TWAP
TRANSBOUNDARY WATERS ASSESSMENT PROGRAMME

Transboundary Waters: A Global Compendium

Water System Information Sheets: Northern, Western & Southern Europe

Volume 6 - Annex D: Northern, Western & Southern Europe

UNEP

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Volume 6-Annex D

Transboundary Waters: A Global Compendium

Water System Information Sheets: Northern, Western & Southern Europe

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Global Change – IGBP – International Geosphere-Biosphere Programme

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Global Change – IGBP – International Geosphere-Biosphere Programme

NOAA

GESAMP – Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection

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WCMC

CERMES

UBC – Sea Around Us

TAT – Tokyo University of Agriculture and Technology

Assessment Team: The Open Ocean

UNESCO – United Nations Educational, Scientific and Cultural Organization · Intergovernmental Oceanographic Commission

GOOS – Global Ocean Observing System

WCRP – World Climate Research Programme

GACS – Global Alliance of CPR Surveys

PML – Plymouth Marine Laboratory

CERMES

UBC – Sea Around Us

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Contents (Volume 6, Annex D)

Preface

The Global Environment Facility (GEF) approved a Full Size Project (FSP), "A Transboundary Waters Assessment Programme: Aquifers, Lake/Reservoir Basins, River Basins, Large Marine Ecosystems, and Open Ocean to catalyze sound environmental management", in December 2012, following the completion of the Medium Size Project (MSP) "Development of the Methodology and Arrangements for the GEF Transboundary Waters Assessment Programme" in 2011. The TWAP FSP started in 2013, focusing on two major objecti es: (1) to carry out the fi st global-scale assessment of transboundary water systems that will assist the GEF and other internationa organization to improve the se ng of priorities for funding; and (2) to formalise the partnership with key institution to ensure that transboundary considerations are incorporated in regular assessment programmes to provide continuing insights on the status and trends of transboundary water systems.

The TWAP FSP was implemented by UNEP as Implementing Agency, UNEP's Division of Early Warning and Assessment (DEWA) as Executin Agency, and the following lead agencies for each of the water system categories: the International Hydrological Programme (IHP) of the United Nations Educational, Scientifi and Cultural Organization (UNESCO) for transboundary aquifers including groundwater systems in small island developing states (SIDS); the International Lake Environment Commi ee Foundation (ILEC) for lake and reservoir basins; the UNEP-DHI Partnership – Centre on Water and Environment (UNEP-DHI) for river basins; and the Intergovernmental Oceanographic Commission (IOC) of UNESCO for large marine ecosystems (LMEs) and the open ocean.

The fi e water-category specific assessments cover 199 transboundary aquifers and groundwater systems in 43 small island developing states, 204 transboundary lakes and reservoirs, 286 transboundary river basins; 66 large marine ecosystems; and the open ocean, a total of 756 international water systems. The assessment results are organized into five technical reports and a sixth volume that provides a cross-category analysis of status and trends:

Volume 1 – ***Transboundary Aquifers and Groundwater Systems of Small Island Developing States: Status and Trends***
Volume 2 – ***Transboundary Lakes and Reservoirs: Status and Trends***
Volume 3 – ***Transboundary River Basins: Status and Trends***
Volume 4 – ***Large Marine Ecosystems: Status and Trends***
Volume 5 – ***The Open Ocean: Status and Trends***
Volume 6 – ***Transboundary Water Systems: Crosscutting Status and Trends***

A ***Summary for Policy Makers*** accompanies each volume.

Volume 6 presents a unique and first global overview of the contemporary risks that threaten international water systems in five transboundary water system categories, building on the detailed quantitative indicator-based assessment conducted for each water category. As a supplement to Volume 6, this global compendium of water system information sheets provides baseline relative risks at regional and system scales. The fact sheets are organized into 14 TWAP regions and presented as 12 annexes. Volume 6 and the compendium are published in collaboration among the five independent water-category based TWAP Assessment Teams under the leadership of the Cross-cutting Analysis Working Group, with support from the TWAP Project Coordinating Unit.

The technical teams of the Transboundary Waters Assessment Programme(TWAP) assessed transboundary aquifers, lakes & reservoirs, river basins, and large marine ecosystems and prepared information (fact) sheets for water systems that were evaluated. Each fact sheet provides basic geomorphological information and presents baseline values of quantitative indicators that were used to establish relative risk levels. The water system fact sheets are organized into 14 TWAP regions that were used in the Crosscutting Analysis described in Volume 6. The regional compilations are presented as 11 annexes (A-K) of a global compendium, combining Southern & Southeastern Asia into one annex (I), and the Pacific Island Countries, Australia & Antarctica into another (Annex K). Each annex highlights contemporary regional risks as well as water system-specific risks. The annexes are:

Annex A. Transboundary waters of Northern America
Annex B. Transboundary waters of Central America & the Caribbean
Annex C. Transboundary waters of Southern America
Annex D. Transboundary waters of Eastern, Northern & Western Europe
Annex E. Transboundary waters of Eastern Europe
Annex F. Transboundary waters of Western & Middle Africa
Annex G. Transboundary waters of Eastern & Southern Africa
Annex H: Transboundary waters of Northern Africa & Western Asia
Annex I: Transboundary waters of Southern & Southeastern Asia
Annex J: Transboundary waters of Eastern & Central Asia
Annex K: Transboundary waters of the Pacific Island Countries, Australia & Antarctica

In the case of the open ocean, which is the largest transboundary water system of planet earth, selected quantitative indicator maps prepared by the Open Ocean Assessment Team, are compiled in Annex L to highlight the contemporaneous state of the global ocean.

Annex L: Selected indicator maps for the open ocean

All information sheets and indicator maps for the open ocean may be downloaded individually from the following websites:

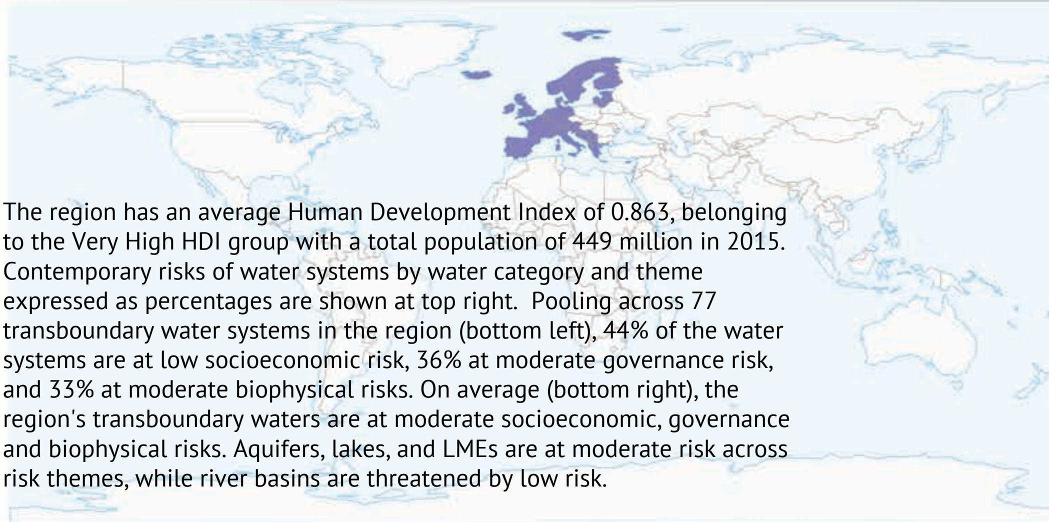
Transboundary Aquifers: http://twapviewer.un-igrac.org
Transboundary Lakes/ Reservoirs: http://ilec.lakes-sys.com/
Transboundary River Basins: http://twap-rivers.org
Large Marine Ecosystems: http://onesharedocean.org
Open Ocean: http://onesharedocean.org

All TWAP publications are available for download at http://www.geftwap.org

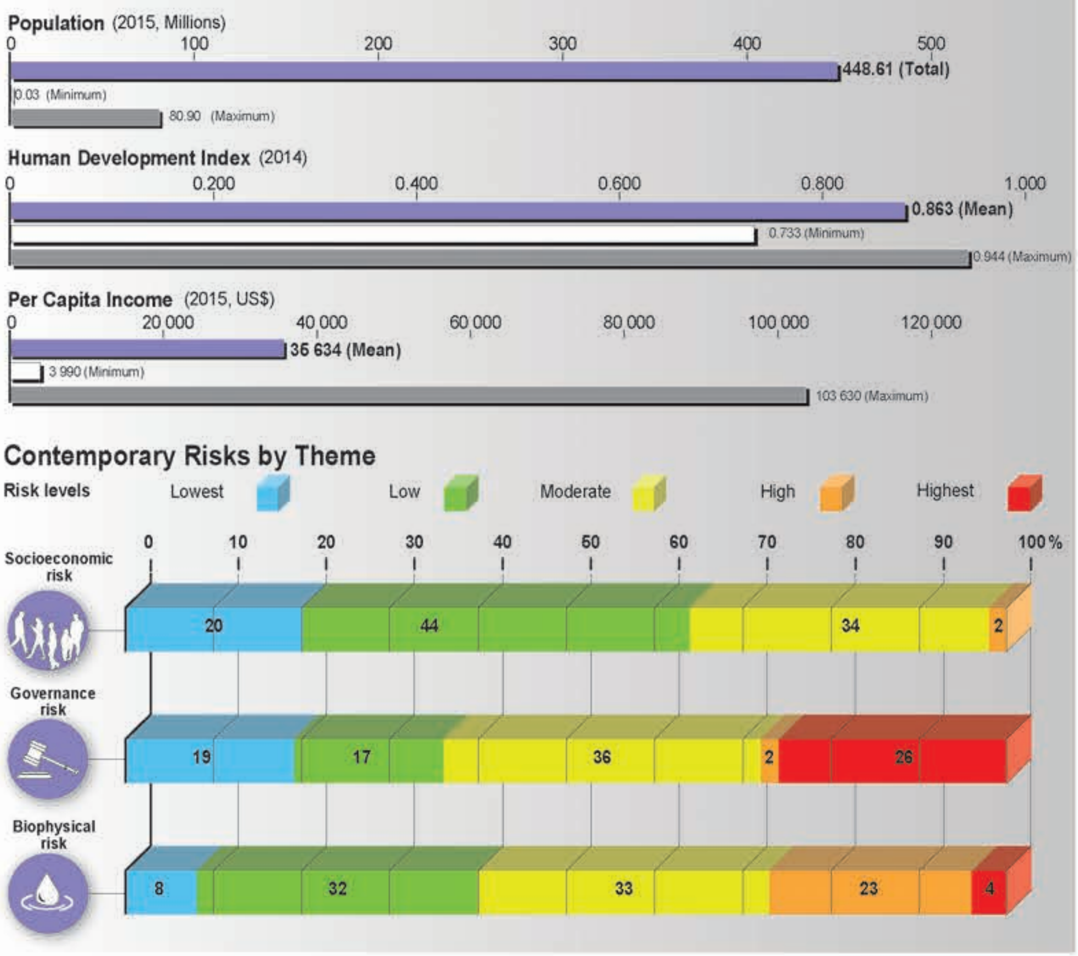
Over the long term, it is envisioned that these baseline information sheets will continue to be updated by future assessments at multiple spatial and temporal scales to better track the changing states of transboundary waters that are essential in sustaining human wellbeing and ecosystem health.

Regional Risks by Theme

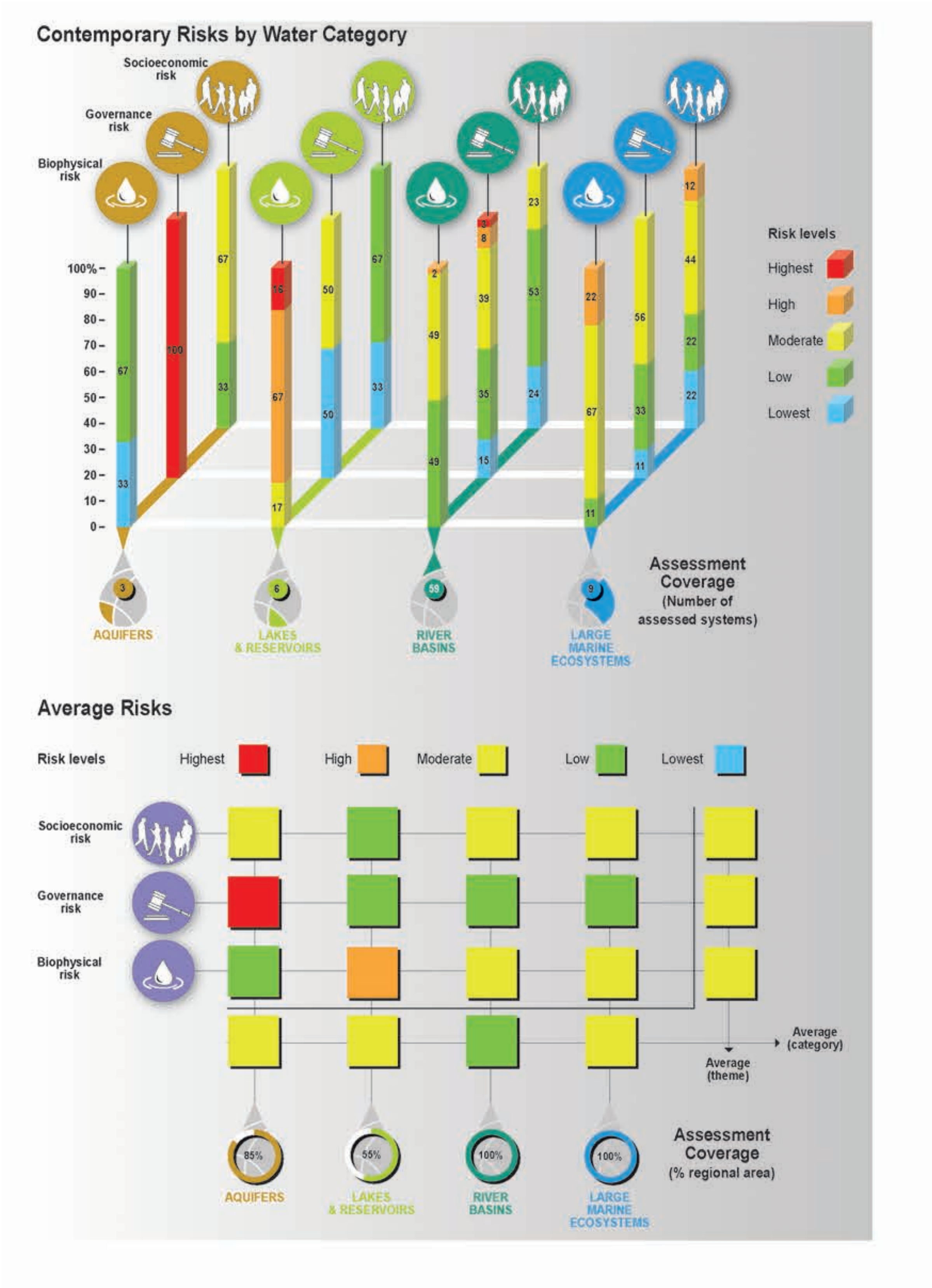
TRANSBOUNDARY WATERS: NORTHERN WESTERN & SOUTHERN EUROPE



The region has an average Human Development Index of 0.863, belonging to the Very High HDI group with a total population of 449 million in 2015. Contemporary risks of water systems by water category and theme expressed as percentages are shown at top right. Pooling across 77 transboundary water systems in the region (bottom left), 44% of the water systems are at low socioeconomic risk, 36% at moderate governance risk, and 33% at moderate biophysical risks. On average (bottom right), the region's transboundary waters are at moderate socioeconomic, governance and biophysical risks. Aquifers, lakes, and LMEs are at moderate risk across risk themes, while river basins are threatened by low risk.



Regional Risks by Water Category



1. Belgian-Dutch-German Lowland Aquifer System
2. Ordovician-Cambrian Groundwater Body
3. Cambrian-Vendian-Voronka Groundwater Body/ Lomonosovsky Aquifer
4. Upper Pannonian Thermal Aquifer

EU283 – Belgian-Dutch-German Lowland Aquifer System

Geography

Total area TBA (km^2): 49 000

No. countries sharing: 3

Countries sharing: Belgium, Germany, the Netherlands

Population: 24 000 000

Climate zone: Marine

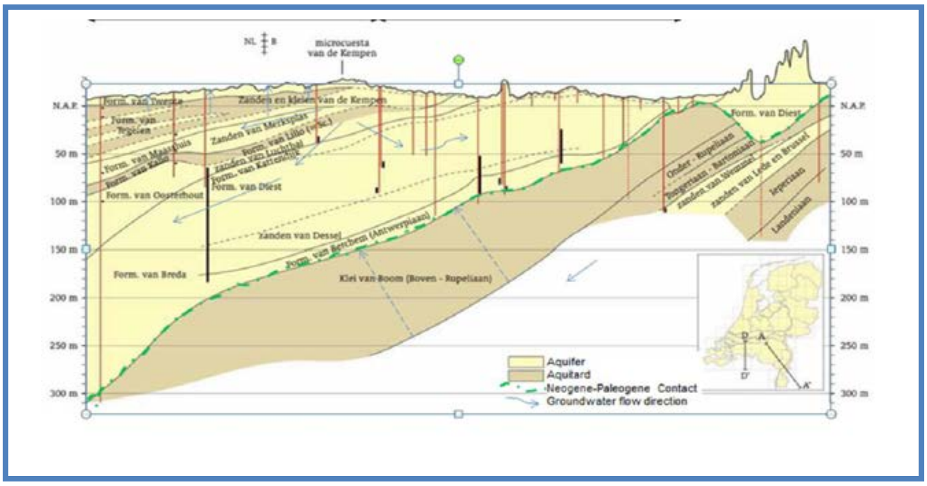
Rainfall (mm/yr): 790

Hydrogeology

Aquifer type: Multiple layers hydraulically connected

Degree of confinement: Mixed conditions

Main Lithology: Sediment - Sand



Cross-section across part of the Aquifer (NW – SE)

Map and cross-section are only provided for illustrative purposes. Dimensions are only approximate

EU283 – Belgian-Dutch-German Lowland Aquifer System

TWAP Groundwater Indicators from Global Inventory

	Recharge (mm/y) (1)	Renewable groundwater per capita (m^3/y/capita)	Natural background groundwater quality (%) (2)	Human dependency on groundwater (%)	Groundwater depletion (mm/y)	Groundwater pollution (%) (3)	Population density (Persons/km2)	Groundwater development stress (%) (4)	Transboundary legal framework (Scores) (5)	Transboundary institutional framework (Scores) (6)
Belgium					0		420		D	E
Germany	140	240			0		600		D	E
Netherlands	77	170	65	10	23		460	35	B	C
TBA level							**490**		**E**	**F**

(1) Recharge: This is the long term average recharge (in m^3/yr) divided by the surface area (m^2) of the complete country segment of the aquifer (i.e. not only the recharge area).
(2) Natural background groundwater quality: Estimate of percentage of surface area of aquifer where the natural groundwater quality satisfies local drinking water standards.
(3) Groundwater pollution: A. No pollution has been identified; B. Some pollution has been identified; Positive number: Significant pollution has been identified (% of surface area of aquifer).
(4) Groundwater development stress: Annual groundwater abstraction divided by recharge.
(5) Legal framework: A. Agreement with full scope for TBA management signed by all parties; B. Agreement with limited scope for TBA management signed by all parties; C. Agreement under preparation or available as an unsigned draft; D. No agreement exists, nor under preparation; E. Legal Framework differs between Aquifer States (see data at National level).
(6) Institutional Framework: A. Dedicated transboundary institution fully operational; B. Dedicated transboundary institution in place, but not fully operational; C. National/Domestic institution fully operational; D. National/Domestic institution in place, but not fully operational; E. No institution exists for TBA management; F. Institutional Framework differs between Aquifer States (see data at National level).
X A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.

TWAP Groundwater Indicators from WaterGAP model

	Recharge, incl. recharge from irrigation (mm/yr)	Renewable groundwater per capita			Human dependency on groundwater (%)	Human dependency on groundwater for domestic water supply (%)	Human dependency on groundwater for irrigation (%)	Human dependency on groundwater for industrial water use(%)
		Current state (m^3/y/capita)	Projection 2030 (% change to current state)	Projection 2050 (% change to current state)				
Belgium	300	660	-4	-4	13	45	80	6
Germany	210	360	5	13	12	42	82	6
Netherlands	280	600	0	3	7	26	50	3
TBA level	**270**	**540**	**1**	**5**	**8**	**30**	**57**	**4**

	Groundwater depletion (mm/y)	Population density			Groundwater development stress		
		Current state (Persons/km2)	Projection 2030 (% change to current state)	Projection 2050 (% change to current state)	Current state (%)	Projection 2030 (% point change to current state)	Projection 2050 (% point change to current state)
Belgium	5	460	4	4	9	0	1
Germany	3	570	-4	-12	13	0	0

EU283 – Belgian-Dutch-German Lowland Aquifer System

	Groundwater depletion (mm/y)	Population density			Groundwater development stress		
		Current state (Persons/km2)	Projection 2030 (% change to current state)	Projection 2050 (% change to current state)	Current state (%)	Projection 2030 (% point change to current state)	Projection 2050 (% point change to current state)
Netherlands	4	470	3	0	8	0	0
TBA level	**4**	**490**	**1**	**-2**	**9**	**0**	**0**

Key parameters table from Global Inventory

	Distance from ground surface to groundwater table (m)	Depth to top of aquifer formation (m)	Full vertical thickness of the aquifer (system)* (m)	Degree of confinement	Predominant aquifer lithology	Primary Porosity	Secondary Porosity	Transmissivity (m^2/d)
Belgium				Aquifer mostly unconfined, but some parts confined	Sediment - Sand	High primary porosity fine/ medium sedimentary deposits	Secondary porosity: Fractures	
Germany	5	5	500	Aquifer mostly confined, but some parts unconfined	Sediment - Sand	High primary porosity fine medium sedimentary deposits	No secondary porosity	200
Netherlands	<5	<5	1000	Aquifer mostly semi-confined, but some parts unconfined	Sediment - Sand	High primary porosity fine/ medium sedimentary deposits	No secondary porosity	4000
TBA level								

* Including aquitards/aquicludes
X A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.

Aquifer description

Aquifer geometry

The Transboundary Aquifer system stretches across national boundaries of Belgium, Germany and The Netherlands. It is a multiple-layered hydraulically connected system that has between 8 and 10 main water-bearing horizons. The average depth to the water table and the average depth to the top of the aquifer is < 5m in both reporting countries. The average vertical thickness of the aquifer system varies between 500m - 1000m as reported for by Germany and the Netherlands.

EU283 – Belgian-Dutch-German Lowland Aquifer System

Hydrogeological aspects

An aquifer system is composed of sandy and clayey Tertiary and Quaternary sedimentary materials, that are hydraulically connected, and are dipping towards The Netherlands and it has a highly variable thickness. The aquifer has a high primary porosity as well as secondary porosity: fractures, giving it a high horizontal and a low vertical connectivity. The groundwater volume is approximately 1 400km³ within the Netherlands and Germany.

Linkages with other water systems

Groundwater flow is mainly controlled by surface flow (Ems, Vechte River) and the average groundwater levels range between 2m and 5m. Recharge is from precipitation and diffuse discharge (seepage zones), is widely distributed in Holland, and evapotranspiration and river base flow are the main aquifer outputs. Groundwater dependent ecosystems cover an important part of the aquifer.

Environmental aspects

The semi-confined aquifer system is characterized by a brackish to saline groundwater at a depth, which varies considerable (connate water interface from less than 110 m and higher than 500 m deep), underlying the fresh upper water zone of the aquifer. Within the Netherlands about 35% of the aquifer over the whole thickness is unsuitable for human consumption mainly because of elevated salinity levels. Some pollution, which is significant within the Netherlands, within the superficial layers has occurred, but the percentage of the aquifer affected has not been recorded. Local impacts mainly are groundwater pollution originating at the land surface and groundwater abstractions in the Netherlands side. Some pollution has been identified, of natural geochemical origin (salinity, As, Ni) and also from agricultural practices, and industrial wastes (organic compounds). Between 55% and 85% of the aquifer within the aquifer states have shallow groundwater with between 3% and 75% of the aquifer area being covered with groundwater dependent ecosystems within Germany and the Netherlands (see Appendix). However, these groundwater dependent ecosystems may not be all associated with the transboundary aquifer, i.e. they may rely on local national aquifers.

Socio-economic aspects

The aquifer area has a very high population density. The fresh aquifer is relatively shallow and is exploited for water supply and irrigation. The total amount of groundwater that was abstracted during 2010 within the Netherlands and Belgium was 1 200Mm^3/annum. The total amount of fresh water that was utilised over the aquifer area within Belgium over the same period was 10 000Mm^3 /annum.

Legal and Institutional aspects

A limited Multilateral Legal Agreement (Germany, The Netherlands) has been ratified for the Transboundary Aquifer Management; the country legislation applies at the National level. No Transboundary Institution has as yet not been established.

Hot spots

Large-scale mining activities are foreseen. Potential threats to groundwater flow and quality to this transboundary aquifer system are: lignite mining (Nordrhein - Westphalen), natural gas exploitation (Groningen), subsurface storage of gas, potential subsurface storage of hazardous waste (Boom clay) and external pressures (e.g. land use, surface-groundwater interaction by rivers entering in the system and human activities). Vulnerability associated with mining, waste disposal, possible acid mine drainage and groundwater abstraction to lower groundwater levels are seen as hot spot issues.

EU283 – Belgian-Dutch-German Lowland Aquifer System

Contributors to Global Inventory

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Considerations and recommendations

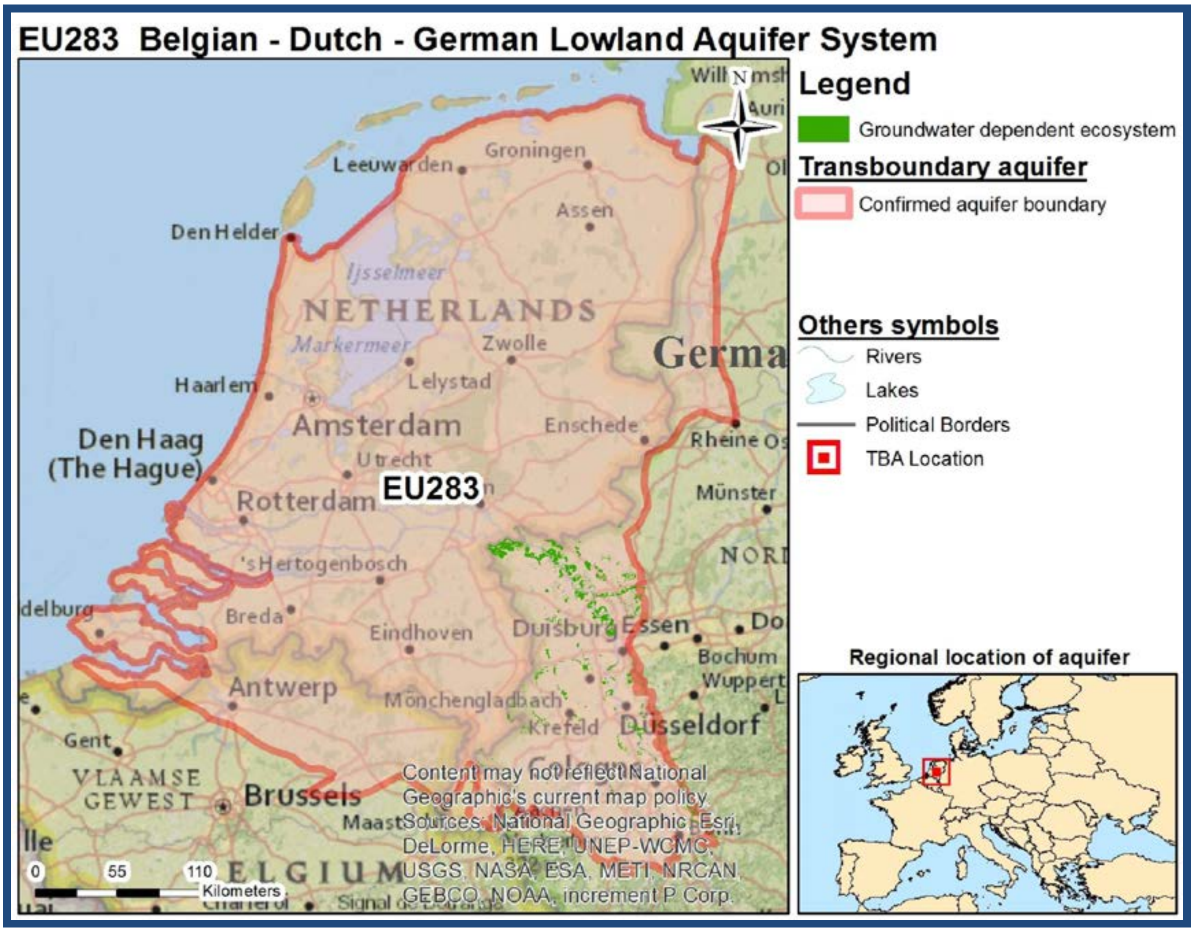
Most data in the tables and text above have been provided by national and regional experts (listed above) or have been derived from the global WaterGAP model. See colophon for more information, including references to data from other sources.

All aspects of the aquifer geometry and parameters have been addressed with consistent and realistic information, allowing indicator estimates at TBA level.

Data gaps and also differences between data from national experts (Global Inventory) and data derived from WaterGAP highlight the need for further research on transboundary aquifers.

EU283 – Belgian-Dutch-German Lowland Aquifer System

Appendix: EU283



Map showing groundwater dependent ecosystems within the Belgian-Dutch-German Lowland Aquifer System

Please note: Information has only been provided for the German part of the aquifer.

Colophon

This Transboundary Aquifers information sheet has been produced as part of the Groundwater Component of the GEF Transboundary Water Assessment Programme (GEF TWAP). **GEF TWAP** is the first truly global comparative assessment of transboundary groundwater, lakes, rivers, large marine ecosystems and the open ocean. More information on TWAP can be found on: www.geftwap.org . **The Groundwater component** of TWAP carried out a global comparison of 199 transboundary aquifers and the groundwater systems of 41 Small Island Developing States. The data used to compile this transboundary aquifer information sheet has been made available by national and regional experts from countries involved in the TWAP Groundwater project. For aquifers larger than 20 000 km2 and which are not overlapping, additional data are available from modelling done by the Goethe University Frankfurt (Germany) as part of TWAP Groundwater. All data were compiled by UNESCO-IHP and the International Groundwater Resources Assessment Centre (IGRAC – UNESCO Category II Institute). Values given in the fact-sheet represent an approximate guide only and should not replace data obtained from recent local assessments. The editors of this information sheet are not responsible for the quality of the data.

For more information on TWAP Groundwater and for more data, please have a look at the TWAP Groundwater Information Management System which is accessible via www.twap.isarm.org or www.un-igrac.org.

Request:

If you have additional data or information about this transboundary aquifer that can improve the quality of this information

EU283 – Belgian-Dutch-German Lowland Aquifer System

sheet and the underlying database, please contact us via email at info@un-igrac.org. If appropriate, the information will be uploaded to the database of transboundary aquifers and will also be used in new versions of this information sheet.

References:

- Population: Population has been calculated based on the aquifer map and grid information on population. Source population data: Center for International Earth Science Information Network - CIESIN - Columbia University, United Nations Food and Agriculture Programme - FAO, and Centro Internacional de Agricultura Tropical - CIAT. 2005. Gridded Population of the World, Version 3 (GPWv3): Population Count Grid, Future Estimates. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). http://dx.doi.org/10.7927/H42B8VZZ. Accessed Jan 2015.
- Rainfall: Average rainfall per TBA has been calculated based on the aquifer map and grid data for precipitation. Source precipitation data: Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. Jarvis, 2005. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology 25: 1965-1978. Grid data download from www.worldclim.org (2015): Data for current conditions (~1950-2000), ESRI grids, 30 arc seconds, Precipitation.
- Climate: Climate indicates the major climate zone which occurs in the aquifer area. If more than 1 climate zone is present the zone with the largest surface area was selected. Source climate data: ArcGIS Online (2015), Simplified World Climate zones. Owner: Mapping Our World GIS Education. Original map: National Geographic World Atlas for Young Explorers (1998).
- All other data: TWAP Groundwater (2015).

Version: September 2015

River Ems originating from spring waters in Schloß Holte-Stukenbrock, Germany, feeds the Belgian-Dutch-German Lowland Aquifer System.

EU 108 – Ordovician-Cambrian Groundwater Body

Geography

Total area TBA (km^2): 81 000

No. countries sharing: 2

Countries sharing: Estonia, Russian Federation

Population: 1 900 000

Climate zone: Humid Continental

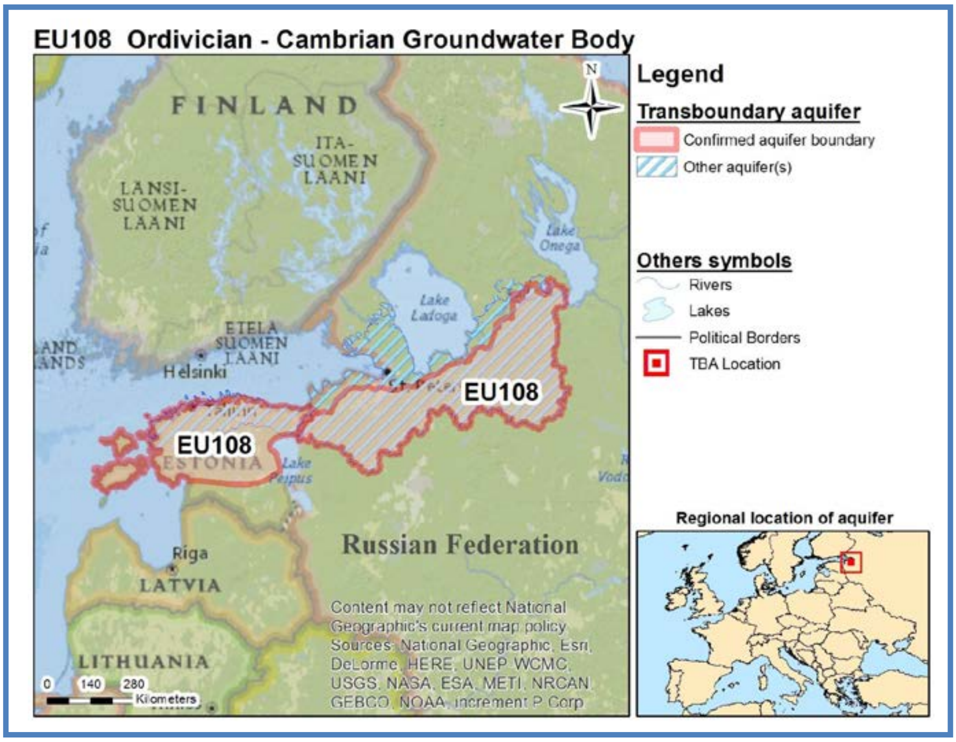
Rainfall (mm/yr): 660

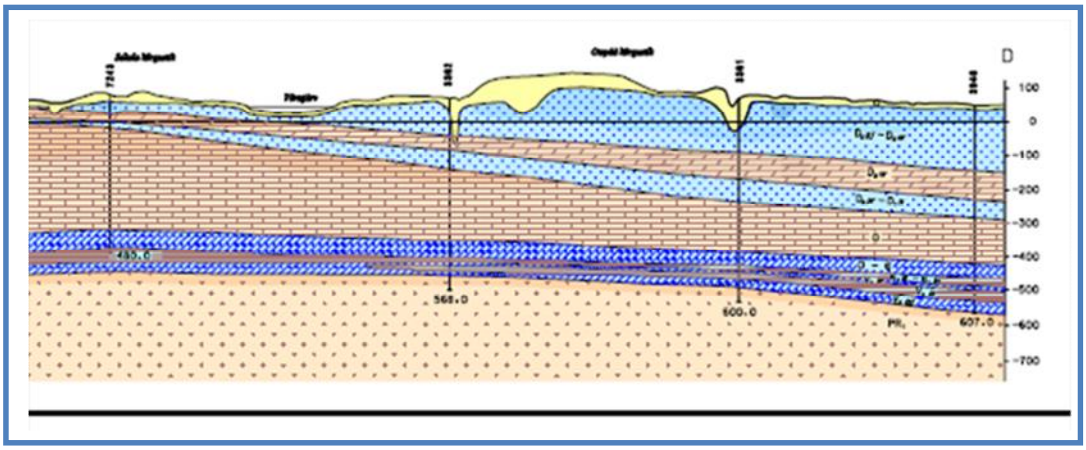
Hydrogeology

Aquifer type: Multiple layers hydraulically connected

Degree of confinement: Confined

Main Lithology: Sedimentary rocks - sandstones





Simplified cross-section: Ordovician Cambrian aquifer (in light blue)

Map and cross-section are only provided for illustrative purposes. Dimensions are only approximate.

EU 108 – Ordovician-Cambrian Groundwater Body

TWAP Groundwater Indicators from Global Inventory

	Recharge (mm/y) (1)	Renewable groundwater per capita (m^3/y/capita)	Natural background groundwater quality (%) (2)	Human dependency on groundwater (%)	Groundwater depletion (mm/y)	Groundwater pollution (%) (3)	Population density (Persons/km2)	Groundwater development stress (%) (4)	Transboundary legal framework (Scores) (5)	Transboundary institutional framework (Scores) (6)
Estonia	1	20	100			A	31	50		A
Russian Federation					0		19		B	D
TBA Level							**23**			**F**

(1) Recharge: This is the long term average recharge (in m^3/yr) divided by the surface area (m^2) of the complete country segment of the aquifer (i.e. not only the recharge area).
(2) Natural background groundwater quality: Estimate of percentage of surface area of aquifer where the natural groundwater quality satisfies local drinking water standards.
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X A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.

Key parameters table from Global Inventory

	Distance from ground surface to groundwater table (m)	Depth to top of aquifer formation (m)	Full vertical thickness of the aquifer (system)* (m)	Degree of confinement	Predominant aquifer lithology	Primary Porosity	Secondary Porosity	Transmissivity (m^2/d)
Estonia	48	130	33	Whole aquifer confined	Sedimentary rocks - Sandstone	Low primary porosity intergranular porosity	No secondary porosity	35
Russian Federation	28**	13**	130	Whole aquifer confined	Sedimentary rocks - Shale	High primary porosity fine/ medium sedimentary deposits	Secondary porosity: Fractures	
TBA Level								

* Including aquitards/aquicludes
** These values would need revision, since a groundwater table lower than depth to top of the aquifer is un-realistic for a confined aquifer.
X A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.

EU 108 – Ordovician-Cambrian Groundwater Body

Aquifer description

Aquifer geometry
This is a confined aquifer system constituted by multiple layers that are hydraulically connected. The average depth to the water table varies between 28m and 48m. The average depth to the top of the aquifer varies between 13m and 130m. The average thickness of the aquifer ranges between 30m and 130m in Estonia and Russia respectively.

Hydrogeological aspects
The aquifer is composed of sandstones, with inter-granular as well secondary porosity due to dissolution and fissured sandstone. The average transmissivity is 35m^2/day within Estonia. The average amount of recharge, which is all due to natural recharge, within the Estonia portion (see Appendix) is 20 Mm^3/annum.

Linkages with other water systems
Recharge is from the overlying aquifer through leakage, and discharge is produced to other connected aquifers. There is no interaction with surface waters. Groundwater flow direction is from Russia to SW Estonia.

Environmental aspects
Besides the presence of some natural salinity that has been reported by Russia, the natural water quality is generally suitable for human consumption. Some local pollution from metals, industrial waste disposal and fertilizers has been reported within the Russia side, but no groundwater pollution has been observed within Estonia. No shallow groundwater or groundwater dependent ecosystems have been recorded within the aquifer area.

Socio-economic aspects
The total amount of groundwater that was abstracted from the aquifer during 2010 was 96 Mm^3, 90% of it in Russia. The type of use was only recorded for Estonia - water supply, industry and a minor consumption for agriculture. The total fresh water abstraction within the aquifer area has not been reported for either country.

Legal and Institutional aspects
A ratified agreement exists for Estonia-Russia TBA management, that was signed during 1995 and a new agreement is in preparation (Estonia). A dedicated Transboundary Institution exists on the Estonian side. Local management is under the National legislation and regulations.

Priority issues
The main pressure on the TBA is the groundwater abstraction taking place in both countries. The most important threat to the confined aquifer with limited recharge is declining piezometric levels as a result of aquifer exploitation.

Contributors to Global Inventory

Name	Organisation	Country	E-mail	Role
Lucila Candela	Universidad Politécnica de Catalunya	Spain	Lucila.Candela@upc.edu	Regional coordinator
Rein Perens	Geological Survey of Estonia	Estonia	perens@egk.ee	Contributing national expert
Eda Andresmaa	Environmental Agency	Estonia	eda.andresmaa@envir.ee	Contributing national expert
Heddy Klasen	Ministry of the Environment	Estonia	heddy.klasen@envir.ee	Lead National Expert

EU 108 – Ordovician-Cambrian Groundwater Body

Name	Organisation	Country	E-mail	Role
Boris Korolev	Federal state unitary geological organization "Hydrospecialgeology"	Russia	korolyev@mail.ru	Contributing national expert

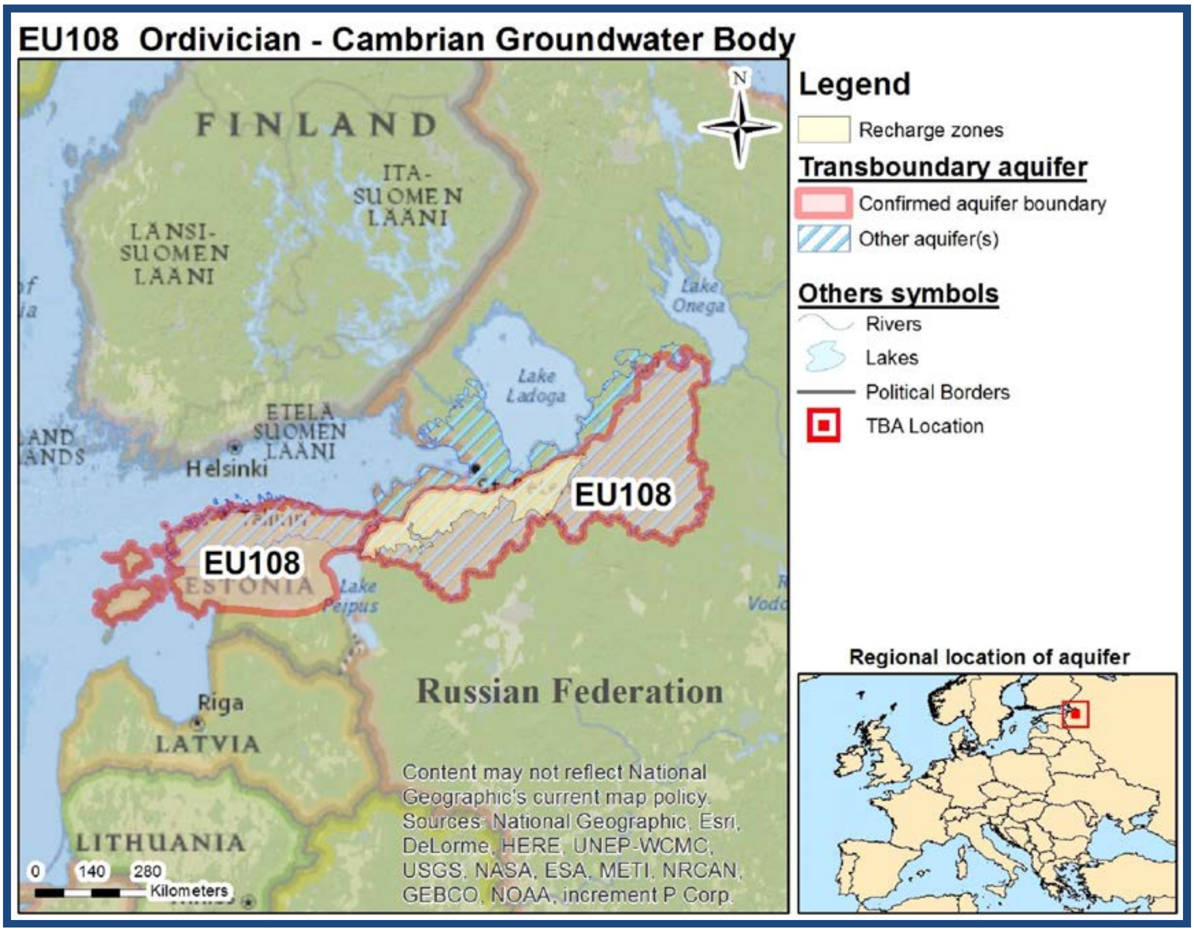
Considerations and recommendations

Most data in the tables and text above have been provided by national and regional experts (listed above) or have been derived from the global WaterGAP model. See colophon for more information, including references to data from other sources.

Both TBA countries provided information that allowed description of the system, but it was not enough to calculate the groundwater indicators for the transboundary system.

Data gaps and also differences between data from national experts (Global Inventory) and data derived from WaterGAP highlight the need for further research on transboundary aquifers.

Appendix: EU 108



Map showing Recharge zones within the Ordovician-Cambrian Groundwater Body

EU 108 – Ordovician-Cambrian Groundwater Body

Colophon

This Transboundary Aquifers information sheet has been produced as part of the Groundwater Component of the GEF Transboundary Water Assessment Programme (GEF TWAP). **GEF TWAP** is the first truly global comparative assessment of transboundary groundwater, lakes, rivers, large marine ecosystems and the open ocean. More information on TWAP can be found on: www.geftwap.org . **The Groundwater component** of TWAP carried out a global comparison of 199 transboundary aquifers and the groundwater systems of 41 Small Island Developing States. The data used to compile this transboundary aquifer information sheet has been made available by national and regional experts from countries involved in the TWAP Groundwater project. For aquifers larger than 20 000 km2 and which are not overlapping, additional data are available from modelling done by the Goethe University Frankfurt (Germany) as part of TWAP Groundwater. All data were compiled by UNESCO-IHP and the International Groundwater Resources Assessment Centre (IGRAC – UNESCO Category II Institute). Values given in the fact-sheet represent an approximate guide only and should not replace data obtained from recent local assessments. The editors of this information sheet are not responsible for the quality of the data.

For more information on TWAP Groundwater and for more data, please have a look at the TWAP Groundwater Information Management System which is accessible via www.twap.isarm.org or www.un-igrac.org.

Request:
If you have additional data or information about this transboundary aquifer that can improve the quality of this information sheet and the underlying database, please contact us via email at info@un-igrac.org. If appropriate, the information will be uploaded to the database of transboundary aquifers and will also be used in new versions of this information sheet.

References:
- Population: Population has been calculated based on the aquifer map and grid information on population. Source population data: Center for International Earth Science Information Network - CIESIN - Columbia University, United Nations Food and Agriculture Programme - FAO, and Centro Internacional de Agricultura Tropical - CIAT. 2005. Gridded Population of the World, Version 3 (GPWv3): Population Count Grid, Future Estimates. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). http://dx.doi.org/10.7927/H42B8VZZ. Accessed Jan 2015.
- Rainfall: Average rainfall per TBA has been calculated based on the aquifer map and grid data for precipitation. Source precipitation data: Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. Jarvis, 2005. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology 25: 1965-1978. Grid data download from www.worldclim.org (2015): Data for current conditions (~1950-2000), ESRI grids, 30 arc seconds, Precipitation.
- Climate: Climate indicates the major climate zone which occurs in the aquifer area. If more than 1 climate zone is present the zone with the largest surface area was selected. Source climate data: ArcGIS Online (2015), Simplified World Climate zones. Owner: Mapping Our World GIS Education. Original map: National Geographic World Atlas for Young Explorers (1998).
- All other data: TWAP Groundwater (2015).

Version: December 2015

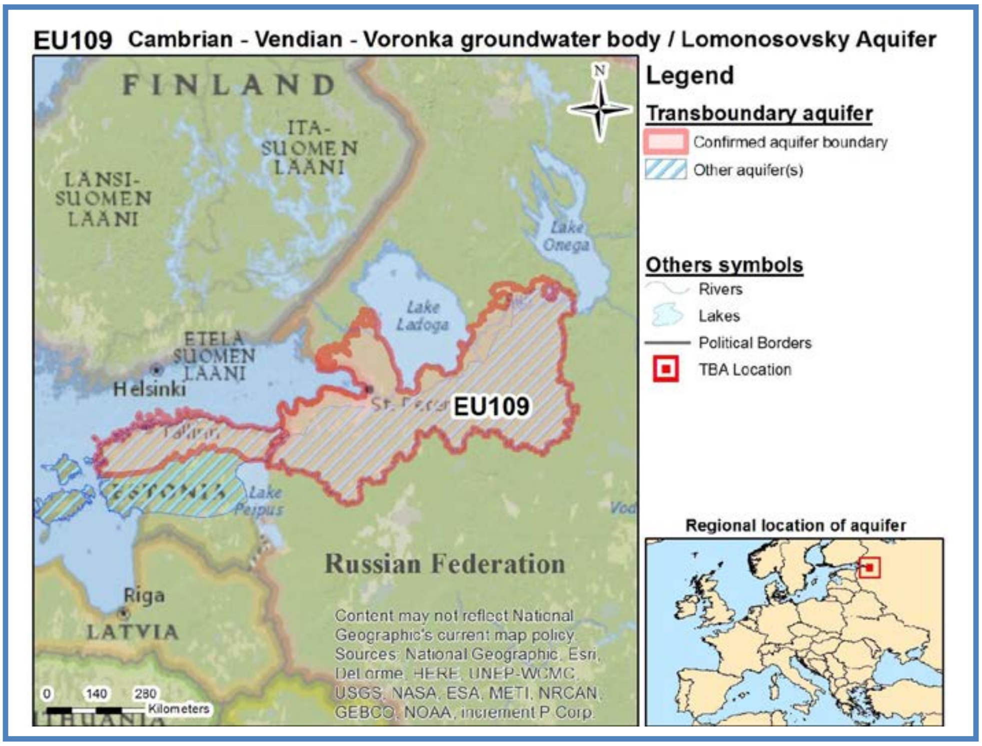
EU109 – Cambrian-Vendian-Voronka Groundwater Body / Lomonosovsky Aquifer

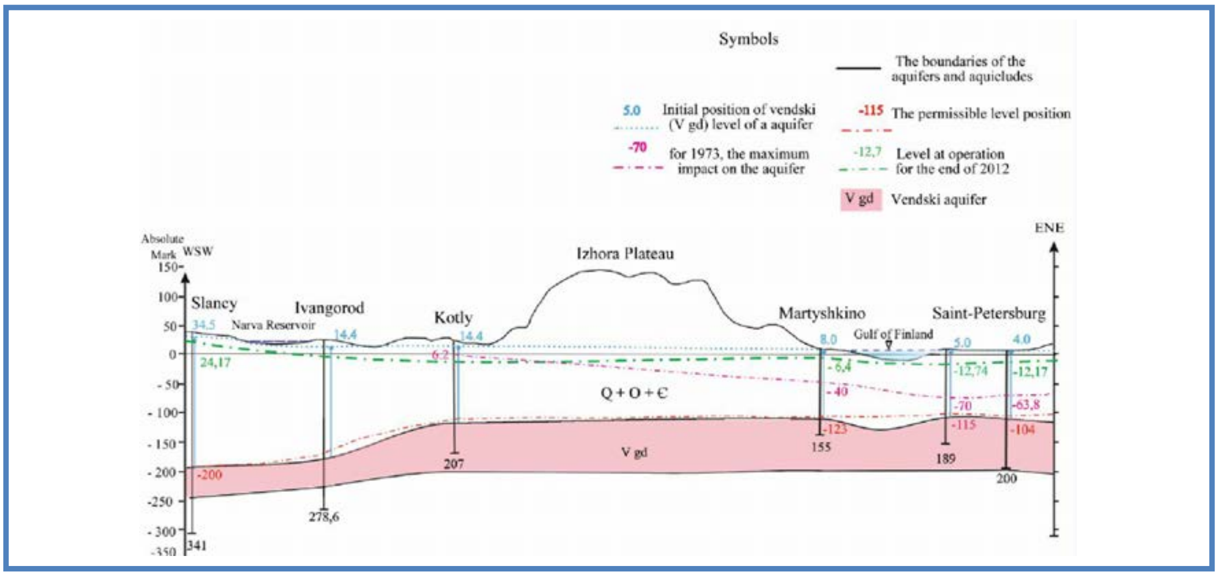
Geography

Total area TBA (km²): 79 000
No. countries sharing: 2
Countries sharing: Estonia, Russian Federation
Population: 3 500 000
Climate zone: Humid Continental
Rainfall (mm/yr): 670

Hydrogeology

Aquifer type: Single layered
Degree of confinement: Confined
Main Lithology: Sedimentary rocks - sandstone





Cross-section of the aquifer showing the Initial water level and the impact on the aquifer
Map and cross-section are only provided for illustrative purposes. Dimensions are only approximate.

EU109 – Cambrian-Vendian-Voronka Groundwater Body / Lomonosovsky Aquifer

TWAP Groundwater Indicators from Global Inventory

	Recharge (mm/y) (1)	Renewable groundwater per capita (m^3/y/capita)	Natural background groundwater quality (%) (2)	Human dependency on groundwater (%)	Groundwater depletion (mm/y)	Groundwater pollution (%) (3)	Population density (Persons/km2)	Groundwater development stress (%) (4)	Transboundary legal framework (Scores) (5)	Transboundary institutional framework (Scores) (6)
Estonia	1	9	100			A	51	50		A
Russian Federation					0		42		B	D
TBA Level							**45**		**E**	**F**

(1) Recharge: This is the long term average recharge (in m^3/yr) divided by the surface area (m^2) of the complete country segment of the aquifer (i.e. not only the recharge area).
(2) Natural background groundwater quality: Estimate of percentage of surface area of aquifer where the natural groundwater quality satisfies local drinking water standards.
(3) Groundwater pollution: A. No pollution has been identified; B. Some pollution has been identified; Positive number: Significant pollution has been identified (% of surface area of aquifer).
(4) Groundwater development stress: Annual groundwater abstraction divided by recharge.
(5) Legal framework: A. Agreement with full scope for TBA management signed by all parties; B. Agreement with limited scope for TBA management signed by all parties; C. Agreement under preparation or available as an unsigned draft; D. No agreement exists, nor under preparation; E. Legal Framework differs between Aquifer States (see data at National level).
(6) Institutional Framework: A. Dedicated transboundary institution fully operational; B. Dedicated transboundary institution in place, but not fully operational; C. National/Domestic institution fully operational; D. National/Domestic institution in place, but not fully operational; E. No institution exists for TBA management; F. Institutional Framework differs between Aquifer States (see data at National level).
X A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.

Key parameters table from Global Inventory

	Distance from ground surface to groundwater table (m)	Depth to top of aquifer formation (m)	Full vertical thickness of the aquifer (system)* (m)	Degree of confinement	Predominant aquifer lithology	Primary Porosity	Secondary Porosity	Transmissivity (m^2/d)
Estonia	48	130	37	Whole aquifer confined	Sedimentary rocks - Sandstone	Low primary porosity intergranular porosity	No secondary porosity	90
Russian Federation	30	200	60	Whole aquifer confined	Sedimentary rocks - Shale	High primary porosity fine/ medium sedimentary deposits	Secondary porosity: Fractures	
TBA level								

* Including aquitards/aquicludes
X A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.

EU109 – Cambrian-Vendian-Voronka Groundwater Body / Lomonosovsky Aquifer

Aquifer description

Aquifer geometry

This is a single-layered confined aquifer system, shared by Estonia and the Russian Federation. The average depth to the water table varies between 30m and 48m and the average depth to the top of the aquifer varies between 130m and 200m. The average thickness of the aquifer system varies between 37m and 60m. See Appendix 1 for a cross-section.

Hydrogeological aspects

The aquifer system is composed of sandstones. Groundwater flow is from the Russian border to Estonia (E-W). It has a low to high primary porosity with some secondary porosity: fractures in parts. Furthermore it has a low to high horizontal connectivity and a low vertical connectivity. The average annual recharge, which is 100% due to natural conditions, on the Estonia part of the aquifer is 6.1Mm^3/annum. Recharge on the Russia portion of the aquifer occurs over an area of 11 000 km^2 (see Appendix 2). There appears to be no groundwater depletion in this shared aquifer system, although groundwater level lowering has been observed in the underlying Vendian hydro-stratigraphic unit aquifer (see Appendix 1), with a cone of depression 60 m deep in the Leningrad region.

Linkages with other water systems

Recharge to aquifer occurs through an overlying leaky aquitard or from leakage through a buried valley filled by Quaternary deposits on the Estonian side and from precipitation on the Russian side. Discharge is produced to boundary aquifers.

Environmental aspects

Groundwater exploitation is limited due to the natural salinity of the aquifer on the Estonian side. No specific data on groundwater use has been provided by Russia. Within Estonia no anthropogenic pollution has been detected although there is some groundwater pollution within the Russia part of the aquifer but the amount has not been quantified. No shallow groundwater or groundwater dependent ecosystems have been recorded.

Socio-economic aspects

The total groundwater annual abstraction from the system during 2010 was 15 Mm^3. The total amount of fresh water that was abstracted over the aquifer area during the same period was not recorded.

Legal and Institutional aspects

A Ratified Agreement for TBA management by Estonia-Russia has been signed (1995) and a new Agreement is in preparation (Estonia). Local management takes place under National legislation and regulations.

Priority issues

Groundwater abstraction may constitute a transboundary threat which needs to be assessed with further data.

Contributors to Global Inventory

Name	Organisation	Country	E-mail	Role
Lucila Candela	Universidad Politécnica de Catalunya	Spain	Lucila.Candela@upc.edu	Regional coordinator
Rein Perens	Geological Survey of Estonia	Estonia	perens@egk.ee	Contributing national expert

EU109 – Cambrian-Vendian-Voronka Groundwater Body / Lomonosovsky Aquifer

Name	Organisation	Country	E-mail	Role
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Heddy Klasen	Ministry of the Environment	Estonia	heddy.klasen@envir.ee	Lead National Expert
Boris Korolev	Federal state unitary geological organization "Hydrospecialgeology"	Russia	korolyev@mail.ru	Contributing national expert

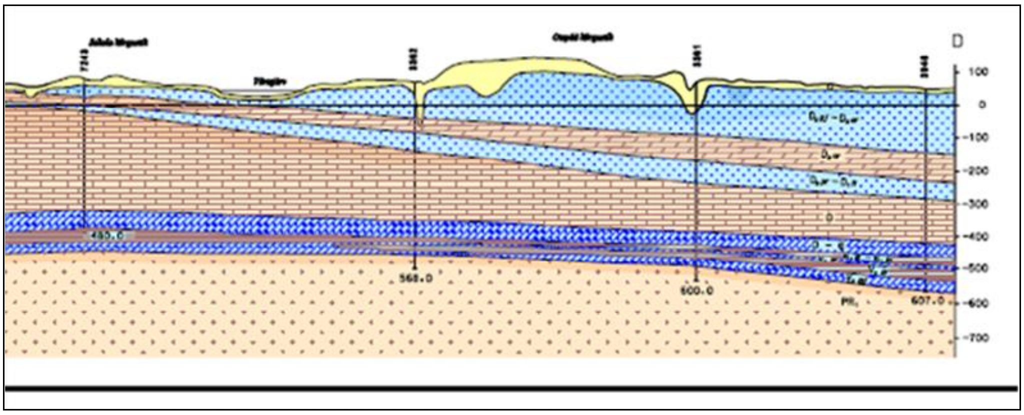
Considerations and recommendations

Most data in the tables and text above have been provided by national and regional experts (listed above) or have been derived from the global WaterGAP model. See colophon for more information, including references to data from other sources.

Both TBA countries provided information that allowed description of the system, but it was not enough to calculate the groundwater indicators for the transboundary system.

Data gaps and also differences between data from national experts (Global Inventory) and data derived from WaterGAP highlight the need for further research on transboundary aquifers.

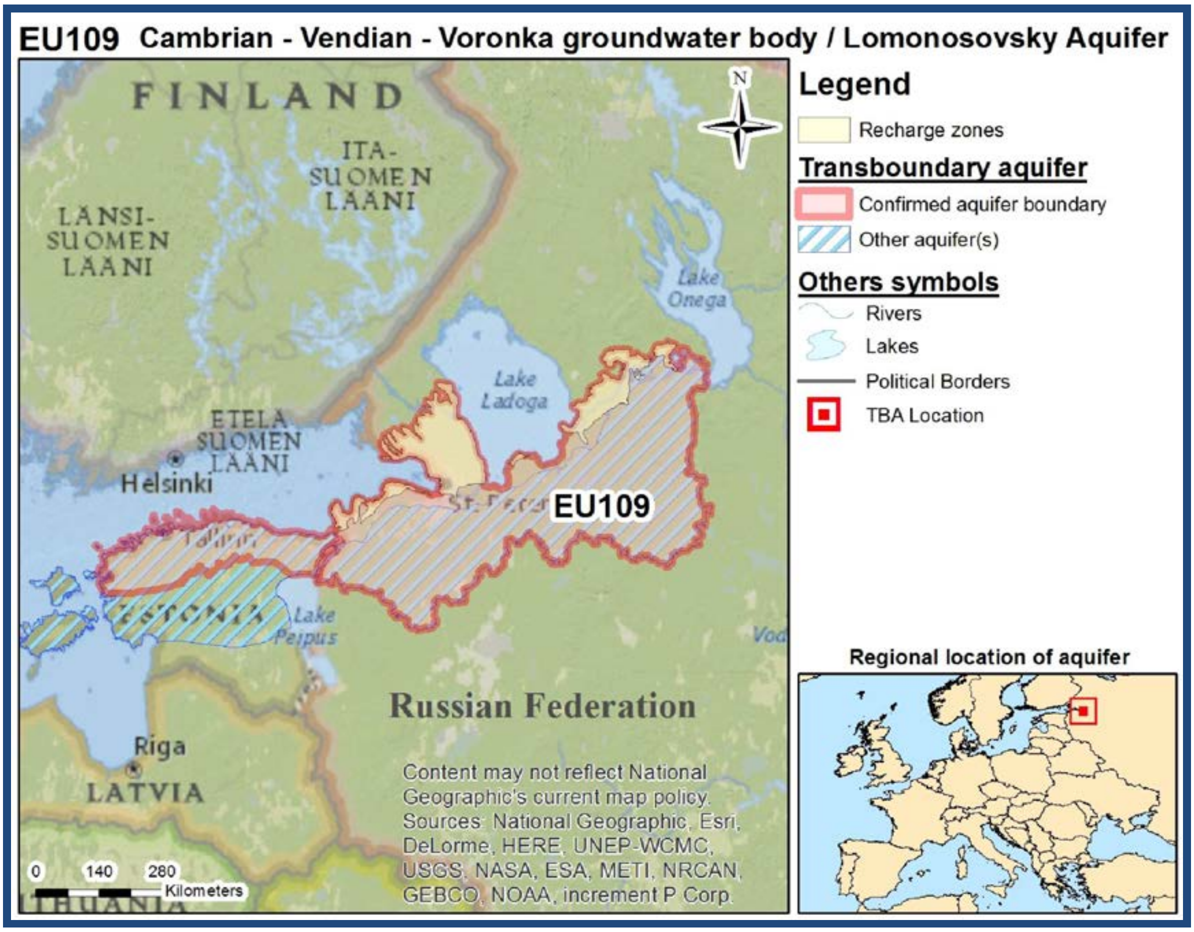
Appendix 1: EU109:



Part of a cross-section - Dark blue: Cambrian Vendian Voronka aquifer

EU109 – Cambrian-Vendian-Voronka Groundwater Body / Lomonosovsky Aquifer

Appendix 2: EU109



Map showing Recharge zones within the Aquifer system

Colophon

This Transboundary Aquifers information sheet has been produced as part of the Groundwater Component of the GEF Transboundary Water Assessment Programme (GEF TWAP). **GEF TWAP** is the first truly global comparative assessment of transboundary groundwater, lakes, rivers, large marine ecosystems and the open ocean. More information on TWAP can be found on: www.geftwap.org . **The Groundwater component** of TWAP carried out a global comparison of 199 transboundary aquifers and the groundwater systems of 41 Small Island Developing States. The data used to compile this transboundary aquifer information sheet has been made available by national and regional experts from countries involved in the TWAP Groundwater project. For aquifers larger than 20 000 km2 and which are not overlapping, additional data are available from modelling done by the Goethe University Frankfurt (Germany) as part of TWAP Groundwater. All data were compiled by UNESCO-IHP and the International Groundwater Resources Assessment Centre (IGRAC – UNESCO Category II Institute). Values given in the fact-sheet represent an approximate guide only and should not replace data obtained from recent local assessments. The editors of this information sheet are not responsible for the quality of the data.

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Request:
If you have additional data or information about this transboundary aquifer that can improve the quality of this information

EU109 – Cambrian-Vendian-Voronka Groundwater Body / Lomonosovsky Aquifer

sheet and the underlying database, please contact us via email at info@un-igrac.org. If appropriate, the information will be uploaded to the database of transboundary aquifers and will also be used in new versions of this information sheet.

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- Climate: Climate indicates the major climate zone which occurs in the aquifer area. If more than 1 climate zone is present the zone with the largest surface area was selected. Source climate data: ArcGIS Online (2015), Simplified World Climate zones. Owner: Mapping Our World GIS Education. Original map: National Geographic World Atlas for Young Explorers (1998).
- All other data: TWAP Groundwater (2015).

Version: December 2015

EU282 – Upper Pannonian Thermal Aquifer

Geography

Total area TBA (km^2): 20 000

No. countries sharing: 5

Countries sharing: Hungary, Slovakia, Slovenia, Austria, Croatia

Population: 2 200 000

Climate zone: Marine

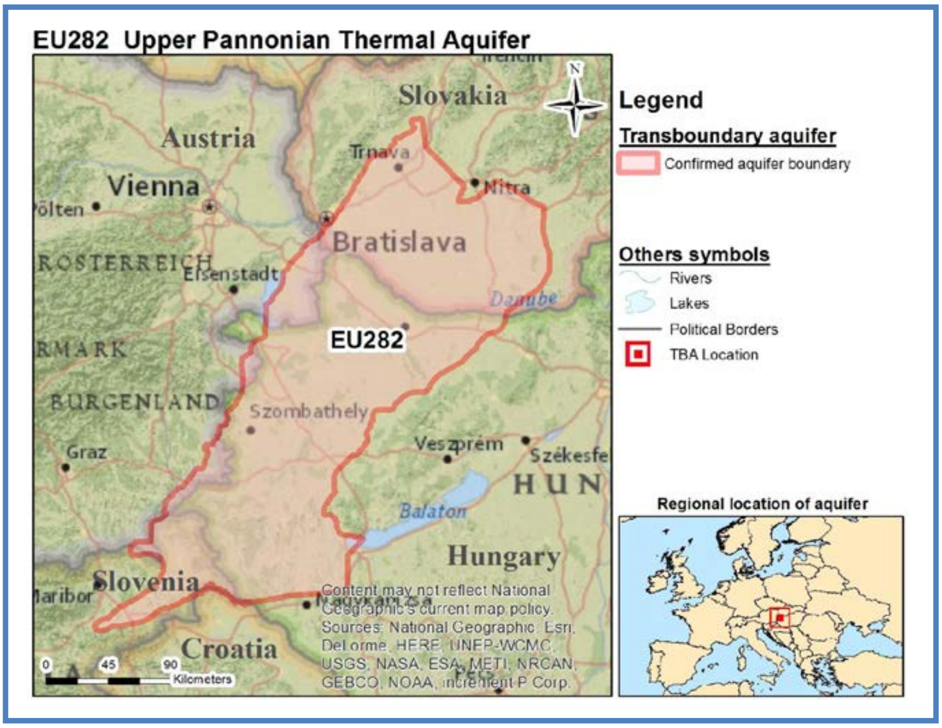
Rainfall (mm/yr): 640

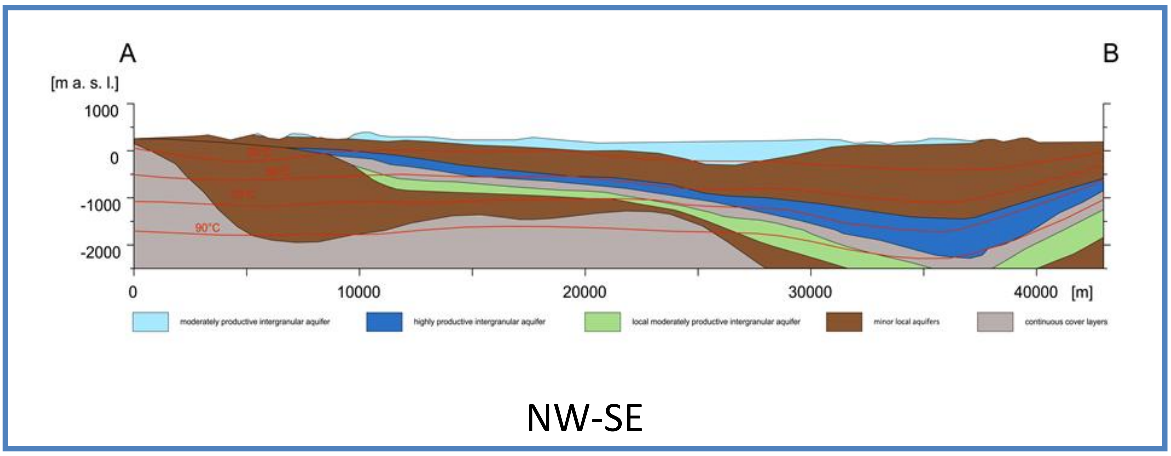
Hydrogeology

Aquifer type: Multi-layered

Degree of confinement: Confined

Main Lithology: Sediment – Sand/gravel/clay, crystalline basement





Cross-section across the NW-SE part of the Aquifer

Map and cross-section are only provided for illustrative purposes. Dimensions are only approximate.

EU282 – Upper Pannonian Thermal Aquifer

TWAP Groundwater Indicators from Global Inventory

	Recharge (mm/y) (1)	Renewable groundwater per capita (m^3/y/capita)	Natural background groundwater quality (%) (2)	Human dependency on groundwater (%)	Groundwater depletion (mm/y)	Groundwater pollution (%) (3)	Population density (Persons/km2)	Groundwater development stress (%) (4)	Transboundary legal framework (Scores) (5)	Transboundary institutional framework (Scores) (6)
Austria							95			
Croatia							214			
Hungary	530	6600	100		0		81		A	D
Slovakia					0		152		D	B
Slovenia	13	77	100		0	A	162	20		D
TBA level							**110**			

(1) Recharge: This is the long term average recharge (in m^3/yr) divided by the surface area (m^2) of the complete country segment of the aquifer (i.e. not only the recharge area).
(2) Natural background groundwater quality: Estimate of percentage of surface area of aquifer where the natural groundwater quality satisfies local drinking water standards.
(3) Groundwater pollution: A. No pollution has been identified; B. Some pollution has been identified; Positive number: Significant pollution has been identified (% of surface area of aquifer).
(4) Groundwater development stress: Annual groundwater abstraction divided by recharge.
(5) Legal framework: A. Agreement with full scope for TBA management signed by all parties; B. Agreement with limited scope for TBA management signed by all parties; C. Agreement under preparation or available as an unsigned draft; D. No agreement exists, nor under preparation; E. Legal Framework differs between Aquifer States (see data at National level).
(6) Institutional Framework: A. Dedicated transboundary institution fully operational; B. Dedicated transboundary institution in place, but not fully operational; C. National/Domestic institution fully operational; D. National/Domestic institution in place, but not fully operational; E. No institution exists for TBA management; F. Institutional Framework differs between Aquifer States (see data at National level).
X A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.

TWAP Groundwater Indicators from WaterGAP model

	Recharge, incl. recharge from irrigation (mm/yr)	Renewable groundwater per capita			Human dependency on groundwater (%)	Human dependency on groundwater for domestic water supply (%)	Human dependency on groundwater for irrigation (%)	Human dependency on groundwater for industrial water use(%)
		Current state (m^3/y/capita)	Projection 2030 (% change to current state)	Projection 2050 (% change to current state)				
Austria	98	1100	-9	-10	42	81	55	28
Croatia	160	1700	-4	-2	41	48	51	28
Hungary	78	960	-5	-4	26	36	28	18
Slovakia	82	480	-6	-2	15	62	8	7
Slovenia	170	1100	-4	-3	22	46	45	9
TBA level	**88**	**760**	**-6**	**-4**	**20**	**50**	**17**	**11**

EU282 – Upper Pannonian Thermal Aquifer

	Groundwater depletion (mm/y)	Population density			Groundwater development stress		
		Current state (Persons/km2)	Projection 2030 (% change to current state)	Projection 2050 (% change to current state)	Current state (%)	Projection 2030 (% point change to current state)	Projection 2050 (% point change to current state)
Austria	0	91	-1	-6	16	2	3
Croatia	0	94	-3	-10	3	0	0
Hungary	0	82	-5	-12	6	1	1
Slovakia	0	170	-1	-9	14	1	0
Slovenia	0	160	-3	-10	5	0	0
TBA level	**0**	**120**	**-3**	**-10**	**9**	**1**	**1**

Key parameters table from Global Inventory

	Distance from ground surface to groundwater table (m)	Depth to top of aquifer formation (m)	Full vertical thickness of the aquifer (system)* (m)	Degree of confinement	Predominant aquifer lithology	Primary Porosity	Secondary Porosity	Transmissivity (m^2/d)
Austria								
Croatia								
Hungary	7	50	800	Whole aquifer confined	Sediment - Sand	High primary porosity fine/ medium sedimentary deposits	No secondary porosity	<5
Slovakia		230		Whole aquifer confined		High primary porosity fine/ medium sedimentary deposits	Secondary porosity: Fractures	
Slovenia	<5	50	800	Whole aquifer confined	Sediment - Sand	High primary porosity fine/ medium sedimentary deposits	Secondary porosity: Fractures	40
TBA level								

* Including aquitards/aquicludes

X A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.

EU282 – Upper Pannonian Thermal Aquifer

Aquifer description

Aquifer geometry

The aquifer system is multi-layered, hydraulically connected and confined system with an average thickness varying between 230 and 800m for the different shared countries, in places up to 2300 m thick. The average distance to the top of the aquifer varies between 50m and 230m, while the average groundwater levels are between close to and 7m below the surface.

