Clyde Marine Region Assessment 2017



Clyde Marine Planning Partnership

Identifying issues relevant to regional marine planning

The Clyde Marine Planning Partnership would like to thank all those who were involved in developing this Assessment and in particular the following people: Martyn Cox, Anna Donald and Drew Milne from Marine Scotland, Matt Gubbins from Marine Scotland Science, Dr. Chris Leakey and other Coastal and Marine Ecosystem Unit staff from Scottish Natural Heritage, Morgane Westley from Scottish Environment Protection Agency, Chris Kelly from Ekos, members of the Clyde2020 Research Advisory Group (see section 1.4) and attendees of the MASTS review workshop – Lucy Greenhill and Dr. Paul Tett from the Scottish Association for Marine Science; Dr. David Green, Dr. Tavis Potts, Dr. Jacqueline Tweddle from the University of Aberdeen and Dr. Tim Stojanovic from the University of St. Andrews.

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Foreword

I am delighted to present to you this Assessment of the Clyde Marine Region, which is a significant milestone in the process of developing a Regional Marine Plan.

The Clyde is a diverse, vibrant and beautiful place, but it is under pressure from increasing demands from more and more users of its seas and coastline. Better, and more informed planning and management is now essential to realise its full potential, and Scottish Ministers have given responsibility to the newly established Clyde Marine Planning Partnership to develop this Regional Marine Plan.

In line with the Marine (Scotland) Act 2010, the Partnership staff have developed the Assessment with the support of data and insight from many different organisations, including government agencies, members of the Partnership and community groups active in the Clyde. It has also been through a rigorous review process involving expert advice.

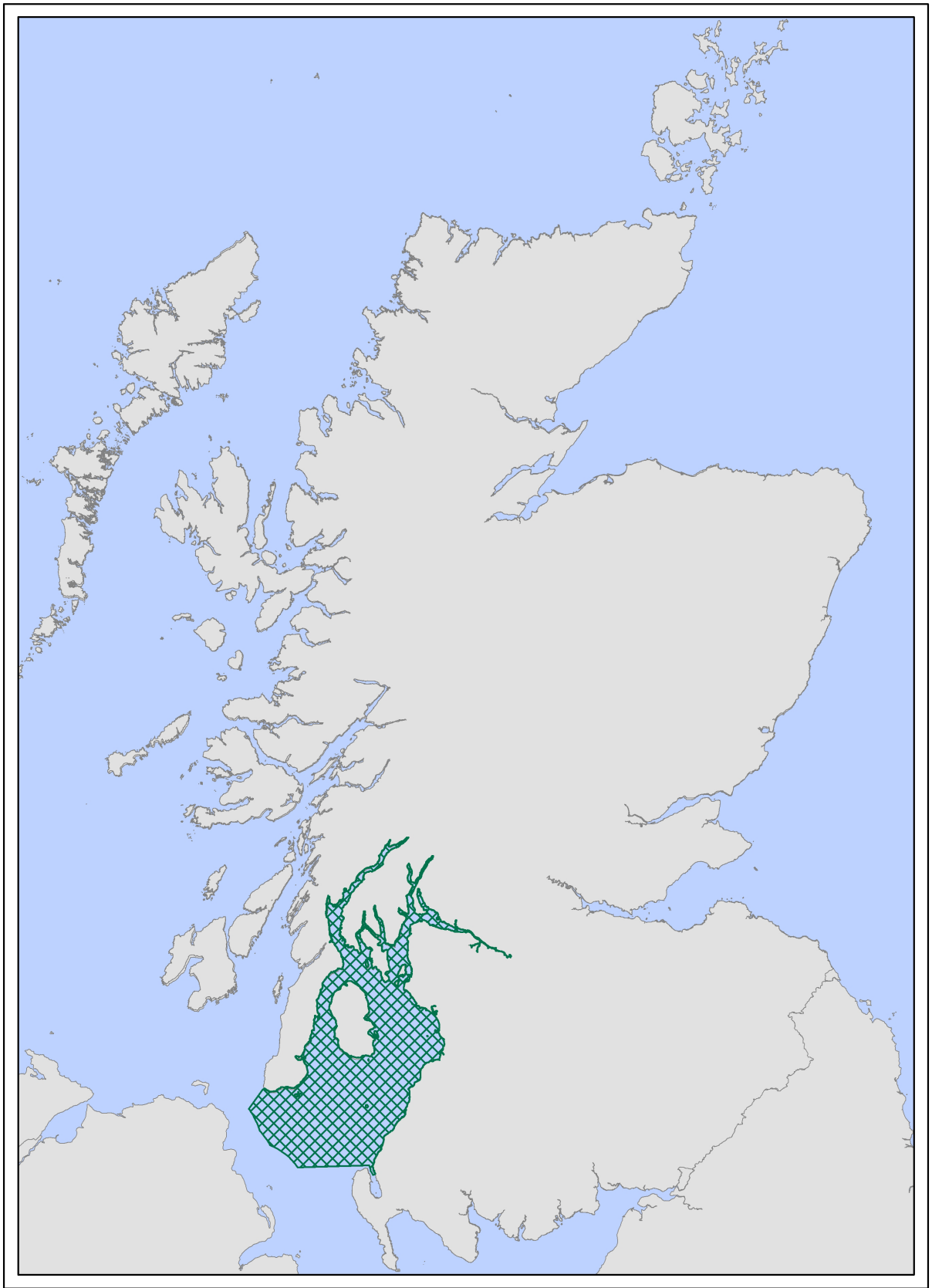
Thanks to this, the resulting Assessment is an up-to-date and comprehensive review of environmental, social and economic trends and issues at the Clyde Marine Region level. It provides us with a baseline from which to measure progress and identifies issues which need to be addressed in the region and which may be suitable for policy within the Regional Marine Plan.

