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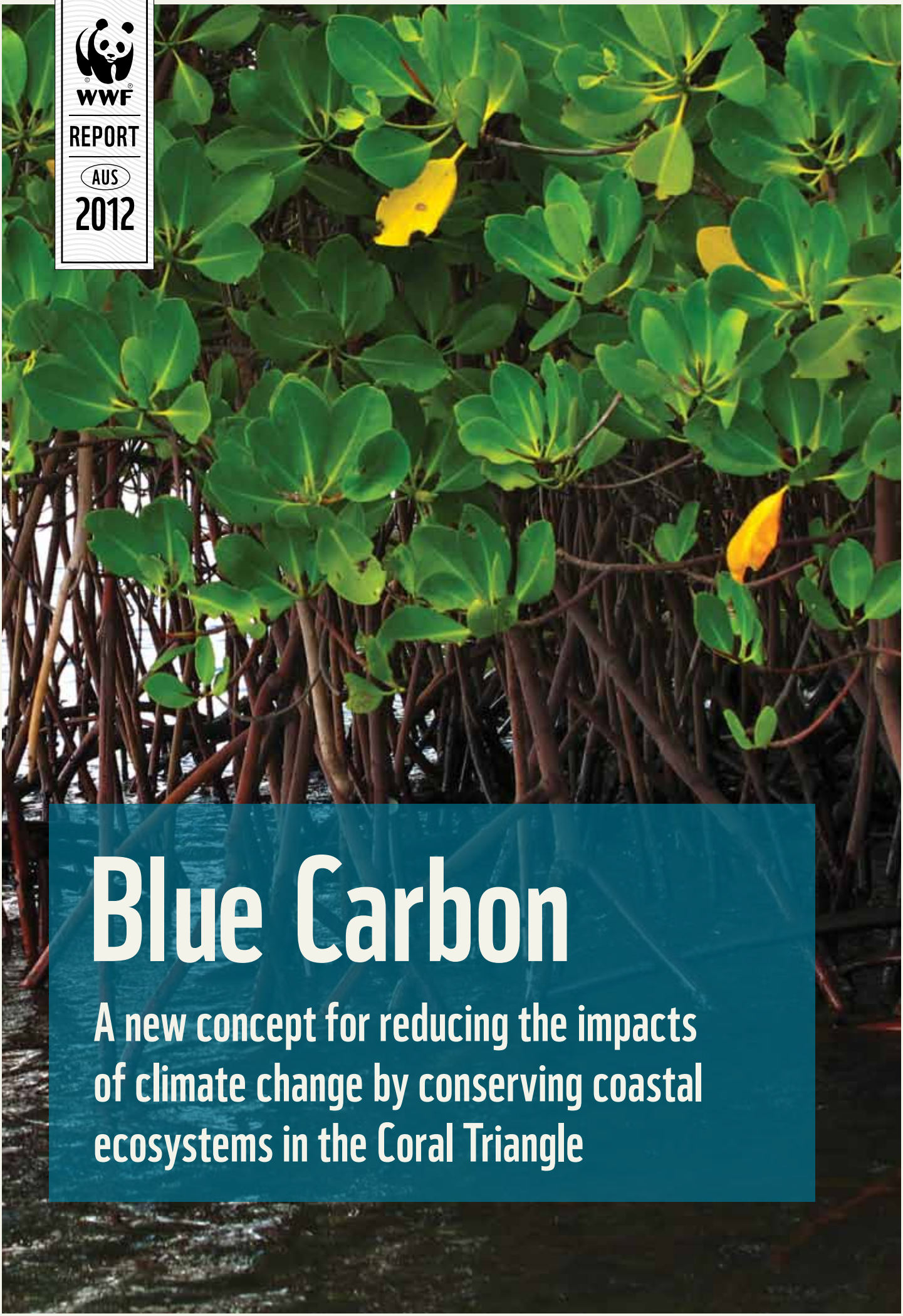

Blue Carbon

A new concept for reducing the impacts of climate change by conserving coastal ecosystems in the Coral Triangle

Written and edited by Anissa Lawrence, TierraMar Consulting, for WWF-Australia June 2012.

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WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global Network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by: conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

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SUMMARY

This paper is aimed at politicians, governments, businesses and organisations that influence the development of policies and strategies in climate change mitigation and adaptation, poverty alleviation, natural resource use, biodiversity conservation and economics. It's aim is to stimulate discussion and debate on how to promote and utilise healthy coastal ecosystems and the valuable benefits they provide to support a sustainable and more climate resilient future for communities within the Coral Triangle.

Coastal ecosystems in the Coral Triangle support key industries such as commercial fishing and tourism. Well over 120 million people rely directly on its coastal resources for their food and livelihoods. In fact the region is the world's largest tuna producer.

WHAT IS BLUE CARBON?

In addition to their critical economic importance, coastal ecosystems, in particular seagrass, mangroves and saltmarsh, are also known as blue carbon sinks because they can transfer and store carbon in their sediments and within plant parts at rates far greater than those of terrestrial forests. This storage of blue carbon can potentially occur for millennia.

Conserving the coastal ecosystems of the Coral Triangle not only protects these social and economic benefits but also removes greenhouse gases from the atmosphere. Therefore, conservation of coastal ecosystems is an immediate and cost effective way to help coastal communities adapt to climate change – making a compelling case for managers, policy makers, researchers and coastal communities within the Coral Triangle to take immediate conservation action.