Hydrogeological aspects

Located in the western part of the Pannonian Basin (late Miocene and Pliocene) within the Danube river basin, in the transboundary zone of Austria, Hungary, Slovak Republic, Croatia and Slovenia, this aquifer system comprises two separate aquifer systems, the porous system that consists of sediment – sand, and the basement system, that consists of crystalline rocks. The confined aquifer system is composed of unconsolidated deltaic and alluvial sand gravel and clay layers, with high primary porosity and hydraulically connected. Slovenia has estimated and average transmissivity of 40m^2/day, going to a maximum of 350m^2/day. Hungary has estimated the mean annual groundwater recharge as 6 000 Mm^3/annum occurring over an area of 20 000 km^2. Groundwater volumes from 3 countries (Hungary, Slovakia, Slovenia) add up to 2 300km^3 but this should be reviewed.

Linkages with other water systems

Groundwater recharge is from precipitation and from overlying quaternary sediments while the complex regional flow discharges through river base flow, and through other connected aquifer levels and some springs in the Slovenian border. At greater depths, along the deeper flow paths the groundwater warms up, a geothermal water system develops (45-140ºC) (see Appendix 1), and brine waters are found in the basin area due to water-rock interaction.

Environmental aspects

The occurrence of groundwater salinity of natural origin is reported. Slovakia reports that it covers a significant part of the aquifer. Slovenia reports on the elevated presence of arsenic, iron and manganese within the natural groundwater that are at problem levels. No pollution has been identified to date. Hungary and Slovenia report shallow groundwater over 65% and 90% of the aquifer respectively and 2% and 30% coverage with groundwater dependent ecosystems. However, these reported areas may not be entirely associated with the transboundary aquifer, i.e. they may rely on other aquifers, since these are un-realistic figures for a confined aquifer.

Socio-economic aspects

At this stage, the level of exploitation remains low (2.2 Mm^3/annum and 3.9Mm^3/annum in Slovakia and Slovenia respectively), although in some local areas a groundwater level drawdown and disappearance of springs has resulted. No country fresh water abstraction information was provided.

Legal and Institutional aspects

A Groundwater Management Agreement between Hungary and Austria exists, while state regulations apply to the different member states. Hungary reports a National Institution with full mandate and capacity.

Priority issues

The foreseen industrial water abstraction by new thermal wells and the spread of the cone of depression constitute the most important transboundary pressure factor.

EU282 – Upper Pannonian Thermal Aquifer

Contributors to Global Inventory

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Considerations and recommendations

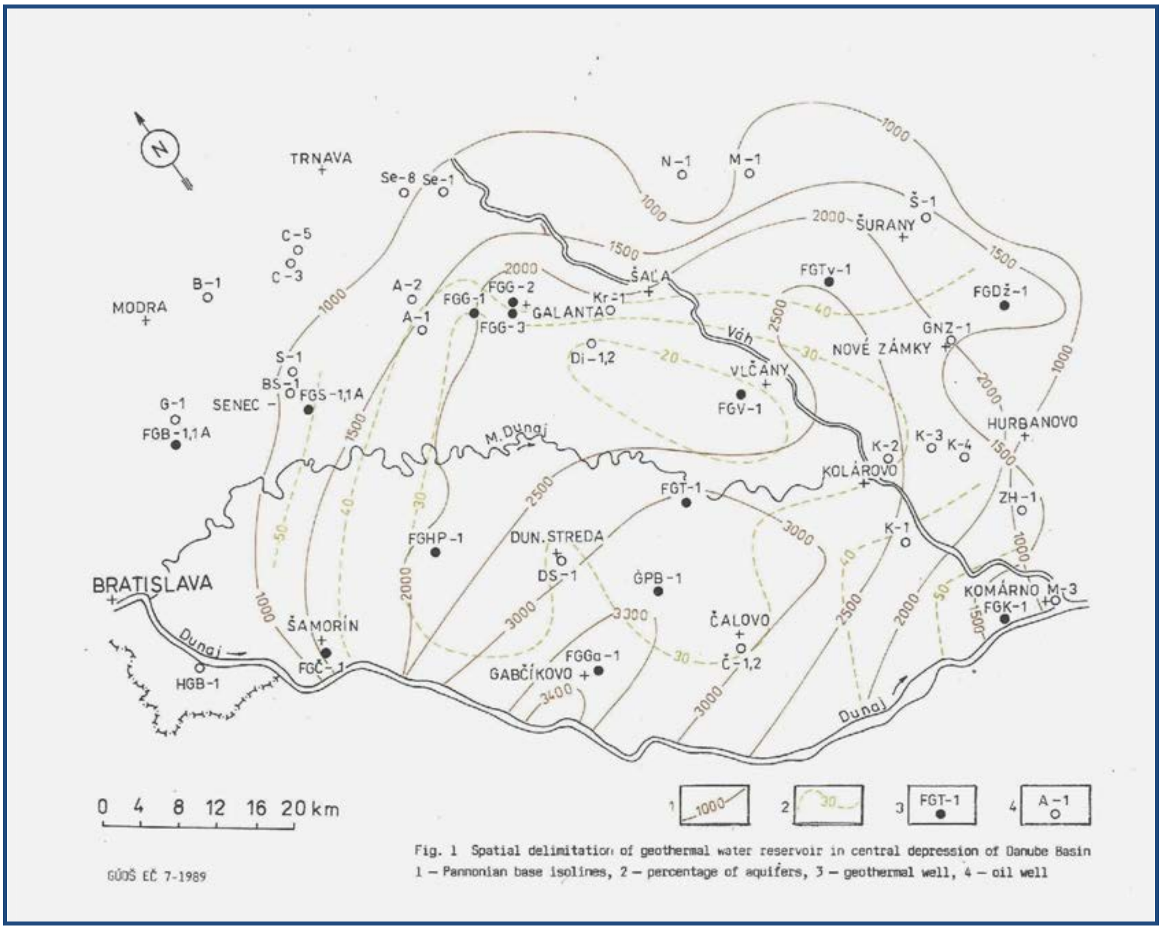
Most data in the tables and text above have been provided by national and regional experts (listed above) or have been derived from the global WaterGAP model. See colophon for more information, including references to data from other sources.

Only two of the five transboundary countries have provided adequate information to describe the complex aquifer system. No calculation of transboundary indicators was possible.

Data gaps and also differences between data from national experts (Global Inventory) and data derived from WaterGAP highlight the need for further research on transboundary aquifers.

EU282 – Upper Pannonian Thermal Aquifer

Appendix 1: EU282



Spatial delineation of the central geothermal reservoir within the Upper Pannonian Thermal Aquifer

Colophon

This Transboundary Aquifers information sheet has been produced as part of the Groundwater Component of the GEF Transboundary Water Assessment Programme (GEF TWAP). **GEF TWAP** is the first truly global comparative assessment of transboundary groundwater, lakes, rivers, large marine ecosystems and the open ocean. More information on TWAP can be found on: www.geftwap.org . **The Groundwater component** of TWAP carried out a global comparison of 199 transboundary aquifers and the groundwater systems of 41 Small Island Developing States. The data used to compile this transboundary aquifer information sheet has been made available by national and regional experts from countries involved in the TWAP Groundwater project. For aquifers larger than 20 000 km2 and which are not overlapping, additional data are available from modelling done by the Goethe University Frankfurt (Germany) as part of TWAP Groundwater. All data were compiled by UNESCO-IHP and the International Groundwater Resources Assessment Centre (IGRAC – UNESCO Category II Institute). Values given in the fact-sheet represent an approximate guide only and should not replace data obtained from recent local assessments. The editors of this information sheet are not responsible for the quality of the data.

For more information on TWAP Groundwater and for more data, please have a look at the TWAP Groundwater Information Management System which is accessible via www.twap.isarm.org or www.un-igrac.org.

Request:
If you have additional data or information about this transboundary aquifer that can improve the quality of this information sheet and the underlying database, please contact us via email at info@un-igrac.org. If appropriate, the information will be uploaded to the database of transboundary aquifers and will also be used in new versions of this information sheet.

References:

EU282 – Upper Pannonian Thermal Aquifer

- Population: Population has been calculated based on the aquifer map and grid information on population. Source population data: Center for International Earth Science Information Network - CIESIN - Columbia University, United Nations Food and Agriculture Programme - FAO, and Centro Internacional de Agricultura Tropical - CIAT. 2005. Gridded Population of the World, Version 3 (GPWv3): Population Count Grid, Future Estimates. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). http://dx.doi.org/10.7927/H42B8VZZ. Accessed Jan 2015.
- Rainfall: Average rainfall per TBA has been calculated based on the aquifer map and grid data for precipitation. Source precipitation data: Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. Jarvis, 2005. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology 25: 1965-1978. Grid data download from www.worldclim.org (2015): Data for current conditions (~1950-2000), ESRI grids, 30 arc seconds, Precipitation.
- Climate: Climate indicates the major climate zone which occurs in the aquifer area. If more than 1 climate zone is present the zone with the largest surface area was selected. Source climate data: ArcGIS Online (2015), Simplified World Climate zones. Owner: Mapping Our World GIS Education. Original map: National Geographic World Atlas for Young Explorers (1998).
- All other data: TWAP Groundwater (2015).

Version: December 2015

Transboundary Lakes/ Reservoirs of Northern, Western & Southern Europe

1. Macro Prespa
2. Maggiore
3. Neusiedler/ Fertö
4. Ohrid
5. Scutari/ Skadar
6. Szczecin Lagoon

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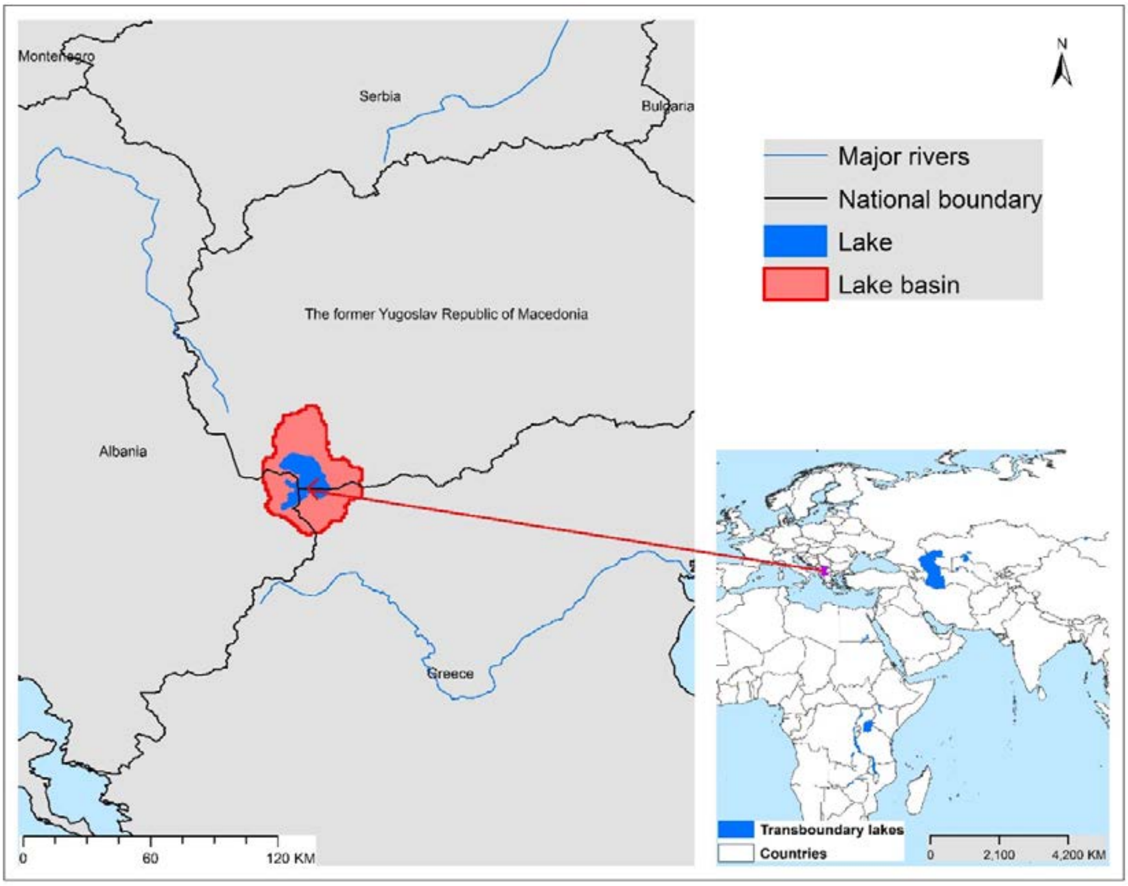
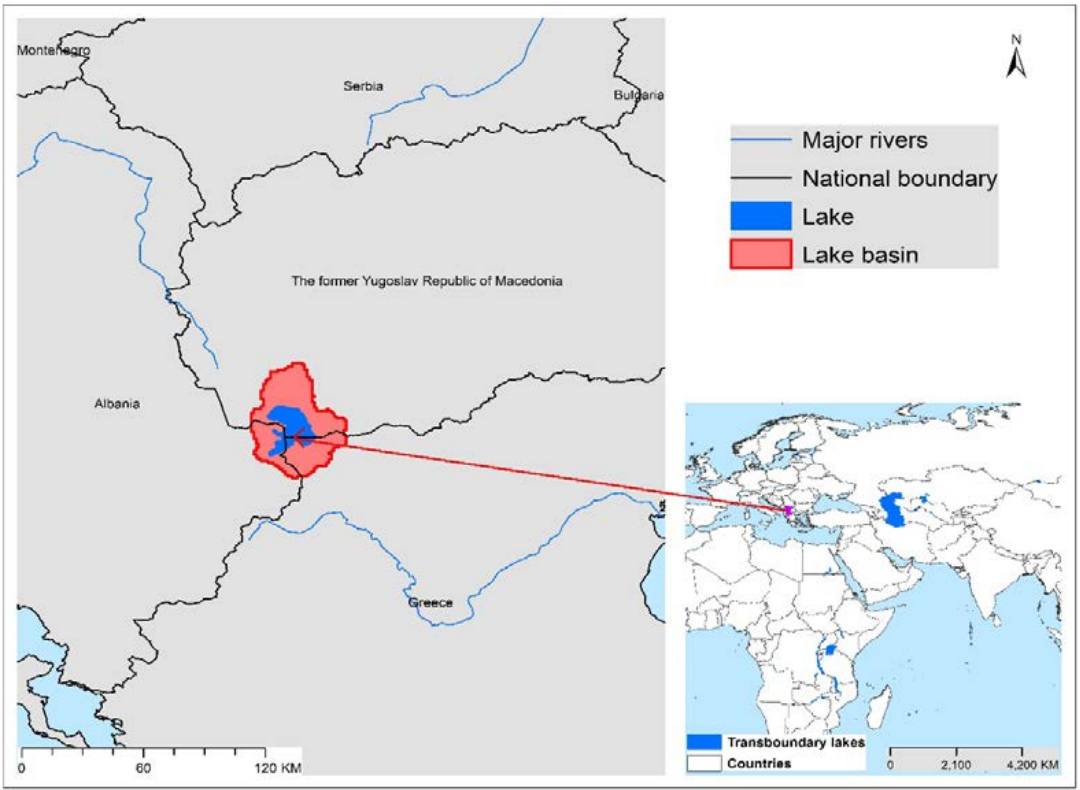
Macro Prespa — Geographic Information

Prespa is the name given to two freshwater lakes in southeast Europe, Macro Prespa and Micro Prespa. They comprise two lakes separated by a narrow strip of land, with Micro (small) Prespa located 8 m higher than Macro Prespa. They are the highest tectonic lakes in the Balkans. The lakes are connected by a natural canal with sluice gates. Macro Prespa is shared by Albania, Greece and Macedonia, while Micro Prespa is only shared by the former two countries. Rather, their waters drain into Lake Ohrid, which is located 150 m lower than the Prespa Lakes, via karst groundwater aquifers. Macro Prespa contains only 11 known native fish species, with nine being endemic to the lake.

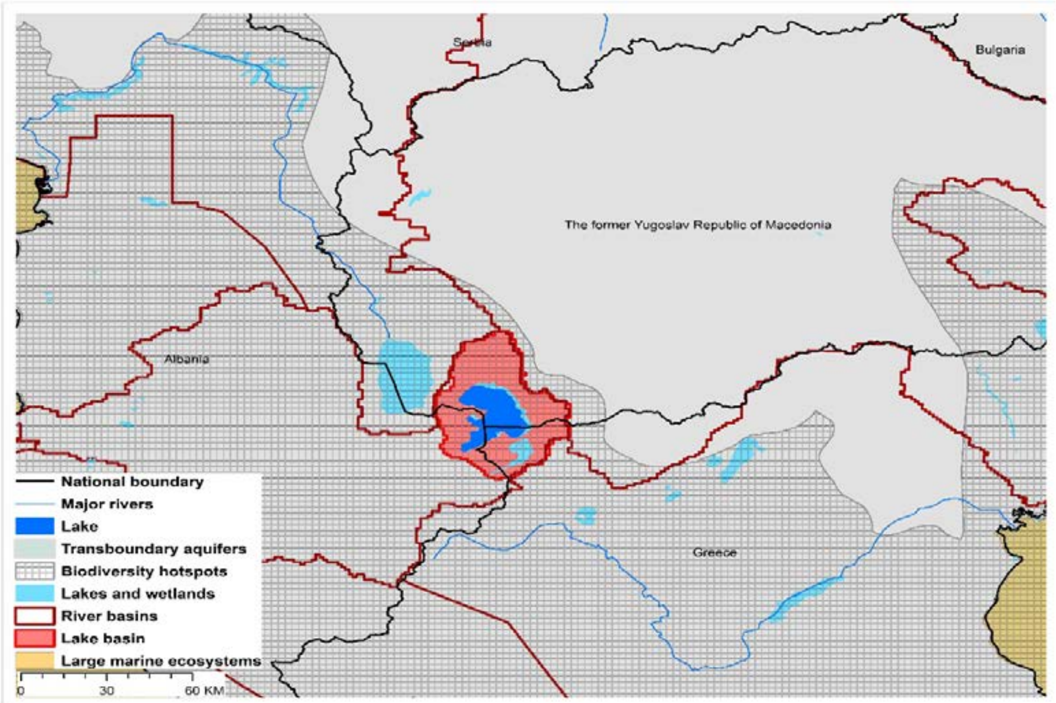


TWAP Regional Designation	Northern, Western & Southern Europe		**Lake Basin Population (2010)**	34,938
River Basin	Macro Prespa (endorheic)		**Lake Basin Population Density (2010; # km^{-2})**	20.4
Riparian Countries	Albania, Greece, Macedonia		**Average Basin Precipitation (mm yr^{-1})**	806.8
Basin Area (km^2)	1,335		**Shoreline Length (km)**	102.9
Lake Area (km^2)	263.0		**Human Development Index (HDI)**	0.75
Lake Area:Lake Basin Ratio	0.193		**International Treaties/Agreements Identifying Lake**	Yes

Macro Prespa Basin Characteristics



(a) Macro Prespa basin and associated transboundary water systems



(b) Macro Prespa basin land use

Macro Prespa Threat Ranking

A serious lack of global-scale uniform data on the TWAP transboundary in-lake conditions required their potential threat risks be estimated on the basis of the characteristics of their drainage basins, rather than in-lake conditions. Using basin characteristics to rank transboundary lake threats precludes consideration of the unique features that can buffer their in-lake responses to basin-derived disturbances, including an integrating nature for all inputs, long water retention times, and complex, non-linear response dynamics.

The lake threat ranks were calculated with a spreadsheet-based interactive scenario analysis program, incorporating data and information about the nature and magnitude of their basin-derived stresses, and their possible impacts on the sustainability of their ecosystem services. These descriptive data for Macro Prespa and the other transboundary lakes included lake and basin areas, population numbers and densities, areal extent of basin stressors on the lake, data grid size, and other components considered important from the perspective of the user of the data results. The scenario analysis program also provides a means to define the appropriate context and preconditions for interpreting the ranking results.

The Macro Prespa threat ranks are expressed in terms of the Adjusted Human Water Security (Adj-HWS) threats, Reverse Biodiversity (RvBD) threats, and the Human Development Index (HDI) score, as well as combinations of these indices. However, it is emphasized that, being based on specific characteristics and assumptions regarding Macro Prespa and its basin characteristics, the calculated threat scores represent only one possible set of lake threat rankings. Defining the appropriate context and preconditions for interpreting the lake rankings remains an important responsibility of those using the threat ranking results, including lake managers and decision-makers.

Table 1. Macro Prespa Relative Threat Ranks, Based on Adjusted Human Water Security (Adj-HWS) and Reverse Biodiversity Threats, and Human Development Index (HDI) Score

(Estimated risks: red – highest; orange – moderately high; yellow – medium; green – moderately low; blue – low)

Adjusted Human Water Security (Adj-HWS) Threat Score	Relative Adj-HWS Threat Rank		Reverse Biodiversity (RvBD) Threat Score	Relative RvBD Threat Rank		Human Development Index (HDI) Score	Relative HDI Rank
0.51	45		0.51	40		0.75	40

It is emphasized that the Macro Prespa rankings above are discussed here within the context of the management and decision-making process, rather than as strict numerical ranks. Based on its geographic, population and socioeconomic assumptions used in the scenario analysis program, the calculated Adj-HWS score for Macro Prespa indicates a low threat rank compared to other priority transboundary lakes.

The Reverse Biodiversity (RvBD) for Macro Prespa, which is meant to describe its biodiversity sensitivity to basin-derived degradation, places the lake in a moderately low threat rank, compared to the other transboundary lakes. Management interventions directed to improving the biodiversity status must be viewed with caution, however, since we lack sufficient knowledge and experience to accurately predict the ultimate impacts of biodiversity manipulations and preservation efforts. Further, the RvBD scores indicate the relative sensitivity of a lake basin to human activities, and high threat scores *per se* do not necessarily justify management interventions. Such interventions may actually increase biodiversity degradation, noting that many developed countries have already fundamentally degraded their biodiversity because of economic development activities. Thus, activities undertaken to address the Adj-HWS threats may actually degrade the biodiversity status and resources, even if the health and socioeconomic conditions of the lake basin stakeholders are improved as a result of better conditions, thereby increasing stakeholder resource consumption.

The relative Human Development Index (HDI) places the Macro Prespa basin in a moderately low threat rank in regard to its health, educational and economic conditions.

Table 2. Macro Prespa Threat Ranks, Based on Multiple Ranking Criteria

(Scores for Adj-HWS, RvBD and HDI ranks are presented in Table 1; the ranks may differ in some cases because of rounding of tied threat scores; Estimated risks: red – highest; orange – moderately high; yellow – medium;
green – moderately low; blue – low)

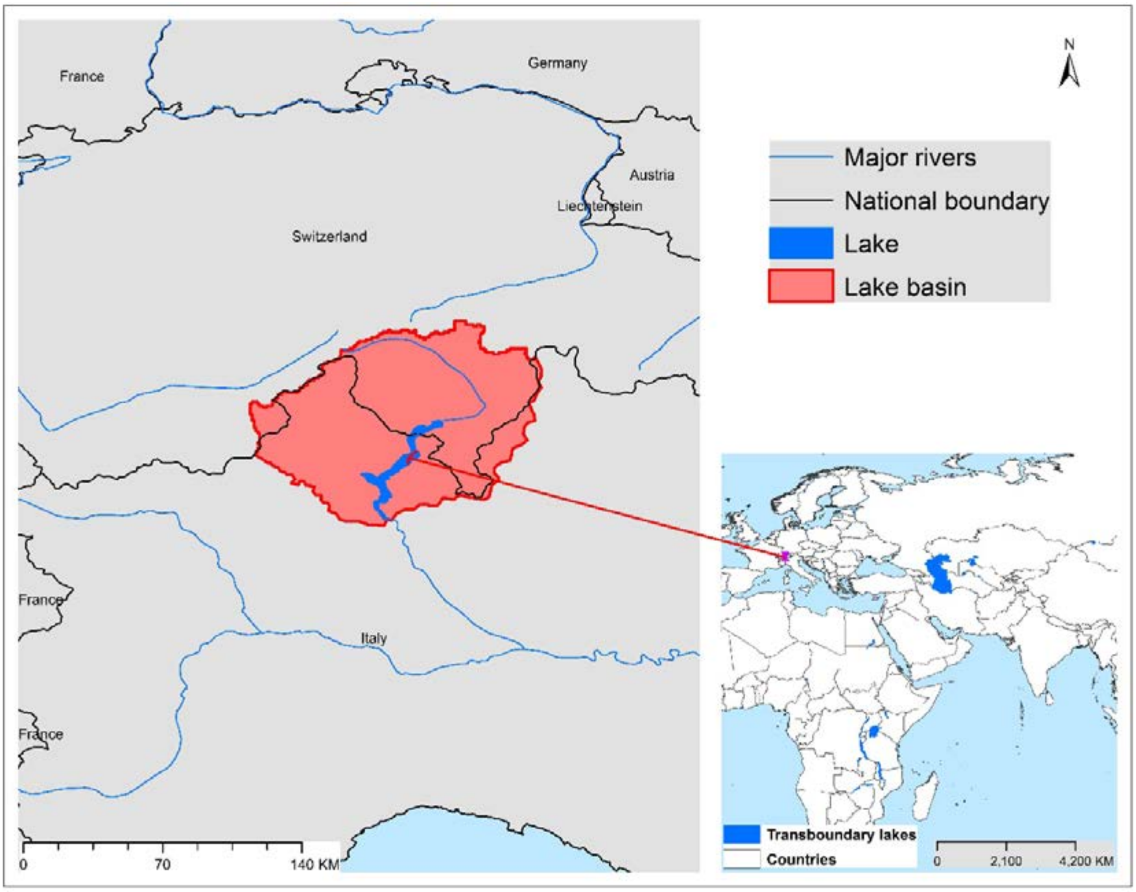
Adj-HWS Rank	HDI Rank	RvBD Rank		Sum Adj-HWS + RvBD	Relative Threat Rank		Sum Adj-HWS + HDI	Relative Threat Rank		Sum Adj-HWS + RvBD + HDI	Overall Threat Rank
44	40	40		84	43		84	42		124	43

When multiple ranking criteria are considered together in the threat rank calculations, the Adj-HWS and HDI scores considered together place Macro Prespa in the lower quarter of the threat ranks. The relative threat is similar when the Adj-HWS and RvBD threats are considered together. Considering all three ranking criteria together, Macro Prespa exhibits a moderately low threat ranking.

Interactions between the ranking parameters for Macro Prespa indicate differing sensitivity to basin-derived stresses. Identifying potential management interventions needs for Macro Prespa must be considered on the basis of educated judgement and accurate representations of its situation. A fundamental question will be how can one decide a given management intervention will produce the greatest benefit(s) for the greatest number of people in the Macro Prespa basin? Accurate answers to such questions for Macro Prespa, and other transboundary lakes, will require a case-by-case assessment approach that considers the specific lake situation and the anticipated improvements from specific management interventions, as well as interactions with water systems to which the lake is linked.

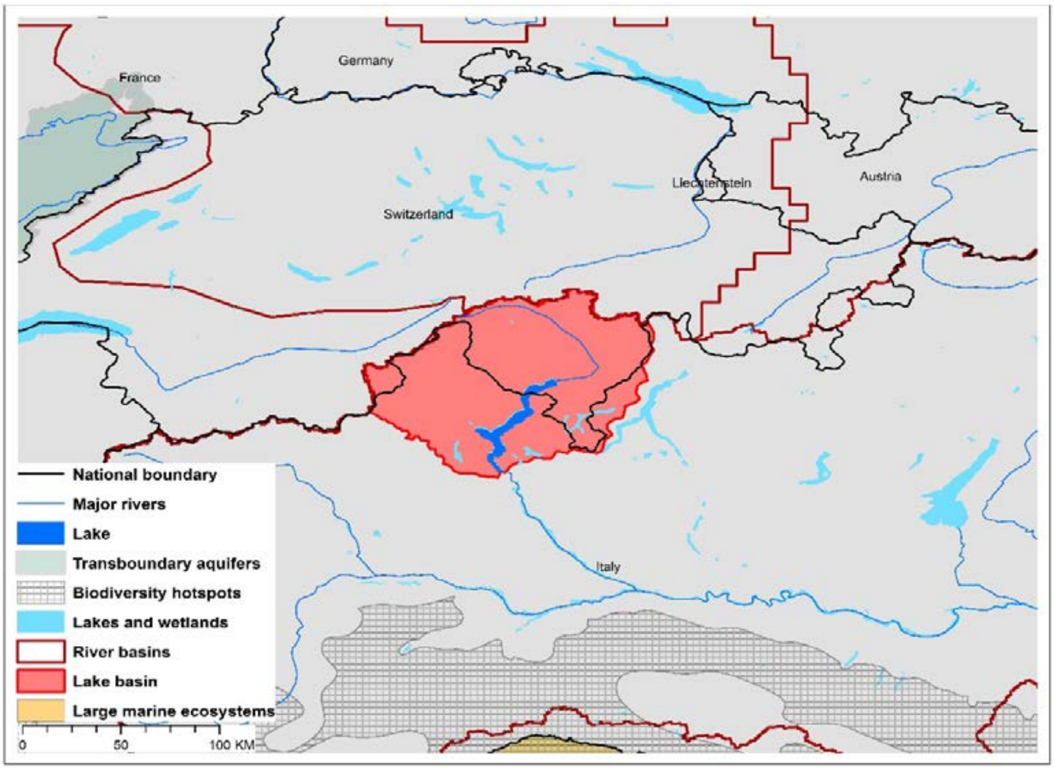
Lake Maggiore — Geographic Information

Lake Maggiore is a large, deep lake located on the southern side of the Alps, the largest lake in southern Switzerland. It also is the longest and second largest lake in Italy, being the most westerly of the three great southern prealpine lakes (Maggiore, Como, Garda). Although located in a mountainous region, it is very deep, with its bottom being below sea level throughout most of the lake. Its sinuous shape makes it difficult to see the entire lake at a single glance from any point around the lake. The upper end of the lake has completely alpine characteristics, the middle regions exhibits gentler hills, and the lower end exhibits a more plain-like character. Because water releases heat energy more slowly than the overlying atmosphere, the lake helps maintain a higher temperature in the surrounding region.

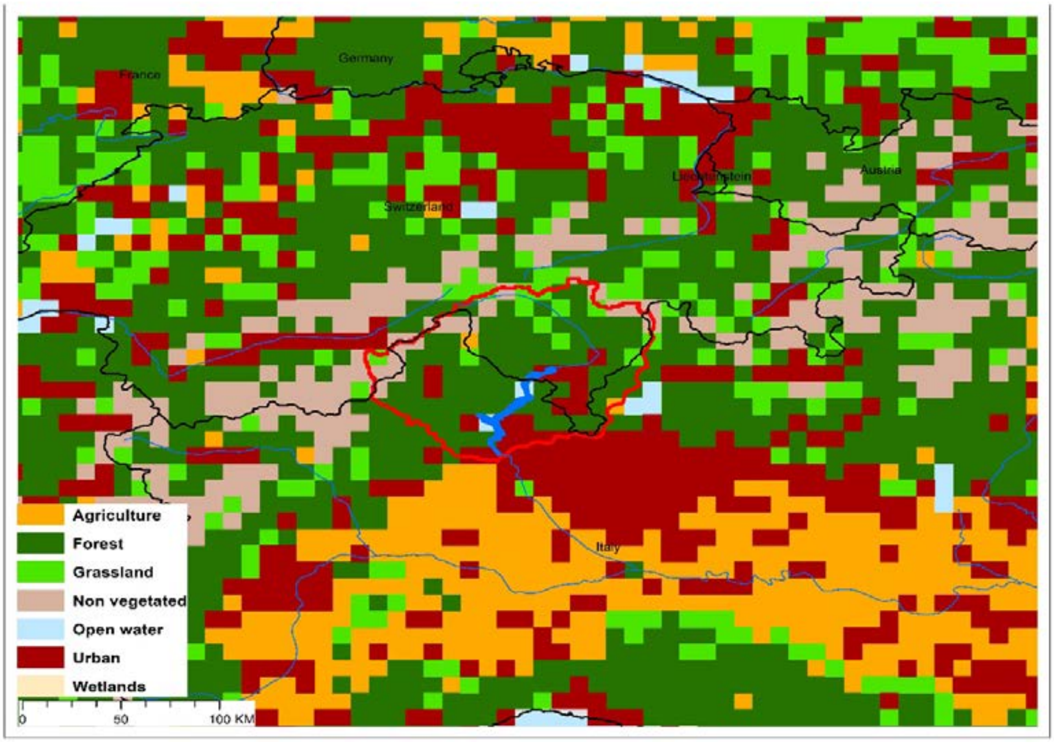


TWAP Regional Designation	Northern, Western & Southern Europe	Lake Basin Population (2010)	894,071
River Basin	Po	Lake Basin Population Density (2010; # km^{-2})	80.5
Riparian Countries	Italy, Switzerland	Average Basin Precipitation (mm yr^{-1})	1,406
Basin Area (km^2)	211.4	Shoreline Length (km)	156.9
Lake Area (km^2)	7,012	Human Development Index (HDI)	0.89
Lake Area:Lake Basin Ratio	0.030	International Treaties/Agreements Identifying Lake	No

Lake Maggiore Basin Characteristics



(a) Lake Maggiore basin and associated transboundary water systems



(b) Lake Maggiore basin land use

Lake Maggiore Threat Ranking

A serious lack of global-scale uniform data on the TWAP transboundary in-lake conditions required their potential threat risks be estimated on the basis of the characteristics of their drainage basins, rather than in-lake conditions. Using basin characteristics to rank transboundary lake threats precludes consideration of the unique features that can buffer their in-lake responses to basin-derived disturbances, including an integrating nature for all inputs, long water retention times, and complex, non-linear response dynamics.

The lake threat ranks were calculated with a spreadsheet-based interactive scenario analysis program, incorporating data and information about the nature and magnitude of their basin-derived stresses, and their possible impacts on the sustainability of their ecosystem services. These descriptive data for Lake Maggiore and the other transboundary lakes included lake and basin areas, population numbers and densities, areal extent of basin stressors on the lake, data grid size, and other components considered important from the perspective of the user of the data results. The scenario analysis program also provides a means to define the appropriate context and preconditions for interpreting the ranking results.

The Lake Maggiore threat ranks are expressed in terms of the Adjusted Human Water Security (Adj-HWS) threats, Reverse Biodiversity (RvBD) threats, and the Human Development Index (HDI) score, as well as combinations of these indices. However, it is emphasized that, being based on specific characteristics and assumptions regarding Lake Maggiore and its basin characteristics, the calculated threat scores represent only one possible set of lake threat rankings. Defining the appropriate context and preconditions for interpreting the lake rankings remains an important responsibility of those using the threat ranking results, including lake managers and decision-makers.

Table 1. Lake Maggiore Relative Threat Ranks, Based on Adjusted Human Water Security (Adj-HWS) and Reverse Biodiversity Threats, and Human Development Index (HDI) Score

(Estimated risks: red – highest; orange – moderately high; yellow – medium; green – moderately low; blue – low)

Adjusted Human Water Security (Adj-HWS) Threat Score	Relative Adj-HWS Threat Rank		Reverse Biodiversity (RvBD) Threat Score	Relative RvBD Threat Rank		Human Development Index (HDI) Score	Relative HDI Rank
0.33	52		0.49	42		0.89	48

It is emphasized that the Lake Maggiore rankings above are discussed here within the context of the management and decision-making process, rather than as strict numerical ranks. Based on its geographic, population and socioeconomic assumptions used in the scenario analysis program, the calculated Adj-HWS score for Lake Maggiore indicates a low threat rank compared to other priority transboundary lakes.

The Reverse Biodiversity (RvBD) for Lake Maggiore, which is meant to describe its biodiversity sensitivity to basin-derived degradation, places the lake in a slightly higher threat rank, compared to the other transboundary lakes. Management interventions directed to improving the biodiversity status must be viewed with caution, however, since we lack sufficient knowledge and experience to accurately predict the ultimate impacts of biodiversity manipulations and preservation efforts. Further, the RvBD scores indicate the relative sensitivity of a lake basin to human activities, and high threat scores *per se* do not necessarily justify management interventions. Such interventions may actually increase biodiversity degradation, noting that many developed countries have already fundamentally degraded their biodiversity because of economic development activities. Thus, activities undertaken to address the Adj-HWS threats may actually degrade the biodiversity status and resources, even if the health and socioeconomic conditions of the lake basin stakeholders are improved as a result of better conditions, thereby increasing stakeholder resource consumption.

The relative Human Development Index (HDI) places the Lake Maggiore basin in a low threat rank in regard to its health, educational and economic conditions.

Table 2. Lake Maggiore Threat Ranks, Based on Multiple Ranking Criteria

(Scores for Adj-HWS, RvBD and HDI ranks are presented in Table 1; the ranks may differ in some cases because of rounding of tied threat scores; Estimated risks: red – highest; orange – moderately high; yellow – medium;
green – moderately low; blue – low)

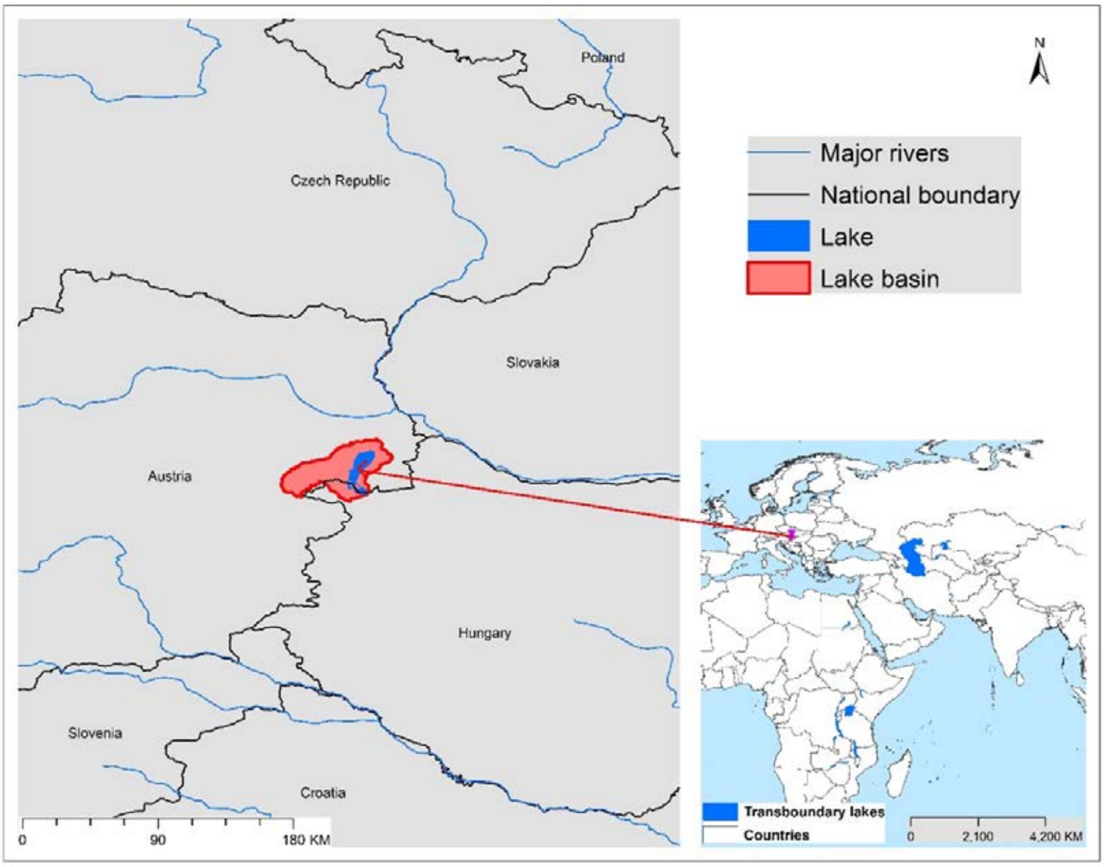
Adj-HWS Rank	HDI Rank	RvBD Rank		Sum Adj-HWS + RvBD	Relative Threat Rank		Sum Adj-HWS + HDI	Relative Threat Rank		Sum Adj-HWS + RvBD + HDI	Overall Threat Rank
52	48	42		94	50		100	50		142	48

When multiple ranking criteria are considered together in the threat rank calculations, the Adj-HWS and HDI scores considered together place Lake Maggiore in the lower quarter of the threat ranks. The relative threat is similar when the Adj-HWS and RvBD threats are considered together. Considering all three ranking criteria together, Lake Maggiore exhibits a low threat ranking.

Interactions between the ranking parameters for Lake Maggiore indicate differing sensitivity to basin-derived stresses. Identifying potential management interventions needs for Lake Maggiore must be considered on the basis of educated judgement and accurate representations of its situation. A fundamental question will be how can one decide a given management intervention will produce the greatest benefit(s) for the greatest number of people in the Lake Maggiore basin? Accurate answers to such questions for Lake Maggiore, and other transboundary lakes, will require a case-by-case assessment approach that considers the specific lake situation and the anticipated improvements from specific management interventions, as well as interactions with water systems to which the lake is linked.

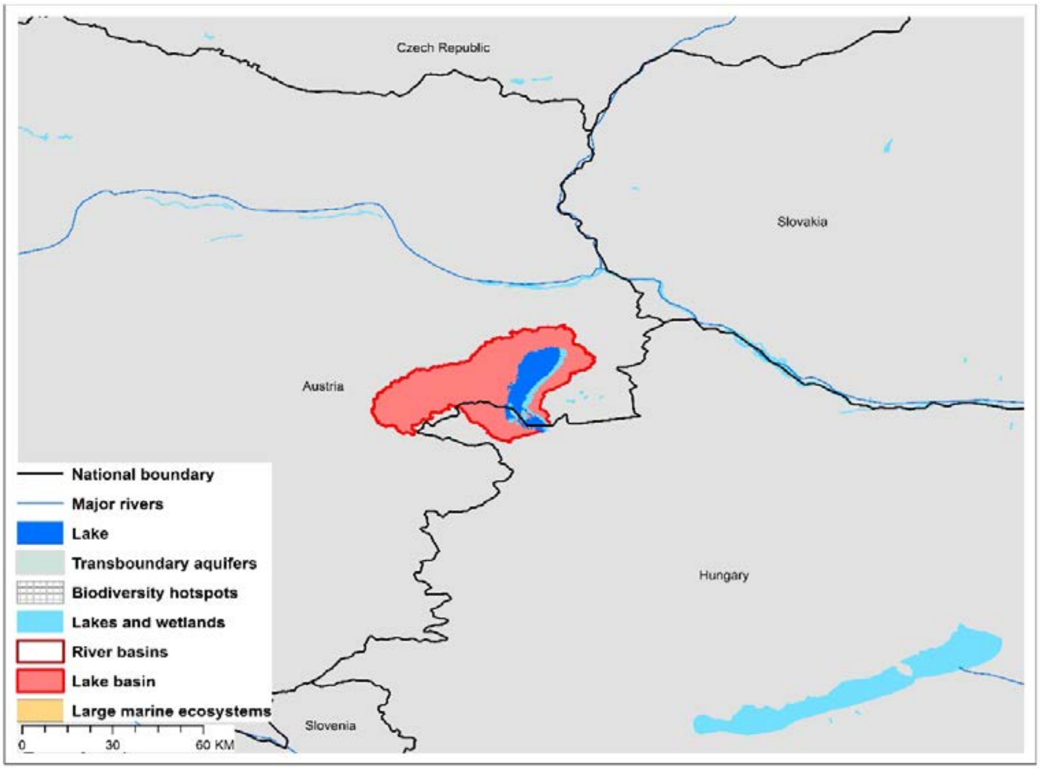
Lake Neusiedler/Fertő — Geographic Information

Lake Neusiedler, called Lake Fertő, straddles the Austria-Hungary border, being the largest endorheic lake in Central Europe. The lake is relatively shallow and marshy, being no more than about 1.8 deep. The lake experiences significant rising and falling water levels, with no clear relationship with the weather patterns. The water level is currently controlled by a sluice on Hungarian territory. Much of the lake is surrounded by reeds serving as a wildlife habitat, particularly a resting place for migratory birds. The reeds are also harvested in winter when the ice is solid, thereby removing organic matter that could decay in the lake. They are also used for construction and housing, thereby having an economic significance. A significant number of tourists visit the lake, particularly from Austria, with the lake providing sailing, windsurfing and commercial fishing opportunities.

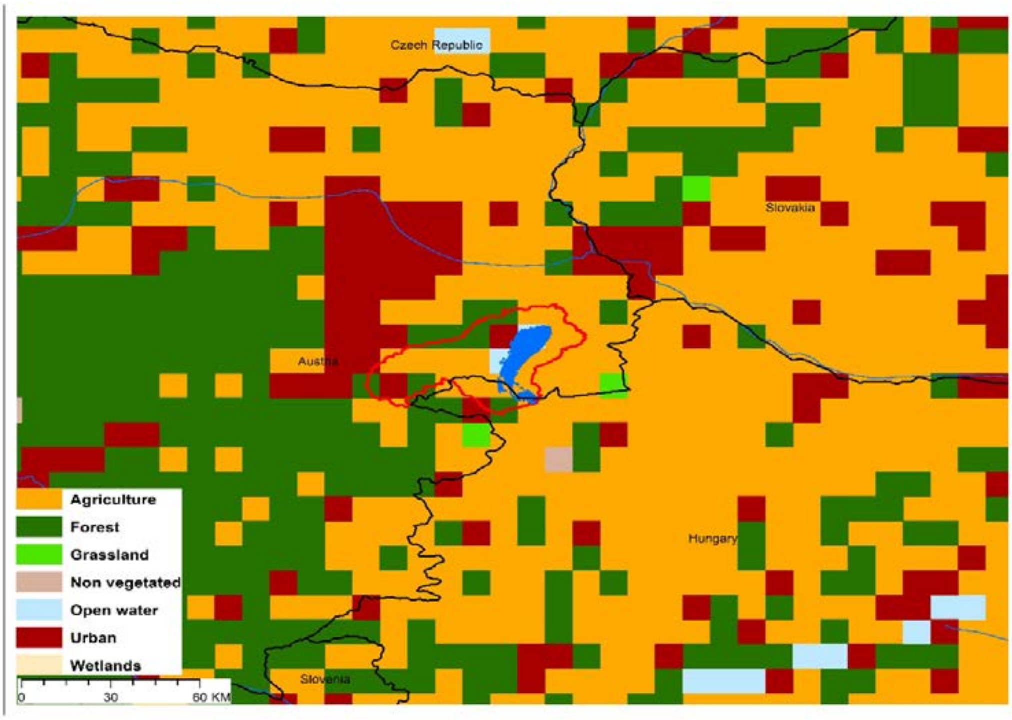


TWAP Regional Designation	Northern, Western & Southern Europe; Eastern Europe		**Lake Basin Population (2010)**	115,345
River Basin	Danube		**Lake Basin Population Density (2010; # km^{-2})**	69.6
Riparian Countries	Austria, Hungary		**Average Basin Precipitation (mm yr^{-1})**	627.1
Basin Area (km^2)	1,118		**Shoreline Length (km)**	199.0
Lake Area (km^2)	142.0		**Human Development Index (HDI)**	0.88
Lake Area:Lake Basin Ratio	0.132		**International Treaties/Agreements Identifying Lake**	No

Lake Neusiedler/Fertő Basin Characteristics



(a) Lake Neusiedler/Fertő basin and associated transboundary water systems



(b) Lake Neusiedler/Fertő basin land use

Lake Neusiedler/Fertő Threat Ranking

A serious lack of global-scale uniform data on the TWAP transboundary in-lake conditions required their potential threat risks be estimated on the basis of the characteristics of their drainage basins, rather than in-lake conditions. Using basin characteristics to rank transboundary lake threats precludes consideration of the unique features that can buffer their in-lake responses to basin-derived disturbances, including an integrating nature for all inputs, long water retention times, and complex, non-linear response dynamics.

The lake threat ranks were calculated with a spreadsheet-based interactive scenario analysis program, incorporating data and information about the nature and magnitude of their basin-derived stresses, and their possible impacts on the sustainability of their ecosystem services. These descriptive data for Lake Neusiedler/Fertő and the other transboundary lakes included lake and basin areas, population numbers and densities, areal extent of basin stressors on the lake, data grid size, and other components considered important from the perspective of the user of the data results. The scenario analysis program also provides a means to define the appropriate context and preconditions for interpreting the ranking results.

The Lake Neusiedler/Fertő threat ranks are expressed in terms of the Adjusted Human Water Security (Adj-HWS) threats, Reverse Biodiversity (RvBD) threats, and the Human Development Index (HDI) score, as well as combinations of these indices. However, it is emphasized that, being based on specific characteristics and assumptions regarding Lake Neusiedler/Fertő and its basin characteristics, the calculated threat scores represent only one possible set of lake threat rankings. Defining the appropriate context and preconditions for interpreting the lake rankings remains an important responsibility of those using the threat ranking results, including lake managers and decision-makers.

Table 1. Lake Neusiedler/Fertő Relative Threat Ranks, Based on Adjusted Human Water Security (Adj-HWS) and Reverse Biodiversity Threats, and Human Development Index (HDI) Score

(Estimated risks: red – highest; orange – moderately high; yellow – medium; green – moderately low; blue – low)

Adjusted Human Water Security (Adj-HWS) Threat Score	Relative Adj-HWS Threat Rank		Reverse Biodiversity (RvBD) Threat Score	Relative RvBD Threat Rank		Human Development Index (HDI) Score	Relative HDI Rank
0.58	42		0.61	50		0.88	47

It is emphasized that the Lake Neusiedler/Fertő rankings above are discussed here within the context of the management and decision-making process, rather than as strict numerical ranks. Based on its geographic, population and socioeconomic assumptions used in the scenario analysis program, the calculated Adj-HWS score for Lake Neusiedler/Fertő indicates a moderately low rank compared to other priority transboundary lakes.

The Reverse Biodiversity (RvBD) for Lake Neusiedler/Fertő, which is meant to describe its biodiversity sensitivity to basin-derived degradation, places the lake in a low threat rank, compared to the other transboundary lakes. Management interventions directed to improving the biodiversity status must be viewed with caution, however, since we lack sufficient knowledge and experience to accurately predict the ultimate impacts of biodiversity manipulations and preservation efforts. Further, the RvBD scores indicate the relative sensitivity of a lake basin to human activities, and high threat scores *per se* do not necessarily justify management interventions. Such interventions may actually increase biodiversity degradation, noting that many developed countries have already fundamentally degraded their biodiversity because of economic development activities. Thus, activities undertaken to address the Adj-HWS threats may actually degrade the biodiversity status and resources, even if the health and socioeconomic conditions of the lake basin stakeholders are improved as a result of better conditions, thereby increasing stakeholder resource consumption.

The relative Human Development Index (HDI) places the Lake Neusiedler/Fertő basin in a low threat rank in regard to its health, educational and economic conditions.

Table 2. Lake Neusiedler/Fertő Threat Ranks, Based on Multiple Ranking Criteria

(Scores for Adj-HWS, RvBD and HDI ranks are presented in Table 1; the ranks may differ in some cases because of rounding of tied threat scores; Estimated risks: red – highest; orange – moderately high; yellow – medium;
green – moderately low; blue – low)

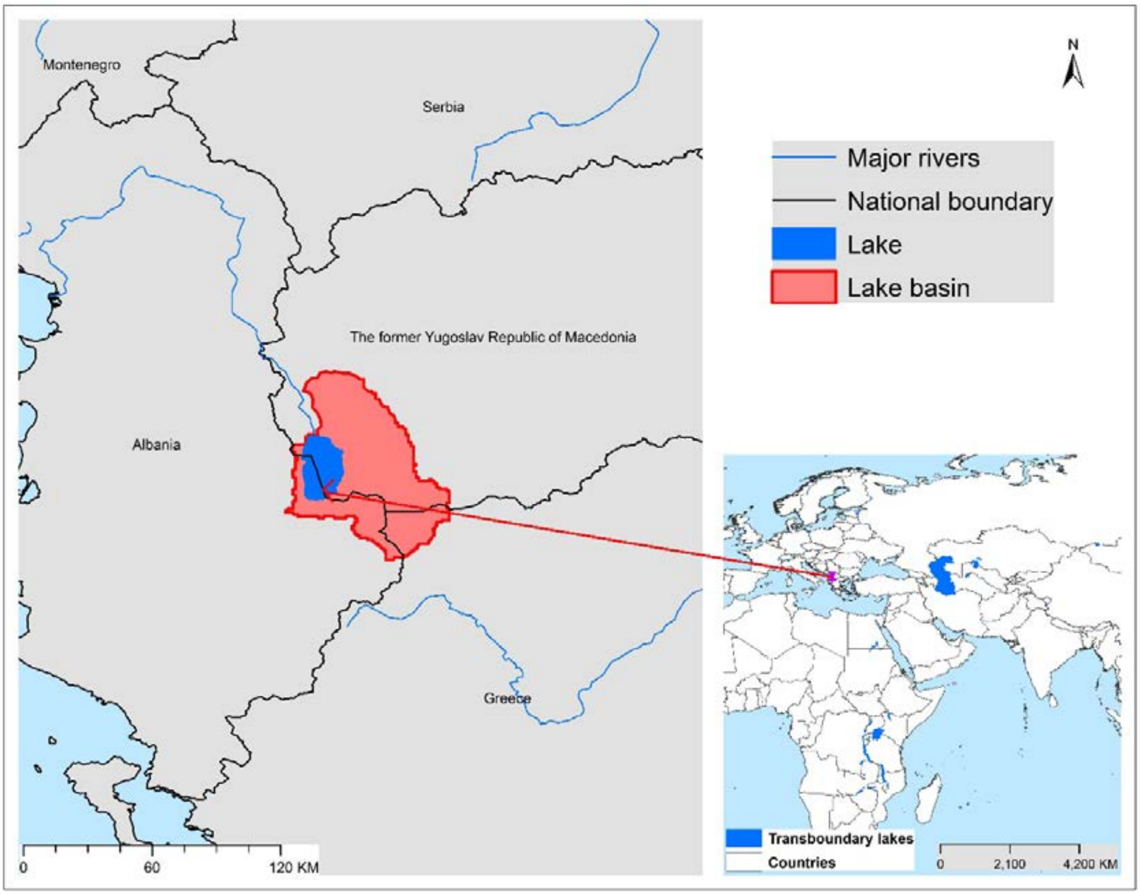
Adj-HWS Rank	HDI Rank	RvBD Rank		Sum Adj-HWS + RvBD	Relative Threat Rank		Sum Adj-HWS + HDI	Relative Threat Rank		Sum Adj-HWS + RvBD + HDI	Overall Threat Rank
42	47	50		92	47		89	45		139	47

When multiple ranking criteria are considered together in the threat rank calculations, the Adj-HWS and HDI scores considered together place Lake Neusiedler/Fertő in the lower quarter of the threat ranks. The relative threat is slightly reduced when the Adj-HWS and RvBD threats are considered together. Considering all three ranking criteria together, Lake Neusiedler/Fertő exhibits a low threat ranking.

Interactions between the ranking parameters for Lake Neusiedler/Fertő indicate differing sensitivity to basin-derived stresses. Identifying potential management interventions needs for Lake Neusiedler/Fertő must be considered on the basis of educated judgement and accurate representations of its situation. A fundamental question will be how can one decide a given management intervention will produce the greatest benefit(s) for the greatest number of people in the Lake Neusiedler/Fertő basin? Accurate answers to such questions for Lake Neusiedler/Fertő, and other transboundary lakes, will require a case-by-case assessment approach that considers the specific lake situation and the anticipated improvements from specific management interventions, as well as interactions with water systems to which the lake is linked.

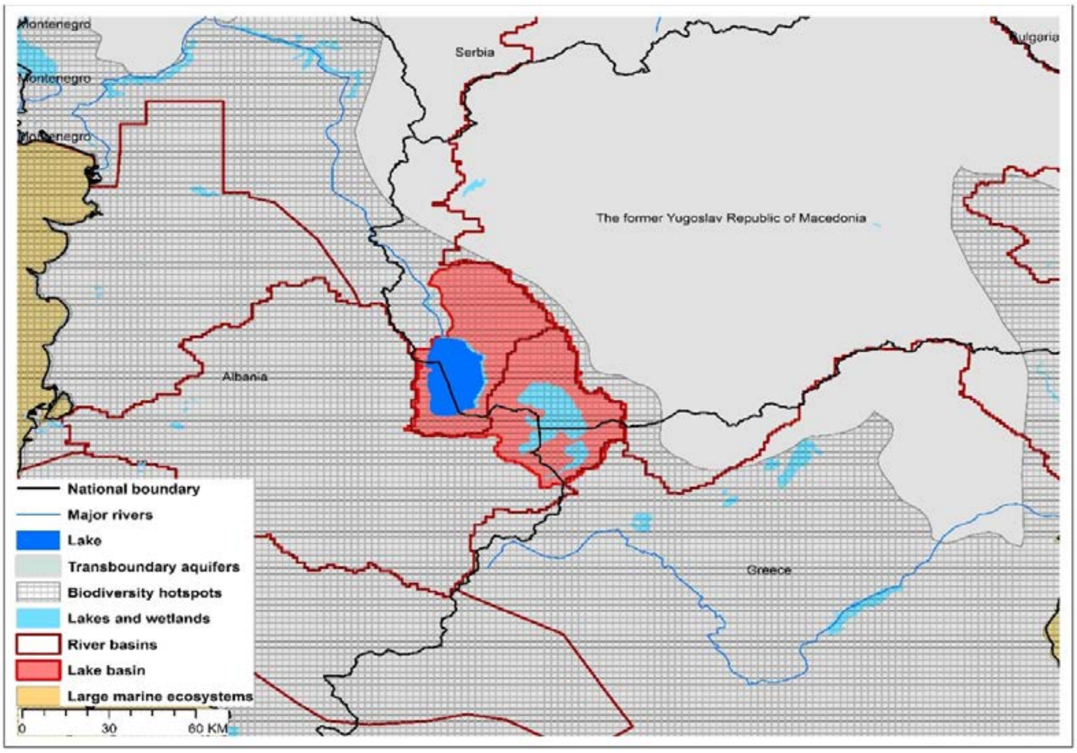
Lake Ohrid — Geographic Information

Lake Ohrid, one of Europe's deepest and oldest lakes, straddles the mountainous region between southwestern Macedonie and eastern Albania. It is the deepest lake of the Balkans, containing a unique aquatic ecosystem of worldwide importance, with more than 200 endemic species, and being previously declared a World Heritage Site. Its endemism is such that it covers the whole lake food chain, from phytoplankton to predatory fish. It receives about half of its inflowing water from karstic aquifers draining upstream lake Prespa. Exhibiting an oligotrophic status, it has exceptionally clear water transparency. Historic monuments, as well as its pristine environment, make the area around Lake Ohrid a prime tourism site.

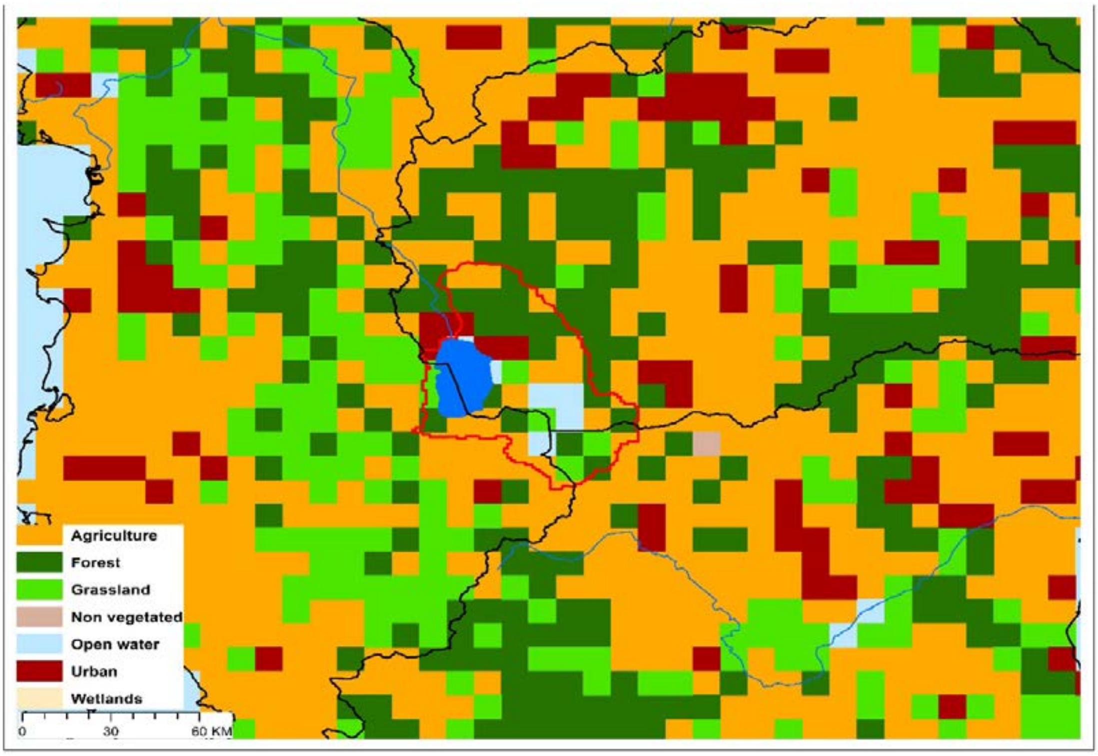


TWAP Regional Designation	Northern, Western & Southern Europe	**Lake Basin Population (2010)**	165,355
River Basin	Black Drin	**Lake Basin Population Density (2010; # km^{-2})**	45.8
Riparian Countries	Albania, Macedonia	**Average Basin Precipitation (mm yr^{-1})**	851.4
Basin Area (km^2)	2,828	**Shoreline Length (km)**	80.9
Lake Area (km^2)	354.3	**Human Development Index (HDI)**	0.74
Lake Area:Lake Basin Ratio	0.123	**International Treaties/Agreements Identifying Lake**	Yes

Lake Ohrid Basin Characteristics



(a) Lake Ohrid basin and associated transboundary water systems



(b) Lake Ohrid basin land use

Lake Ohrid Threat Ranking

A serious lack of global-scale uniform data on the TWAP transboundary in-lake conditions required their potential threat risks be estimated on the basis of the characteristics of their drainage basins, rather than in-lake conditions. Using basin characteristics to rank transboundary lake threats precludes consideration of the unique features that can buffer their in-lake responses to basin-derived disturbances, including an integrating nature for all inputs, long water retention times, and complex, non-linear response dynamics.

The lake threat ranks were calculated with a spreadsheet-based interactive scenario analysis program, incorporating data and information about the nature and magnitude of their basin-derived stresses, and their possible impacts on the sustainability of their ecosystem services. These descriptive data for Lake Ohrid and the other transboundary lakes included lake and basin areas, population numbers and densities, areal extent of basin stressors on the lake, data grid size, and other components considered important from the perspective of the user of the data results. The scenario analysis program also provides a means to define the appropriate context and preconditions for interpreting the ranking results.

The Lake Ohrid threat ranks are expressed in terms of the Adjusted Human Water Security (Adj-HWS) threats, Reverse Biodiversity (RvBD) threats, and the Human Development Index (HDI) score, as well as combinations of these indices. However, it is emphasized that, being based on specific characteristics and assumptions regarding Lake Ohrid and its basin characteristics, the calculated threat scores represent only one possible set of lake threat rankings. Defining the appropriate context and preconditions for interpreting the lake rankings remains an important responsibility of those using the threat ranking results, including lake managers and decision-makers.

Table 1. Lake Ohrid Relative Threat Ranks, Based on Adjusted Human Water Security (Adj-HWS) and Reverse Biodiversity Threats, and Human Development Index (HDI) Score

(Estimated risks: red – highest; orange – moderately high; yellow – medium; green – moderately low; blue – low)

Adjusted Human Water Security (Adj-HWS) Threat Score	Relative Adj-HWS Threat Rank		Reverse Biodiversity (RvBD) Threat Score	Relative RvBD Threat Rank		Human Development Index (HDI) Score	Relative HDI Rank
0.47	**49**		**0.51**	**39**		**0.74**	**39**

It is emphasized that the Lake Ohrid rankings above are discussed here within the context of the management and decision-making process, rather than as strict numerical ranks. Based on its geographic, population and socioeconomic assumptions used in the scenario analysis program, the calculated Adj-HWS score for Lake Ohrid indicates a low threat rank compared to other priority transboundary lakes.

The Reverse Biodiversity (RvBD) for Lake Ohrid, which is meant to describe its biodiversity sensitivity to basin-derived degradation, increases the lake to a moderately low threat rank, compared to the other transboundary lakes. Management interventions directed to improving the biodiversity status must be viewed with caution, however, since we lack sufficient knowledge and experience to accurately predict the ultimate impacts of biodiversity manipulations and preservation efforts. Further, the RvBD scores indicate the relative sensitivity of a lake basin to human activities, and high threat scores *per se* do not necessarily justify management interventions. Such interventions may actually increase biodiversity degradation, noting that many developed countries have already fundamentally degraded their biodiversity because of economic development activities. Thus, activities undertaken to address the Adj-HWS threats may actually degrade the biodiversity status and resources, even if the health and socioeconomic conditions of the lake basin stakeholders are improved as a result of better conditions, thereby increasing stakeholder resource consumption.

The relative Human Development Index (HDI) places the Lake Ohrid basin in a moderately low threat rank in regard to its health, educational and economic conditions.

Table 2. Lake Ohrid Threat Ranks, Based on Multiple Ranking Criteria

(Scores for Adj-HWS, RvBD and HDI ranks are presented in Table 1; the ranks may differ in some cases because of rounding of tied threat scores; Estimated risks: red – highest; orange – moderately high; yellow – medium;
green – moderately low; blue – low)

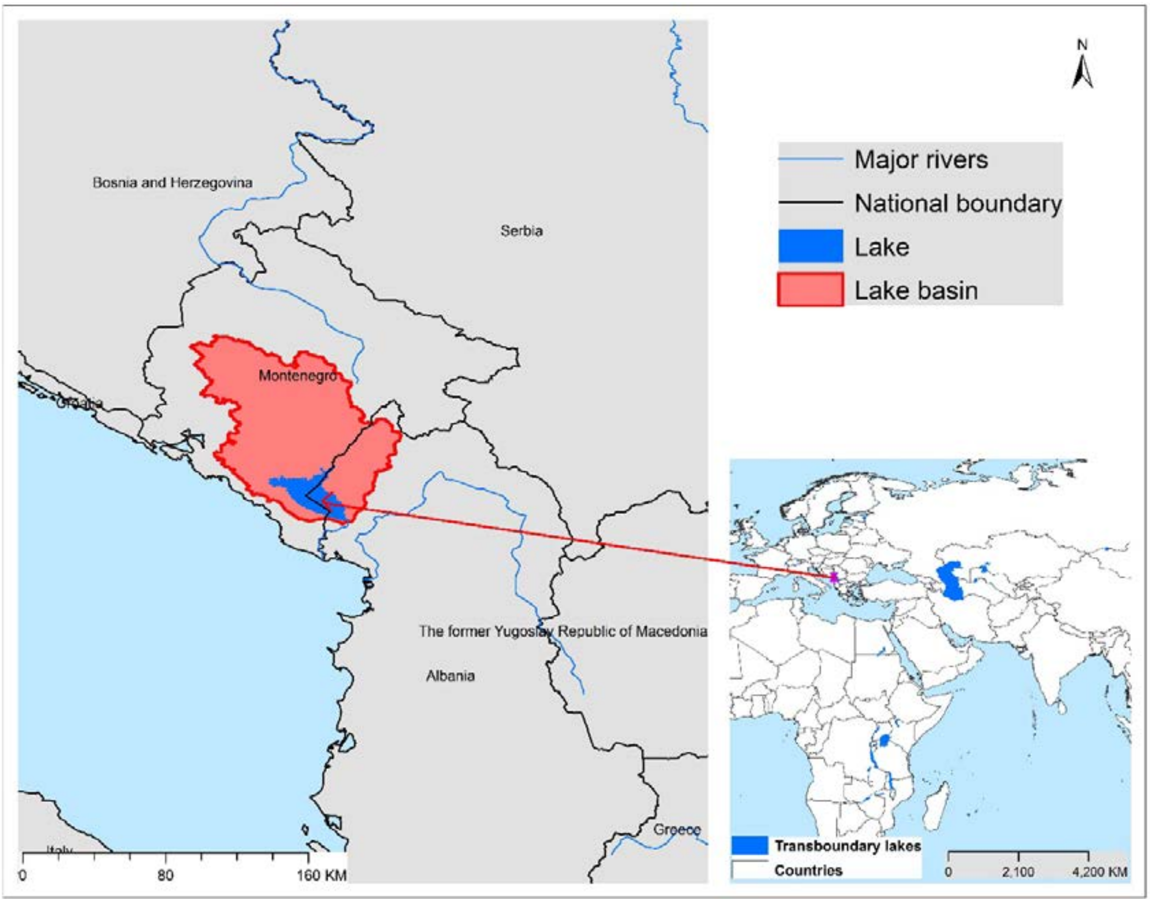
Adj-HWS Rank	HDI Rank	RvBD Rank		Sum Adj-HWS + RvBD	Relative Threat Rank		Sum Adj-HWS + HDI	Relative Threat Rank		Sum Adj-HWS + RvBD + HDI	Overall Threat Rank
49	39	39		88	46		88	44		129	44

When multiple ranking criteria are considered together in the threat rank calculations, the Adj-HWS and HDI scores considered together place Lake Ohrid in the lower quarter of the threat ranks. The relative threat is similar when the Adj-HWS and RvBD threats are considered together. Considering all three ranking criteria together, Lake Ohrid exhibits a low threat ranking.

Interactions between the ranking parameters for Lake Ohrid indicate differing sensitivity to basin-derived stresses. Identifying potential management interventions needs for Lake Ohrid must be considered on the basis of educated judgement and accurate representations of its situation. A fundamental question will be how can one decide a given management intervention will produce the greatest benefit(s) for the greatest number of people in the Lake Ohrid basin? Accurate answers to such questions for Lake Ohrid, and other transboundary lakes, will require a case-by-case assessment approach that considers the specific lake situation and the anticipated improvements from specific management interventions, as well as interactions with water systems to which the lake is linked.

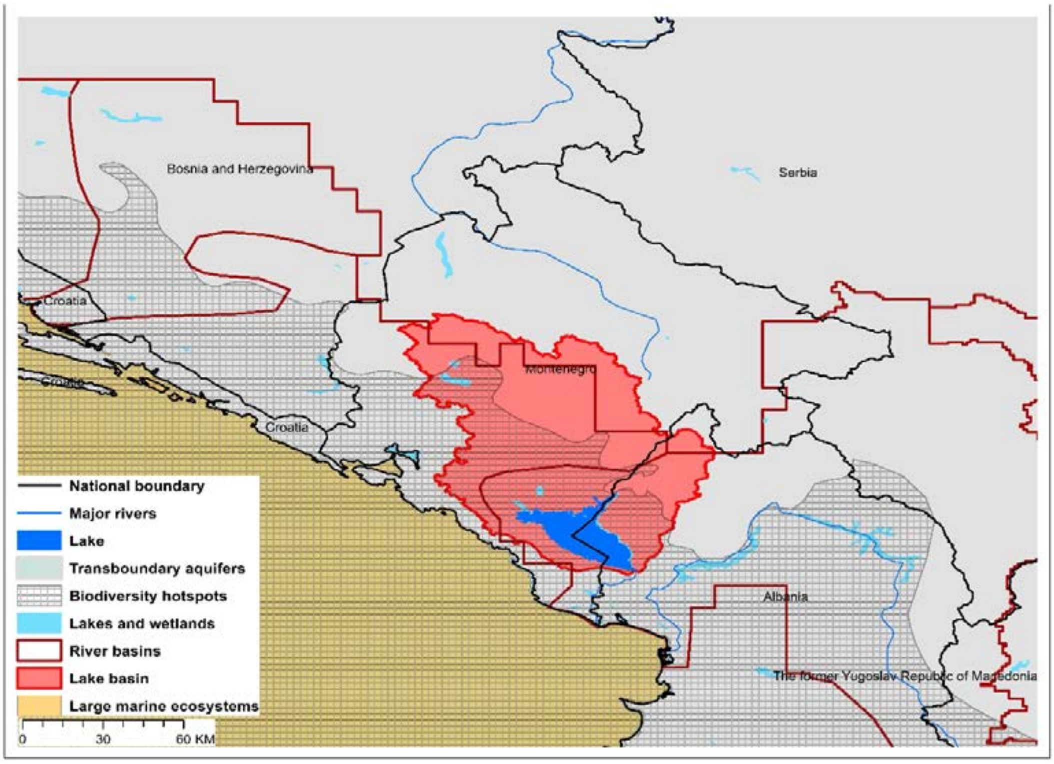
Lake Scutari/Skadar — Geographic Information

Lake Scutari, also called Lake Skadar, is the largest lake in the Balkan Peninsula, lying on the Albania-Montenegro border. Its surface area fluctuates seasonally between the seasons. It is a karst lake in that it receives a high water inflow from a number of temporary and permanent karstic springs lying on its bottom. It is a well-known hotspot of freshwater biodiversity. It is one of the largest bird reserves in Europe. It also is abundant in fish, with seven of its 34 native fish species being endemic to the lake. Threats to the lake include increasing eutrophication, water pollution and sand and gravel exploration activities in the lake and its basin.