I would like to thank all who have been engaged so far with this process, and, in particular, thank the three members of the Partnership staff who have developed and written this Assessment. It is an invaluable first step towards the Regional Marine Plan for the Clyde.

Isabel Glasgow

Chair of the Clyde Marine Planning Partnership

Map 1. Location of the Clyde Marine Region within Scotland



NOT FOR NAVIGATION. Created by Scottish Government (Marine Scotland) 2015. © Crown Copyright, All rights reserved. OceanWise License No. EK001-201404001. Ordnance Survey License No. 100024655. Projection: Transverse Mercator. Scale 1:1,980,193

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Abbreviations and acronyms

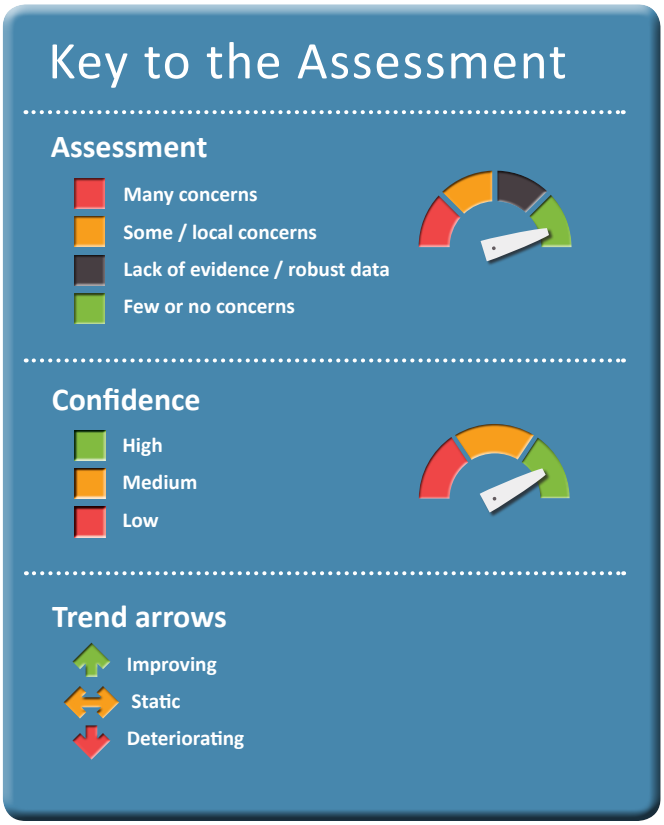
AAG	Area Advisory Group
ABBF	Argyll and Bute Beach Forum
ABS	Annual Business Survey
ACOPS	Advisory Committee on Protection of the Sea
AFRC	Advanced Forming Research Centre
AHA	Associated Harvesting Area
BTO	British Trust for Ornithology
CAR	Controlled Activities Regulations
CAS	Census Area Statistics
CFA	Clyde Fisherman's Association
CFP	EU Common Fisheries Policy
CMAL	Caledonian Maritime Assets Ltd
CMMP	Clyde Marine Mammal Project
CMR	Clyde Marine Region
COAST	Community of Arran Seabed Trust
CPR	Counter Pollution and Response
CPUE	catch per unit effort
CSEMP	UK Clean Seas Environment Monitoring Programme
CSHA	Classified Shellfish Harvesting Areas
DM	Defence Munitions
EEZ	Exclusive Economic Zone
EFF	European Fisheries Fund
EcP	Ecological Potential
EROD	7-Ethoxyresorufin-O-deethylase
EU	European Union
F	Fishing Mortality
FFL	Fishing for Litter
FMSY	Maximum Rate of Fishing Mortality
FSC	Field Studies Council
FSS	Food Standards Scotland
GBR	General binding regulations
GBBG	Great Black-Backed Gull
GDP	Gross Domestic Product
GEcP	Good Ecological Potential (under WFD)
GEcS	Good Ecological Status (under WFD)
GES	Good Environmental Status (under MSFD)
GRAB	Trust - Group for Recycling in Argyll and Bute
GRT	Gross Register Tonnage
GVA	Gross Value Added
HE/FE	Higher and Further Education
HMNB	Her Majesty's Naval Base
HMWB	Heavily Modified Water Body
HWDT	Hebridean Whale and Dolphin Trust
ICES	International Council for the Exploration of the Seas
IMO	International Maritime Organization
INNS	Invasive Non-Native Species
IPCC	Intergovernmental Panel on Climate Change
ISLES	Irish-Scottish Links on Energy Study
IUCN	International Union for the Conservation of Nature
JAMP	Joint Assessment and Monitoring Programme
JNCC	Joint Nature Conservation Committee
LBBG	Lesser Black Backed Gull
LCA	Length Cohort Analysis
MAIB	Marine Accidents Investigation Branch
MASTS	Marine Alliance for Science and Technology Scotland
MCA	Maritime & Coastguard Agency
MCA	Maritime and Coastguard Agency
MCCIP	Marine Climate Change Impacts Partnership
MCS	Marine Conservation Society
MoD	Ministry of Defence
MPA	Marine Protected Area
MRCC	Maritime Rescue Co-ordination Centre
MSFD	Marine Strategy Framework Directive
MSS	Marine Scotland Science
MSY	Maximum Sustainable Yield
NAG	National Advisory Group
NCN	National Cycle Network
NGO	Non-governmental organisation
NM	Nautical Mile
NMPi	National Marine Plan interactive
NNS	Non-native species
NPF3	National Planning Framework
N-RIP	National Renewables Infrastructure Plan
ORE	Offshore Renewable Energy
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PAH	Polycystic aromatic hydrocarbons
PBDE	Polybrominated diphenyl ethers
PCB/CB	Polychloronated biphenyl hydrocarbons
PMF	Priority Marine Feature
POP	Persistent Organic Pollutant
Ramsar	Convention of the international treaty for the conservation and sustainable use of wetlands
RBMP	River Basement Management Plan
RET	Road Equivalent Tariff
RMP	Representative monitoring Point
RO-RO	Roll on – Roll off
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yacht Association
SAC	Special Areas of Conservation
SAIC	Scottish Aquaculture Innovation Centre
SAMS	Scottish Association for Marine Science
SCU	Salvage Control Unit
SEPA	Scottish Environment Protection Agency
SFC	Scottish Funding Council
SIC	Standard Industrial Classification
SMP	Seabird Monitoring Programme
SMRTS	Scottish Marine Recreation and Tourism Study
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPRI	Scottish Pollutant Release Inventory
SPT	Strathclyde Partnership for Transport
SRC	Shoreline Response Centre
SRD	Sewage Related Debris
SSACN	Scottish Sea Angling Conservation Network
SSB	spawning stock biomass
SSPO	Scottish Salmon Producers Organisation
SSSI	Site of Special Scientific Interest
SSTP	Scottish Shark Tagging Programme
SWPA	Shellfish Water Protected Areas
TAC	Total Allowable Catch
TBT	Tri-butyl Tin
THI	Townscape Heritage Initiatives
UKCP	UK Climate Projections
UKPCZ	United Kingdom Pollution Control Zone
UNEP	United Nations Environment Programme
UWTV	Underwater TV survey
UWWT	Urban Waste Water Treatment
WCRIFG	West Coast Regional Inshore Fisheries Group
WeBS	Wetlands Bird survey
WFD	Water Framework Directive
Wider CMR	Sectoral data based at planning authority level
WWT	waste water treatment