The Coral Triangle encompasses Indonesia, Malaysia, Papua New Guinea, Philippines, Solomon Islands and Timor-L'este. These countries have launched a Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security that aims to transform marine resource management within this region.
Find out more: www.cti-secretariat.net

BACKGROUND

OUR COASTAL ECOSYSTEMS ARE IN TROUBLE

Covering just one per cent of the earth's surface, the Coral Triangle is comprised of extensive seagrass beds, more mangroves than anywhere else in the world and is a global hotspot for marine biodiversity (Figure 1). More than 120 million people, along with thousands of small and medium businesses rely heavily on the marine resources that are generated by these vast and thriving ecosystems to support livelihoods and provide income and food security, particularly for coastal communities.

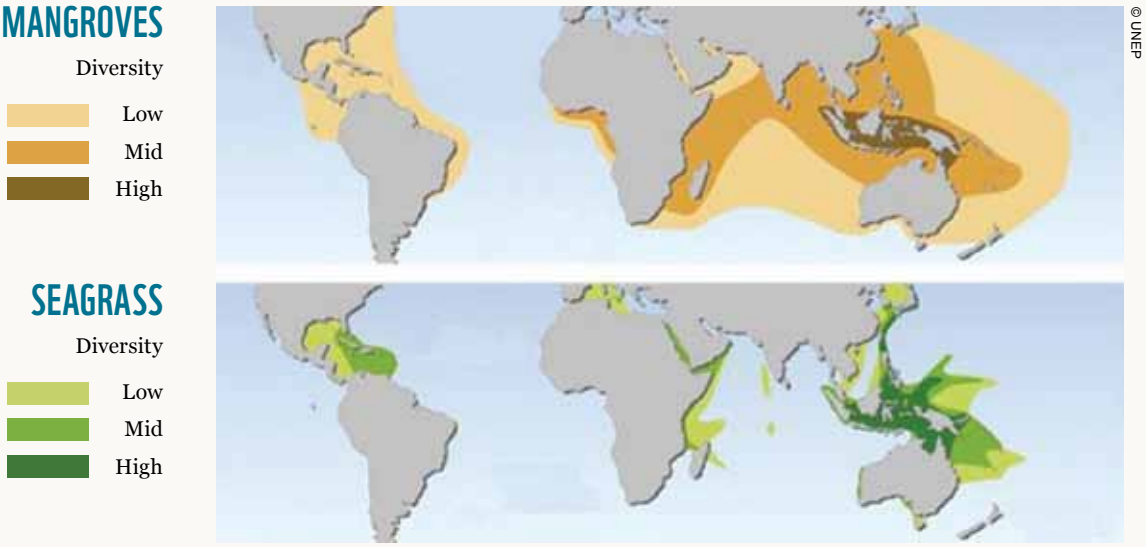


FIGURE 1

Global distribution of mangroves and seagrass [i]

Many low-lying areas within the Coral Triangle are extremely vulnerable to the impacts of climate change, particularly to increases in storm intensity and coastal inundation linked to sea level rise. By the end of this century, scientists are predicting that many parts of the Coral Triangle will be largely unliveable if our present trajectory of greenhouse gas emissions is not slowed. Climate change is already having a significant and costly impact on the Coral Triangle coastal ecosystems through warming, acidifying and rising seas. Ongoing mass coral bleaching and mortality events associated with increasing temperatures are likely to result in the accelerated degradation of our spectacular reef systems if these events continue to increase in intensity and frequency.

Mangroves, seagrasses and saltmarsh within the Coral Triangle are highly sensitive to rising sea levels, and are also being threatened by climate change. Other changes such as coastal ecosystem destruction by clearing, infilling, siltation from upland catchment disturbances and pollution from industry and urban development are also destabilising these critically important ecosystems along the coast. The stresses arising from climate change are also amplifying the impacts of local stresses, leading to an accelerated deterioration of coastal ecosystems [ii].

It is well understood that healthy reef systems and mangrove belts protect coastal communities from storms and tsunamis, and can reduce future reconstruction costs and the need for international aid. In addition to providing a measure of resistance and resilience to coastal communities, these coastal ecosystems transfer and store carbon from the atmosphere and ocean at rates of up to 4 times higher than tropical forests [iii]. There is a growing awareness in the region of the combination of climate change adaptation and mitigation benefits provided by these coastal ecosystems.