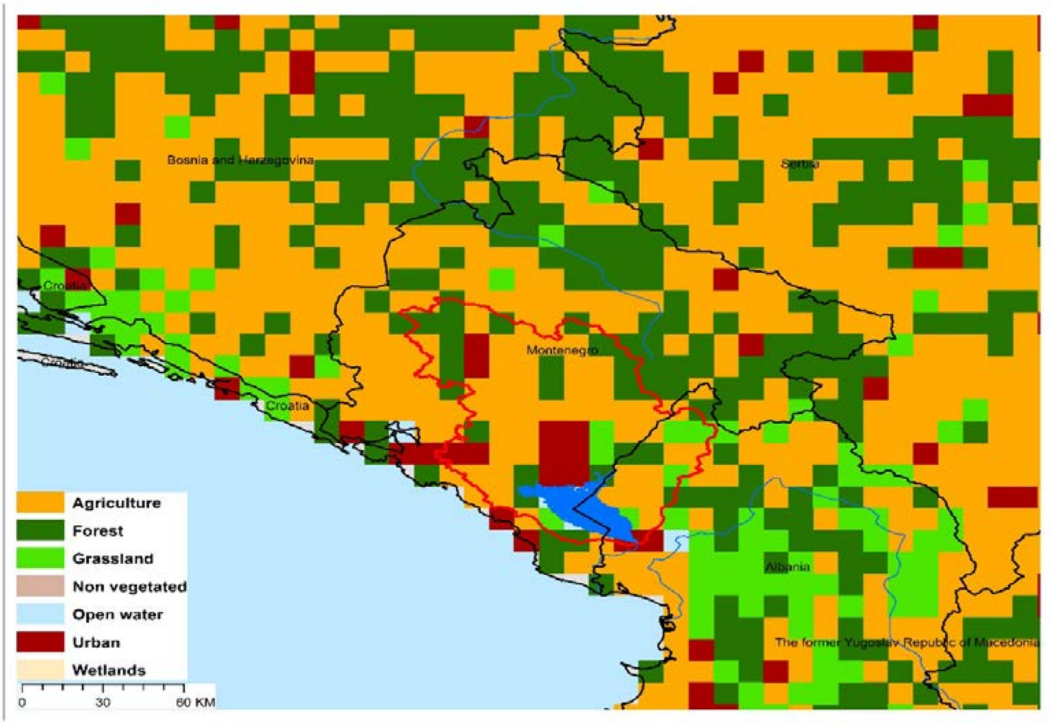


TWAP Regional Designation	Northern, Western & Southern Europe	**Lake Basin Population (2010)**	381,012
River Basin	Drin	**Lake Basin Population Density (2010; # km^{-2})**	48.6
Riparian Countries	Albania, Montenegro	**Average Basin Precipitation (mm yr^{-1})**	1,420
Basin Area (km^2)	381.5	**Shoreline Length (km)**	271.1
Lake Area (km^2)	5,251	**Human Development Index (HDI)**	0.78
Lake Area:Lake Basin Ratio	0.072	**International Treaties/Agreements Identifying Lake**	No

Lake Scutari/Skadar Basin Characteristics



(a) Lake Scutari/Skadar basin and associated transboundary water systems



(b) Lake Scutari/Skadar basin land use

Lake Scutari/Skadar Threat Ranking

A serious lack of global-scale uniform data on the TWAP transboundary in-lake conditions required their potential threat risks be estimated on the basis of the characteristics of their drainage basins, rather than in-lake conditions. Using basin characteristics to rank transboundary lake threats precludes consideration of the unique features that can buffer their in-lake responses to basin-derived disturbances, including an integrating nature for all inputs, long water retention times, and complex, non-linear response dynamics.

The lake threat ranks were calculated with a spreadsheet-based interactive scenario analysis program, incorporating data and information about the nature and magnitude of their basin-derived stresses, and their possible impacts on the sustainability of their ecosystem services. These descriptive data for Lake Scutari/Skadar and the other transboundary lakes included lake and basin areas, population numbers and densities, areal extent of basin stressors on the lake, data grid size, and other components considered important from the perspective of the user of the data results. The scenario analysis program also provides a means to define the appropriate context and preconditions for interpreting the ranking results.

The Lake Scutari/Skadar threat ranks are expressed in terms of the Adjusted Human Water Security (Adj-HWS) threats, Reverse Biodiversity (RvBD) threats, and the Human Development Index (HDI) score, as well as combinations of these indices. However, it is emphasized that, being based on specific characteristics and assumptions regarding Lake Scutari/Skadar and its basin characteristics, the calculated threat scores represent only one possible set of lake threat rankings. Defining the appropriate context and preconditions for interpreting the lake rankings remains an important responsibility of those using the threat ranking results, including lake managers and decision-makers.

Table 1. Lake Scutari/Skadar Relative Threat Ranks, Based on Adjusted Human Water Security (Adj-HWS) and Reverse Biodiversity Threats, and Human Development Index (HDI) Score

(Estimated risks: red – highest; orange – moderately high; yellow – medium; green – moderately low; blue – low)

Adjusted Human Water Security (Adj-HWS) Threat Score	Relative Adj-HWS Threat Rank		Reverse Biodiversity (RvBD) Threat Score	Relative RvBD Threat Rank		Human Development Index (HDI) Score	Relative HDI Rank
0.62	41		0.55	34		0.78	42

It is emphasized that the Lake Scutari/Skadar rankings above are discussed here within the context of the management and decision-making process, rather than as strict numerical ranks. Based on its geographic, population and socioeconomic assumptions used in the scenario analysis program, the calculated Adj-HWS score for Lake Scutari/Skadar indicates a moderately low threat rank compared to other priority transboundary lakes.

The Reverse Biodiversity (RvBD) for Lake Scutari/Skadar, which is meant to describe its biodiversity sensitivity to basin-derived degradation, also places the lake in a moderately low threat rank, compared to the other transboundary lakes. Management interventions directed to improving the biodiversity status must be viewed with caution, however, since we lack sufficient knowledge and experience to accurately predict the ultimate impacts of biodiversity manipulations and preservation efforts. Further, the RvBD scores indicate the relative sensitivity of a lake basin to human activities, and high threat scores *per se* do not necessarily justify management interventions. Such interventions may actually increase biodiversity degradation, noting that many developed countries have already fundamentally degraded their biodiversity because of economic development activities. Thus, activities undertaken to address the Adj-HWS threats may actually degrade the biodiversity status and resources, even if the health and socioeconomic conditions of the lake basin stakeholders are improved as a result of better conditions, thereby increasing stakeholder resource consumption.

The relative Human Development Index (HDI) places the Lake Scutari/Skadar basin in a moderately low threat rank in regard to its health, educational and economic conditions.

Table 2. Lake Scutari/Skadar Threat Ranks, Based on Multiple Ranking Criteria

(Scores for Adj-HWS, RvBD and HDI ranks are presented in Table 1; the ranks may differ in some cases because of rounding of tied threat scores; Estimated risks: red – highest; orange – moderately high; yellow – medium;
green – moderately low; blue – low)

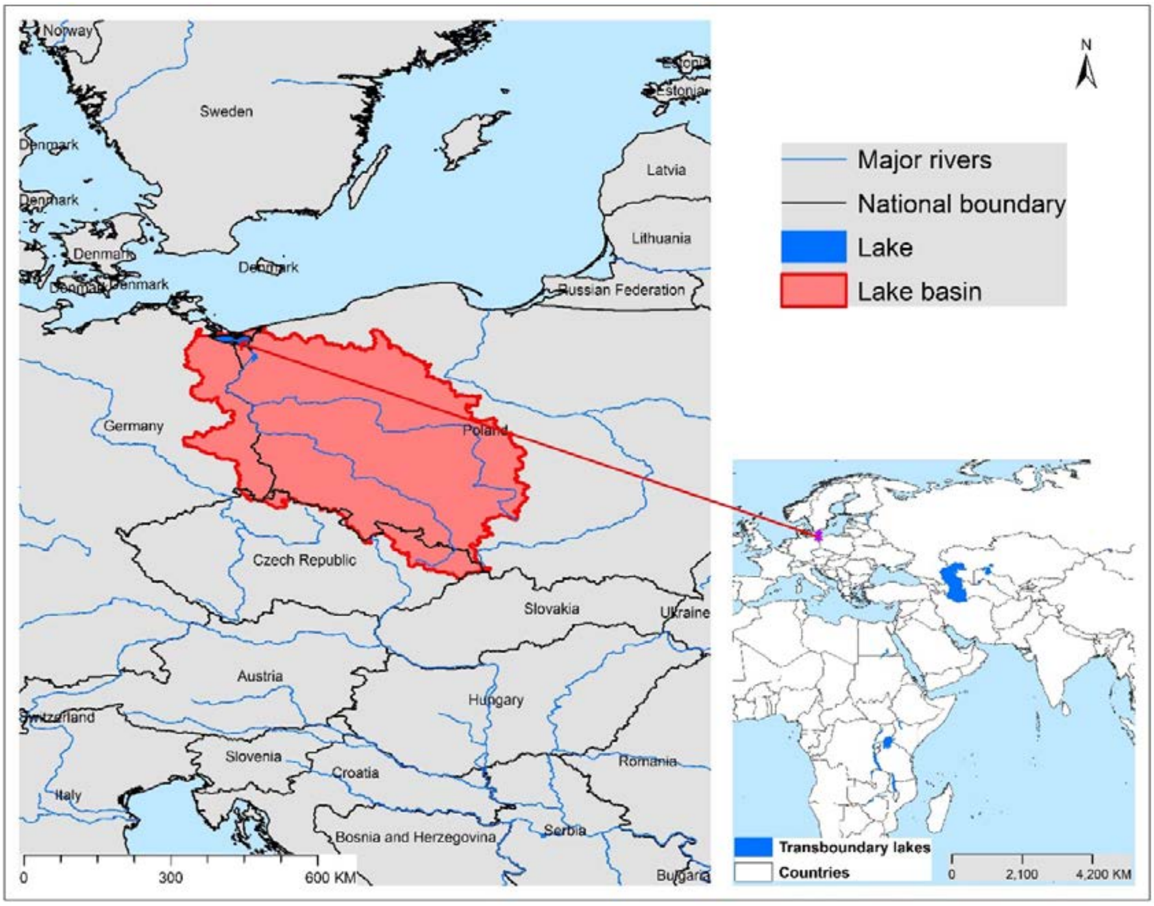
Adj-HWS Rank	HDI Rank	RvBD Rank		Sum Adj-HWS + RvBD	Relative Threat Rank		Sum Adj-HWS + HDI	Relative Threat Rank		Sum Adj-HWS + RvBD + HDI	Overall Threat Rank
41	42	34		75	41		83	41		117	41

When multiple ranking criteria are considered together in the threat rank calculations, the Adj-HWS and HDI scores considered together place Lake Scutari/Skadar in the lower third of the threat ranks. The relative threat is similar when the Adj-HWS and RvBD threats are considered together. Considering all three ranking criteria together, Lake Scutari/Skadar exhibits a moderately low threat ranking.

Interactions between the ranking parameters for Lake Scutari/Skadar indicate differing sensitivity to basin-derived stresses. Identifying potential management interventions needs for Lake Scutari/Skadar must be considered on the basis of educated judgement and accurate representations of its situation. A fundamental question will be how can one decide a given management intervention will produce the greatest benefit(s) for the greatest number of people in the Lake Scutari/Skadar basin? Accurate answers to such questions for Lake Scutari/Skadar, and other transboundary lakes, will require a case-by-case assessment approach that considers the specific lake situation and the anticipated improvements from specific management interventions, as well as interactions with water systems to which the lake is linked.

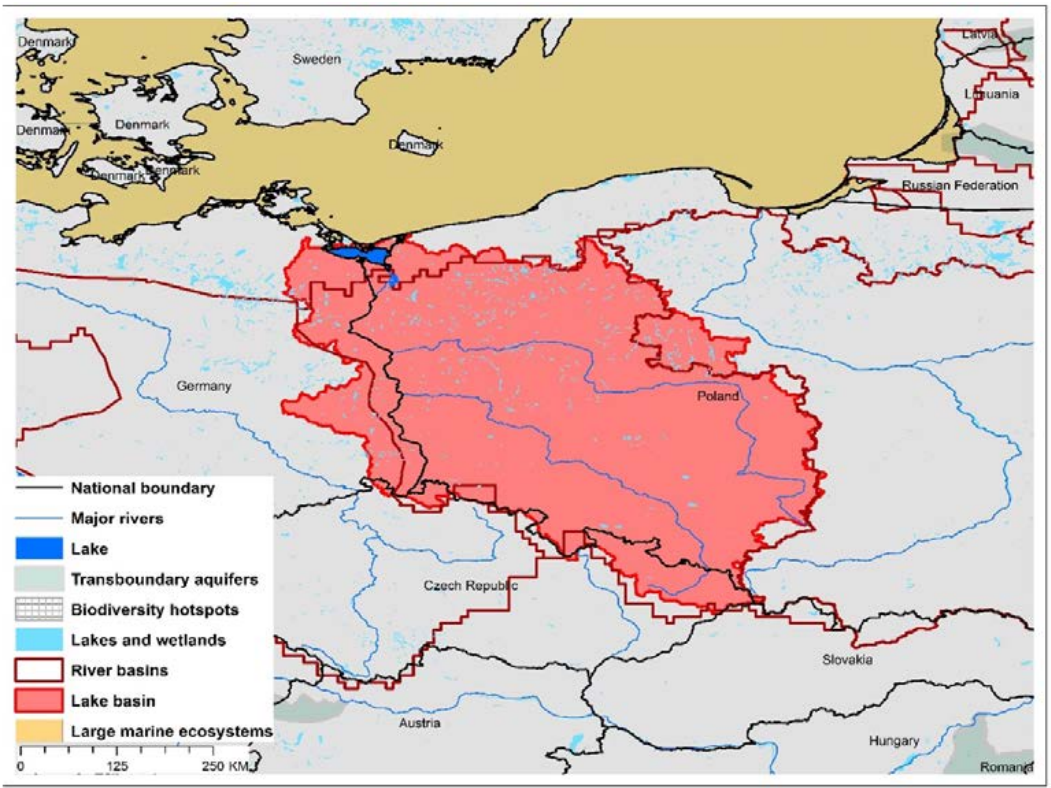
Szczecin Lagoon — Geographic Information

The Szczecin Lagoon is an inland water basin, a lagoon of the Oder River, in the southwestern part of the Baltic Sea, and exhibits the characteristics of a coastal lake. It empties into a bay of the Baltic Sea via three straits that divide the mainland and several islands. The major freshwater inflow is the Oder River. A channel was opened more than a century ago to connect the lagoon with the Baltic Sea for ship passage. The lagoon has been an important fishing grounds for centuries, and has become a tourist destination as well since the 20th Century, offering passenger ship tours, various water sports and some noteworthy beaches. It is currently being threated from pollution from the Oder River, including increased eutrophication.

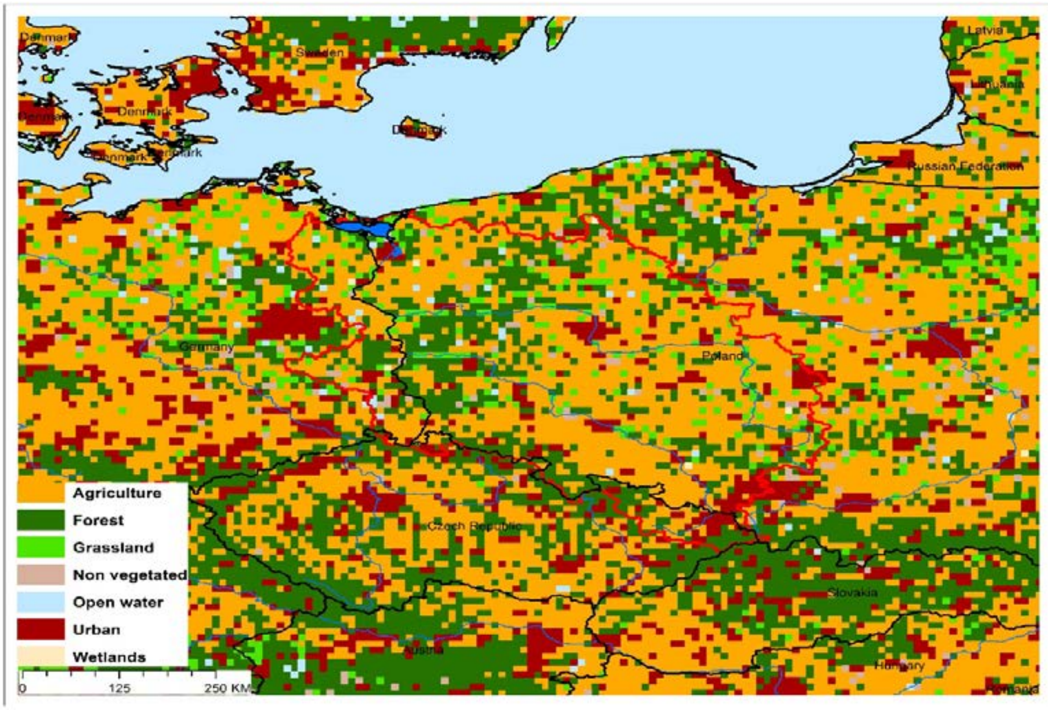


TWAP Regional Designation	Northern, Western & Southern Europe; Eastern Europe	**Lake Basin Population (2010)**	16,862,454
River Basin	Oder	**Lake Basin Population Density (2010; # km^{-2})**	67.1
Riparian Countries	Germany, Poland	**Average Basin Precipitation (mm yr^{-1})**	580.0
Basin Area (km^2)	144,845	**Shoreline Length (km)**	515.9
Lake Area (km^2)	822.4	**Human Development Index (HDI)**	0.83
Lake Area:Lake Basin Ratio	0.006	**International Treaties/Agreements Identifying Lake**	No

Szczecin Lagoon Basin Characteristics



(a) Szczecin Lagoon basin and associated transboundary water systems



(b) Szczecin Lagoon basin land use

Szczecin Lagoon Threat Ranking

A serious lack of global-scale uniform data on the TWAP transboundary in-lake conditions required their potential threat risks be estimated on the basis of the characteristics of their drainage basins, rather than in-lake conditions. Using basin characteristics to rank transboundary lake threats precludes consideration of the unique features that can buffer their in-lake responses to basin-derived disturbances, including an integrating nature for all inputs, long water retention times, and complex, non-linear response dynamics.

The lake threat ranks were calculated with a spreadsheet-based interactive scenario analysis program, incorporating data and information about the nature and magnitude of their basin-derived stresses, and their possible impacts on the sustainability of their ecosystem services. These descriptive data for Szczecin Lagoon and the other transboundary lakes included lake and basin areas, population numbers and densities, areal extent of basin stressors on the lake, data grid size, and other components considered important from the perspective of the user of the data results. The scenario analysis program also provides a means to define the appropriate context and preconditions for interpreting the ranking results.

The Szczecin Lagoon threat ranks are expressed in terms of the Adjusted Human Water Security (Adj-HWS) threats, Reverse Biodiversity (RvBD) threats, and the Human Development Index (HDI) score, as well as combinations of these indices. However, it is emphasized that, being based on specific characteristics and assumptions regarding Szczecin Lagoon and its basin characteristics, the calculated threat scores represent only one possible set of lake threat rankings. Defining the appropriate context and preconditions for interpreting the lake rankings remains an important responsibility of those using the threat ranking results, including lake managers and decision-makers.

Table 1. Szczecin Lagoon Relative Threat Ranks, Based on Adjusted Human Water Security (Adj-HWS) and Reverse Biodiversity Threats, and Human Development Index (HDI) Score

(Estimated risks: red – highest; orange – moderately high; yellow – medium; green – moderately low; blue – low)

Adjusted Human Water Security (Adj-HWS) Threat Score	Relative Adj-HWS Threat Rank		Reverse Biodiversity (RvBD) Threat Score	Relative RvBD Threat Rank		Human Development Index (HDI) Score	Relative HDI Rank
0.53	**43**		**0.49**	**43**		**0.85**	**44**

It is emphasized that the Szczecin Lagoon rankings above are discussed here within the context of the management and decision-making process, rather than as strict numerical ranks. Based on its geographic, population and socioeconomic assumptions used in the scenario analysis program, the calculated Adj-HWS score for Szczecin Lagoon indicates a low threat rank compared to other priority transboundary lakes.

The Reverse Biodiversity (RvBD) for Szczecin Lagoon, which is meant to describe its biodiversity sensitivity to basin-derived degradation, places the lake in a moderately low threat rank, compared to the other transboundary lakes. Management interventions directed to improving the biodiversity status must be viewed with caution, however, since we lack sufficient knowledge and experience to accurately predict the ultimate impacts of biodiversity manipulations and preservation efforts. Further, the RvBD scores indicate the relative sensitivity of a lake basin to human activities, and high threat scores *per se* do not necessarily justify management interventions. Such interventions may actually increase biodiversity degradation, noting that many developed countries have already fundamentally degraded their biodiversity because of economic development activities. Thus, activities undertaken to address the Adj-HWS threats may actually degrade the biodiversity status and resources, even if the health and socioeconomic conditions of the lake basin stakeholders are improved as a result of better conditions, thereby increasing stakeholder resource consumption.

The relative Human Development Index (HDI) places the Szczecin Lagoon basin in a low threat rank in regard to its health, educational and economic conditions.

Table 2. Szczecin Lagoon Threat Ranks, Based on Multiple Ranking Criteria

(Scores for Adj-HWS, RvBD and HDI ranks are presented in Table 1; the ranks may differ in some cases because of rounding of tied threat scores; Estimated risks: red – highest; orange – moderately high; yellow – medium;
green – moderately low; blue – low)

Adj-HWS Rank	HDI Rank	RvBD Rank		Sum Adj-HWS + RvBD	Relative Threat Rank		Sum Adj-HWS + HDI	Relative Threat Rank		Sum Adj-HWS + RvBD + HDI	Overall Threat Rank
43	43	43		86	44		86	43		129	45

When multiple ranking criteria are considered together in the threat rank calculations, the Adj-HWS and HDI scores considered together place Szczecin Lagoon in the lower quarter of the threat ranks. The relative threat is similar when the Adj-HWS and RvBD threats are considered together. Considering all three ranking criteria together, Szczecin Lagoon exhibits a low threat ranking.

Interactions between the ranking parameters for Szczecin Lagoon indicate differing sensitivity to basin-derived stresses. Identifying potential management interventions needs for Szczecin Lagoon must be considered on the basis of educated judgement and accurate representations of its situation. A fundamental question will be how can one decide a given management intervention will produce the greatest benefit(s) for the greatest number of people in the Szczecin Lagoon basin? Accurate answers to such questions for Szczecin Lagoon, and other transboundary lakes, will require a case-by-case assessment approach that considers the specific lake situation and the anticipated improvements from specific management interventions, as well as interactions with water systems to which the lake is linked.

METHODOLOGY AND CAVEATS REGARDING TRANSBOUNDARY LAKE THREAT RANKS

A serious lack of global-scale uniform data on the TWAP transboundary in-lake conditions required their potential risks be estimated on the basis of the characteristics of their drainage basins, rather than analysis of their in-lake conditions. The lake threat ranks were calculated with a scenario analysis program that allowed incorporation of specific assumptions and preconditions about the nature and magnitude of their basin-derived stresses, and their possible impacts on the sustainability of their ecosystem services, as defined by the user of the ranking results. Because the transboundary lake threat ranks are based on specific lake and basin assumptions, therefore, the calculated rankings represent only one possible set of lake rankings.

Using basin characteristics to rank transboundary lake threats precludes consideration of the unique features that can buffer their in-lake responses to basin-derived disturbances, including an integrating nature for all inputs, long water retention times, and complex, non-linear response dynamics. A global overview of river basin threats based on 23 basin-scale drivers under four thematic areas (catchment disturbance; pollution; water resource development; biotic factors) was modified for the transboundary lakes assessment. The driver weights were initially based on collective opinions of experts exhibiting a range of disciplinary expertise, subsequently being refined with inputs from lake scientists and managers participating in ILEC's 15th World Lake Conference.

A spreadsheet-based, interactive scenario analysis program was used to rank the transboundary lake threats. The lake basin characteristics were determined by superimposing the lake basins over the river basin grids, and scaling the driver data to lake basin scale. Selected basin drivers, weights and preconditions were used in the scenario analysis program to calculate the relative lake threat ranks, expressed in terms of the Incident (HWS) and Adjusted (Adj-HWS) Human Water Security and Incident Biodiversity (BD) threats.

The transboundary lake analyses incorporated several assumptions and preconditions. Small transboundary lakes (area <5 km^2), sparse basin populations (< 5 persons km^{-1}), or that were frozen over for major portions of the year (annual air temperature <5 ^{o}C), were eliminated from the analyses. The areal extent of the influences of the basin drivers was addressed with a sensitivity analysis that indicated an areal band of 100 km^2 around a lake, appropriately clipped for the surrounding basin, was a realistic upper boundary for the scenario analysis program. The river basin grid size was problematic in that some grids (30' grid [0.5^o]) were often larger than those of some transboundary lake basins, and about 10% of the transboundary lakes lacked driver data for some grids. Based on these considerations, a final list of 53 priority transboundary lakes was selected for the scenario analysis program calculations of relative threat scores.

Insights obtained from lake scientists and managers participating in the 15th World Lake Conference helped address some of these concerns. Region-specific lake questionnaires also were distributed in some cases, obtaining both quantitative and qualitative data regarding the transboundary lakes and their basins.

These various factors and concerns indicate the transboundary lake threat ranks must be considered within the context of the specific basin conditions and assumptions used to derive them, since they represent only one possible set of lake threat rankings. Other factors such as lake and basin area, basin population and density, regional location, per capita Gross National Income (GNI), and Human

Development Index (HDI) could produce markedly different ranking results. Defining the appropriate context and preconditions for interpreting the lake ranking results, a task beyond the scope of this analysis, remains an important responsibility of those using the results, including lake managers and decision-makers.

The calculated ranks of the priority transboundary lakes, based on the specific assumptions and preconditions regarding the lakes and their drainage basins, is expressed below in terms of Adjusted Human Water Security (Adj-HWS) threats, Reverse Biodiversity (RvBD) threats, and Human Development Index (HDI) status. The Incident Human Water Security (HWS) score would suggest the current threat ranks of the lakes. However, for identifying needed management interventions, the ability of the basin countries to undertake investments to reduce identified transboundary water threats (i.e., water supply stabilization, improved water services, etc.) is also a relevant factor. This ability is considered within the context of the Adj-HWS threat. Countries less able to make such investments, mainly developing countries, exhibited higher Adj-HWS threats. Thus, the Adj-HWS threat ranks provide a more realistic picture of the transboundary lakes most in need of catalytic funding for management interventions than those with lower Adj-HWS scores.

Our more limited knowledge and experience regarding the ultimate outcomes of ecosystem restoration and conservation activities precluded a BD metric identical to the Adj-HWS threat. The Adj-HWS threat rank is meant to identify the transboundary lakes in most need of management interventions from a water investment perspective. The native biodiversity of most developed countries, however, has already been largely degraded as a result of their economic development activities. Thus, the preservation of those ecosystems still exhibiting the most pristine or undisturbed conditions should be the major BD management intervention goal. To address this goal, a RvBD threat was developed as a BD surrogate to define relative BD threats. It was calculated as 1-BD score, with the resulting RvBD score indicating the relative 'pristineness' of a lake in regard to its biodiversity status. The higher RvBD scores calculated with this normalization procedure identify the transboundary lakes most likely to be sensitive to BD degradation and, therefore, the lakes most in need of management attention.

The Human Development Index (HDI) is a composite statistic used by the United Nations Development Programme (UNDP) to reflect the relative life expectancy, education level, and per capita income of a country. A country whose inhabitants exhibit longer life spans, higher education levels, and higher per capita GDPs typically exhibit higher HDI scores, suggesting a higher overall condition of its citizens. It is meant to indicate that economic growth alone is not the sole criteria to assessment of a country, but that the status of its citizens and their capabilities also are important defining factors, therefore being an indication of potential human development.

Along with the assumptions and preconditions defining specific lake basin characteristics, these three criteria were major indicators considered within the context of the scenario analysis program to calculate the relative threat ranks of the transboundary lakes, as presented in the transboundary lake profile sheets.

Transboundary Lakes Ranked on Basis of (a) Incident Human Water Security [HWS] Threats, (b) Adjusted Human Water Security [Adj-HWS] Threats, and (c) Incident Biodiversity [BD] Threats

(Cont., continent; Eur, Europe; N.Am, North America; Afr., Africa; S.Am, South America;
Estimated risks: red – highest; orange – moderately high; yellow – medium; green – moderately low; blue – low)

(A) Lakes Ranked on Basis of Adjusted Human Water Security (Adj-HWS) Threats

Lake	Cont.	Surface Area (km^2)	Adj-HWS Threat Score	Rank
Sistan	Asia	488.2	0.98	1
Ihema	Afr.	93.2	0.97	2
Azuei	S.Am	117.3	0.96	3
Rweru/Moero	Afr.	125.6	0.96	4
Cohoha	Afr.	64.8	0.96	5
Edward	Afr.	2232.0	0.94	6
Natron/Magadi	Afr.	560.4	0.93	7
Abbe/Abhe	Afr.	310.6	0.93	8
Victoria	Afr.	66841.5	0.91	9
Albert	Afr.	5502.3	0.91	10
Kivu	Afr.	2371.1	0.91	11
Malawi/Nyasa	Afr.	29429.2	0.91	12
Dead Sea	Eur	642.7	0.90	13
Turkana	Afr.	7439.2	0.90	14
Aras Su Qovsaginin Su Anbari	Asia	52.1	0.89	15
Mangla	Asia	85.4	0.87	16
Galilee	Eur	162.0	0.87	17
Darbandikhan	Asia	114.3	0.87	18
Selingue	Afr.	334.4	0.87	19
Shardara/Kara-Kul	Asia	746.1	0.86	20
Nasser/Aswan	Afr.	5362.7	0.86	21
Chilwa	Afr.	1084.2	0.86	22
Josini/Pongola-poort Dam	Afr.	128.6	0.85	23

(B) Lakes Ranked on Basis of Reverse Biodiversity (RvBD) Threats

Lake	Cont.	Surface area (km^2)	RvBD Threat Score	Rank
Lake Congo River	Afr.	306.0	0.80	1
Sarygamysh	Asia	3777.7	0.75	2
Chiuta	Afr.	143.3	0.74	3
Mweru	Afr.	5021.5	0.72	4
Aral Sea	Asia	23919.3	0.72	5
Tanganyika	Afr.	32685.5	0.71	6
Abbe/Abhe	Afr.	310.6	0.71	7
Titicaca	S.Am	7480.0	0.71	8
Chilwa	Afr.	1084.2	0.70	9
Salto Grande	S.Am	532.9	0.70	10
Turkana	Afr.	7439.2	0.70	11
Cahora Bassa	Afr.	4347.4	0.69	12
Chungarkkota	S.Am	52.6	0.69	13
Malawi/Nyasa	Afr.	29429.2	0.68	14
Nasser/Aswan	Afr.	5362.7	0.68	15
Selingue	Afr.	334.4	0.68	16
Kivu	Afr.	2371.1	0.67	17
Natron/Magadi	Afr.	560.4	0.67	18
Lago de Yacyreta	S.Am	1109.4	0.66	19
Kariba	Afr.	5258.6	0.66	20
Edward	Afr.	2232.0	0.65	21
Aby	Afr.	438.8	0.65	22
Chad	Afr.	1294.6	0.64	23

(C) Lakes Ranked on Basis of Human Development Index (HDI) Scores

Lake	Cont.	Surface area (km^2)	HDI Score	Rank
Lake Congo River	**Afr**	**306.0**	**0.34**	**1**
Selingue	**Afr**	**334.4**	**0.36**	**2**
Rweru/Moero	**Afr**	**125.6**	**0.36**	**3**
Cohoha	**Afr**	**64.8**	**0.38**	**4**
Kivu	**Afr**	**2371.1**	**0.38**	**5**
Mweru	**Afr**	**5021.5**	**0.38**	**6**
Abbe/Abhe	**Afr**	**310.6**	**0.40**	**7**
Tanganyika	**Afr**	**32685.5**	**0.40**	**8**
Turkana	**Afr**	**7439.2**	**0.41**	**9**
Chiuta	**Afr**	**143.3**	**0.41**	**10**
Chilwa	**Afr**	**1084.2**	**0.41**	**11**
Malawi/Nyasa	**Afr**	**29429.2**	**0.42**	**12**
Edward	**Afr**	**2232.0**	**0.43**	**13**
Nasser/Aswan	**Afr**	**5362.7**	**0.43**	**14**
Cahora Bassa	**Afr**	**4347.4**	**0.43**	**15**
Chad	**Afr**	**1294.6**	**0.43**	**16**
Kariba	**Afr**	**5358.6**	**0.43**	**17**
Ihema	**Afr**	**93.2**	**0.44**	**18**
Sistan	**Asia**	**488.2**	**0.46**	**19**
Albert	**Afr**	**5502.3**	**0.46**	**20**
Azuei	**S.Am,**	**117.3**	**0.46**	**21**
Victoria	**Afr**	**66841.5**	**0.47**	**22**
Natron/Magadi	**Afr**	**560.4**	**0.51**	**23**

	Afr.	143.3	0.85	24	Albert	Afr.	5502.3	0.63	24	**Aby**	**Afr**	**438.8**	**0.52**	**24**
Chad	Afr.	1294.6	0.84	25	Sistan	Asia	488.2	0.62	25	**Mangla**	**Asia**	**85.4**	**0.54**	**25**
Aral Sea	Asia	23919.3	0.84	26	Amistad	N.Am	131.3	0.61	26	**Aral Sea**		**23919.3**	**0.60**	**26**
Tanganyika	Afr.	32685.5	0.84	27	Caspian Sea	Asia	377543.2	0.60	27	**Josini/Pongola-poort Dam**	**Afr**	**128.6**	**0.61**	**27**
Aby	Afr.	438.8	0.83	28	Cohoha	Afr.	64.8	059	28	**Shardara/Kara-kul**	**Asia**	**746.1**	**0.65**	**28**
Cahul	Eur	89.0	0.82	29	Itaipu	S.Am	1154.1	0.58	29	**Sarygamysh**	**Asia**	**3777.7**	**0.67**	**29**
Chungarkkota	S.Am	52.6	0.82	30	Rweru/Moero	Afr.	125.6	0.58	30	**Darbandikhan**	**Asia**	**114.3**	**0.68**	**30**
Titicaca	S.Am	7480.0	0.82	31	Azuei	S.Am	117.3	0.57	31	**Cahul**	**Eur**	**89.0**	**0.69**	**31**
Sarygamysh	Asia	3777.7	0.82	32	Ihema	Afr.	93.2	0.56	32	**Titicaca**	**S.Am**	**7480.0**	**0.71**	**32**
Mweru	Afr.	5021.5	0.81	33	Victoria	Afr.	66841.5	0.56	33	**Chungarkkota**	**S.Am**	**52.6**	**0.71**	**33**
Cahora Bassa	Afr.	4347.4	0.78	34	Scutari/Skadar	Eur	381.5	0.55	34	**Dead Sea**	**Eur**	**642.7**	**0.72**	**34**
Itaipu	S.Am	1154.1	0.75	35	Shardara/Kara-Kul	Asia	746.1	0.54	35	**Lago de Yacyreta**	**S.Am**	**1109.4**	**0.73**	**35**
Kariba	Afr.	5258.6	0.75	36	Huron	N.Am	60565.2	0.53	36	**Aras Su Qovsaginin Su Anbari**	**Asia**	**52.1**	**0.73**	**36**
Lago de Yacyreta	S.Am	1109.4	0.75	37	Josini/Pongola-poort Dam	Afr.	128.6	0.52	37	**Itaipu**	**S.Am**	**1154.1**	**0.73**	**37**
Lake Congo River	Afr.	306.0	0.75	38	Champlain	N.Am	1098.9	0.51	38	**Salto Grande**	**S.Am**	**532.9**	**0.74**	**38**
Caspian Sea	Asia	377543.2	0.73	39	Ohrid	Eur	354.3	0.51	39	**Ohrid**	**Eur**	**354.3**	**0.74**	**39**
Salto Grande	S.Am	532.9	0.67	40	Macro Prespa	Eur	263.0	0.51	40	**Macro Prespa**	**Eur**	**263.0**	**0.75**	**40**
Scutari/Skadar	Eur	381.5	0.62	41	Dead Sea	Eur	642.7	0.51	41	**Caspian Sea**	**Asia**	**377543.2**	**0.77**	**41**
Neusiedler/Ferto	Eur	141.9	0.58	42	Maggiore	Eur	211.4	0.49	42	**Scutari/Skadar**	**Eur**	**381.5**	**0.78**	**42**
Szczecin Lagoon	Eur	822.4	0.53	43	Szczecin Lagoon	Eur	822.4	0.49	43	**Szczecin Lagoon**	**Eur**	**822.4**	**0.83**	**43**
Erie	N.Am	26560.8	0.51	44	Ontario	N.Am	19062.2	0.47	44	**Falcon**	**N.Am**	**120.6**	**0.85**	**44**
Macro Prespa)	Eur	263.0	0.51	45	Aras Su Qovsaginin Su Anbari	Asia	52.1	0.47	45	**Amistad**	**N.Am**	**131.3**	**0.86**	**45**
Falcon	N.Am	120.6	0.50	46	Darbandikhan	Asia	114.3	0.46	46	**Galilee**	**Eur**	**162.0**	**0.88**	**46**
Amistad	N.Am	131.3	0.49	47	Galilee	Eur	162.0	0.45	47	**Neusiedler/Ferto**	**Eur**	**141.9**	**0.88**	**47**
Ontario	N.Am	19062.2	0.48	48	Michigan	N.Am	58535.5	0.44	48	**Lake Maggiore**	**Eur**	**211.4**	**0.89**	**48**
Ohrid	Eur	354.3	0.47	49	Erie	N.Am	26560.8	0.43	49	**Ontario**	**N.Am**	**19062.2**	**0.92**	**49**
Michigan	N.Am	58535.5	0.44	50	Neusiedler/Ferto	Eur	141.9	0.39	50	**Huron**	**N.Am**	**60565.2**	**0.93**	**50**
Huron	N.Am	60565.2	0.42	51	Cahul	Eur	89.0	0.39	51	**Erie**	**N.Am**	**26560.8**	**0.93**	**51**
Maggiore	Eur	211.4	0.33	52	Mangla	Asia	85.4	0.38	52	**Champlain**	**N.Am**	**1098.9**	**0.94**	**52**
Champlain	N.Am	1098.9	0.29	53	Falcon	N.Am	120.6	0.38	53	**Michigan**	**N.Am**	**58535.5**	**0.94**	**53**

Transboundary Lake Threat Ranks by Multiple Ranking Criteria

(Cont., continent; Eur, Europe; N.Am, North America; Afr, Africa; S.Am, South America;
Adj-HWS, Adjusted Human Water Security threat; HWS, Incident Human Water Security threat; BD, Incident Biodiversity threat;
HDI, Human Development Index, RvBD, surrogate for 'Adjusted' Biodiversity threat;
Estimated risks: Red – highest; Orange – moderately high; Yellow – medium; Green – moderately low; Blue – low)

Cont.	Lake Name	Adj-HWS Threat	RvBD Threat	HDI	Adj-HWS Rank	HDI Rank	RvBD Rank	Sum Adj-HWS + RvBD	Relative Rank	Sum Adj-HWS + HDI	Relative Rank	Sum Adj-HWS + RvBD + HDI	Overall Rank
Afr	Abbe/Abhe	0.93	0.71	0.40	7	7	7	14	1	14	3	21	1
Afr	Turkana	0.90	0.70	0.41	13	10	9	22	2	23	10	32	2
Afr	Selingue	0.87	0.68	0.36	16	2	15	31	11	18	5	33	3
Afr	Malawi/Nyasa	0.91	0.68	0.42	9	12	14	23	3	21	9	35	4
Afr	Chiuta	0.85	0.74	0.41	23	9	3	26	5	32	15	35	4
Afr	Cohoha	0.96	0.59	0.38	3	4	28	31	2	7	1	35	4
Afr	Kivu	0.91	0.67	0.38	12	6	18	30	8	18	4	36	7
Afr	Rweru/Moero	0.96	0.58	0.36	4	3	30	34	16	7	2	37	8
Afr	Lake Congo River	0.75	0.78	0.34	35	1	1	36	18	36	19	37	8
Afr	Tanganyika	0.84	0.71	0.40	26	8	6	32	14	34	17	40	10
Afr	Edward	0.94	0.65	0.43	6	13	22	28	7	19	6	41	11
Afr	Chilwa	0.86	0.70	0.41	21	11	10	31	10	32	14	42	12
Afr	Mweru	0.81	0.72	0.38	33	5	4	37	21	38	20	42	12
Asia	Sistan	0.98	0.62	0.46	1	20	25	26	6	21	8	46	14
Afr	Natron/Magadi	0.93	0.67	0.51	8	23	17	25	4	31	13	48	15
Afr	Nasser/Aswan	0.86	0.68	0.43	20	16	16	36	19	36	18	52	16
Afr	Albert	0.91	0.63	0.46	10	19	24	34	15	29	12	53	17
Afr	Ihema	0.97	0.56	0.44	2	18	33	35	17	20	7	53	17
S.Am,	Azuei	0.96	0.57	0.46	5	21	31	36	20	26	11	57	19
Asia	Aral Sea	0.84	0.62	0.60	27	26	5	32	13	53	31	58	20
Asia	Sarygamysh	0.82	0.75	0.67	29	29	2	31	9	58	32	60	21
Afr	Cahora Bassa	0.78	0.69	0.43	34	15	13	47	25	49	25	62	22
Afr	Victoria	0.91	0.56	0.47	11	22	32	43	24	33	16	65	23
Afr	Chad	0.84	0.64	0.43	25	17	23	48	26	42	21	65	23
Afr	Kariba	0.75	0.66	0.43	36	14	19	55	30	50	28	69	25

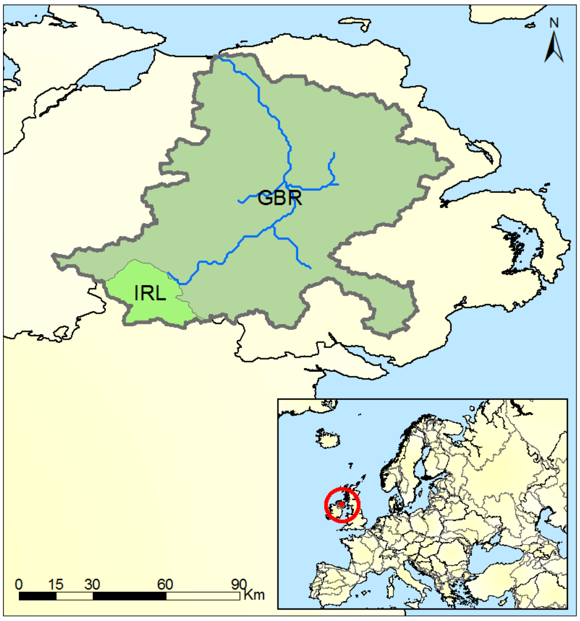
S.Am	Titicaca	0.82	0.71	0.71	32	32	8	40	22	25	35	72	26
Afr	Aby	0.83	0.65	0.52	28	24	21	49	27	52	30	73	27
S.Am	Chungarkkota	0.82	0.69	0.71	31	33	12	43	23	64	34	76	28
Asia	Shardara/Kara-kul	0.86	0.54	0.65	22	28	35	57	31	50	27	85	29
Eur	Dead Sea	0.90	0.51	0.72	14	34	38	52	29	48	24	86	30
Afr	Josini/Pongola-poort Dam	0.85	0.52	0.61	24	27	37	61	34	51	29	88	31
S.Am	Salto Grande	0.67	0.70	0.74	40	38	11	51	28	78	39	89	32
Asia	Darbandikhan	0.87	0.46	0.68	17	30	46	63	35	47	23	93	33
S.Am	Lago de Yacyreta	0.75	0.66	0.73	38	36	20	58	32	74	38	94	34
Asia	Aras Su Qovsaginin Su Anbari	0.89	0.47	0.73	15	35	44	59	33	50	26	94	34
Asia	Mangla	0.87	0.38	0.54	18	25	53	71	39	43	22	96	36
S.Am	Itaipu	0.75	0.58	0.73	37	37	29	66	37	74	37	103	37
Asia	Caspian Sea	0.73	0.60	0.77	39	41	27	66	36	80	40	107	38
Eur	Galilee	0.87	0.45	0.88	19	46	47	66	38	65	36	112	39
Eur	Cahul	0.82	0.39	0.69	30	31	51	81	42	61	33	112	39
Eur	Scutari/Skadar	0.62	0.55	0.78	41	42	34	75	41	83	41	117	41
N.Am	Amistad	0.49	0.61	0.86	47	45	26	73	40	47	40	118	42
Eur	Macro Prespa (Large Prespa)	0.51	0.51	0.75	44	40	40	84	43	84	42	124	43
Eur	Ohrid	0.47	0.51	0.74	49	39	39	88	46	88	44	127	44
Eur	Szczecin Lagoon	0.53	0.49	0.83	43	43	43	86	44	86	43	129	45
N.Am	Huron	0.42	0.53	0.93	51	50	36	87	45	101	51	137	46
Eur	Neusiedler/Ferto	0.58	0.39	0.88	42	47	50	92	47	89	45	139	47
N.Am	Ontario	0.48	0.47	0.92	48	49	45	93	48	97	49	142	48
Eur	Lake Maggiore	0.33	0.50	0.89	52	48	42	94	50	100	50	142	48
N.Am	Falcon	0.50	0.38	0.85	46	44	52	98	53	90	46	142	48
N.Am	Erie	0.51	0.43	0.93	45	51	49	94	51	96	48	145	51
N.Am	Champlain	0.29	0.51	0.94	53	52	41	94	49	105	53	146	52
N.Am	Michigan	0.44	0.44	0.94	50	53	48	98	52	103	52	151	53

Spot Image, CNES

Transboundary River Basins of Northern, Western & Southern Europe

1. Bann
2. Barta
3. Bidasoa
4. Castletown
5. Danube
6. Daugava
7. Douro/ Duero
8. Drin
9. Ebro
10. Elbe
11. Erne
12. Fane
13. Flurry
14. Foyle
15. Garonne
16. Gauja
17. Glama
18. Guadiana
19. Isonzo
20. Jacobs
21. Kemi
22. Klaralven
23. Krka
24. Lake Prespa
25. Lava/ Pregel
26. Lielupe
27. Lima
28. Lough Melvin
29. Maritsa
30. Mino
31. Naatamo
32. Narva
33. Neman
34. Meretva
35. Nestos
36. Oder/ Odra
37. Olanga
38. Oulu
39. Parnu
40. Pasvik
41. Po
42. Rhine
43. Rhone
44. Roia
45. Salaca
46. Schelde
47. Seine
48. Struma
49. Tagus/ Tejo
50. Tana
51. Tornealven
52. Tuloma
53. Vardar
54. Venta
55. Vijose
56. Vuoksa
57. Wiedau
58. Yser

Bann Basin



Geography

Total drainage area (km^2)	5,746
No. of countries in basin	2
BCUs in basin	Ireland (IRL), U.K. of Great Britain and Northern Ireland (GBR)
Population in basin (people)	546,281
Country at mouth	Northern Ireland (GBR)
Average rainfall (mm/year)	1,048

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	1
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
BANN_GBR		481.70			380.30	3.42
BANN_IRL						
Total in Basin	2.77	481.70			380.30	3.42

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
BANN_GBR	317.07	2.91	22.57	99.75	31	160.44	599.56	
BANN_IRL								

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	317.07	2.91	22.57	99.75	31.40	160.44	580.42	11.45

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
BANN_GBR	5	0.94	529	98.40	0.60	0.00	100.00	0	39,336.91	0	0.00
BANN_IRL	0	0.06	17	46.87	1.45	0.00	100.00	0	47,399.90	0	0.00
Total in Basin	6	1.00	546	95.06	0.61	0.00	100.00	0	39,594.36	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
BANN_GBR	1	1	2		1	3	4	3	2	4	3	1	4	1	2
BANN_IRL					1	1			1	4	3	2	1	1	1
River Basin	1	1	2	5	1	4	4	4	2	4	3	1	4	1	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
BANN_GBR	2	2	1	1			1	1	3
BANN_IRL									3
River Basin	2	2	1	1	5	5	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	3				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

Disclaimer

The results and information of factsheet is produced and maintained by the River Basins Component of the GEF Transboundary Water Assessment Programme (GEF TWAP).

GEF TWAP is the first global-scale assessment of all transboundary water systems. The TWAP consists of five independent indicator-based water system assessments and the linkages between them, including their socioeconomic and governance-related features. The United Nations Environment Programme (UNEP) is the implementing agency of TWAP. Project Coordination Unit (PCU) in Nairobi, Kenya coordinates the work of UNESCO-IHP, ILEC, UNEP-DHI and the IOC of UNESCO on Transboundary Aquifers, Lake Basins, River Basins, Large Marine Ecosystems and Open Ocean respectively. Each executing partner engages a broad network of data and information rich partners with responsibilities either of a thematic or geographic nature. More on TWAP full size project at http://www.geftwap.org .

The TWAP River Basins component (TWAP RB) carried out a global comparison of 286 transboundary river basins, in order to enable the prioritisation of funds for basins at risk from a variety of issues, covering water quantity, water quality, ecosystems, governance and socio-economics. It also considered risks to deltas from threats of a transboundary nature, and considered the relative influence of lakes on these river basins. TWAP RB is an indicator–based assessment, allowing for an analysis of basins, based on risks to both societies and ecosystems. It also includes provisional outlook projections to 2030 and 2050 for a limited number of indicators.
Values given in the present fact-sheet represent an approximate guide only and should not replace recent local assessments.

Country Boundaries Under TWAP
TWAP RB assessment uses country delineations provided by FAO GAUL (Global Administrative Unit Layers) (FAO 2014). GAUL uses the International Boundary dataset of the UNCS (UN Cartographic Section) and inland boundaries are same for both datasets. Some differences occur in coastlines, where FAO GAUL dataset offers more detail.

Disputed areas
The GAUL project and original dataset maintains disputed areas in such a way to preserve national integrity for all disputing countries. The GAUL Set reports the international, first level and second level administrative boundaries delimiting, or falling within, the disputed areas in a way to enable the re-construction of the administrative units as they are specified by the individual disputing countries. Disputed areas are therefore shown as individual entities, not dependent from countries, with corresponding coding. Same approach has been taken by TWAP RB, reporting on disputed territories, as well as presentation of Basin Country Units.

Basin Delineation
TWAP RB assessment includes 286 transboundary river basins. Information on this layer and delineation methodology can be retrieved by downloading metadata sheet for the Basins layer from TWAP Rivers Data Portal at http://twap-rivers.org/indicators/ or by direct download from http://twap-rivers.org/assets/Basin%20and%20BCU%20Creation%20Documentation.pdf

For more information on data sources, indicator calculation methodologies, limitations and more consult indicator metadata sheets available on TWAP RB Data portal on http://twap-rivers.org . To view sources of data included in this Factsheet download the Factsheet Reference file at http://twap-rivers.org/assets/Factsheet_template_with_references.pdf.

For more information on data sources, indicator calculation methodologies, limitations and more consult indicator metadata sheets available on TWAP RB Data portal on http://twap-rivers.org .

Barta Basin

Geography

Total drainage area (km^2)	2,725
No. of countries in basin	2
BCUs in basin	Latvia (LVA), Lithuania (LTU)
Population in basin (people)	82,710
Country at mouth	Latvia
Average rainfall (mm/year)	812

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
BRTA_LTU		488.17				
BRTA_LVA		361.05				
Total in Basin	1.10	403.61			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
BRTA_LTU	2.15	0.02	0.33	0.00	0	1.42	105.90	
BRTA_LVA	19.19	0.06	0.57	4.03	8	6.07	307.40	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	21.34	0.08	0.90	4.03	8.84	7.49	257.97	1.94

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
BRTA_LTU	1	0.25	20	29.33	-0.55	0.00	100.00	0	15,537.92	0	0.00
BRTA_LVA	2	0.75	62	30.70	-0.47	0.48	99.52	0	15,375.45	0	0.00
Total in Basin	3	1.00	83	30.35	-1.04	0.36	99.64	0	15,415.30	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
BRTA_LTU	1	1	1		3		2	3	3	4	3	1	1	2	2
BRTA_LVA	1	1	1		3		2	3	3	4	3	2	1	1	2
River Basin	1	1	1	4	3		2	3	2	4	3	2	1	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
BRTA_LTU	3	3	1	1			1	1	3
BRTA_LVA	3	3	1	1					3
River Basin	3	3	1	1	4	4	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Bidasoa Basin

Geography

Total drainage area (km^2)	720
No. of countries in basin	2
BCUs in basin	France (FRA), Spain (ESP)
Population in basin (people)	55,354
Country at mouth	France, Spain
Average rainfall (mm/year)	1,838

Governance

No. of treaties and agreements[1]	1
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
BDSO_ESP		810.63				
BDSO_FRA						
Total in Basin	0.58	810.63			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
BDSO_ESP	72.01	0.75	1.98	1.88	26	41.79	1,451.33	
BDSO_FRA								

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	72.01	0.75	1.98	1.88	25.61	41.79	1,300.97	12.35

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
BDSO_ESP	1	0.98	50	70.66	1.20			0	29,117.64	0	0.00
BDSO_FRA	0	0.02	6	329.83	0.58			0	41,420.76	0	0.00
Total in Basin	1	1.00	55	76.92	-0.16	0.00	0.00	0	30,392.27	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
BDSO_ESP	1	1	2		1		3	4	3	3	2	1	1	1	2
BDSO_FRA					1				3	3	2	1	1	1	2
River Basin	1	1	2	4	1		3	4	2	3	2	1	1	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
BDSO_ESP	2	2	1	1			1	1	2
BDSO_FRA									2
River Basin	2	2	1	1	4	4	1	1	2

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Castletown Basin

Geography

Total drainage area (km²)	265
No. of countries in basin	2
BCUs in basin	Ireland (IRL), U.K. of Great Britain and Northern Ireland (GBR)
Population in basin (people)	31,747
Country at mouth	Ireland
Average rainfall (mm/year)	

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
CSTL_GBR						
CSTL_IRL						
Total in Basin					0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
CSTL_GBR								
CSTL_IRL								

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
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Total in Basin								

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
CSTL_GBR	0	0.70	9	49.50	0.60			0	39,336.91	0	0.00
CSTL_IRL	0	0.30	23	282.63	1.45	0.00	100.00	0	47,399.90	0	0.00
Total in Basin	0	1.00	32	119.60	0.31	0.00	71.06	0	45,066.37	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CSTL_GBR					1				2	4	3	1	1	1	1
CSTL_IRL					1				2	4	3	2	1	1	1
River Basin				5	1				1	4	3	2	1	1	1

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
CSTL_GBR									3
CSTL_IRL									3
River Basin					5	5			3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin					

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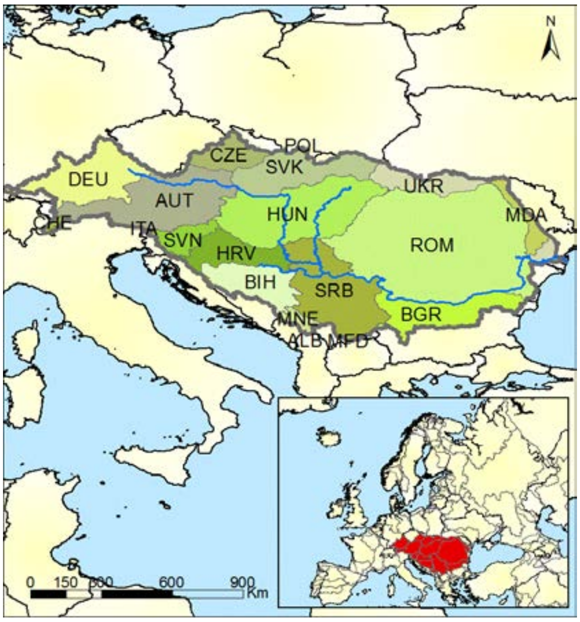
Danube Basin



Geography

Total drainage area (km^2)	796,498
No. of countries in basin	19
BCUs in basin	Albania (ALB), Austria (AUT), Bosnia And Herzegovina (BIH), Bulgaria (BGR), Croatia (HRV), Czech Republic (CZE), Germany (DEU), Hungary (HUN), Italy (ITA), Moldova, Republic Of (MDA), Montenegro (MNE), Poland (POL), Romania (ROM), Serbia (SRB), Slovakia (SVK), Slovenia (SVN), Switzerland (CHE), The former Yugoslav Republic of Macedonia (MFD), Ukraine (UKR)
Population in basin (people)	80,184,793
Country at mouth	Romania
Average rainfall (mm/year)	792

Governance

No. of treaties and agreements[1]	37
No. of RBOs and Commissions[2]	5

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	12
Large Marine Ecosystems	0

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All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
DANU_ALB						
DANU_AUT		515.35			153.38	0.15
DANU_BGR		159.68				
DANU_BIH		420.02				
DANU_CHE		764.81				

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DANU_CZE		150.85				
DANU_DEU		474.03			134.10	5.00
DANU_HRV		403.04				
DANU_HUN		118.16			711.52	1.87
DANU_ITA		465.01				
DANU_MDA		173.09			1.88	0.00
DANU_MFD						
DANU_MNE		903.63				
DANU_POL						
DANU_ROM		194.51			159.39	0.67
DANU_SRB		168.69			11.61	0.07
DANU_SVK		251.64				
DANU_SVN		642.53				
DANU_UKR		289.26			427.12	0.79
Total in Basin	221.76	278.42			1,599.00	8.55

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
DANU_ALB								
DANU_AUT	5,551.14	320.09	56.76	1,680.97	2,871	622.13	728.69	
DANU_BGR	4,825.91	1,506.69	13.66	2,297.04	575	433.19	1,440.13	
DANU_BIH	599.45	24.48	8.66	341.30	43	181.54	193.79	
DANU_CHE	6.81	0.28	0.26	0.00	0	6.27	300.34	
DANU_CZE	548.43	78.67	11.01	50.20	219	189.57	200.93	
DANU_DEU	3,323.59	43.69	73.33	1,975.94	674	556.61	336.81	
DANU_HRV	883.67	74.57	13.04	497.27	107	191.37	315.87	
DANU_HUN	6,725.28	1,084.25	38.42	4,285.69	515	801.83	707.92	
DANU_ITA	109.62	26.51	2.22	10.32	6	64.23	6,264.83	
DANU_MDA	381.16	288.38	4.87	0.00	32	55.99	363.77	
DANU_MFD								
DANU_MNE	228.47	0.66	1.96	183.54	4	38.78	631.98	
DANU_POL								
DANU_ROM	21,320.78	13,846.26	115.30	3,292.15	1,431	2,635.72	1,007.40	
DANU_SRB	4,815.57	352.12	43.13	3,316.35	197	906.94	553.16	
DANU_SVK	2,383.64	652.35	22.48	356.45	976	376.61	454.73	
DANU_SVN	1,006.67	14.89	11.06	729.71	77	173.57	488.93	

DANU_UKR	1,111.43	645.94	21.33	79.47	157	207.33	435.59	
Total in Basin	53,821.60	18,959.84	437.48	19,096.38	7,886.24	7,441.66	671.22	24.27

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
DANU_ALB	0	0.00	11	82.72	0.39			0	4,652.35	0	0.00
DANU_AUT	81	0.10	7,618	94.48	0.39	0.00	100.00	5	49,053.82	22	272.86
DANU_BGR	48	0.06	3,351	70.45	-0.64	0.00	100.00	4	7,296.49	16	336.37
DANU_BIH	38	0.05	3,093	81.74	-0.11	0.34	99.66	2	4,655.60	6	158.55
DANU_CHE	2	0.00	23	12.58	0.66	100.00	0.00	0	80,477.43	0	0.00
DANU_CZE	22	0.03	2,729	125.72	0.53	0.00	100.00	2	18,861.43	9	414.55
DANU_DEU	56	0.07	9,868	175.97	-0.06	0.00	100.00	5	45,084.87	9	160.49
DANU_HRV	33	0.04	2,798	84.58	-0.18	4.24	95.76	1	13,529.88	2	60.47
DANU_HUN	93	0.12	9,500	102.02	-0.21	23.51	76.49	9	13,133.82	5	53.69
DANU_ITA	1	0.00	17	25.09	0.63			0	34,619.24	1	1,433.69
DANU_MDA	12	0.02	1,048	85.54		1.64	98.36	0	2,229.62	0	0.00
DANU_MFD	0	0.00	8	149.21				0	4,850.51	0	0.00
DANU_MNE	7	0.01	362	52.72	0.15	0.00	100.00	0	7,125.67	1	145.84
DANU_POL	0	0.00	37	84.91	0.06			0	13,431.95	0	0.00
DANU_ROM	230	0.29	21,164	92.01	-0.26	0.03	99.97	24	9,499.21	80	347.80
DANU_SRB	82	0.10	8,706	106.32	0.00	0.00	100.00	6	5,935.32	16	195.40
DANU_SVK	47	0.06	5,242	111.25	0.17	0.30	99.70	2	17,689.04	15	318.36
DANU_SVN	16	0.02	2,059	126.52	0.27	3.84	96.16	1	22,729.32	2	122.90
DANU_UKR	29	0.04	2,552	88.11	-0.64	0.00	100.00	2	3,900.47	0	0.00
Total in Basin	796	1.00	80,185	100.67	-0.18	3.12	96.79	63	18,477.98	184	231.01

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
DANU_ALB					5				2	3	2	5	1	2	1

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

DANU_AUT	1	2	2		2	2	5	4	5	1	3		5	1	3
DANU_BGR	2	5	3		4	2	5	4	4	2	3	1	4	1	3
DANU_BIH	1	1	2		5	1	5	4	4	1	3	3	5	2	3
DANU_CHE	1	1	2		1	4	4	5	2	3	2	1	1	1	2
DANU_CZE	2	3	2		2		5	4	3	2	1	1	3	1	3
DANU_DEU	1	2	2		1	1	5	5	4	1	1	1	1	1	3
DANU_HRV	1	1	2		5	2	4	4	4	1	3		5	1	2
DANU_HUN	2	5	3		3	2	4	4	3	1	1	2	5	1	3
DANU_ITA	1		2		1	3			3	2	2		1	2	1
DANU_MDA	2	5	3		4	1	4	3	3	1	1	4	2	1	3
DANU_MFD					5				2	5	3	5	1	2	1
DANU_MNE	1	1	2		5		5	4	3	2	5	3	4	1	3
DANU_POL					2				2	2	1	2	1	1	1
DANU_ROM	2	4	3		5	1	5	4	3	1	3	1	5	1	3
DANU_SRB	2	4	2		5	2	4	4	3	1	3	4	5	2	4
DANU_SVK	2	2	2		3	1	5	4	3	1	1	2	5	1	3
DANU_SVN	1	1	2		3		5	4	4	1	3	4	4	1	2
DANU_UKR	2	2	2		5	1	4	4	3	1	1	2	1	1	4
River Basin	2	3	2	4	3	2	5	4	5	1	2	3	5	2	3

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	**1.Environmental water stress**		**2.Human water stress**		**4.Nutrient pollution**		**16.Change in population density**		**11.Hydropolitical tension**
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
DANU_ALB									2
DANU_AUT	3	3	2	2			1	1	3
DANU_BGR	3	3	5	5			1	1	3
DANU_BIH	2	3	1	1			1	1	3
DANU_CHE	5	5	1	1			1	1	2

DANU_CZE	2	3	3	3			1	1	1
DANU_DEU	2	2	2	2			1	1	1
DANU_HRV	2	2	2	2			1	1	3
DANU_HUN	2	2	5	5			1	1	1
DANU_ITA	5	5							2
DANU_MDA	2	3	5	5			1	1	1
DANU_MFD									3
DANU_MNE	3	3	1	1					5
DANU_POL							1	1	1
DANU_ROM	3	3	5	5			1	1	3
DANU_SRB	2	3	5	5			3	5	3
DANU_SVK	2	3	3	3			1	1	1
DANU_SVN	2	3	1	2			1	1	3
DANU_UKR	3	3	3	3			1	1	1
River Basin	3	3	3	4	4	4	1	1	2

TWAP RB Assessment results: Water System Linkages

Thematic group	**Lake Influence Indicator**	**Delta Vulnerability Index**			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1	2	5	1	4

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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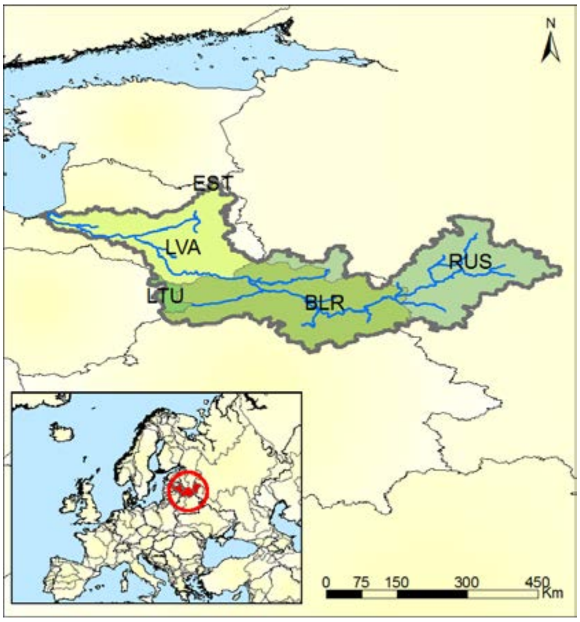
Daugava Basin



Geography

Total drainage area (km^2)	86,343
No. of countries in basin	5
BCUs in basin	Belarus (BLR), Estonia (EST), Latvia (LVA), Lithuania (LTU), Russian Federation (RUS)
Population in basin (people)	2,519,402
Country at mouth	Latvia
Average rainfall (mm/year)	719

Governance

No. of treaties and agreements[1]	5
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	4
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
DUGV_BLR		229.02				
DUGV_EST						
DUGV_LTU		300.88				
DUGV_LVA		328.60			137.00	0.54
DUGV_RUS		241.10			113.10	0.58
Total in Basin	22.48	260.37			250.10	1.12

Water Withdrawals

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
DUGV_BLR	702.30	16.67	12.25	448.04	95	130.61	654.33	
DUGV_EST								
DUGV_LTU	2,029.64	0.03	0.33	2,026.13	1	2.12	22,545.98	
DUGV_LVA	173.11	0.87	3.94	49.60	70	48.64	151.73	
DUGV_RUS	34.99	0.91	3.47	0.00	4	26.30	163.15	
Total in Basin	2,940.04	18.48	19.99	2,523.77	170.15	207.66	1,166.96	13.08

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
DUGV_BLR	33	0.39	1,073	32.11	-0.47	0.00	100.00	2	7,575.48	0	0.00
DUGV_EST	0	0.00	1	4.90				0	18,478.27	0	0.00
DUGV_LTU	2	0.02	90	48.30	-0.55	2.74	97.26	0	15,537.92	0	0.00
DUGV_LVA	23	0.27	1,141	48.75	-0.47	0.18	99.82	2	15,375.45	3	128.20
DUGV_RUS	28	0.32	214	7.79	-0.12			0	14,611.70	0	0.00
Total in Basin	86	1.00	2,519	29.18	-0.48	0.18	91.28	4	11,994.06	3	34.74

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
DUGV_BLR	1	1	2		1	2	2	2	2	2	2		1	1	3
DUGV_EST					2				2	4	2	2	1	2	1
DUGV_LTU	1	5	1		3	2	3	3	2	4	2	1	1	2	2
DUGV_LVA	1	2	2		3	1	3	2	2	4	2	2	5	1	2
DUGV_RUS	1	1	2		4	2	2	2	2	2	2	2	1	2	3
River Basin	1	2	2	3	2	2	2	3	2	3	2		3	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
DUGV_BLR	3	3	2	2			1	1	2
DUGV_EST									2
DUGV_LTU	1	2	5	5			1	1	2
DUGV_LVA	2	3	2	2			1	1	2
DUGV_RUS	3	3	1	1			1	1	2
River Basin	3	3	2	2	3	3	1	1	2

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Douro/Duero Basin

Geography

Total drainage area (km^2)	97,379
No. of countries in basin	2
BCUs in basin	Portugal (PRT), Spain (ESP)
Population in basin (people)	3,492,449
Country at mouth	Portugal
Average rainfall (mm/year)	757

Governance

No. of treaties and agreements[1]	6
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	2
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
DURO_ESP		185.95			198.40	1.23
DURO_PRT		447.48				
Total in Basin	24.11	247.62			198.40	1.23

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
DURO_ESP	5,270.77	4,323.17	44.24	521.29	101	280.80	2,719.46	
DURO_PRT	2,145.65	1,514.13	12.52	126.35	209	284.13	1,380.47	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	7,416.42	5,837.30	56.76	647.63	309.81	564.92	2,123.56	30.76

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
DURO_ESP	79	0.81	1,938	24.62	1.20	2.79	97.21	4	29,117.64	26	330.34
DURO_PRT	19	0.19	1,554	83.24	0.25	23.63	76.37	1	21,035.01	13	696.23
Total in Basin	97	1.00	3,492	35.86	-0.37	12.07	87.93	5	25,520.54	39	400.50

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DURO_ESP	4	3	3		1	1	5	3	3	1	1	1	2	1	3
DURO_PRT	3	2	3		2	1	5	3	3	1	1	3	2	2	2
River Basin	4	2	3	4	1	1	5	3	3	1	1	1	2	2	3

Indicators

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Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
DURO_ESP	4	5	3	3			1	1	1
DURO_PRT	4	4	2	2			1	1	1
River Basin	4	5	3	3	4	4	1	1	1

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

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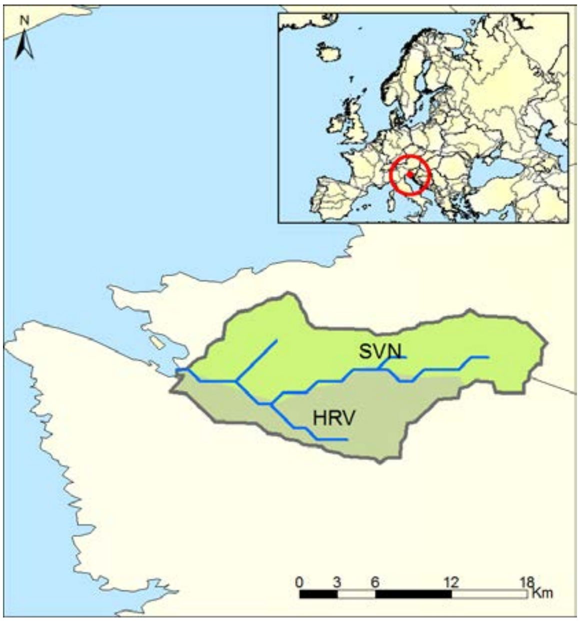
Dragonja Basin



Geography

Total drainage area (km²)	154
No. of countries in basin	2
BCUs in basin	Croatia (HRV), Slovenia (SVN)
Population in basin (people)	12,665
Country at mouth	Slovenia
Average rainfall (mm/year)	1,037

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
DRAG_HRV						
DRAG_SVN		508.08				
Total in Basin	0.08	508.08			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
DRAG_HRV								
DRAG_SVN	24.01	1.65	0.61	0.00	9	12.85	2,278.93	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	24.01	1.65	0.61	0.00	8.89	12.85	1,895.38	30.74

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
DRAG_HRV	0	0.40	2	34.99				0	13,529.88	0	0.00
DRAG_SVN	0	0.60	11	113.54				0	22,729.32	0	0.00
Total in Basin	0	1.00	13	82.41	0.08	0.00	0.00	0	21,181.04	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DRAG_HRV					5					4	3		1	1	1
DRAG_SVN	1		2		3					4	3	4	1	1	1
River Basin	1		2	5	3					4	3		1	2	1

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low | Low | Medium | High | Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
DRAG_HRV									3
DRAG_SVN	2	2							3
River Basin	2	2			5	5			3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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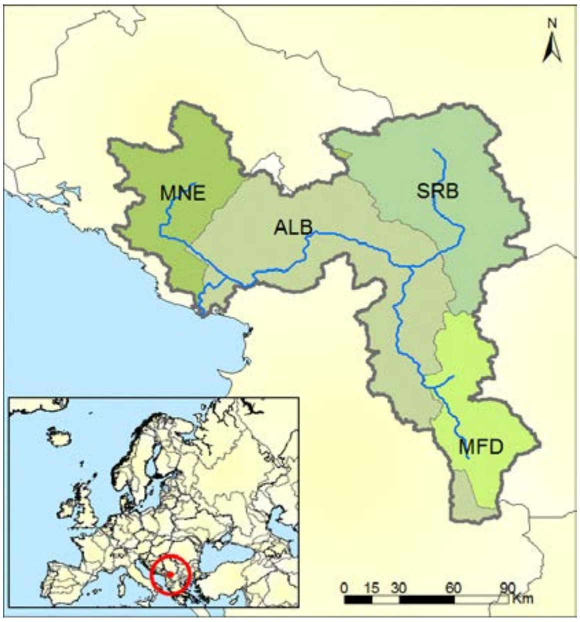
Drin Basin



Geography

Total drainage area (km^2)	17,286
No. of countries in basin	4
BCUs in basin	Albania (ALB), Montenegro (MNE), Serbia (SRB), The former Yugoslav Republic of Macedonia (MFD)
Population in basin (people)	1,766,320
Country at mouth	Albania
Average rainfall (mm/year)	1,170

Governance

No. of treaties and agreements[1]	1
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	3
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
DRIN_ALB		1,011.34			243.67	12.45
DRIN_MFD		677.40			266.95	38.17
DRIN_MNE		1,575.65				
DRIN_SRB		508.41				
Total in Basin	15.03	869.22			510.61	50.62

Water Withdrawals

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[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

BCU	Total (km³/year)	Irrigation (km³/year)	Livestock (km³/year)	Electricity (km³/year)	Manufacture (km³/year)	Domestic (km³/year)	Per capita (m³/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
DRIN_ALB	526.90	416.07	5.12	0.00	19	86.85	1,339.92	
DRIN_MFD	63.05	26.43	0.66	0.00	22	14.00	409.97	
DRIN_MNE	15.28	0.18	0.63	0.00	0	13.99	102.75	
DRIN_SRB	436.29	183.26	5.73	25.99	52	169.25	407.54	
Total in Basin	1,041.53	625.95	12.14	25.99	93.37	284.08	589.66	6.93

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km²)
DRIN_ALB	7	0.41	393	56.09	0.39	0.00	100.00	0	4,652.35	3	427.89
DRIN_MFD	3	0.15	154	61.14		0.00	100.00	0	4,850.51	3	1,192.72
DRIN_MNE	3	0.18	149	48.42	0.15	0.00	100.00	1	7,125.67	0	0.00
DRIN_SRB	5	0.27	1,071	228.37	0.00	0.00	100.00	0	5,935.32	1	213.32
Total in Basin	17	1.00	1,766	102.18	-0.51	0.00	100.00	1	5,655.49	7	404.95

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
DRIN_ALB	2	1	2		5		5	5	5	2	4	5	2	2	2
DRIN_MFD	2	1	2		5		5	3	5	2	5	5	1	2	2
DRIN_MNE	1	1	1		5		3	4	4	4	5	3	3	1	3
DRIN_SRB	2	2	2		5		4	4	3	4	5	4	2	2	2
River Basin	2	1	2	4	5		5	5	5	3	5	4	2	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
DRIN_ALB	3	3	1	1			1	1	4
DRIN_MFD	3	3	1	1					5
DRIN_MNE	3	3	1	1					5
DRIN_SRB	3	3	4	4			3	5	5
River Basin	3	3	1	1	4	4	2	4	5

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	5				

Indicators

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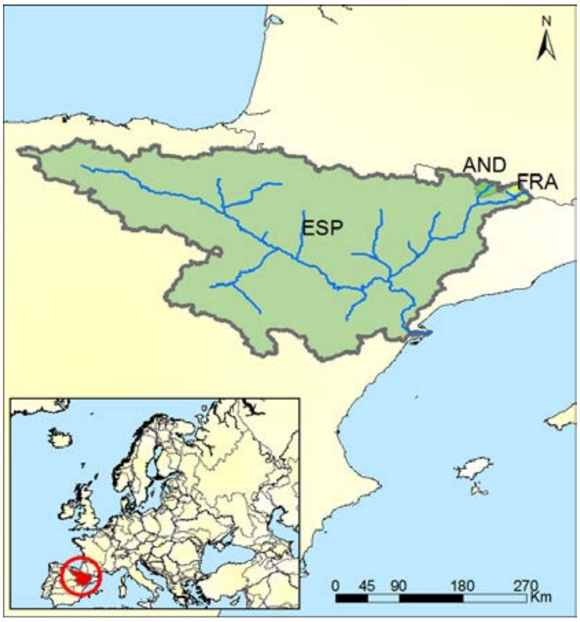
Ebro Basin



