and refuel during journeys between breeding and wintering grounds. Here, birds feast on abundant invertebrates, build up essential fat stores and prepare for the next leg of their travels.

Protecting and restoring saltmarshes across the world's flyways will require transboundary cooperation, integrated habitat planning, and investment from flyway-wide partnerships.

Many invertebrates, from shrimps to gastropods, are detritivores, feeding on decaying plant material and recycling nutrients. Their activities help lock carbon into sediments - an important co-benefit that supports both biodiversity and climate resilience.

Bivalves also play a surprisingly important role. Where they grow around the roots of saltmarsh plants, they improve freshwater retention and reduce soil salinity, aiding marsh recovery after droughts[44] — an interspecies partnership that speeds up ecosystem restoration.

From the bustling saltmarshes of Australia's estuaries, to the tidal wetlands along the South China coast, to the sprawling marshes of Atlantic shores, these ecosystems are biodiversity hotspots, migration hubs and nursery grounds all at once. Protecting, restoring and reconnecting saltmarshes is not just a biodiversity issue. It is fundamental to the future health of our oceans — and of the species, including ourselves, who depend on them.



43 Laffaille, P., Feunteun, E., Lefeuvre, J.C. (2000). Role of fish communities in particulate organic matter fluxes between salt marshes and coastal marine waters in Mont Saint-Michel Bay. Hydrobiologia, 426(1), 147–158.

44 Angelini, C., Griffin, J., van de Koppel, J. et al. A keystone mutualism underpins resilience of a coastal ecosystem to drought. 2016. Nat Commun 7, 12473.

SPARTINA – FOUNDATION SPECIES OR COASTAL INVADER?

Spartina species (cordgrass) is one of the most ecologically important and widely distributed saltmarsh plant genera in the world. In native temperate marshes - such as the southeastern United States - species like Spartina alterniflora form the backbone of the ecosystem. Their dense root systems act as ecosystem engineers to stabilise sediment, trap organic matter, and create critical habitat for other species. In addition to these physical functions, Spartina also contributes to food webs by producing detritus that fuels trophic interactions with invertebrates, fish, and birds. These processes support nursery habitats for commercially valuable species like blue crabs and shrimp.

Yet, Spartina also tells a story of ecological caution. In many parts of the world, it has become invasive — most notably in China, the UK and along the west coast of North America - following intentional introductions for coastal protection or accidental spread. In China's Yellow Sea region, Spartina alterniflora has outcompeted native mudflat species, altered sediment dynamics, and reduced available habitat for migratory shorebirds, including the critically endangered spoon-billed sandpiper.

Efforts to manage Spartina invasions vary widely. In San Francisco Bay, large-scale removal has been undertaken to restore native tidal marshes and intertidal flats, while in China, integrated approaches are being developed to balance erosion control with the needs of biodiversity. In the UK, hybrid Spartina anglica (a species which originated by hybridization between the Eastern Atlantic S. maritima and the Western Atlantic S. alterniflora) has transformed mudflats in some estuaries, prompting both control efforts and ecological debate over its management.

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The story of Spartina underscores the complexity of saltmarsh biodiversity. Its global spread highlights the importance of context-specific conservation and restoration strategies - rooted in both science and local ecological history.

The Full Value of Saltmarshes: Recognising What Can - and Cannot - Be Measured

While the global importance of saltmarshes for carbon storage, fisheries and disaster risk reduction is increasingly well recognised, many of their additional benefits — such as nutrient retention, microplastic capture or cultural and spiritual significance — remain underrepresented in global assessments and economic valuations. In many geographies, these contributions have yet to be fully studied or documented. This lack of comprehensive data should not be mistaken for a lack of value.

Rather, it highlights an urgent need: to broaden how we measure, communicate and protect the full richness of what saltmarshes provide. They are not only carbon sinks or biodiversity reservoirs, but dynamic landscapes of resilience, connection and regeneration. Protecting and restoring them offers one of the most multi-dimensional opportunities for building a future where both people and nature thrive.

It highlights an urgent need: to broaden how we measure, communicate and protect the full richness of what saltmarshes provide.

4 SCALING SOLUTIONS: CONSERVATION, RESTORATION & SUSTAINABLE USE

By Wetlands International

Evidence-Based Action for a Resilient Future

The recovery of saltmarsh ecosystems hinges on scaling up conservation, restoration and sustainable management actions that are rooted in evidence, adaptable to local contexts and aligned with global climate and biodiversity targets. Saltmarshes, though frequently overlooked, offer some of the most cost-effective and multifunctional nature-based solutions available today.

This section draws heavily from the guidance *Restoration, Creation and Management of Salt Marshes and Tidal Flats* by the Conservation Evidence Group at the University of Cambridge and Wetlands International[45], alongside practical experiences and scientific findings contributed by global experts. The goal: to chart a practical, flexible and evidence-informed path to saltmarsh recovery at scale.

From Planning to Practice: A Stepwise Approach

Effective restoration begins with clearly defined, function-oriented ecological targets. Restoration should not aim solely at structural change but should re-establish key ecosystem functions—such as coastal flood attenuation, fish nursery provisioning and biodiversity support.

To support a shared vision for ecosystem recovery, the UN Decade on Ecosystem Restoration (2021–2030) has developed core principles for achieving the highest level of ecological and social restoration. Building on these, the *Standards of Practice to Guide Ecosystem Restoration*[46] outlines best practices across five key phases: assessment (evaluating degradation and context), planning and design (defining goals and constraints), implementation (ensuring inclusive, equitable participation), ongoing management (addressing long-term needs), and monitoring and evaluation (tracking progress toward goals).

In line with these principles, a recommended stepwise framework - abbreviated from a more detailed step process - outlines the essential phases for effective, evidence-based saltmarsh restoration:

1. Site Selection and Assessment – understand geomorphology, hydrology, sediment dynamics, land-use history and socio-political constraints.
2. Stakeholder Engagement – build ownership with communities, governments and sectoral actors, especially at the local scale.
3. SMART Targets – set specific, measurable, achievable, relevant and time-bound objectives.
4. Design and Implementation – apply best-available evidence and integrate local knowledge.
5. Monitoring and Adaptive Management – track functional outcomes, over a broad array of ecological metrics and refine approaches over time.

45 Restoration, creation and management of salt marshes and tidal flats. Available here.

46 Nelson, C.R., Hallett, J.G., Romero Montoya, A.E., Andrade, A., Besacier, C., Boerger, V., Bouazza, K., Chazdon, R., Cohen-Shacham, E., Danano, D., Diederichsen, A., Fernandez, Y., Gann, G.D., Gonzales, E.K., Gruca, M., Guariguata, M.R., Gutierrez, V., Hancock, B., Innecken, P., Katz, S.M., McCormick, R., Moraes, L.F.D., Murcia, C., Nagabhatla, N., Pouaty Nzembialela, D., Rosado-May, F.J., Shaw, K., Swiderska, K., Vasseur, L., Venkataraman, R., Walder, B., Wang, Z., & Weidlich, E.W.A. 2024. Standards of practice to guide ecosystem restoration – A contribution to the United Nations Decade on Ecosystem Restoration 2021-2030. Rome, FAO, Washington, DC, SER & Gland, Switzerland, IUCN CEM. https://doi.org/10.4060/cc9106en

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Table 1. Summary of Restoration and Management Techniques

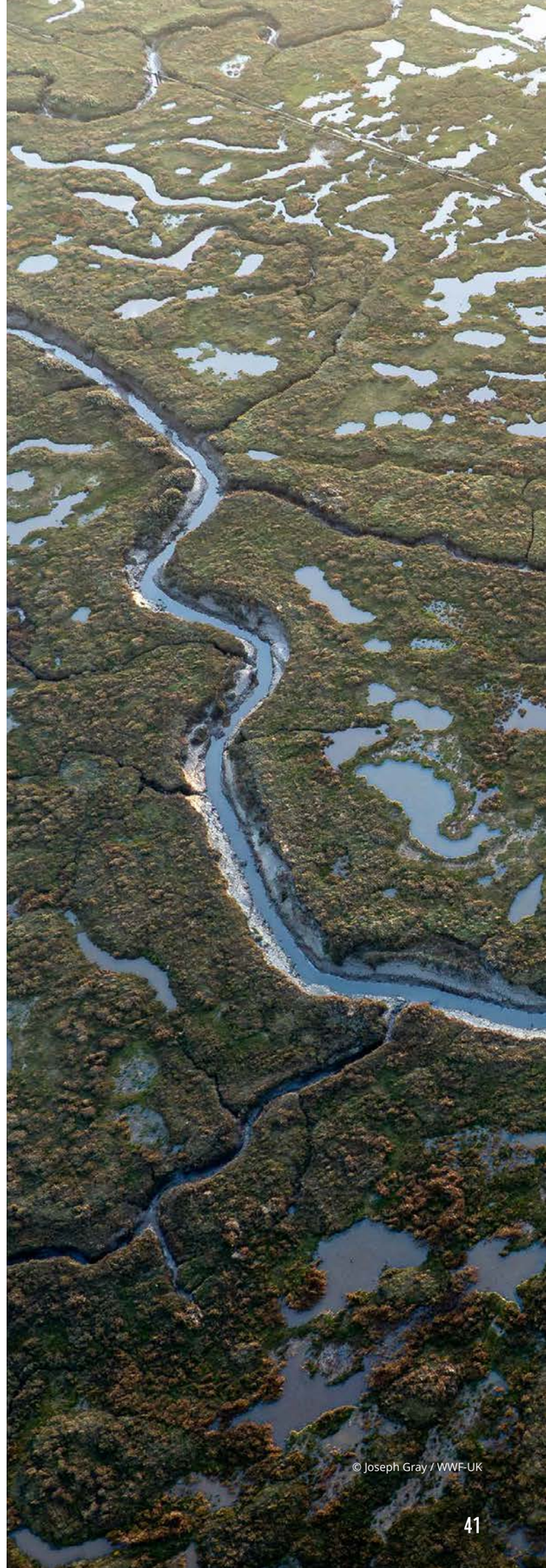
TECHNIQUE	DESCRIPTION	APPLICATIONS & CONSIDERATIONS
Managed Realignment (Dike Breaching)	Breaching, removing, or setting back sea defences to restore tidal flow and natural marsh processes.	Used extensively in Europe and the United States; enhances habitat complexity and reduces maintenance costs of seawalls. Full ecological benefits can take years to mature.
Regulated Tidal Exchange (RTE)	Using sluices or culverts to control tidal inflow, enabling partial restoration.	Appropriate where full reintroduction of tides would not be possible. Allows staged adaptation.
Beneficial Use of Dredged Sediment (BuDS) / thin layer placement	Using dredged material to raise marsh elevations and aid plant colonisation.	Supports marsh accretion and resilience to sea-level rise. Requires careful attention to grain size, compaction, and hydrology.
Reprofiling and creek blocking	Reshaping land to create pools, ridges, or slopes, and re-wetting previously drained marshes	Enhances habitat heterogeneity and accelerates ecological wrecovery. Heavy machinery and ecological sensitivity must be balanced.
Vegetation Restoration	Active planting or seeding to aid colonisation.	Needed where natural seed sources are limited. Suitable species must match site salinity, elevation, and tidal regime.
Invasive Species Control	Removal or suppression of non-native species like *Spartina alterniflora*.	Requires persistence and adaptive monitoring. Often essential to maintain biodiversity and function.
Biodiversity Enhancement	Creating microhabitats such as nesting islands, tidal pools, or driftwood zones.	Boosts structural diversity and species richness. Can be integrated into restoration design.