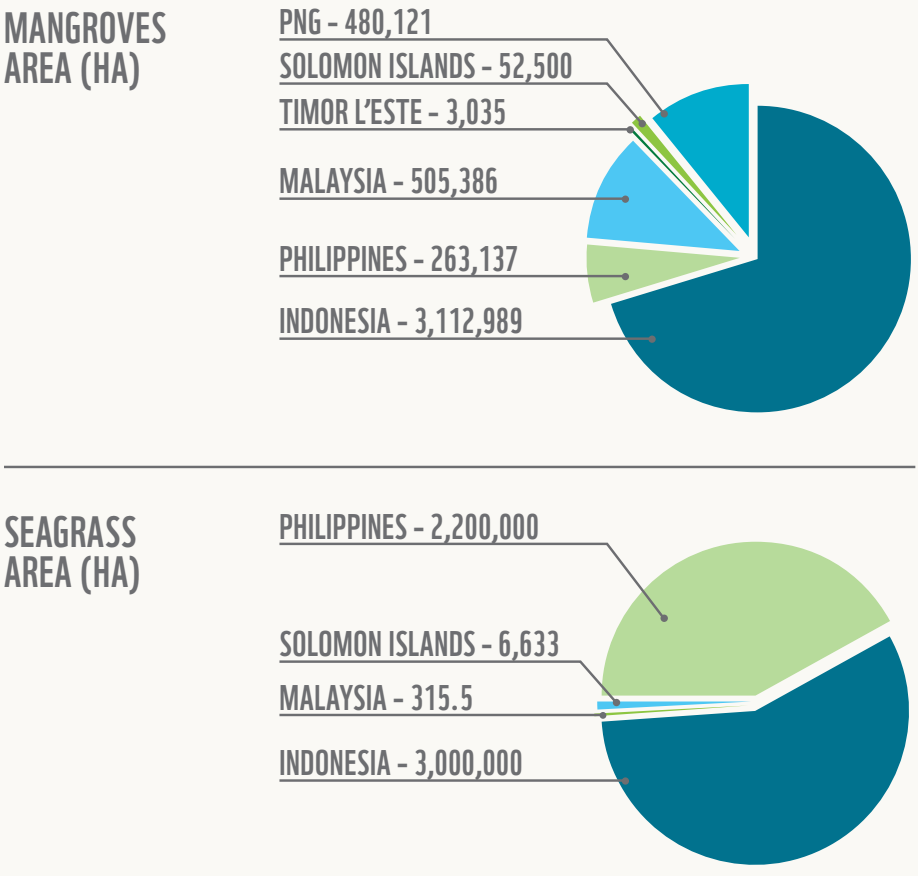
Globally, we are losing our coastal ecosystems at rates of up to 4 times higher than terrestrial forests. The news is not any better in the Coral Triangle where coastal ecosystems are deteriorating rapidly. Over 40% of mangroves have already been lost in the past 40 years. Coastal deforestation, coastal reclamation, declining water quality, pollution and exploitation of marine life have had a severe impact on these essential ecosystems. This is placing many communities and businesses within the Coral Triangle at risk. Not only this, but degraded coastal ecosystems are contributing to increased greenhouse gases in the atmosphere through emitting enormous quantities of greenhouse gases. It is estimated that clearing mangroves and using their peat soils for alternate uses such as shrimp ponds can result in CO_2 emissions comparable with that from rainforest peat soils drained for agriculture [iv]. All countries in the Coral Triangle have experienced significant loss of coastal ecosystems. For example, Indonesia harbours nearly a quarter of the world's mangroves and yet has lost over half of its mangroves in the past three decades, shrinking from 4.2 million hectares in 1982 to 2 million hectares in 2000 [v]. Likewise the Philippines had around 450,000 hectares of mangroves in 1918 [vi] and latest estimates have mangroves at 263,137 hectares [v]. In both cases, large areas of mangroves have been converted into fish and shrimp ponds – Philippines (232,000 ha)[vi] and Indonesia (211,000 ha) [vii].

Latest estimates of area of remaining coastal ecosystems in Coral Triangle countries are found in Figure 2.

Intensive shrimp farming in Surabaya, East Java Indonesia.

FIGURE 2

Area of coastal ecosystems within Coral Triangle countries. Note no information is available on seagrass coverage for Timor L'este and PNG. Seagrass coverage for Malaysia relates to Peninsula Malaysia only, Borneo Malaysia unknown. No information available for saltmarsh, however saltmarsh is found throughout the Coral Triangle [v, viii, ix, x, xi]



“Unfortunately, the relationship between people and coastal ecosystems is now under extreme threat from climate change, as well as escalating local and regional environmental pressures. Regional and international action is urgently needed to avoid an ecological and human catastrophe…These challenges are increasing, and unchecked, climate change will ultimately undermine and destroy ecosystems and livelihoods in the Coral Triangle[ii].”

Professor Ove Hoegh-Guldberg, University of Queensland
James P. Leape, Director General WWF International

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COASTAL ECOSYSTEMS SUPPORT LOCAL COMMUNITIES

Coastal ecosystems provide extensive benefits for supporting and enriching people’s lives and national wellbeing for countries within the Coral Triangle. Globally, coastal ecosystems have been valued at US$25,783 billion [xii]. For many coastal communities of the Coral Triangle, coastal ecosystems also play a significant role in their culture and identify.

Without coastal ecosystems many people, communities and countries would suffer serious economic hardship through impacts to critical industries such as fishing, aquaculture and tourism. In addition, the wellbeing of many coastal communities would decline as essential needs like protein, fuel wood, shelter, clean water and storm surge protection could not be met.

WWF Western Melanesia Mangrove Rehabilitation Program, Papua New Guinea

Since 2007/08 WWF has been working with local communities, government and researchers in mangrove rehabilitation and restoration in Western Melanesia, PNG to build resilience in local communities against the impacts of climate change. Mangrove ecosystems provide many resources to local villages, including fuel wood and fish protein. The impacts of coastal erosion, sea level rise and an increasing demand for fuel wood and fish protein prompted local communities to restore their mangrove forest habitats. Since these mangrove forests support the local fishing industry by acting as breeding grounds for fish and providing income through the selling of fuel wood, local communities saw value in protecting their livelihoods by conserving their mangroves.

A mangrove nursery was established at the pilot project site at Tahira outside of Port Moresby, in partnership with the University of PNG's Motupore Island Research Centre (MIRC), and the local communities and funded by AusAID. WWF provided technical expertise for the mangrove restoration and rehabilitation program. In 2008 more than 15 schools and 1,000 children were able to plant 5,000 mangrove seedlings in one day. WWF is now replicating this project in the Madang and Manus Provinces with its partners. In addition, alternative fuel woods are being investigated to reduce the overharvesting of mangroves. Since the project commenced, communities have seen an increase in fish catch, providing communities with a good income on a regular basis.