Opposite: Tarbert harbour © CLAIRE PESCOD

1. Assessment Summary

1.1 Summary – Physical, Clean and Safe, Healthy and Biologically Diverse

SECTION	CHAPTER	ASSESSMENT	CONFIDENCE
Physical	Climate change – impact on marine life	Concerns for the future / Many unknowns	Low/medium
	Climate change – sea level rise	↓	High
	Seabed and coastal geology and sediments	Not Applicable	Not Applicable
	Coastal change	Not Applicable	Not Applicable
	Water circulation	Not Applicable	Not Applicable
	Landscape – Seascape	Not Applicable	Not Applicable
Clean and safe	Water Framework Directive – transitional and coastal waters	↑	High
	Hazardous substances including biological effects	↔ Clyde estuary, Inner Firth, Holy Loch, Garroch Head / ↑ Other lochs and outer Firth	High
	Microbiological contamination – Shellfish water protected areas	↔	High
	Microbiological contamination – Bathing waters	↑	High
	Eutrophication	↑	High
	Oil and chemical spills and accidents	↑	High
	Dissolved oxygen	↑ Inner Clyde Estuary / ↔ Rest of CMR	High
	Marine litter	↓	Low/medium
	Noise	↔	Low
Healthy and biologically diverse	Habitats – Intertidal rock and sediments	↓	High
	Habitats – Sub-tidal rock	↔ Sub-tidal rock / ↓ Biogenic reefs	Medium
	Habitats – Shallow and shelf subtidal sediments	↔	Medium
	Marine fish (demersal and pelagic) and shellfish	↔	Medium
	Sharks, skates and rays	↑ Basking sharks / ↓ All other elasmobranchs	Medium
	Whales, dolphins and porpoises	↔	Low
	Seals	↑	High
	Seabirds and water birds	↓ Seabirds – some species / ↓ Water birds – some species	High
	Protected areas – nature conservation	↔ Others / ↓ Seabirds	High
	Marine non-native species	↓	Medium



Assessment

Confidence

Dials display confidence ratings of high, medium or low where assessment is made. An explanation is provided at the start of each chapter.

High – where data are gathered as part of ongoing monitoring for EU, UK or Scottish legislation and/or where a specific report (<10 years old) is available providing background data and information on which assessment can be based.

Medium – where data or information are available in a one-off report or map which may be out of date or from another part of the world but can give a reasonable snapshot view.

Low – where data are not readily available. However, information or knowledge from stakeholders can give an informed view.

Trends

The coloured arrows indicate whether the overall trend is improving, deteriorating, or static.

Any variation in scoring to the Marine Atlas Clyde assessment is indicated and explained at the start of each chapter where relevant.

1.2 Summary – Productive

This summary should be treated with caution. There are differences in base years and comparison periods. Also some figures are strictly Clyde Marine Region, whilst others are only available at the Wider region which includes all activity in Argyll and Bute (a large portion of which is not part of the Clyde Marine Region). It should also be noted that some industries, whilst perhaps smaller, are particularly important to rural communities.

Sport, Recreation and Tourism figures include wider tourism activity, not just marine activity. To provide context it is estimated that between 10 % and 50 % can be attributed directly or indirectly to marine activity. It should be noted that almost £1bn of the £2bn turnover is attributed to the Glasgow local authority area – most likely from service sector activities such as restaurants and accommodation providers, and therefore unlikely to be directly attributable to marine activity.

Note that data are not available for the following chapters: Historic environment and cultural heritage (included within Sport, recreation and tourism); Energy, subsea cables and pipelines; Wastewater treatment and industrial outfalls; Water abstraction; and Marine management, education, research and development.

It should be noted that any Forward Look in the Productive section does not take into account any of the implications of the UK leaving the European Union.

Sea Fisheries

INDICATOR	VALUE 2013/14	% OF SCOTLAND	CHANGE 2010-14
WIDER CLYDE MARINE REGION			
Employment (nos.)	600	16%	+24%
Turnover*	£36.2m	11%	+14%
GVA*	£13.2m	12%	-18%
CLYDE MARINE REGION			
Tonnage	5,742	9%	-12%
Value of landings	£14.8m	10.5%	+12%
Effort (kW days)	23,500	–	+6%

*2009 – 2013 and adjusted to 2013 prices

Aquaculture

INDICATOR		VALUE 2013/14	% OF SCOTLAND	CHANGE 2010-14
WIDER CLYDE MARINE REGION				
Employment (nos.)		160	8%	-16%
Turnover*		£30.1m	11%	+21%
GVA*		£11.5m	10%	+51%
CLYDE MARINE REGION				
Tonnage	Mussels	300	4%	0%#
	Oysters and Scallops	500,000 shells	13%	-75%
	Salmon	11,000	8%	+40%
Value – Salmon		£45m	–	+44%*

* based on combined two year figures due to two year cycles in salmon harvesting. 2009 – 2013 and adjusted to 2013 prices.
# using 2005 as a base year as 2010 was a peak year that skews the assessment.