Geography

Total drainage area (km^2)	85,444
No. of countries in basin	3
BCUs in basin	Andorra (AND), France (FRA), Spain (ESP)
Population in basin (people)	2,804,520
Country at mouth	Spain
Average rainfall (mm/year)	711

Governance

No. of treaties and agreements[1]	1
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	2
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
EBRO_AND						
EBRO_ESP		200.21			87.47	0.49
EBRO_FRA		573.84				
Total in Basin	19.08	223.32			87.47	0.49

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
EBRO_AND								

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EBRO_ESP	9,783.40	7,029.07	61.05	1,875.17	262	556.43	3,650.30	
EBRO_FRA	81.89	36.08	2.64	0.39	11	31.54	6,125.47	
Total in Basin	9,865.29	7,065.15	63.69	1,875.56	272.92	587.97	3,517.64	51.70

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km²)
EBRO_AND	0	0.01	111	254.24		0.00	100.00	0	0.00	0	0.00
EBRO_ESP	84	0.99	2,680	31.72	1.20	2.03	97.97	5	29,117.64	40	473.47
EBRO_FRA	1	0.01	13	25.46	0.58			0	41,420.76	2	3,808.49
Total in Basin	85	1.00	2,805	32.82	-0.19	1.94	97.58	5	28,023.94	42	491.55

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
EBRO_AND					4				3	5	3	2	5	1	1
EBRO_ESP	3	3	4		1	1	5	4	3	3	2	1	2	1	3
EBRO_FRA	2		2		1				3	3	2	1	1	1	1
River Basin	3	3	3	4	1	1	5	5	3	3	2	1	3	2	3

Indicators

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Very low	Low	Medium	High	Very high

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Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
EBRO_AND									3
EBRO_ESP	4	5	4	4			1	1	2
EBRO_FRA	3	4							2
River Basin	4	5	4	4	4	4	1	1	2

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TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

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Elbe Basin

Geography

Total drainage area (km²)	138,891
No. of countries in basin	4
BCUs in basin	Austria (AUT), Czech Republic (CZE), Germany (DEU), Poland (POL)
Population in basin (people)	21,860,257
Country at mouth	Germany
Average rainfall (mm/year)	718

Governance

No. of treaties and agreements[1]	8
No. of RBOs and Commissions[2]	2

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	1
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
ELBE_AUT						
ELBE_CZE		191.71				
ELBE_DEU		216.87			110.40	0.39
ELBE_POL						
Total in Basin	28.96	208.51			110.40	0.39

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)

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[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

ELBE_AUT								
ELBE_CZE	1,417.71	60.86	29.20	373.17	460	494.38	238.75	
ELBE_DEU	6,044.50	551.76	93.13	2,996.62	1,333	1,069.77	381.26	
ELBE_POL								
Total in Basin	7,462.21	612.62	122.32	3,369.78	1,793.33	1,564.15	341.36	25.77

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
ELBE_AUT	1	0.01	47	50.89	0.39	0.00	100.00	0	49,053.82	0	0.00
ELBE_CZE	50	0.36	5,938	119.06	0.53	0.00	100.00	2	18,861.43	21	421.07
ELBE_DEU	88	0.63	15,854	180.47	-0.06	0.00	100.00	14	45,084.87	21	239.05
ELBE_POL	0	0.00	21	86.98	0.06			0	13,431.95	0	0.00
Total in Basin	139	1.00	21,860	157.39	0.21	0.00	99.91	16	37,940.27	42	302.40

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
ELBE_AUT					2	3			2	4	3		1	1	1
ELBE_CZE	1	2	2		2	1	5	4	2	2	1	1	4	1	3
ELBE_DEU	2	4	2		1	1	5	3	2	2	1	1	3	1	3
ELBE_POL					2				2	2	1	2	1	1	1
River Basin	2	4	2	5	1	1	5	4	2	2	1	1	4	1	3

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

ELBE_AUT									3
ELBE_CZE	2	2	2	2			1	1	1
ELBE_DEU	2	2	4	4			1	1	1
ELBE_POL									1
River Basin	2	2	4	4	5	5	1	1	1

TWAP RB Assessment results: Water System Linkages

Thematic group	**Lake Influence Indicator**	**Delta Vulnerability Index**			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Erne Basin

Geography

Total drainage area (km^2)	4,438
No. of countries in basin	2
BCUs in basin	Ireland (IRL), U.K. of Great Britain and Northern Ireland (GBR)
Population in basin (people)	126,898
Country at mouth	Ireland
Average rainfall (mm/year)	1,140

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	2
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
ERNE_GBR		814.06			120.18	1.44
ERNE_IRL		481.61			0.12	0.00
Total in Basin	2.87	646.85			120.30	1.44

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
ERNE_GBR	20.56	0.01	6.65	0.00	0	13.90	330.36	
ERNE_IRL	87.19	0.00	4.72	62.20	7	13.50	1,348.09	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	107.74	0.01	11.37	62.20	6.77	27.40	849.04	3.75

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
ERNE_GBR	2	0.43	62	32.44	0.60			0	39,336.91	0	0.00
ERNE_IRL	3	0.57	65	25.66	1.45	40.03	59.97	0	47,399.90	1	396.81
Total in Basin	4	1.00	127	28.59	0.40	20.40	30.56	0	43,446.19	1	225.30

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ERNE_GBR	1	1	1		1	2	3	4	2	4	3	1	1	1	3
ERNE_IRL	1		1		1	1			2	4	3	2	1	1	2
River Basin	1	1	1	5	1	2	3	4	2	4	3	2	1	1	2

Indicators

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Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
ERNE_GBR	2	2	1	1			1	1	3
ERNE_IRL	2	2							3
River Basin	2	2	1	1	5	5	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	2				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Fane Basin

Geography

Total drainage area (km²)	341
No. of countries in basin	2
BCUs in basin	Ireland (IRL), U.K. of Great Britain and Northern Ireland (GBR)
Population in basin (people)	21,912
Country at mouth	Ireland
Average rainfall (mm/year)	937

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km³/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km³/year)	Av. Groundwater Discharge (km³/year)	Lake and Reservoir Surface Area (km²)	Lake and Reservoir Volume (km³)
FANE_GBR						
FANE_IRL		510.10				
Total in Basin	0.17	510.10			0.00	0.00

Water Withdrawals

BCU	Total (km³/year)	Irrigation (km³/year)	Livestock (km³/year)	Electricity (km³/year)	Manufacture (km³/year)	Domestic (km³/year)	Per capita (m³/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
FANE_GBR								
FANE_IRL	38.69	0.08	4.10	0.00	20	14.45	2,063.66	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	38.69	0.08	4.10	0.00	20.05	14.45	1,765.49	22.23

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
FANE_GBR	0	0.18	3	52.44	0.60			0	39,336.91	0	0.00
FANE_IRL	0	0.82	19	66.77	1.45	0.00	100.00	0	47,399.90	0	0.00
Total in Basin	0	1.00	22	64.23	0.25	0.00	85.55	0	46,234.90	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FANE_GBR					1				2	4	3	1	1	1	1
FANE_IRL	1		2		1				2	4	3	2	1	1	1
River Basin	1		2	5	1				1	4	3	2	1	1	1

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
FANE_GBR									3
FANE_IRL	2	2							3
River Basin	2	2			5	5			3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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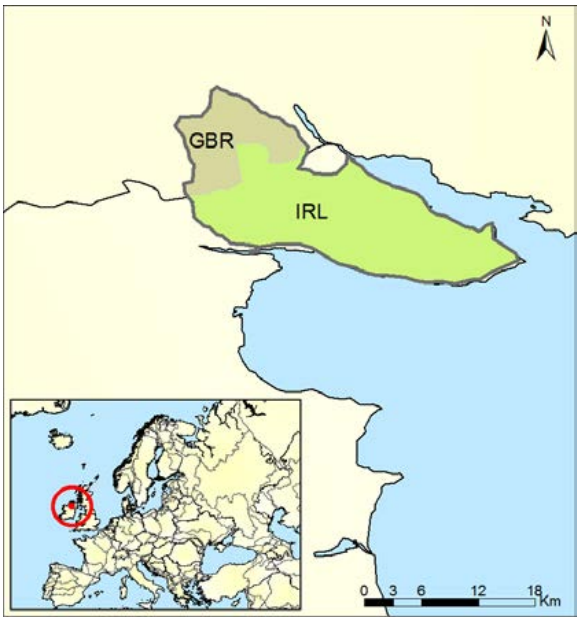
Flurry Basin



Geography

Total drainage area (km²)	201
No. of countries in basin	2
BCUs in basin	Ireland (IRL), U.K. of Great Britain and Northern Ireland (GBR)
Population in basin (people)	16,608
Country at mouth	Ireland
Average rainfall (mm/year)	913

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

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All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km³/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km³/year)	Av. Groundwater Discharge (km³/year)	Lake and Reservoir Surface Area (km²)	Lake and Reservoir Volume (km³)
FLRY_GBR						
FLRY_IRL		354.53				
Total in Basin	0.07	354.53			0.00	0.00

Water Withdrawals

BCU	Total (km³/year)	Irrigation (km³/year)	Livestock (km³/year)	Electricity (km³/year)	Manufacture (km³/year)	Domestic (km³/year)	Per capita (m³/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
FLRY_GBR								
FLRY_IRL	116.73	1.89	16.44	0.09	43	54.86	9,871.47	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
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Total in Basin	116.73	1.89	16.44	0.09	43.45	54.86	7,028.56	163.42

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
FLRY_GBR	0	0.23	5	103.33	0.60			0	39,336.91	0	0.00
FLRY_IRL	0	0.77	12	76.20	1.45			0	47,399.90	0	0.00
Total in Basin	0	1.00	17	82.43	0.31	0.00	0.00	0	45,077.82	0	0.00

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FLRY_GBR					1				2	4	3	1	1	1	1
FLRY_IRL	1		2		1				2	4	3	2	4	1	1
River Basin	1		2	5	1				1	4	3	2	3	1	1

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Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
FLRY_GBR									3
FLRY_IRL	2	2							3
River Basin	2	2			5	5			3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

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Foyle Basin

Geography

Total drainage area (km^2)	2,923
No. of countries in basin	2
BCUs in basin	Ireland (IRL), U.K. of Great Britain and Northern Ireland (GBR)
Population in basin (people)	173,399
Country at mouth	disputed between the GBR and Ireland
Average rainfall (mm/year)	1,182

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems
(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
FOYL_GBR		710.43				
FOYL_IRL		593.58				
Total in Basin	1.85	632.69			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
FOYL_GBR	49.93	0.31	5.50	24.86	1	18.38	341.58	
FOYL_IRL	48.60	0.20	4.48	0.00	25	18.87	1,785.09	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
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Total in Basin	98.53	0.52	9.98	24.86	25.93	37.25	568.24	5.33

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
FOYL_GBR	2	0.69	146	72.07	0.60	0.00	100.00	0	39,336.91	0	0.00
FOYL_IRL	1	0.31	27	30.44	1.45	100.00	0.00	0	47,399.90	0	0.00
Total in Basin	3	1.00	173	59.33	0.56	15.70	84.30	0	40,602.94	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FOYL_GBR	1	1	2		1	5	4	4	2	4	3	1	1	1	3
FOYL_IRL	1	1	2		1	5	4	4	2	4	3	2	1	1	3
River Basin	1	1	2	5	1	5	4	4	1	4	3	1	1	1	3

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
FOYL_GBR	2	2	1	1			1	1	3
FOYL_IRL	2	2	1	1			1	2	3
River Basin	2	2	1	1	5	5	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Disputed areas
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Garonne Basin

Geography

Total drainage area (km^2)	56,168
No. of countries in basin	3
BCUs in basin	Andorra (AND), France (FRA), Spain (ESP)
Population in basin (people)	3,804,619
Country at mouth	France
Average rainfall (mm/year)	1,045

Governance

No. of treaties and agreements[1]	4
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
GRON_AND						
GRON_ESP		492.43				
GRON_FRA		443.98				
Total in Basin	25.01	445.19			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
GRON_AND								

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
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GRON_ESP	4.92	1.10	0.83	0.62	0	2.37	722.29	
GRON_FRA	7,113.20	2,953.75	53.01	3,339.50	243	523.54	1,874.19	
Total in Basin	7,118.12	2,954.85	53.84	3,340.11	243.40	525.91	1,870.91	28.47

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
GRON_AND	0	0.00	2	64.93				0	0.00	0	0.00
GRON_ESP	1	0.01	7	11.55	1.20			0	29,117.64	0	0.00
GRON_FRA	56	0.99	3,795	68.33	0.58	0.00	100.00	2	41,420.76	24	432.12
Total in Basin	56	1.00	3,805	67.74	0.53	0.00	99.76	2	41,371.83	24	427.29

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
GRON_AND					4				3	5	3	2	1	1	1
GRON_ESP	2	1	2		1	1	5	5	3	3	1	1	1	1	1
GRON_FRA	2	1	2		1	2	5	4	3	3	1	1	3	1	3
River Basin	2	1	2	4	1	2	5	5	2	3	1	1	3	2	3

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low | Low | Medium | High | Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
GRON_AND									3
GRON_ESP	3	4	1	1			1	1	1
GRON_FRA	3	3	2	2			1	1	1
River Basin	3	3	2	2	4	4	1	1	1

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

TWAP RB Assessment results: Water System Linkages

Thematic group	**Lake Influence Indicator**	**Delta Vulnerability Index**			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Gauja Basin

Geography

Total drainage area (km^2)	9,207
No. of countries in basin	2
BCUs in basin	Estonia (EST), Latvia (LVA)
Population in basin (people)	196,490
Country at mouth	Latvia
Average rainfall (mm/year)	754

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
GUJA_EST		357.92				
GUJA_LVA		393.00				
Total in Basin	3.57	387.22			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
GUJA_EST	1.92	0.00	0.15	0.00	1	1.23	221.02	
GUJA_LVA	20.93	0.17	1.81	6.24	5	7.48	111.44	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	22.85	0.17	1.95	6.24	5.78	8.72	116.29	0.64

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
GUJA_EST	1	0.13	9	7.52	-0.07			0	18,478.27	0	0.00
GUJA_LVA	8	0.87	188	23.33	-0.47	6.62	93.38	0	15,375.45	0	0.00
Total in Basin	9	1.00	196	21.34	-0.99	6.33	89.24	0	15,512.85	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
GUJA_EST	1	1	1		2			2	2	4	3	2	1	2	2
GUJA_LVA	1	1	1		3		2	2	2	4	3	2	1	1	2
River Basin	1	1	1	4	3		2	2	2	4	3	2	1	2	2

Indicators

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Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
GUJA_EST	4	3	1	1					3
GUJA_LVA	3	3	1	1			1	1	3
River Basin	3	4	1	1	4	4	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

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Glama Basin

Geography

Total drainage area (km^2)	41,375
No. of countries in basin	2
BCUs in basin	Norway (NOR), Sweden (SWE)
Population in basin (people)	645,522
Country at mouth	Norway
Average rainfall (mm/year)	767

Governance

No. of treaties and agreements[1]	1
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	3
Large Marine Ecosystems	1

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All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
GLAM_NOR		568.02			435.70	54.96
GLAM_SWE						
Total in Basin	23.50	568.02			435.70	54.96

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
GLAM_NOR	1,150.89	116.89	8.96	1.05	726	297.58	1,785.66	
GLAM_SWE								

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	1,150.89	116.89	8.96	1.05	726.42	297.58	1,782.89	4.90

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
GLAM _NOR	41	0.99	645	15.72	1.09	18.12	81.88	0	100,818.50	6	146.32
GLAM _SWE	0	0.01	1	2.71	0.76			0	58,269.03	0	0.00
Total in Basin	41	1.00	646	15.60	1.30	18.09	81.76	0	100,752.36	6	145.01

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
GLAM_NOR	1	1	2		2	2	4	3	2	3	2	1	4	1	1
GLAM_SWE					1	4			2	3	2	1	1	1	1
River Basin	1	1	2	2	2	2	5	3	2	3	2	1	4	1	1

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
GLAM_NOR	5	5	1	1			1	1	2
GLAM_SWE									2
River Basin	5	5	1	1	3	2	1	1	2

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	4				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Guadiana Basin

Geography

Total drainage area (km²)	67,060
No. of countries in basin	2
BCUs in basin	Portugal (PRT), Spain (ESP)
Population in basin (people)	1,474,895
Country at mouth	Portugal, Spain
Average rainfall (mm/year)	570

Governance

No. of treaties and agreements[1]	3
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	6
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km³/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km³/year)	Av. Groundwater Discharge (km³/year)	Lake and Reservoir Surface Area (km²)	Lake and Reservoir Volume (km³)
GUDN_ESP		130.25			284.08	1.79
GUDN_PRT		272.31			226.52	2.85
Total in Basin	11.08	165.17			510.60	4.64

Water Withdrawals

BCU	Total (km³/year)	Irrigation (km³/year)	Livestock (km³/year)	Electricity (km³/year)	Manufacture (km³/year)	Domestic (km³/year)	Per capita (m³/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
GUDN_ESP	6,676.29	6,363.06	22.52	84.33	30	176.55	5,240.28	
GUDN_PRT	1,928.80	1,762.53	10.66	89.76	6	60.31	9,602.64	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	8,605.09	8,125.58	33.19	174.09	35.36	236.86	5,834.37	77.69

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
GUDN_ESP	55	0.83	1,274	22.99	1.20	8.43	91.57	1	29,117.64	17	306.78
GUDN_PRT	12	0.17	201	17.25	0.25	58.22	41.78	0	21,035.01	6	515.20
Total in Basin	67	1.00	1,475	21.99	-0.28	15.21	84.79	1	28,016.89	23	342.97

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
GUDN_ESP	5	3	5		1	1	5	3	3	1	1	1	2	1	4
GUDN_PRT	4	1	3		2	1	5	2	4	1	1	3	2	2	3
River Basin	5	3	4	4	1	1	5	3	3	1	1	1	2	2	4

Indicators

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Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
GUDN_ESP	5	5	4	4			1	1	1
GUDN_PRT	5	5	1	2			1	1	1
River Basin	5	5	3	4	4	4	1	1	1

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	2				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Isonzo Basin

Geography

Total drainage area (km^2)	3,357
No. of countries in basin	2
BCUs in basin	Italy (ITA), Slovenia (SVN)
Population in basin (people)	300,495
Country at mouth	Italy
Average rainfall (mm/year)	1,766

Governance

No. of treaties and agreements[1]	3
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
ISNZ_ITA		1,611.16				
ISNZ_SVN		918.30				
Total in Basin	3.55	1,056.13			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
ISNZ_ITA	105.97	8.12	0.70	9.31	39	48.88	563.13	
ISNZ_SVN	408.06	101.89	3.52	172.53	52	77.88	3,632.88	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	514.02	110.01	4.22	181.83	91.20	126.76	1,710.59	14.50

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
ISNZ_ITA	1	0.34	188	165.88	0.63	0.00	100.00	0	34,619.24	0	0.00
ISNZ_SVN	2	0.66	112	50.54	0.27	19.96	80.04	0	22,729.32	0	0.00
Total in Basin	3	1.00	300	89.51	0.37	7.46	92.54	0	30,174.86	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
ISNZ_ITA	1	1	2		1		5	3	3	4	4		1	2	2
ISNZ_SVN	1	1	2		3		5	3	3	4	4	4	4	1	2
River Basin	1	1	2	3	2		5	3	3	4	4		3	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
ISNZ_ITA	2	3	1	1			1	1	4
ISNZ_SVN	2	3	1	1			1	1	4
River Basin	2	3	1	1	4	4	1	1	4

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

3 Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

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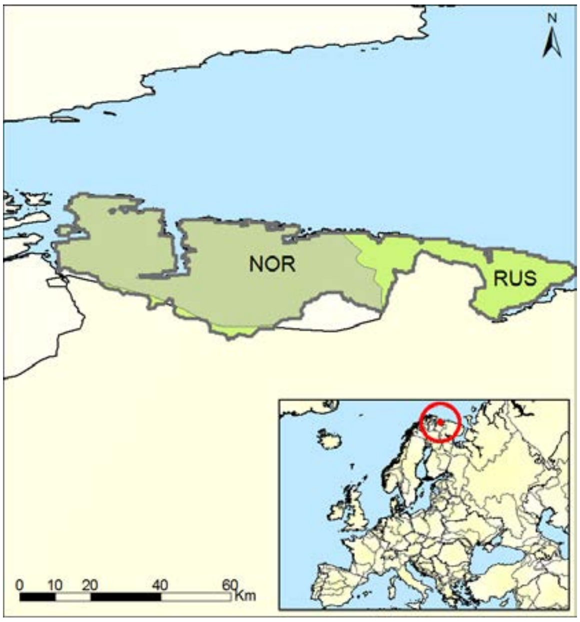
Jacobs Basin



Geography

Total drainage area (km^2)	944
No. of countries in basin	2
BCUs in basin	Norway (NOR), Russian Federation (RUS)
Population in basin (people)	1,972
Country at mouth	Norway
Average rainfall (mm/year)	653

Governance

No. of treaties and agreements[1]	1
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
JCBS_NOR		330.97				
JCBS_RUS		154.70				
Total in Basin	0.23	242.84			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
JCBS_NOR	0.30	0.00	0.01	0.00	0	0.28	196.27	
JCBS_RUS	0.12	0.00	0.00	0.00	0	0.12	252.24	

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Total in Basin	0.41	0.00	0.02	0.00	0.00	0.40	209.43	0.18

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
JCBS_NOR	1	0.73	2	2.18	1.09			0	100,818.50	0	0.00
JCBS_RUS	0	0.27	0	1.85	-0.12			0	14,611.70	0	0.00
Total in Basin	1	1.00	2	2.09	1.05	0.00	0.00	0	80,545.88	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
JCBS_NOR	1	1	1		2		3		3	4	3	1	1	1	1
JCBS_RUS	1	1	1		4		3		3	3	3	2	1	2	1
River Basin	1	1	1	2	2		3		3	4	3	2	1	1	1

Indicators

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Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
JCBS_NOR	4	4	1	1					3
JCBS_RUS	4	4	1	1					3
River Basin	4	4	1	1	2	2			3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

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Kemi Basin

Geography

Total drainage area (km^2)	53,911
No. of countries in basin	3
BCUs in basin	Finland (FIN), Norway (NOR), Russian Federation (RUS)
Population in basin (people)	104,757
Country at mouth	Finland
Average rainfall (mm/year)	599

Governance

No. of treaties and agreements[1]	3
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	4
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
KEMI_FIN		332.96			851.10	17.32
KEMI_NOR						
KEMI_RUS		387.60				
Total in Basin	18.13	336.30			851.10	17.32

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
KEMI_FIN	29.14	0.15	0.65	5.48	13	9.46	303.50	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

KEMI_NOR								
KEMI_RUS	1.29	0.00	0.03	0.00	0	1.25	147.47	
Total in Basin	30.43	0.15	0.68	5.48	13.41	10.71	290.48	0.17

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
KEMI_FIN	51	0.94	96	1.89	0.45	0.00	100.00	0	47,218.77	9	177.34
KEMI_NOR	0	0.00	0	0.27				0	100,818.50	0	0.00
KEMI_RUS	3	0.06	9	2.78	-0.12			0	14,611.70	0	0.00
Total in Basin	54	1.00	105	1.94	0.45	0.00	91.66	0	44,504.24	9	166.94

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
KEMI_FIN	2	1	1		1	1	4	3	3	3	2	1	1	1	1
KEMI_NOR					2				3	4	2	1	1	1	1
KEMI_RUS	1	1	1		4		3	1	3	2	3	2	1	2	1
River Basin	2	1	1	2	2	1	4	3	3	3	2	1	1	1	1

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
KEMI_FIN	4	5	1	1			1	1	2
KEMI_NOR									2
KEMI_RUS	5	5	1	1			1	1	3
River Basin	4	5	1	1	2	2	1	1	2

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

TWAP RB Assessment results: Water System Linkages

Thematic group	**Lake Influence Indicator**	**Delta Vulnerability Index**			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	3				

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Klaralven Basin

Geography

Total drainage area (km^2)	50,092
No. of countries in basin	2
BCUs in basin	Norway (NOR), Sweden (SWE)
Population in basin (people)	900,981
Country at mouth	Sweden
Average rainfall (mm/year)	790

Governance

No. of treaties and agreements[1]	1
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	13
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
KRLV_NOR		401.35			226.41	6.02
KRLV_SWE		412.15			6,217.89	162.82
Total in Basin	20.57	410.68			6,444.30	168.84

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
KRLV_NOR	24.33	3.06	0.37	0.00	12	8.80	498.54	
KRLV_SWE	578.21	63.71	9.22	17.00	302	185.91	678.50	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	602.53	66.76	9.58	17.00	314.49	194.70	668.75	2.93

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
KRLV_NOR	9	0.18	49	5.34	1.09	77.19	22.81	0	100,818.50	0	0.00
KRLV_SWE	41	0.82	852	20.81	0.76	0.00	100.00	0	58,269.03	5	122.08
Total in Basin	50	1.00	901	17.99	0.79	4.18	95.82	0	60,573.41	5	99.82

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
KRLV_NOR	1	1	2		2	2	5	3	2	3	2	1	1	1	1
KRLV_SWE	1	1	2		1	1	4	3	2	3	2	1	4	1	1
River Basin	1	1	2	3	1	2	5	3	2	3	2	1	4	1	1

Indicators

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Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
KRLV_NOR	3	3	1	1			1	1	2
KRLV_SWE	2	2	1	1			1	1	2
River Basin	2	3	1	1	3	3	1	1	2

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	5				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Krka Basin

Geography

Total drainage area (km^2)	2,488
No. of countries in basin	2
BCUs in basin	Bosnia And Herzegovina (BIH), Croatia (HRV)
Population in basin (people)	59,485
Country at mouth	Croatia
Average rainfall (mm/year)	1,109

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
KRKA_BIH		654.85				
KRKA_HRV		777.60				
Total in Basin	1.86	747.04			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
KRKA_BIH	11.09	0.06	0.38	2.59	1	7.15	1,668.71	
KRKA_HRV	74.65	2.07	1.60	14.21	21	35.43	1,412.69	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	85.74	2.13	1.98	16.81	22.23	42.58	1,441.29	4.61

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
KRKA_ BIH	0	0.03	7	77.26	-0.11			0	4,655.60	0	0.00
KRKA_ HRV	2	0.97	53	22.00	-0.18	6.42	93.58	0	13,529.88	0	0.00
Total in Basin	2	1.00	59	23.91	-0.32	5.70	83.12	0	12,538.43	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
KRKA_BIH	1	1	1		5		5	2	3	4	3	3	1	2	1
KRKA_HRV	1		2		5				4	4	5		1	1	2
River Basin	1	1	2	4	5		3	1	3	4	5		1	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
KRKA_BIH	2	2	1	1			1	1	3
KRKA_HRV	2	2							5
River Basin	2	2	1	1	4	4	1	1	5

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

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Lake Prespa Basin

Geography

Total drainage area (km^2)	7,526
No. of countries in basin	3
BCUs in basin	Albania (ALB), Greece (GRC), The former Yugoslav Republic of Macedonia (MFD)
Population in basin (people)	600,756
Country at mouth	Albania, Greece
Average rainfall (mm/year)	897

Governance

No. of treaties and agreements[1]	2
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	1
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
LKPP_ALB		598.99			36.21	0.91
LKPP_GRC					39.67	0.99
LKPP_MFD					196.42	4.91
Total in Basin	4.51	598.99			272.30	6.81

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)

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[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

LKPP_ALB	1,074.73	813.15	7.34	7.71	91	155.73	1,896.43	
LKPP_GRC								
LKPP_MFD								
Total in Basin	1,074.73	813.15	7.34	7.71	90.81	155.73	1,788.96	23.84

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
LKPP_ALB	6	0.85	567	88.78	0.39	0.00	100.00	0	4,652.35	0	0.00
LKPP_GRC	0	0.05	3	7.49	0.31			0	21,910.22	0	0.00
LKPP_MFD	1	0.11	31	39.63		0.00	100.00	0	4,850.51	0	0.00
Total in Basin	8	1.00	601	79.82	-0.95	0.00	99.56	0	4,737.98	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
LKPP_ALB	2	2	3		5		4	3	4	2	4	5	3	2	3
LKPP_GRC					1				4	2	3	3	1	1	3
LKPP_MFD					5				4	4	5	5	1	2	1
River Basin	2	2	3	4	5		4	3	3	2	4	5	3	2	3

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
LKPP_ALB	3	3	2	3			1	1	4
LKPP_GRC									3
LKPP_MFD									5

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

River Basin	3	3	2	3	5	5	1	1	4

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	3				

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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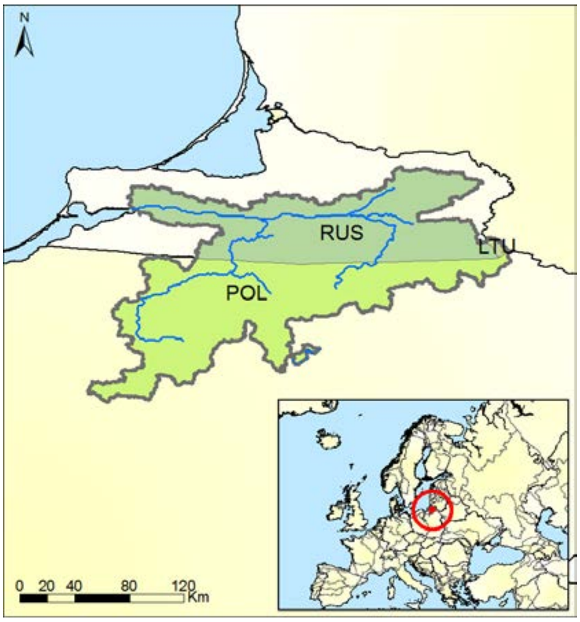
Lava/Pregel Basin



Geography

Total drainage area (km²)	14,466
No. of countries in basin	3
BCUs in basin	Lithuania (LTU), Poland (POL), Russian Federation (RUS)
Population in basin (people)	1,068,308
Country at mouth	Russian Federation
Average rainfall (mm/year)	727

Governance

No. of treaties and agreements[1]	2
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	1
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km³/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km³/year)	Av. Groundwater Discharge (km³/year)	Lake and Reservoir Surface Area (km²)	Lake and Reservoir Volume (km³)
LAVA_LTU						
LAVA_POL		291.25			102.70	1.09
LAVA_RUS		406.87				
Total in Basin	4.82	332.88			102.70	1.09

Water Withdrawals

BCU	Total (km³/year)	Irrigation (km³/year)	Livestock (km³/year)	Electricity (km³/year)	Manufacture (km³/year)	Domestic (km³/year)	Per capita (m³/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
LAVA_LTU								

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

LAVA_POL	66.50	9.49	3.96	1.14	6	46.24	121.30	
LAVA_RUS	188.32	2.25	13.91	151.51	8	12.89	363.74	
Total in Basin	254.82	11.75	17.87	152.65	13.42	59.13	238.52	5.29

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km²)
LAVA_LTU	0	0.00	2	39.30				0	15,537.92	0	0.00
LAVA_POL	8	0.55	548	69.53	0.06	0.00	100.00	1	13,431.95	0	0.00
LAVA_RUS	7	0.45	518	79.39	-0.12	0.00	100.00	1	14,611.70	0	0.00
Total in Basin	14	1.00	1,068	73.85	0.10	0.00	99.78	2	14,008.31	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
LAVA_LTU					3				2	2	3	1	1	2	1
LAVA_POL	1	1	2		2		2	3	2	2	3	2	1	1	2
LAVA_RUS	1	1	2		4	2	2	3	2	2	3	2	1	2	3
River Basin	1	1	2	4	3	1	2	3	2	2	3	2	1	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
LAVA_LTU									3
LAVA_POL	2	2	1	1			1	1	3
LAVA_RUS	2	2	1	1			1	1	3
River Basin	2	2	1	1	4	5	1	1	3

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Lielupe Basin

Geography

Total drainage area (km^2)	17,667
No. of countries in basin	2
BCUs in basin	Latvia (LVA), Lithuania (LTU)
Population in basin (people)	653,410
Country at mouth	Latvia
Average rainfall (mm/year)	690

Governance

No. of treaties and agreements[1]	2
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
LLUP_LTU		267.20				
LLUP_LVA		316.87				
Total in Basin	5.07	286.94			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
LLUP_LTU	13.90	1.77	1.70	0.53	2	8.07	45.77	
LLUP_LVA	46.51	0.27	1.52	8.55	21	14.90	133.00	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	60.41	2.04	3.22	9.08	23.09	22.97	92.45	1.19

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km²)
LLUP_LTU	9	0.50	304	34.33	-0.55	2.66	97.34	1	15,537.92	1	113.02
LLUP_LVA	9	0.50	350	39.65	-0.47	0.00	100.00	0	15,375.45	0	0.00
Total in Basin	18	1.00	653	36.99	-1.05	1.23	98.77	1	15,450.97	1	56.60

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
LLUP_LTU	1	1	2		3		4	3	2	2	2	1	2	2	2
LLUP_LVA	1	1	2		3		3		2	4	3	2	2	1	2
River Basin	1	1	2	4	3		4	3	2	3	3	1	2	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
LLUP_LTU	2	3	1	1			1	1	2
LLUP_LVA	3	3	1	1			1	1	3
River Basin	2	3	1	1	4	4	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

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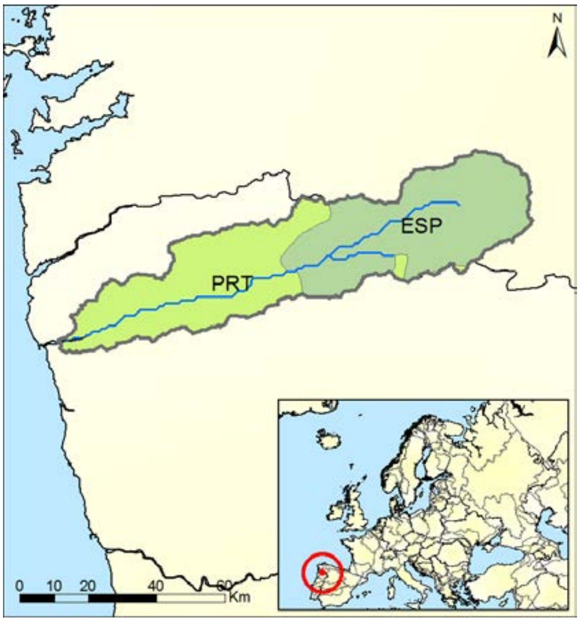
Lima Basin



Geography

Total drainage area (km^2)	2,469
No. of countries in basin	2
BCUs in basin	Portugal (PRT), Spain (ESP)
Population in basin (people)	121,602
Country at mouth	Portugal
Average rainfall (mm/year)	1,492

Governance

No. of treaties and agreements[1]	2
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
LIMA_ESP						
LIMA_PRT		873.09				
Total in Basin	2.16	873.09			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
LIMA_ESP								
LIMA_PRT	342.99	288.71	1.78	6.84	17	28.98	3,778.73	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	342.99	288.71	1.78	6.84	16.68	28.98	2,820.58	15.91

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
LIMA_ESP	1	0.53	31	23.61	1.20	100.00	0.00	0	29,117.64	2	1,531.55
LIMA_PRT	1	0.47	91	78.06	0.25	100.00	0.00	0	21,035.01	2	1,720.07
Total in Basin	2	1.00	122	49.26	-0.45	100.00	0.00	0	23,084.47	4	1,620.34

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LIMA_ESP					1	3			3	1	1	1	1	1	1
LIMA_PRT	2		2		2	2			3	1	1	3	1	2	2
River Basin	3		2	4	2				2	1	1	2	1	2	2

Indicators

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Very low | Low | Medium | High | Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
LIMA_ESP									1
LIMA_PRT	3	4							1
River Basin	3	4			4	4			1

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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UNEP-DHI PARTNERSHIP Centre on Water and Environment

Lough Melvin Basin

Geography

Total drainage area (km^2)	290
No. of countries in basin	2
BCUs in basin	Ireland (IRL), U.K. of Great Britain and Northern Ireland (GBR)
Population in basin (people)	5,487
Country at mouth	XXX
Average rainfall (mm/year)	1,410

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
LMEL_GBR						
LMEL_IRL		866.91				
Total in Basin	0.25	866.91			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
LMEL_GBR								
LMEL_IRL	13.98	0.00	3.39	0.00	2	8.76	3,611.74	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	13.98	0.00	3.39	0.00	1.84	8.76	2,548.29	5.57

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km²)
LMEL_GBR	0	0.40	2	14.04				0	39,336.91	0	0.00
LMEL_IRL	0	0.60	4	22.19		0.00	100.00	0	47,399.90	0	0.00
Total in Basin	0	1.00	5	18.95	0.31	0.00	70.56	0	45,025.81	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LMEL_GBR					1	3			2	4	3	1	1	1	3
LMEL_IRL	1		1		1	4			2	4	3	2	1	1	1
River Basin	1		1	5	1				2	4	3	2	1	1	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
LMEL_GBR									3
LMEL_IRL	2	2							3
River Basin	2	2			5	5			3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Maritsa Basin

Geography

Total drainage area (km^2)	52,590
No. of countries in basin	3
BCUs in basin	Bulgaria (BGR), Greece (GRC), Turkey (TUR)
Population in basin (people)	3,476,248
Country at mouth	Greece, Turkey
Average rainfall (mm/year)	629

Governance

No. of treaties and agreements[1]	2
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
MRSA_BGR		194.24				
MRSA_GRC		307.47				
MRSA_TUR		275.60				
Total in Basin	11.97	227.61			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
MRSA_BGR	4,070.42	1,794.50	9.40	1,650.39	332	284.56	1,906.20	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

MRSA_GRC	404.85	389.27	1.26	0.00	0	14.32	4,888.30	
MRSA_TUR	1,928.52	1,162.59	10.26	214.94	169	372.12	1,532.92	
Total in Basin	6,403.79	3,346.36	20.92	1,865.33	500.19	671.00	1,842.16	53.50

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
MRSA_BGR	35	0.67	2,135	60.94	-0.64	0.00	100.00	3	7,296.49	19	542.22
MRSA_GRC	3	0.06	83	26.96	0.31	66.75	33.25	0	21,910.22	0	0.00
MRSA_TUR	14	0.28	1,258	86.90	1.31	0.00	100.00	1	10,945.92	7	483.52
Total in Basin	53	1.00	3,476	66.10	0.10	1.59	98.41	4	8,965.40	26	494.39

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
MRSA_BGR	2	5	3		4	1	5	3	3	1	4	1	4	1	3
MRSA_GRC	2	4	3		1	1	5	4	3	4	5	3	1	1	3
MRSA_TUR	3	4	3		3	1	5	3	3	2	4		1	2	2
River Basin	2	4	3	4	4	1	5	3	3	2	4		3	2	2

Indicators

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Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
MRSA_BGR	3	4	5	5			1	1	4
MRSA_GRC	3	4	5	5			1	1	5
MRSA_TUR	3	4	4	5			1	2	4
River Basin	3	4	5	5	4	4	1	1	4

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

TWAP RB Assessment results: Water System Linkages

Thematic group	**Lake Influence Indicator**	**Delta Vulnerability Index**			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

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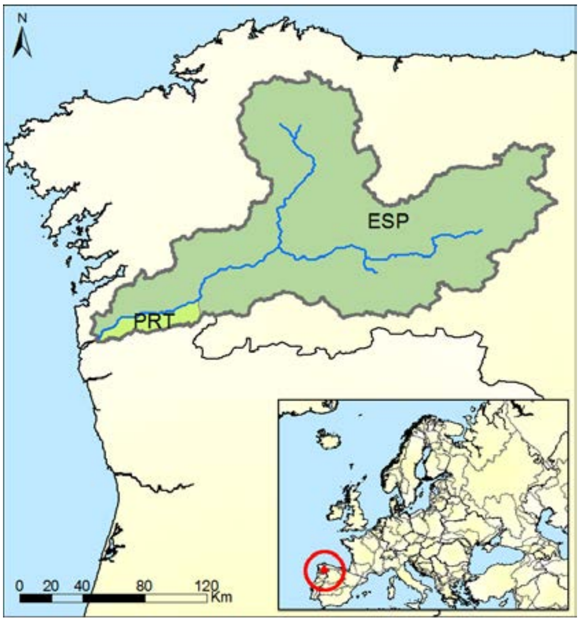
Mino Basin



Geography

Total drainage area (km^2)	16,679
No. of countries in basin	2
BCUs in basin	Portugal (PRT), Spain (ESP)
Population in basin (people)	749,858
Country at mouth	Portugal, Spain
Average rainfall (mm/year)	1,262

Governance

No. of treaties and agreements[1]	5
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

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All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
MINO_ESP		713.07				
MINO_PRT		1,001.29				
Total in Basin	12.59	754.64			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
MINO_ESP	866.49	327.72	15.77	397.32	27	98.91	1,219.74	
MINO_PRT	963.34	174.34	4.00	636.33	56	92.51	24,410.01	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	1,829.84	502.07	19.77	1,033.65	82.93	191.42	2,440.24	14.54

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
MINO_ESP	16	0.97	710	43.95	1.20	2.21	97.79	1	29,117.64	17	1,051.81
MINO_PRT	1	0.03	39	76.39	0.25			0	21,035.01	0	0.00
Total in Basin	17	1.00	750	44.96	-0.26	2.09	92.64	1	28,692.25	17	1,019.24

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
MINO_ESP	2	1	2		1	1	5	3	3	1	1	1	1	1	2
MINO_PRT	2		2		2	3			3	1	1	3	1	2	3
River Basin	2	1	2	4	1	2	5	4	2	1	1	1	1	2	2

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Very low | Low | Medium | High | Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
MINO_ESP	2	3	1	1			1	1	1
MINO_PRT	3	3							1
River Basin	2	3	1	1	4	4	1	1	1

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

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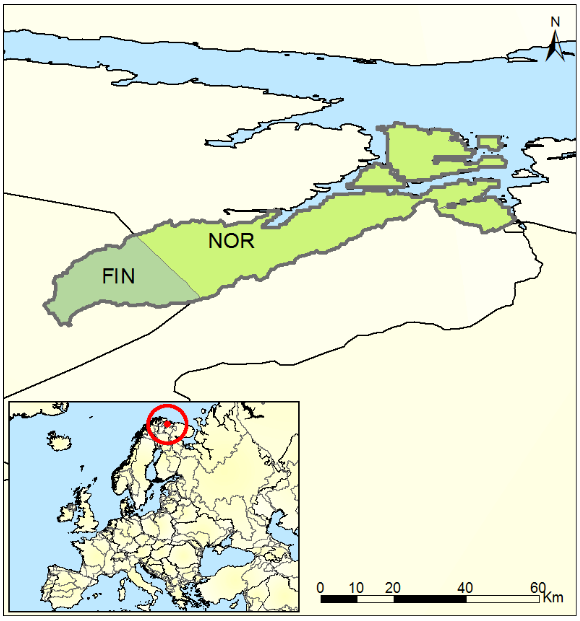
Naatamo Basin



Geography

Total drainage area (km^2)	719
No. of countries in basin	2
BCUs in basin	Finland (FIN), Norway (NOR)
Population in basin (people)	1,206
Country at mouth	Norway
Average rainfall (mm/year)	

Governance

No. of treaties and agreements[1]	2
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
NAAT_FIN						
NAAT_NOR						
Total in Basin					0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
NAAT_FIN								
NAAT_NOR								

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
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Total in Basin									

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km²)
NAAT_FIN	0	0.26	0	0.48	0.45			0	47,218.77	0	0.00
NAAT_NOR	1	0.74	1	2.09	1.09			0	100,818.50	0	0.00
Total in Basin	1	1.00	1	1.68	1.24	0.00	0.00	0	96,846.21	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NAAT_FIN					1				3	3	1	1	1	1	1
NAAT_NOR		1			2		2	3	3	3	1	1	1	1	1
River Basin		1		2	2		2	3	2	3	1	1	1	1	1

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
NAAT_FIN									1
NAAT_NOR			1	1					1
River Basin			1	1	2	1			1

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin					

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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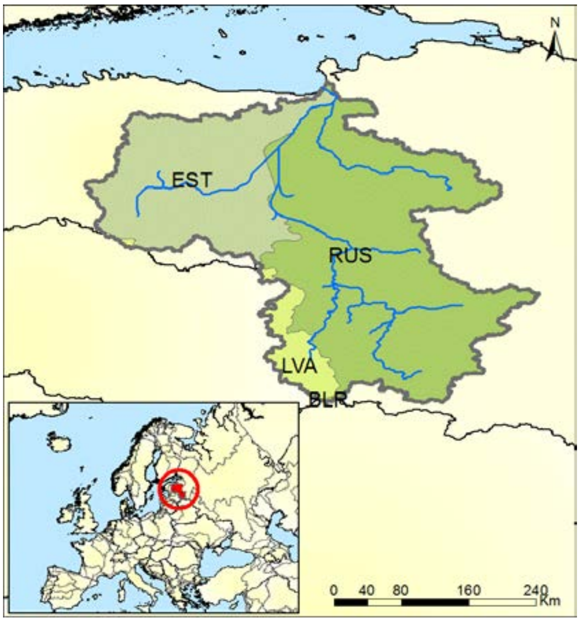
Narva Basin



Geography

Total drainage area (km^2)	56,519
No. of countries in basin	4
BCUs in basin	Belarus (BLR), Estonia (EST), Latvia (LVA), Russian Federation (RUS)
Population in basin (people)	897,899
Country at mouth	Estonia, Russian Federation
Average rainfall (mm/year)	714

Governance

No. of treaties and agreements[1]	4
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	3
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
NRVA_BLR						
NRVA_EST		257.04			1,908.72	12.12
NRVA_LVA		226.35				
NRVA_RUS		272.20			2,031.58	13.80
Total in Basin	14.98	264.99			3,940.30	25.92

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

NRVA_BLR								
NRVA_EST	1,225.23	1.31	2.88	1,184.09	15	22.17	3,277.70	
NRVA_LVA	4.60	0.05	0.25	0.00	1	3.42	98.87	
NRVA_RUS	125.88	2.54	5.82	4.21	40	73.03	263.77	
Total in Basin	1,355.71	3.90	8.95	1,188.30	55.95	98.61	1,509.87	9.05

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
NRVA_BLR	0	0.00	0	13.38	-0.47			0	7,575.48	0	0.00
NRVA_EST	17	0.31	374	21.38	-0.07	1.16	98.84	1	18,478.27	0	0.00
NRVA_LVA	3	0.06	47	13.70	-0.47	15.76	84.24	0	15,375.45	0	0.00
NRVA_RUS	36	0.63	477	13.40	-0.12	0.00	100.00	1	14,611.70	0	0.00
Total in Basin	57	1.00	898	15.89	0.05	1.30	98.66	2	16,258.16	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NRVA_BLR					1				2	3	3		1	1	1
NRVA_EST	1	2	2		2	1	2	2	3	2	2	2	4	2	2
NRVA_LVA	1	1	1		3	1	2	2	2	2	3	2	1	1	2
NRVA_RUS	1	1	2		4	2	1	1	3	2	2	2	1	2	3
River Basin	1	1	2	3	3	2	1	2	2	2	2	2	2	2	3

Indicators

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Very low | Low | Medium | High | Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

NRVA_BLR									3
NRVA_EST	3	3	2	2			1	1	2
NRVA_LVA	3	3	1	1			1	1	3
NRVA_RUS	2	2	1	1			1	1	2
River Basin	2	3	1	1	3	3	1	1	2

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	4				

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Neman Basin

Geography

Total drainage area (km^2)	92,929
No. of countries in basin	5
BCUs in basin	Belarus (BLR), Latvia (LVA), Lithuania (LTU), Poland (POL), Russian Federation (RUS)
Population in basin (people)	4,788,665
Country at mouth	Latvia, Russian Federation
Average rainfall (mm/year)	705

Governance

No. of treaties and agreements[1]	7
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	3
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
NMAN_BLR		191.43			173.40	1.28
NMAN_LTU		248.46			56.90	1.42
NMAN_LVA						
NMAN_POL		167.87				
NMAN_RUS		318.01				
Total in Basin	20.74	223.23			230.30	2.70

Water Withdrawals

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

BCU	Total (km³/year)	Irrigation (km³/year)	Livestock (km³/year)	Electricity (km³/year)	Manufacture (km³/year)	Domestic (km³/year)	Per capita (m³/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
NMAN_BLR	548.73	35.96	39.56	1.98	217	254.59	274.57	
NMAN_LTU	316.14	5.63	17.83	150.94	52	89.36	122.46	
NMAN_LVA								
NMAN_POL	6.10	0.78	0.46	0.00	0	4.87	50.01	
NMAN_RUS	9.01	1.51	4.40	0.00	1	2.57	105.84	
Total in Basin	879.98	43.87	62.24	152.92	269.56	351.39	183.76	4.24

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km²)
NMAN _BLR	45	0.48	1,999	44.57	-0.47	0.00	100.00	3	7,575.48	1	22.30
NMAN _LTU	44	0.47	2,582	59.03	-0.55	0.97	99.03	3	15,537.92	1	22.87
NMAN _LVA	0	0.00	1	18.65	-0.47	100.00	0.00	0	15,375.45	0	0.00
NMAN _POL	3	0.03	122	48.34	0.06	0.00	100.00	0	13,431.95	0	0.00
NMAN _RUS	2	0.02	85	48.44	-0.12	0.00	100.00	0	14,611.70	0	0.00
Total in Basin	93	1.00	4,789	51.53	-0.56	0.55	99.45	6	12,144.65	2	21.52

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
NMAN_BLR	1	1	2		1	1	3	3	2	2	2		2	1	2
NMAN_LTU	1	1	2		3	2	4	3	2	2	2	1	5	2	3
NMAN_LVA					3	3			2	2	2	2	1	1	1
NMAN_POL	1	1	2		2	2	4	3	2	2	3	2	1	1	2
NMAN_RUS	1	1	2		4	2	3	3	2	2	2	2	1	2	2
River Basin	1	1	2	4	2	1	4	3	2	2	2		4	2	3

Indicators

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Very low	Low	Medium	High	Very high

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Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
NMAN_BLR	2	3	1	1			1	1	2
NMAN_LTU	2	2	2	2			1	1	2
NMAN_LVA									2
NMAN_POL	2	2	1	1			1	1	3
NMAN_RUS	2	2	1	1			1	1	2
River Basin	2	2	1	1	4	4	1	1	2

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
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Neretva Basin

Geography

Total drainage area (km^2)	6,808
No. of countries in basin	2
BCUs in basin	Bosnia And Herzegovina (BIH), Croatia (HRV)
Population in basin (people)	633,216
Country at mouth	Croatia
Average rainfall (mm/year)	1,415

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
NRTV_BIH		1,162.58				
NRTV_HRV		874.04				
Total in Basin	7.13	1,047.26			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
NRTV_BIH	60.21	14.06	1.48	1.90	9	33.94	107.99	
NRTV_HRV	361.30	13.31	0.99	305.28	15	27.06	4,772.96	

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[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	421.50	27.36	2.47	307.19	23.48	61.00	665.65	5.91

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km²)
NRTV_BIH	6	0.94	558	87.44	-0.11	0.00	100.00	0	4,655.60	3	470.50
NRTV_HRV	0	0.06	76	175.36	-0.18	0.00	100.00	0	13,529.88	1	2,316.62
Total in Basin	7	1.00	633	93.01	-0.15	0.00	100.00	0	5,716.45	4	587.56

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NRTV_BIH	1	1	2		5		4	2	4	4	5	3	3	2	3
NRTV_HRV	1		2		5				4	4	5		1	1	2
River Basin	1	1	2	4	5		4	2	4	4	5	4	3	2	3

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
NRTV_BIH	2	2	1	1			1	1	5
NRTV_HRV	2	2							5
River Basin	2	2	1	1	4	4	1	1	5

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Nestos Basin

Geography

Total drainage area (km^2)	5,888
No. of countries in basin	2
BCUs in basin	Bulgaria (BGR), Greece (GRC)
Population in basin (people)	179,201
Country at mouth	Greece
Average rainfall (mm/year)	592

Governance

No. of treaties and agreements[1]	3
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
NSTO_BGR		305.56				
NSTO_GRC		295.09				
Total in Basin	1.76	298.56			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
NSTO_BGR	45.78	21.28	0.45	0.00	12	11.88	325.19	
NSTO_GRC	236.73	210.44	1.16	0.24	1	23.53	6,160.73	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	282.51	231.73	1.60	0.24	13.53	35.41	1,576.48	16.07

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km²)
NSTO_BGR	3	0.58	141	41.36	-0.64			0	7,296.49	1	293.80
NSTO_GRC	2	0.42	38	15.47	0.31	100.00	0.00	0	21,910.22	2	804.95
Total in Basin	6	1.00	179	30.43	-0.56	21.44	0.00	0	10,430.06	3	509.49

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NSTO_BGR	2	2	2		4		5	1	3	3	3	1	1	1	2
NSTO_GRC	3	3	3		1	3	5	2	3	3	3	3	1	1	2
River Basin	2	3	3	4	3	1	5	2	2	3	3	2	1	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
NSTO_BGR	3	4	2	3			1	1	3
NSTO_GRC	4	4	4	4			1	1	3
River Basin	3	4	3	3	4	4	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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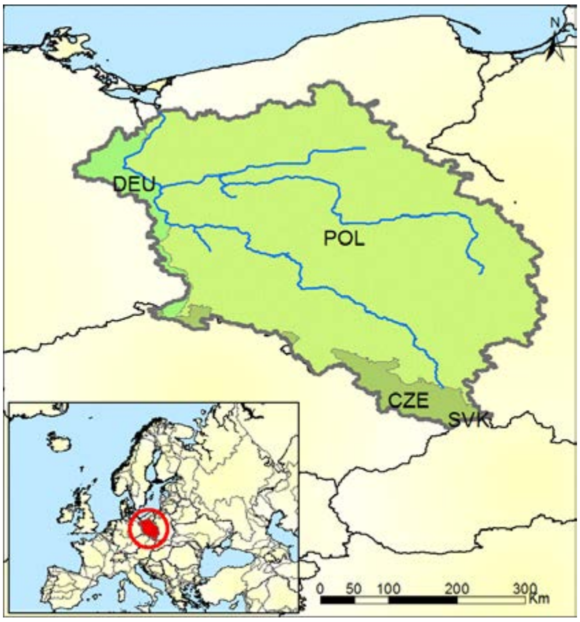
Oder/Odra Basin



Geography

Total drainage area (km^2)	119,245
No. of countries in basin	4
BCUs in basin	Czech Republic (CZE), Germany (DEU), Poland (POL), Slovakia (SVK)
Population in basin (people)	15,718,061
Country at mouth	Poland
Average rainfall (mm/year)	674

Governance

No. of treaties and agreements[1]	7
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	1
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
ODER_CZE		304.22				
ODER_DEU		185.45				
ODER_POL		168.69			53.90	0.40
ODER_SVK						
Total in Basin	21.00	176.11			53.90	0.40

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

ODER_CZE	226.14	0.31	5.88	15.56	107	97.77	150.38	
ODER_DEU	137.32	10.70	3.55	34.17	43	46.32	228.32	
ODER_POL	4,356.65	103.59	69.73	2,637.22	548	997.95	320.04	
ODER_SVK								
Total in Basin	4,720.11	114.60	79.16	2,686.96	697.35	1,142.04	300.30	22.48

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
ODER_ CZE	7	0.06	1,504	207.20	0.53	0.00	100.00	2	18,861.43	5	688.93
ODER_ DEU	6	0.05	601	105.15	-0.06	0.00	100.00	0	45,084.87	0	0.00
ODER_ POL	106	0.89	13,613	128.10	0.06	0.00	100.00	15	13,431.95	10	94.10
ODER_ SVK	0	0.00	0	0.00	0.17			0	17,689.04	0	0.00
Total in Basin	119	1.00	15,718	131.81	0.01	0.00	100.00	17	15,162.56	15	125.79

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
ODER_CZE	1	1	2		2	1	5	4	2	2	1	1	1	1	2
ODER_DEU	1	4	2		1		4	3	2	2	1	1	1	1	3
ODER_POL	2	4	2		2	1	4	3	2	2	1	2	3	1	2
ODER_SVK					3					3	1	2	1	1	
River Basin	2	4	2	4	2	1	4	4	2	2	1	2	3	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

ODER_CZE	2	2	2	2			1	1	1
ODER_DEU	2	2	5	4			1	1	1
ODER_POL	2	2	4	4			1	1	1
ODER_SVK							1	1	1
River Basin	2	2	4	4	5	5	1	1	1

TWAP RB Assessment results: Water System Linkages

Thematic group	**Lake Influence Indicator**	**Delta Vulnerability Index**			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

Indicators

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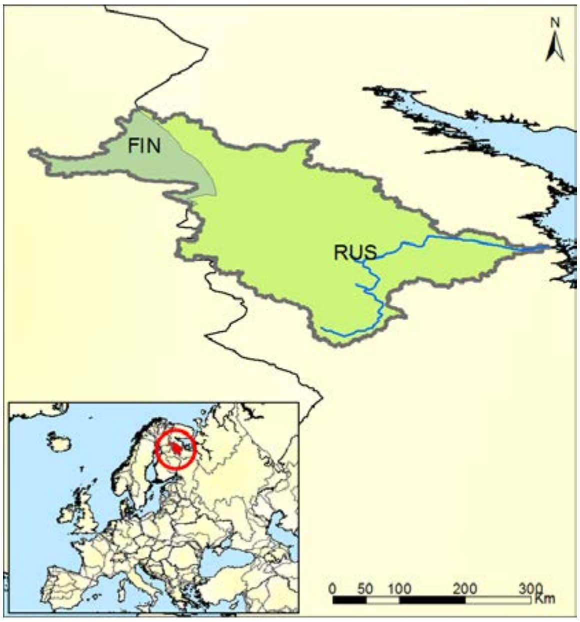
ESA/NASA, ESA Astronaut Alexander Gerst

Olanga Basin



Geography

Total drainage area (km^2)	41,766
No. of countries in basin	2
BCUs in basin	Finland (FIN), Russian Federation (RUS)
Population in basin (people)	49,787
Country at mouth	Russian Federation
Average rainfall (mm/year)	606

Governance

No. of treaties and agreements[1]	3
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	13
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
OLNG_FIN		414.74			383.70	4.16
OLNG_RUS		289.30			2,504.10	35.47
Total in Basin	12.65	302.91			2,887.80	39.63

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
OLNG_FIN	1.10	0.02	0.13	0.02	0	0.92	101.01	
OLNG_RUS	7.41	0.00	0.20	0.00	1	6.67	190.33	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	8.50	0.03	0.33	0.02	0.54	7.58	170.81	0.07

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
OLNG_FIN	6	0.14	11	1.88	0.45	0.00	100.00	0	47,218.77	0	0.00
OLNG_RUS	36	0.86	39	1.08	-0.12	0.00	100.00	0	14,611.70	0	0.00
Total in Basin	42	1.00	50	1.19	0.28	0.00	100.00	0	21,737.24	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
OLNG_FIN	1	1	1		1		2	2	3	3	2	1	1	1	1
OLNG_RUS	1	1	1		4	1	2	1	3	2	2	2	1	2	1
River Basin	1	1	1	2	4	1	2	2	2	2	2	2	1	2	1

Indicators

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Very low Low Medium High Very high

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Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
OLNG_FIN	3	3	1	1			1	1	2
OLNG_RUS	2	3	1	1			1	1	2
River Basin	2	4	1	1	2	2	1	1	2

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	5				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

UNEP gef UNEP-DHI PARTNERSHIP Centre on Water and Environment UNEP DHI

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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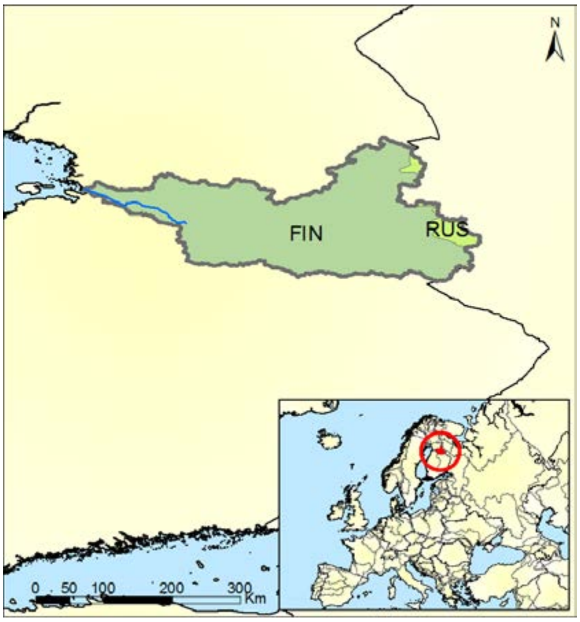
Oulu Basin



Geography

Total drainage area (km^2)	25,972
No. of countries in basin	2
BCUs in basin	Finland (FIN), Russian Federation (RUS)
Population in basin (people)	172,018
Country at mouth	Finland
Average rainfall (mm/year)	658

Governance

No. of treaties and agreements[1]	2
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	8
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
OULU_FIN		348.56			1,406.10	37.71
OULU_RUS		336.06			105.70	0.85
Total in Basin	9.04	348.11			1,511.80	38.55

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
OULU_FIN	87.07	4.57	2.12	13.17	46	20.74	507.83	
OULU_RUS	0.15	0.00	0.01	0.00	0	0.13	258.25	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	87.22	4.57	2.13	13.17	46.47	20.88	507.01	0.96

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
OULU_FIN	25	0.95	171	6.95	0.45	34.27	65.73	0	47,218.77	1	40.51
OULU_RUS	1	0.05	1	0.44	-0.12			0	14,611.70	0	0.00
Total in Basin	26	1.00	172	6.62	0.47	34.16	65.52	0	47,112.63	1	38.50

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
OULU_FIN	2	1	2		1		3	3	3	4	2	1	1	1	1
OULU_RUS	1	1	1		4		2	2	3	3	2	2	1	2	1
River Basin	2	1	2	3	1		3	3	3	4	2	1	1	1	1

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
OULU_FIN	3	4	1	1			1	1	2
OULU_RUS	3	5	1	1			1	1	2
River Basin	3	4	1	1	3	3	1	1	2

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	5				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Parnu Basin

Geography

Total drainage area (km^2)	6,923
No. of countries in basin	2
BCUs in basin	Estonia (EST), Latvia (LVA)
Population in basin (people)	114,468
Country at mouth	Estonia
Average rainfall (mm/year)	775

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
PRNU_EST		405.79				
PRNU_LVA						
Total in Basin	2.81	405.79			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
PRNU_EST	98.47	0.98	2.21	81.24	4	9.63	860.79	
PRNU_LVA								

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	98.47	0.98	2.21	81.24	4.42	9.63	860.24	3.51

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
PRNU_EST	7	1.00	114	16.55	-0.07	15.44	84.56	0	18,478.27	0	0.00
PRNU_LVA	0	0.00	0	7.66	-0.47			0	15,375.45	0	0.00
Total in Basin	7	1.00	114	16.53	-0.03	15.43	84.50	0	18,476.29	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
PRNU_EST	1	1	2		2		3		2	4	3	2	3	2	2
PRNU_LVA					3				3	4	3	2	1	1	1
River Basin	1	1	2	4	2		3		2	4	3	2	3	2	2

Indicators

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Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
PRNU_EST	3	3	1	1			1	1	3
PRNU_LVA									3
River Basin	3	3	1	1	4	4	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

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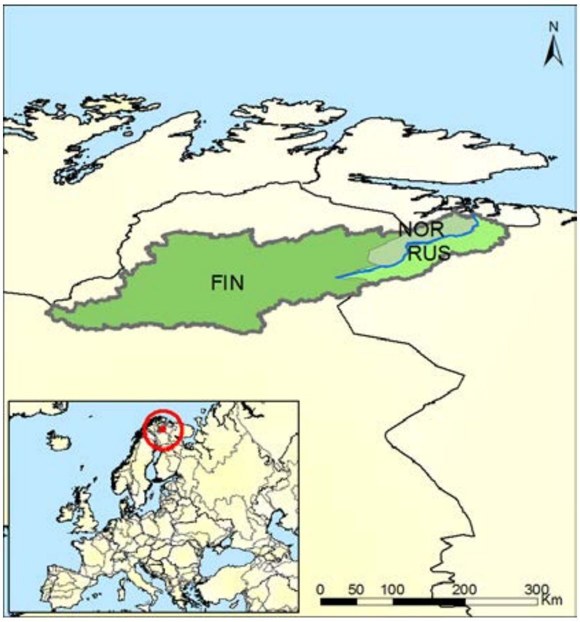
Pasvik Basin



Geography

Total drainage area (km²)	17,961
No. of countries in basin	2
BCUs in basin	Finland (FIN), Norway (NOR), Russian Federation (RUS)
Population in basin (people)	12,893
Country at mouth	Norway, Russian Federation
Average rainfall (mm/year)	499

Governance

No. of treaties and agreements[1]	10
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	2
Large Marine Ecosystems	1

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All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
PSVK_FIN		392.19			1,184.60	16.58
PSVK_NOR		294.53			43.32	0.25
PSVK_RUS		282.77			22.78	0.13
Total in Basin	6.57	365.65			1,250.70	16.97

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
PSVK_FIN	0.59	0.00	0.05	0.02	0	0.53	116.05	

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[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

PSVK_NOR	1.29	0.00	0.07	0.00	0	1.22	389.09	
PSVK_RUS	0.55	0.00	0.02	0.00	0	0.53	121.49	
Total in Basin	2.43	0.00	0.13	0.02	0.00	2.28	188.16	0.04

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
PSVK_FIN	14	0.79	5	0.36	0.45			0	47,218.77	0	0.00
PSVK_NOR	1	0.08	3	2.26	1.09	0.00	100.00	0	100,818.50	1	682.02
PSVK_RUS	2	0.12	4	2.01	-0.12			0	14,611.70	1	446.73
Total in Basin	18	1.00	13	0.72	0.60	0.00	25.71	0	49,625.44	2	111.35

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
PSVK_FIN	2	1	1		1	1	1	4	3	2	1	1	1	1	1
PSVK_NOR	1	1	1		2		2	3	3	2	1	1	1	1	1
PSVK_RUS	1	1	1		4		2	3	3	1	1	2	1	2	1
River Basin	2	1	1	2	2	1	1	4	2	2	1	1	1	1	1

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Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
PSVK_FIN	4	5	1	1			1	1	1
PSVK_NOR	3	4	1	1			1	1	1
PSVK_RUS	2	3	1	1			1	1	1
River Basin	3	5	1	1	2	2	1	1	1

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TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
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Po Basin

Geography

Total drainage area (km^2)	72,450
No. of countries in basin	3
BCUs in basin	France (FRA), Italy (ITA), Switzerland (CHE)
Population in basin (people)	15,918,158
Country at mouth	Italy
Average rainfall (mm/year)	1,058

Governance

No. of treaties and agreements[1]	7
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	5
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
POXX_CHE		1,595.57			39.01	6.90
POXX_FRA						
POXX_ITA		655.18			719.59	106.09
Total in Basin	48.95	675.70			758.60	113.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
POXX_CHE	49.58	0.98	1.49	0.20	11	36.39	162.22	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

POXX_FRA								
POXX_ITA	18,525.12	7,418.56	109.20	3,888.20	3,719	3,389.76	1,186.66	
Total in Basin	18,574.70	7,419.54	110.70	3,888.41	3,729.90	3,426.15	1,166.89	37.94

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
POXX_CHE	4	0.05	306	80.97	0.66	46.12	53.88	0	80,477.43	8	2,119.61
POXX_FRA	0	0.00	1	7.00	0.58			0	41,420.76	1	4,880.22
POXX_ITA	68	0.95	15,611	228.00	0.63	0.00	100.00	9	34,619.24	24	350.51
Total in Basin	72	1.00	15,918	219.71	0.50	0.89	99.11	9	35,500.29	33	455.48

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
POXX_CHE	1	1	2		1	3	5	5	3	2	1	1	1	1	3
POXX_FRA					1	3			3	4	3	1	1	1	4
POXX_ITA	2	4	3		1	3	5	5	3	2	1		5	2	2
River Basin	2	3	3	4	1	3	5	5	3	2	1		5	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
POXX_CHE	2	3	1	1			1	1	1
POXX_FRA									3
POXX_ITA	3	3	4	4			1	1	1
River Basin	3	3	4	4	4	4	1	1	1

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	4				

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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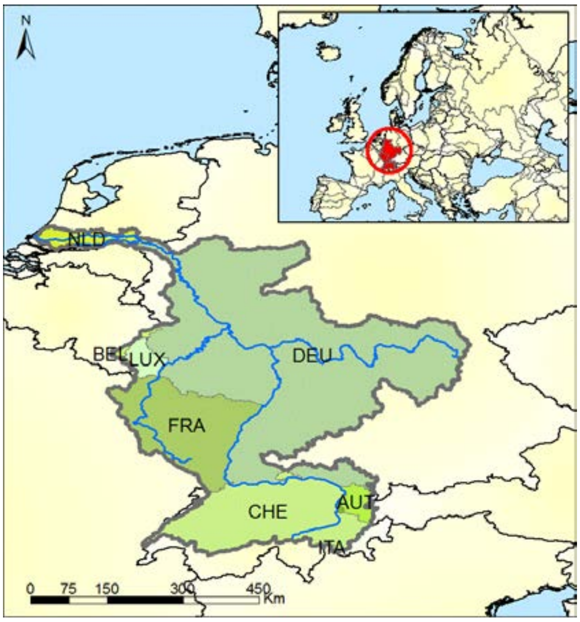
Rhine Basin



Geography

Total drainage area (km^2)	163,609
No. of countries in basin	9
BCUs in basin	Austria (AUT), Belgium (BEL), France (FRA), Germany (DEU), Italy (ITA), Liechtenstein (LIE), Luxembourg (LUX), Netherlands (NLD), Switzerland (CHE)
Population in basin (people)	48,831,090
Country at mouth	Netherlands
Average rainfall (mm/year)	1,000

Governance

No. of treaties and agreements[1]	37
No. of RBOs and Commissions[2]	9

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	5
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
RHIN_AUT		1,207.52			46.31	4.17
RHIN_BEL		435.31				
RHIN_CHE		1,023.31			540.79	43.31
RHIN_DEU		353.16			298.39	26.86
RHIN_FRA		393.20				
RHIN_ITA						
RHIN_LIE						
RHIN_LUX		369.68				
RHIN_NLD		413.67				

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
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Total in Basin	74.97	458.25			885.50	74.34

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
RHIN_AUT	224.44	0.12	2.67	7.57	182	31.98	668.90	
RHIN_BEL	102.98	0.09	2.09	23.96	60	16.79	2,300.24	
RHIN_CHE	2,787.31	20.66	29.10	1,365.57	441	930.49	505.87	
RHIN_DEU	15,562.70	510.79	150.04	8,958.01	3,557	2,386.65	442.08	
RHIN_FRA	3,003.54	93.03	18.94	2,357.11	195	339.07	778.60	
RHIN_ITA								
RHIN_LIE								
RHIN_LUX	335.50	1.29	3.81	213.33	55	62.00	783.25	
RHIN_NLD	6,817.79	405.58	70.95	3,095.17	2,397	848.88	1,994.59	
Total in Basin	28,834.26	1,031.54	277.60	16,020.73	6,888.55	4,615.85	590.49	38.46

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
RHIN_AUT	2	0.01	336	140.59	0.39	0.00	100.00	0	49,053.82	0	0.00
RHIN_BEL	1	0.00	45	57.36	0.56	8.64	91.36	0	45,387.18	0	0.00
RHIN_CHE	28	0.17	5,510	197.36	0.66	32.71	67.29	3	80,477.43	20	716.39
RHIN_DEU	102	0.63	35,204	344.08	-0.06	0.00	100.00	45	45,084.87	17	166.16
RHIN_FRA	24	0.14	3,858	162.87	0.58	0.00	100.00	8	41,420.76	3	126.66
RHIN_ITA	0	0.00	1	18.02	0.63			0	34,619.24	1	18,739.94
RHIN_LIE	0	0.00	32	213.65		9.59	90.41	0	0.00	0	0.00
RHIN_LUX	3	0.02	428	168.44	2.09	40.63	59.37	0	111,161.69	1	393.23
RHIN_NLD	4	0.02	3,418	904.32	0.37	0.00	100.00	6	47,617.40	0	0.00
Total in Basin	164	1.00	48,831	298.46	0.38	4.06	95.94	62	49,543.47	42	256.71

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity	Water Quality	Ecosystems	Governance	Socioeconomics

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RHIN_AUT	1	1	1		2	1	5	4	3	1	1		1	1	3
RHIN_BEL	1	1	1		2		4	5	2	1	1	1	1	1	1
RHIN_CHE	1	2	2		1	2	5	5	3	1	1	1	4	1	2
RHIN_DEU	2	4	2		1	2	5	4	3	1	1	1	4	1	3
RHIN_FRA	2	3	2		1	1	4	4	3	1	1	1	1	1	3
RHIN_ITA					1	4			2	3	2		1	2	1
RHIN_LIE									2	4	3		5	1	2
RHIN_LUX	1	3	2		1		4	4	2	1	1		5	1	2
RHIN_NLD	2		2		1	5			2	1	1	1	5	1	4
River Basin	2	3	2	5	1	2	5	5	3	1	1	1	4	1	3

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
RHIN_AUT	3	3	1	1			1	1	1
RHIN_BEL	2	2	1	1			1	1	1
RHIN_CHE	3	3	2	2			1	1	1
RHIN_DEU	2	2	4	4			1	1	1
RHIN_FRA	2	2	3	3			1	1	1
RHIN_ITA									2
RHIN_LIE									3
RHIN_LUX	2	2	3	3			1	2	1
RHIN_NLD	3	3					1	1	1
River Basin	2	3	3	3	4	4	1	1	1

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	3	2	3	4	1

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Rhone Basin

Geography

Total drainage area (km^2)	96,856
No. of countries in basin	3
BCUs in basin	France (FRA), Italy (ITA), Switzerland (CHE)
Population in basin (people)	10,055,260
Country at mouth	France
Average rainfall (mm/year)	1,120

Governance

No. of treaties and agreements[1]	12
No. of RBOs and Commissions[2]	4

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	3
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
RHON_CHE		1,022.09			322.68	49.69
RHON_FRA		513.48			266.72	36.48
RHON_ITA		405.59				
Total in Basin	52.34	540.38			589.40	86.17