The PNG Government has recently launched the Millions of Mangrove Initiative to plant mangroves as a cost effective means to protect coastlines in north-eastern PNG. WWF and its partners are assisting the Government to upscale this program.

Ecosystem services are the benefits provided to people from nature that play a vital role in livelihoods and economies at all scales – these benefits can only be realised if the capacity of natural processes is retained [xiii].

Key benefits from coastal ecosystems in the Coral Triangle include:	
Food security	Soil protection and control of erosion and sedimentation
Poverty alleviation	Shelter and wood (fuel)
Fish production	Wildlife habitat
Tourism	Cultural identify
Coastal protection	Natural adaptation and resilience to climate change
Clean water	Climate change mitigation through storing and transferring carbon from the atmosphere and oceans

Coastal ecosystems can play a critical and cost effective role for coastal communities as natural adaptation solutions against the impacts from climate change or extreme weather events causing coastal inundation, contamination of water supply and damage from storm surge.

The cost benefit of conserving and sustainably managing coastal ecosystems can far outweigh engineered "armouring", that often occurs retrospectively. For example, the ecosystem services provided by mangroves are not always considered when they are converted to other uses such as shrimp ponds. Intact tropical mangroves are worth around US$10,000–12,000 a hectare, but when cleared for shrimp ponds the value of the land falls to around $1,000 a hectare [xiv]. There is evidence to suggest that in the 2004 Asian tsunami of the 12 Indian Ocean countries affected by the tsunami disaster, those coastal areas that had dense and healthy mangrove forests suffered fewer losses and less damage to property than those areas in which mangroves had been degraded or converted to other land uses [xiv, xv].

> *"Ensuring that conservation contributes to poverty alleviation means conserving biodiversity in places where poor people live, ensuring that poor people are not denied access to the biodiversity-based goods and services on which they depend, and putting in place policies which conserve the components of biodiversity on which poor people's resilience is based [xvi]."*

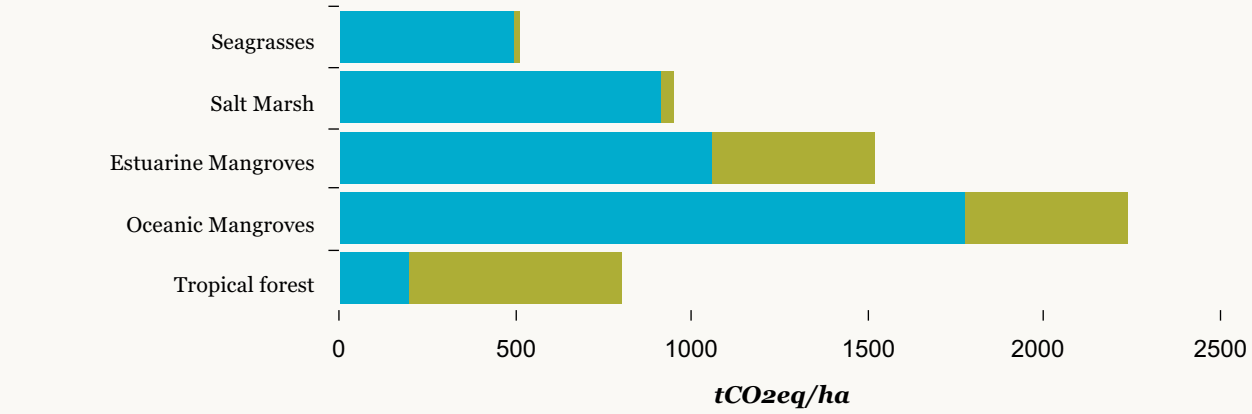
THE SCIENCE
COASTAL ECOSYSTEMS ARE RICH CARBON SINKS

Coastal ecosystems can store carbon at rates estimated to be up to 4 times higher than mature tropical forests.

In addition to providing a measure of resistance and resilience to coastal communities, coastal ecosystems are very effective at sequestering and storing carbon (Figures 3 and 4). By far, the largest carbon pool is that stored in the soils of these coastal ecosystems [1]. About 95% to 99% of total carbon stocks of saltmarsh and seagrass ecosystems are stored in the soils beneath them, while in mangrove systems, 50% to 90% of the total carbon stock is in the soil; the rest is in living biomass. The rates of carbon sequestered in the soils annually by mangroves, saltmarsh and seagrass are similar, but can vary greatly within each habitat type. Mangroves and saltmarsh average between 6 and 8 tonnes of CO_2 equivalent per hectare per year, whereas seagrass are estimated at a rate of around 4 tonnes of CO_2 equivalent per hectare per year[iii]. These rates are about two to four times greater than global rates observed in mature tropical forests (1.8–2.7 t CO_2equivalent per hectare per year[xvii]). The amount of carbon held in living biomass of coastal ecosystems is much more variable among the habitat types. Mangroves have the largest above ground biomass as they can grow up to 40 metres tall in some locations [xviii].

FIGURE 3

Coastal ecosystems store large quantities of carbon. Global averages for carbon pools (soil organic carbon and living biomass) of coastal ecosystems. Only the top meter of soil is included in the soil carbon estimates. Note tropical forests included for comparison[iii].



"What is exciting is that when healthy, coastal ecosystems continuously store carbon in their soils over long time scales, unlike terrestrial soils which tend to plateau over time [xix]. In addition, the rate of carbon sequestered and the size of the carbon pool may continue to increase over time [xx]. This is because the sediments in which healthy mangroves, saltmarsh and seagrass grow increase in volume in response to rising sea levels [xxi]."