Processing – Fisheries and Aquaculture

INDICATOR	VALUE 2013/14	% OF SCOTLAND	CHANGE 2010-14
WIDER CLYDE MARINE REGION			
Turnover*	£175.7m	11%	+46%
GVA*	£40.1	10%	+48%
CLYDE MARINE REGION			
Employment (nos.)	440	5%	+60%

*2009 – 2013 and adjusted to 2013 prices

Sport, Recreation and Tourism

INDICATOR	VALUE 2013/14	% OF SCOTLAND	CHANGE 2010-14
WIDER CLYDE MARINE REGION			
Turnover*	£2bn	30%	-19%
GVA*	£1bn	29%	+0.3%
CLYDE MARINE REGION			
Employment (nos.)	35,150	18%	+7%

*2009 – 2013 and adjusted to 2013 prices

Defence

INDICATOR	VALUE 2015	% OF SCOTLAND	CHANGE 2010-14
WIDER CLYDE MARINE REGION			
Employment (nos.)	4,970	Not known	-9%

Shipping and transport

INDICATOR	VALUE 2013/14	% OF SCOTLAND	CHANGE 2010-14
WIDER CLYDE MARINE REGION			
Employment (nos.)	4,750	32%	-10%
Turnover*	£1.08bn	35%	-17%
GVA*	£314m	27%	-23%
CLYDE MARINE REGION			
Freight tonnage	16,300	24%	+23%
Freight ship calls	3,485	18%	+41%
Cruise ship passengers (2012 to 2015)	110,000 (2015)	25%	+66%
Ferry passengers*#	4.1m	-	-12%
Ferry cars*#	1m	-	-11%

*2009 – 2013 and adjusted to 2013 prices
Decline in passenger numbers driven by significant decline and change of service on subsidised Gourock to Dunoon route