Emerging innovations are also improving saltmarsh restoration outcomes. One potentially promising example is the use of eco-friendly structures (EFS) made from biodegradable materials to support early-stage plant establishment. These structures help stabilise sediments, attenuate water flow and provide anchorage for vegetation, particularly in exposed or erosion-prone sites. This exemplifies the broader need to embrace adaptive, evidence-led experimentation in saltmarsh restoration — combining traditional techniques with emerging technologies to boost resilience and functionality across diverse coastal settings.

While considerable progress has been made in restoring and managing saltmarshes, there remain important areas for further development. Many regions would benefit from context-specific, evidence-based guidance that can support effective conservation action. Continued investment is needed in long-term monitoring, adaptive management and the integration of traditional and local knowledge. Further efforts should also focus on underrepresented topics such as sustainable use, climate adaptation and habitat connectivity. In particular, a deeper understanding of upstream–downstream sediment dynamics is essential. Sediment supply underpins the long-term stability of saltmarshes, influencing their capacity to adapt to sea-level rise and erosion pressures.

Strengthening this knowledge base will support the implementation of effective nature-based solutions and integrated catchment-coastal management. Initiatives like the *World Coastal Ecosystems Conservation Toolkit* are addressing these gaps by fostering a global community of practice, promoting knowledge exchange, and delivering modular, evidence-informed guidance. This evolving body of work is essential to ensure that conservation actions are effective, scalable, and grounded in the best available science.

This exemplifies the broader need to embrace adaptive, evidence-led experimentation in saltmarsh restoration — combining traditional techniques with emerging technologies to boost resilience and functionality across diverse coastal settings.



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BENEFICIAL USE OF DREDGED SEDIMENT (BUDS): RESTORING COASTAL RESILIENCE

Saltmarsh restoration requires context-specific approaches that respond to local ecological conditions and landscape dynamics. One increasingly promising technique is the Beneficial Use of Dredged Sediment (BuDS) — also known as thin layer placement - repurposing dredged material to restore elevation, reduce erosion, and support plant and faunal recolonisation.

In the United States, Blackwater National Wildlife Refuge in Maryland offers one of the most advanced examples of saltmarsh restoration using thin layer placement[47]. The refuge has experienced significant marsh loss due to sea-level rise and subsidence. In response, a large-scale project placed over 26,000 m³ of dredged material in a thin layer across nearly 24 hectares of degraded marsh. This restored elevation and hydrologic function while creating favourable conditions for native vegetation and wildlife. Early results showed rapid stabilisation of sediment, re-emergence of saltmarsh grasses, and the return of target species like the saltmarsh sparrow.

In the UK, the **Solent Seascape Project** is trialling BuDS for saltmarsh as part of a broader effort to restore coastal habitats across the Solent Estuary. Collaborating with Land & Water/Earth Change, the team developed a Saltmarsh Restoration Drag Box (SDRB)—a novel technique to place consolidated dredged sediment directly onto saltmarsh surfaces without requiring retaining fences or altering ongoing dredging operations. Over 1,500 m³ of sediment was placed with minimal environmental disruption, low sediment loss, and promising conditions for marsh plant colonisation. Early observations reported rapid sediment stabilisation and even geese foraging on the restored area shortly after placement.

Globally, it is estimated that only around 1% of dredged sediment is used for ecological restoration—representing a major untapped opportunity. These case studies illustrate that, when applied thoughtfully, and where sediments are suitable for ecological use, BuDS can be an effective tool for rebuilding resilient saltmarsh systems and enhancing coastal protection.

47 https://tlp.el.erdc.dren.mil/blackwater-national-wildlife-refuge-restoration/

Enabling policy interventions

The Ramsar Convention on Wetlands, the UNFCCC and the CBD, are amongst the main international frameworks and conventions that address the importance of blue carbon ecosystems, and provide mechanisms for countries to develop policies, strategies and management commitments to guide action towards protecting coastal and marine ecosystems. However, efforts to facilitate the identification of similarities across contributions made by a country to mainstream each country's action towards a multitude of international commitments is limited and often not streamlined.

Local and international policies have influence over the future of saltmarshes given their distribution and ecosystem services. These policies range from local zoning regulations to global biodiversity and climate agreements. Subsequently, coordinated action and robust policy frameworks are required to ensure adequate and effective protection at local and national levels is achieved.

THE WADDEN SEA: COLLABORATIVE GOVERNANCE AND ADAPTIVE MANAGEMENT

The Wadden Sea, stretching across the coasts of the Netherlands, Germany, and Denmark, is the world's largest tidal flat system and home to over 42,000 hectares of saltmarsh - around 20% of Europe's total. Once heavily altered by drainage and land reclamation, these marshes have been the focus of major conservation efforts since the 1970s.

In 1978, the three countries established the **Trilateral Cooperation on the Protection of the Wadden Sea,** committing to manage it as a single ecological entity. Their shared goal is to maintain a natural and sustainable ecosystem shaped by undisturbed processes.

Saltmarsh management reflects this cooperative approach. Passive management focussing on natural dynamics is common in Germany and Denmark, while the Netherlands also favours active conservation grazing. Restoration efforts increasingly focus on enhancing natural morphology and integrating priorities like carbon sequestration.

Joint ecological targets set in the Trilateral Wadden Sea Plan (2010), including coordinated monitoring, assessment and shared learning - synthesised in the **Quality Status Report** - have supported steady gains in saltmarsh area since the 1990s. This case study highlights the value of long-term, cross-border collaboration in adapting to environmental change and restoring saltmarsh landscapes at scale.

International Developments for Saltmarsh Action

International commitments and agreements help drive unified action relating to the restoration and protection of saltmarshes. These agreements help to guide national commitments and distribute funding effectively. These include: The Ramsar Convention on Wetlands, the UNFCCC's UAE Consensus and the CBD's Global Biodiversity Framework.

The Ramsar Convention on Wetlands:
The Convention on Wetlands provides a global framework for intergovernmental cooperation on wetland issues, with 172 Parties.
Its mission is the 'conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world'[48].
The Convention sets international frameworks and promotes transboundary collaboration for wetland conservation under a formal agreement. Targets under the Convention include promoting the conservation, restoration and sustainable management of saltmarshes.