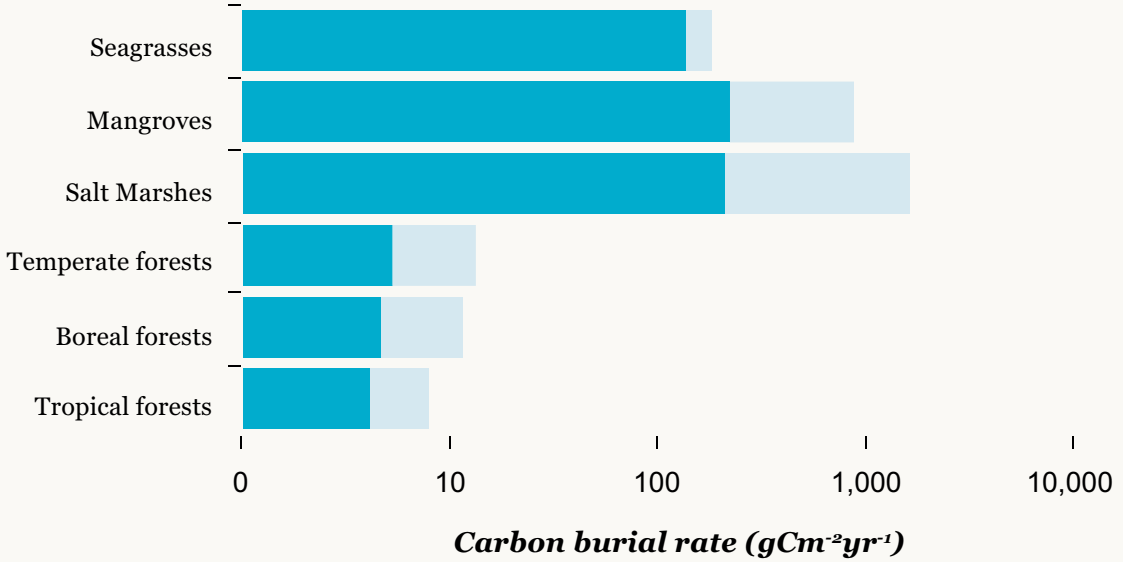
1 Note that while the carbon stored in the soil can be many metres deep, only the first metre of soil depth has been considered so as to allow for consistent comparisons among habitat types and in recognition of the fact that the top metre of carbon is most at risk after conversion of the ecosystem to other uses.

Even though the total land area of mangroves, coastal marshes, and seagrass is small compared with land in agriculture or forests, the carbon beneath these habitats is substantial. If released to the atmosphere, the carbon stored in a typical hectare of mangroves could contribute as much to greenhouse gas emissions as three to five hectares of tropical forest. A hectare of intact saltmarsh may contain carbon with a climate impact equivalent to 488 cars on U.S. roads each year. Even a hectare of seagrass meadow, with its small living biomass, may hold as much carbon as one to two hectares of typical temperate forest[iii].

Similarly to terrestrial ecosystems, in the coastal zone, landuse change has lead to high levels of CO_2 emissions. The draining, conversion or destruction of coastal ecosystems for other uses can disrupt the carbon sequestration by coastal ecosystems and may switch these ecosystems from being net sinks to net sources of carbon [xxii]. For example, converting mangrove forests to aquaculture ponds could result in the release of 150 tonnes of carbon per hectare per year from the removal of the mangroves and 750 tonnes of carbon per hectare per year from the exposure of mangrove sediments that have been accumulating carbon for millennia. Over 10 years, this could equate to a loss of carbon from the sediments 50 times greater than the rate of carbon previously sequestered by these mangroves [xxiii]. Globally, early estimations of carbon emissions resulting from mangrove deforestation and land use change are suggested to be in the order of 20 million to 120 million tonnes of carbon per year – as much as around 10% of emissions from deforestation globally, despite accounting for just 0.7% of tropical forest area [xxiv]. While we do not know these estimates for the Coral Triangle, the significance of carbon losses in coastal ecosystems here makes a powerful argument for the conservation of mangrove forests, particularly when increasing atmospheric concentrations of CO_2 are considered.

FIGURE 4

Coastal ecosystems sequester large amounts of carbon. Mean long-term rates of carbon sequestration in soils in terrestrial forests and coastal ecosystems. Error bars indicate maximum rates of accumulation[xxii].



International blue carbon action

Large-scale emissions from ecosystem degradation and habitat conversion in coastal ecosystems are ongoing, but currently not accounted for in national greenhouse gas inventories, nor are they being mitigated to any degree [xxv].

Forest conservation schemes such as Reduced Emissions from Deforestation and Forest Degradation (REDD+), are now emerging as potential tools to reduce emissions from deforestation and degraded forests and enhance carbon storage. The understanding and acknowledgment of the role of blue carbon in climate change mitigation may see the development of a similar scheme which could support the sustainable use of Coral Triangle coastal ecosystems, but there are some uncertainties around factors influencing carbon sequestration and carbon stocks in these coastal ecosystems and how a payment scheme might work.

An International Scientific Blue Carbon Working Group consisting of leading scientists from around the world is currently working to detail the global relevance of coastal ecosystems carbon, assess the feasibility of this blue carbon as a conservation and management tool, provide implementable recommendations for marine policy, conservation and management and identify and work with others to address critical information needs and data gaps.