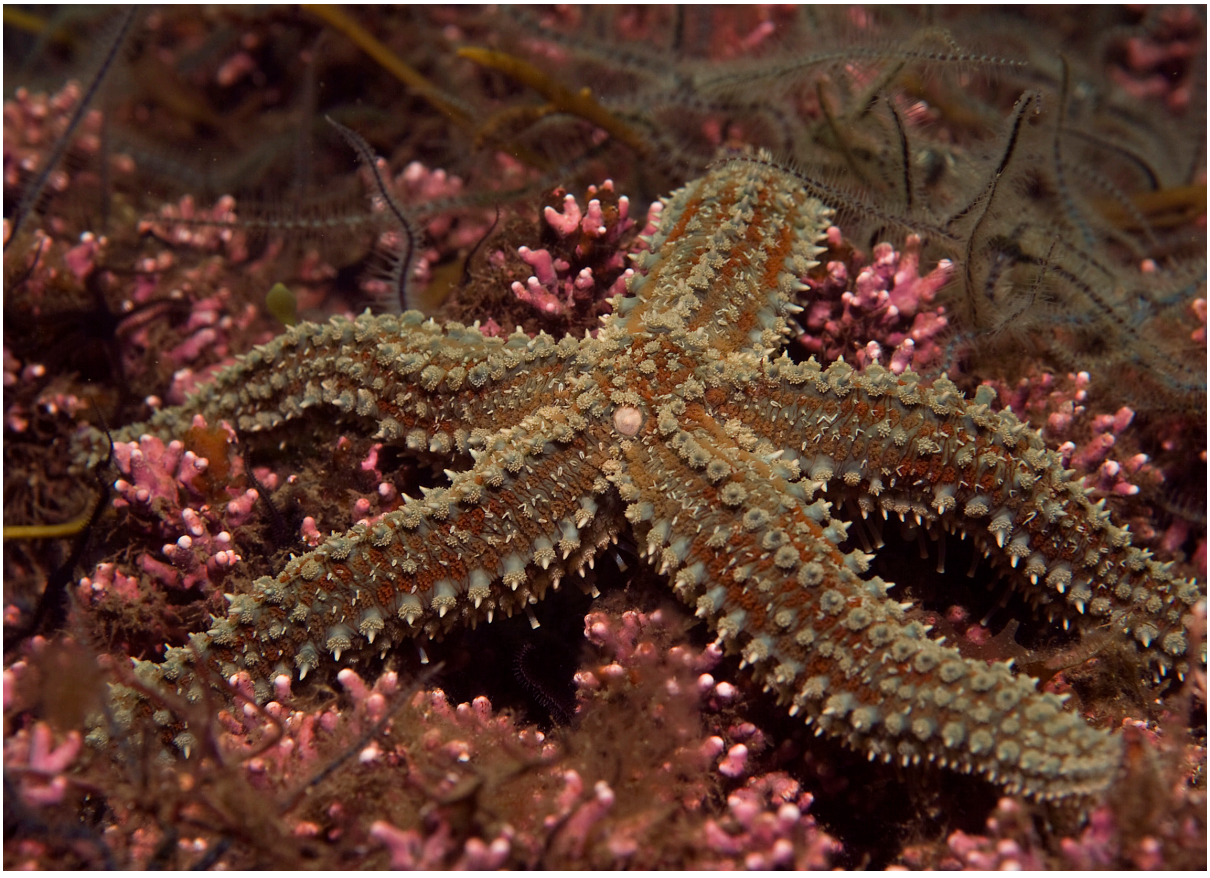
1.3 Summary – Ecosystem Services

An ecosystem is a community of interacting living organisms and their physical environment. Ecosystem Services provide benefits to people from the ecological functions of healthy ecosystems. The UK National Ecosystem Assessment defines them as 'the benefits provided by ecosystems that contribute to making human life both possible and worth living'. The services are further divided into the four descriptors shown below.[1]

In order to follow the Ecosystem Approach, the marine plan should consider the functioning of Ecosystem Services in their region. For each chapter of the Physical, Clean & Safe and Healthy & Biologically Diverse sections, wherever relevant, a table has been included to capture relevant Ecosystem Services for that chapter and any known issues with their functioning. Not all types of ecosystem service are relevant for every chapter and therefore some chapters only address e.g. Cultural Services. The state of provision of Ecosystem Services within the Clyde Marine Region (CMR) is given in the table on page 8. For more information on Ecosystem Services see Appendix I.

Ecosystem Services

ROLE	SERVICES
Provisioning	Products obtained from ecosystems. For example food provision (wild and farmed fish, shellfish), fish feed, algae, ornamental materials, water storage and provision, fertiliser and biofuels, medicines and biotechnology.
Regulating	Benefits obtained from the regulation of ecosystem processes. For example biological control, natural hazard regulation and protection, waste breakdown and detoxification, carbon sequestration, climate regulation.
Cultural	Non-material benefits. Recreation, tourism, aesthetic, education and research, spiritual and cultural.
Supporting	Services necessary for the production of all other ecosystem services. For example primary production, larval and gamete supply, nutrient cycling, water cycling, formation of: species-habitat, physical barriers, seascape.