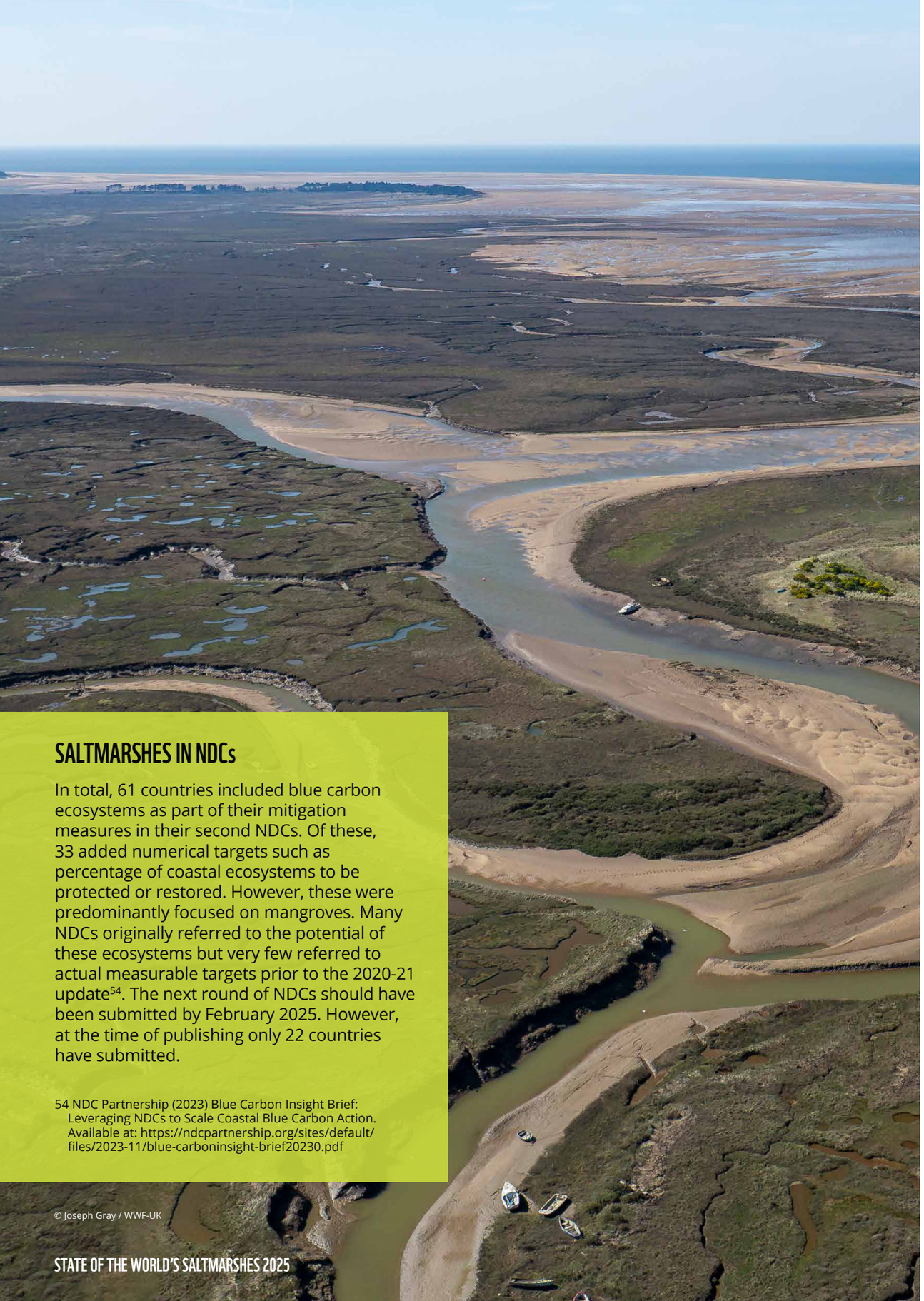
The CBD and the Kunming-Montreal Global Biodiversity Framework:
The CBD references coastal blue carbon ecosystems throughout the Convention, particularly relevant to their conservation, restoration and sustainable use, in the provision of Article 8: "Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of plans or other management strategies..."[49].

In 2022, the historic Kunming-Montreal Global Biodiversity Framework was adopted[50]. The Framework mandates for countries to halt and reverse biodiversity loss by 2030. Saltmarshes fall under Target 3, conserving 30 per cent of land, waters and sea, Target 2, restoring 30 per cent of all degraded ecosystems, Target 1 on reducing biodiversity loss connected to spatial planning and Target 8, minimising the impacts of climate change on biodiversity and build resilience. Parties to the CBD must now update their National Biodiversity Strategies and Action Plans (NBSAPs) in line with the targets of the Global Biodiversity Framework. In 2024, 13% of 24 NBSAPs explicitly mentioned saltmarshes in relation to Target 8 (Canada, Republic of Korea)[51]. Therefore, there is an opportunity for more Parties to include saltmarsh within their NBSAPs while also meeting commitments under the Ramsar Convention.

The UNFCCC and the UAE Consensus:
The UNFCCC references to the importance of coastal ecosystems, including saltmarshes, for climate change mitigation and adaptation, and can be found throughout the entirety of the UNFCCC structure, in particular in the Preamble: "....Aware [the Parties] of the role and importance in terrestrial and marine ecosystems of sinks and reservoirs of greenhouse gases..."[52]. In 2023 at COP28 in Dubai, the first Global Stocktake took place. Countries agreed to a landmark transition away from fossil fuels[53]. This included a call for concerted climate action on oceans including the protection and restoration of coastal ecosystems, enhancing ocean-based mitigation strategies and increasing ocean-based resilience measures.

This highlights that the protection, restoration and conservation of blue carbon ecosystems is an important nature-based solution that counties can use to help meet global climate and biodiversity targets. These solutions are often identified as low-regret options that offer significant and cost-effective mitigation and adaptation measures, while also offering numerous socio-economic co-benefits. There are viable opportunities for all 120 countries who have saltmarsh, to include them within their national climate and biodiversity plans.

48 Ramsar Convention Available: https://www.ramsar.org/about/convention-wetlands-and-its-mission
49 Convention on Biological Diversity (CBD), 1992. Article 8: In-situ conservation. [online] Available at: https://www.cbd.int/convention/articles/default.shtml?a=cbd-08
50 https://www.cbd.int/gbf
51https://www.wetlands.org/publication/assessing-the-inclusion-of-wetlands-in-national-biodiversity-strategies-and-action-plans/
52 United Nations Framework Convention on Climate Change (UNFCCC), 1992. Preamble. [online] Available at: https://unfccc.int/resource/docs/convkp/conveng.pdf
53 UNFCCC (2023) Decision -/CMA.5: Sharm el-Sheikh Global Stocktake. Available at: https://unfccc.int/sites/default/files/resource/cma2023_L17_adv.pdf



SALTMARSHES IN NDCs

In total, 61 countries included blue carbon ecosystems as part of their mitigation measures in their second NDCs. Of these, 33 added numerical targets such as percentage of coastal ecosystems to be protected or restored. However, these were predominantly focused on mangroves. Many NDCs originally referred to the potential of these ecosystems but very few referred to actual measurable targets prior to the 2020-21 update[54]. The next round of NDCs should have been submitted by February 2025. However, at the time of publishing only 22 countries have submitted.

54 NDC Partnership (2023) Blue Carbon Insight Brief: Leveraging NDCs to Scale Coastal Blue Carbon Action. Available at: https://ndcpartnership.org/sites/default/files/2023-11/blue-carboninsight-brief20230.pdf

NATIONAL BIODIVERSITY STRATEGIES AND ACTION PLANS (NBSAPs)

Decision 15/6 of the Global Biodiversity Framework explicitly suggests that NBSAPs should promote synergies across other multilateral agreements such as the Ramsar Convention and the other Rio Conventions[55]. Therefore, there is a key opportunity for governments to meet the targets of multiple conventions that maximise synergies and streamline resources.

55 CBD (2022) COP 15 Decision 06: Kunming–Montreal Global Biodiversity Framework. Available at: https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-06-en.pdf

There is potential for further coordination across these Conventions. A joint work plan established between the subsidiary bodies could help identify the best options for integrated action for saltmarsh protection, restoration and conservation. This could also provide guidance for how to measure progress against key targets relevant to saltmarsh. In addition, the IPCC and IPBES could also strengthen their cooperation around saltmarsh.

Specific bodies could also be utilised such as the Biodiversity Expert Group, the Ocean Expert Group of the Nairobi Work Programme could also provide concrete guidance for governments on how to incorporate ocean-climate action into their NBSAPs, NDCs and NAPs alongside the CBD Secretariat. Guidance could also be provided to governments to develop coherent policies that can be translated into on the ground action. Governments should seek to establish coordinated processes across different ministries and focal points to ensure optimal resource allocation.

Civil Society Action

Key to accelerating action on saltmarsh-based solutions in global policy is enhancing the role and visibility of Non-State Actors. Ocean-based climate solutions, including saltmarsh conservation, restoration and sustainable management, rely on close cooperation between governments and local stakeholders, intergovernmental organisations, non-governmental organisations and companies.

Non-state actors are critical to facilitating solutions and helping to deliver on-the-ground implementation at each level including regional and local. Working alongside governments they can help drive transformative change alongside clear pathways and goals. For instance, cities with direct control of spatial planning, natural resources and land management are ideally positioned to deliver of nature-positive targets around restoration while considering trade-offs with other sectors. For example, in Australia the Townsville City Council is restoring 69 hectares of urban saltmarsh by addressing human-induced pressures caused by development and pollution[56]. Non-stare actors are a critical part of the equation to achieve global targets.

In 2022, the Blue Ambition Loop Report was launched at UNFCCC COP27 (Sharm El Sheik, Egypt) to connect the ocean sub-sectors across the 2030 Breakthrough Agenda and provide a snapshot of progress by non-state actors. The following year, the Ocean Breakthroughs were launched and received overwhelming support from both Parties and non-state actors at UNFCCC COP28 (Dubai, UAE). The Ocean Breakthroughs identify five turning points to reach by 2030 to achieve a healthy and productive ocean in 2050. They are science-based targets, designed to boost mitigation and adaptation efforts for the benefit of people and nature.

The Marine Conservation Breakthrough targets finance of at least USD $72 billion by 2030 to secure the integrity of ocean ecosystems by protecting, restoring, and conserving at least 30% of the ocean for the benefit of people, climate and nature. The Saltmarsh Breakthrough will sit under the Marine Conservation Breakthrough with targets developed in the coming months.

The conclusions of the first Global Stocktake were unequivocal: the world is not on track to limit global warming to 1.5°C. While Parties will be expected to respond with updated and more ambitious national strategies by COP30, in Brazil, in 2025 (i.e., as part of the next NDC revision cycle), the Ocean Breakthroughs are currently the only established pathways for ocean sub-sectors to deliver on the climate and nature targets.