This work is also facilitating an International Blue Carbon Economics and Policy Working Group who are focused on identifying relevant international climate, coastal and ocean policy agreements, frameworks, platforms and mechanisms for supporting adequate management and long-term financing of blue carbon defining priorities, opportunities and issues that allow for conservation and restoration of coastal 'blue carbon' ecosystems, and creating a Blue Carbon Policy Framework and timeline.

LEARNING THE REDD LESSONS

There is much to be learned from existing schemes that attempt to balance conservation with sustainable livelihoods. REDD+ schemes, particularly relevant for mangroves, provide a unique learning opportunity, given their focus on harnessing forests to mitigate climate change. REDD+ is designed to reduce greenhouse gas emissions through avoiding the release of carbon stored in trees when trees are cut down; encouraging the storage of additional carbon by leaving trees standing; and promoting reforestation [xxvi].

Sustainable financing

It should be noted however, that while schemes such as REDD+ are showing great potential, there are also significant challenges in developing and financing effective incentive systems that will provide efficient carbon reductions while protecting dependent communities against new risks [xxvii]. Any such schemes for coastal ecosystems are also likely to face similar challenges.

'Like REDD+ financing, blue carbon financing could flow through national planning, development of pilot programs, and payments for verified emissions reductions. The current REDD+ funding process suggests however, that the future financing of blue carbon will hinge on three key issues:

Incorporation of blue carbon in the REDD+ readiness process: As readiness plans evolve and more countries enter the readiness process, the applicability of blue carbon to that process can strongly define future funding for coastal habitat protection.

Inclusion of blue carbon in future REDD+ agreements: Unless future REDD+ protocols include soil carbon, achieving any scale on blue carbon investments may be difficult.

Competitiveness of blue carbon sequestration with other land use mitigation activities: Blue carbon offsets will be required to compete not only with other REDD+ projects, but also with other carbon mitigation strategies as well' [xxviii].

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What is clear for coastal ecosystems and the communities that depend on them is a need for a holistic, integrated conservation management approach. A resilient and robust coastal ecosystem conservation strategy should encompass a regional vision which is supported by ecosystem based management approaches which recognise and strengthen the inherent and interdependent linkages between the land/sea interface, as well as incorporate the different land uses and recognise the social and economic needs of local inhabitants, their cultural rights and local capacities. This can help facilitate the transition of Coral Triangle countries to a green economy through reducing emissions, while at the same time generating multiple benefits for people's livelihoods, the economy and conservation.

Key lessons from the REDD+ [xxix] experience for developing and implementing coastal ecosystems conservation policy, planning and Payments for Ecosystem Services (PES) schemes, include:

Governance

- The **rights of local communities and their management capability must be recognised**, a substantial portion of the **financial benefit must go to the communities** who have the ability to manage and protect these coastal ecosystems and these coastal **communities must have secure rights** to the land and shorelines where they live.
- As coastal land becomes increasingly valuable for agriculture, carbon and development, there is greater pressure from investors and less interest by many governments to recognise local land rights [xxx]. The behaviour of landowners and coastal ecosystem stewards can change immediately in the light of decisions to introduce carbon trading or a REDD+ regime and a short-term consequence can be an increase in clearing in reaction to an unexpected government 'tax take' linked to the nationalisation of carbon rights. The implications of such a decision for different types of coastal ecosystems and land ownership categories could be severe, particularly in countries where rights to land are contentious and where vulnerable groups that depend on coastal ecosystem resources may lose out. From the perspective of investors, **assigning carbon rights to governments may be a disincentive** for external investment as investors may see their returns from projects significantly reduced[xxvii].
- National governments need to **take proactive steps to clarify tenure**. Only when tenure of an area is secure, on paper and in practice, do longer-term investments in sustainable management become worthwhile [xxxi].
- **Coordination among different stakeholders**, such as agriculture, planning, fisheries and forestry ministries, in order **to reduce deforestation** from aquaculture or development expansion is critical. REDD+ like schemes can succeed if stakeholders share a common understanding of appropriate coastal land use, a shared and trusted way of negotiating agreements, and if local users derive co-benefits.

Policies and Measurement, Reporting and Verification (MRV)

- Global decisions will influence the design and implementation of national REDD+ type schemes for coastal ecosystems, and national policy makers face some uncertainties until global policy direction is provided. Therefore, initially the focus should be on **national blue carbon strategy development and readiness**, which can occur quickly if adequate data, resourcing and capacity is available. However many countries in the Coral Triangle do not have even a minimum capacity for MRV. The priority should be on **developing a roadmap for establishing a sustainable MRV system** and its early implementation. This will require an understanding of the active drivers and processes of coastal ecosystems emissions, sufficient data to assess their importance (carbon impact), and policies that will achieve REDD+ (or equivalent) objectives.
- **Blue carbon related national policies should be focused on actions to encourage or discourage drivers of coastal carbon loss and the processes that increase coastal ecosystems emissions** and their long-term effects. Policies should be underpinned by basic coastal ecosystem data and information (and thus monitoring capacity). Additionally, an integrated and cross **cutting national coastal ecosystem/blue carbon strategy and implementation plan** may help to set priorities for MRV.
- REDD+ type strategies are likely to be **more equitable and locally legitimate if they represent local needs and aspirations** in design, implementation and benefit allocation.