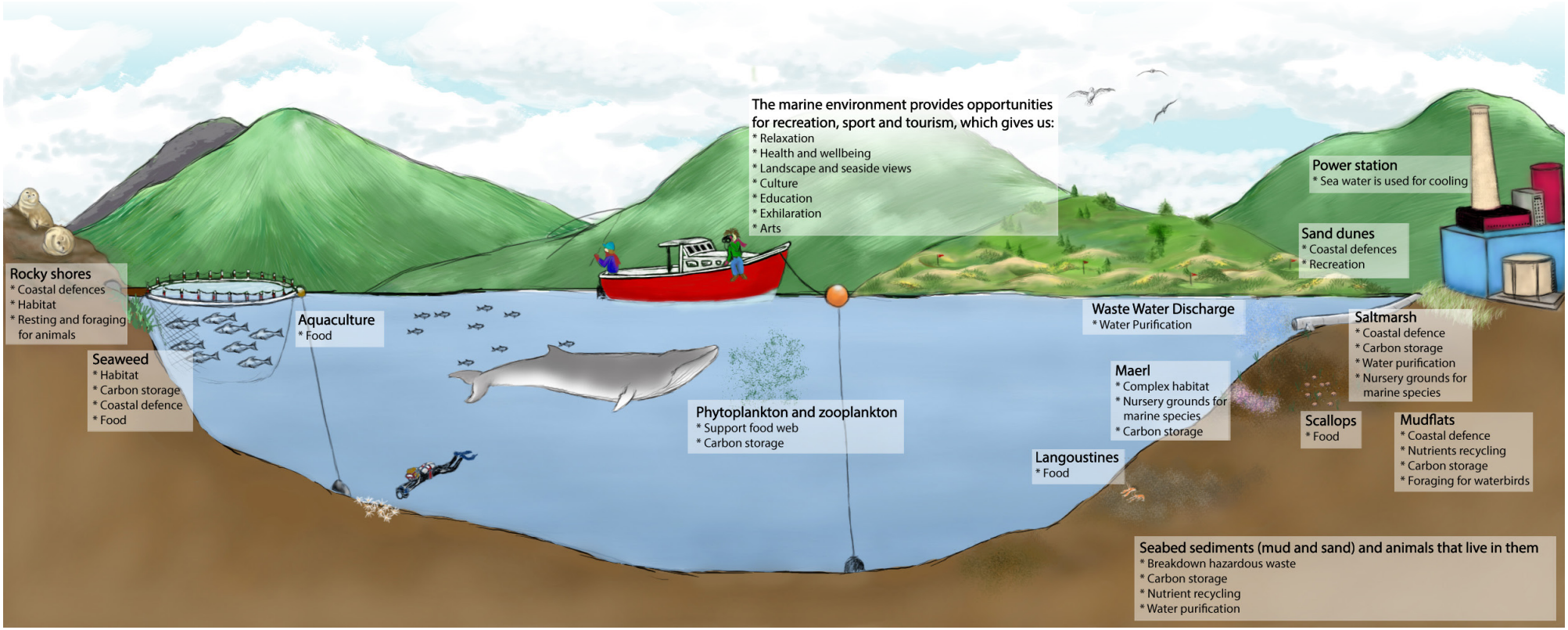


Spiny starfish on a maerl bed © GRAHAM SAUNDERS, MARINE SCOTLAND

1. Adapted from the conceptual framework of the UK NEA, 2011.

Aspects of the Clyde Marine Region and Associated Ecosystem Services

This diagram illustrates elements of the marine ecosystem and the goods and services they provide