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
RHON_CHE	242.33	40.37	5.48	3.28	60	132.97	203.40	

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RHON_FRA	7,960.22	1,951.65	61.21	4,289.26	580	1,077.96	898.18	
RHON_ITA	4.22	2.61	0.17	0.00	0	1.45	3,312.34	
Total in Basin	8,206.77	1,994.62	66.86	4,292.54	640.37	1,212.37	816.17	15.68

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
RHON_CHE	8	0.08	1,191	156.81	0.66	22.14	77.86	2	80,477.43	8	1,053.02
RHON_FRA	89	0.92	8,863	99.50	0.58	0.00	100.00	12	41,420.76	30	336.81
RHON_ITA	0	0.00	1	6.77				0	34,619.24	0	0.00
Total in Basin	97	1.00	10,055	103.82	0.60	2.62	97.36	14	46,047.35	38	392.34

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
RHON_CHE	1	1	2		1	3	5	5	3	2	1	1	4	1	3
RHON_FRA	2	2	2		1	1	5	4	4	2	3	1	3	1	3
RHON_ITA	1		2		1	3			3	4	3		1	2	1
River Basin	2	2	2	4	1	1	5	5	3	2	3	1	3	2	3

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Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
RHON_CHE	3	4	1	1			1	1	1
RHON_FRA	2	3	2	2			1	1	3
RHON_ITA	3	3							3
River Basin	3	3	2	2	4	4	1	1	3

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

TWAP RB Assessment results: Water System Linkages

Thematic group	**Lake Influence Indicator**	**Delta Vulnerability Index**			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	4	5	4	2	2

Indicators

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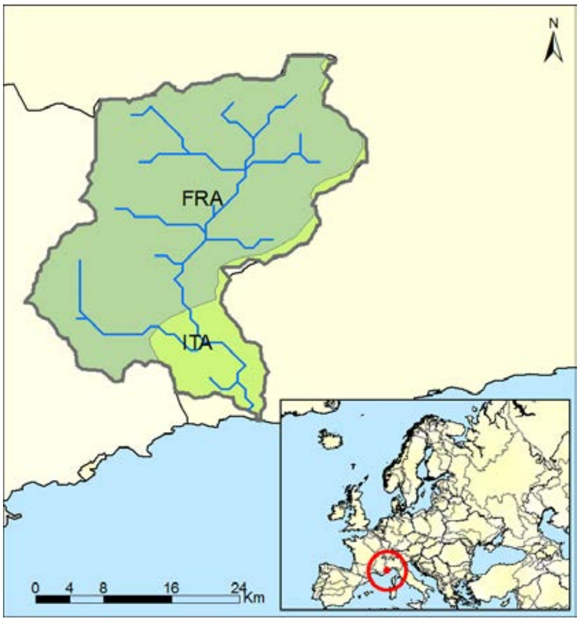
Roia Basin



Geography

Total drainage area (km^2)	675
No. of countries in basin	2
BCUs in basin	France (FRA), Italy (ITA)
Population in basin (people)	25,866
Country at mouth	Italy
Average rainfall (mm/year)	1,134

Governance

No. of treaties and agreements[1]	2
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
ROIA_FRA						
ROIA_ITA		647.75				
Total in Basin	0.44	647.75			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
ROIA_FRA								
ROIA_ITA	168.76	8.77	0.31	13.21	56	90.38	9,717.33	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	168.76	8.77	0.31	13.21	56.09	90.38	6,524.27	38.60

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
ROIA_FRA	1	0.85	8	14.87	0.58			0	41,420.76	0	0.00
ROIA_ITA	0	0.15	17	167.70	0.63	0.00	100.00	0	34,619.24	0	0.00
Total in Basin	1	1.00	26	38.32	0.50	0.00	67.14	0	36,854.18	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ROIA_FRA					1				3	3	2	1	1	1	1
ROIA_ITA	1		2		1				3	3	2		1	2	4
River Basin	1		2	5	1				2	3	2		1	2	3

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
ROIA_FRA									2
ROIA_ITA	2	2							2
River Basin	2	2			4	4			2

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Salaca Basin

Geography

Total drainage area (km²)	3,585
No. of countries in basin	2
BCUs in basin	Estonia (EST), Latvia (LVA)
Population in basin (people)	48,397
Country at mouth	Latvia
Average rainfall (mm/year)	747

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km³/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km³/year)	Av. Groundwater Discharge (km³/year)	Lake and Reservoir Surface Area (km²)	Lake and Reservoir Volume (km³)
SALC_EST						
SALC_LVA		379.79				
Total in Basin	1.36	379.79			0.00	0.00

Water Withdrawals

BCU	Total (km³/year)	Irrigation (km³/year)	Livestock (km³/year)	Electricity (km³/year)	Manufacture (km³/year)	Domestic (km³/year)	Per capita (m³/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
SALC_EST								
SALC_LVA	9.11	0.27	0.45	0.00	4	4.79	208.87	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	9.11	0.27	0.45	0.00	3.60	4.79	188.15	0.67

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
SALC_EST	0	0.08	5	17.53	-0.07			0	18,478.27	0	0.00
SALC_LVA	3	0.92	44	13.17	-0.47	0.00	100.00	0	15,375.45	0	0.00
Total in Basin	4	1.00	48	13.50	-0.93	0.00	90.08	0	15,683.21	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SALC_EST					2				3	4	3	2	1	2	1
SALC_LVA	1	1	2		3		2	2	3	4	3	2	1	1	3
River Basin	1	1	2	4	3		2	3	2	4	3	2	1	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low | Low | Medium | High | Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
SALC_EST									3
SALC_LVA	3	3	1	1			1	1	3
River Basin	3	3	1	1	4	4	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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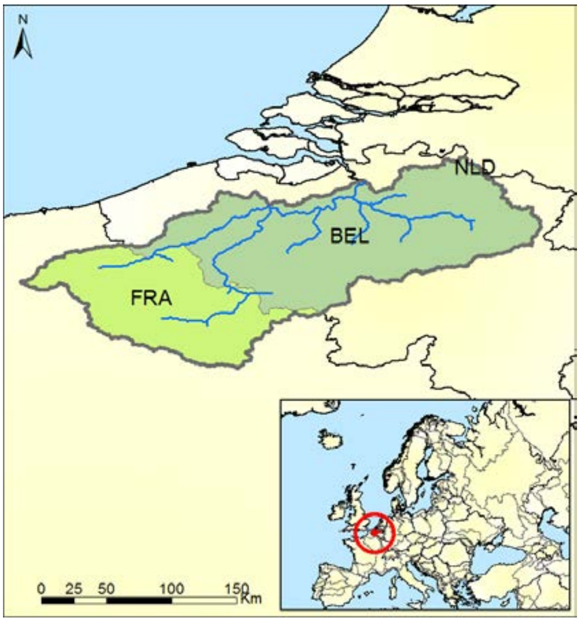
Schelde Basin



Geography

Total drainage area (km^2)	19,069
No. of countries in basin	3
BCUs in basin	Belgium (BEL), France (FRA), Netherlands (NLD)
Population in basin (people)	9,158,158
Country at mouth	Belgium
Average rainfall (mm/year)	844

Governance

No. of treaties and agreements[1]	3
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
SHLD_BEL		381.55				
SHLD_FRA		404.98				
SHLD_NLD		452.06				
Total in Basin	7.52	394.62			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
SHLD_BEL	7,220.40	146.62	81.00	4,031.22	2,323	638.96	1,169.74	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

SHLD_FRA	925.79	101.75	20.03	187.93	303	312.81	310.47	
SHLD_NLD	300.04	59.01	6.85	11.28	176	46.89	84,279.07	
Total in Basin	8,446.22	307.39	107.88	4,230.43	2,801.88	998.65	922.26	112.25

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
SHLD_BEL	12	0.65	6,173	499.57	0.56	0.07	99.93	4	45,387.18	0	0.00
SHLD_FRA	7	0.35	2,982	445.23	0.58	0.00	100.00	5	41,420.76	0	0.00
SHLD_NLD	0	0.00	4	238.32	0.37			0	47,617.40	0	0.00
Total in Basin	19	1.00	9,158	480.28	0.58	0.05	99.91	9	44,096.56	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
SHLD_BEL	2	5	2		2	1	4	4	2	3	2	1	5	1	3
SHLD_FRA	2	4	2		1		5	2	2	3	2	1	1	1	2
SHLD_NLD	2		2		1				2	4	2	1	1	1	1
River Basin	2	5	2	5	2	1	5	4	2	3	2	1	4	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
SHLD_BEL	3	2	5	5			1	1	2
SHLD_FRA	2	2	5	5			1	1	2
SHLD_NLD	3	3							2
River Basin	2	2	5	5	5	5	1	1	2

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TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
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Seine Basin

Geography

Total drainage area (km^2)	73,474
No. of countries in basin	2
BCUs in basin	Belgium (BEL), France (FRA)
Population in basin (people)	15,775,468
Country at mouth	France
Average rainfall (mm/year)	862

Governance

No. of treaties and agreements[1]	1
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

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Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
SEIN_BEL						
SEIN_FRA		281.88				
Total in Basin	20.71	281.88			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
SEIN_BEL								
SEIN_FRA	8,353.32	1,659.03	62.88	3,811.46	1,034	1,786.37	529.67	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	8,353.32	1,659.03	62.88	3,811.46	1,033.59	1,786.37	529.51	40.33

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km²)
SEIN_BEL	0	0.00	5	64.09	0.56			0	45,387.18	0	0.00
SEIN_FRA	73	1.00	15,771	214.86	0.58	0.00	100.00	7	41,420.76	10	136.24
Total in Basin	73	1.00	15,775	214.71	0.53	0.00	99.97	7	41,421.94	10	136.10

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SEIN_BEL					2				2	4	3	1	1	1	1
SEIN_FRA	2	3	2		1	2	4	3	3	4	3	1	3	1	3
River Basin	2	3	2	5	1	2	5	3	2	4	3	1	3	2	3

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
SEIN_BEL							1	1	3
SEIN_FRA	2	2	4	4			1	1	3
River Basin	2	2	4	4	5	5	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Struma Basin

Geography

Total drainage area (km^2)	16,825
No. of countries in basin	4
BCUs in basin	Bulgaria (BGR), Greece (GRC), Serbia (SRB), The former Yugoslav Republic of Macedonia (MFD)
Population in basin (people)	945,538
Country at mouth	Greece
Average rainfall (mm/year)	589

Governance

No. of treaties and agreements[1]	3
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	1
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
STUM_BGR		274.70				
STUM_GRC		180.32				
STUM_MFD						
STUM_SRB						
Total in Basin	3.71	220.39			0.00	0.00

Water Withdrawals

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

BCU	Total (km³/year)	Irrigation (km³/year)	Livestock (km³/year)	Electricity (km³/year)	Manufacture (km³/year)	Domestic (km³/year)	Per capita (m³/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
STUM_BGR	442.18	126.84	1.30	229.32	45	40.13	950.37	
STUM_GRC	1,047.47	998.77	3.63	0.16	3	42.40	3,576.01	
STUM_MFD								
STUM_SRB								
Total in Basin	1,489.65	1,125.61	4.93	229.49	47.09	82.53	1,575.45	40.17

Socioeconomic Geography

BCU	Area ('000 km²)	BCU area in basin (%)	Population ('000 people)	Population density (people/km²)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km²)
STUM_BGR	8	0.50	465	54.78	-0.64	0.00	100.00	0	7,296.49	2	235.46
STUM_GRC	6	0.36	293	48.68	0.31	58.76	41.24	0	21,910.22	0	0.00
STUM_MFD	2	0.10	122	74.59		0.00	100.00	0	4,850.51	2	1,226.82
STUM_SRB	1	0.04	66	96.24	0.00			0	5,935.32	0	0.00
Total in Basin	17	1.00	946	56.20	-0.47	18.20	74.84	0	11,414.43	4	237.74

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
STUM_BGR	2	4	2		4		4	3	3	4	5	1	1	1	2
STUM_GRC	3	5	5		1	1	4	2	3	3	3	3	2	1	1
STUM_MFD					5				3	4	3	5	1	2	2
STUM_SRB					5				3	4	1	4	1	2	1
River Basin	3	4	3	4	3	1	5	3	3	4	4	2	1	2	2

Indicators

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Very low Low Medium High Very high

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
STUM_BGR	3	4	4	4			1	1	5
STUM_GRC	4	5	5	5			1	1	3
STUM_MFD									3
STUM_SRB									1
River Basin	4	5	4	5	5	5	1	1	4

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	2				

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Tagus/Tejo Basin

Geography

Total drainage area (km^2)	71,190
No. of countries in basin	2
BCUs in basin	Portugal (PRT), Spain (ESP)
Population in basin (people)	7,243,802
Country at mouth	Portugal
Average rainfall (mm/year)	713

Governance

No. of treaties and agreements[1]	4
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	7
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
TAGU_ESP		172.82			484.75	3.10
TAGU_PRT		458.22			79.95	0.46
Total in Basin	19.30	271.09			564.70	3.56

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
TAGU_ESP	4,991.18	2,689.22	24.04	1,181.16	401	696.26	766.29	
TAGU_PRT	2,976.59	2,042.42	16.58	344.24	239	334.61	4,075.31	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	7,967.77	4,731.64	40.62	1,525.41	639.24	1,030.87	1,099.94	41.29

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
TAGU_ESP	56	0.78	6,513	116.83	1.20	0.78	99.22	7	29,117.64	39	699.53
TAGU_PRT	15	0.22	730	47.31	0.25	40.93	59.07	0	21,035.01	9	582.95
Total in Basin	71	1.00	7,244	101.75	-0.27	4.83	95.17	7	28,302.66	48	674.25

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
TAGU_ESP	4	3	3		1	1	5	3	4	1	1	1	2	1	3
TAGU_PRT	4	2	3		2	1	5	3	3	1	1	3	2	2	2
River Basin	4	3	3	3	1	1	5	3	3	1	1	1	2	2	3

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
TAGU_ESP	4	5	4	4			1	1	1
TAGU_PRT	4	5	3	3			1	1	1
River Basin	4	5	3	4	3	3	1	1	1

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

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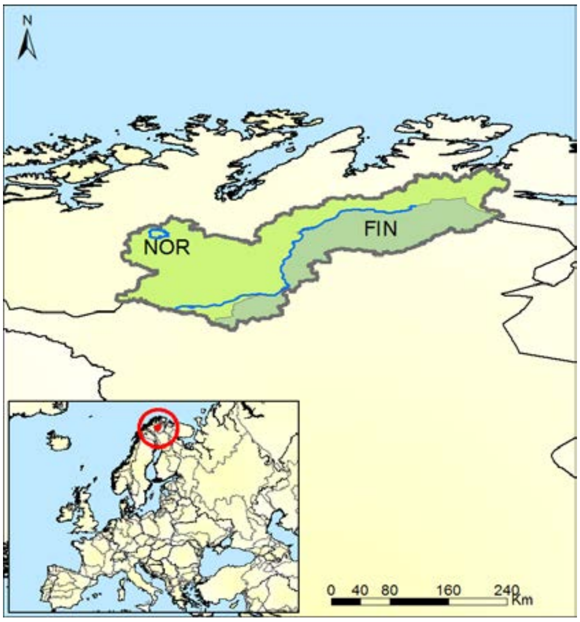
Tana Basin



Geography

Total drainage area (km^2)	16,872
No. of countries in basin	2
BCUs in basin	Finland (FIN), Norway (NOR)
Population in basin (people)	7,054
Country at mouth	Finland
Average rainfall (mm/year)	478

Governance

No. of treaties and agreements[1]	1
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	1
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
TANA_FIN		357.42				
TANA_NOR		338.88			71.50	0.29
Total in Basin	5.80	343.54			71.50	0.29

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
TANA_FIN	0.34	0.09	0.04	0.00	0	0.22	245.26	
TANA_NOR	3.11	0.23	0.31	0.00	0	2.57	550.52	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	3.46	0.32	0.34	0.00	0.00	2.79	489.76	0.06

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
TANA_FIN	6	0.35	1	0.24	0.45			0	47,218.77	0	0.00
TANA_NOR	11	0.65	6	0.52	1.09	100.00	0.00	0	100,818.50	0	0.00
Total in Basin	17	1.00	7	0.42	1.13	80.10	0.00	0	90,150.36	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TANA_FIN	1	1	1		1	1	1	4	3	3	2	1	1	1	1
TANA_NOR	1	1	1		2		2	2	3	3	2	1	1	1	1
River Basin	1	1	1	2	2	1	2	3	2	3	2	1	1	1	1

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
TANA_FIN	4	5	1	1			1	1	2
TANA_NOR	4	5	1	1			1	1	2
River Basin	4	5	1	1	3	3	1	1	2

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

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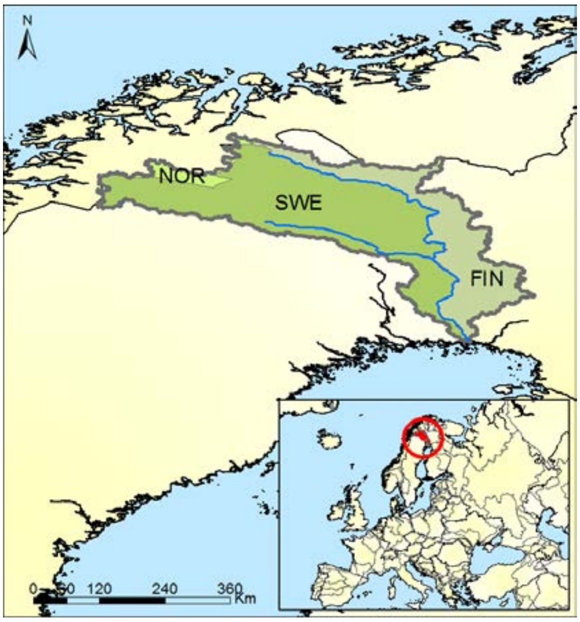
Torne/Tornealven Basin



Geography

Total drainage area (km²)	40,834
No. of countries in basin	3
BCUs in basin	Finland (FIN), Norway (NOR), Sweden (SWE)
Population in basin (people)	53,734
Country at mouth	Finland, Sweden
Average rainfall (mm/year)	565

Governance

No. of treaties and agreements[1]	3
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	3
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
TORN_FIN		369.95			54.20	0.31
TORN_NOR		286.41			82.40	1.15
TORN_SWE		444.19			315.40	16.40
Total in Basin	17.11	418.95			452.00	17.86

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
TORN_FIN	4.68	0.34	0.16	0.00	2	2.33	213.01	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

TORN_NOR	0.30	0.00	0.03	0.00	0	0.27	123.73	
TORN_SWE	6.51	0.22	0.23	0.00	0	6.06	222.03	
Total in Basin	11.49	0.56	0.42	0.00	1.85	8.65	213.88	0.07

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
TORN_FIN	13	0.31	22	1.72	0.45	0.00	100.00	0	47,218.77	0	0.00
TORN_NOR	2	0.04	2	1.39	1.09			0	100,818.50	1	570.60
TORN_SWE	26	0.64	29	1.11	0.76	0.00	100.00	0	58,269.03	0	0.00
Total in Basin	41	1.00	54	1.32	0.67	0.00	95.46	0	55,678.35	1	24.49

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
TORN_FIN	1	1	1		1	1	3	2	3	2	1	1	1	1	1
TORN_NOR	1	1	1		2		4	2	3	2	2	1	1	1	1
TORN_SWE	1	1	1		1	1	3	2	3	1	1	1	1	1	1
River Basin	1	1	1	2	1	1	3	2	2	2	1	1	1	1	1

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
TORN_FIN	3	5	1	1			1	1	1
TORN_NOR	4	5	1	1					2
TORN_SWE	4	5	1	1			1	1	1
River Basin	4	5	1	1	2	2	1	1	1

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	3				

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Tuloma Basin

Geography

Total drainage area (km^2)	27,005
No. of countries in basin	2
BCUs in basin	Finland (FIN), Russian Federation (RUS)
Population in basin (people)	123,556
Country at mouth	Russian Federation
Average rainfall (mm/year)	610

Governance

No. of treaties and agreements[1]	2
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	4
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
TULM_FIN		370.63				
TULM_RUS		399.67			753.20	11.03
Total in Basin	10.73	397.21			753.20	11.03

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
TULM_FIN	0.22	0.00	0.02	0.00	0	0.21	162.10	
TULM_RUS	604.93	0.00	0.49	570.71	10	23.62	4,951.46	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	605.15	0.00	0.50	570.71	10.11	23.83	4,897.77	5.64

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
TULM_FIN	2	0.09	1	0.56	0.45			0	47,218.77	0	0.00
TULM_RUS	25	0.91	122	4.98	-0.12	0.00	100.00	1	14,611.70	1	40.78
Total in Basin	27	1.00	124	4.58	0.23	0.00	98.88	1	14,977.17	1	37.03

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TULM_FIN	1	1	1		1		3	3	3	4	3	1	1	1	1
TULM_RUS	2	1	1		4	1	3	2	3	3	3	2	1	2	1
River Basin	2	1	1	1	4	1	3	2	2	3	3	2	1	2	1

Indicators

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Very low Low Medium High Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
TULM_FIN	5	5	1	1			1	1	3
TULM_RUS	4	5	1	1			1	1	3
River Basin	4	5	1	1	1	1	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	3				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Vardar Basin

Geography

Total drainage area (km^2)	24,558
No. of countries in basin	4
BCUs in basin	Bulgaria (BGR), Greece (GRC), Serbia (SRB), The former Yugoslav Republic of Macedonia (MFD)
Population in basin (people)	2,125,676
Country at mouth	Greece
Average rainfall (mm/year)	624

Governance

No. of treaties and agreements[1]	1
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	1
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
VRDR_BGR						
VRDR_GRC		236.62				
VRDR_MFD		309.89				
VRDR_SRB		349.63				
Total in Basin	7.44	303.09			0.00	0.00

Water Withdrawals

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
VRDR_BGR								
VRDR_GRC	2,141.27	1,970.80	2.00	0.00	37	131.77	17,198.12	
VRDR_MFD	1,808.57	1,180.52	9.32	156.09	271	191.44	1,011.04	
VRDR_SRB	186.14	85.20	1.70	0.02	25	74.64	879.06	
Total in Basin	4,135.98	3,236.51	13.03	156.11	332.48	397.85	1,945.72	55.57

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
VRDR_BGR	0	0.00	1	57.42	-0.64			0	7,296.49	0	0.00
VRDR_GRC	3	0.12	125	42.94	0.31	76.42	23.58	0	21,910.22	0	0.00
VRDR_MFD	20	0.83	1,789	87.58		0.00	100.00	1	4,850.51	4	195.83
VRDR_SRB	1	0.05	212	173.29	0.00			0	5,935.32	0	0.00
Total in Basin	25	1.00	2,126	86.56	-0.02	4.48	85.53	1	5,958.49	4	162.88

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
VRDR_BGR					4				2	4	3	1	1	1	1
VRDR_GRC	4	5	5		1	3	4	2	3	3	4	3	3	1	2
VRDR_MFD	2	3	3		5		5	2	3	4	5	5	5	2	3
VRDR_SRB	2	4	3		5		5	4	2	4	4	4	1	2	1
River Basin	3	4	3	4	5	1	5	3	2	4	5	5	5	2	3

Indicators

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Very low	Low	Medium	High	Very high

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TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
VRDR_BGR									3
VRDR_GRC	5	5	5	5			1	1	4
VRDR_MFD	3	4	4	4					5
VRDR_SRB	3	3	5	5			2	3	4
River Basin	3	4	4	5	4	5	1	2	5

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
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Venta Basin

Geography

Total drainage area (km^2)	11,901
No. of countries in basin	2
BCUs in basin	Latvia (LVA), Lithuania (LTU)
Population in basin (people)	352,694
Country at mouth	Latvia
Average rainfall (mm/year)	771

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
VENT_LTU		408.31				
VENT_LVA		379.50				
Total in Basin	4.66	391.21			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
VENT_LTU	12.44	0.31	1.49	0.00	3	7.51	59.66	
VENT_LVA	19.46	0.07	0.93	0.00	9	9.90	134.99	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	31.90	0.38	2.42	0.00	11.69	17.41	90.45	0.69

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
VENT_LTU	5	0.44	209	40.12	-0.55	3.24	96.76	0	15,537.92	0	0.00
VENT_LVA	7	0.56	144	21.51	-0.47	3.84	96.16	0	15,375.45	0	0.00
Total in Basin	12	1.00	353	29.64	-1.05	3.49	96.51	0	15,471.50	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VENT_LTU	1	1	2		3		3	3	2	4	3	1	1	2	2
VENT_LVA	1	1	1		3	1	2	3	3	4	3	2	1	1	2
River Basin	1	1	1	4	3	1	2	3	2	4	3	1	1	2	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
VENT_LTU	3	3	1	1			1	1	3
VENT_LVA	2	3	1	1			1	1	3
River Basin	3	3	1	1	4	4	1	1	3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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Vijose Basin

Geography

Total drainage area (km^2)	6,816
No. of countries in basin	2
BCUs in basin	Albania (ALB), Greece (GRC)
Population in basin (people)	248,310
Country at mouth	Albania
Average rainfall (mm/year)	1,001

Governance

No. of treaties and agreements[1]	1
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
VJSE_ALB		850.06				
VJSE_GRC		635.08				
Total in Basin	4.75	696.31			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
VJSE_ALB	196.00	171.65	2.30	0.00	0	22.04	833.32	
VJSE_GRC	398.83	369.25	3.62	0.00	0	25.62	30,417.41	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	594.83	540.91	5.92	0.00	0.34	47.66	2,395.50	12.53

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
VJSE_ALB	4	0.66	235	52.52	0.39	0.00	100.00	0	4,652.35	0	0.00
VJSE_GRC	2	0.34	13	5.61	0.31	100.00	0.00	0	21,910.22	0	0.00
Total in Basin	7	1.00	248	36.43	-0.98	5.28	94.72	0	5,563.65	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
VJSE_ALB	2	1	2		5		4	2	3	2	4	5	1	2	3
VJSE_GRC	2	1	2		1		4	2	3	2	2	3	1	1	2
River Basin	2	1	2	4	5		4	3	2	2	4	4	1	2	2

Indicators

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Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
VJSE_ALB	3	3	1	1			1	1	4
VJSE_GRC	3	3	1	1			1	1	2
River Basin	3	4	1	1	4	4	1	1	4

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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UNEP gef UNEP-DHI PARTNERSHIP Centre on Water and Environment UNEP DHI

Vuoksa Basin

Geography

Total drainage area (km^2)	287,094
No. of countries in basin	3
BCUs in basin	Belarus (BLR), Finland (FIN), Russian Federation (RUS)
Population in basin (people)	3,246,181
Country at mouth	Russian Federation
Average rainfall (mm/year)	695

Governance

No. of treaties and agreements[1]	5
No. of RBOs and Commissions[2]	1

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	62
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
VUKS_BLR		247.74				
VUKS_FIN		321.80			8,814.30	123.33
VUKS_RUS		299.18			30,535.70	1,132.35
Total in Basin	87.40	304.43			39,350.00	1,255.68

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
VUKS_BLR	2.81	0.26	0.40	0.00	0	2.15	599.84	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

VUKS_FIN	288.81	27.75	6.71	4.74	176	73.80	345.40	
VUKS_RUS	5,298.42	17.26	18.56	4,351.03	400	511.57	2,202.78	
Total in Basin	5,590.04	45.26	25.67	4,355.77	575.82	587.52	1,722.03	6.40

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
VUKS_BLR	0	0.00	5	10.09				0	7,575.48	0	0.00
VUKS_FIN	64	0.22	836	13.09	0.45	10.97	89.03	0	47,218.77	5	78.29
VUKS_RUS	223	0.78	2,405	10.80	-0.12	0.00	100.00	5	14,611.70	3	13.47
Total in Basin	287	1.00	3,246	11.31	0.29	2.83	97.03	5	23,000.59	8	27.87

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
VUKS_BLR	1	1	2		1	1	2	1	2	3	3		1	1	2
VUKS_FIN	2	1	2		1		5	3	3	2	1	1	4	1	1
VUKS_RUS	2	1	2		4	2	4	2	3	1	1	2	1	2	2
River Basin	2	1	2	3	4	2	4	2	2	2	1	2	2	2	1

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
VUKS_BLR	2	2	1	1					3
VUKS_FIN	2	3	1	1			1	1	1
VUKS_RUS	3	3	1	1			1	1	1
River Basin	3	3	1	1	3	3	1	1	1

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TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	17	18	19	20	21
River Basin	5				

Indicators

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Wiedau Basin

Geography

Total drainage area (km^2)	1,352
No. of countries in basin	2
BCUs in basin	Denmark (DNK), Germany (DEU)
Population in basin (people)	77,402
Country at mouth	Denmark
Average rainfall (mm/year)	977

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	1

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
WIED_DEU						
WIED_DNK		488.63				
Total in Basin	0.66	488.63			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
WIED_DEU								
WIED_DNK	366.83	184.09	8.42	106.96	25	42.70	6,915.84	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	366.83	184.09	8.42	106.96	24.65	42.70	4,739.28	55.52

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/ km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500 ,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000 .000 km^2)
WIED_DEU	0	0.23	24	79.91	-0.06			0	45,084.87	0	0.00
WIED_DNK	1	0.77	53	50.65	0.48	32.15	67.85	0	58,894.00	0	0.00
Total in Basin	1	1.00	77	57.24	0.35	22.03	46.50	0	54,547.97	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
WIED_DEU					1	5			2	4	3	1	1	1	2
WIED_DNK	2		2		1	4			2	4	3	2	4	1	2
River Basin	2		2	5	1				2	4	3	2	3	1	2

Indicators

1 - Environmental water stress **2** – Human water stress **3** – Agricultural water stress **4** – Nutrient pollution **5** – Wastewater pollution **6** – Wetland disconnectivity **7** – Ecosystem impacts from dams **8** – Threat to fish **9** – Extinction risk **10** – Legal framework **11** – Hydropolitical tension **12** – Enabling environment **13** – Economic dependence on water resources **14** – Societal well-being **15** – Exposure to floods and droughts

Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**P-2030**	**P-2050**	**Projected**
WIED_DEU									3
WIED_DNK	2	2							3
River Basin	2	2			4	4			3

TWAP RB Assessment results: Water System Linkages

Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
Basin/Delta	**17**	**18**	**19**	**20**	**21**
River Basin	1				

[3] Lined (or dotted) cells indicate a lower degree of confidence in results due to global modelling limitations and other gap-filling methods.

Indicators

17 – Lake influence indicator **18** – Relative sea level rise (RSLR) **19** – Wetland ecological threat **20** – Population pressure **21** – Delta governance

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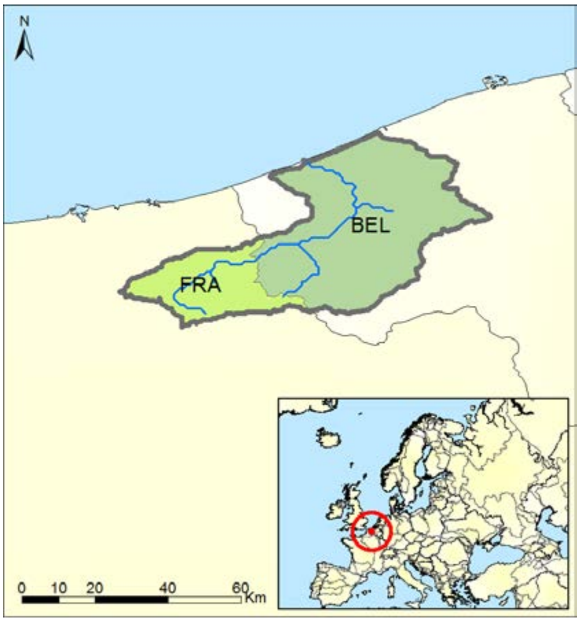
Yser Basin



Geography

Total drainage area (km^2)	1,560
No. of countries in basin	2
BCUs in basin	Belgium (BEL), France (FRA)
Population in basin (people)	293,784
Country at mouth	Belgium
Average rainfall (mm/year)	902

Governance

No. of treaties and agreements[1]	0
No. of RBOs and Commissions[2]	0

Geographical Overlap with Other Transboundary Systems

(No. of overlapping water systems)

Groundwater	
Lakes	0
Large Marine Ecosystems	0

A BCU (Basin Country Unit) is defined as the portion of a country within a particular river basin.
All BCUs have a BCU code which includes a Basin Code of four letters and a Country Code of three letters: XXXX-XXX

Water Resources

BCU	Annual Discharge (km^3/year)	Annual Runoff (mm/year)	Av. Groundwater Recharge (km^3/year)	Av. Groundwater Discharge (km^3/year)	Lake and Reservoir Surface Area (km^2)	Lake and Reservoir Volume (km^3)
YSER_BEL		278.87				
YSER_FRA		532.16				
Total in Basin	0.63	406.19			0.00	0.00

Water Withdrawals

BCU	Total (km^3/year)	Irrigation (km^3/year)	Livestock (km^3/year)	Electricity (km^3/year)	Manufacture (km^3/year)	Domestic (km^3/year)	Per capita (m^3/year)	Total withdrawal as a % of Total Actual Renewable Water Resources (%)
YSER_BEL	185.89	19.90	3.54	39.98	97	25.82	728.71	
YSER_FRA	180.91	19.96	1.41	111.61	17	30.49	4,676.48	

[1] For details on Treaties and Agreements please see http://www.transboundarywaters.orst.edu/
[2] For details on River Basin Organisations (RBOs) and Commissions please visit http://www.transboundarywaters.orst.edu/

Total in Basin	366.80	39.86	4.95	151.60	114.09	56.31	1,248.55	57.90

Socioeconomic Geography

BCU	Area ('000 km^2)	BCU area in basin (%)	Population ('000 people)	Population density (people/km^2)	Annual pop. growth (%)	Rural population ratio (% pop. rural)	Urban population ratio (% pop. urban)	Large Cities (>500,000)	GDP per capita (USD)	No. of dams	Dam Density (No./000.000 km^2)
YSER_BEL	1	0.76	255	215.82	0.56	0.00	100.00	0	45,387.18	0	0.00
YSER_FRA	0	0.24	39	102.45	0.58			0	41,420.76	0	0.00
Total in Basin	2	1.00	294	188.37	0.59	0.00	86.83	0	44,864.88	0	0.00

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Indicator[3]

Thematic group	Water Quantity			Water Quality			Ecosystems			Governance			Socioeconomics		
BCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
YSER_BEL	2		2		2				2	4	3	1	1	1	2
YSER_FRA	1		2		1				2	4	3	1	1	1	1
River Basin	2		2	5	2				2	4	3	1	1	2	2

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Very low	Low	Medium	High	Very high

TWAP RB Assessment Results: BCU and Basin Relative Risk Category per Projected Indicator

Projected Indicator	1.Environmental water stress		2.Human water stress		4.Nutrient pollution		16.Change in population density		11.Hydropolitical tension
Basin BCU	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	P-2030	P-2050	Projected
YSER_BEL	2	2							3
YSER_FRA	2	2							3
River Basin	2	2			5	5			3

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Thematic group	Lake Influence Indicator	Delta Vulnerability Index			
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River Basin	1				

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Large Marine Ecosystems of Northern, Western & Southern Europe

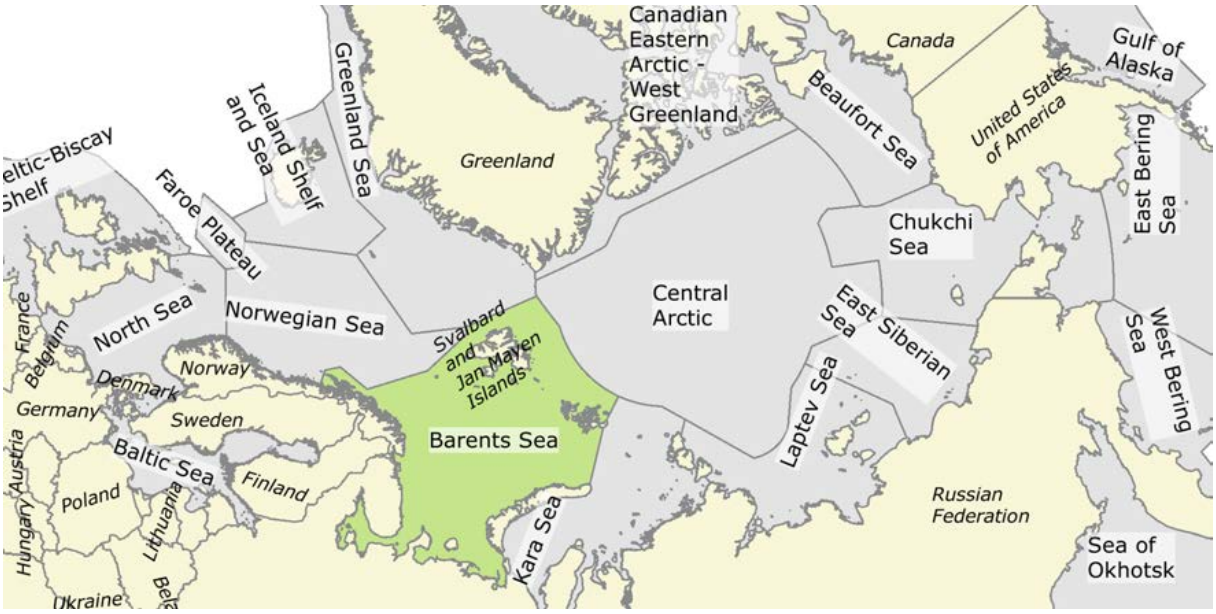
1. LME 20 - Barents Sea
2. LME 21 – Norwegian Sea
3. LME 22 – North Sea
4. LME 23 – Baltic Sea
5. LME 24 – Celtic-Biscay Shelf
6. LME 25 – Iberian Coastal
7. LME 26 – Mediterranean Sea
8. LME 59 – Iceland Shelf and Sea
9. LME 60 – Faroe Plateau

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

Center for Marine Assessment and Planning, UCSB

LME 20 – Barents Sea



Bordering countries: Norway, Russia, Svalbard
LME Total area: 2,023,335 km^2

Contents

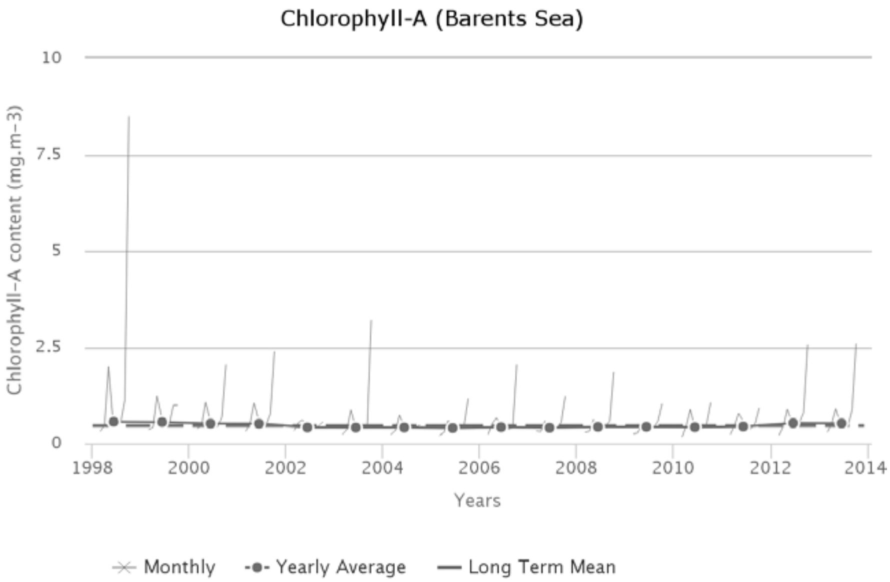
LME overall risk

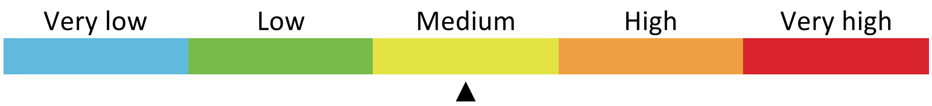
Results unavailable.

Productivity

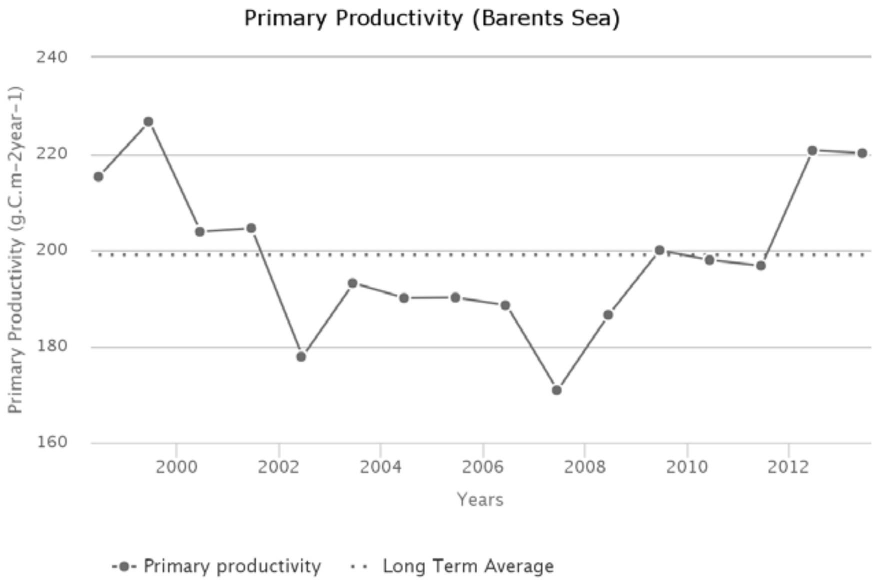
Chlorophyll-A

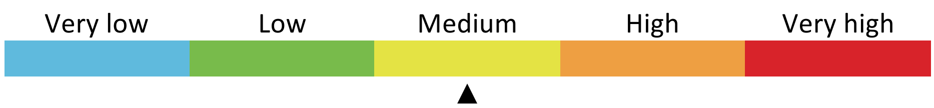
The annual Chlorophyll a concentration (CHL) cycle has a maximum peak (1.14 mg.m^{-3}) in October and a minimum (0.267 mg.m^{-3}) during March. The average CHL is 0.455 mg.m^{-3}. Maximum primary productivity (227 g.C.m^{-2}.y^{-1}) occurred during 1999 and minimum primary productivity (171 g.C.m^{-2}.y^{-1}) during 2007. There is a statistically insignificant increasing trend in Chlorophyll of 8.90 % from 2003 through 2013. The average primary productivity is 199 g.C.m^{-2}.y^{-1}, which places this LME in Group 3 of 5 categories (with 1 = lowest and 5= highest).





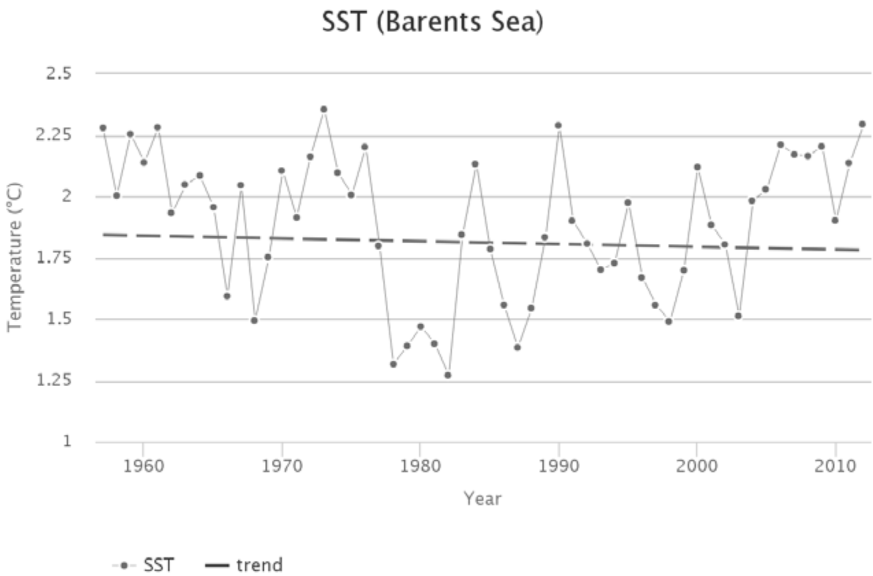
Primary productivity





Sea Surface Temperature

From 1957 to 2012, the Barents Sea LME #20 has cooled by 0.06°C, thus belonging to Category 5 (cooling LME). In the long-term, the Barents Sea LME appears relatively stable, although interannual variations of its SST are substantial, having a magnitude of 1°C. The timing of cold events of 1978-79, 1987, and 1997-99 is consistent with the well-documented passages of the decadal-scale Great Salinity Anomalies (Dickson et al., 1988; Belkin et al., 1998; Belkin, 2004) of the 1970s, 1980s, and 1990s through the Barents Sea. A few warming events are also noteworthy. The last warming event, of 2000, was concurrent with a sharp maximum in the Norwegian Sea LME #21. The previous SST peak of 1974 in the Norwegian Sea may have been related to the Barents Sea SST peak of 1973.



Fish and Fisheries

Results are unavailable for this LME.

Pollution and Ecosystem Health

Pollution

Nutrient ratio, Nitrogen load and Merged Indicator

Human activities in watersheds are affecting nutrients transported by rivers into LMEs. Large amounts of nutrients (in particular *nitrogen load*) entering coastal waters of LMEs can result in high biomass algal blooms, leading to hypoxic or anoxic conditions, increased turbidity and changes in community composition, among other effects. In addition, changes in the *ratio of nutrients* entering LMEs can result in dominance by algal species that have deleterious effects (toxic, clog gills of shellfish, etc.) on ecosystems and humans. An overall nutrient indicator (*Merged Nutrient Indicator*) based on 2 sub-indicators: *Nitrogen Load* and *Nutrient Ratio* (ratio of dissolved Silica to Nitrogen or Phosphorus - the Index of Coastal Eutrophication Potential or ICEP) was calculated.

Nitrogen load

The Nitrogen Load risk level for contemporary (2000) conditions was low (level 2 of the five risk categories, where 1 = lowest risk; 5 = highest risk). Based on a "current trends" scenario (Global Orchestration), this remained the same in 2030 and 2050.

Nutrient ratio

The Nutrient Ratio (ICEP) risk level for contemporary (2000) conditions was moderate (3). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

Merged nutrient indicator

The risk level for the Merged Nutrient Indicator for contemporary (2000) conditions was low (2). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

2000			2030			2050		
Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator
2	3	2	2	3	2	2	3	2

Legend:

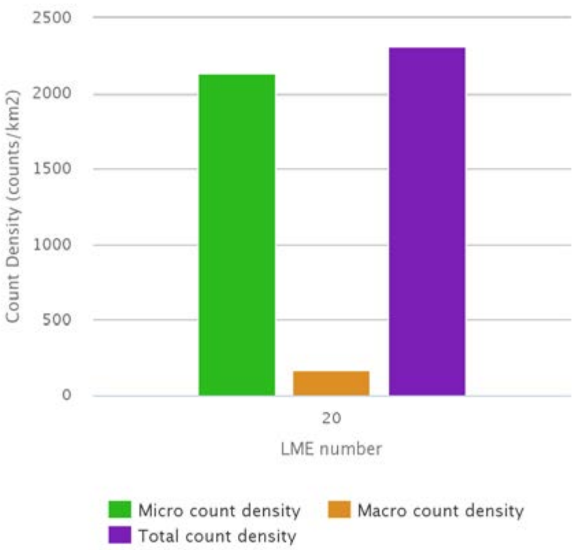
Very low Low Medium High Very high

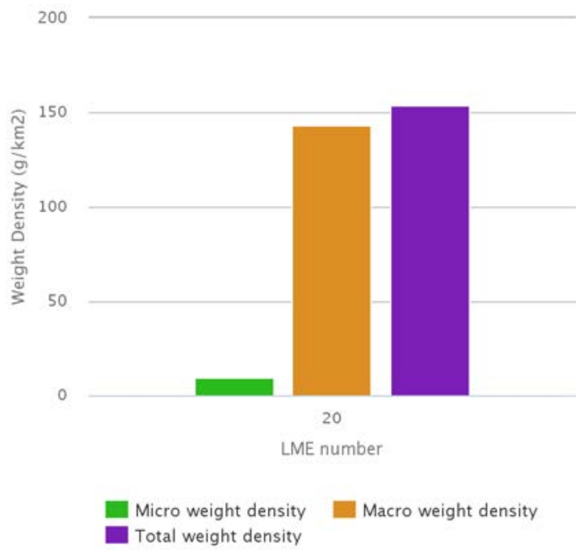
POPs

No pellet samples were obtained from this LME.

Plastic debris

Modelled estimates of floating plastic abundance (items km^{-2}), for both micro-plastic (<4.75 mm) and macro-plastic (>4.75 mm), indicate that this LME is in the group with relatively moderate levels of plastic concentration. Estimates are based on three proxy sources of litter: shipping density, coastal population density and the level of urbanisation within major watersheds, with enhanced run-off. The high values are due to the relative importance of these sources in this LME. The abundance of floating plastic in this category is estimated to be on average over 12 times lower that those LMEs with lowest values. There is very limited evidence from sea-based direct observations and towed nets to support this conclusion.





Ecosystem Health

Mangrove and coral cover

Not applicable.

Reefs at risk

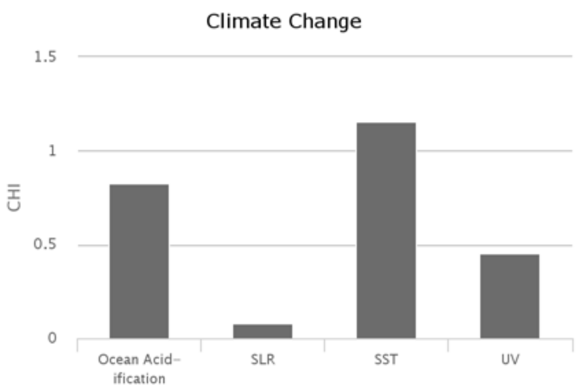
Not applicable.

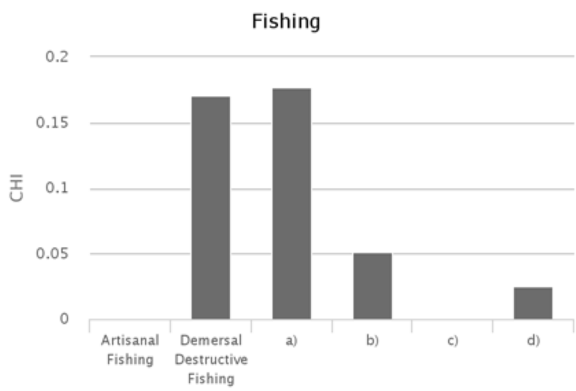
Marine Protected Area change

The Barents Sea LME experienced an increase in MPA coverage from 70,379 km^2 prior to 1983 to 199,982 km^2 by 2014. This represents an increase of 184%, within the low category of MPA change.

Cumulative Human Impact

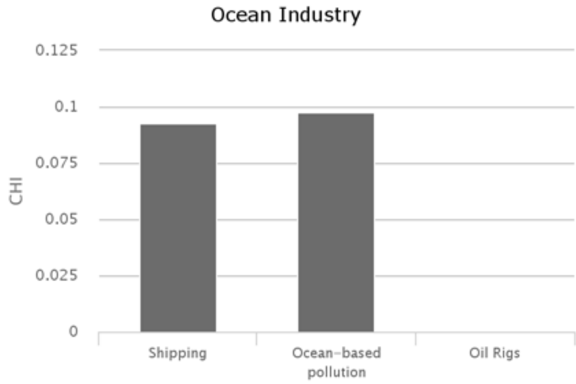
The Barents Sea LME experiences an above average overall cumulative human impact (score 4.03; maximum LME score 5.22), which is also well above the LME with the least cumulative impact. It falls in risk category 4 of the five risk categories (1 = lowest risk; 5 = highest risk). This LME is most vulnerable to climate change. Of the 19 individual stressors, three connected to climate change have the highest average impact on the LME: ocean acidification (0.83; maximum in other LMEs was 1.20), UV radiation (0.45; maximum in other LMEs was 0.76), and sea surface temperature (1.15; maximum in other LMEs was 2.16). Other key stressors include commercial shipping, ocean based pollution, and all three types of demersal commercial fishing (demersal destructive, non-destructive low-bycatch, and non-destructive high-bycatch)..

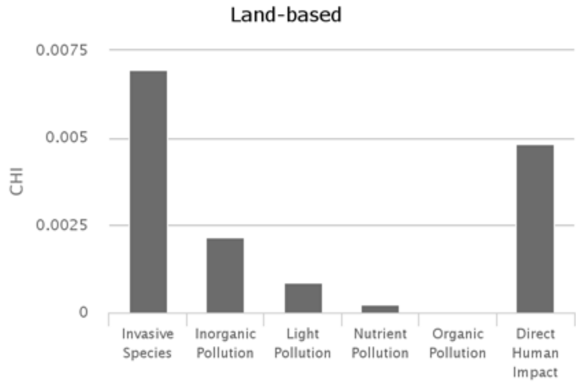




a) Demersal Non-destructive High Bycatch Fishing
c) Pelagic High Bycatch Fishing

b) Demersal Non-destructive Low Bycatch Fishing
d) Pelagic Low Bycatch Fishing





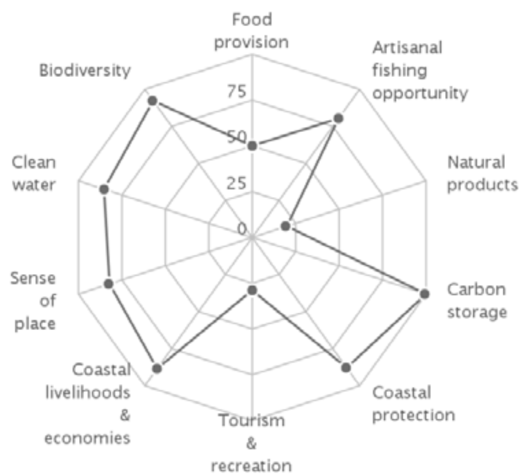
CHI: 3.14

Very low | Low | Medium | High | Very high

▲ (Low)

Ocean Health Index

The Barents Sea LME scores above average on the Ocean Health Index compared to other LMEs (score 74 out of 100; range for other LMEs was 57 to 82) but still relatively low. This score indicates that the LME is well below its optimal level of ocean health, although there are some aspects that are doing well. Its score in 2013 remained unchanged compared to the previous year. This LME scores lowest on food provision, natural products and tourism & recreation goals and highest on artisanal fishing opportunities, carbon storage, coastal economies, lasting special places, and habitat biodiversity goals. It falls in risk category 2 of the five risk categories, which is a moderate level of risk (1 = lowest risk; 5 = highest risk).



OHI: 70.52

Very low | Low | Medium | High | Very high

▲ (High)

Socio-economics

Indicators of demographic trends, economic dependence on ecosystem services, human wellbeing and vulnerability to present-day extreme climate events and projected sea level rise, are assessed for the Barents Sea LME. To compare and rank LMEs, they were classified into five categories of risk (from 1 to 5, corresponding to lowest, low, medium, high and highest risk, respectively) based on the values of the individual indicators. In the case of economic revenues, the LMEs were grouped to 5 classes of revenues from lowest, low, medium, high and highest, as revenues did not translate to risk.

Population

The coastal area includes northern Norway, the shores of Murmansk, the Republic of Karelia, Arkhangelsk, the Nenets Autonomous Okrug, and the Norwegian island of Svalbard, all stretching over 743,645 km^2. A current population of 2 million in 2010 is projected to decrease to 1 M in 2100, with density decreasing from 3 persons per km^2 in 2010 to 2 per km^2 by 2100. About 33% of coastal population lives in rural areas, and is projected to decrease in share to 28% in 2100.

Total population		Rural population	
2010	2100	2010	2100
2,028,968	1,101,642	675,670	307,031

Legend: Very low, Low, Medium, High, Very high

Coastal poor

The indigent population makes up 11% of the LME's coastal dwellers. The Barents Sea places in the very low-risk category based on percentage and in the low risk category using absolute number of coastal poor (present day estimate).

Coastal poor
228,975

Revenues and Spatial Wealth Distribution

Fishing and tourism depend on ecosystem services provided by LMEs. The Barents Sea LME ranks in the medium revenue category in fishing revenues based on yearly average total ex-vessel price of US 2013 $556 million for the period 2001-2010. Fish protein accounts for 16% of the total animal protein consumption of the coastal population. Its yearly average tourism revenue for 2004-2013 of US 2013 $18,289 million places it in the medium revenue category. On average, LME-based tourism income contributes 6% to the national GDPs of the LME coastal states. Spatial distribution of economic activity (e.g. spatial wealth distribution) measured by night-light and population distribution as coarse proxies can range from 0.0000 (totally equal distribution and lowest risk) to 1.0000 (concentrated in 1 place and most inequitable and highest risk). The Night Light Development Index (NLDI) thus indicates the level of spatial economic development, and that for the Barents Sea LME falls in the category with high risk (low/ modestly developed)..

Fisheries Annual Landed Value	% Fish Protein Contribution	Tourism Annual Revenues	% Tourism Contribution to GDP	NLDI
556,441,114	15.9	18,288,744,573	6.4	0.8484

Legend: Very low, Low, Medium, High, Very high

Human Development Index

Using the Human Development Index (HDI) that integrates measures of health, education and income, the present-day Barents Sea LME HDI belongs to the highest HDI and lowest risk category. Based on an HDI of 0.819, this LME has an HDI Gap of 0.181, the difference between present and highest possible HDI (1.000). The HDI Gap measures an overall vulnerability to external events such as disease or extreme climate related events, due to less than perfect health, education, and income levels, and is independent of the harshness of and exposure to specific external shocks.

HDI values are projected to the year 2100 in the contexts of shared socioeconomic development pathways (SSPs). The Barents Sea LME is projected to assume a place in the very low risk category (very high HDI) in 2100 under a sustainable development pathway. Under a fragmented world scenario, the LME is estimated to place in high-risk category (low HDI) because of reduced income level compared to estimated income values in a sustainable development pathway.

	HDI 2100	
HDI	SSP1	SSP3
0.8194	0.9143	0.6366

Legend: Very low, Low, Medium, High, Very high

Climate-Related Threat Indices

The Climate-Related Threat Indices utilize the HDI Gaps for present-day and projected 2100 scenarios. The contemporary climate index accounts for deaths and property losses due to storms, flooding and extreme temperatures incurred by coastal states during a 20-year period from 1994 to 2013 as hazard measures, the 2010 coastal population as proxy for exposure, and the present day HDI Gap as vulnerability measure.

The Contemporary Threat Index incorporates a Dependence Factor based on the fish protein contribution to dietary animal protein, and on the mean contribution of LME tourism to the national GDPs of LME coastal states. The HDI Gap and the degree of dependence on LME ecosystem services define the vulnerability of a coastal population. It also includes the average of risk related to extreme climate events, and the risk based on the degrading system states of an LME (e.g. overexploited fisheries, pollution levels, decrease in coastal ecosystem areas, excluding fisheries).

The 2100 sea level rise threat indices, each computed for the sustainable world and fragmented world development pathways, use the maximum projected sea level rise at the highest level of warming of 8.5 W/m^2 in 2100 as hazard measure, development pathway-specific 2100 populations in the 10 m × 10 km coast as exposure metrics, and development pathway-specific 2100 HDI Gaps as vulnerability estimates.

Present day climate threat index to the Barents Sea LME is within the medium-risk (medium threat) category. The combined contemporaneous risk due to extreme climate events, degrading LME states and the level of vulnerability of the coastal population, is medium. In a sustainable development scenario, the risk index from sea level rise in 2100 is very low, and increases to low risk under a fragmented world development pathway.

2010		2100	
Climate Threat	Contemporary Threat	SSP1	SSP3
0.6193	0.3403	0.3136	0.5083

Legend: Very low, Low, Medium, High, Very high

Governance

Governance architecture

In this LME, none of the transboundary fisheries arrangements appear to be integrated while the three arrangements for pollution and biodiversity appear to have the Arctic Council as an integrating arrangement for one set of issues and the OSPAR Convention for a second set of similar issues relating to pollution and biodiversity. Additionally, the specific biodiversity arrangements for marine mammals and polar bears do not appear to have any formal linkages. Whereas, the Arctic Council is not a binding arrangement, so its implementation is voluntary and country dependent, it does appear to have the potential to develop into an informal overall policy coordinating organization. Nonetheless, this LME has been assigned an overall integration score of 1.0 due to the presence of the Arctic Council with its ability to potentially function as an overall policy coordinating organization for the key transboundary issues within the LME.

The overall scores for ranking of risk were:

Engagement	Completeness	Integration
75	**74**	**0.1**

Legend: Very low · Low · Medium · High · Very high

LME 21 – Norwegian Sea

Bordering country: Norway
LME Total area: 1,109,613 km^2

Contents

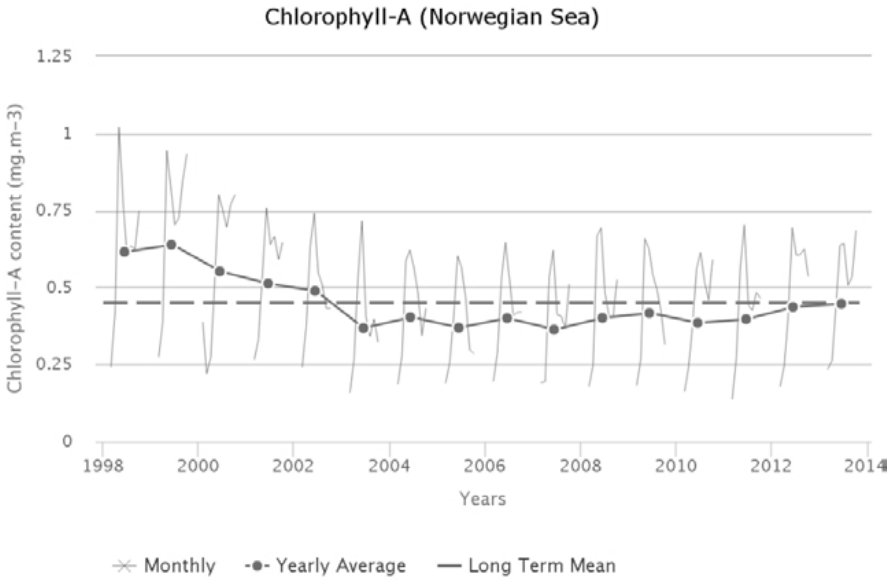
LME overall risk

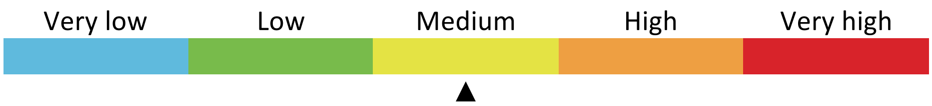
Results unavailable

Productivity

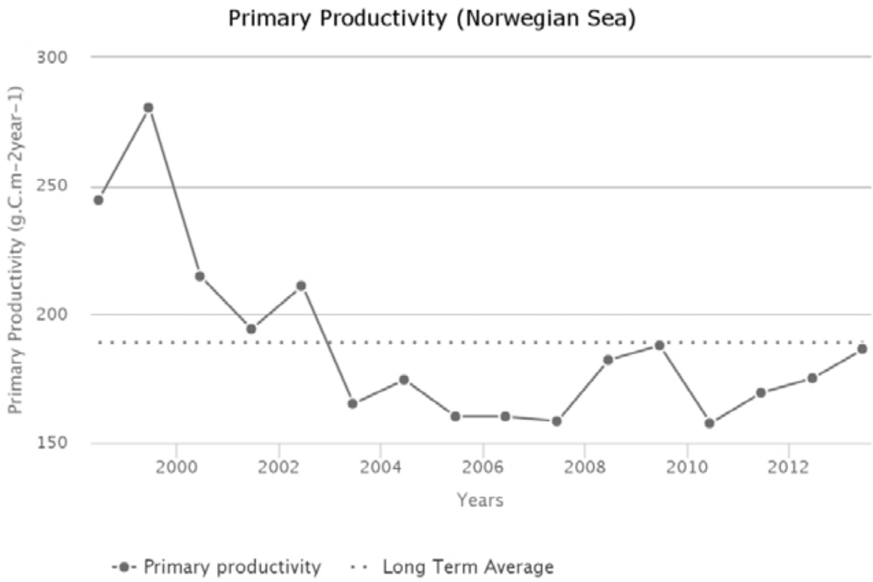
Chlorophyll-A

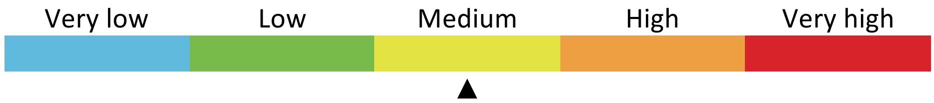
The annual Chlorophyll a concentration (CHL) cycle has a maximum peak (0.689 $mg.m^{-3}$) in June and a minimum (0.184 $mg.m^{-3}$) during March. The average CHL is 0.450 $mg.m^{-3}$. Maximum primary productivity (281 $g.C.m^{-2}.y^{-1}$) occurred during 1999 and minimum primary productivity (158 $g.C.m^{-2}.y^{-1}$) during 2010. There is a statistically insignificant increasing trend in Chlorophyll of 11.0 % from 2003 through 2013. The average primary productivity is 189 $g.C.m^{-2}.y^{-1}$, which places this LME in Group 3 of 5 categories (with 1 = lowest and 5= highest).





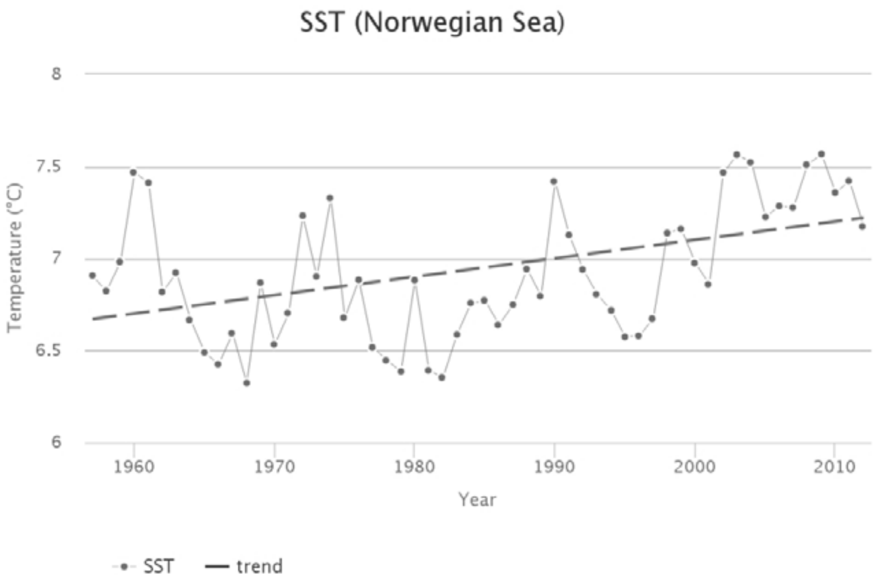
Primary productivity





Sea Surface Temperature

From 1957 to 2012, the Norwegian Sea LME #21 has warmed by 0.55°C, thus belonging to Category 3 (moderate warming LME). After exceeding 7.4°C in 1960, SST decreased to the absolute minimum of 6.3°C in 1968, increased up to 7.3°C, then dropped again below 6.4°C by 1982. From this coldest point, SST rose back to 7.6°C in 2008 and slightly declined afterward. The SST minimum in 1965-1966 was a regional manifestation of a global cold spell. Despite its proximity to Iceland, the Norwegian Sea LME has a distinctly different thermal history. The difference can be explained by the location of the North Atlantic Current: south and east of Iceland but west of Norway. The SST minima in 1977-79, 1986-87, and 1993-1996 have been caused by the well-documented “Great Salinity Anomalies” (GSAs) transported by the North Atlantic Current and its extension, the Norwegian Current (Dickson et al., 1988; Belkin et al., 1998; Belkin, 2004). The cold anomaly of 1993-1996 travelled with the Norwegian Current to the Barents Sea to contribute to a cold anomaly in winters 1997-1998 and 1998-1999 reported by Matishov et al. (2012).



Fish and Fisheries

Results are unavailable for this LME.

Pollution and Ecosystem Health

Pollution

Nutrient ratio, Nitrogen load and Merged Indicator

Human activities in watersheds are affecting nutrients transported by rivers into LMEs. Large amounts of nutrients (in particular *nitrogen load*) entering coastal waters of LMEs can result in high biomass algal blooms, leading to hypoxic or anoxic conditions, increased turbidity and changes in community composition, among other effects. In addition, changes in the *ratio of nutrients* entering LMEs can result in dominance by algal species that have deleterious effects (toxic, clog gills of shellfish, etc.) on ecosystems and humans. An overall nutrient indicator (*Merged Nutrient Indicator*) based on 2 sub-indicators: *Nitrogen Load* and *Nutrient Ratio* (ratio of dissolved Silica to Nitrogen or Phosphorus - the Index of Coastal Eutrophication Potential or ICEP) was calculated.

Nitrogen load

The Nitrogen Load risk level for contemporary (2000) conditions was very low. (level 1 of the five risk categories, where 1 = lowest risk; 5 = highest risk). Based on a “current trends” scenario (Global Orchestration), this remained the same in 2030 and 2050.

Nutrient ratio

The Nutrient Ratio (ICEP) risk level for contemporary (2000) conditions was very low (1). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

Merged nutrient indicator

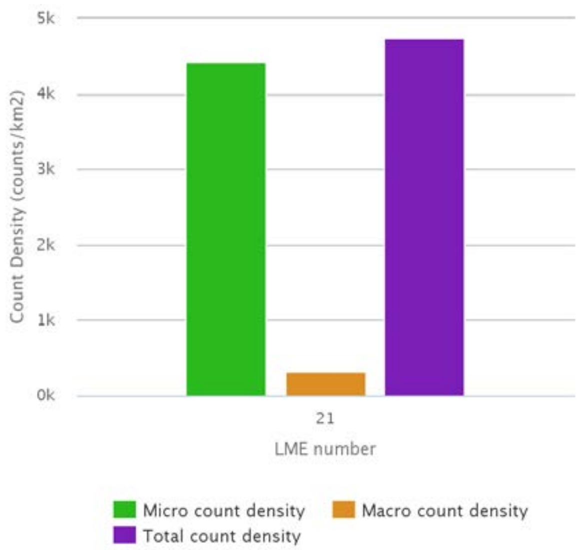
The risk level for the Merged Nutrient Indicator for contemporary (2000) conditions was very low (1). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

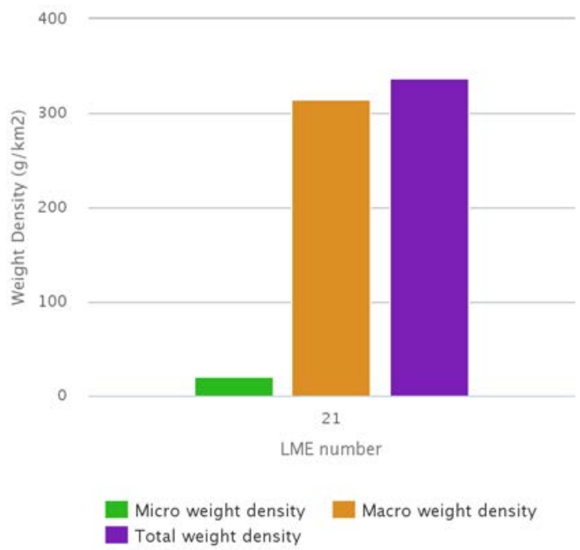
2000			2030			2050		
Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator
1	1	1	1	1	1	1	1	1

Legend: Very low, Low, Medium, High, Very high

POPs
No pellet samples were obtained from this LME.

Plastic debris
Modelled estimates of floating plastic abundance (items km-2), for both micro-plastic (<4.75 mm) and macro-plastic (>4.75 mm), indicate that this LME is in the group with relatively moderate levels of plastic concentration. Estimates are based on three proxy sources of litter: shipping density, coastal population density and the level of urbanisation within major watersheds, with enhanced run-off. The high values are due to the relative importance of these sources in this LME. The abundance of floating plastic in this category is estimated to be on average over 12 times lower that those LMEs with lowest values. There is limited evidence from sea-based direct observations and towed nets to support this conclusion.





Ecosystem Health

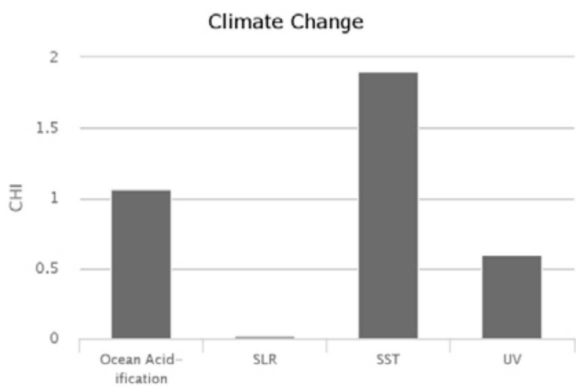
Mangrove and coral cover
Not applicable.

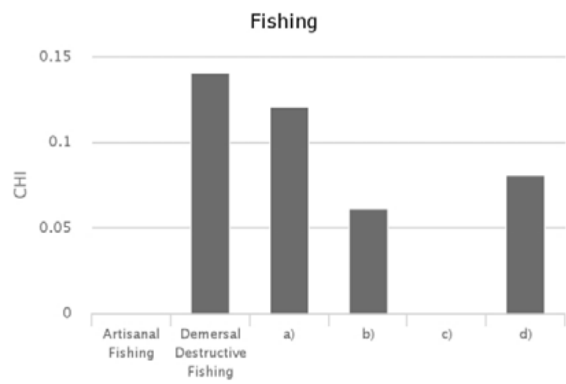
Reefs at risk
Not applicable

Marine Protected Area change
Not applicable.