56 Townsville City Council (n.d.) Townsville's Living Coastlines: Space for Saltmarshes Project. Available at: https://www.townsville.qld.gov.au/building-planning-and-projects/council-projects/under-development/townsvilles-living-coastlines-space-for-saltmarshes-project

TOOLS TO SUPPORT POLICY FRAMEWORKS

IPCC Wetlands Supplement: Tidal marshes, mangroves and seagrasses (known as blue carbon ecosystems, BCEs) are included within the 2013 Supplement to the 2006 Intergovernmental Panel on Climate Changes (IPCC) Guidelines for National Greenhouse Gas Inventories: Wetlands (or 'Wetlands Supplement'). This provides detailed guidance for countries on how to estimate and report GHG emissions and removals from these ecosystems[57]. Only these three ecosystems have IPCC-approved guidance and therefore proper accounting of their mitigation potential, although other blue carbon ecosystems may be incorporated in future. In 2023 only 18 countries included BCEs within their GHG inventories. China explicitly references the "carbon sequestration capacity of mangroves, seagrass beds, saltmarshes and others"[58]. There is therefore scope to support countries to include these critical ecosystems within their GHG inventories and thereby include concrete mitigation targets associated with their coastal ecosystems.

NDC Partnership and NBSAP Accelerator Partnership: The NDC Partnership is a global coalition bringing together more than 200 members to help deliver ambitious climate action. Similarly, the NBSAP Accelerator Partnership brings together 21 non-state actors and 52 countries to strengthen global, regional and national ambition for biodiversity plans[59]. Initiatives such as these can help support Parties with human, technical and technology capacity gaps alongside actionable plans to address them. Many countries are beginning to request support through the NDC Partnership to conduct blue carbon related activities to enhance and implement their NDCs. Between 2017 and 2023, 25 countries submitted 183 requests for support on 'blue carbon, oceans and coasts' demonstrating the ambition around the world but the lack of capacity or technical expertise to deliver these solutions[60].

57 IPCC (2014) 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands. Intergovernmental Panel on Climate Change. Available at: https://www.ipcc-nggip.iges.or.jp/public/wetlands/pdf/Wetlands_Supplement_Entire_Report.pdf

58 UNFCCC NDC Registry. China's updated NDC (p45): https://unfccc.int/sites/default/files/NDC/2022-06/China%E2%80%99s%20Achievements%2C%20New%20Goals%20and%20New%20Measures%20for%20Nationally%20Determined%20Contributions.pdf

59 UNDP and UNEP. *NBSAP Accelerator Partnership*. Available at: https://nbsapaccelerator.org/

60 NDC Partnership (2023) *Blue Carbon & Coastal Wetlands Ecosystems: Trends in NDC Partnership Support*. Available at: https://ndcpartnership.org/news/blue-carbon-coastal-wetlands-ecosystems-trends-ndc-partnership-support

5 FINANCING THE FUTURE OF SALTMARSHES

Saltmarshes are not just beautiful coastal margins — they are frontline infrastructure, economic assets to the sustainable blue economy and unsung engines of climate resilience.

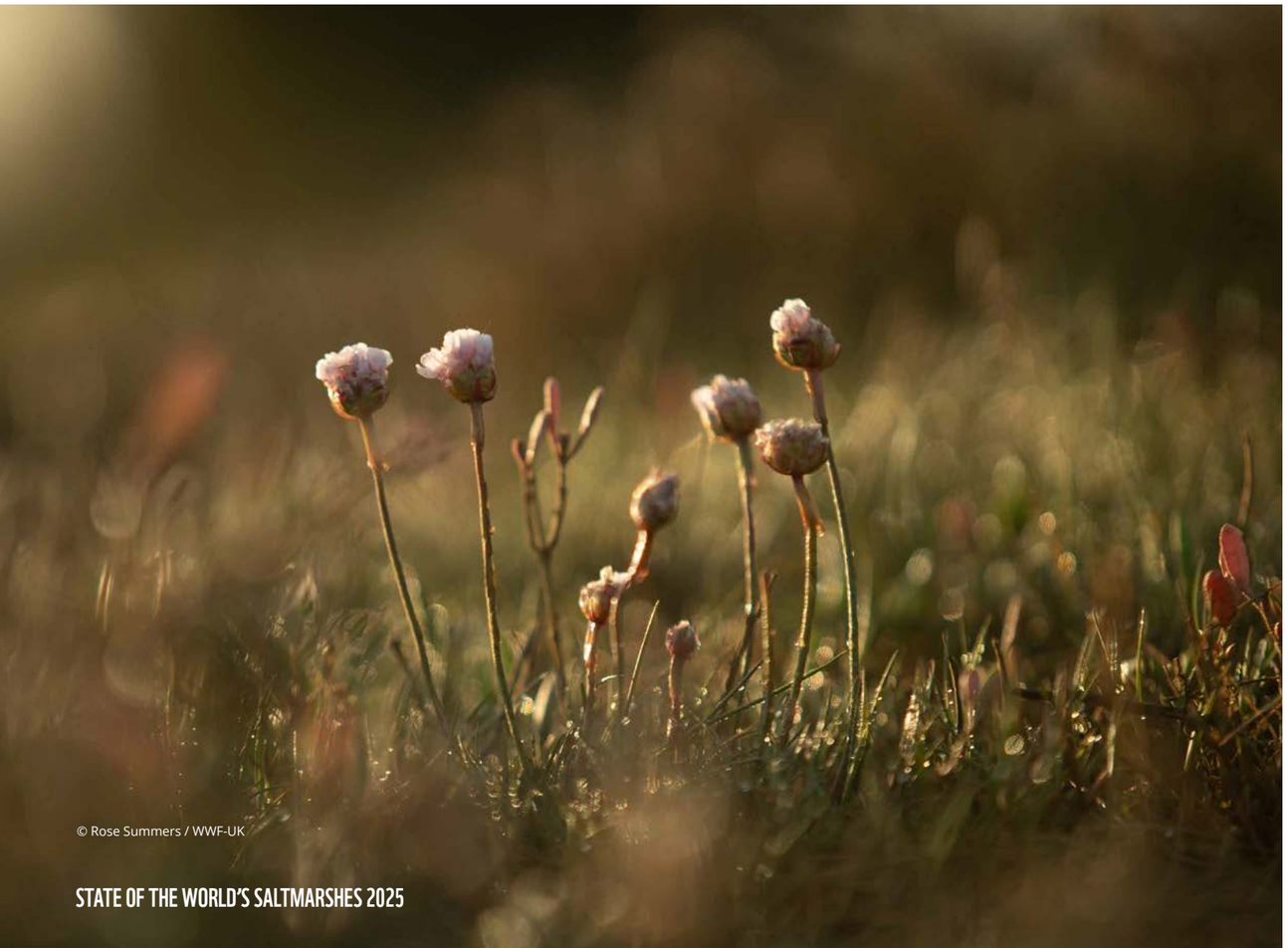
As sea levels rise and storms grow more intense, the question for coastal cities and communities is no longer *if* they will invest in protection — but *how*. Too often, the default is concrete: seawalls, dykes and artificial barriers. But nature offers another path — one that is cost-effective, regenerative and aligned with climate and biodiversity goals.

Saltmarshes and other blue carbon ecosystems also underpin thriving coastal economies. Healthy saltmarsh ecosystems offer ecosystem services valued in the billions annually. These benefits make saltmarshes not just an ecological priority, but a smart investment in long-term resilience and prosperity.

Saltmarshes cover less than 1% of Earth's surface...

...but deliver a staggering US$8.7 trillion/year in ecosystem services, cultural value, and employment.[61]

61 Wang, J.J., Li, X.Z., Lin, S.W. and Ma, Y.X., 2022. Economic evaluation and systematic review of salt marsh restoration projects at a global scale. Frontiers in Ecology and Evolution, 10, p.865516.



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Despite growing recognition of their value, saltmarsh management and conservation remains critically underfunded and under-prioritised compared to other blue carbon ecosystems like mangroves. Governments have committed to mobilising USD $200 billion annually for biodiversity conservation[62] and USD $300 billion annually by 2035 for climate action[63]. However, global financing for ocean health is scarce, and saltmarshes receive only a tiny fraction of it. Official development assistance (ODA) for the ocean economy totalled USD $3.5 billion in 2022, a 45% increase compared to 2021[64]. However, this represented only a small fraction of total ODA (1%) 2022. Private investment tells a similar story: in 2020, SDG 14 attracted only 1% of total impact finance[65].

The situation is again all too familiar when it comes to climate finance under the UNFCCC. Although annual financial flows for sectors such as forests, agriculture, land use and fisheries have surpassed USD $16 billion, the fisheries sector - the category most closely linked to blue carbon ecosystems — has received just 1% of this total, amounting to USD $160 million[66].

The result is a wide and persistent funding gap, with available resources falling far short of what is needed to secure the future of these vital ecosystems. A global study by Deutz et al. (2020) estimated that meeting annual funding needs for saltmarsh restoration through to 2050 would require between USD $4.8 -14.4 billion. Wider conservation costs, which includes saltmarsh management, would add significantly more to this.

This shortfall is especially acute in the Global South, where saltmarshes are often overlooked and under-mapped. Bridging this disparity will require not only increased investment but also better data and monitoring to support equitable conservation outcomes worldwide.

But there is hope and building momentum for marine nature-based solutions. The diverse benefits of saltmarshes enable a range of models, from blue carbon markets and biodiversity credits to blended finance models, nature-based insurance schemes and results-based climate funding. Underpinning these instruments is economic valuation, which helps make the case for investment, translating ecosystem services like flood mitigation, water quality improvements and fisheries enhancement into monetary terms that resonate with financial decision-makers.

Recognising this value is critical to bringing saltmarshes onto the balance sheet of investment portfolios. Through a combination of long-term public, private and philanthropic financing solutions, saltmarshes can move from being an undervalued asset to a critical component within nature-based climate solutions. In the following sections, we explore the mechanisms already making a difference, those poised to unlock sustainable funding at scale, and barriers to mobilising the finance needed to protect and restore saltmarshes globally.

The result is a wide and persistent funding gap, with available resources falling far short of what is needed to secure the future of these vital ecosystems.