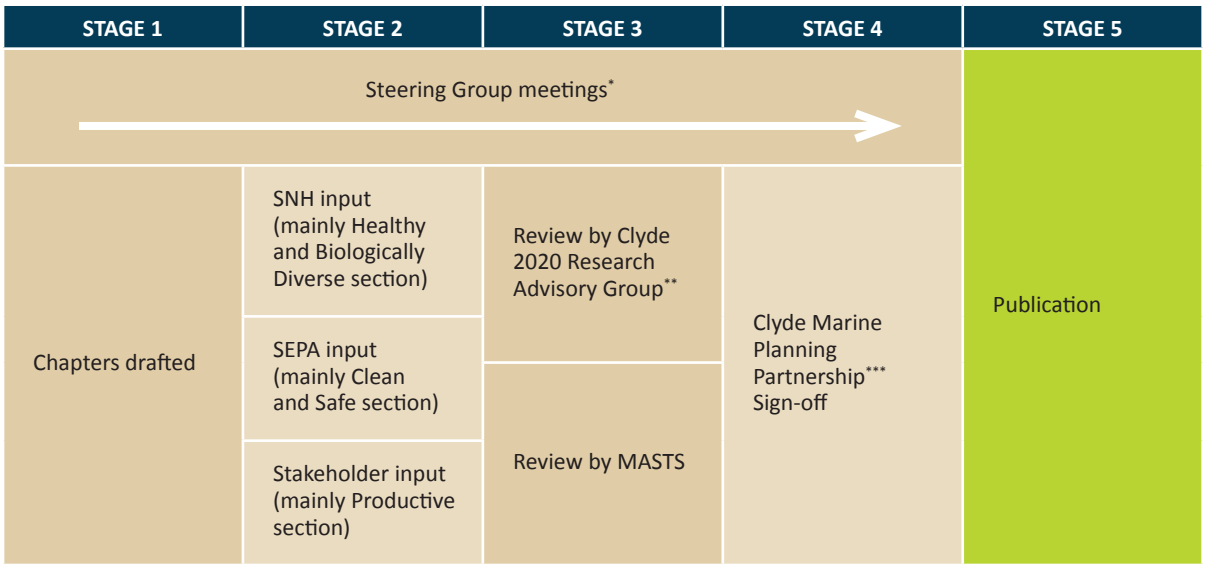
© DR L MCWHINNIE

Ecosystem Services Overview Assessment of the Clyde Marine Region

ROLE	SERVICES
Provisioning	• There is concern over richness and evenness of demersal and pelagic fish species that have previously been targeted by commercial fisheries. There is no demersal and pelagic fishery due to depletion of fish stocks. The impact of this on the wider ecosystem and food webs is not fully understood. • There is a sustainably managed *Nephrops* fishery, largely for export markets. • There are concerns over the sustainability of the scallop fishery due to lack of official stock assessment and management. • There are concerns over micro plastic ingestion by species (incl. *Nephrops*) limiting growth and resistance to disease. This is not an issue exclusive to the Clyde. • Contamination by hazardous substances in the Clyde estuary and inner Firth limits consumption of filter feeders, e.g. mussels. Classified Shellfish Harvesting Areas occur in the inner and outer Firth and the lochs – some are A/B which means treatment is required due to E.coli being too high for direct human consumption (although there are currently no CSHAs where harvesting is not permitted). • Levels of PCBs in biota (plaice) are at unacceptably high levels in several parts of the Clyde Marine Region. • Climate change will impact which species of fish, shellfish and algae will be available to both wild fisheries and aquaculture operations. • The Landings Obligation may lead to an increase in supply to fish feed (from quota species below Minimum Conservation Reference Size).
Regulating	• The Clyde estuary coast has been morphologically altered due to the construction of quay walls, industrial, residential and transport infrastructure developments. This limits the ability of the natural coastline (saltmarsh, mudflats, sand dunes) to protect coastal areas from storm damage and to adapt to sea level rise. Some areas exist that may be suitable for managed realignment. • The decreasing extent of saltmarsh impacts the provision of waste breakdown, wave energy reduction, protection against erosion and carbon sequestration. • The ecosystem can provide waste breakdown and detoxification services up to a point, however, sensitive areas (e.g. lochs) or areas with legacy of contamination such as the Clyde estuary and Inner Firth can become overloaded. • There are declining trends in numbers of key apex predators (e.g. cetaceans, sharks, skates, rays and seabirds) which may both impact the healthy functioning of the ecosystem and act as an indicator that other ecosystem services are compromised. • Whilst non-native species are on the rise, there is no evidence of detrimental impact on ecosystem services as yet; however, this may be due to a lack of research into this area.
Cultural	• The CMR is unique in the Scottish coast in terms of the amount and expanse of sea broadly contained by the mainland. There is a complexity and variety of seascapes which, coupled with industry and coastal development have contributed to the natural and cultural landscape much appreciated by locals and visitors to the CMR. • The seascape and landscape character of the CMR has aesthetic properties that have inspired a wealth of literature and art and form part of the cultural heritage. • Generally there has been improvement over the last 5 years in the water quality of bathing waters, although diffuse pollution and combined sewer overflows at certain points in Ayrshire exceed the capacity of plants