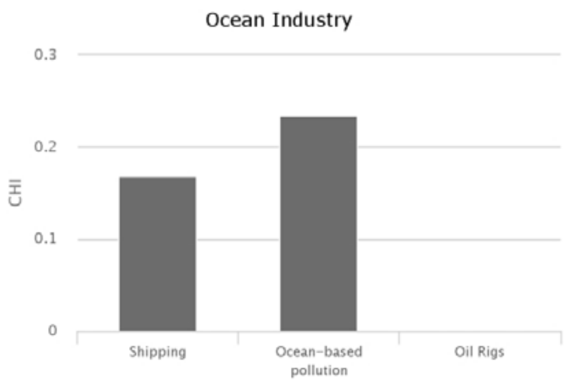
Cumulative Human Impact

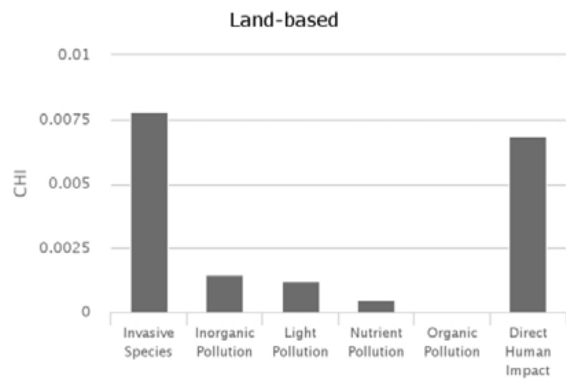
The Norwegian Sea LME experiences well above average overall cumulative human impact (score 4.41; maximum LME score 5.22), which is also well above the LME with the least cumulative impact. It falls in risk category 5 of the five risk categories (1 = lowest risk; 5 = highest risk). This LME is most vulnerable to climate change. Of the 19 individual stressors, three connected to climate change have the highest average impact on the LME: ocean acidification (1.07; maximum in other LMEs was 1.20), UV radiation (0.60; maximum in other LMEs was 0.76), and sea surface temperature (1.90; maximum in other LMEs was 2.16). Other key stressors include commercial shipping, ocean based pollution, pelagic high-bycatch commercial fishing, and all three types of demersal commercial fishing (demersal destructive, non-destructive low-bycatch, and non-destructive high-bycatch).





a) Demersal Non-destructive High Bycatch Fishing
c) Pelagic High Bycatch Fishing
b) Demersal Non-destructive Low Bycatch Fishing
d) Pelagic Low Bycatch Fishing



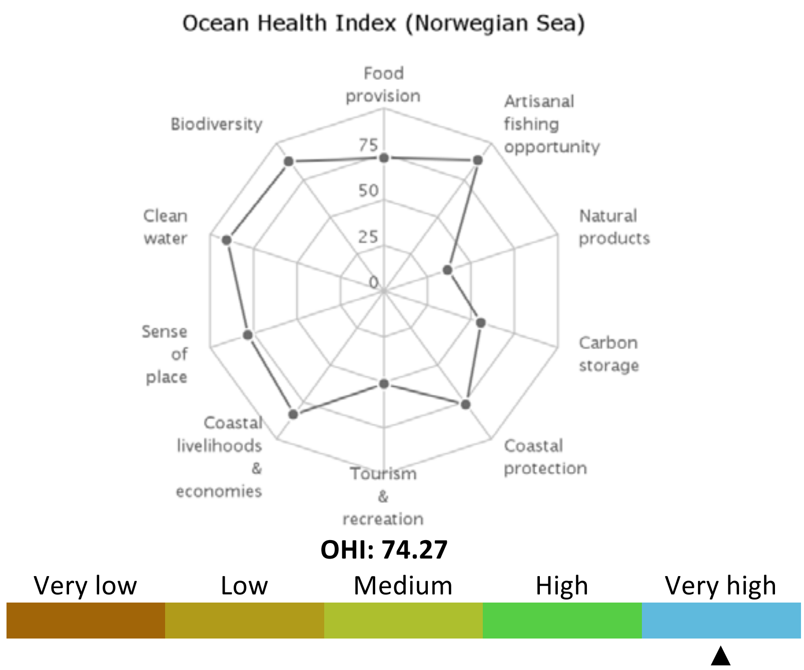


CHI: 4.41

Very low | Low | Medium | High | Very high

Ocean Health Index

The Norwegian Sea LME scores above average on the Ocean Health Index compared to other LMEs (score 79 out of 100; range for other LMEs was 57 to 82) but still relatively low. This score indicates that the LME is below its optimal level of ocean health, although there are some aspects that are doing well. Its score in 2013 increased 1 point compared to the previous year, due in large part to changes in the scores for coastal livelihoods and clean waters. This LME scores lowest on carbon storage and iconic species goals and highest on mariculture, artisanal fishing opportunities, and species biodiversity goals. It falls in risk category 1 of the five risk categories, which is the lowest level of risk (1 = lowest risk; 5 = highest risk).



Socio-economics

Indicators of demographic trends, economic dependence on ecosystem services, human wellbeing and vulnerability to present-day extreme climate events and projected sea level rise, are assessed for the Norwegian Sea LME. To compare and rank LMEs, they were classified into five categories of risk (from 1 to 5, corresponding to lowest, low, medium, high and highest risk, respectively) based on the values of the individual indicators. In the case of economic revenues, the LMEs were grouped to 5 classes of revenues from lowest, low, medium, high and highest, as revenues did not translate to risk.

Population

The coastal area includes western Norway, from Nordland to Alesund, stretching over 91,219 km^2. A current population of 841 thousand in 2010 is projected to decrease to 586 thousand in 2100, with density decreasing from 9 persons per km^2 in 2010 to 6 per km^2 by 2100. About 46% of coastal population lives in rural areas, and is projected to decrease in share slightly to 44% in 2100.

Total population		Rural population	
2010	2100	2010	2100
840,903	585,562	387,956	257,429

Legend: Very low, Low, Medium, High, Very high

Coastal poor

The indigent population makes up 8% of the LME's coastal dwellers. The Norwegian Sea places in the very low-risk category based on percentage and in the low risk category using absolute number of coastal poor (present day estimate).

Coastal poor
64,119

Revenues and Spatial Wealth Distribution

Fishing and tourism depend on ecosystem services provided by LMEs. The Norwegian Sea LME ranks in the medium revenue category in fishing revenues based on yearly average total ex-vessel price of US 2013 $470 million for the period 2001-2010. Fish protein accounts for 23% of the total animal protein consumption of the coastal population. Its yearly average tourism revenue for 2004-2013 of

US 2013 $6,315 million places it in the low revenue category. On average, LME-based tourism income contributes 7% to the national GDPs of the LME coastal states. Spatial distribution of economic activity (e.g. spatial wealth distribution) measured by night-light and population distribution as coarse proxies can range from 0.0000 (totally equal distribution and lowest risk) to 1.0000 (concentrated in 1 place and most inequitable and highest risk). The Night Light Development Index (NLDI) thus indicates the level of spatial economic development, and that for the Norwegian Sea LME falls in the category with high risk (low/ modestly developed).

Fisheries Annual Landed Value	% Fish Protein Contribution	Tourism Annual Revenues	% Tourism Contribution to GDP	NLDI
469,878,820	23.4	6,315,183,200	7.4	0.8086

Legend: Very low, Low, Medium, High, Very high

Human Development Index

Using the Human Development Index (HDI) that integrates measures of health, education and income, the present-day Norwegian Sea LME HDI belongs to the highest HDI and lowest risk category. Based on an HDI of 0.940, this LME has an HDI Gap of 0.060, the difference between present and highest possible HDI (1.000). The HDI Gap measures an overall vulnerability to external events such as disease or extreme climate related events, due to less than perfect health, education, and income levels, and is independent of the harshness of and exposure to specific external shocks.
HDI values are projected to the year 2100 in the contexts of shared socioeconomic development pathways (SSPs). The Norwegian Sea LME is projected to assume a place in the very low risk category (very high HDI) in 2100 under a sustainable development pathway. Under a fragmented world scenario, the LME is estimated to place in medium-risk category (medium HDI) because of reduced income level compared to estimated income values in a sustainable development pathway.

	HDI 2100	
HDI	SSP1	SSP3
0.9404	0.9805	0.7400

Legend: Very low, Low, Medium, High, Very high

Climate-Related Threat Indices

The Climate-Related Threat Indices utilize the HDI Gaps for present-day and projected 2100 scenarios. The contemporary climate index accounts for deaths and property losses due to storms, flooding and extreme temperatures incurred by coastal states during a 20-year period from 1994 to 2013 as hazard measures, the 2010 coastal population as proxy for exposure, and the present day HDI Gap as vulnerability measure.
The Contemporary Threat Index incorporates a Dependence Factor based on the fish protein contribution to dietary animal protein, and on the mean contribution of LME tourism to the national GDPs of LME coastal states. The HDI Gap and the degree of dependence on LME ecosystem services define the vulnerability of a coastal population. It also includes the average of risk related to extreme climate events, and the risk based on the degrading system states of an LME (e.g. overexploited fisheries, pollution levels, decrease in coastal ecosystem areas, excluding fisheries).
The 2100 sea level rise threat indices, each computed for the sustainable world and fragmented world development pathways, use the maximum projected sea level rise at the highest level of warming of 8.5 W/m^2 in 2100 as hazard measure, development pathway-specific 2100 populations in the 10 m × 10 km coast as exposure metrics, and development pathway-specific 2100 HDI Gaps as vulnerability estimates.

Present day climate threat index to the Norwegian Sea LME is within the very low-risk (very low threat) category. The combined contemporaneous risk due to extreme climate events, degrading LME states and the level of vulnerability of the coastal population, is very low. In a sustainable development scenario, the risk index from sea level rise in 2100 is very low, and remains at very low risk under a fragmented world development pathway.

2010		2100	
Climate Threat	**Contemporary Threat**	**SSP1**	**SSP3**
0.0000	0.2032	0.1899	0.4398

Legend:

Very low | Low | Medium | High | Very high

Governance

Governance architecture

In this LME, the policy cycles relating to the key issues of fisheries and pollution are associated with well-established transboundary arrangements that are among the strongest globally. However, there does not appear to be much integration among these processes. Since the LME is largely a single country one and Denmark has a focus on EBM, the integration may be taking place at the national level.

The overall scores for the ranking of risk were:

Engagement	Completeness	Integration
83	**76**	**0.1**

Legend:

Very low | Low | Medium | High | Very high

LME 22 – North Sea

Bordering countries: Belgium, Denmark, France, Germany, Netherlands, Norway, Sweden, United Kingdom.
LME Total area: 690,041 km^2

List of indicators

LME overall risk

This LME falls in the cluster of LMEs that exhibit medium to high numbers of collapsed and overexploited fish stocks, high levels of demersal non-destructive low bycatch fishing, as well as very high shipping pressure.

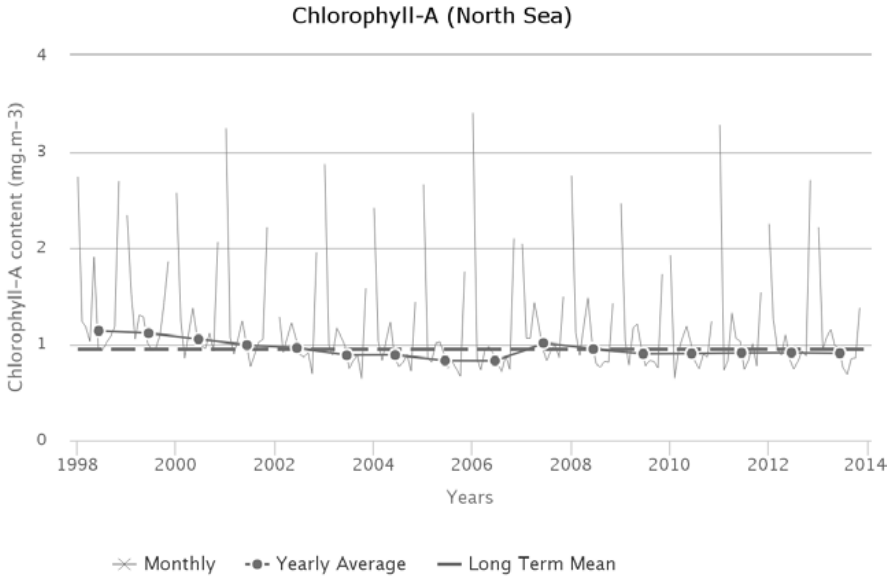
Based on a combined measure of the Human Development Index and the averaged indicators for fish & fisheries and pollution & ecosystem health modules, the overall risk factor is medium.

Very low	Low	Medium	High	Very high
		▲		

Productivity

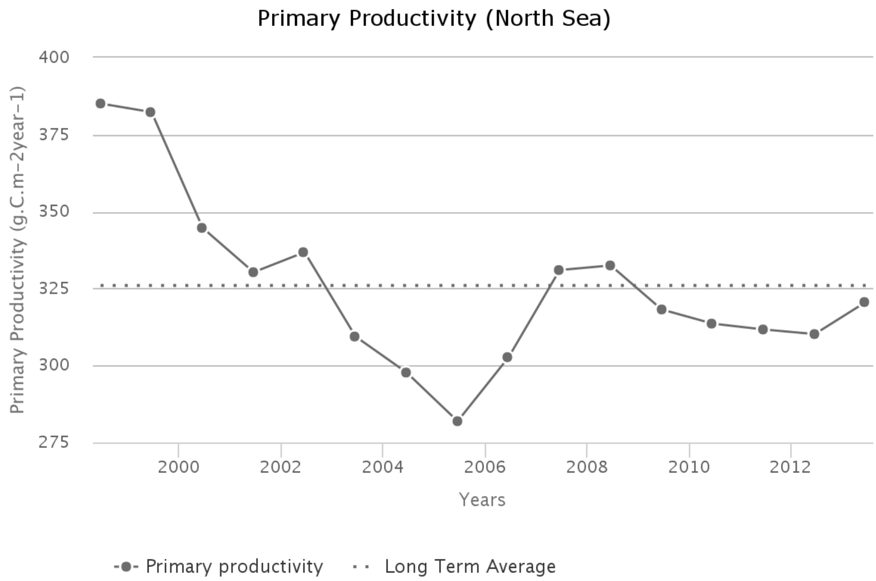
Chlorophyll-A

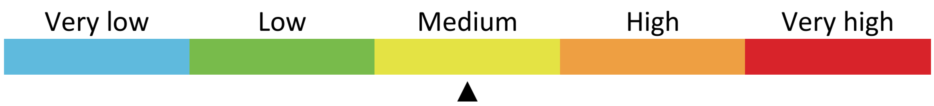
The annual Chlorophyll a concentration (CHL) cycle has a maximum peak (2.68 $mg.m^{-3}$) in January and a minimum (0.813 $mg.m^{-3}$) during July. The average CHL is 0.945 $mg.m^{-3}$. Maximum primary productivity (385 $g.C.m^{-2}.y^{-1}$) occurred during 1998 and minimum primary productivity (282 $g.C.m^{-2}.y^{-1}$) during 2005. There is a statistically insignificant increasing trend in Chlorophyll of 7.07 % from 2003 through 2013. The average primary productivity is 326 $g.C.m^{-2}.y^{-1}$, which places this LME in Group 3 of 5 categories (with 1 = lowest and 5= highest).



Very low	Low	Medium	High	Very high
		▲		

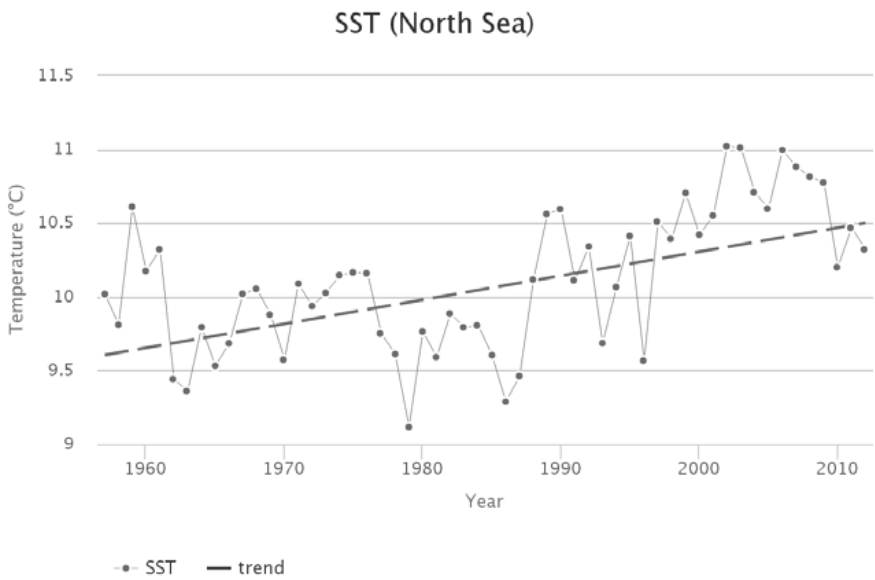
Primary productivity





Sea Surface Temperature

From 1957 to 2012, the North Sea LME #22 has warmed by 0.93°C, thus belonging to Category 2 (fast warming LME). The thermal history of this LME has been uniform. Like in the Baltic Sea LME, the high warming rate of the North Sea is a result of two factors combined: (1) the cold epoch of the late 1970s-1980s (preceded by another cold epoch, of the 1960s), and (2) the rapid warming that commenced in the late 1980s. During this warming epoch, the North Sea was one of the fastest warming LMEs in the World Ocean (Belkin, 2009). Recent years saw a reversal of the post-1979 warming. After peaking at >11°C in 2002-2006, SST dropped down to 10.2°C by 2010. The similarity between the North Sea and Baltic Sea SST variations is especially noteworthy since oceanic circulation directly impacts the North Sea, but not the Baltic Sea.

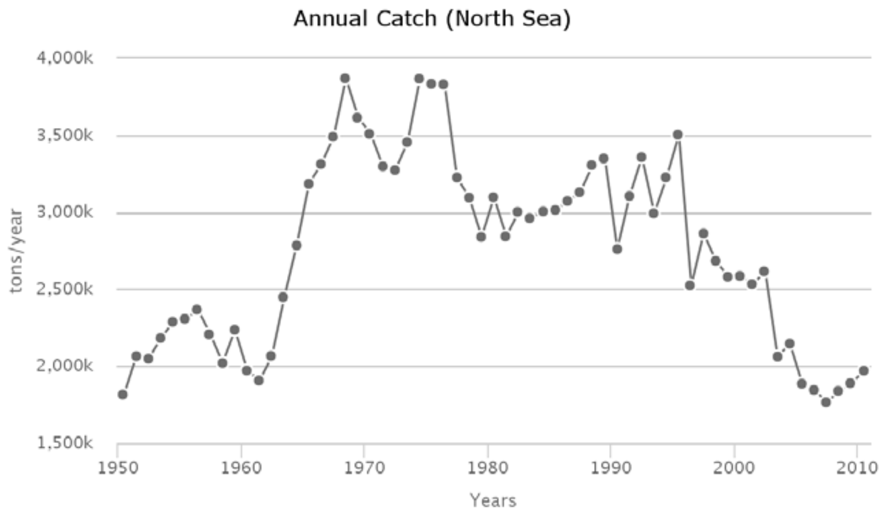


Fish and Fisheries

Fishing is a long-established activity in the North Sea LME and there is a wealth of fisheries data. The most important species for human consumption represented in the catch are cod-like fishes (cod, saithe, haddock, etc.), herring, sprat and flatfishes.

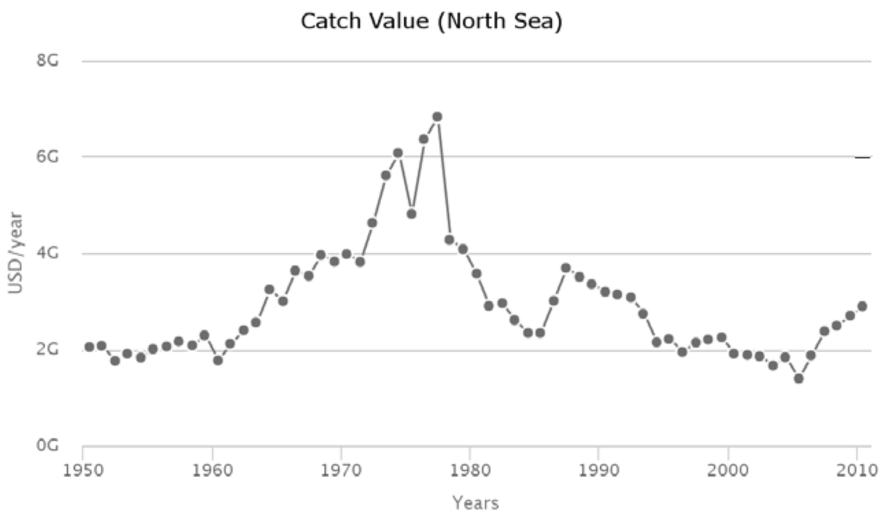
Annual Catch

Landings from the industrial fishery consist mainly of sand eel, Norway pout and sprat. The North Sea is a highly productive LME that, on average, supported total reported landings of over 3 million t per year from the mid-1960s to the early 1990s, with peak landings of 3.9 million t in 1968.



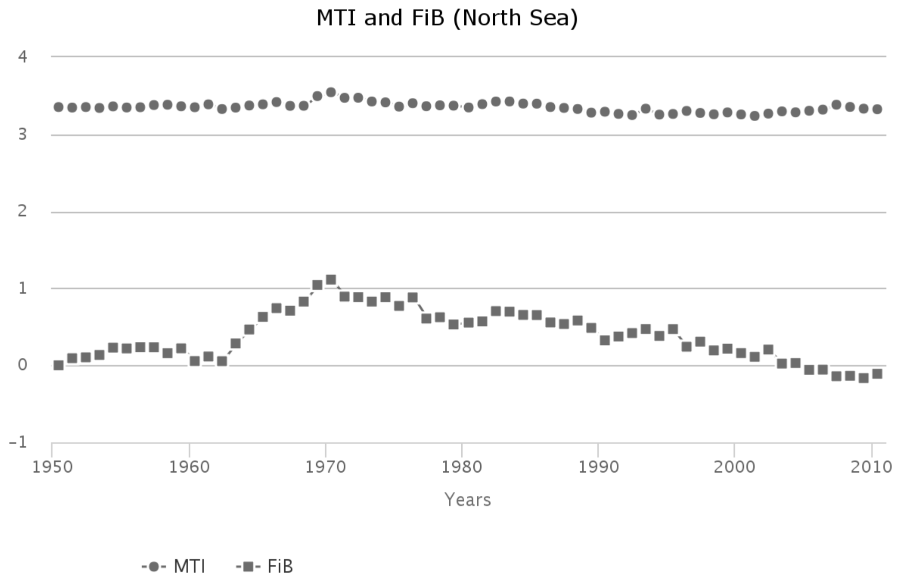
Catch value

The value of the reported landings reached 6.8 billion US$ (in 2005 real US$) in 1977, following which it steadily declined.



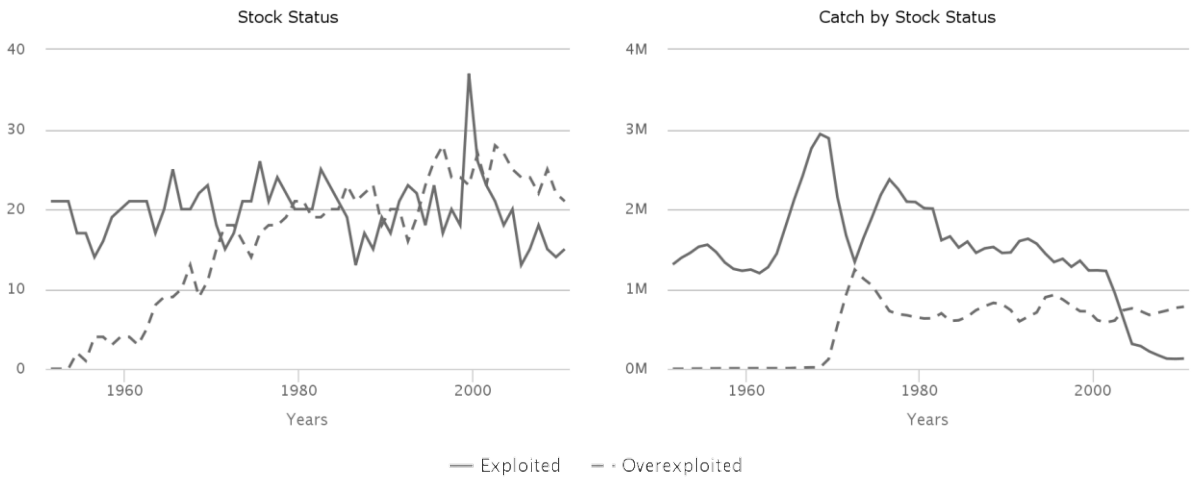
Marine Trophic Index and Fishing-in-Balance index

The MTI has shown a steady decline since 1970, an indication of 'fishing down' of the food web in the LME, while the FiB index has been on a similar decline over the past three decades.



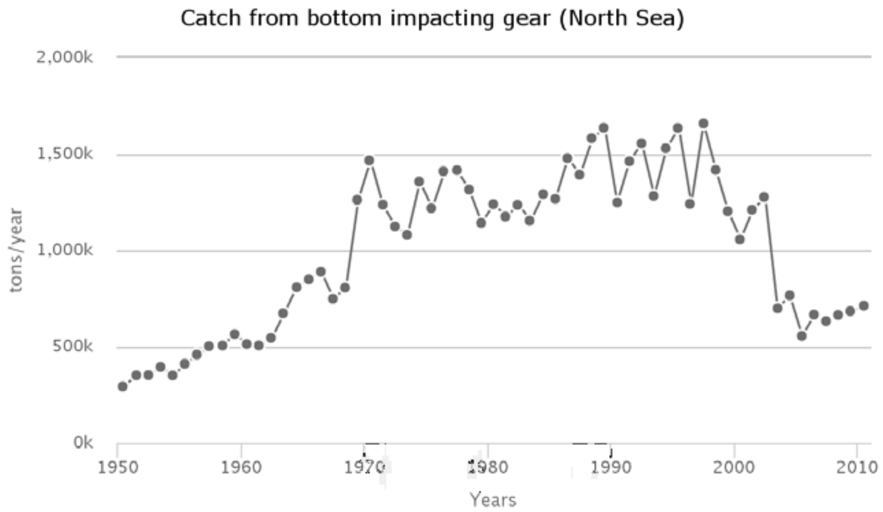
Stock status

The Stock-Catch Status Plots, based on the first analysis of an LME using such plots indicate that the number of collapsed and overexploited stocks have been increasing, accounting for close to 60% of all commercially exploited stocks in the LME. A majority of the reported landings biomass, particularly in recent years, is supplied by overexploited and rebuilding stocks.



Catch from bottom impacting gear

The percentage of catch from the bottom gear type to the total catch increased from 20% in the 1950s to its first peak at around 60% in 1996. In the recent decade, this percentage ranged between 30 and 50%..

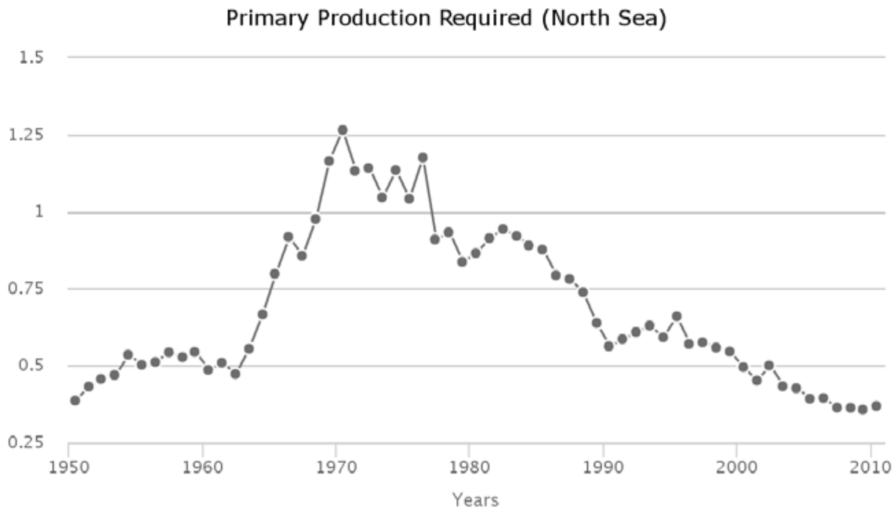


Fishing effort

The total effective effort continuously increased from around 180 million kW in the 1950s to its peak at 540 million kW in the mid-2000s.

Primary Production Required

The primary production required (PPR) to sustain the reported landings in this LME reached an extremely high level, over 70% of the observed primary production in the late 1960s, but has declined to less than 40% in recent years.



Pollution and Ecosystem Health

Pollution

Nutrient ratio, Nitrogen load and Merged Indicator

Human activities in watersheds are affecting nutrients transported by rivers into LMEs. Large amounts of nutrients (in particular *nitrogen load*) entering coastal waters of LMEs can result in high biomass algal blooms, leading to hypoxic or anoxic conditions, increased turbidity and changes in community composition, among other effects. In addition, changes in the *ratio of nutrients* entering LMEs can result in dominance by algal species that have deleterious effects (toxic, clog gills of shellfish, etc.) on ecosystems and humans. An overall nutrient indicator (*Merged Nutrient Indicator*) based on 2 sub-indicators: *Nitrogen Load* and *Nutrient Ratio* (ratio of dissolved Silica to Nitrogen or Phosphorus - the Index of Coastal Eutrophication Potential or ICEP) was calculated.

Nitrogen load

The Nitrogen Load risk level for contemporary (2000) conditions was moderate (level 3 of the five risk categories, where 1 = lowest risk; 5 = highest risk). Based on a "current trends" scenario (Global Orchestration), this remained the same in 2030 and 2050.

Nutrient ratio

The Nutrient Ratio (ICEP) risk level for contemporary (2000) conditions was high (4). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

Merged nutrient indicator

The risk level for the Merged Nutrient Indicator for contemporary (2000) conditions was high (4). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

2000			2030			2050		
Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator
3	4	4	3	4	4	3	4	4

Legend:

Very low Low Medium High Very high

POPs

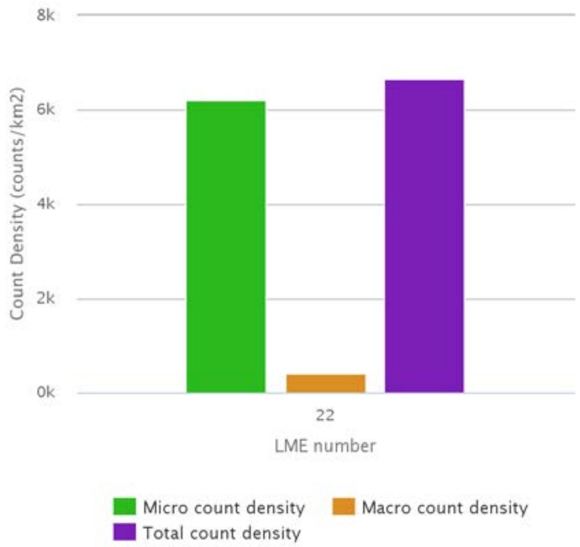
The North Sea LME has 11 samples at 11 locations. The average concentration (ng.g^{-1} of pellets) was 145 (range 43 – 446 ng.g^{-1}) for PCBs, 9.9 (range 2 – 39 ng.g^{-1}) for DDTs, and 2.4 (range not detected – 6.1 ng.g^{-1}) for HCHs. The PCBs average corresponds to risk category 3 and DDTs and HCHs averages correspond to risk category 2, of the five risk categories (1 = lowest risk; 5 = highest risk). Diffuse pollution by PCBs throughout the coast is noticeable, with higher pollution in the Dutch coast (105 – 281 ng.g^{-1}). This is probably due to legacy pollution. Continuous monitoring is recommended and more locations should be monitored to examine spatial variation. Total DDT concentrations are relatively low but the proportion of DDT is dominant, suggesting recent inputs.

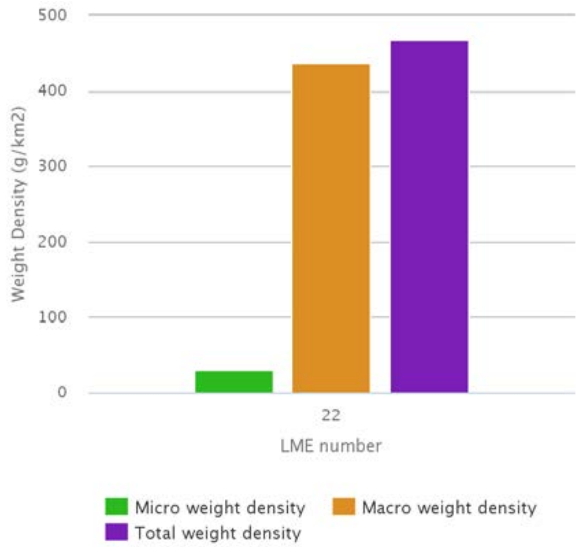
	PCBs		DDTs		HCHs	
Locations	Avg. (ng/g)	Risk	Avg. (ng/g)	Risk	Avg. (ng/g)	Risk
11	145	**3**	10	**2**	2.4	**2**

Legend: Very low | Low | Medium | High | Very high

Plastic debris

Modelled estimates of floating plastic abundance (items km^{-2}), for both micro-plastic (<4.75 mm) and macro-plastic (>4.75 mm), indicate that this LME is in the group with relatively moderate levels of plastic concentration. Estimates are based on three proxy sources of litter: shipping density, coastal population density and the level of urbanisation within major watersheds, with enhanced run-off. The high values are due to the relative importance of these sources in this LME. The abundance of floating plastic in this category is estimated to be on average over 12 times lower that those LMEs with lowest values. There is good evidence from sea-based direct observations and towed nets to support this conclusion.





Ecosystem Health

Mangrove and coral cover

Not applicable.

Reefs at risk

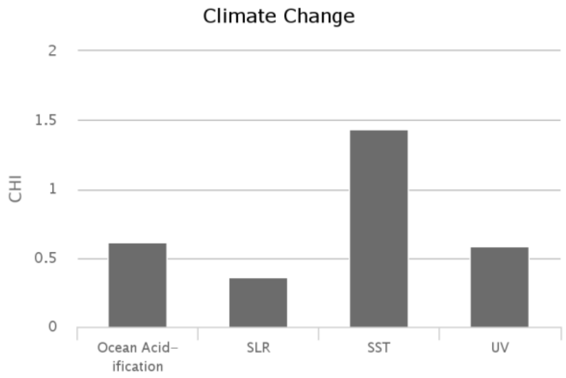
Not applicable.

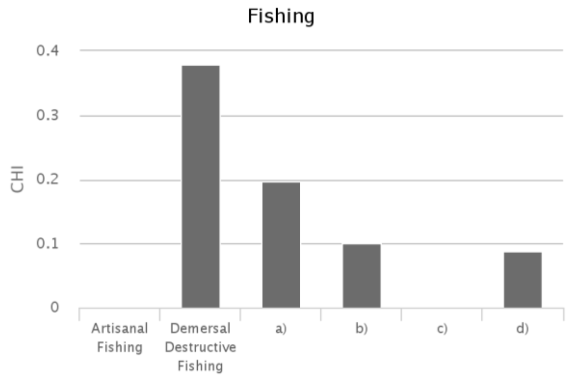
Marine Protected Area change

The North Sea LME experienced an increase in MPA coverage from 2,960 km^2 prior to 1983 to 16,846 km^2 by 2014. This represents an increase of 469%, within the low category of MPA change.

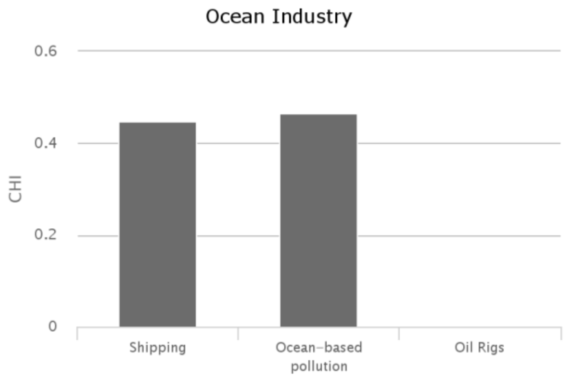
Cumulative Human Impact

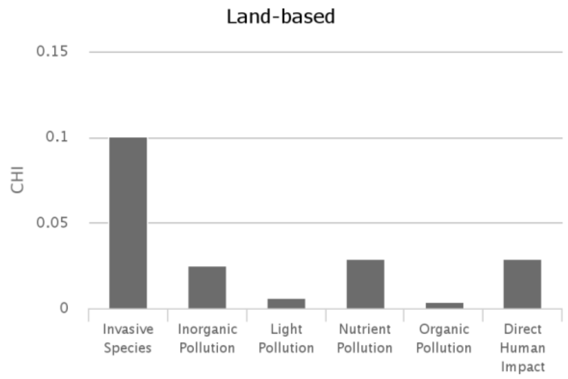
The North Sea LME experiences one of the highest overall cumulative human impact (score 4.87; maximum LME score 5.22). It falls in risk category 5 of the five risk categories (1 = lowest risk; 5 = highest risk). This LME is most vulnerable to climate change. Of the 19 individual stressors, all four connected to climate change have the highest average impact on the LME: ocean acidification (0.62; maximum in other LMEs was 1.20), UV radiation (0.59; maximum in other LMEs was 0.76), sea level rise (0.36; maximum in other LMEs was 0.71), and sea surface temperature (1.44; maximum in other LMEs was 2.16). Other key stressors include commercial shipping, nutrient pollution from land, ocean based pollution, pelagic high-bycatch commercial fishing, invasive species, and all three types of demersal commercial fishing (demersal destructive, non-destructive low-bycatch, and non-destructive high-bycatch)..



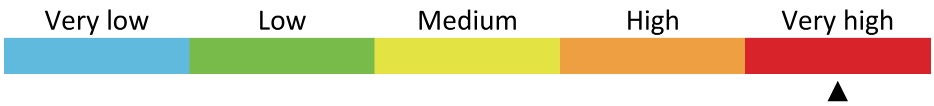


a) Demersal Non-destructive High Bycatch Fishing
c) Pelagic High Bycatch Fishing
b) Demersal Non-destructive Low Bycatch Fishing
d) Pelagic Low Bycatch Fishing



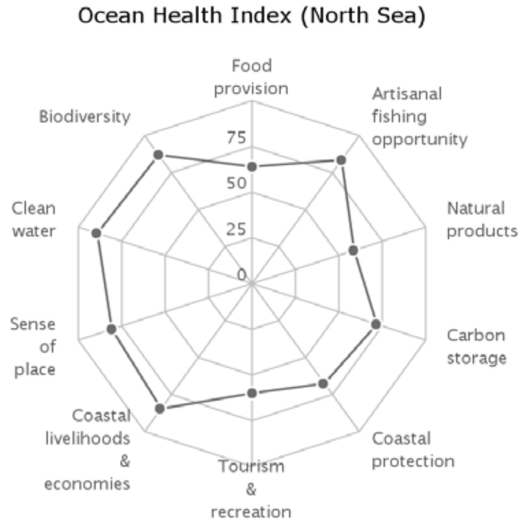


CHI: 4.87



Ocean Health Index

The North Sea LME scores above average on the Ocean Health Index compared to other LMEs (score 80 out of 100; range for other LMEs was 57 to 82), but still relatively low. This score indicates that the LME is below its optimal level of ocean health, although there are some aspects that are doing well. Its score in 2013 increased 1 point compared to the previous year, due in large part to changes in the scores for natural products. This LME scores lowest on mariculture and iconic species goals and highest on artisanal fishing opportunities, natural products and lasting special places goals. It falls in risk category 1 of the five risk categories, which is the lowest level of risk (1 = lowest risk; 5 = highest risk).



OHI: 74.78

Socio-economics

Indicators of demographic trends, economic dependence on ecosystem services, human wellbeing and vulnerability to present-day extreme climate events and projected sea level rise, are assessed for this LME. To compare and rank LMEs, they were classified into five categories of risk (from 1 to 5, corresponding to lowest, low, medium, high and highest risk, respectively) based on the values of the individual indicators. In the case of economic revenues, the LMEs were grouped to 5 classes of revenues from lowest, low, medium, high and highest, as revenues did not translate to risk.

Population

The coastal area stretches over 409 034 km^2. A current population of 81 437 thousand in 2010 is projected to increase to 86 764 thousand in 2100, with a density of 199 persons per km^2 in 2010 reaching 212 per km^2 by 2100. About 18% of coastal population lives in rural areas, and is not projected to change in share in 2100. .

Total population		Rural population	
2010	**2100**	**2010**	**2100**
81,437,234	86,764,309	14,713,667	15,802,440

Legend: Very low, Low, Medium, High, Very high

Coastal poor

The indigent population makes up 5% of the LME's coastal dwellers. This LME places in the very low-risk category based on percentage and in the high-risk category using absolute number of coastal poor (present day estimate).

Coastal poor
3,786,085

Revenues and Spatial Wealth Distribution

Fishing and tourism depend on ecosystem services provided by LMEs. This LME ranks in the very high-revenue category in fishing revenues based on yearly average total ex-vessel price of US 2013 $2 497 million for the period 2001-2010. Fish protein accounts for 10% of the total animal protein consumption of the coastal population. Its yearly average tourism revenue for 2004-2013 of US 2013 $338 271 million places it in the very high-revenue category. On average, LME-based tourism income contributes 10% to the national GDPs of the LME coastal states. Spatial distribution of economic activity (e.g. spatial wealth distribution) measured by night-light and population distribution as coarse proxies can range from 0.0000 (totally equal distribution and lowest risk) to 1.0000 (concentrated in 1 place and most inequitable and highest risk). The Night Light Development Index (NLDI) thus indicates the level of spatial economic development, and that for this LME falls in the category with low risk.

Fisheries Annual Landed Value	% Fish Protein Contribution	Tourism Annual Revenues	% Tourism Contribution to GDP	NLDI
2,497,061,157	10.5	338,271,000,000	10.0	0.6625

Legend: Very low, Low, Medium, High, Very high

Human Development Index

Using the Human Development Index (HDI) that integrates measures of health, education and income, the present-day LME HDI belongs to the very high HDI and very low risk category. Based on an HDI of 0.900, this LME has an HDI Gap of 0.100, the difference between present and highest possible HDI (1.000). The HDI Gap measures an overall vulnerability to external events such as disease or extreme climate related events, due to less than perfect health, education, and income levels, and is independent of the harshness of and exposure to specific external shocks.

HDI values are projected to the year 2100 in the contexts of shared socioeconomic development pathways (SSPs). This LME is projected to assume a place in the very low risk category (very high HDI) in 2100 under a sustainable development pathway. Under a fragmented world scenario, the LME is estimated to place in a high-risk category (low HDI) because of reduced income levels and increased population values from those in a sustainable development pathway.

	HDI 2100	
HDI	SSP1	SSP3
0.8996	0.9513	0.6526

Legend: Very low, Low, Medium, High, Very high

Climate-Related Threat Indices

The Climate-Related Threat Indices utilize the HDI Gaps for present-day and projected 2100 scenarios. The contemporary climate index accounts for deaths and property losses due to storms, flooding and extreme temperatures incurred by coastal states during a 20-year period from 1994 to 2013 as hazard measures, the 2010 coastal population as proxy for exposure, and the present day HDI Gap as vulnerability measure.

The Contemporary Threat Index incorporates a Dependence Factor based on the fish protein contribution to dietary animal protein, and on the mean contribution of LME tourism to the national GDPs of LME coastal states. The HDI Gap and the degree of dependence on LME ecosystem services define the vulnerability of a coastal population. It also includes the average of risk related to extreme

climate events, and the risk based on the degrading system states of an LME (e.g. overexploited fisheries, pollution levels, decrease in coastal ecosystem areas).
The 2100 sea level rise threat indices, each computed for the sustainable world and fragmented world development pathways, use the maximum projected sea level rise at the highest level of warming of 8.5 W/m^2 in 2100 as hazard measure, development pathway-specific 2100 populations in the 10 m × 10 km coast as exposure metrics, and development pathway-specific 2100 HDI Gaps as vulnerability estimates.
Present day climate threat index of this LME is within the medium-risk (medium threat) category. The combined contemporaneous risk due to extreme climate events, degrading LME states and the level of vulnerability of the coastal population, is medium. In a sustainable development scenario, the risk index from sea level rise in 2100 is very low, and increases to high risk under a fragmented world development pathway.

2010		2100	
Climate Threat	Contemporary Threat	SSP1	SSP3
0.5558	0.3280	0.3095	0.5812

Legend: Very low · Low · Medium · High · Very high

Governance

Governance architecture

In this LME, the policy cycles relating to the key issues of fisheries and pollution are associated with well-established transboundary arrangements that are among the strongest globally. However, there does not appear to be much integration among these processes.
The overall scores for the ranking of risk were:

Engagement	Completeness	Integration
62	73	0.1

Legend: Very low · Low · Medium · High · Very high

LME 23 – Baltic Sea

Bordering countries: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden
LME Total area: 396,838 km^2

List of indicators

LME overall risk

This LME falls in the cluster of LMEs that exhibit a significant influence of capacity-enhancing fisheries subsidies.

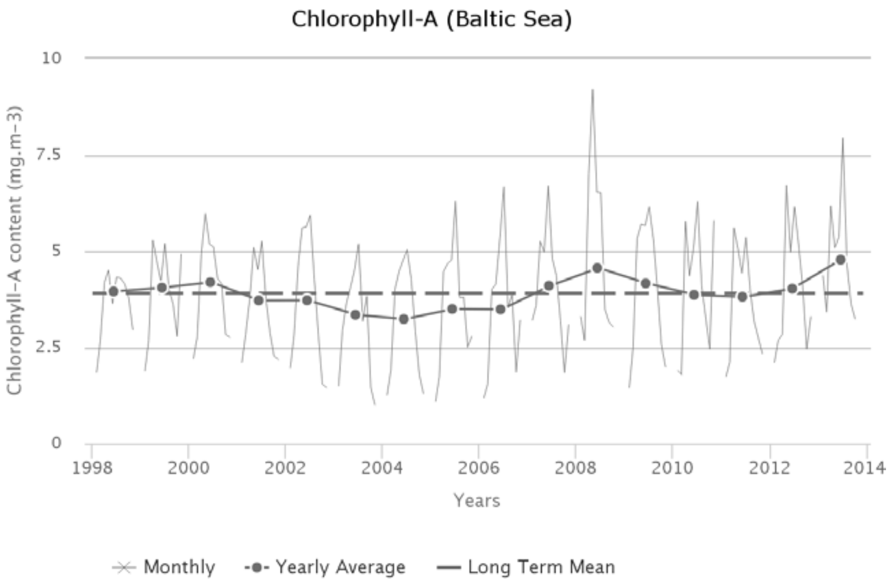
Based on a combined measure of the Human Development Index and the averaged indicators for fish & fisheries and pollution & ecosystem health modules, the overall risk factor is medium.

Very low	Low	Medium	High	Very high
		▲		

Productivity

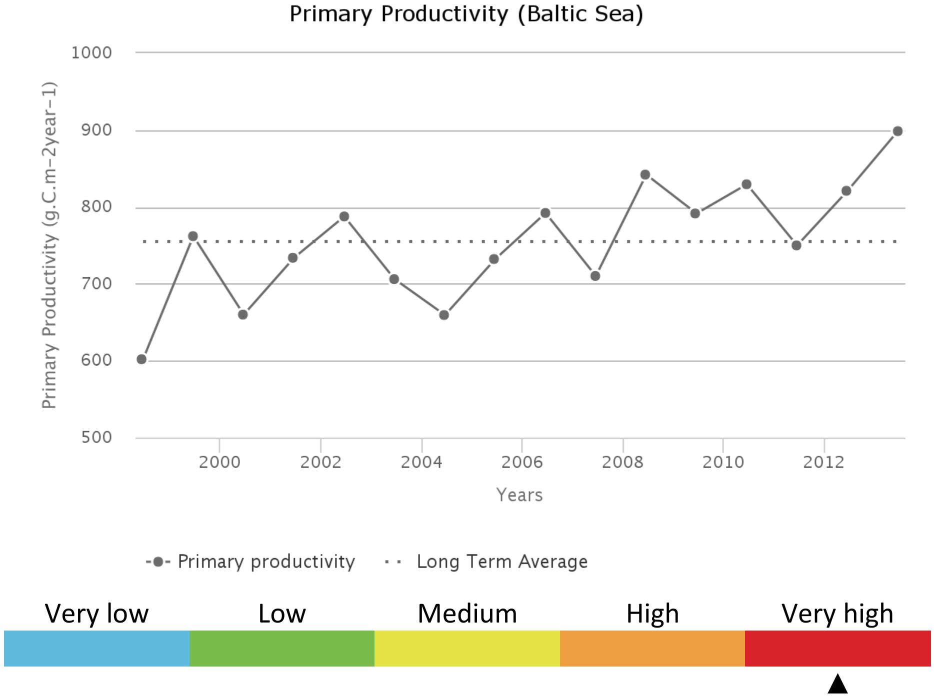
Chlorophyll-A

The annual Chlorophyll a concentration (CHL) cycle has a maximum peak (5.78 mg.m^{-3}) in July and a minimum (2.03 mg.m^{-3}) during February. The average CHL is 3.90 mg.m^{-3}. Maximum primary productivity (898 g.C.m^{-2}.y^{-1}) occurred during 2013 and minimum primary productivity (602 g.C.m^{-2}.y^{-1}) during 1998. There is a statistically insignificant increasing trend in Chlorophyll of 48.5 % from 2003 through 2013. The average primary productivity is 755 g.C.m^{-2}.y^{-1}, which places this LME in Group 5 of 5 categories (with 1 = lowest and 5= highest).



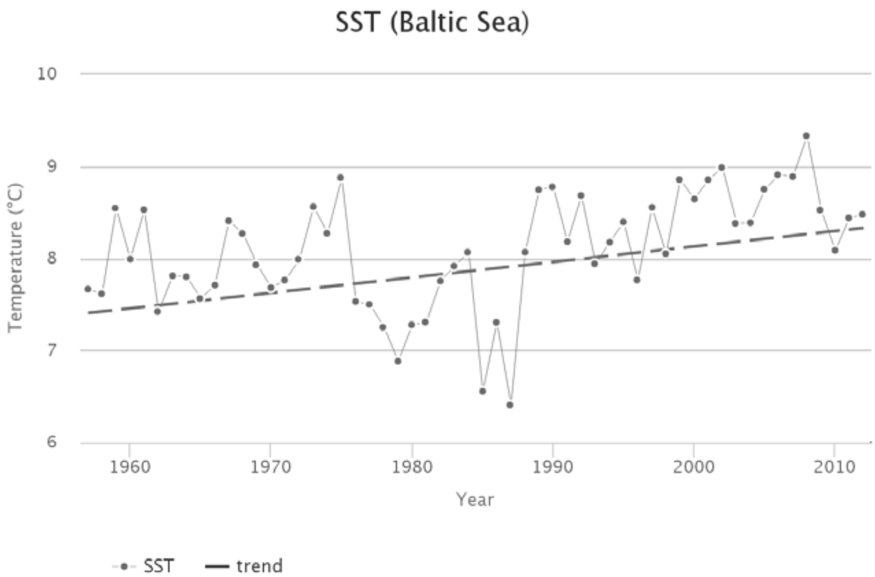
Very low	Low	Medium	High	Very high
				▲

Primary productivity



Sea Surface Temperature

From 1957 to 2012, the Baltic Sea LME #23 has warmed by 0.93°C, thus belonging to Category 3 (fast warming LME). The Baltic Sea was the fastest warming LME in the World Ocean between 1982 and 2006 (delta SST = 1.35°C, according to Belkin, 2009). This extremely high warming rate was in a large part due to the extremely cold epoch of the late 1970s-1980s that began abruptly in 1976 and ended abruptly in 1989. After that, the temperature rise was rather modest. The absolute maximum SST (9.2°C) was reached in 2008, after which SST dropped by 1°C. The rapid warming of the Baltic Sea reported by Belkin (2009) is consistent with SST warming rates reported by Mackenzie and Schiedek (2007), who noted strong seasonality of the long-term warming: In the entire Baltic-North Sea region the temperature increase in summer is much higher (1.5°C) than in winter (0.3°C). The SST variations correlate with air temperature over the Baltic Sea, which increased by 2°C between 1870 and 2004 (HELCOM, 2007, Fig. 3).

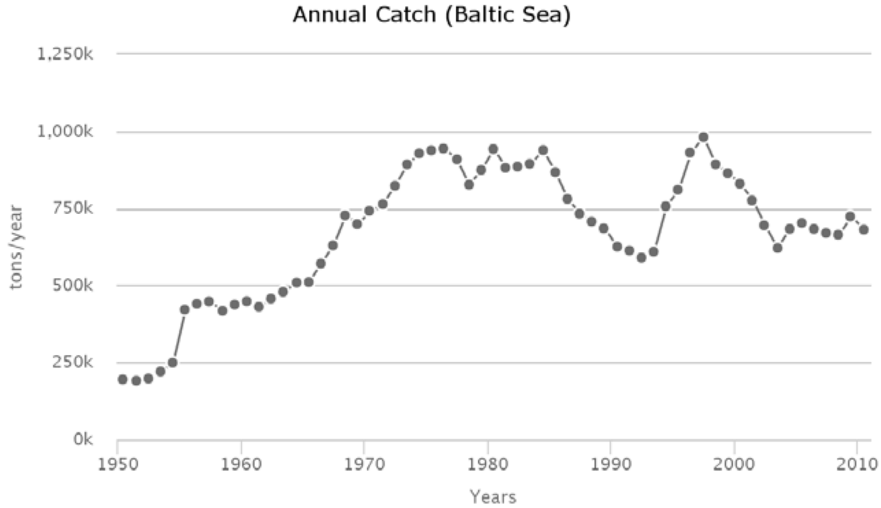


Fish and Fisheries

In the Baltic Sea LME, cod (*Gadus morhua*), herring (*Clupea harengus*) and sprat (*Strattus sprattus*) dominate the fish community in terms of numbers and biomass.

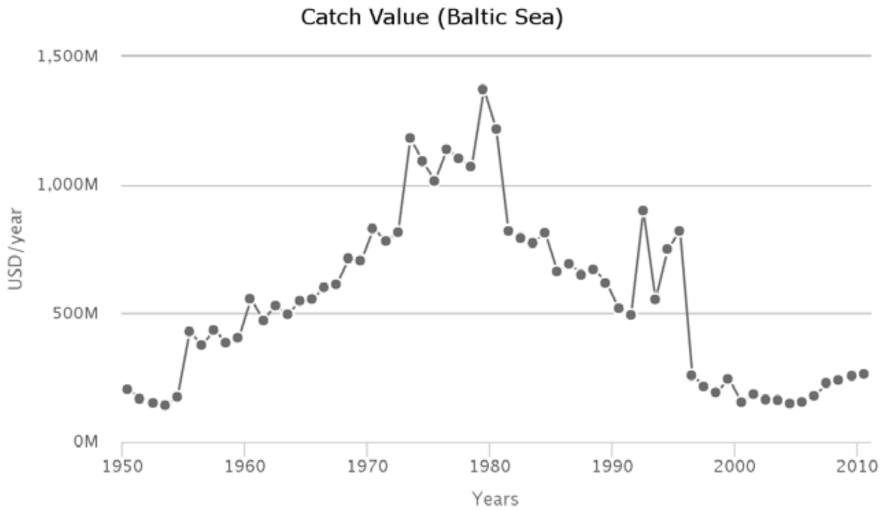
Annual Catch

Total reported landings in this LME showed a steady increase from the 1950s to the 1980s. Since then, the catch declined slightly from the 1980s to the mid-1990s, and followed by a sharp increase to a peak with 980,000 t in 1997.



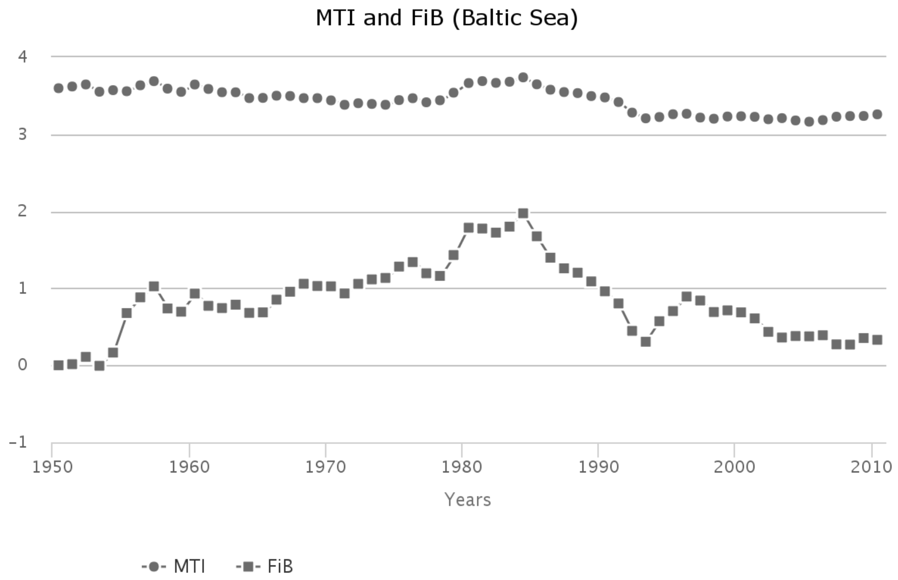
Catch value

The value of the reported landings peaked in 1979, estimated at 1.4 billion US$ (in 2005 real US$).



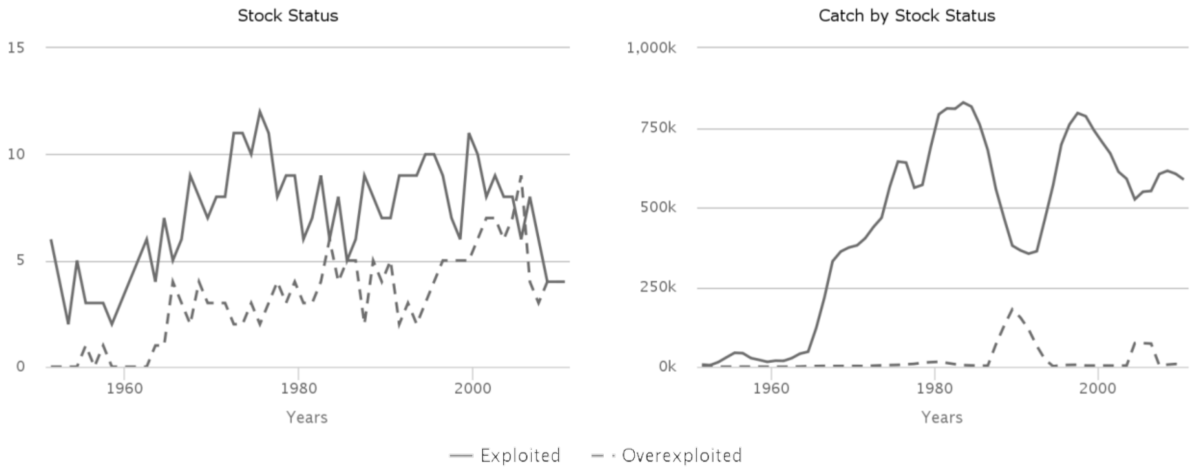
Marine Trophic Index and Fishing-in-Balance index

The MTI shows a significant decline from the mid-1980s to 2010 likely due to the increased sprat landings. However, as a notable decline in Atlantic cod landings is also evident, the decline in the mean trophic level constitutes a case of a "fishing down" of the local food web. The rapid decline in the FiB index also supports this interpretation.



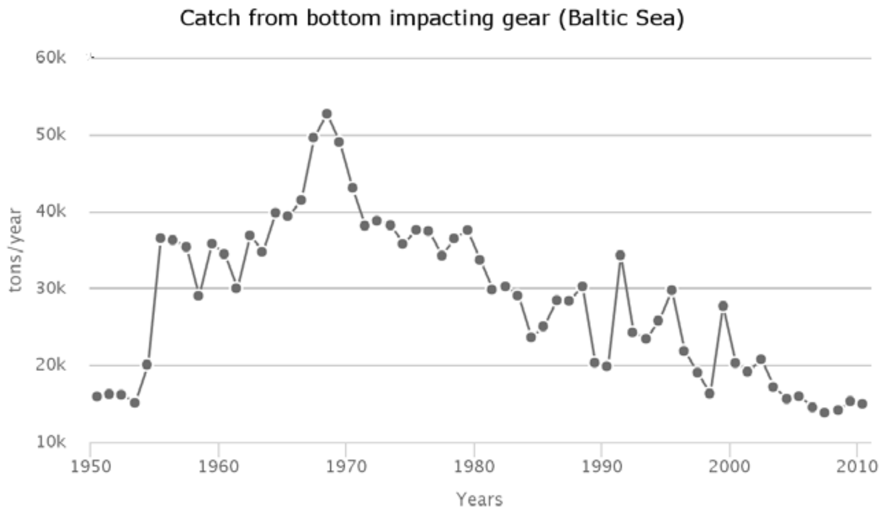
Stock status

The Stock-Catch Status Plots indicate that about 40% of the fished stocks in the LME have collapsed, but that the majority of the catch is supplied by fully exploited stocks, likely due to the large European sprat catch.



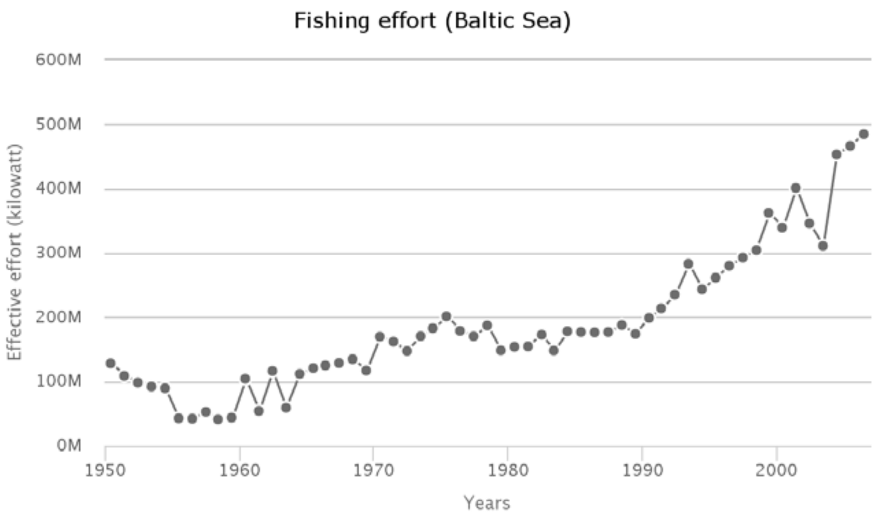
Catch from bottom impacting gear

The percentage of catch from the bottom gear type to the total catch was around 8% in the 1950s and then started to decline in the early 1970s. In the recent decade, this percentage is lower than 2%.



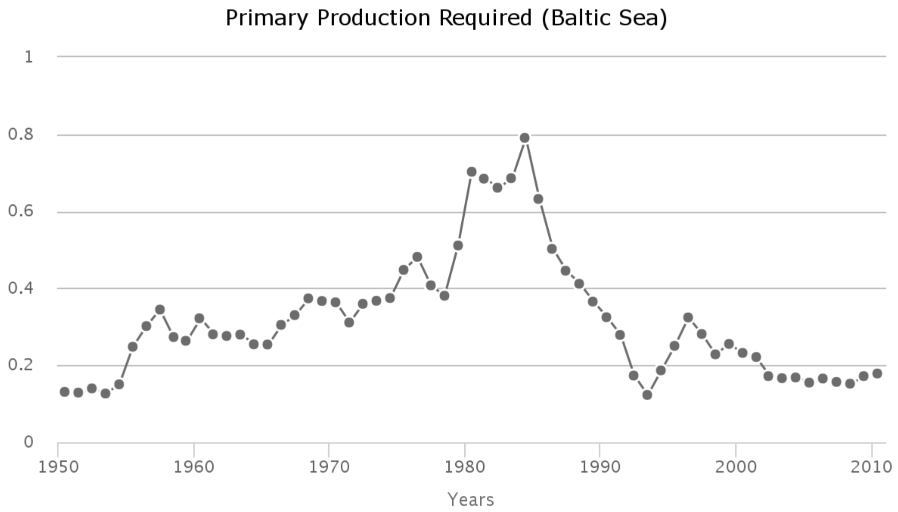
Fishing effort

The total effective effort continuously increased from around 100 million kW in the early 1950s to its peak at 500 million kW in the mid-2000s.



Primary Production Required

The primary production required (PPR) to sustain the reported landings in this LME reached 25% of the observed primary production in the mid-1980s, but has declined to less than 10 % in recent years.



Pollution and Ecosystem Health

Pollution

Nutrient ratio, Nitrogen load and Merged Indicator

Human activities in watersheds are affecting nutrients transported by rivers into LMEs. Large amounts of nutrients (in particular *nitrogen load*) entering coastal waters of LMEs can result in high biomass algal blooms, leading to hypoxic or anoxic conditions, increased turbidity and changes in community composition, among other effects. In addition, changes in the *ratio of nutrients* entering LMEs can result in dominance by algal species that have deleterious effects (toxic, clog gills of shellfish, etc.) on ecosystems and humans. An overall nutrient indicator (*Merged Nutrient Indicator*) based on 2 sub-indicators: *Nitrogen Load* and *Nutrient Ratio* (ratio of dissolved Silica to Nitrogen or Phosphorus - the Index of Coastal Eutrophication Potential or ICEP) was calculated.

Nitrogen load

The Nitrogen Load risk level for contemporary (2000) conditions was moderate (level 3 of the five risk categories, where 1 = lowest risk; 5 = highest risk). Based on a “current trends” scenario (Global Orchestration), this remained the same in 2030 and 2050.

Nutrient ratio

The Nutrient Ratio (ICEP) risk level for contemporary (2000) conditions was moderate (3). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

Merged nutrient indicator

The risk level for the Merged Nutrient Indicator for contemporary (2000) conditions was moderate (3). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

2000			2030			2050		
Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator
3	3	3	3	3	3	3	3	3

Legend:

Very low   Low   Medium   High   Very high

POPs

Only one sample from Helsinborg, Sweden, is available because another sample from the same beach was only white (fresh) pellets, which could underestimate the pollution status. PCB concentration (ng.g^{-1} of pellets) in the analyzed sample was 405, corresponding to risk category 4 of the five risk categories (1 = lowest risk; 5 = highest risk), suggesting heavy impact by PCBs. DDT concentration was 10 ng.g^{-1} (category 2) and HCH concentration was 0.5 (category 1). More locations should be sampled and analyzed for proper evaluation of this LME.

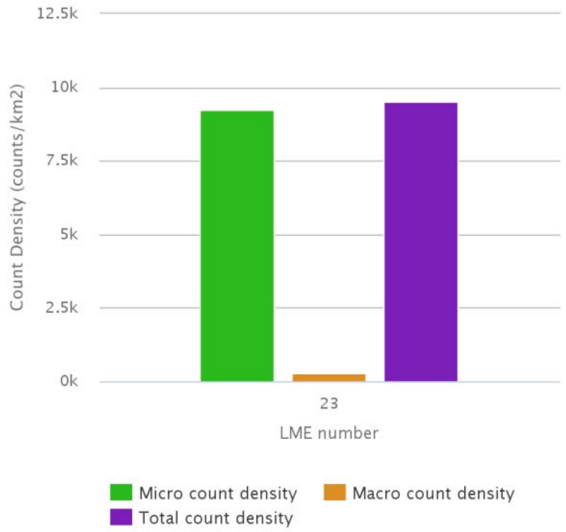
	PCBs		DDTs		HCHs	
Locations	Avg. (ng/g)	Risk	Avg. (ng/g)	Risk	Avg. (ng/g)	Risk
2	405	4	10	2	0.5	1

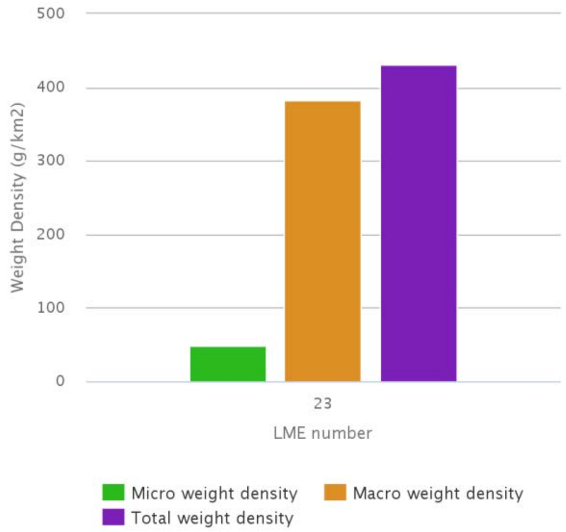
Legend:

Very low Low Medium High Very high

Plastic debris

Modelled estimates of floating plastic abundance (items km^{-2}), for both micro-plastic (<4.75 mm) and macro-plastic (>4.75 mm), indicate that this LME is in the group with relatively high levels of plastic concentration. Estimates are based on three proxy sources of litter: shipping density, coastal population density and the level of urbanisation within major watersheds, with enhanced run-off. The high values are due to the relative importance of these sources in this LME. The abundance of floating plastic in this category is estimated to be on average over 100 times higher that those LMEs with lowest values. There is good evidence from sea-based direct observations and towed nets to support this conclusion.





Ecosystem Health

Mangrove and coral cover

Not applicable.

Reefs at risk

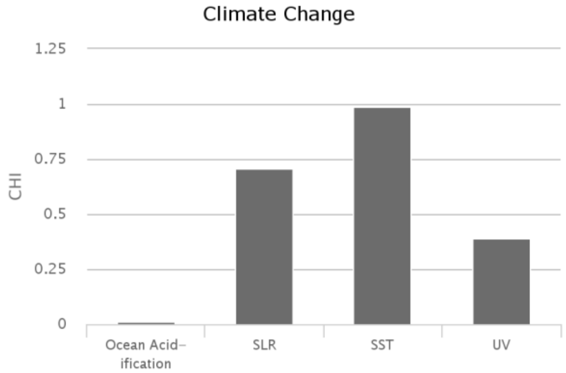
Not applicable.

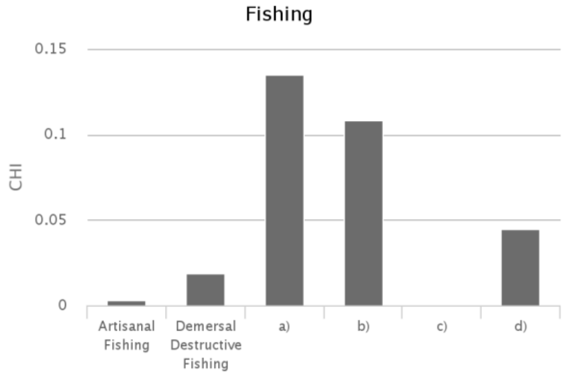
Marine Protected Area change

The Baltic Sea LME experienced an increase in MPA coverage from 2,913 km^2 prior to 1983 to 17,150 km^2 by 2014. This represents an increase of 488%, within the low category of the 5 categories of MPA change (low, lowest, medium, high, highest).

Cumulative Human Impact

The Baltic Sea LME experiences an above average overall cumulative human impact (score 3.65; maximum LME score 5.22), which is also well above the LME with the least cumulative impact. It falls in risk category 3 of the five risk categories (1 = lowest risk; 5 = highest risk). This LME is most vulnerable to climate change. Of the 19 individual stressors, three connected to climate change have the highest average impact on the LME: UV radiation (0.39; maximum in other LMEs was 0.76), sea level rise (0.71, the highest value for any LME), and sea surface temperature (0.99; maximum in other LMEs was 2.16). Other key stressors include commercial shipping, nutrient and pesticide pollution from land, ocean based pollution, pelagic low-bycatch commercial fishing, and demersal non-destructive low- and high-bycatch commercial fishing.





a) Demersal Non-destructive High Bycatch Fishing
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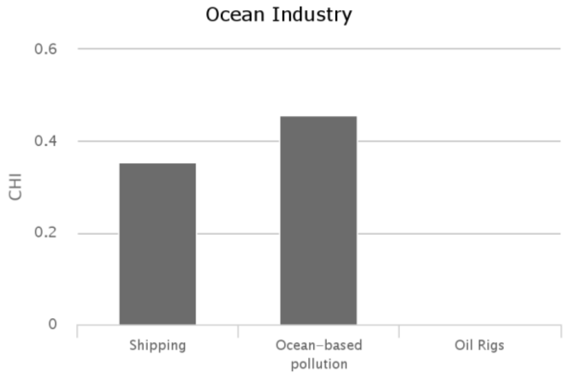
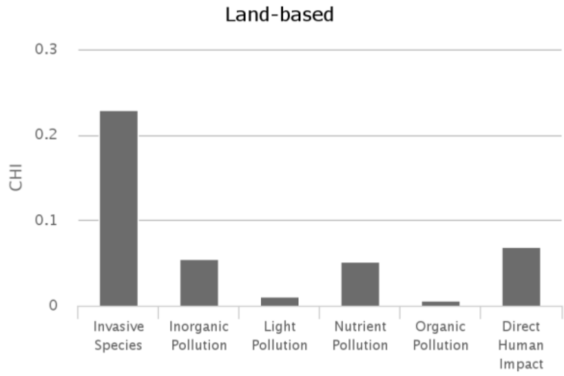
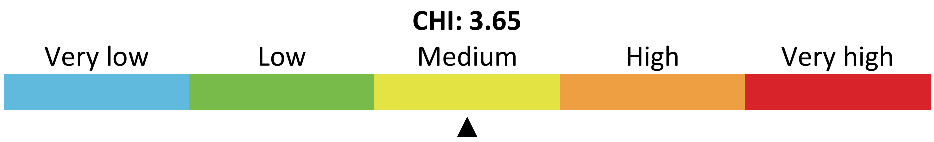
b) Demersal Non-destructive Low Bycatch Fishing
d) Pelagic Low Bycatch Fishing





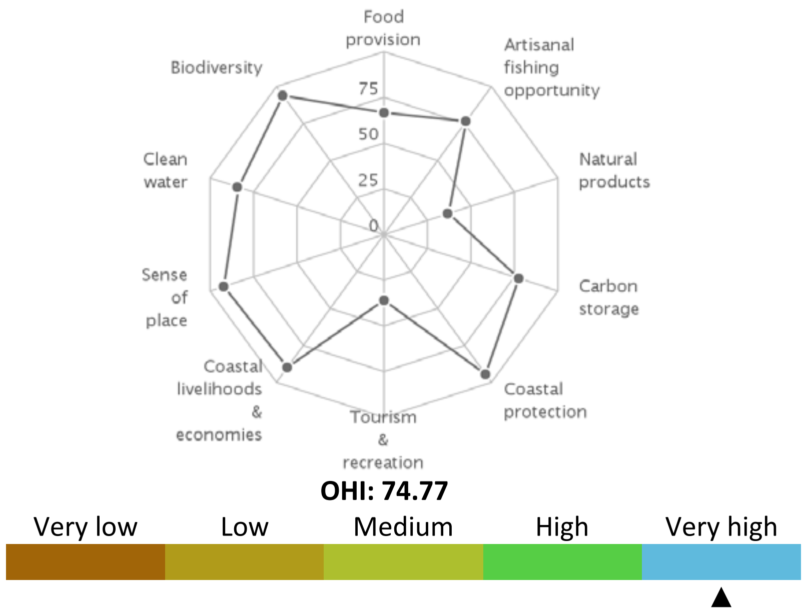


Ocean Health Index

The Baltic Sea LME scores above average on the Ocean Health Index compared to other LMEs (score 80 out of 100; range for other LMEs was 57 to 82) but still relatively low. This score indicates that the LME is below its optimal level of ocean health, although there are some aspects that are doing well. Its score in 2013 increased 1 point compared to the previous year, due in large part to changes in the scores for coastal livelihoods and clean waters. This LME scores lowest on mariculture and tourism &

recreation goals and highest on artisanal fishing opportunities, coastal protection, coastal economies, lasting special places, and biodiversity goals. It falls in risk category 1 of the five risk categories, which is the lowest level of risk (1 = lowest risk; 5 = highest risk).