62 CBD (2022) *COP 15 Decision 04: Enhancing planning, monitoring, reporting and review mechanisms*. Available at: https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf
63 UNFCCC (2023) *Ocean and climate change dialogue 2023: Dialogue summary report by the Chair of the Subsidiary Body for Scientific and Technological Advice*. Available at: https://unfccc.int/documents/643641
64 OECD, 2023. "Data Platform on Development Finance for the Sustainable Ocean Economy." https://oecd-main.shinyapps.io/ocean.
65 Barber, M., Mitchell, W., von Hirsch, T. and Vyas, T., 2021. A drop in the ocean: Closing the gap in ocean climate finance. Deloitte LLP.
66 Chiriac, D., Vishnumolakala, H., & Rosane, P. (2022). "Landscape of Climate Finance for Agriculture, Forestry, Other Land Uses and Fisheries." Climate Policy Initiative. Retrieved from: World Bank. 2023. Unlocking Blue Carbon Development: Investment Readiness Framework for Governments. Washington, D.C.: World Bank.

The business case for investment

Undervaluing saltmarshes has contributed to their ongoing decline — a missed opportunity for investors, insurers and policymakers alike.

While some benefits, like carbon storage, lend themselves more easily to monetisation due to carbon trading prices, others — such as cultural and spiritual values, or contributions to mental health and well-being — are harder to capture in financial models. As a result, these non-market benefits are often omitted from economic analyses, contributing to a systemic underestimation of saltmarshes' true value.

Studies that have attempted to value saltmarsh have demonstrated that their benefits far outweigh their conservation or restoration costs. Restoration studies show strong returns: in the United States, USD $1 invested in coastal projects can generate up to USD $15 in economic output[67]; in the UK, every GBP £1 invested in saltmarshes can yield GBP £3–£9.30 in combined economic and social value[68,69]. However, in most cases the economic benefits from flood and climate resilience account for majority of the monetisable benefits.

With proven returns in flood protection – taken together with carbon storage, and biodiversity support - saltmarshes offer one of the most cost-effective nature-based investments available. Their value spans economic, social and environmental dimensions. Scaling up protection and restoration is not just an environmental imperative, but a strategic investment in climate resilience and long-term prosperity.

According to The Nature Conservancy, properties located behind existing saltmarshes experience, on average, 20% less damage from coastal storms compared to areas where saltmarshes have been degraded or lost[70].

Why should investors care?

It is evident that these ecosystems can help governments and businesses meet their climate and biodiversity targets. For governments, restoration offers a smart alternative to grey infrastructure — often delivering the same protective benefits at a fraction of the cost, while allowing coastlines to adapt naturally as sea levels rise[71].

For businesses, especially those with coastal operations or value chains, saltmarshes offer a way to manage risk and deliver on ESG goals. With growing pressure to disclose nature-related risks and show real climate impact through frameworks such as the Taskforce for Nature-related Financial Disclosures (TNFD) and the EU's Corporate Sustainability Reporting Directive (CSRD), more companies are turning to nature-based solutions as part of their broader strategy.

67 Rouleau, T., Colgan, C.S., Adkins, J., Castelletto, A., Dirlam, P., Lyons, S., and Stevens, H. (2021) The Economic Value of America's Estuaries: 2021 Report. Restore America's Estuaries. Available at: https://estuaries.org/wp-content/uploads/2021/11/2021-Report.pdf
68 Mel Research (2023) Valuing Saltmarshes: Economic and Social Benefits of Saltmarsh Restoration in the UK. Birmingham: Mel Research. Available at: https://www.melresearch.co.uk/wp-content/uploads/2023/07/Valuing-Saltmarshes-Report.pdf
69 Eftec (2015) The Economic Case for Investment in Natural Capital in England. London: Department for Environment, Food & Rural Affairs (Defra). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/517006/ncc-research-invest-natural-capital.pdf
70 Narayan, S., Beck, M.W., Wilson, P., Thomas, C., Guerrero, A., Shepard, C., Reguero, B.G., Franco, G., Ingram, C.J., & Trespalacios, D. (2016). Coastal Wetlands and Flood Damage Reduction: Using Risk Industry-based Models to Assess Natural Defenses in the Northeastern USA. The Nature Conservancy.
71 Kochnower, D., Rella, A., & Miller, J. (2015). Factors influencing local decisions to use habitats to protect coastal communities: Case studies of salt marshes and beaches. Ocean & Coastal Management, 116, 277–290.

MEASURING WHAT MATTERS: THE RISE OF NATURE-BASED REPORTING IN BUSINESS

Voluntary frameworks such as the Taskforce for Nature-related Financial Disclosures (TNFD) and the Science-based Targets for Nature (SBTN) provide the structure to guide reporting on nature risk management. Together, these frameworks are creating a pathway for businesses to not only assess and disclose their biodiversity impacts but also offering them a non-market-based and non-offset approach to compensate for their residual impacts, supporting conservation efforts.

The TNFD and SBTN are currently voluntary frameworks, but their adoption among businesses is steadily growing, with over 500 TNFD early adopters and more than 150 SBTN members. This is primarily fuelled by increasing pressure on companies and financial institutions to assess and manage their environmental impacts – often referred to as their "biodiversity footprint". This pressure largely originates from corporate leadership, including board members, trustees and advisory groups, as well as investors. Guidance on ocean-related impacts have recently been integrated into these frameworks, with TNFD introducing its marine-specific guidance in 2024 and SBTN releasing its ocean-related targets in March 2025.

Beyond business sector reputation and compliance, a long-term supply chain vulnerabilities are becoming harder to ignore as climate impacts intensify and ecosystems degrade. The World Economic Forum's 2024 Global Risks Perception Survey reflects this shift: over the next decade, environmental risks - including extreme weather, ecosystem collapse, biodiversity loss and natural resource shortages - are expected to eclipse technological and geopolitical threats as the most pressing challenges facing businesses worldwide. From fisheries and aquaculture to shipping, tourism and coastal infrastructure, many sectors rely - directly or indirectly - on healthy coastal ecosystems. The loss of natural buffers like saltmarshes increases exposure to storm damage, erosion and disruption, with cascading impacts to commercial operations and markets. If we want to harness the ecosystem service potential of saltmarshes - as carbon sinks, climate defences and community assets - we need to bridge the financing gap. We must scale the solutions that work, support innovation and build tools and frameworks to get more funding flowing, faster.

Funding mechanisms and market innovations

The global financing landscape for saltmarshes still depends heavily on traditional public funding — namely national government agency investments and philanthropic donations. While this support remains vital, it isn't enough to meet the scale of the challenge. Fortunately, the wide-ranging benefits saltmarshes provide create opportunities to tap into diverse revenue models. From blue carbon markets and ecosystem service payments to insurance-linked finance and tourism, a growing mix of mechanisms is emerging to unlock private capital.

Whatever the financing mechanism, Indigenous Peoples and local communities must be meaningfully involved in project design and implementation and equitably considered in all benefit- and risk-sharing arrangements. Transparent financial flows and fair distribution of returns are essential to building trust and securing long-term community engagement. While this is especially critical in carbon finance, it applies equally to any investment in nature that generates environmental, social, or economic value - whether through ecosystem services, education, employment or community development.

Traditional funding sources

Public funding remains the backbone of global saltmarsh restoration and protection efforts, largely driven by flood and coastal resilience programmes. Australia recently committed nearly AUD $9.5 million (2021–2025) to saltmarsh projects through its Blue Carbon Ecosystem Grants. In the US, over USD $530 million has been awarded since 1992 via the National Coastal Wetlands Conservation Grants, with an additional USD $129 million recently allocated through the Coastal Resilience Fund, leveraging match funding of nearly the same value. In Europe, the EU LIFE programme and various UK schemes have supported several initiatives. And between 2006 and 2015, China invested over USD $760 million in coastal wetland restoration, supported further by a USD $37 million Asian Development Bank loan.

Philanthropic funding is also playing a growing role, helping to de-risk large-scale projects and build local capacity. Since 2022, the Endangered Landscapes and Seascapes Programme has committed GBP £30 million to coastal restoration across Europe, with saltmarsh featuring prominently among the funded projects.

While these investments mark important progress, they remain unevenly distributed. Saltmarshes in the Global South — where restoration needs are often greatest — receive a fraction of available global support, in part due to limited data and under-recognition.

NRM SOUTH'S BLUE CARBON PROJECT

NRM South's Blue Carbon project has been the largest wetland restoration project to ever have been undertaken in Tasmania. Through funding support from the Australian Government's Blue Carbon Ecosystem Restoration Grants, NRM South has overseen a suite of on-ground efforts that has re-established natural tidal flows, and has seen a consequent burst of plant, bird and marine life to this internationally significant saltmarsh wetland.

Find out more on the work and its impacts **here.**

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FROM MANGROVES TO SALTMARSHES: BUILDING A GLOBAL INVESTMENT BLUEPRINT FOR COASTAL WETLANDS

The Mangrove Breakthrough Financial Roadmap[73] developed under the Mangrove Breakthrough provides a set of recommendations and a toolbox of financial instruments and enabling conditions to scale mangrove investments. Resources such as these can serve as a useful tool, creating a share direction for countries, financial institutions, private sector and other stakeholders. Since its inception the Mangrove Breakthrough has leveraged support from 31 governments and launched a formal partnership between the Mangrove Alliance for Climate which has 23 country members. The Saltmarsh Breakthrough could act as a useful platform to develop a resource similar providing a common vision for global saltmarsh investment needs and opportunities.