and micro-organisms to assimilate, buffer or process faecal contaminants. This prevents effective waste processing and water purification services. • Marine litter is an increasing problem on the shoreline and can have an impact on ecosystem services. It can lead to a loss of amenity for local residents and detrimentally impact tourism and recreation activities. Careful planning of development should provide increased opportunities for tourism, recreation, education and research in the coastal zone. • Concerns over declining trends in numbers of key apex predators (e.g. cetaceans, sharks, skates, rays and seabirds) may impact the wildlife tourism sector, as has happened to the sea angling sector.
Supporting	• In general, supporting services are functioning: primary production occurs which sustains secondary zooplankton production (which in turn feeds an active food web). • The condition of phytoplankton has been of concern in Loch Long and Loch Goil. This is probably caused by diffuse pollution, combined with the long flushing time for these enclosed lochs. Recent monitoring shows a general improvement. • Climate change is the greatest unknown in terms of likely impact on the type, amount, location and timing of phytoplankton and zooplankton production. • Historic input and persistence of hazardous substances in sediments may impact the ability of the sediment to provide full nutrient cycling services at particular parts of the CMR, in particular the Clyde estuary, Garroch Head and Holy Loch. • Water bodies in the south Bute to east of Arran corridor have highlighted concerns until very recently over the condition of benthic invertebrates which provide nutrient cycling services. • Complex habitat, such as maerl beds and reef forming species are in decline which may compromise the ability of the environment to supply habitat (including nursery habitat) for species and may inhibit recovery of fish stocks. Some vulnerable subtidal sediments have been impacted by fishing activities. • Levels of oxygen within the inner and outer Clyde estuary are improving. The inner Clyde is now reaching levels which will support most ecological processes.

1.4 Process

This chart shows the process followed to develop this Assessment.



*Marine Scotland, SNH, SEPA, MASTS, JNCC, Shetland and Clyde MPP staff.

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Scottish Environment LINK,
Scottish Natural Heritage,
Scottish Sea Anglers Conservation Network,
South Ayrshire Council,
Crown Estate Scotland (Interim management),
The Scottish Salmon Company,
Visit Scotland,
West Coast Regional Inshore Fisheries Group.

Where possible, the CMPP has endeavoured to utilise knowledge co-produced from community and volunteer groups within the assessment. Examples of where this has been done are as follows: information provided from the Clyde Marine Mammal Project; volunteers from local bird groups contributed to data within the seabirds and waterbirds chapter; information from local marine litter groups; and inputs from the Community of Arran Seabed Trust.

The report of the review by MASTS is available at www.masts.ac.uk/research/research-forums/marine-planning-governance-forum/.

Many maps in this Assessment are sourced from National Marine Plan interactive (NMPi).[2] www.gov.scot/Topics/marine/seamanagement/nmpihome, which is an interactive tool designed to assist in the development of national and regional marine planning.

2. Marine Scotland, 2016a



Emergency services on the Clyde © PETER SANDGROUND