Community engagement

- **Communities** in coastal areas can be **trained to map and inventory mangroves, seagrass and saltmarsh**, although they may need technical support for some tasks to assess carbon storage and sequestration rates. Communities have successfully and accurately mapped and collected local forest data more cost effectively than researchers and this may also be possible for coastal ecosystems.
- Balancing the requirements of a REDD+ type system (storing carbon) and **satisfying the expectations of local stakeholders** may prove challenging and it is critical that communities are engaged in an open and transparent way, being made fully aware of the full range of issues affecting revenue generation with respect to coastal ecosystems. Unrealistically high expectations generated in governments and communities about large money flows and REDD+ type rents put REDD+ type coastal ecosystems projects at risk.
- **Payments for environmental services (PES) or conservation agreements aimed at reducing deforestation or degradation can be effective for coastal ecosystems** when payments depend on delivering results; if payment rates are set appropriately; and when land tenure and carbon rights are clearly defined. Because they are voluntary and based on incentives, PES are more equitable for conserving coastal ecosystems than erecting fences or imposing fines. Using spatial targeting toward high-threat, high-service, and low-cost areas can dramatically improve the carbon outcome[xxvii].

OPPORTUNITIES AND CHALLENGES
FOR BLUE CARBON PROJECTS IN THE CORAL TRIANGLE

Managing your blue carbon reserves

Natural ecosystems underpin all of the resources upon which we depend and therefore are critical for securing human wellbeing.

Investing in ecosystems and nature based solutions can bring both local and global benefits, providing the

dual goals of supporting local communities, helping them cope with and adapt to a changing climate, while also helping to mitigate global climate impacts depending on implemented practice[x].

While the science on blue carbon is refined and policy frameworks developed for mitigating climate change using coastal ecosystems through market driven mechanisms such as carbon offsets and PES, the immediate focus for decision makers in the Coral Triangle needs to be on:

- **building resilience in coastal communities** to improve protein and fuel wood resource security and wellbeing through developing natural adaptation strategies for coastal communities through community led conservation of coastal ecosystems;
- **building on existing policy mechanisms that support integrated coastal zone management** including climate change resilient networks of marine protected areas, to ensure a priority focus on coastal ecosystems management;
- **reducing current greenhouse gas emissions from degraded coastal ecosystems** through improved conservation and restoration; and
- **commencing pilot and demonstration projects** geared towards the collection of coastal ecosystem carbon emissions data in preparation for an offset scheme should it become available down the track.

While there are many organisations working within the Coral Triangle with local communities to restore and rehabilitate mangroves and seagrass for the benefit of coastal communities, this work is really only scratching the surface. Serious investment in the conservation of these critical ecosystems, combined with integrated coastal zone planning and innovative and sustainable solutions to create alternate income generation schemes will allow improvements to the wellbeing of adjacent coastal communities. This will also improve the health of coastal ecosystems upon which they depend and will contribute to reducing global greenhouse gas emissions.

A natural solution model for adapting to climate change – Green Coast[xxxii]

Green Coast was developed in response to the December 2004 tsunami which hit the coasts of Asian countries and caused enormous destruction and loss of human lives. Together with partners Wetlands International, IUCN and Both ENDS, WWF developed a program to restore damaged coastal ecosystems, such as mangroves in tsunami hit areas in Indonesia, Sri Lanka, India, Thailand and Malaysia. The Green Coast model provides effective natural adaptation solutions for climate change related impacts that engage coastal communities and improve livelihoods. A total of 91,000 tsunami affected people in these coastal areas have benefited from rehabilitated coastal ecosystems; more than 1,100 hectares of mangrove and coastal forests, 2,5 km of sand dunes and 100 hectare of damaged coral reef and seagrass beds were restored and protected. An additional 12,000 people have also benefited from increased income from livelihood activities supported by Green Coast such as fishing, small-scale aquaculture, eco-enterprises, home gardening and livestock. The Green Coast model is based around:

- Science and community based assessments identifying ecological damage and priority options for coastal restoration;
- Community-based restoration of coastal ecosystems and livelihoods through a 'bio-rights' approach (community groups receive financial capital to rebuild their livelihoods and in return, provide environmental services to the coastal restoration work); and
- Policy guidance and targeted communications aimed towards large-scale 'green reconstruction' programs by influencing the coastal resource management policies of district and national governments and increasing general awareness on value of coastal ecosystems.

Establishing blue carbon initiatives

For the Coral Triangle, effective conservation is about balancing conservation of biodiversity with a need to improve sustainable livelihoods and the ecosystem services that support communities. A blue carbon project is no different. Blue carbon is not a new concept, but potentially might offer a new funding source to finance pre-existing goals. Building climate change objectives into project activities can open up a broader range of financing opportunities. Whether a reworking of an existing conservation project or a newly developed project seeking carbon money for conservation finance, blue carbon projects need to focus on co-benefits. It should be noted however, that as for many REDD+ projects, many potential blue carbon projects will face significant challenges in demonstrating both financial and environmental additionality – because they would have been implemented without carbon funding or they are paying for coastal ecosystems that are not under threat.

Blue carbon should be used as an incentive to finance coastal ecosystem conservation efforts, rather than as a stand-alone mitigation opportunity.