73 SYSTEMIQ (2023) *Mangrove Breakthrough Financial Roadmap*. Available at: https://www.systemiq.earth/mangrove-breakthrough-financial-roadmap/

Emerging financing solutions:

Recognising the many benefits of saltmarshes, a range of emerging financial solutions is beginning to take shape. The diverse ecosystem services they provide offer promising avenues to attract new forms of private and blended finance. These innovative models are helping to bridge the gap left by public and philanthropic funding, and typically fall into three categories[72]:

- **Payments for ecosystem services (PES):** Revenues generated from those who directly benefit from the outcomes of saltmarsh protection and restoration, such as carbon credit buyers or insurers underwriting coastal infrastructure.
- **User-based fees:** Charges or levies applied to activities within or around saltmarsh areas, designed to incentivise stewardship and fund ecosystem management (e.g. ecotourism access fees, licensing for sustainable fisheries).
- **Sustainable enterprises:** Business models that reduce pressure on saltmarsh ecosystems while generating local income, such as low-impact aquaculture, nature-based tourism or regenerative harvesting of natural products.

From these broad categories, five replicable revenue models are emerging across saltmarsh and other blue carbon ecosystem projects worldwide:

1. **Blue carbon credit sales** in carbon markets, monetising saltmarsh carbon sequestration and storage.
2. **Biodiversity certificates/credits and bioremediation credits** generated from activities such as habitat restoration and water quality improvement.
3. **Coastal protection payments** including contributions from insurance providers and infrastructure owners who benefit from risk reduction.
4. **User-based fees**, including from tourism and recreation charges to licensing for sustainable harvesting.
5. **Sustainable enterprises,** other livelihood-based models that align economic and ecological outcomes.

By diversifying funding sources and aligning financial returns with ecosystem outcomes, these models offer a pathway to scale saltmarsh conservation and restoration, transforming them from overlooked assets to pillars of climate and economic resilience.

Blue carbon credit sales

Although blue carbon-inspired restoration currently centres on mangroves, growing initiatives like the Carbon Farming Initiative in Australia, UK Saltmarsh Code and Verra trials in the US indicate growing interest in saltmarshes. Yet many projects, especially smaller ones in areas with uncertain land tenure or carbon rights, face high transaction costs and struggle to cover implementation, compounded by the technical challenges of measuring carbon sequestration in dynamic tidal environments[74].

Nevertheless, forward-thinking companies with strong ocean ties are beginning to view blue carbon as a strategic complement to their net-zero programmes. Although blue carbon projects for saltmarshes may be perceived as higher-risk, smaller in scale and more expensive than terrestrial credits, the additional ecosystem benefits help to improve their overall value. As project leaders refine methodologies and demonstrate solid carbon sequestration outcomes, integrating other financing approaches (like blended finance, biodiversity credits and public–private partnerships) may unlock the full potential of saltmarsh blue carbon as a sustainable, long-term revenue stream.

In parallel, other financing models can complement carbon revenues and reduce project risk. These include compliance markets — government-regulated schemes where companies are required to buy carbon credits — and national voluntary carbon markets, which offer locally tailored rules and lower barriers to entry. Companies may also invest through beyond value chain mitigation, where funding is provided for nature projects without claiming carbon offsets, often as part of broader climate or biodiversity commitments. Larger or bundled projects may attract capital through instruments like blue bonds or impact-linked finance, which tie investment returns to environmental performance. These alternative approaches can help fill funding gaps where carbon credit sales alone may fall short.

72 Tom Brook, Mark Lutes, Louise Heaps, Simon Walmsley, Mauro Randone, Pauli Merriman. 2023. Responsible Finance for Blue Carbon Ecosystems. WWF International, Gland, Switzerland. Available at: https://wwfint.awsassets.panda.org/downloads/responsible_finance_for_blue_carbon_ecosystems.pdf

74 Conservation International, Rare, & International Blue Carbon Initiative. (2023). Non-carbon market approaches for conserving and restoring blue carbon habitats. Retrieved from https://static1.squarespace.com/static/603e674744293f085766ad7d/t/6758d04406025e3305a7be4e/1733873733452/Non_Carbon_Market_Approaches_for_Conserving_Restoring_Blue_Carbon_Habitats_CI_Rare_IBCI.pdf

HIGH INTEGRITY CARBON CREDITS

Various initiatives have sought to demonstrate how project developers and buyers can support high-integrity blue carbon markets, with emerging guidance focused on both the supply of high-quality [blue carbon] credits and their responsible use.

High quality blue carbon principles & guidance

A science-policy-finance coalition created five guiding principles for high-quality blue carbon projects: Safeguard Nature, Empower People, Employ Best Practices, Operate Locally, and Mobilise High-Integrity Capital. Link to report **here.**

And; **Responsible use of carbon credits: Guidance for mobilising and vetting buyers**

To ensure market integrity, this guidance sets out eight key components that define responsible corporate behaviour in the voluntary carbon market - from transparent emissions accounting to alignment with Paris Agreement targets and support for high-quality nature-based solutions. Link to report **here.**

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Biodiversity and bioremediation credits

Biodiversity and bioremediation/nutrient credits are also increasingly gaining popularity as a tool to finance restoration of saltmarsh habitats. These models aim to financially reward the restoration and maintenance of these critical functions through issuing biodiversity and nutrient credits based on quantifiable metrics (e.g. % biodiversity uplift per hectare per year) These markets can be split into compliance/ regulatory, and voluntary markets:

Saltmarsh restoration is gaining traction in both compliance and voluntary credit markets, offering new pathways for financing nature. In the UK, Biodiversity Net Gain requirements are driving demand for habitat restoration, while nutrient trading in places like Chesapeake Bay (US) allows saltmarsh projects to generate credits linked to water quality improvements. Voluntary schemes, such as the Solent Seascape Project using Plan Vivo's PV Nature Standard, enable companies to support restoration beyond legal obligations, with a portion of revenues reinvested in local communities. While challenges remain - particularly around standardisation and market confidence - these models show growing potential to scale saltmarsh restoration while delivering social and ecological benefits.

Coastal protection payments

Saltmarshes naturally reduce wave energy, buffer storm surges and prevent coastal erosion — benefits that translate directly into savings for insurers, property developers and local governments. As climate change intensifies coastal hazards, interest in nature-based solutions is growing, with significant new funding sources such as parametric insurance, triggered by specific natural events, like high wind speeds — offering potential funds for post-event ecosystem restoration.

These models are gaining traction as awareness of climate adaptation grows, although challenges remain in assigning clear monetary values to the risk reduction provided by dynamic ecosystems like saltmarshes over time.

User-based fees

Saltmarshes, particularly those near urban centres, are increasingly being integrated into mature models of community engagement and revenue generation. Nature conservation organisations are already utilising and conserving these assets through membership fees, entrance fees, and other charges associated with sustainable tourism and recreation. By linking saltmarsh conservation to direct economic benefits, these user-based models not only generate local income but also strengthen community stewardship. When integrated into broader regional ecotourism and public recreational programs, such fees serve as a robust revenue stream that supports both conservation efforts and sustainable local development.

Sustainable enterprises

Saltmarshes have long supported local enterprises - from traditional salt production to grazing and foraging. Today, they also offer potential for sustainable livelihoods, such as through using halophytes, which can help remediate salt-affected soils caused by saline intrusion. Cultivating these species for food, fodder, or fibre supports both land recovery and low-impact income generation, linking restoration with economic resilience.

As climate change intensifies coastal hazards, interest in nature-based solutions is growing, with significant new funding sources such as parametric insurance, triggered by specific natural events, like high wind speeds — offering potential funds for post-event ecosystem restoration.

Barriers to scaling saltmarsh finance

Saltmarsh finance is hampered by long payback periods, high upfront costs and the challenge of demonstrating near-term returns. Investor appetite is especially limited in regions with unclear land tenure, weak governance or a lack of robust ecological and financial data. Certification costs, particularly for carbon or biodiversity credits, are often prohibitively high for small or early-stage projects, creating barriers to entry for community-led and locally managed initiatives.

On the supply side, many saltmarsh restoration efforts are too small, fragmented or technically underdeveloped to meet investor expectations around scale, permanence or verification. Methodological gaps, inconsistent monitoring frameworks and a lack of standardised valuation approaches further erode confidence and limit access to finance.

Additionally, most saltmarsh initiatives are designed with ecological goals in mind, not financial models — leading to missed opportunities for bankable design, risk-sharing, or blended finance structures. Aggregating projects into portfolios, supported by improved spatial data and investment-grade baselines, could help overcome these limitations and unlock greater private sector participation.

Ultimately, building a more investable pipeline of saltmarsh projects will require stronger institutional support, clearer policy signals and a shift toward integrated planning that aligns ecological restoration with long-term financial viability.

To address some of these barriers, concessional finance — such as grants, low-interest loans, or philanthropic capital — can help reduce risk and attract additional investment, particularly for small or early-stage initiatives. These funds are often essential for covering the high start-up and certification costs that many community-led projects face. Incubation and accelerator programmes can also provide technical and financial support to build bankable project pipelines, especially in regions where saltmarsh restoration is underfunded or technically complex. Creating space for these early investments is key to ensuring more equitable access to finance and scaling saltmarsh restoration globally.