Ocean Health Index (Baltic Sea)



Socio-economics

Indicators of demographic trends, economic dependence on ecosystem services, human wellbeing and vulnerability to present-day extreme climate events and projected sea level rise, are assessed for this LME. To compare and rank LMEs, they were classified into five categories of risk (from 1 to 5, corresponding to lowest, low, medium, high and highest risk, respectively) based on the values of the individual indicators. In the case of economic revenues, the LMEs were grouped to 5 classes of revenues from lowest, low, medium, high and highest, as revenues did not translate to risk.

Population

The coastal area stretches over 567 489 km^2. A current population of 34 273 thousand in 2010 is projected to decrease to 25 679 thousand in 2100, with a density of 60 persons per km^2 in 2010 decreasing to 45 per km^2 by 2100. About 29% of coastal population lives in rural areas, and is projected to decrease in share to 27% in 2100.

Total population		Rural population	
2010	**2100**	**2010**	**2100**
34,273,905	25,679,136	10,088,857	6,859,108

Legend: Very low, Low, Medium, High, Very high

Coastal poor

The indigent population makes up 11% of the LME's coastal dwellers. This LME places in the very low-risk category based on percentage and in the high-risk category using absolute number of coastal poor (present day estimate).

Coastal poor
3,864,980

Revenues and Spatial Wealth Distribution

Fishing and tourism depend on ecosystem services provided by LMEs. This LME ranks in the low-revenue category in fishing revenues based on yearly average total ex-vessel price of US 2013 $236 million for the period 2001-2010. Fish protein accounts for 12% of the total animal protein consumption of the coastal population. Its yearly average tourism revenue for 2004-2013 of US 2013 $89 034 million places it in the very high-revenue category. On average, LME-based tourism income contributes 8% to the national GDPs of the LME coastal states. Spatial distribution of economic activity (e.g. spatial wealth distribution) measured by night-light and population distribution as coarse proxies can range from 0.0000 (totally equal distribution and lowest risk) to 1.0000 (concentrated in 1 place and most inequitable and highest risk). The Night Light Development Index (NLDI) thus indicates the level of spatial economic development, and that for this LME falls in the category with low risk.

Fisheries Annual Landed Value	% Fish Protein Contribution	Tourism Annual Revenues	% Tourism Contribution to GDP	NLDI
235,820,699	11.8	89,034,004,337	8.5	0.6930

Legend: Very low, Low, Medium, High, Very high

Human Development Index

Using the Human Development Index (HDI) that integrates measures of health, education and income, the present-day LME HDI belongs to the very high HDI and very low risk category. Based on an HDI of 0.866, this LME has an HDI Gap of 0.134, the difference between present and highest possible HDI (1.000). The HDI Gap measures an overall vulnerability to external events such as disease or extreme climate related events, due to less than perfect health, education, and income levels, and is independent of the harshness of and exposure to specific external shocks.

HDI values are projected to the year 2100 in the contexts of shared socioeconomic development pathways (SSPs). This LME is projected to assume a place in the very low risk category (very high HDI) in 2100 under a sustainable development pathway. Under a fragmented world scenario, the LME is estimated to place in a high-risk category (low HDI) because of reduced income levels and population values from those estimated in a sustainable development scenario.

	HDI 2100	
HDI	SSP1	SSP3
0.8659	0.9544	0.6951

Legend: Very low, Low, Medium, High, Very high

Climate-Related Threat Indices

The Climate-Related Threat Indices utilize the HDI Gaps for present-day and projected 2100 scenarios. The contemporary climate index accounts for deaths and property losses due to storms, flooding and extreme temperatures incurred by coastal states during a 20-year period from 1994 to 2013 as hazard measures, the 2010 coastal population as proxy for exposure, and the present day HDI Gap as vulnerability measure.

The Contemporary Threat Index incorporates a Dependence Factor based on the fish protein contribution to dietary animal protein, and on the mean contribution of LME tourism to the national GDPs of LME coastal states. The HDI Gap and the degree of dependence on LME ecosystem services define the vulnerability of a coastal population. It also includes the average of risk related to extreme climate events, and the risk based on the degrading system states of an LME (e.g. overexploited fisheries, pollution levels, decrease in coastal ecosystem areas).

The 2100 sea level rise threat indices, each computed for the sustainable world and fragmented world development pathways, use the maximum projected sea level rise at the highest level of warming of 8.5 W/m^2 in 2100 as hazard measure, development pathway-specific 2100 populations in the 10 m × 10 km coast as exposure metrics, and development pathway-specific 2100 HDI Gaps as vulnerability estimates.

Present day climate threat index of this LME is within the medium-risk (medium threat) category. The combined contemporaneous risk due to extreme climate events, degrading LME states and the level of vulnerability of the coastal population, is high. In a sustainable development scenario, the risk index from sea level rise in 2100 is very low, and increases to medium risk under a fragmented world development pathway.

2010		2100	
Climate Threat	**Contemporary Threat**	**SSP1**	**SSP3**
0.6330	0.3476	0.2871	0.5300

Legend:

Very low Low Medium High Very high

Governance

Governance architecture

The arrangements for pollution (both marine and land-based) and biodiversity in this LME – under the Helsinki Convention - appear to be well integrated. This Convention also has structural components that address fisheries and biodiversity and as such, provides an integrating mechanism for the LME at a level that is lacking in most LMEs. The extent to which HELCON has any formal linkages with NASCO and NAMMCO is not clear. It is also likely that ICES provides a common science advisory role within all of the arrangements.

The overall scores for ranking of risk were:

Engagement	Completeness	Integration
65	**61**	**0.1**

Legend:

Very low Low Medium High Very high

LME 24 – Celtic-Biscay Shelf

Bordering countries: France, Guernsey, Ireland, Isle of Man, Jersey, United Kingdom.
LME Total area: 766,550 km^2

List of indicators

LME overall risk

This LME falls in the cluster of LMEs that exhibit medium to high numbers of collapsed and overexploited fish stocks, high levels of demersal non-destructive low bycatch fishing, as well as very high shipping pressure.

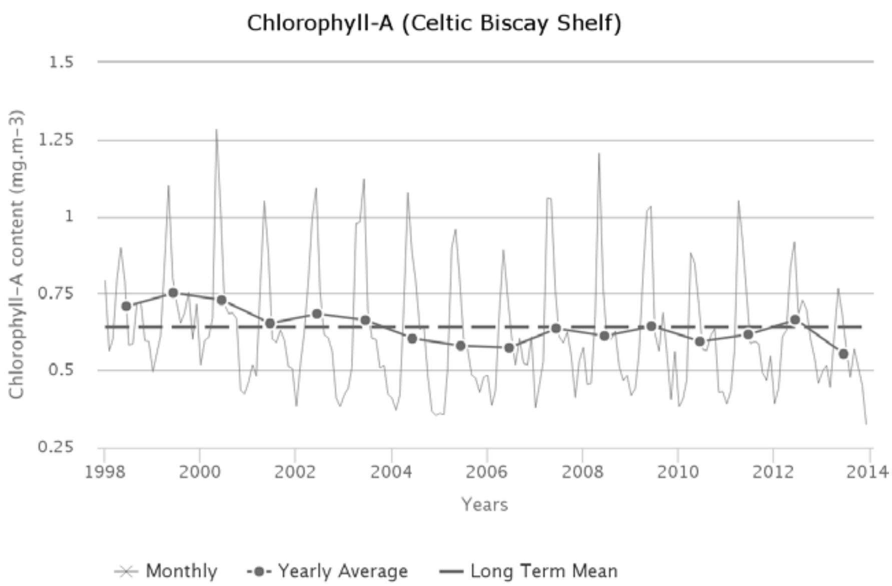
Based on a combined measure of the Human Development Index and the averaged indicators for fish & fisheries and pollution & ecosystem health modules, the overall risk factor is medium.

Very low	Low	Medium	High	Very high
		▲		

Productivity

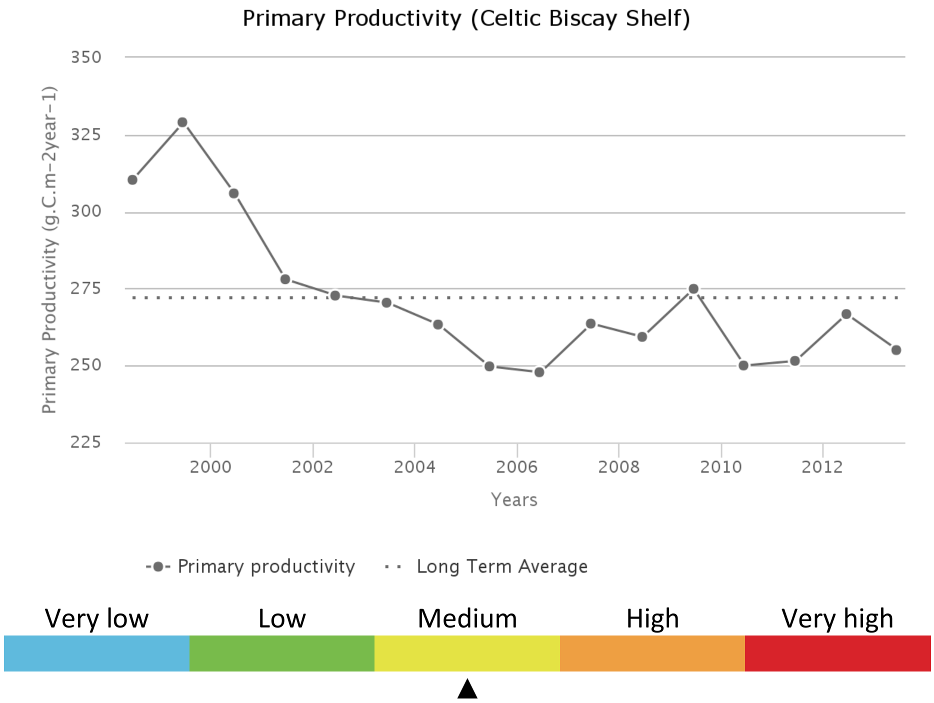
Chlorophyll-A

The annual Chlorophyll a concentration (CHL) cycle has a maximum peak (0.978 $mg.m^{-3}$) in May and a minimum (0.369 $mg.m^{-3}$) during December. The average CHL is 0.641 $mg.m^{-3}$. Maximum primary productivity (329 $g.C.m^{-2}.y^{-1}$) occurred during 1999 and minimum primary productivity (248 $g.C.m^{-2}.y^{-1}$) during 2006. There is a statistically significant decreasing trend in Chlorophyll of -4.11 % from 2003 through 2013. The average primary productivity is 272 $g.C.m^{-2}.y^{-1}$, which places this LME in Group 3 of 5 categories (with 1 = lowest and 5= highest).



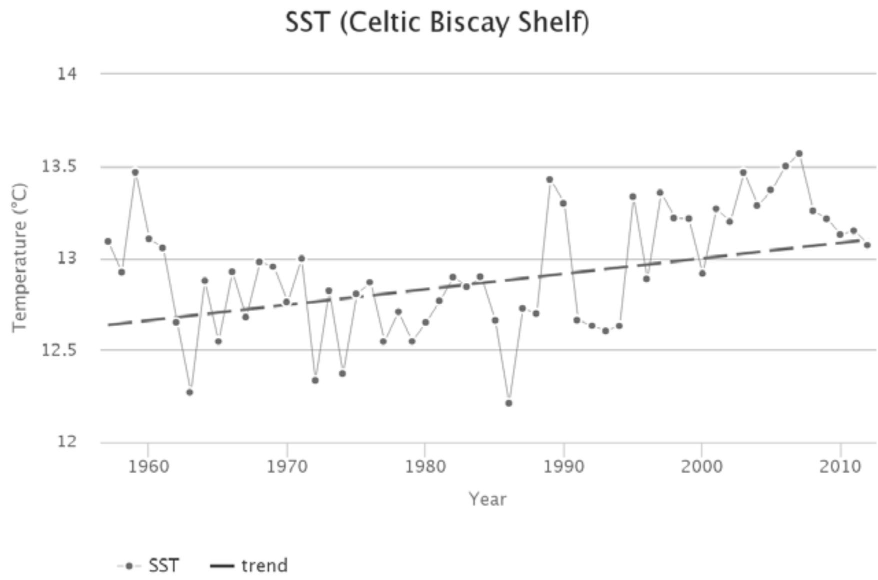
Very low	Low	Medium	High	Very high
		▲		

Primary productivity



Sea Surface Temperature

From 1957 to 2012, the Celtic-Biscay Shelf LME #24 has warmed by 0.51°C, thus belonging to Category 3 (moderate warming LME). After the sharp drop around 1960, SST remained relatively cold until it bottomed out at 12.2°C in 1986. An abrupt rebound has followed, resulting in SST exceeding 13.4°C in 1989, a 1.2°C jump in just 3 years. Except of the cold spell in 1991-1994, SST remained relative warm until it has peaked at 13.6°C in 2007. Measured from the absolute minimum of 12.2°C in 1986 to the absolute maximum of 13.6°C in 2007, the rate of SST increase was 1.4°C in 21 years. The subsequent cooling between 2007 and 2012 resulted in SST decrease of 0.6°C. This is the longest interrupted decrease of SST in this LME since 1957.

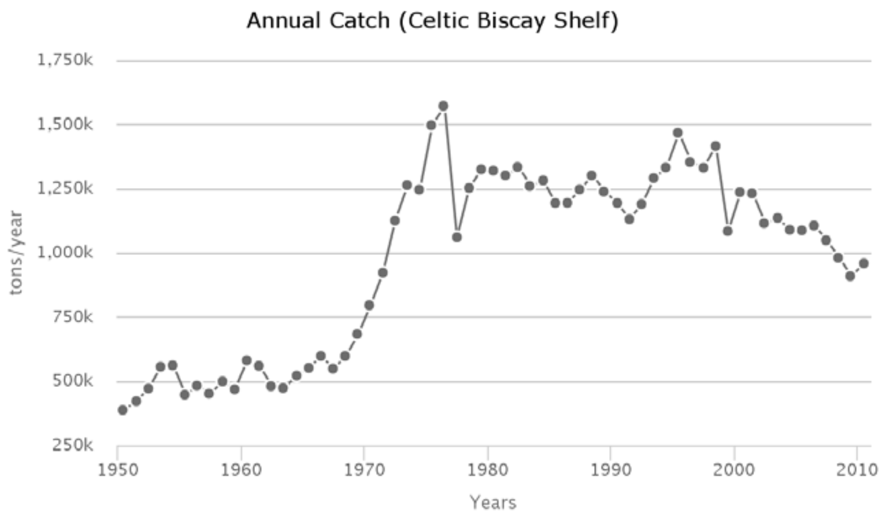


Fish and Fisheries

The natural environmental variability in this LME adds a high degree of uncertainty to the management of marine resources. Cyclical oscillations, such as the North Atlantic Oscillation, have been linked to fluctuations in the abundance of albacore and bluefin tuna. Many stocks in the LME are intensively exploited or depleted and Total Allowable Catch (TAC)-based regulations have been implemented for anchovy, hake and blue whiting.

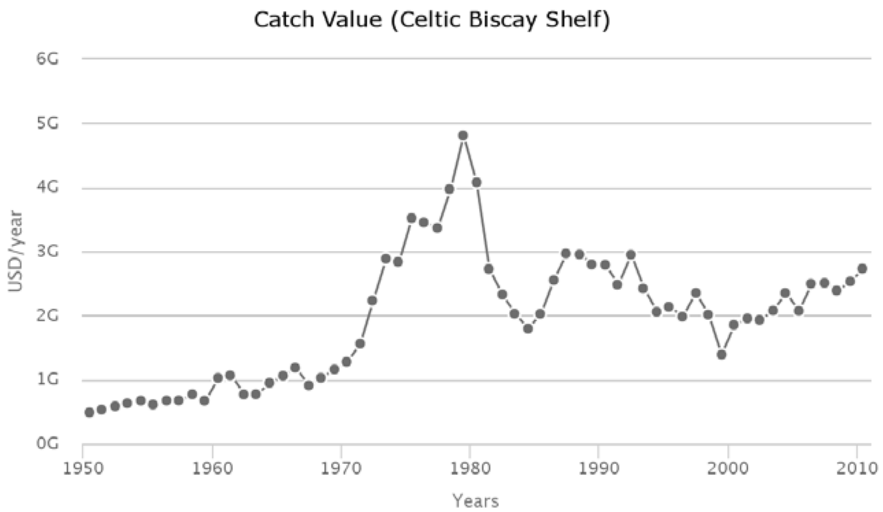
Annual Catch

Total reported landings in this LME show changes in biomass and catch composition. The landings recorded a peak of 1.6 million t in 1976, and declined to 1 million t in recent years.



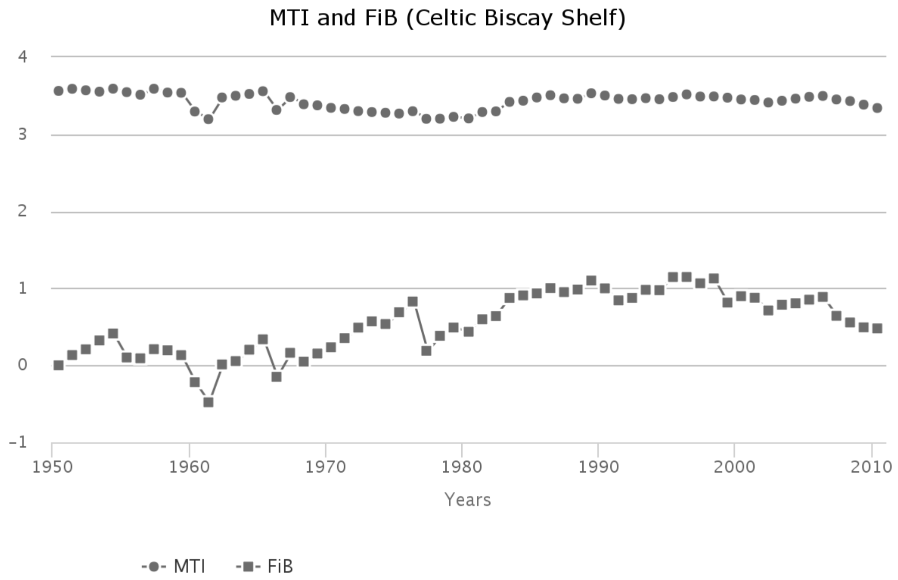
Catch value

The value of the reported landings reached 4.8 billion US$ (in 2005 real US$) in 1979.



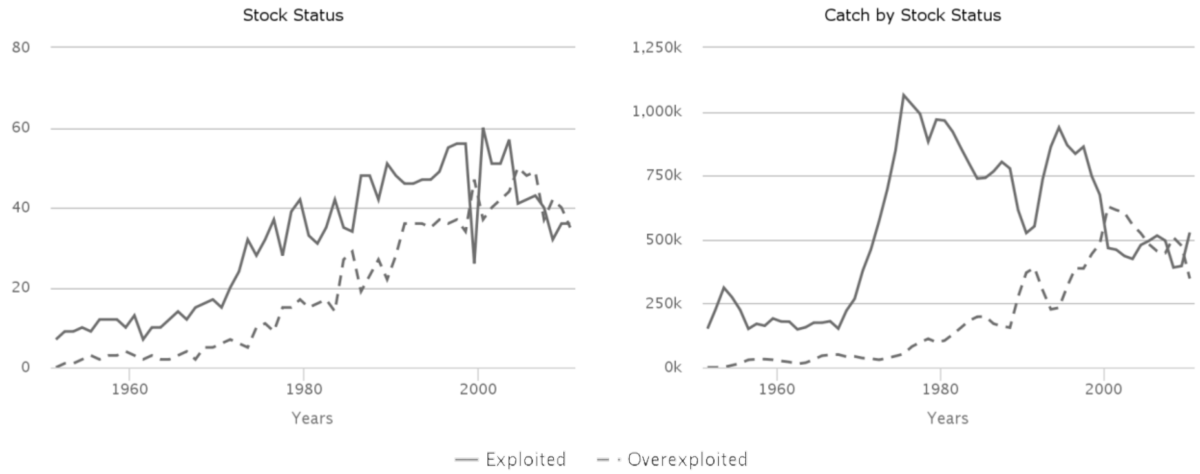
Marine Trophic Index and Fishing-in-Balance index

The MTI declined over the three decades from 1950 to 1980. In the early 1980s, however, it experienced a strong increase, while the FiB index reached a new plateau. These trends indicate that 'fishing down' of the food web occurred from 1950 to the 1980s, after which the effect was masked by expansion of the fisheries into new stocks (e.g., blue whiting).



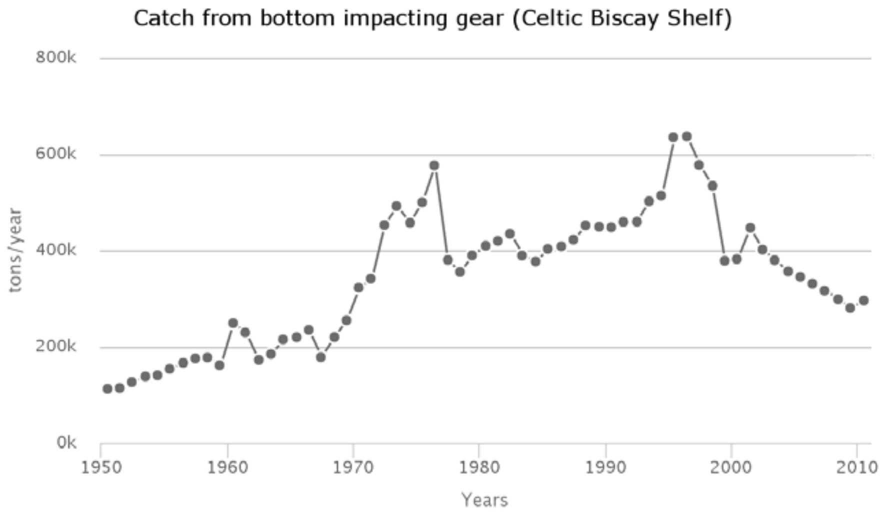
Stock status

The Stock-Catch Status Plots indicate that collapsed stocks make up 30% of all stocks exploited in the LME, but that fully exploited stocks contribute almost 50% of the reported landings biomass.



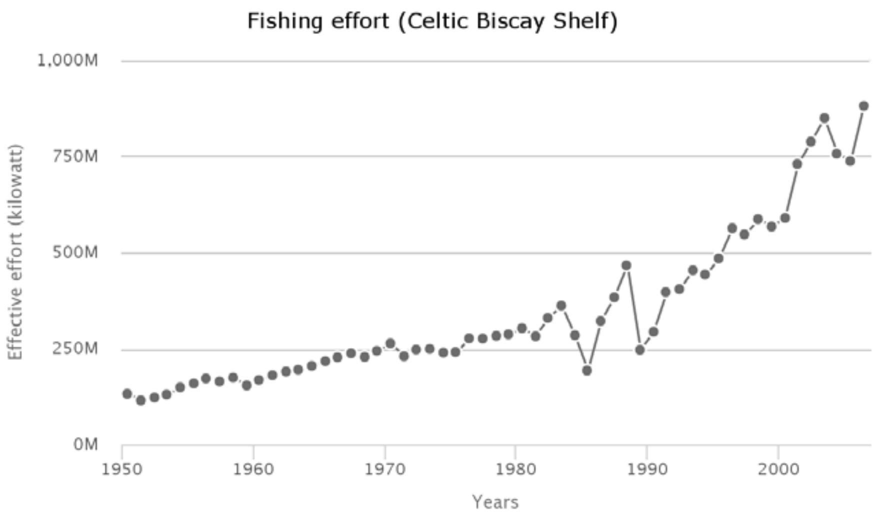
Catch from bottom impacting gear

The percentage of catch from the bottom gear type to the total catch fluctuated between 25 and 47% from 1950 to 2010. This percentage reached its peak at 47% in 1995. In the recent decade, this percentage fluctuated around 30%.



Fishing effort

The total effective effort continuously increased from around 100 million kW in the 1950s to its peak at 540 million kW in the mid-2000s.



Primary Production Required

The primary production required (PPR) to sustain the reported landings in this LME reached 50% of the observed primary production in the mid-1990s, but has declined to 40% in recent years.

Pollution and Ecosystem Health

Pollution

Nutrient ratio, Nitrogen load and Merged Indicator

Human activities in watersheds are affecting nutrients transported by rivers into LMEs. Large amounts of nutrients (in particular *nitrogen load*) entering coastal waters of LMEs can result in high biomass algal blooms, leading to hypoxic or anoxic conditions, increased turbidity and changes in community composition, among other effects. In addition, changes in the *ratio of nutrients* entering LMEs can result in dominance by algal species that have deleterious effects (toxic, clog gills of shellfish, etc.) on ecosystems and humans. An overall nutrient indicator (*Merged Nutrient Indicator*) based on 2 sub-indicators: *Nitrogen Load* and *Nutrient Ratio* (ratio of dissolved Silica to Nitrogen or Phosphorus - the Index of Coastal Eutrophication Potential or ICEP) was calculated.

Nitrogen load

The Nitrogen Load risk level for contemporary (2000) conditions was high. (level 4 of the five risk categories, where 1 = lowest risk; 5 = highest risk). Based on a “current trends” scenario (Global Orchestration), this remained the same in 2030 and 2050.

Nutrient ratio

The risk level for the Nutrient Ratio Sub-Indicator (ICEP) for contemporary (2000) conditions was high (4). According to the Global Orchestration scenario, the risk category remained the same in 2030 and 2050.

Merged nutrient indicator

The risk level for the Merged Nutrient Indicator for contemporary (2000) conditions was high (4). According to the Global Orchestration scenario, the risk category remained the same in 2030 and 2050.

2000			**2030**			**2050**		
Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator
4	4	4	4	4	4	4	4	4

Legend: Very low, Low, Medium, High, Very high

POPs

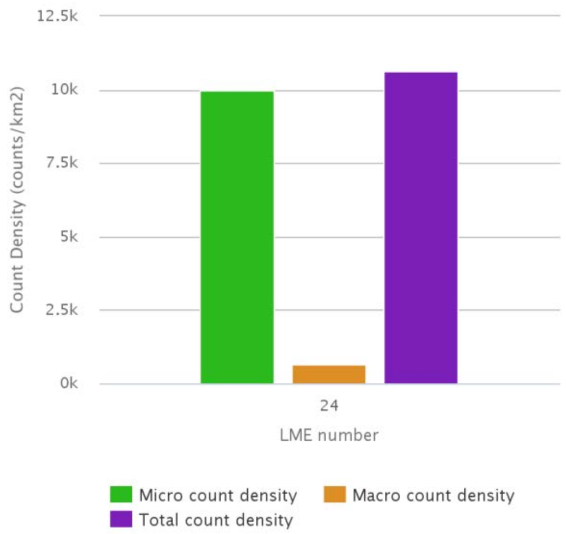
Fifteen samples were available from this LME. The average concentration (ng.g^{-1} of pellets) was 423 (range 9 –2,970 ng.g^{-1}) for PCBs, 13 (range 1–86 ng.g^{-1}) for DDTs, and 5.1 (range 0.2- 21.1 ng.g^{-1}) for HCHs. The PCBs average corresponds to risk category 4, DDTs to category 2 and HCHs to category 3, of the five risk categories (1 = lowest risk; 5 = highest risk). Distinct spatial difference in pollution status was observed between the United Kingdom side (9 - 46 ng.g^{-1} of pellets for PCBs and 1 - 3 ng.g^{-1} of pellets for DDTs) and the French side (64 - 2,970 ng.g^{-1} of pellets for PCBs and 4 - 86 ng.g^{-1} of pellets for DDTs), especially in Normandy. PCB concentration (ng.g^{-1} pellet) in the pellets from Le Havre, at the mouth of Seine River, exhibited one of the highest concentrations among all samples worldwide (2,970 ng.g^{-1}). This region is a historically developed industrial area and has one of the biggest harbours in France. The resultant highly contaminated bottom sediments act as legacy sources of PCBs. High concentrations of DDTs in Le Havre could be also legacy pollution arising from runoff from the catchment of the Seine River where DDT might have been used in the past. Higher concentrations of HCHs (up to 21.1 ng.g^{-1} of pellets) could be related to the current usage of pesticide Lindane in northern France. This is consistent with monitoring results of atmospheric HCHs (Pozo et al., 2006). Continuous monitoring in this area, especially northern France, is recommended.

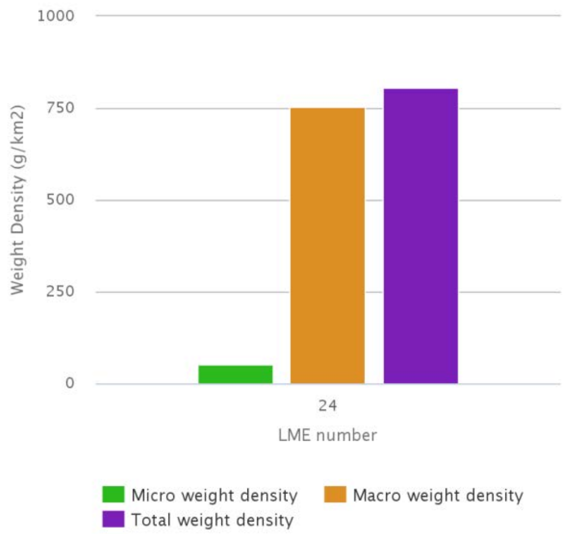
	PCBs		DDTs		HCHs	
Locations	Avg. (ng/g)	Risk	Avg. (ng/g)	Risk	Avg. (ng/g)	Risk
16	426	**4**	13	**2**	5.1	**3**

Legend: Very low, Low, Medium, High, Very high

Plastic debris

Modelled estimates of floating plastic abundance (items km^{-2}), for both micro-plastic (<4.75 mm) and macro-plastic (>4.75 mm), indicate that this LME is in the group with relatively high levels of plastic concentration. Estimates are based on three proxy sources of litter: shipping density, coastal population density and the level of urbanisation within major watersheds, with enhanced run-off. The high values are due to the relative importance of these sources in this LME. The abundance of floating plastic in this category is estimated to be on average over 100 times higher that those LMEs with lowest values. There is moderate evidence from sea-based direct observations and towed nets to support this conclusion.





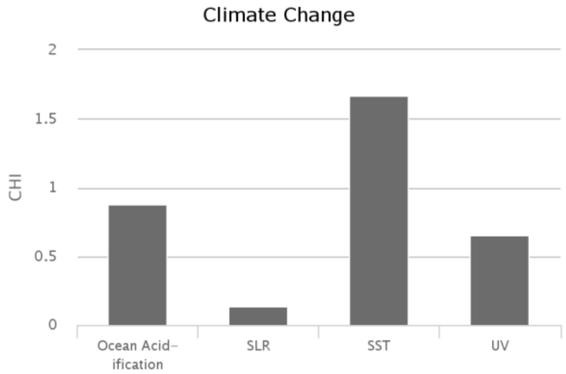
Ecosystem Health

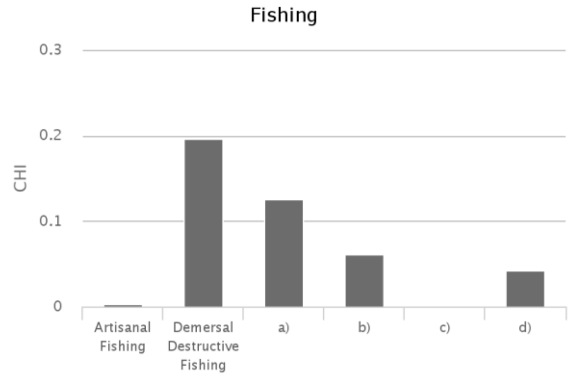
Mangrove and coral cover
Not applicable.

Reefs at risk
Not applicable.

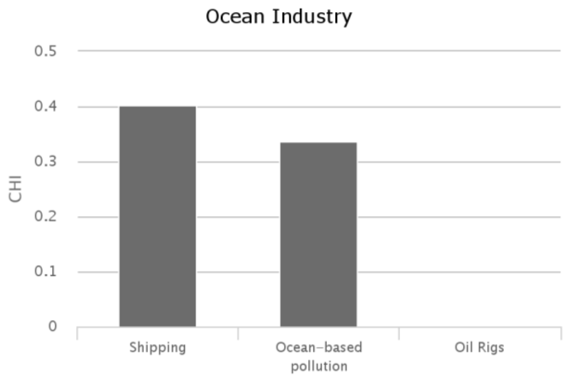
Marine Protected Area change
The Celtic-Biscay Shelf LME experienced an increase in MPA coverage from 4,967 km^2 prior to 1983 to 11,206 km^2 by 2014. This represents an increase of 126%, within the low category of MPA change.

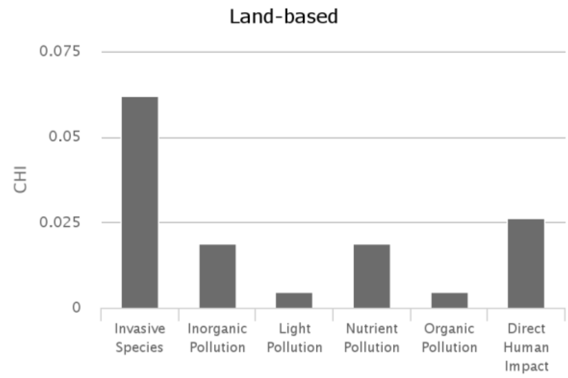
Cumulative Human Impact
The Celtic-Biscay Shelf LME experiences well above average overall cumulative human impact (score 4.64; maximum LME score 5.22). It falls in risk category 5 of the five risk categories (1 = lowest risk; 5 = highest risk). This LME is most vulnerable to climate change. Of the 19 individual stressors, three connected to climate change have the highest average impact on the LME: ocean acidification (0.87; maximum in other LMEs was 1.20), UV radiation (0.65; maximum in other LMEs was 0.76), and sea surface temperature (1.67; maximum in other LMEs was 2.16). Other key stressors include commercial shipping, sea level rise, ocean based pollution, invasive species, pelagic low-bycatch commercial fishing, and all three types of demersal commercial fishing (demersal destructive, non-destructive low-bycatch, and non-destructive high-bycatch).

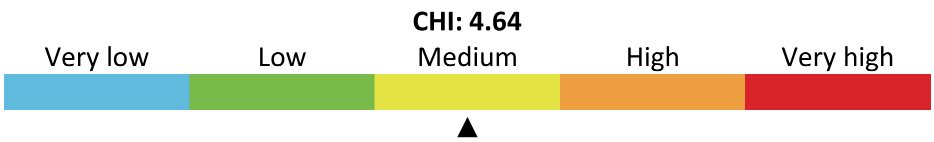




a) Demersal Non-destructive High Bycatch Fishing
c) Pelagic High Bycatch Fishing
b) Demersal Non-destructive Low Bycatch Fishing
d) Pelagic Low Bycatch Fishing

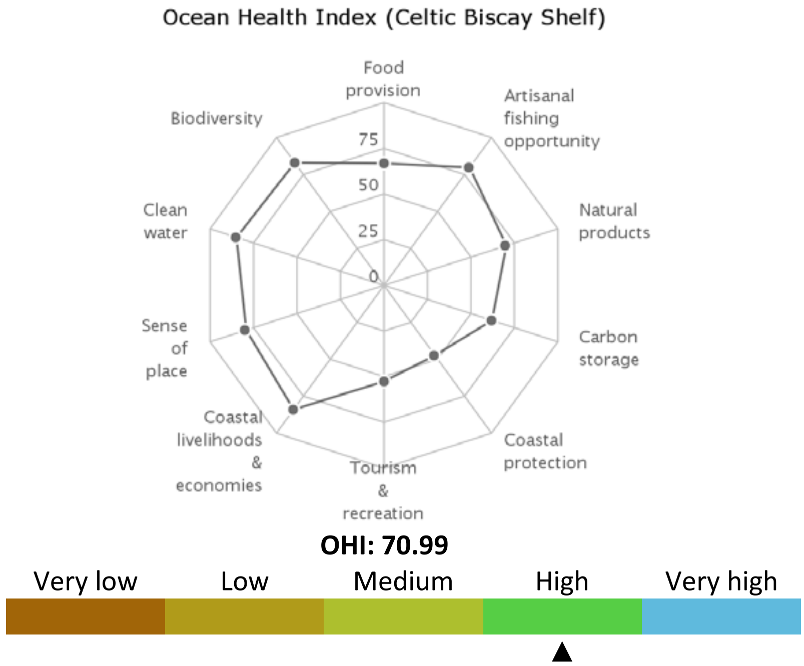






Ocean Health Index

The Celtic-Biscay Shelf LME scores above average on the Ocean Health Index compared to other LMEs (score 75 out of 100; range for other LMEs was 57 to 82), but still relatively low. This score indicates that the LME is well below its optimal level of ocean health, although there are some aspects that are doing well. Its score in 2013 remained unchanged compared to the previous year. This LME scores lowest on mariculture, coastal protection, carbon storage, and tourism & recreation goals and highest on artisanal fishing opportunities, coastal economies and lasting special places goals. It falls in risk category 2 of the five risk categories, which is a moderate level of risk (1 = lowest risk; 5 = highest risk).



Socio-economics

Indicators of demographic trends, economic dependence on ecosystem services, human wellbeing and vulnerability to present-day extreme climate events and projected sea level rise, are assessed for the this LME. To compare and rank LMEs, they were classified into five categories of risk (from 1 to 5, corresponding to lowest, low, medium, high and highest risk, respectively) based on the values of the individual indicators. In the case of economic revenues, the LMEs were grouped to 5 classes of revenues from lowest, low, medium, high and highest, as revenues did not translate to risk.

Population

The coastal area stretches over 389 613 km^2. A current population of 68 611 thousand in 2010 is projected to increase to 76 595 thousand in 2100, with a density of 176 persons per km^2 in 2010 increasing to 197 per km^2 by 2100. About 21% of coastal population lives in rural areas, and is projected to increase in share to 23% in 2100.

Total population		Rural population	
2010	2100	2010	2100
68,611,158	76,595,295	14,118,858	17,684,612

Legend: Very low, Low, Medium, High, Very high

Coastal poor

The indigent population makes up 2% of the LME's coastal dwellers. This LME places in the very low-risk category based on percentage and in the medium-risk category using absolute number of coastal poor (present day estimate).

Coastal poor
1,560,558

Revenues and Spatial Wealth Distribution

Fishing and tourism depend on ecosystem services provided by LMEs. This LME ranks in the very high-revenue category in fishing revenues based on yearly average total ex-vessel price of US 2013 $2 742 million for the period 2001-2010. Fish protein accounts for 10% of the total animal protein consumption of the coastal population. Its yearly average tourism revenue for 2004-2013 of US 2013 $233 075 million places it in the very high-revenue category. On average, LME-based tourism income contributes 11% to the national GDPs of the LME coastal states. Spatial distribution of economic activity (e.g. spatial wealth distribution) measured by night-light and population distribution as coarse proxies can range from 0.0000 (totally equal distribution and lowest risk) to 1.0000 (concentrated in 1 place and most inequitable and highest risk). The Night Light Development Index (NLDI) thus indicates the level of spatial economic development, and that for this LME falls in the category with very low risk.

Fisheries Annual Landed Value	% Fish Protein Contribution	Tourism Annual Revenues	% Tourism Contribution to GDP	NLDI
2,741,868,138	10.0	233,075,000,000	11.4	0.5913

Legend: Very low, Low, Medium, High, Very high

Human Development Index

Using the Human Development Index (HDI) that integrates measures of health, education and income, the present-day LME HDI belongs to the very high HDI and very low risk category. Based on an HDI of 0.892, this LME has an HDI Gap of 0.108, the difference between present and highest possible HDI (1.000). The HDI Gap measures an overall vulnerability to external events such as disease or extreme climate related events, due to less than perfect health, education, and income levels, and is independent of the harshness of and exposure to specific external shocks.

HDI values are projected to the year 2100 in the contexts of shared socioeconomic development pathways (SSPs). This LME is projected to assume a place in the very low risk category (very high HDI) in 2100 under a sustainable development pathway. Under a fragmented world scenario, the LME is estimated to place in a high-risk category (low HDI) because of reduced income levels and increased population values from those estimated in a sustainable development scenario.

	HDI 2100	
HDI	SSP1	SSP3
0.8924	0.9433	0.6332

Legend: Very low, Low, Medium, High, Very high

Climate-Related Threat Indices

The Climate-Related Threat Indices utilize the HDI Gaps for present-day and projected 2100 scenarios. The contemporary climate index accounts for deaths and property losses due to storms, flooding and extreme temperatures incurred by coastal states during a 20-year period from 1994 to

2013 as hazard measures, the 2010 coastal population as proxy for exposure, and the present day HDI Gap as vulnerability measure.

The Contemporary Threat Index incorporates a Dependence Factor based on the fish protein contribution to dietary animal protein, and on the mean contribution of LME tourism to the national GDPs of LME coastal states. The HDI Gap and the degree of dependence on LME ecosystem services define the vulnerability of a coastal population. It also includes the average of risk related to extreme climate events, and the risk based on the degrading system states of an LME (*e.g.* overexploited fisheries, pollution levels, decrease in coastal ecosystem areas).

The 2100 sea level rise threat indices, each computed for the sustainable world and fragmented world development pathways, use the maximum projected sea level rise at the highest level of warming of 8.5 W/m^2 in 2100 as hazard measure, development pathway-specific 2100 populations in the 10 m × 10 km coast as exposure metrics, and development pathway-specific 2100 HDI Gaps as vulnerability estimates.

Present day climate threat index of this LME is within the medium-risk (medium threat) category. The combined contemporaneous risk due to extreme climate events, degrading LME states and the level of vulnerability of the coastal population, is medium. In a sustainable development scenario, the risk index from sea level rise in 2100 is very low, and increases to medium risk under a fragmented world development pathway.

2010		2100	
Climate Threat	Contemporary Threat	SSP1	SSP3
0.5517	0.3286	0.3184	0.5795

Legend:

Very low Low Medium High Very high

Governance

Governance architecture

In this LME, the policy cycles relating to the key issues of fisheries and pollution are associated with well-established transboundary arrangements that are among the strongest globally. However, there does not appear to be much integration among these processes. Given that all coastal countries in this LME are within the European Union, the EU CFP may provide integration among fisheries bodies and between fisheries and environmental issues. Further, this LME has been assigned an overall integration score of 1.0 due to the presence of the European Union Maritime Policy with its ability to function as an overall policy coordinating organization for the key transboundary issues within the LME.

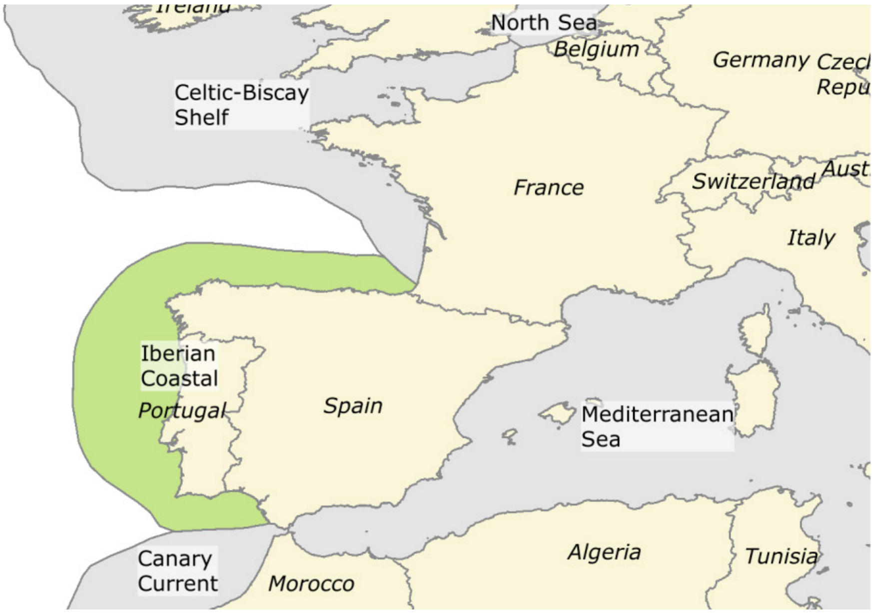
The overall scores for the ranking of risk were:

Engagement	Completeness	Integration
59	74	1

Legend:

Very low Low Medium High Very high

LME 25 – Iberian Coastal



Bordering countries: Portugal, Spain, France.
LME Total area: 300,915 km^2

List of indicators

LME overall risk

This LME falls in the cluster of LMEs that exhibit medium to high numbers of collapsed and overexploited fish stocks, high levels of demersal non-destructive low bycatch fishing, as well as very high shipping pressure.

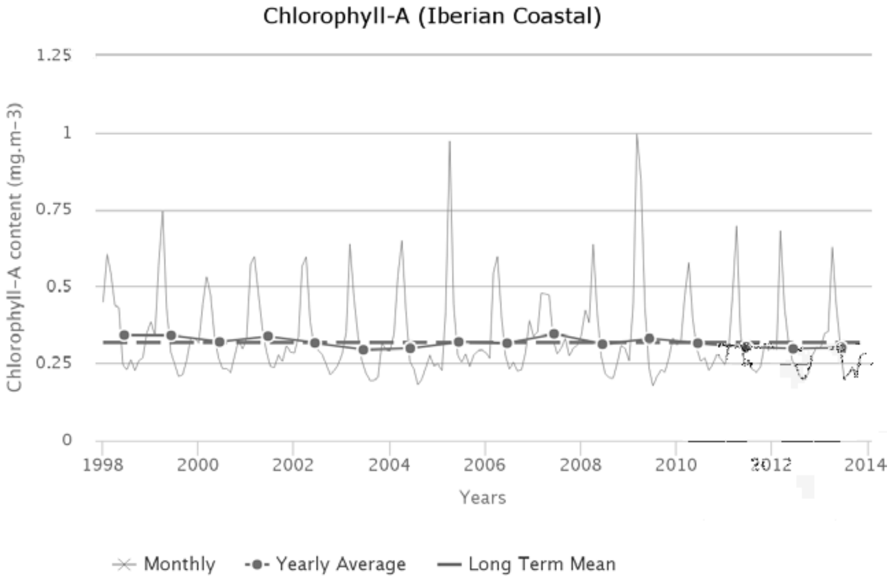
Based on a combined measure of the Human Development Index and the averaged indicators for fish & fisheries and pollution & ecosystem health modules, the overall risk factor is medium.

Very low	Low	Medium	High	Very high
		▲		

Productivity

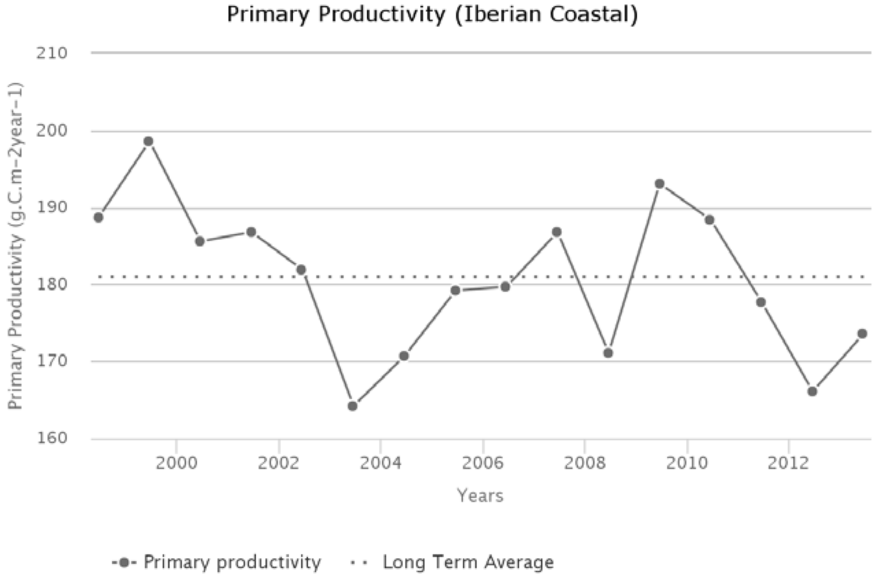
Chlorophyll-A

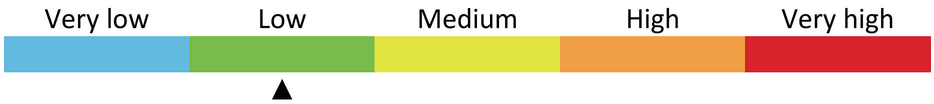
The annual Chlorophyll a concentration (CHL) cycle has a maximum peak (0.579 $mg.m^{-3}$) in April and a minimum (0.232 $mg.m^{-3}$) during September. The average CHL is 0.318 $mg.m^{-3}$. Maximum primary productivity (199 $g.C.m^{-2}.y^{-1}$) occurred during 1999 and minimum primary productivity (164 $g.C.m^{-2}.y^{-1}$) during 2003. There is a statistically insignificant increasing trend in Chlorophyll of 9.63 % from 2003 through 2013. The average primary productivity is 181 $g.C.m^{-2}.y^{-1}$, which places this LME in Group 2 of 5 categories (with 1 = lowest and 5= highest).



Very low	Low	Medium	High	Very high
	▲			

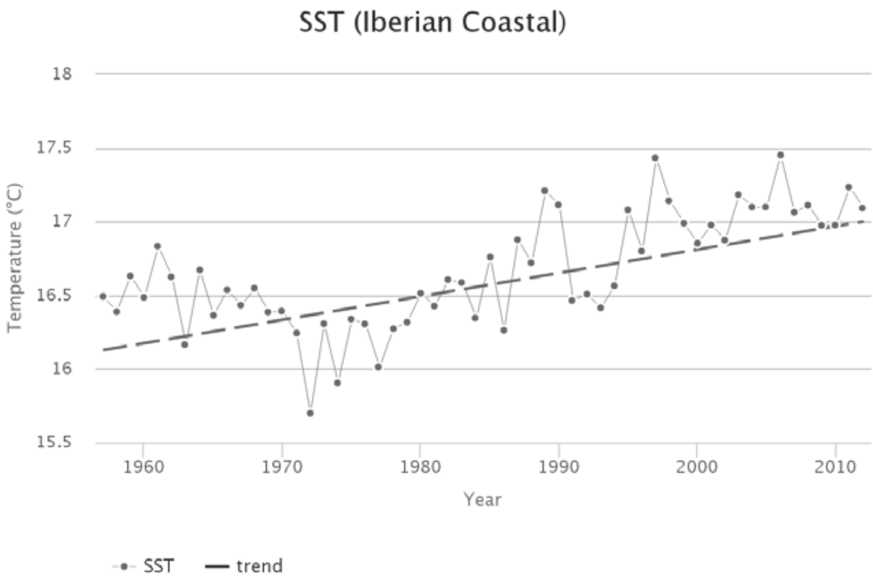
Primary productivity





Sea Surface Temperature

From 1957 to 2012, the Iberian Coastal LME #25 has warmed by 0.90°C, thus belonging to Category 2 (fast warming LME). The thermal history of this LME consisted of two epochs. The cold epoch culminated in SST plunging to 15.7°C in 1972, which marked a sharp transition to the warm epoch. The ensuing long-term warming continued almost unabated, save for a few reversals, until present. From the absolute minimum of 15.7°C in 1972 to the near-absolute maximum of 17.4°C in 1997, the SST warming rate was 1.7°C in 25 years. Overall, the thermal history of this LME is similar to that of the adjacent Mediterranean Sea LME #26. This similarity is noteworthy because ocean circulation patterns of these LMEs are almost completely independent from one another. The above-noted similarity between the thermal regimes of these LMEs means that atmospheric connections in this region likely play a more significant role than in other regions whose thermal regimes are largely determined by ocean currents.

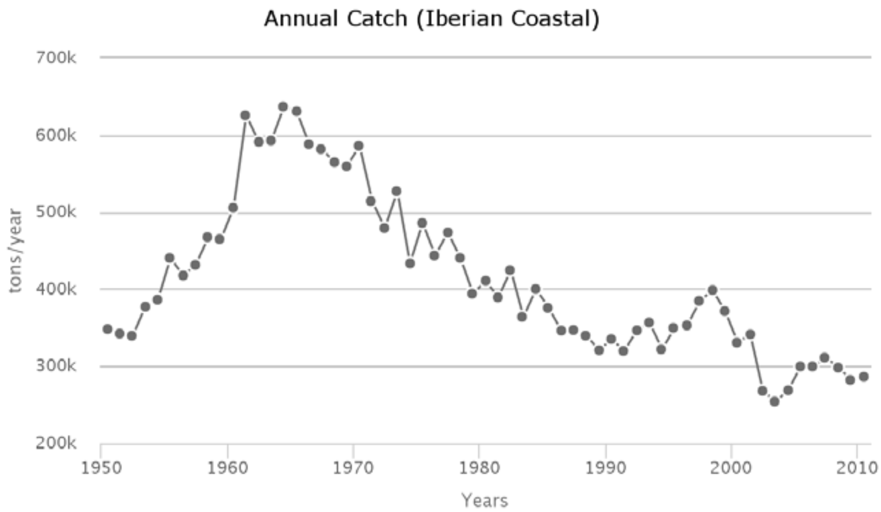


Fish and Fisheries

The catch in the Iberian Coastal LME is composed mainly of three groups: herring, sardine and anchovy (42%), other pelagic fish (28%), and cod, hake and haddock. Coastal species harvested are anchovy, sardine, mackerel and horse mackerel. Hake, blue whiting, bream, bogue, pilchard, sprat and tuna are also caught.

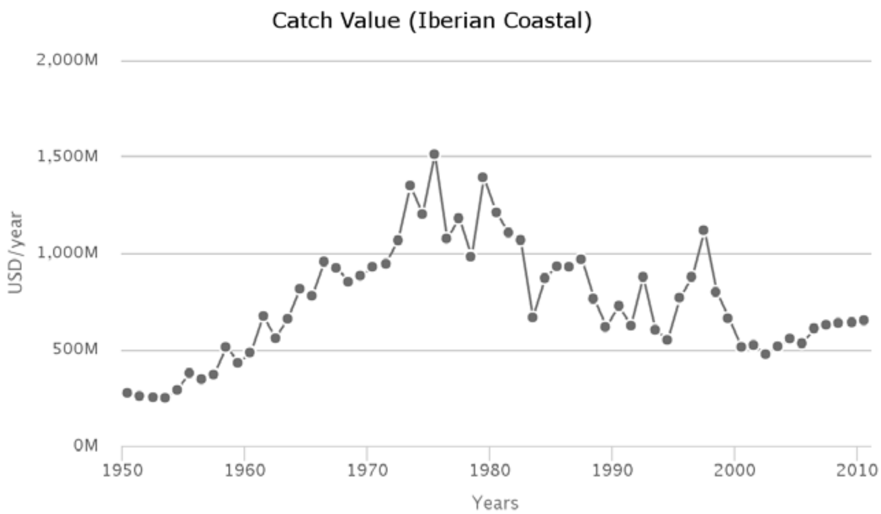
Annual Catch

Total reported landings in the LME peaked at 640,000 t in 1964, but in general have fluctuated between 250,000 to 400,000 t.



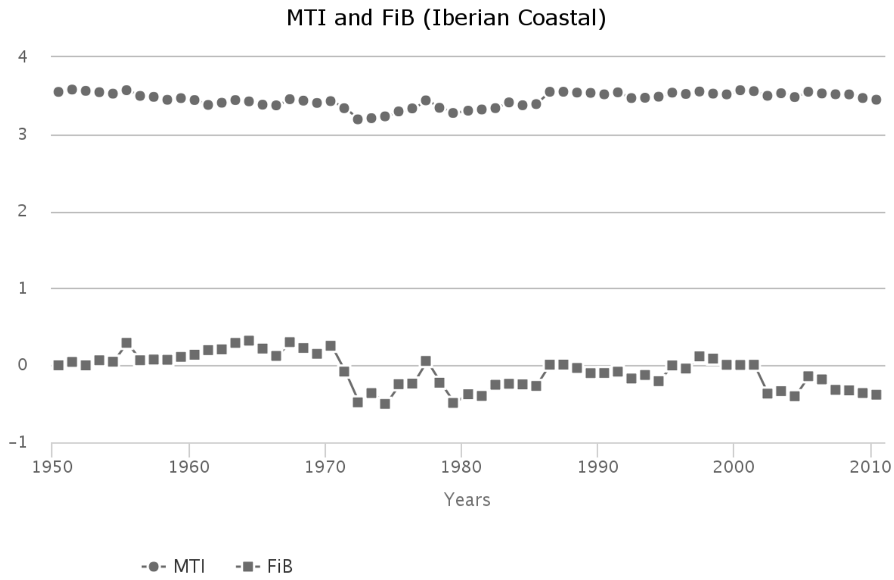
Catch value

The value of the reported landings reached 1.5 billion US$ (in 2005 real US$) in 1976.



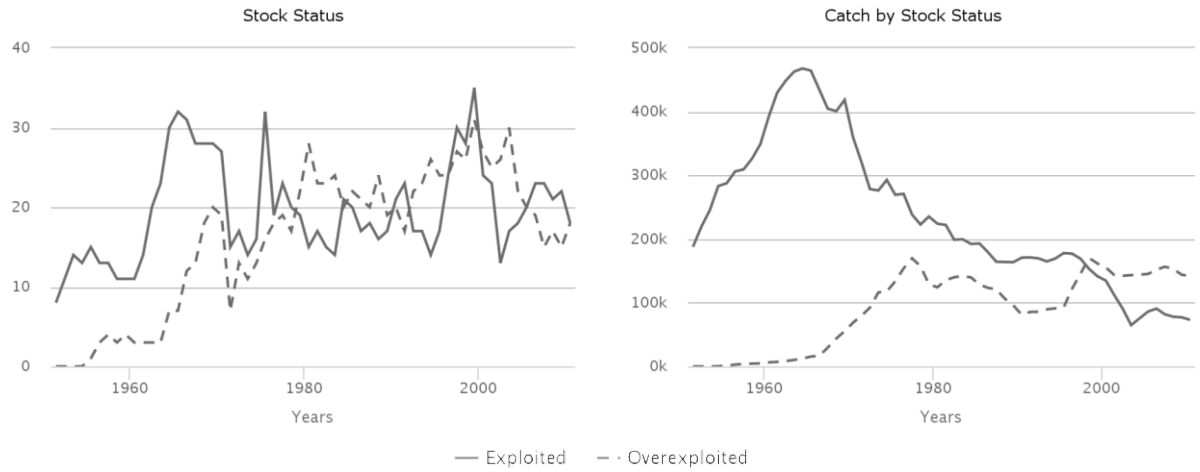
Marine Trophic Index and Fishing-in-Balance index

The MTI remained more or less even, except for two 'dips' in 1973 and 1983, likely associated with the high landings of (possibly farmed) mussels. The FiB index is also rather uninformative, except for the very last years, which reflects the decline in the landings.



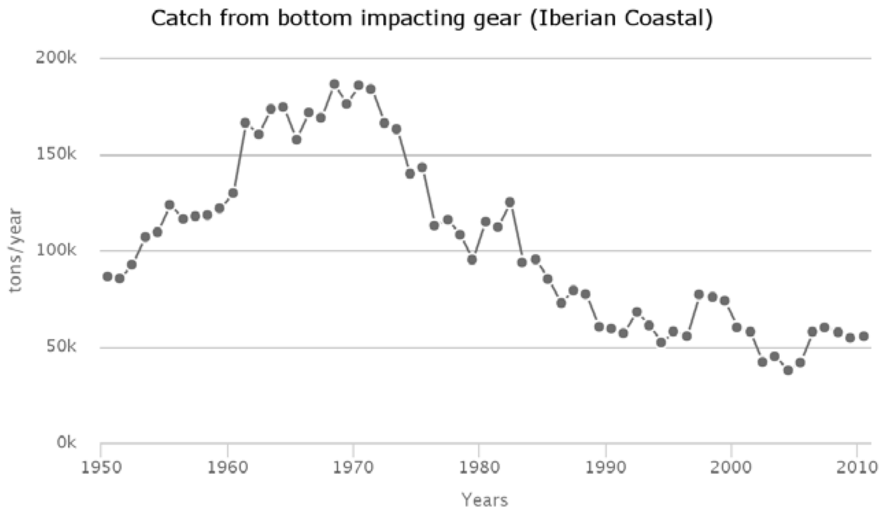
Stock status

The Stock-Catch Status Plots indicate that the number of collapsed stocks have been increasing, accounting for over 50% of the commercially exploited stocks in the LME, while the majority (50%) of the reported landings biomass is supplied by overexploited stocks.



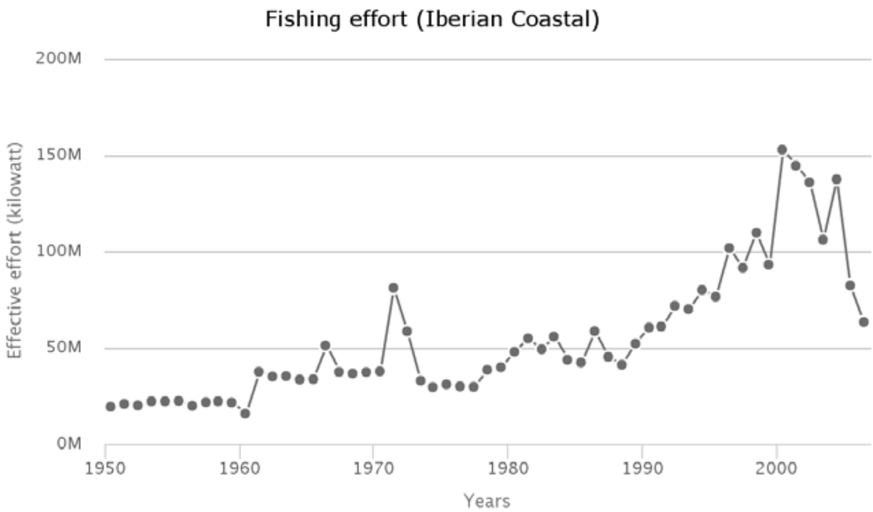
Catch from bottom impacting gear

The percentage of catch from the bottom gear type to the total catch reached its first peak at 35% in 1971 and then declined to 14% in 2004. In the recent decade, this percentage fluctuated around 18%.



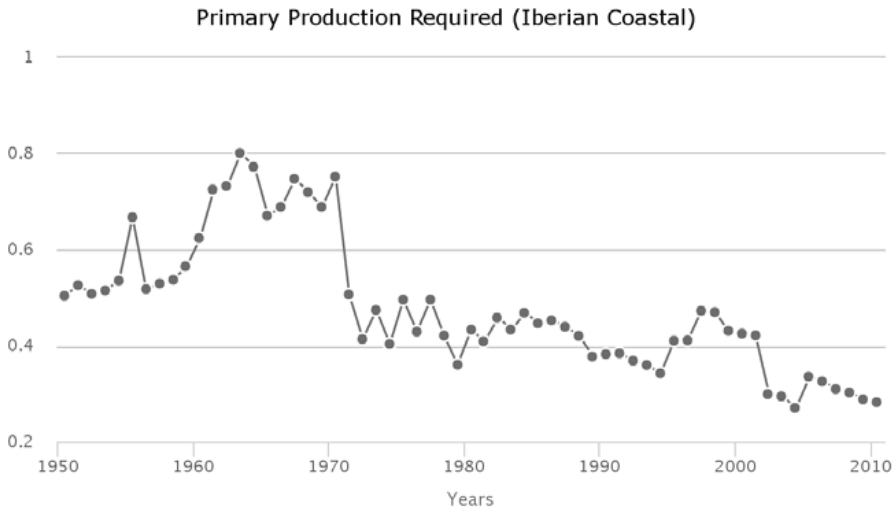
Fishing effort

The total effective effort increased from around 20 million kW in the 1950s to its peak at 150 million kW in 2000. In the recent few years, the fishing effort kept declining.



Primary Production Required

The primary production required (PPR) to sustain the reported landings in this LME reached extremely high level in the mid-1970s, but declined to 30% by 2004.



Pollution and Ecosystem Health

Pollution

Nutrient ratio, Nitrogen load and Merged Indicator

Human activities in watersheds are affecting nutrients transported by rivers into LMEs. Large amounts of nutrients (in particular *nitrogen load*) entering coastal waters of LMEs can result in high biomass algal blooms, leading to hypoxic or anoxic conditions, increased turbidity and changes in community composition, among other effects. In addition, changes in the *ratio of nutrients* entering LMEs can result in dominance by algal species that have deleterious effects (toxic, clog gills of shellfish, etc.) on ecosystems and humans. An overall nutrient indicator (*Merged Nutrient Indicator*) based on 2 sub-indicators: *Nitrogen Load* and *Nutrient Ratio* (ratio of dissolved Silica to Nitrogen or Phosphorus - the Index of Coastal Eutrophication Potential or ICEP) was calculated.

Nitrogen load

The Nitrogen Load risk level for contemporary (2000) conditions was low (level 2 of the five risk categories, where 1 = lowest risk; 5 = highest risk). Based on a “current trends” scenario (Global Orchestration), this decreased to very low (1) in 2030 and did not change further by 2050.

Nutrient ratio

The Nutrient Ratio (ICEP) risk level for contemporary (2000) conditions was high (4). According to the Global Orchestration scenario, this decreased to moderate in 2030 and remained moderate in 2050.

Merged nutrient indicator

The risk level for the Merged Nutrient Indicator for contemporary (2000) conditions was low (2). According to the Global Orchestration scenario, this decreased to very low in 2030 and remained the same in 2050.

2000			**2030**			**2050**		
Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator
2	4	2	1	3	1	1	3	1

Legend:

Very low · Low · Medium · High · Very high

POPs

Ten samples at 10 locations from 500 km of coastline are available for the Iberian Coastal LME. This LME exhibits moderate average concentration (ng.g^{-1} of pellets) of 90 (range 11 – 307 ng.g^{-1}) for PCBs and low average concentrations of 7.6 (range 1-40 ng.g^{-1}) for DDTs and 2.3 (range 0-14.3 ng.g^{-1}) for HCHs. These correspond to risk category 3 for PCBs and category 2 for DDTs and HCHs, of the five risk categories (1 = lowest risk; 5 = highest risk). Two hot spots of PCBs pollution (Oporto: 307 ng.g^{-1} and Lisbon: 274 ng.g^{-1}) were identified and legacy pollution was suspected (Mizukawa et al., 2013). Pollution levels for the other locations were low and thought to be derived from atmospheric depositions. DDTs and HCHs concentrations were mostly low with relatively higher inputs at Oporto and Lisbon, where river runoff was suspected as the contributor (Mizukawa et al., 2013). High concentration of HCH (14.3 ng.g^{-1}), corresponding to risk category 4, was detected at one Spanish location. Future monitoring should cover a wider area.

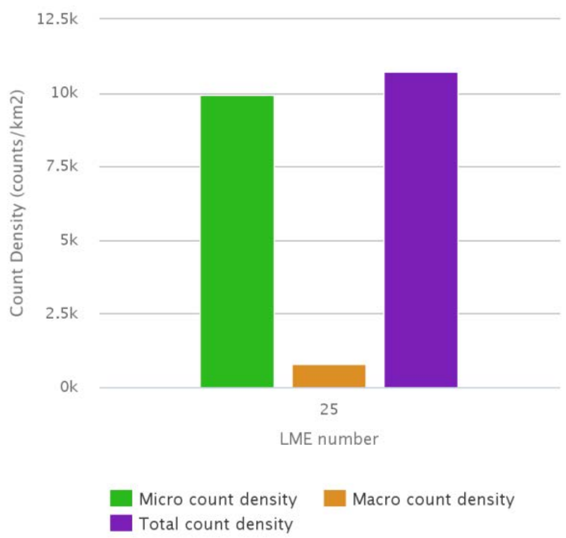
	PCBs		DDTs		HCHs	
Locations	Avg. (ng/g)	Risk	Avg. (ng/g)	Risk	Avg. (ng/g)	Risk
10	90	**3**	8	**2**	2.3	**2**

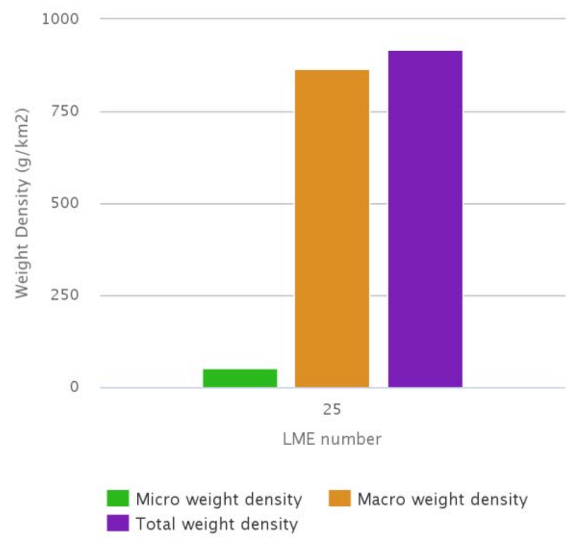
Legend:

Very low Low Medium High Very high

Plastic debris

Modelled estimates of floating plastic abundance (items km^{-2}), for both micro-plastic (<4.75 mm) and macro-plastic (>4.75 mm), indicate that this LME is in the group with relatively high levels of plastic concentration. Estimates are based on three proxy sources of litter: shipping density, coastal population density and the level of urbanisation within major watersheds, with enhanced run-off. The high values are due to the relative importance of these sources in this LME. The abundance of floating plastic in this category is estimated to be on average over 100 times higher that those LMEs with lowest values. There is moderate evidence from sea-based direct observations and towed nets to support this conclusion.





Ecosystem Health

Mangrove and coral cover

Not applicable.

Reefs at risk

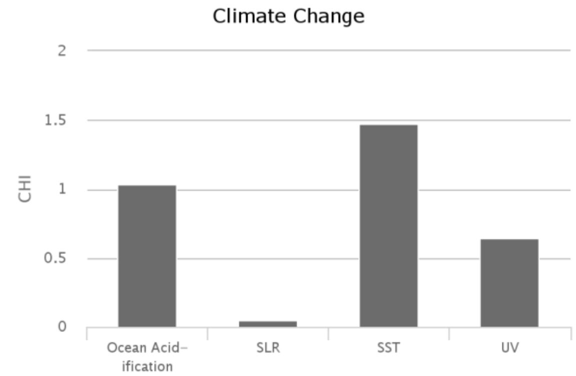
Not applicable.

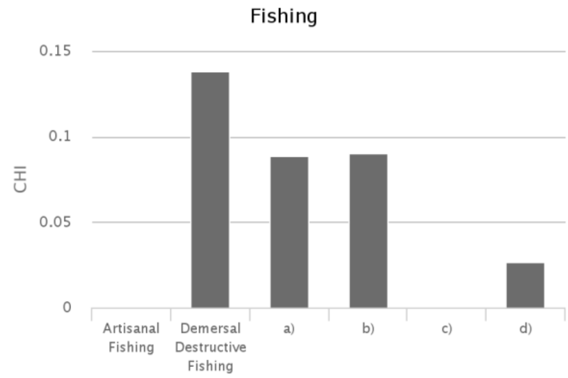
Marine Protected Area change

The Iberian Coastal LME experienced an increase in MPA coverage from 429 km^2 prior to 1983 to 838 km^2 by 2014. This represents an increase of 95%, within the lowest category of MPA change.

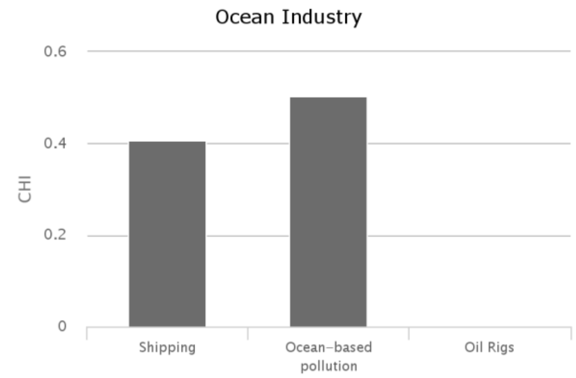
Cumulative Human Impact

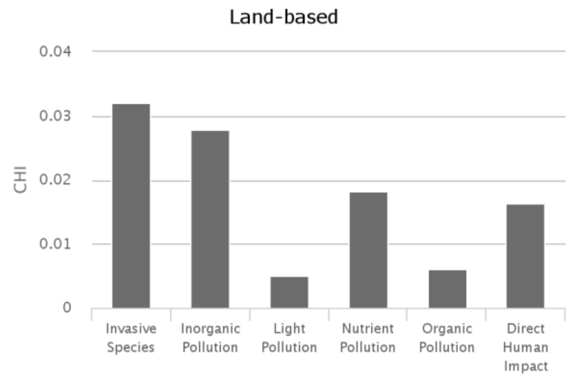
The Iberian Coastal LME experiences an above average overall cumulative human impact (score 4.57; maximum LME score 5.22), which is also well above the LME with the least cumulative impact. It falls in risk category 5 of the five risk categories (1 = lowest risk; 5 = highest risk). This LME is most vulnerable to climate change. Of the 19 individual stressors, three connected to climate change have the highest average impact on the LME: ocean acidification (1.04; maximum in other LMEs was 1.20), UV radiation (0.64; maximum in other LMEs was 0.76), and sea surface temperature (1.48; maximum in other LMEs was 2.16). Other key stressors include commercial shipping, ocean based pollution, and all three types of demersal commercial fishing (demersal destructive, non-destructive low-bycatch, and non-destructive high-bycatch).