In developing blue carbon projects a number of critical success factors need to be considered:

- Projects should be geared towards improving the resilience and livelihoods of coastal communities through improving the ecosystem services that are critical for their survival – **livelihoods and food security are generally the concerns of coastal communities, not carbon**. Blue carbon should be used as an incentive to finance coastal ecosystem conservation efforts, rather than as a stand-alone mitigation opportunity.
- **Effective partnerships and technical capacity supported by strong project governance, management and clearly defined roles and responsibilities** are key. This will include technical expertise in coastal ecosystems, biomass measurements and carbon accounting; experience in stakeholder engagement; familiarity with the local conditions; detailed knowledge of relevant national and international laws and policies; significant knowledge of the project area; strong credibility with local communities; and solid, pre-existing working relationships among project partners [xxxiii].
- **Solid technical information and scientific site-specific analyses** to support the project by way of baseline carbon, environmental and socio-economic data and adequate methodologies.
- The **choice of which standard to apply to a blue carbon initiative can have important implications for the speed, ease and cost of project development.** In the case of coastal ecosystem replanting or rehabilitation projects, this choice will also be crucial in determining the amount of land that is eligible for planting, which will affect potential carbon credits that can be generated. The voluntary carbon offset market is currently the only sales outlet for carbon credits generated by blue carbon projects and many project investors will seek guarantees that the credits they purchase actually reduce net carbon emissions, and do so without negative impacts on biodiversity and local livelihoods.

The most recognised standards for natural carbon projects are the Climate, Community and Biodiversity Standards (CCBS), the UNFCCC Clean Development Mechanism (CDM), and the Verified Carbon Standard (VCS), which is the leading standard focused on the integrity of emissions reductions. New requirements are under development for crediting the climate benefits of Wetlands Restoration and Conservation (WRC) activities, including for mangroves, saltmarsh, seagrass, under the VCS. The requirements are due for release in mid-2012.

Mangroves now recognised under the Clean Development Mechanism

A new methodology[xxxiv] for calculating the role that mangrove restoration plays in slowing climate change, by capturing and storing CO_2 from the atmosphere, has been adopted under the UN climate change convention's Kyoto Protocol, as part of the Clean Development Mechanism that supports emission reduction projects in developing countries.

This will not only reduce emissions from degraded mangrove sites and provide a significant boost for existing and new mangrove restoration efforts for Coral Triangle countries, but it has the potential to improve the livelihoods of coastal communities by improving fisheries productivity and access to sustainable timber.

A word of caution though…

The latest science[xxxv] shows that there remains large uncertainties concerning the extent to which these mangroves are a natural sink for carbon. This uncertainty is coupled to the natural dynamics of mangrove ecosystems. Any PES or REDD+ scheme must account for this level of uncertainty. To maximise carbon payments for mangroves, PES and REDD+ type schemes must therefore be restricted to choosing sites conducive to net accumulation of carbon, that is, primarily at the sea-forest boundary, unless payments are being made simply to preserve existing mangroves or to preserve biodiversity. In order to maximise the efficiency of PES and REDD+ schemes, close collaboration between managers and scientists is required. A combination of approaches, such as ecological modelling, field testing of ecosystem services and filling in of existing information gaps to improve the accuracy of modelling estimates is necessary for the successful sustainable management of mangrove ecosystems.

It should be noted that it is likely that this natural variability will also be a challenge for seagrass and saltmarsh carbon related projects.

- For project activities **to deliver clear, tangible benefits to local stakeholders, they need to be actively engaged in project design and implementation**. Adequate capacity building will also need to be provided in coastal ecosystem carbon project risk management, community based MRV and for onground activities to build trust and confidence in the local community to participate in the project.
- **Supportive government policy geared towards integrated coastal zone management and adequate experience and capacity of government representatives** in carbon related projects to actively engage in the project and act effectively on project outcomes by way of policy or onground efforts.
- Investors willing to **provide adequate financial resources** to support the project from design through to completion.

MOVING FORWARD

PURSUING BLUE CARBON OPPORTUNITIES

For Coral Triangle countries interested in pursuing the opportunities blue carbon may offer the key priorities include:

Policy

- building on existing policy mechanisms that support integrated coastal zone management to ensure a priority focus on coastal ecosystems management;
- reducing current greenhouse gas emissions from degraded coastal ecosystems through improved conservation and restoration; and

– leveraging existing coastal ecosystem conservation programs to use blue carbon as a means to provide ongoing funding to regional and national coastal ecosystem livelihood improvement programs and site-level adaptation projects.

Governance

– building on and including blue carbon into existing regional, national and sub-national climate change policies, strategies and adaptation action plans; and

– working with the Global Blue Carbon Initiative to influence the UNFCCC.

Science

– commencing pilot and demonstration projects geared towards the collection of coastal ecosystem carbon emissions data in preparation for an offset scheme should it become available down the track.

Communities

– building resilience in coastal communities to improve food security and wellbeing through developing natural adaptation strategies for coastal communities through community led conservation of coastal ecosystems.

HOW DO I STAY IN THE LOOP?

There are a number of key websites that will keep you in the loop of latest developments, science and publications, including:

– Blue carbon portal: bluecarbonportal.org

– Blue carbon blog: bluecarbonblog.blogspot.com

For more information on the science supporting blue carbon refer to:

– Duke University publication "State of Science on Coastal Blue Carbon: A summary for policy makers. May 2011" available from http://nicholasinstitute.duke.edu/economics/naturalresources/state-of-science-coastal-blue-carbon

– Recommendations from the international working group on coastal blue carbon "Minimising carbon emissions and maximising sequestration and storage by seagrass, tidal marsh and mangroves" http://www.marineclimatechange.com/marineclimatechange/bluecarbon_recommendations_files/bluecarbon_recommendations_3.28.11.FINAL.HIGH.pdf

For more information on the global policy directions for blue carbon refer to:

– Blue Carbon Policy Framework from the second workshop of the International Blue Carbon Policy Working Group http://www.iucn.org/about/work/programmes/marine/marine_news/?uNewsID=9336

If you would like to discuss establishing a blue carbon initiative in your country please contact your local WWF office who can provide assistance.

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