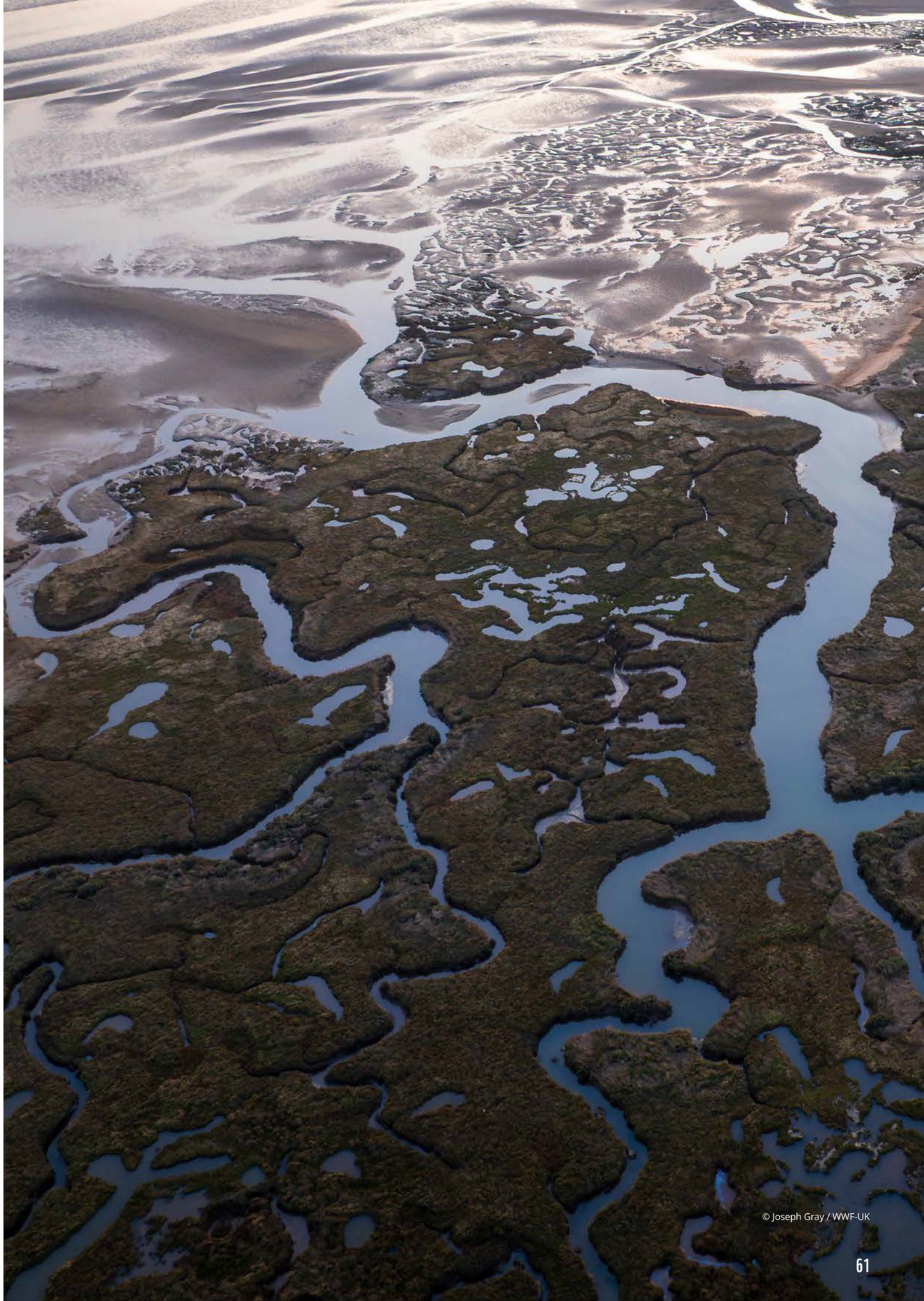
Bridging the finance gap

The case for a sustainable ocean economy is clear: total goods and services from the ocean amount to USD $2.5 trillion per year in areas such as fishing, transportation, energy and tourism, and more than 500 million people depend on coastal resources for food. In addition, two-thirds of the base economic value of oceans is generated by assets that rely on healthy ocean conditions — conditions that are in part underpinned by thriving blue carbon ecosystems, including saltmarshes.

To realise the full potential of saltmarsh conservation, a multifaceted approach is needed. Building investment-readiness through improved scientific data, robust governance and scalable business models is vital. Blended finance mechanisms, accelerators and venture-builder programmes can help de-risk early projects and bridge the funding gap between public resources and private investment. While current efforts are concentrated in developed regions, expanding structured mapping and comprehensive resource inventories in the Global South is crucial. Moreover, integrating coordinated policy reforms, improved methodologies and innovative financial instruments — such as nature markets, tourism levies and user fees — will provide diverse revenue streams that can be structured through a blended finance facility.

Only by ensuring equitable access to finance and knowledge, and by reducing financial uncertainties through risk-sharing arrangements and technological innovation, can global saltmarsh conservation efforts be truly scaled and the full promise of these vital blue carbon ecosystems be realised.

Ultimately, building a more investable pipeline of saltmarsh projects will require stronger institutional support, clearer policy signals and a shift toward integrated planning that aligns ecological restoration with long-term financial viability.



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NDC PARTNERSHIP AND NBSAP ACCELERATOR PARTNERSHIP:

These initiatives should actively enhance global coherence through providing targeted technical assistance and guidance. Through closer collaboration they can help better identify synergies between Party biodiversity and climate commitments. A specific coastal ecosystem workstream could be developed to help foster alignment between strategies. Other non-state actors can also help develop ecosystem specific guidance for NDCs and NBSAPs such as the Mangrove NDC Task Force who have produced a series of briefs[75] to support countries in developing science-based, measurable and actionable NDC targets for mangrove conservation, restoration and financing. The same could be developed for saltmarshes especially given the lack of saltmarsh specific targets in current NDCs.

In April 2025 these initiatives came together to discuss how to strengthen collaboration and foster more synergies. The meeting revealed that there was significant opportunity for restoration. This presents a concrete avenue for collaboration contributing to carbon sequestration, biodiversity resilience and improved livelihoods[76].

75 UN Climate Change High-Level Champions (n.d.) Saltmarsh Breakthrough – Shared Documents Folder. Available at: https://drive.google.com/drive/u/0/folders/1StTwChzr0DLvuSoXaYkXPhVlP4NPtv6D

76 NBSAP Accelerator Partnership (2024) Enhancing Synergies Between NDCs and NBSAPs. Available at: https://nbsapaccelerator.org/news_and_events/enhancing-synergies-between-ndcs-and-nbsaps/

6 A GLOBAL CALL TO ACTION – THE FUTURE STATE OF SALTMARSHES

We stand at a turning point. Around the world, momentum for saltmarsh protection and restoration is building. Yet action remains patchy and underpowered. This section sets out a global call to action - backed by science, driven by communities, and aligned with the goals of the Paris Agreement, the Global Biodiversity Framework, the Ramsar Convention on Wetlands and the Ocean Breakthroughs.

The Task Ahead

A Saltmarsh Breakthrough, serving as a global call to action, will not happen by accident. It must be forged by deliberate choices — by governments, researchers, financiers and citizens. It means embedding saltmarshes in climate and biodiversity strategies. It means building funding pathways. It means working across silos and sectors, and above all, across scales.

What Needs to Change

To unlock the full potential of saltmarshes, coordinated action is needed across three critical fronts:

For too long, saltmarshes have been a blind spot in climate and nature policy. But that is beginning to change. New commitments are emerging. The tools are in place. Now is the time to accelerate.

Policy: Give Saltmarshes a Seat at the Table

For too long, saltmarshes have been a blind spot in climate and nature policy. But that is beginning to change. New commitments are emerging. The tools are in place. Now is the time to accelerate.

- Integrate saltmarsh conservation and restoration into updated NDCs and NBSAPs, ensuring these vital intertidal systems are fully embedded within national nature-based solutions – ensuring alignments across climate and biodiversity strategies.
- Recognise saltmarshes as priority ecosystems within national strategies for climate adaptation, disaster risk reduction and blue economy planning.
- Create national frameworks and legal protections that allow saltmarshes to persist and migrate in the face of sea level rise.
- Ensure saltmarshes are fully acknowledged within technical support and guidance about blue carbon ecosystems for Parties of the CBD and UNFCCC.

Like the Global Mangrove Alliance, a global saltmarsh coalition could galvanise collaboration across countries and sectors - creating a platform for shared learning, goal-setting and progress tracking.

SCIENCE NOTE: PRIORITIES FOR SALTMARSH RESTORATION

Saltmarsh conservation and restoration are increasingly guided by scientific evidence - but key knowledge gaps remain. For instance, data on the long-term (multi-decadal) outcomes of saltmarsh restoration are rare. Understanding where and how to expand saltmarsh habitats, and how to maximise their benefits, requires a coordinated research agenda, including standardised monitoring of saltmarshes.

A recent study identified ten global research priorities to advance saltmarsh restoration and conservation[77]. These range from improving estimates of global saltmarsh extent and rates of change, to the economic valuation of ecosystem services—including often-overlooked cultural services such as heritage, identity and place.

Addressing these gaps demands a transdisciplinary approach, integrating ecology, social science, economics, and policy to tackle the complex pressures facing these vulnerable coastal systems.

77 Pétillon, J., McKinley, E., Alexander, M., Adams, J.B., Angelini, C., Balke, T., Griffin, J.N., Bouma, T., Hacker, S., He, Q. and Hensel, M.J., 2023. Top ten priorities for global saltmarsh restoration, conservation and ecosystem service research. Science of the Total Environment, 898, p.165544.

Science: Illuminate What We Cannot Afford to Ignore

The world knows too little about saltmarshes. Where they thrive. Where they are slipping. Where they can be brought back. This data gap hampers ambition.

- Standardise saltmarsh monitoring and mapping, building on the lessons of Global Mangrove Watch and the Coastal Carbon Network.
- Invest in under-mapped and under-studied regions - particularly tropical and arid-zone marshes, as well as those in the Global South which are underrepresented.
- Integrate benefits beyond GHG removals to help make finance more accessible, addressing current barriers relating to blue carbon project costs, while also increasing ecosystem and community resilience associated with restoration and protection interventions.
- Bridge research and action by grounding restoration efforts in the best available evidence, using structured, adaptive planning approaches that support effective, measurable outcomes.
- Develop understanding of the barriers and enablers associated with saltmarsh restoration, including social acceptability of initiatives within local communities.

Science must also make space for lived knowledge. Indigenous, traditional and community-led stewardship holds invaluable insights for effective restoration and governance.

STRENGTHENING THE SALTMARSH EVIDENCE BASE

Saltmarshes remain underrepresented in national climate reporting, but scientific efforts are beginning to close key data gaps. In the UK, carbon flux towers are collecting high-resolution carbon exchange data from saltmarsh ecosystems - providing the kind of robust, site-specific evidence that helped bring forests and peatlands into mainstream climate policy[78].

78 https://www.ceh.ac.uk/our-science/projects/wwf-saltmarsh-research-platform

In the United States, coastal states such as California and Oregon have taken steps to integrate saltmarshes and other tidal wetlands into their greenhouse gas inventories—complementing national-level reporting, where coastal wetlands are now included in the official U.S. GHG inventory submitted to the UNFCCC. These efforts offer valuable models for broader inclusion and improved accounting of blue carbon ecosystems.

Finance: Make Saltmarshes Investable

Nature is not short on value - but it is short on funding. This is especially true for saltmarshes, which struggle to attract dedicated finance.

- Develop saltmarsh-specific funding pipelines through climate finance, blended models and insurance-linked resilience funding.
- Prioritise high-integrity blue carbon approaches, with robust safeguards and benefit-sharing mechanisms that prioritise community ownership and stewardship.
- Mobilise philanthropic and public-sector investment to de-risk early-stage restoration and support project readiness, in turn driving more action from the private sector and commercial sources.

Unlocking this opportunity means tackling the structural barriers that hold capital back. Saltmarsh restoration must move from fragmented efforts to investable systems - with support from accelerators, venture builders and enabling partnerships that can turn promising ideas into scalable, finance-ready solutions.

Nature is not short on value - but it is short on funding. This is especially true for saltmarshes, which struggle to attract dedicated finance.

BUILDING THE FINANCIAL ARCHITECTURE FOR SALTMARSH INVESTMENT

Across the globe, a new wave of public and philanthropic funding initiatives is emerging to unlock investment in nature. Programmes like the Australian Government's Blue Carbon Accelerator Fund, NOAA's Transformational Habitat Restoration and Coastal Resilience Grants in the United States, and the Natural Environment Investment Readiness Fund (NEIRF) in the United Kingdom aim to bridge early-stage financing gaps and bring coastal restoration projects closer to market.

These funds provide critical support for feasibility assessments, permitting, stakeholder engagement, and blended finance structuring - activities that often stall for lack of dedicated capital.

Yet in many regions, these efforts still fall short of what's needed. They are mostly concentrated in developed countries. Few are tailored to the unique ecological and logistical complexities of saltmarsh restoration. And most operate at modest scales relative to the ambition and urgency of coastal resilience and climate goals.

To make saltmarshes truly investable, financial architecture must evolve: expanding geographically, increasing in scale, and integrating accelerators, venture builders, and outcome-based finance that recognises the full value of these ecosystems.

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Pathways to 2030: How We Get There

The successful protection and conservation of saltmarsh ecosystems requires coordinated efforts across national and international levels, underpinned by robust policy frameworks. Recognising their immense relevance, saltmarsh ecosystems are significantly influenced, from local to global scales, by policies at all levels, ranging from local zoning regulations to global climate agreements.

International policy frameworks and agreements drive global collective action, guide national efforts and allocate resources effectively. NDCs are a cornerstone of the Paris Agreement - but to date, saltmarshes have been largely absent from them. While some countries have already submitted their revised NDCs for the 2025 cycle, others still have an opportunity to enhance their commitments. Even where full integration of saltmarsh ecosystems into NDCs may not be feasible in this round, laying the groundwork for future inclusion is both timely and strategic. It is essential for these updated NDCs to align with countries new and updated NBSAPs under the Global Biodiversity Framework, amongst other international policy frameworks.

This is important for spatial planning to ensure biodiversity and climate strategies such as renewable energy or other development plans are considered against protection and restoration targets.

Saltmarshes are coastal climate solutions hiding in plain sight. Their value extends across both mitigation and adaptation priorities. Countries can begin now to recognise these benefits - whether through pilot studies, national inventories or sectoral plans - and reflect them in the adaptation and/or mitigation components of their NDCs, depending on priorities and data availability. Doing so sets the stage for more systematic and ambitious integration by 2030, while contributing to nature-positive, climate-resilient development.

International policy frameworks and agreements drive global collective action, guide national efforts and allocate resources effectively.

LESSONS FROM THE MANGROVE BREAKTHROUGH — A MODEL FOR SALTMARSH ACTION

The Mangrove Breakthrough, launched under the Ocean Breakthroughs initiative, has emerged as a powerful rallying call for global action. Its goal: to halt mangrove loss, restore recent degradation, double global protection, and secure long-term finance to support more than 15 million hectares of mangroves by 2030, underpinned by USD $4 billion in sustainable finance.

What makes the Mangrove Breakthrough notable is not only its ambition—but its structure. It has created a clear set of measurable targets and aligned them with global frameworks such as the Paris Agreement, the Global Biodiversity Framework, and the UN Decades on Ecosystem Restoration and Ocean Science. Its design links finance, science, policy, and equity—ensuring that action on the ground reflects both climate priorities and community needs.

At the heart of this effort is the Mangrove Breakthrough Community of Action — a collaboration between civil society organisations, governments, scientists and the private sector. Together, they work to build project pipelines, share best practices, and embed sustainability, biodiversity, and equity at the core of mangrove interventions.

The initiative is co-led by the UN Climate Change High-Level Champions and the Global Mangrove Alliance, whose leadership has been pivotal in mobilising national and sectoral commitments, forming cross-sector partnerships, and positioning mangroves as frontline solutions in climate and development agendas.

What Saltmarshes Can Learn

The Saltmarsh Breakthrough begins at a similar inflection point. As with mangroves, saltmarshes offer enormous yet under-recognised potential for climate mitigation, adaptation, biodiversity and coastal resilience. But saltmarshes lack the scale of coordinated global action that mangroves have recently gained.

The Mangrove Breakthrough – and its governance - offers a replicable model:

- **Set bold, measurable global targets** that align with international climate and biodiversity frameworks.
- **Build a broad-based coalition** — a Global Saltmarsh Coalition — that brings together local communities, scientists, NGOs, investors and governments to drive collaboration and accountability.
- **Secure fit-for-purpose finance** by unlocking early-stage funding, building investment-ready project pipelines, and creating enabling conditions for scalable restoration and protection.
- **Embed science, equity and community leadership** as guiding principles from the outset.

The opportunity is clear: saltmarshes can follow a similar trajectory — but tailored to their unique challenges. With momentum building and political interest growing, now is the moment to translate intention into collective infrastructure for global saltmarsh recovery.

7 OUTLOOK: PROTECTING SALTMARSHES, SECURING OUR FUTURE

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Everywhere they are, saltmarshes offer a vision of resilience. They absorb, adapt and endure. They help store carbon, protect biodiversity and support communities. Yet, they cannot do it alone. As climate change intensifies, saltmarshes must become central to our solutions, not remain on the margins.

The actions we take in the coming decade will be decisive to avoid climate tipping points and to secure a future for biodiversity. Whether saltmarshes thrive or vanish depends on the choices we make now. We must scale up research, promote community-led restoration and adapt strategies to local needs. This must be guided by Indigenous and traditional knowledge, supported by global collaboration.

We are not starting from scratch. Around the world, restoration efforts are blooming, legal reforms are advancing and local voices are being heard. But to match the scale of the challenge, we need bold action: stronger and more effective policies, more funding to support science and restoration efforts as well as coordinated conservation at global, national and local levels.

LOOKING FORWARD

This year marks a pivotal moment for climate and ocean action - the midpoint of the UN Decade of Ocean Science and a crucial milestone on the path toward the 2030 climate and biodiversity targets. Upcoming events like the third UN Ocean Conference and COP30 in Belem, Brazil, offer a unique chance to elevate saltmarshes alongside coral reefs, mangroves, and seagrasses, as essential to a resilient ocean future. As part of the Global Stocktake, COP30 is especially significant for securing stronger recognition and investment in saltmarshes as powerful nature-based climate solutions.

We have the tools to make this a reality. The financial pathways are opening. The science is advancing – and we can build it together. What's needed now is resolve.

A SALTMARSH BREAKTHROUGH

Let us chart a new course for saltmarshes. A future where what has been degraded is restored and what endures is safeguarded. A breakthrough that is not just a policy success, but a lived reality on the coastlines of the world. The Saltmarsh Breakthrough is a call to action urging governments, civil society and the private sector to unite around science-based, equitable and sustainable restoration.

The mission of the Saltmarsh Breakthrough is to drive a transformative shift in global saltmarsh conservation and restoration, aiming to address climate change, protect biodiversity and uplift coastal communities.

The next step is to co-create global goals for saltmarshes by 2030. Establishing science-based targets designed to unlock their full potential for climate mitigation, adaptation, and resilience will create an agenda that complements and feeds directly into the objectives of the UNFCCC COP30 in November 2025; where nature, ocean, and climate will converge as central pillars for negotiations and action.

Saltmarshes are part of the solution. By forming strong partnerships and supporting impactful projects, we can ensure saltmarshes play a vital role in sustainable development and climate action. Through the collective efforts of global and local partners, we can ensure that saltmarshes, and everything that depends on them, survives for future generations.

We call on governments, the private sector and civil society organisations across all sectors to join us in mobilising toward 2030, powered by science, local knowledge, and innovative finance. The time to act is now.

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