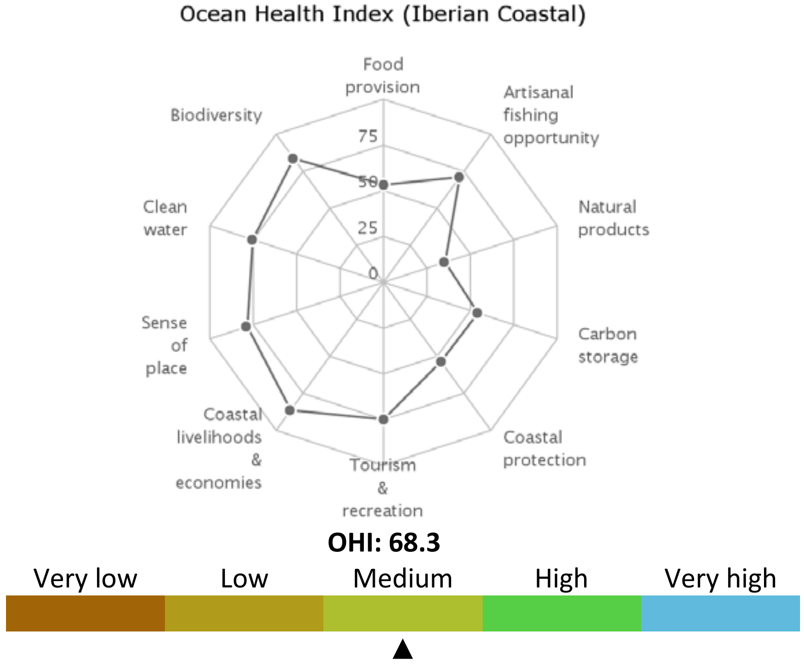
a) Demersal Non-destructive High Bycatch Fishing
c) Pelagic High Bycatch Fishing
b) Demersal Non-destructive Low Bycatch Fishing
d) Pelagic Low Bycatch Fishing





Ocean Health Index

The Iberian Coastal LME scores above average on the Ocean Health Index compared to other LMEs (score 73 out of 100; range for other LMEs was 57 to 82) but still relatively low. This score indicates that the LME is well below its optimal level of ocean health, although there are some aspects that are doing well. Its score in 2013 decreased 2 points compared to the previous year, due in large part to changes in the scores for natural products and clean waters. This LME scores lowest on food provision, natural products, coastal protection, carbon storage, and iconic species goals and highest on artisanal fishing opportunities, coastal economies, lasting special places and habitat biodiversity goals. It falls in risk category 2 of the five risk categories, which is a moderate level of risk (1 = lowest risk; 5 = highest risk).



Socio-economics

Indicators of demographic trends, economic dependence on ecosystem services, human wellbeing and vulnerability to present-day extreme climate events and projected sea level rise, are assessed for this LME. To compare and rank LMEs, they were classified into five categories of risk (from 1 to 5, corresponding to lowest, low, medium, high and highest risk, respectively) based on the values of the individual indicators. In the case of economic revenues, the LMEs were grouped to 5 classes of revenues from lowest, low, medium, high and highest, as revenues did not translate to risk.

Population

The coastal area stretches over 167 834 km^2. A current population of 21 510 thousand in 2010 is projected to decrease to 14 662 thousand in 2100, with a density of 128 persons per km2 in 2010 decreasing to 87 per km^2 by 2100. About 28% of coastal population lives in rural areas, and is projected to decrease in share to 27% in 2100.

Total population		Rural population	
2010	2100	2010	2100
21,509,735	14,662,042	6,085,091	3,915,869

Legend: Very low, Low, Medium, High, Very high

Coastal poor

The indigent population makes up 13% of the LME's coastal dwellers. This LME places in the low-risk category based on percentage and in the medium-risk category using absolute number of coastal poor (present day estimate).

Coastal poor
2,834,357

Revenues and Spatial Wealth Distribution

Fishing and tourism depend on ecosystem services provided by LMEs. This LME ranks in the medium-revenue category in fishing revenues based on yearly average total ex-vessel price of US 2013 $686 million for the period 2001-2010. Fish protein accounts for 20% of the total animal protein consumption of the coastal population. Its yearly average tourism revenue for 2004-2013 of US 2013 $96 028 million places it in the very high-revenue category. On average, LME-based tourism income contributes 15% to the national GDPs of the LME coastal states. Spatial distribution of economic activity (e.g. spatial wealth distribution) measured by night-light and population distribution as coarse proxies can range from 0.0000 (totally equal distribution and lowest risk) to 1.0000 (concentrated in 1 place and most inequitable and highest risk). The Night Light Development Index (NLDI) thus indicates the level of spatial economic development, and that for this LME falls in the category with medium risk.

Fisheries Annual Landed Value	% Fish Protein Contribution	Tourism Annual Revenues	% Tourism Contribution to GDP	NLDI
685,837,650	20.3	96,028,430,736	15.0	0.7083

Legend: Very low, Low, Medium, High, Very high

Human Development Index

Using the Human Development Index (HDI) that integrates measures of health, education and income, the present-day LME HDI belongs to the very high HDI and very low risk category. Based on an HDI of 0.845, this LME has an HDI Gap of 0.154, the difference between present and highest possible HDI (1.000). The HDI Gap measures an overall vulnerability to external events such as disease or extreme climate related events, due to less than perfect health, education, and income levels, and is independent of the harshness of and exposure to specific external shocks.

HDI values are projected to the year 2100 in the contexts of shared socioeconomic development pathways (SSPs). This LME is projected to assume a place in the very low risk category (very high HDI) in 2100 under a sustainable development pathway. Under a fragmented world scenario, the LME is estimated to place in a very high-risk category (very low HDI) because of reduced income levels and population values from those estimated in a sustainable development scenario.

	HDI 2100	
HDI	SSP1	SSP3
0.8451	0.9290	0.6142

Legend: Very low, Low, Medium, High, Very high

Climate-Related Threat Indices

The Climate-Related Threat Indices utilize the HDI Gaps for present-day and projected 2100 scenarios. The contemporary climate index accounts for deaths and property losses due to storms, flooding and extreme temperatures incurred by coastal states during a 20-year period from 1994 to 2013 as hazard measures, the 2010 coastal population as proxy for exposure, and the present day HDI Gap as vulnerability measure.

The Contemporary Threat Index incorporates a Dependence Factor based on the fish protein contribution to dietary animal protein, and on the mean contribution of LME tourism to the national GDPs of LME coastal states. The HDI Gap and the degree of dependence on LME ecosystem services define the vulnerability of a coastal population. It also includes the average of risk related to extreme climate events, and the risk based on the degrading system states of an LME (*e.g.* overexploited fisheries, pollution levels, decrease in coastal ecosystem areas).

The 2100 sea level rise threat indices, each computed for the sustainable world and fragmented world development pathways, use the maximum projected sea level rise at the highest level of warming of 8.5 W/m^2 in 2100 as hazard measure, development pathway-specific 2100 populations in the 10 m × 10 km coast as exposure metrics, and development pathway-specific 2100 HDI Gaps as vulnerability estimates.

Present day climate threat index of this LME is within the high-risk (high threat) category. The combined contemporaneous risk due to extreme climate events, degrading LME states and the level of vulnerability of the coastal population, is high. In a sustainable development scenario, the risk index from sea level rise in 2100 is very low, and increases to medium risk under a fragmented world development pathway.

2010		2100	
Climate Threat	**Contemporary Threat**	**SSP1**	**SSP3**
0.6370	0.3978	0.3328	0.5717

Legend:

Very low | Low | Medium | High | Very high

Governance

Governance architecture

In this LME, the policy cycles relating to the key issues of fisheries and pollution are associated with well-established transboundary arrangements that are among the strongest globally. However, there does not appear to be much integration among these processes. Given that all coastal countries in this LME are within the European Union the EU CFP may provide integration among fisheries bodies and between fisheries and environmental issues. Further, this LME has been assigned an overall integration score of 1.0 due to the presence of the European Union Maritime Policy with its ability to function as an overall policy coordinating organization for the key transboundary issues within the LME.

The overall scores for the ranking of risk were:

Engagement	Completeness	Integration
41	74	1

Legend:

Very low | Low | Medium | High | Very high

LME 26 – Mediterranean Sea

Bordering countries: Albania, Algeria, Bosnia-Herzegovina, Croatia, Cyprus, Egypt, France, Gibraltar, Greece, Holy See (Vatican), Israel, Italy, Lebanon, Libyan Arab Jamahiriya, Malta, Monaco, Morocco, Occupied Palestinian Territory, San Marino, Serbia and Montenegro, Slovenia, Spain, Syrian Arab Republic, Tunisia, Turkey.
LME Total area: 2,528,398 km^2

List of indicators

LME overall risk

This LME falls in the cluster of LMEs that exhibit medium to high numbers of collapsed and overexploited fish stocks, high levels of demersal non-destructive low bycatch fishing, as well as very high shipping pressure.

Based on a combined measure of the Human Development Index and the averaged indicators for fish & fisheries and pollution & ecosystem health modules, the overall risk factor is high.

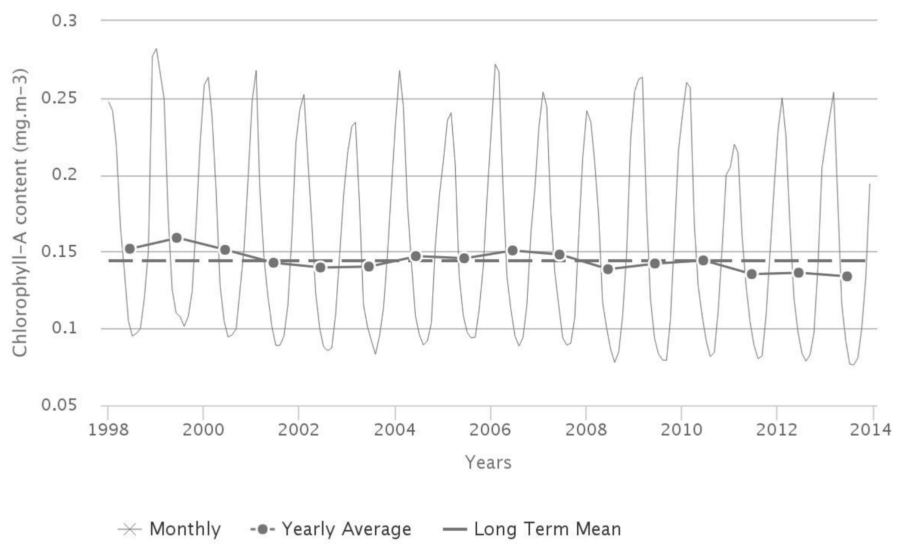
Very low	Low	Medium	High	Very high
			▲	

Productivity

Chlorophyll-A

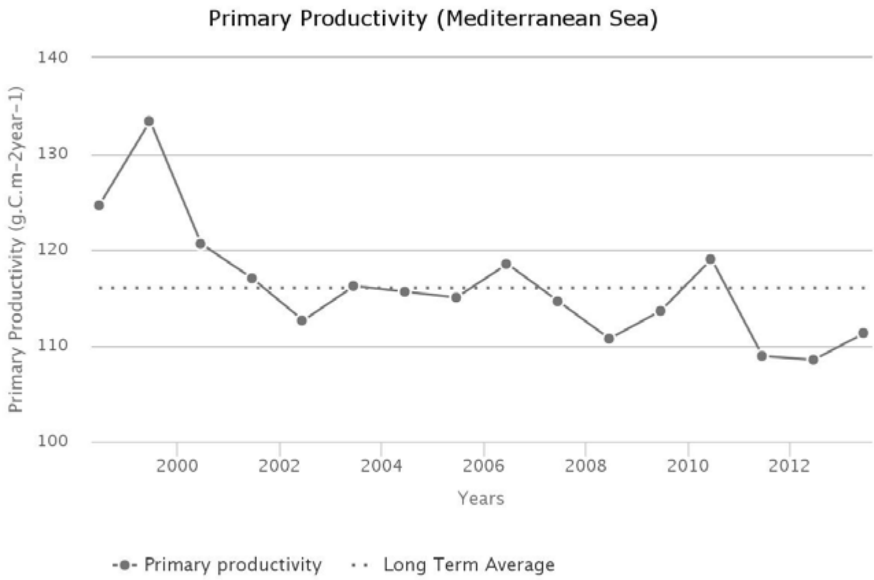
The annual Chlorophyll a concentration (CHL) cycle has a maximum peak (0.249 mg.m^{-3}) in February and a minimum (0.0866 mg.m^{-3}) during August. The average CHL is 0.144 mg.m^{-3}. Maximum primary productivity (133 g.C.m^{-2}.y^{-1}) occurred during 1999 and minimum primary productivity (108 g.C.m^{-2}.y^{-1}) during 2012. There is a statistically insignificant increasing trend in Chlorophyll of 2.72 % from 2003 through 2013. The average primary productivity is 116 g.C.m^{-2}.y^{-1}, which places this LME in Group 1 of 5 categories (with 1 = lowest and 5= highest).

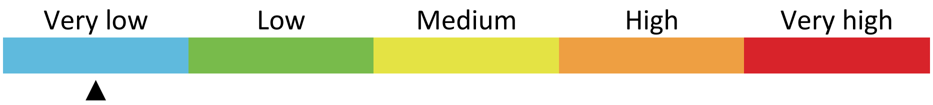
Chlorophyll-A (Mediterranean Sea)



Very low	Low	Medium	High	Very high
▲				

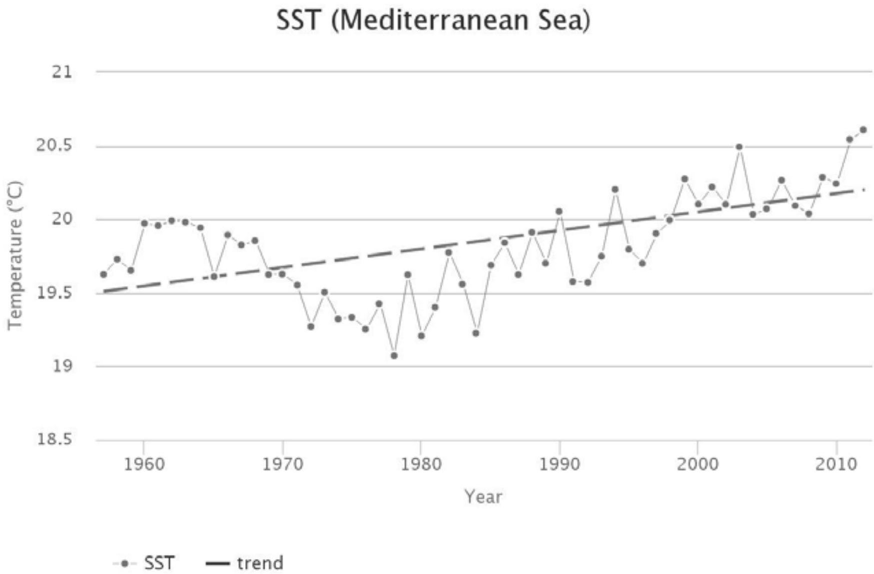
Primary productivity





Sea Surface Temperature

From 1957 to 2012, the Mediterranean Sea LME #26 has warmed by 0.66°C, thus belonging to Category 3 (moderate warming LME). The thermal history of this LME between 1957 and 2012 consists of two regimes. During the first (mostly cooling) epoch, after peaking at 20°C in the early 1960s, SST cooled down to 19.1°C in 1978. This year has marked a sharp transition from cooling to warming. During the second (warming) regime (still on), SST rose to 20.6°C in 2012. From the absolute minimum of 19.1°C in 1978 to the absolute maximum of 20.6°C in 2012, the SST warming rate was 1.5°C in 34 years. This LME consists of two parts, Western and Eastern Mediterranean, whose circulation patterns are rather independent from one another. The 1982-2003 warming magnitude increased eastward, from 0.5-1.0°C in the Gulf of Lions and Ligurian Sea up to 2-3°C in the Levantine Basin (EEA, 2007, p.236, Map 5.9).

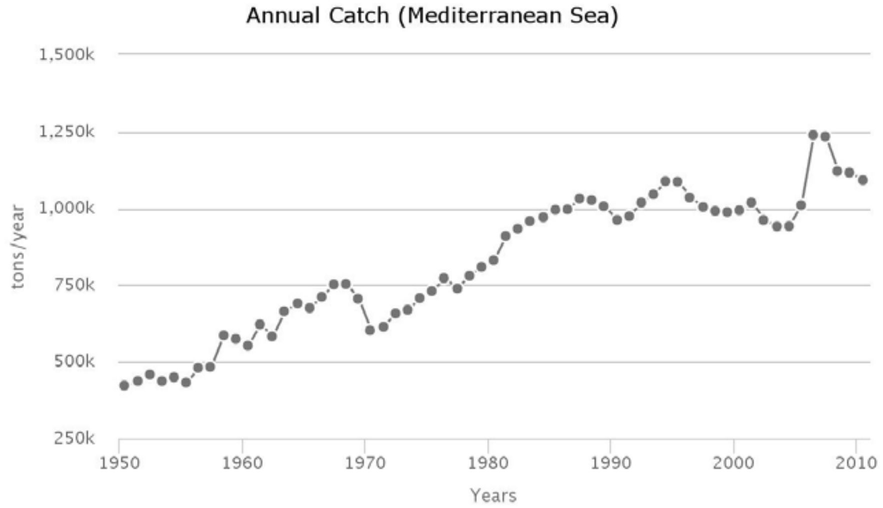


Fish and Fisheries

The Mediterranean Sea LME is one of the most diverse and stable LMEs in terms of species groupings and their share in the total catch. Total reported landings in the LME, consisting largely of clupeoids (pilchard, anchovy and sardinella), increased from 1950 to the mid-1980s, levelling off at around 900,000 t in the 1990s, with landings over 1 million t recorded in 1994 and 1995.

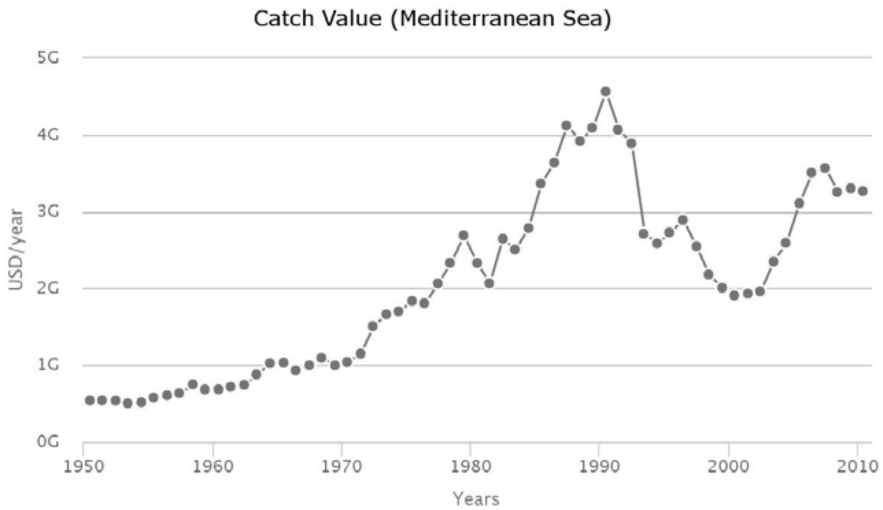
Annual Catch

The landings peaked at about 1.2 million t in 2006.



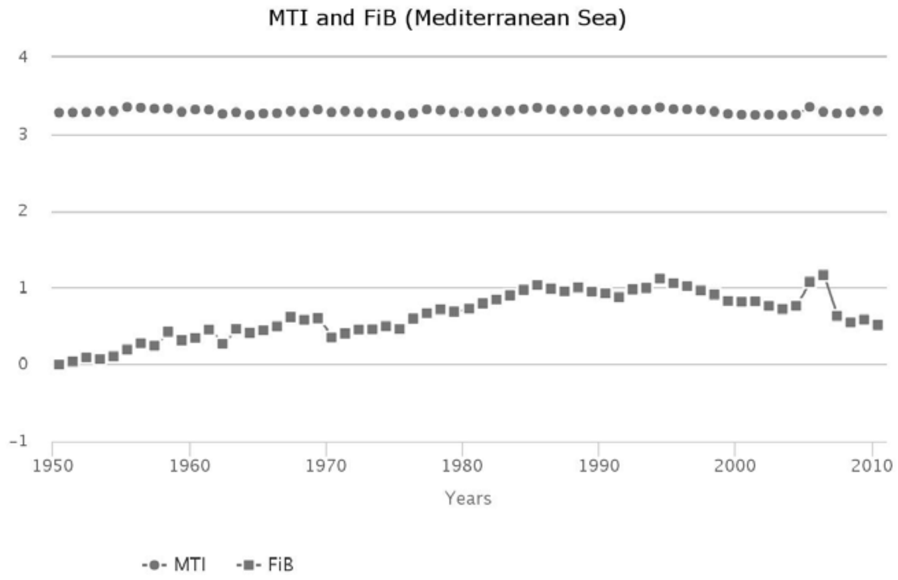
Catch value

The value of the reported landings peaked at about 4.6 billion US$ (in 2005 real US$) in 1990.



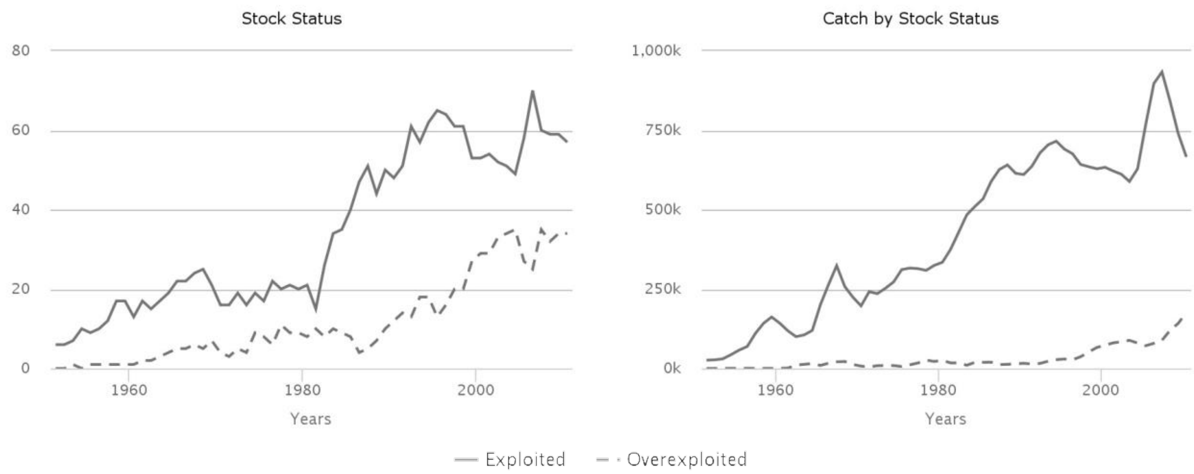
Marine Trophic Index and Fishing-in-Balance index

The MTI increased until the mid-1980s and has declined since the mid-1990s, when the expansion of the fisheries, particularly offshore, ceased, as suggested by the increase of the FiB index from 1950 to the mid-1980s. Since the mid-1980s, the FiB has stabilized and began to decline in the late 1990s, an indication of decline in both the MTI and catch, and a confirmation that substantial ‘fishing down’ has occurred in the Mediterranean. The FiB index increased in the mid-2000 and then further declined since 2006. This indicates ‘fishing down’ of the food web in LME.



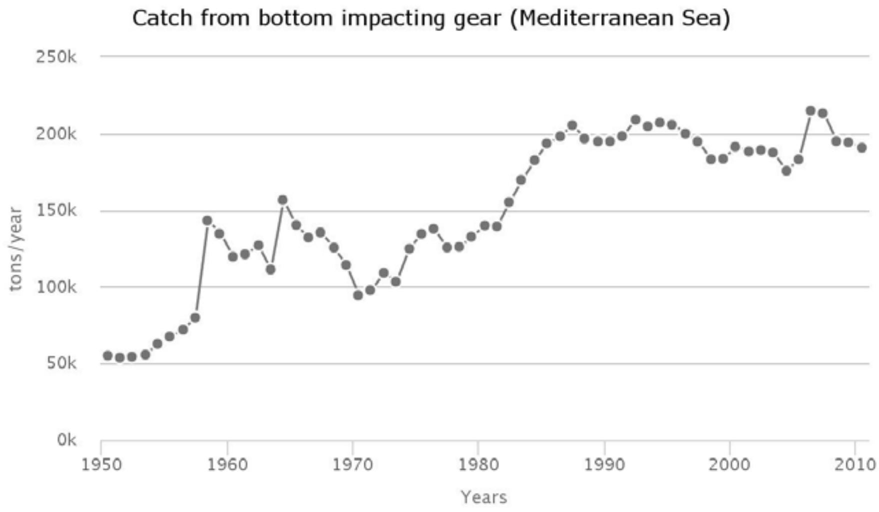
Stock status

The Stock-Catch Status Plots suggest that, based on reported landings statistics, very few stocks have collapsed (less than 15%), and that over 86 % of the reported landings originate from overexploited and fully exploited stocks.



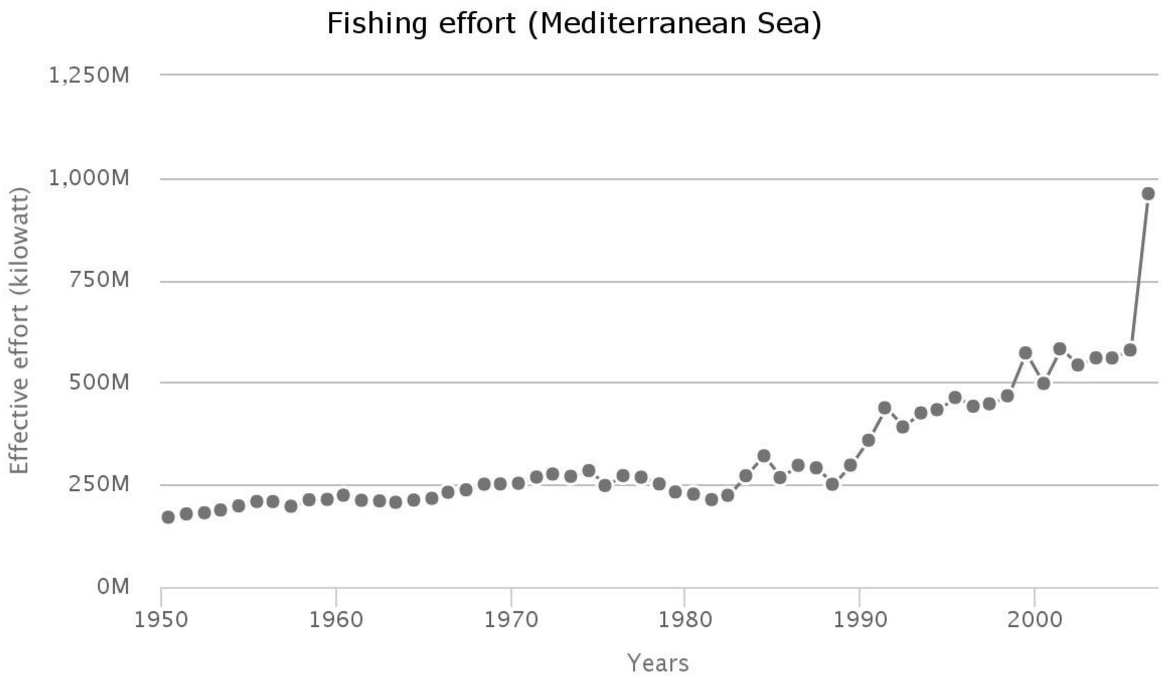
Catch from bottom impacting gear

The percentage of catch from the bottom gear type to the total catch fluctuated between 12 and 25% from 1950 to 2010. This percentage reached its peak at 25% in 1957. In the recent decade, this percentage fluctuated around 18%.



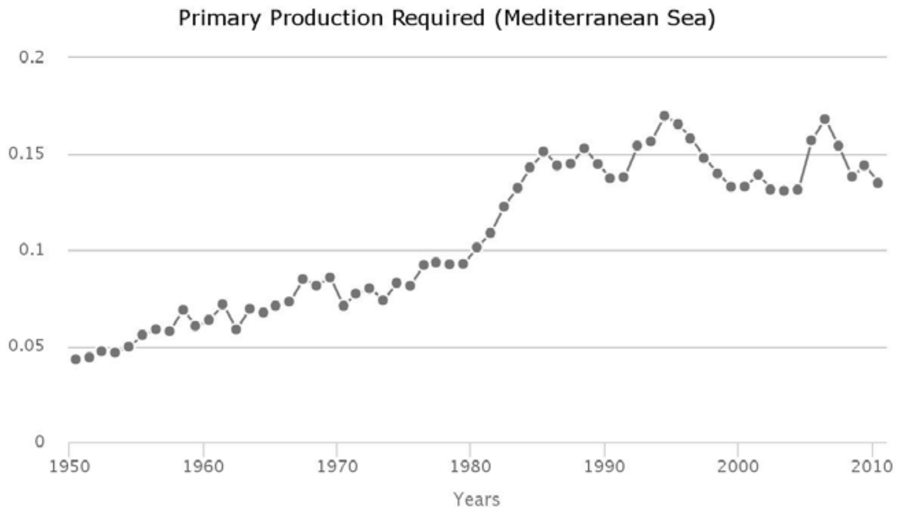
Fishing effort

The total effective effort continuously increased from around 200 million kW in the 1950s to its peak at 960 million kW in the mid-2000s.



Primary Production Required

The primary production required (PPR) to sustain the reported landings in this LME reached 20% of the observed primary production in 1994, but has since declined to 15%..



Pollution and Ecosystem Health

Pollution

Nutrient ratio, Nitrogen load and Merged Indicator

Human activities in watersheds are affecting nutrients transported by rivers into LMEs. Large amounts of nutrients (in particular *nitrogen load*) entering coastal waters of LMEs can result in high biomass algal blooms, leading to hypoxic or anoxic conditions, increased turbidity and changes in community composition, among other effects. In addition, changes in the *ratio of nutrients* entering LMEs can result in dominance by algal species that have deleterious effects (toxic, clog gills of shellfish, etc.) on ecosystems and humans. An overall nutrient indicator (*Merged Nutrient Indicator*) based on 2 sub-indicators: *Nitrogen Load* and *Nutrient Ratio* (ratio of dissolved Silica to Nitrogen or Phosphorus - the Index of Coastal Eutrophication Potential or ICEP) was calculated.

Nitrogen load

The Nitrogen Load risk level for contemporary (2000) conditions was moderate (level 3 of the five risk categories, where 1 = lowest risk; 5 = highest risk). Based on a "current trends" scenario (Global Orchestration), this remained the same in 2030 and 2050.

Nutrient ratio

The Nutrient Ratio (ICEP) risk level for contemporary (2000) conditions was moderate (3). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

Merged nutrient indicator

The risk level for the Merged Nutrient Indicator for contemporary (2000) conditions was moderate (3). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

2000			**2030**			**2050**		
Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator
3	3	3	3	3	3	3	3	3

Legend:

Very low · Low · Medium · High · Very high

POPs

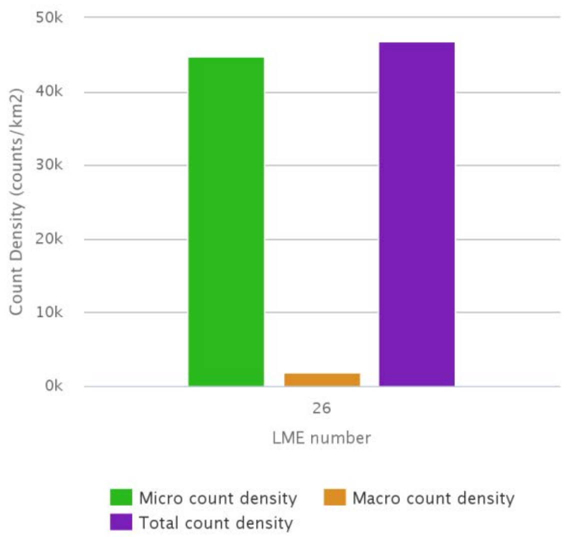
Data are available from 15 samples at 15 locations on the European side and Israel. They show moderate average concentrations (ng.g^{-1} of pellets) of 112 (range 5-264 ng.g^{-1}) for PCBs and 125 (range 1- 1,061 ng.g^{-1}) for DDTs, corresponding to risk category 3 and category 4, respectively, of the five risk categories (1 = lowest risk; 5 = highest risk). On the other hand, HCHs show a minimal average concentration of 1.1 (range 0-2.2 ng.g^{-1}), corresponding to risk category 1. PCBs seem to be widely distributed in this LME. High concentrations of PCBs (225 – 264 ng.g^{-1}) were observed at industrial centers in Greece, and are due to legacy pollution. Extremely high concentrations of DDTs (1,061 ng.g^{-1} and 262 ng.g^{-1}) were observed in Durres (Albania) and Athens (Greece), respectively. The sources of DDTs should be investigated. Pellets from the North African coast are also necessary to improve the understanding of the pollution status of this LME.

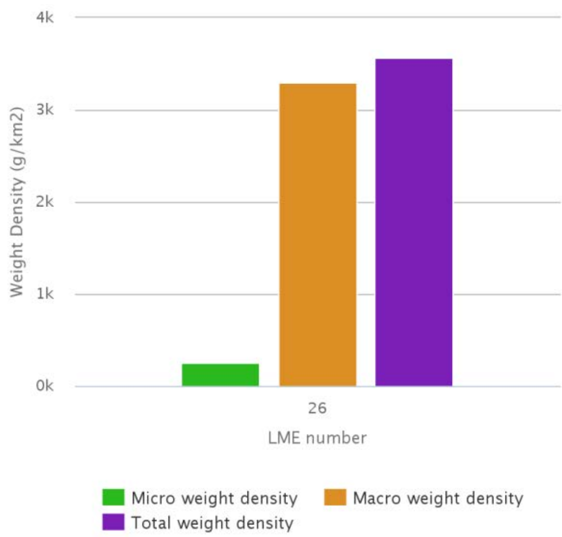
	PCBs		DDTs		HCHs	
Locations	Avg. (ng/g)	Risk	Avg. (ng/g)	Risk	Avg. (ng/g)	Risk
15	112	3	125	4	1.1	1

Legend: Very low, Low, Medium, High, Very high

Plastic debris

x Modelled estimates of floating plastic abundance (items km^{-2}), for both micro-plastic (<4.75 mm) and macro-plastic (>4.75 mm), indicate that this LME is in the group with the highest plastic concentration. Estimates are based on three proxy sources of litter: shipping density, coastal population density and the level of urbanisation within major watersheds, with enhanced run-off. The high values are due to relative importance of these sources in this LME. The abundance of floating plastic in this category is estimated to be on average over 400 times higher that those LMEs with lowest values. There is good evidence from sea-based direct observations and towed nets to support this conclusion.





Ecosystem Health

Mangrove and coral cover

Not applicable.

Reefs at risk

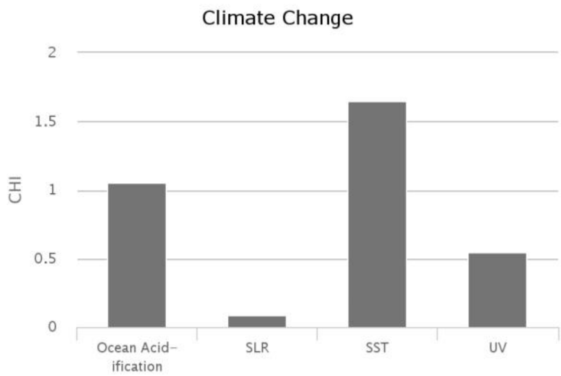
Not applicable.

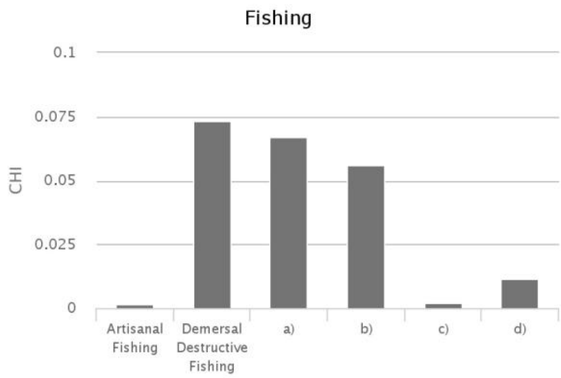
Marine Protected Area change

The Mediterranean Sea LME experienced an increase in MPA coverage from 1,357 km^2 prior to 1983 to 106,325 km^2 by 2014. This represents an increase of 7,733%, within the medium category of MPA change.

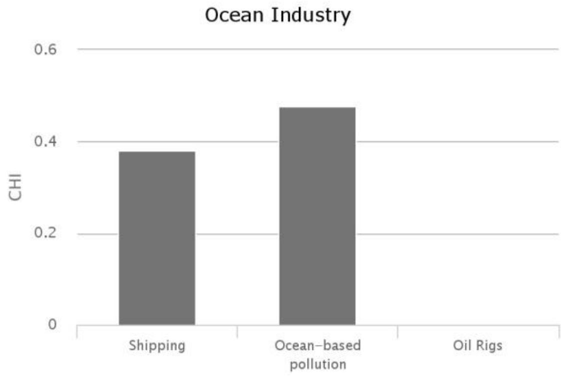
Cumulative Human Impact

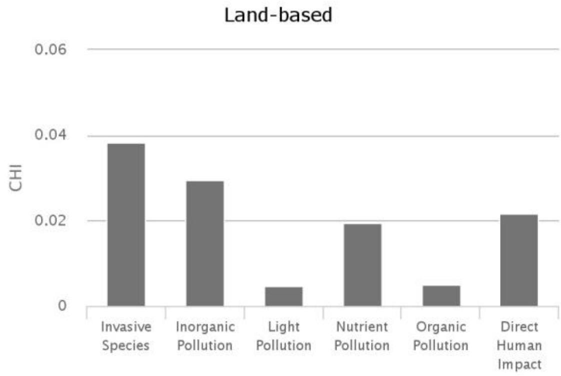
The Mediterranean Sea LME experiences an above average overall cumulative human impact (score 4.52; maximum LME score 5.22), which is also well above the LME with the least cumulative impact. It falls in risk category 5 of the five risk categories (1 = lowest risk; 5 = highest risk). This LME is most vulnerable to climate change. Of the 19 individual stressors, three connected to climate change have the highest average impact on the LME: ocean acidification (1.06; maximum in other LMEs was 1.20), UV radiation (0.54; maximum in other LMEs was 0.76), and sea surface temperature (1.65; maximum in other LMEs was 2.16). Other key stressors include commercial shipping, sea level rise, ocean based pollution, and all three types of demersal commercial fishing (demersal destructive, non-destructive low-bycatch, and non-destructive high-bycatch).

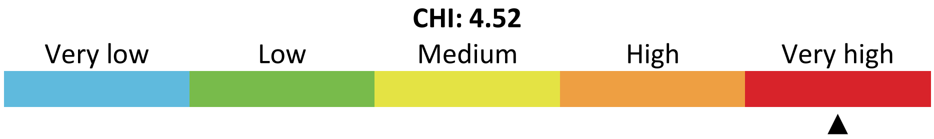




a) Demersal Non-destructive High Bycatch Fishing
c) Pelagic High Bycatch Fishing
b) Demersal Non-destructive Low Bycatch Fishing
d) Pelagic Low Bycatch Fishing



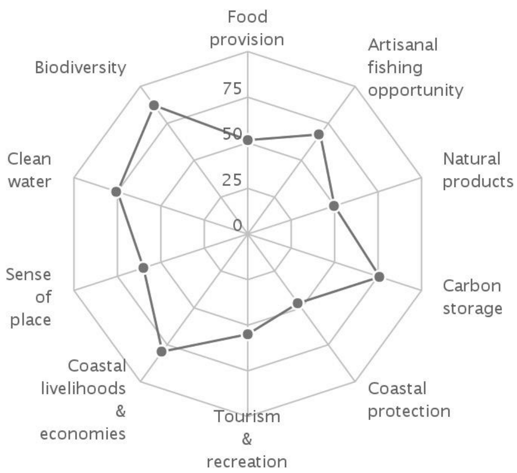




Ocean Health Index

The Mediterranean Sea LME scores below average on the Ocean Health Index compared to other LMEs (score 69 out of 100; range for other LMEs was 57 to 82). This score indicates that the LME is well below its optimal level of ocean health, although there are some aspects that are doing well. Its score in 2013 decreased 1 point compared to the previous year, due in large part to changes in the scores for clean waters. This LME scores lowest on mariculture, natural products, coastal protection, and iconic species goals and highest on artisanal fishing opportunities, coastal economies, and habitat biodiversity goals. It falls in risk category 3 of the five risk categories, which is an average level of risk (1 = lowest risk; 5 = highest risk).

Ocean Health Index (Mediterranean Sea)



OHI: 64.88

Socio-economics

Indicators of demographic trends, economic dependence on ecosystem services, human wellbeing and vulnerability to present-day extreme climate events and projected sea level rise, are assessed for this LME. To compare and rank LMEs, they were classified into five categories of risk (from 1 to 5, corresponding to lowest, low, medium, high and highest risk, respectively) based on the values of the individual indicators. In the case of economic revenues, the LMEs were grouped to 5 classes of revenues from lowest, low, medium, high and highest, as revenues did not translate to risk.

Population

The coastal area stretches over 1 427 730 km^2. A current population of 236 678 thousand in 2010 is projected to increase to 353 578 thousand in 2100, with a density of 166 persons per km^2 in 2010 increasing to 248 per km^2 by 2100. About 35% of coastal population lives in rural areas, and is projected to increase in share to 36% in 2100.

Total population		Rural population	
2010	**2100**	**2010**	**2100**
236,677,556	353,577,642	83,755,361	128,562,772

Legend: Very low, Low, Medium, High, Very high

Coastal poor

The indigent population makes up 15% of the LME's coastal dwellers. This LME places in the medium-risk category based on percentage and in the very high-risk category using absolute number of coastal poor (present day estimate).

Coastal poor
35,405,357

Revenues and Spatial Wealth Distribution

Fishing and tourism depend on ecosystem services provided by LMEs. This LME ranks in the very high-revenue category in fishing revenues based on yearly average total ex-vessel price of US 2013 $3 431 million for the period 2001-2010. Fish protein accounts for 12% of the total animal protein consumption of the coastal population. Its yearly average tourism revenue for 2004-2013 of US 2013 $478 729 million places it in the very high-revenue category. On average, LME-based tourism income contributes 13% to the national GDPs of the LME coastal states. Spatial distribution of economic activity (e.g. spatial wealth distribution) measured by night-light and population distribution as coarse proxies can range from 0.0000 (totally equal distribution and lowest risk) to 1.0000 (concentrated in 1 place and most inequitable and highest risk). The Night Light Development Index (NLDI) thus indicates the level of spatial economic development, and that for this LME falls in the category with medium risk.

Fisheries Annual Landed Value	% Fish Protein Contribution	Tourism Annual Revenues	% Tourism Contribution to GDP	NLDI
3,430,991,381	12.2	478,729,000,000	13.1	0.7301

Legend:

Very low Low Medium High Very high

Human Development Index

Using the Human Development Index (HDI) that integrates measures of health, education and income, the present-day LME HDI belongs to the high HDI and low risk category. Based on an HDI of 0.780, this LME has an HDI Gap of 0.220, the difference between present and highest possible HDI (1.000). The HDI Gap measures an overall vulnerability to external events such as disease or extreme climate related events, due to less than perfect health, education, and income levels, and is independent of the harshness of and exposure to specific external shocks.

HDI values are projected to the year 2100 in the contexts of shared socioeconomic development pathways (SSPs). This LME is projected to assume a place in the very low risk category (very high HDI) in 2100 under a sustainable development pathway. Under a fragmented world scenario, the LME is estimated to place in a very high-risk category (very low HDI) because of reduced income levels and increased population values from those estimated in a sustainable development scenario.

	HDI 2100	
HDI	SSP1	SSP3
0.7804	0.9058	0.5554

Legend:

Very low Low Medium High Very high

Climate-Related Threat Indices

The Climate-Related Threat Indices utilize the HDI Gaps for present-day and projected 2100 scenarios. The contemporary climate index accounts for deaths and property losses due to storms, flooding and extreme temperatures incurred by coastal states during a 20-year period from 1994 to 2013 as hazard measures, the 2010 coastal population as proxy for exposure, and the present day HDI Gap as vulnerability measure.

The Contemporary Threat Index incorporates a Dependence Factor based on the fish protein contribution to dietary animal protein, and on the mean contribution of LME tourism to the national GDPs of LME coastal states. The HDI Gap and the degree of dependence on LME ecosystem services define the vulnerability of a coastal population. It also includes the average of risk related to extreme climate events, and the risk based on the degrading system states of an LME (*e.g.* overexploited fisheries, pollution levels, decrease in coastal ecosystem areas).

The 2100 sea level rise threat indices, each computed for the sustainable world and fragmented world development pathways, use the maximum projected sea level rise at the highest level of warming of 8.5 W/m^2 in 2100 as hazard measure, development pathway-specific 2100 populations in the 10 m × 10 km coast as exposure metrics, and development pathway-specific 2100 HDI Gaps as vulnerability estimates.

Present day climate threat index of this LME is within the very high-risk (very high threat) category. The combined contemporaneous risk due to extreme climate events, degrading LME states and the level of vulnerability of the coastal population, is high. In a sustainable development scenario, the risk index from sea level rise in 2100 is very low, and increases to very high risk under a fragmented world development pathway.

2010		2100	
Climate Threat	**Contemporary Threat**	**SSP1**	**SSP3**
0.7779	0.4400	0.3957	0.6605

Legend:

Very low | Low | Medium | High | Very high

Governance

Governance architecture

Given the semi-enclosed nature of this LME, the fit of arrangements to the LME is very close, with two extending also to the Black Sea, and one (ICCAT) extending an Atlantic ocean-wide. The fact that decisions taken in ICCAT are not binding, seriously weakens this arrangement. However, the uptake of recommendations by the GFCM strengthens them in the Mediterranean. The Barcelona Convention and its protocols provide a strong framework for addressing land and marine-based sources of pollution as well as biodiversity issues. A strength of the Specially Protected Areas and Biodiversity Protocol is that it applies to areas beyond national jurisdiction. The need for an integrating mechanism is recognized by the countries in the establishment of the Mediterranean Commission on Sustainable Development. However, it appears to be a consultative body that is largely advisory in nature rather than having any formal coordination mandate.

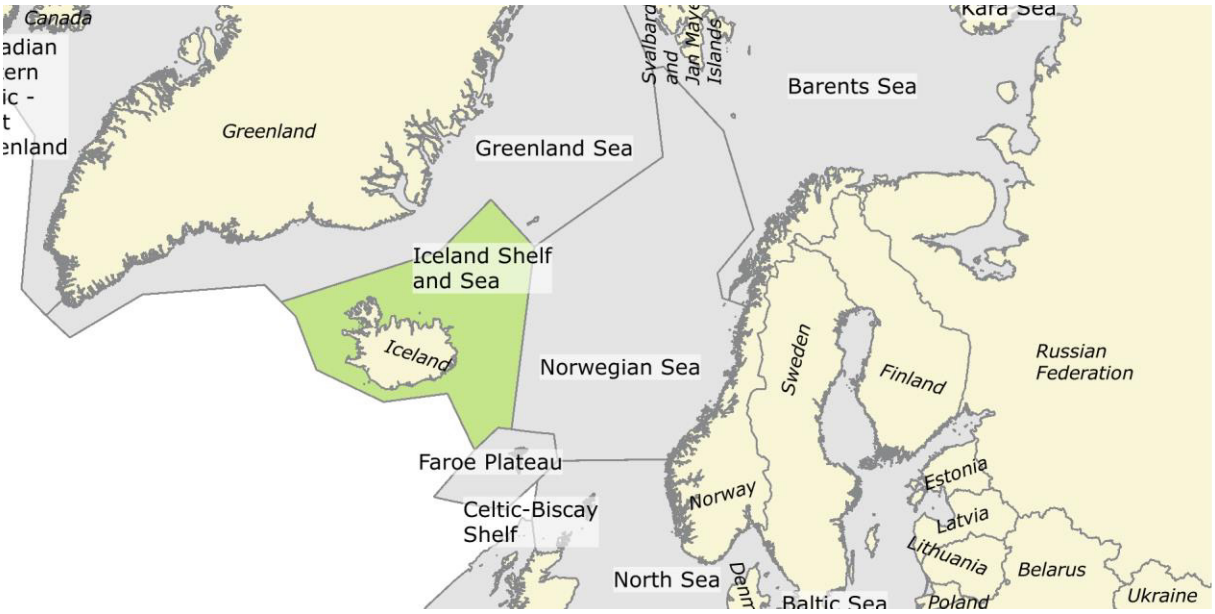
The overall scores for ranking of risk were:

Engagement	Completeness	Integration
85	**78**	**1**

Legend:

Very low | Low | Medium | High | Very high

LME 59 – Iceland Shelf and Sea



Bordering countries: Iceland.
LME Total area: 1,176,522 km^2

List of indicators

LME overall risk

This LME falls in the cluster of LMEs that exhibit a significant influence of capacity-enhancing fisheries subsidies.

Based on a combined measure of the Human Development Index and the averaged indicators for fish & fisheries and pollution & ecosystem health modules, the overall risk factor is low.

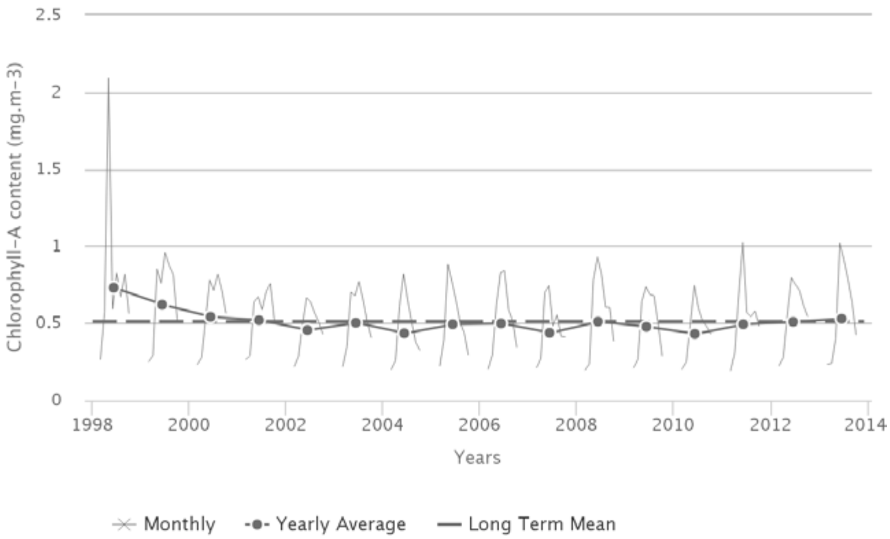
Very low Low Medium High Very high

Productivity

Chlorophyll-A

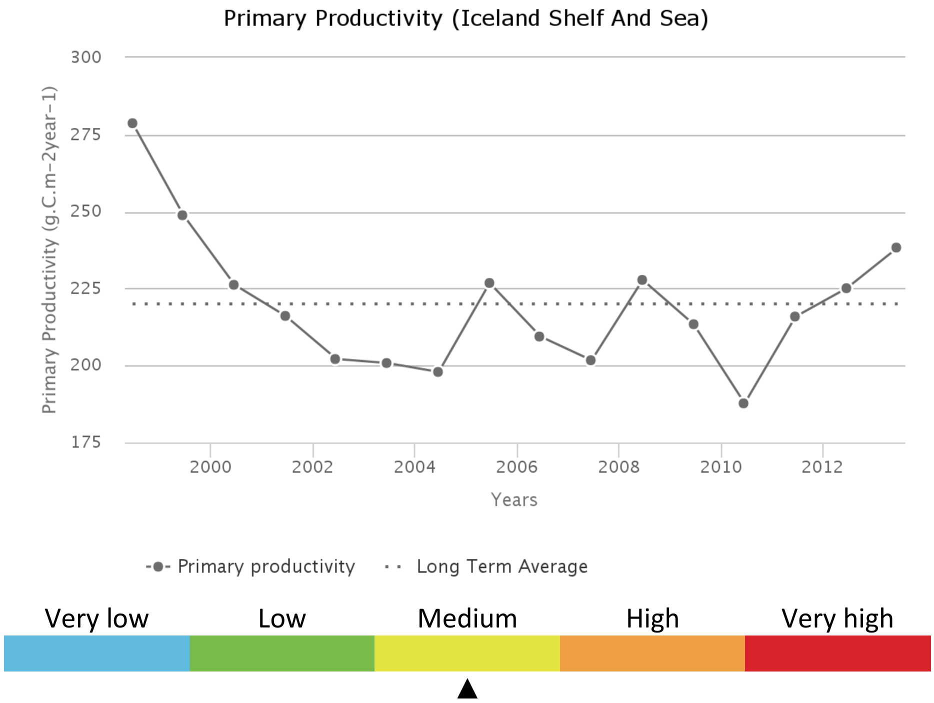
The annual Chlorophyll a concentration (CHL) cycle has a maximum peak (0.778 $mg.m^{-3}$) in June and a minimum (0.215 $mg.m^{-3}$) during March. The average CHL is 0.511 $mg.m^{-3}$. Maximum primary productivity (279 $g.C.m^{-2}.y^{-1}$) occurred during 1998 and minimum primary productivity (188 $g.C.m^{-2}.y^{-1}$) during 2010. There is a statistically insignificant increasing trend in Chlorophyll of 6.28 % from 2003 through 2013. The average primary productivity is 220 $g.C.m^{-2}.y^{-1}$, which places this LME in Group 3 of 5 categories (with 1 = lowest and 5= highest).

Chlorophyll-A (Iceland Shelf And Sea)



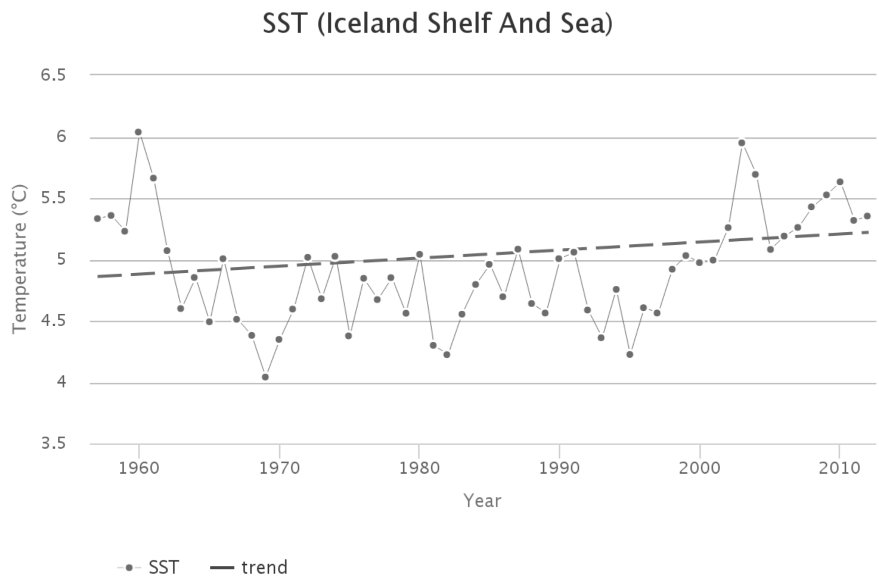
Very low Low Medium High Very high

Primary productivity



Sea Surface Temperature

From 1957 to 2012, the Iceland Shelf and Sea LME #59 has warmed by 0.36°C, thus belonging to Category 4 (slow warming LME). The thermal history of this LME is quite special. Three epochs can be distinguished here: (1) Abrupt cooling from the absolute maximum of >6.0°C in 1960 down to the absolute minimum of 4.0°C in 1969, a drop of >2.0°C in just 9 years; (2) Cold epoch from 1969 through 1995 with SST<5.1°C; (3) Abrupt warming from 4.2°C in 1995 to >5.9°C in 2003, an increase of >1.7°C in just 8 years. The extremely abrupt changes off Iceland can be explained by abrupt switches or shifts of ocean currents that flow past Iceland. The "Great Salinity Anomalies" that were transported by ocean currents past Iceland (Dickson et al., 1988; Belkin et al., 1998; Belkin, 2004) were associated with cold events in 1968-1972, 1981-1982, and 1993-1995.

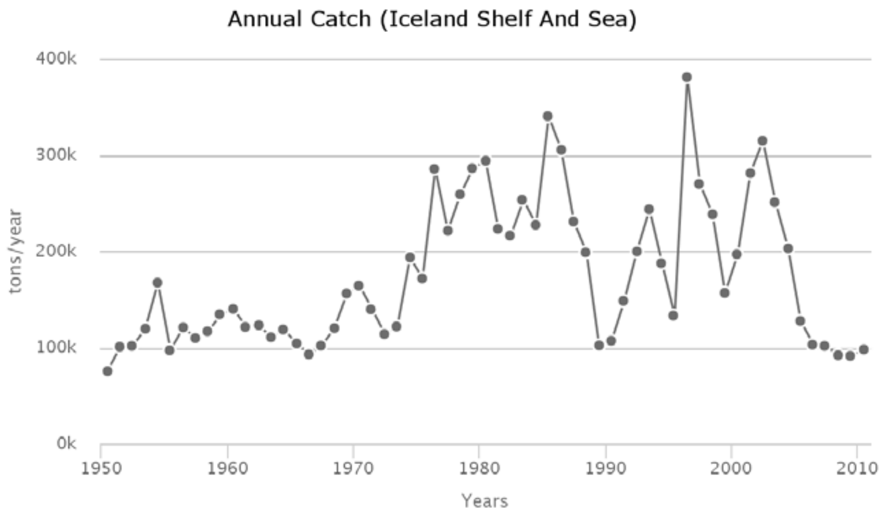


Fish and Fisheries

Total reported landings from 1950 to 2003 show a series of peaks and troughs. Reported landings fluctuated from a low of 100,000 t in the 1950s and 1960s to a high of 380,000 t in 1996. While historically cod dominated reported landings, in more recent years pelagic fish (notably capelin) dominate.

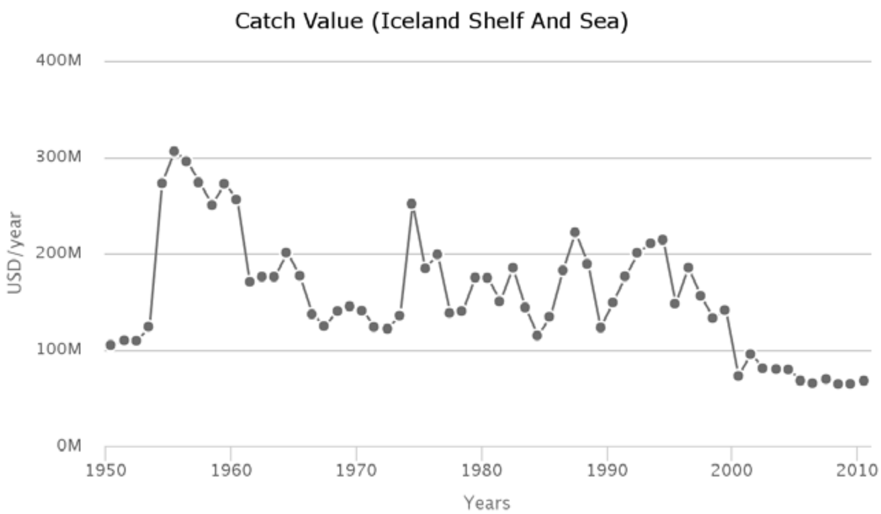
Annual Catch

The value of the fisheries landings peaked in 1955 with an estimate of 300 million US$ (in 2005 real US$).



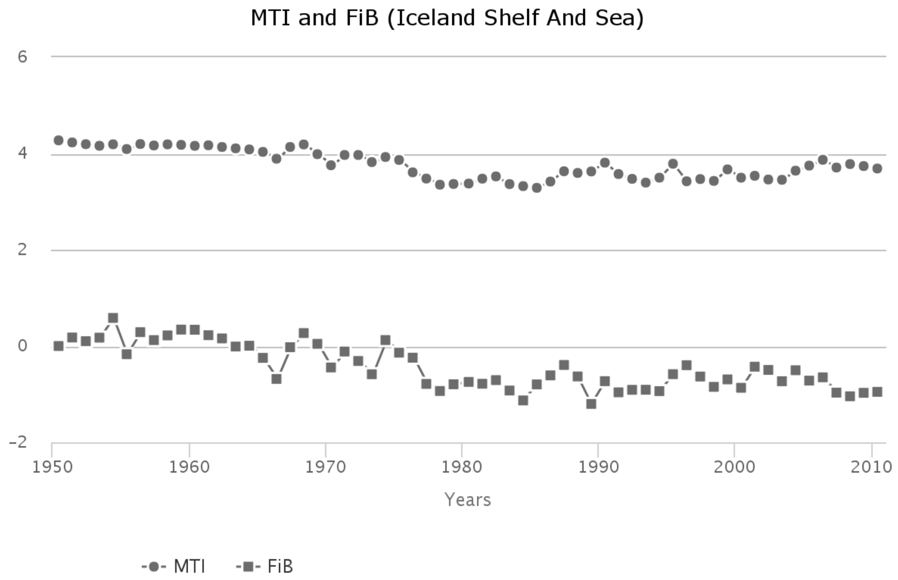
Catch value

The value of the fisheries landings peaked in 1955 with an estimate of 300 million US$ (in 2005 real US$).



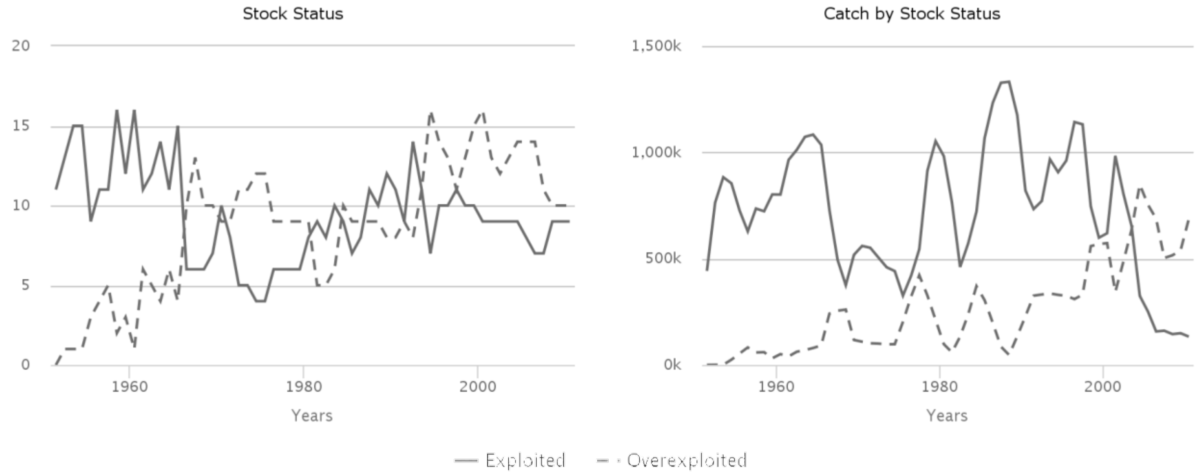
Marine Trophic Index and Fishing-in-Balance index

Until the early 1970s, reported landings from this LME were dominated by cod, whose high trophic level dominated the mean trophic level of the entire fisheries in the region (i.e., the MTI). With new species coming under exploitation, and the gradual decline of cod landings, a classical 'fishing down' scenario ensued with trophic levels declining and some compensation through higher landings of species from lower trophic levels (e.g., capelin), the reason for the stability in the FiB index.



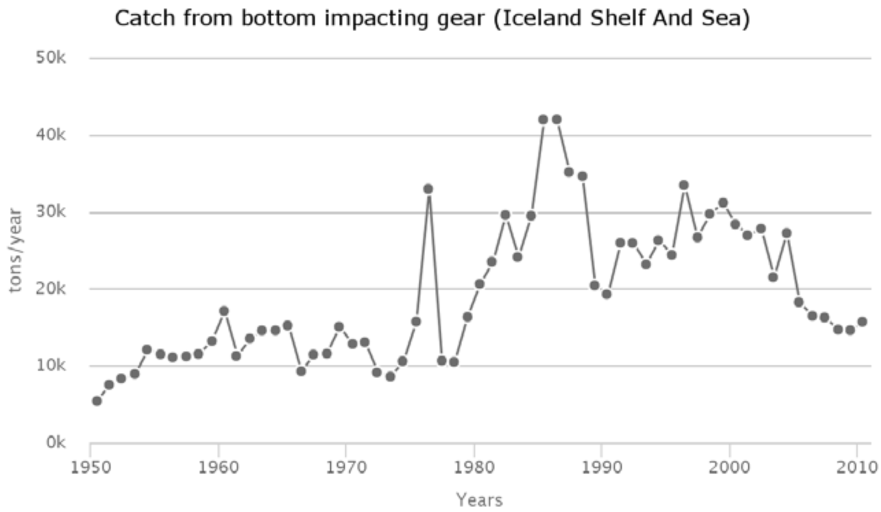
Stock status

The Stock-Catch Status Plots indicate a high proportion of collapsed and overexploited stocks in the LME, and a high contribution of these stocks to the reported landings biomass. The jagged appearance of the latter plot reflects fluctuations in the reported landings.



Catch from bottom impacting gear

The percentage of catch from the bottom gear type to the total catch fluctuated between 4 and 20% from 1950 to 2010. This percentage fluctuated between 8 and 16% in the recent decade.

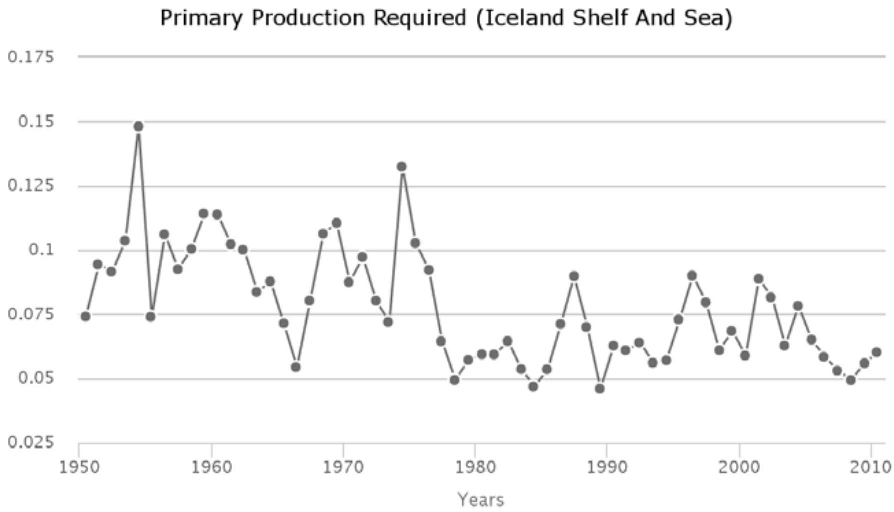


Fishing effort

The total effective effort continuously increased from around 17 million kW in the 1950s to its peak around 120 million kW in 2005.

Primary Production Required

The primary production required (PPR) to sustain the reported landings in this LME reached to 35% of the observed primary production in the mid-1950s, but this relatively high value did not reoccur in recent years, and has remained mostly under 10 %. The countries with the largest share of the PPR or ecological footprint in this LME have changed frequently over the years, with Iceland accounting for the largest footprint in recent years.



Pollution and Ecosystem Health

Pollution

Nutrient ratio, Nitrogen load and Merged Indicator

Human activities in watersheds are affecting nutrients transported by rivers into LMEs. Large amounts of nutrients (in particular *nitrogen load*) entering coastal waters of LMEs can result in high biomass algal blooms, leading to hypoxic or anoxic conditions, increased turbidity and changes in community composition, among other effects. In addition, changes in the *ratio of nutrients* entering LMEs can result in dominance by algal species that have deleterious effects (toxic, clog gills of shellfish, etc.) on ecosystems and humans.
An overall nutrient indicator (*Merged Nutrient Indicator*) based on 2 sub-indicators: *Nitrogen Load* and *Nutrient Ratio* (ratio of dissolved Silica to Nitrogen or Phosphorus - the Index of Coastal Eutrophication Potential or ICEP) was calculated.

Nitrogen load

The Nitrogen Load risk level for contemporary (2000) conditions was very low. (level 1 of the five risk categories, where 1 = lowest risk; 5 = highest risk). Based on a “current trends” scenario (Global Orchestration), this remained the same in 2030 and 2050.

Nutrient ratio

The Nutrient Ratio (ICEP) risk level for contemporary (2000) conditions was very low (1). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

Merged nutrient indicator

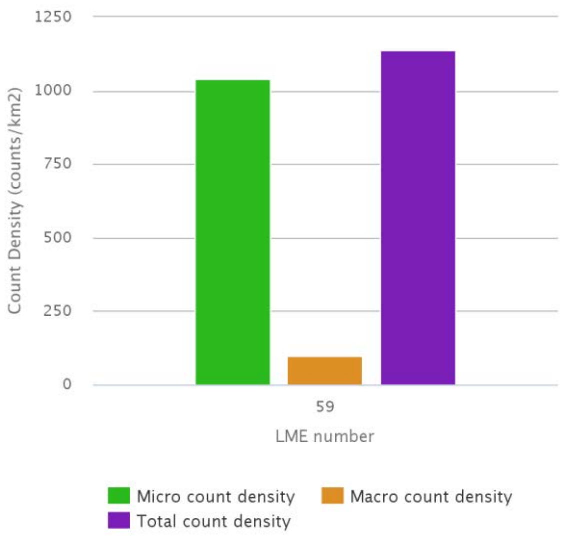
The risk level for the Merged Nutrient Indicator for contemporary (2000) conditions was very low (1). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

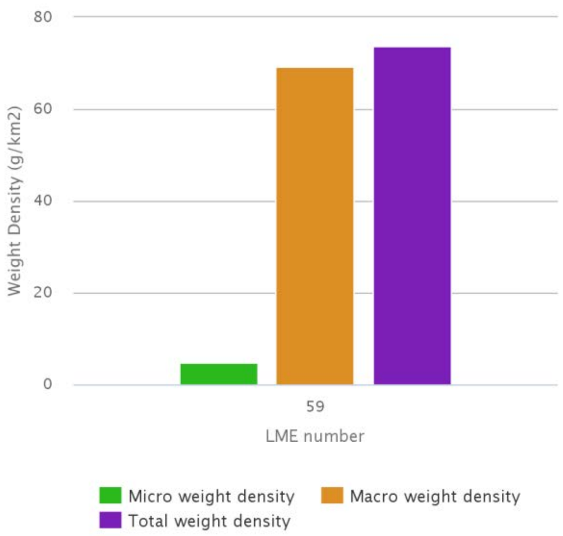
2000			2030			2050		
Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator
1	1	1	1	1	1	1	1	1

Legend:
Very low
Low
Medium
High
Very high

POPs
No pellet samples were obtained from this LME.

Plastic debris
Modelled estimates of floating plastic abundance (items km^{-2}), for both micro-plastic (<4.75 mm) and macro-plastic (>4.75 mm), indicate that this LME is in the group with relatively low levels of plastic concentration. Estimates are based on three proxy sources of litter: shipping density, coastal population density and the level of urbanisation within major watersheds, with enhanced run-off. The low values are due to the relative remoteness of this LME from significant sources of plastic. The abundance of floating plastic in this category is estimated to be on average over 40 times lower that those LMEs with the highest values. There is limited evidence from sea-based direct observations and towed nets to support this conclusion.





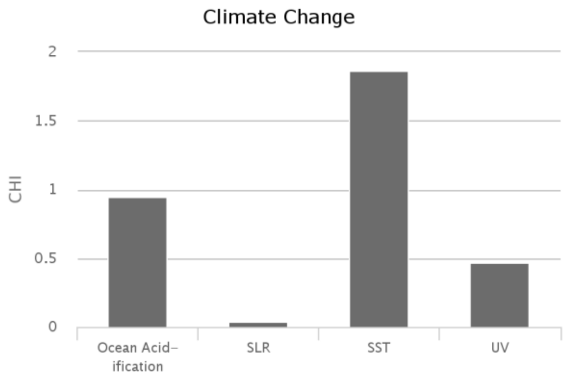
Ecosystem Health

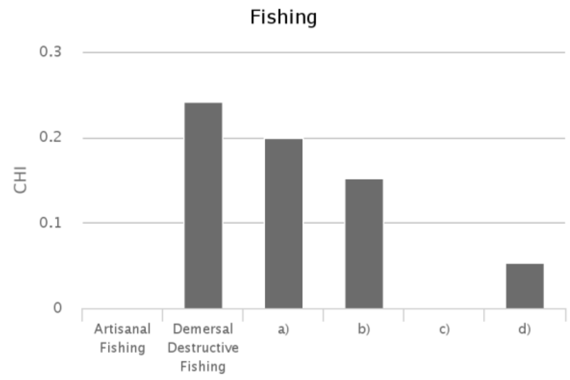
Mangrove and coral cover
Not applicable.

Reefs at risk
The Iceland Shelf and Sea LME experienced an increase in MPA coverage from 24.1 km^2 prior to 1983 to 2,789 km^2.

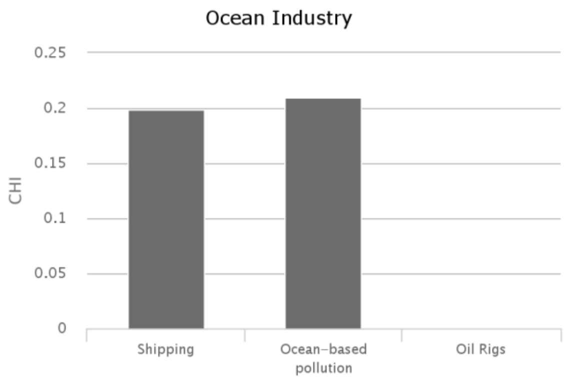
Marine Protected Area change
Not applicable.

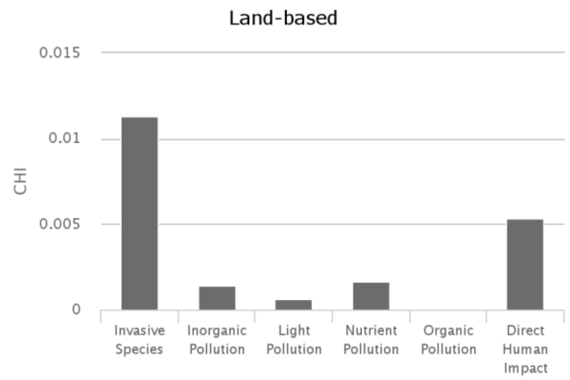
Cumulative Human Impact
The Iceland Shelf and Sea LME experiences well above average overall cumulative human impact (score 4.40; maximum LME score 5.22). It falls in risk category 5 of the five risk categories (1 = lowest risk; 5 = highest risk). This LME is most vulnerable to climate change. Of the 19 individual stressors, three connected to climate change have the highest average impact on the LME: ocean acidification (0.95; maximum in other LMEs was 1.20), UV radiation (0.47; maximum in other LMEs was 0.76), and sea surface temperature (1.87; maximum in other LMEs was 2.16). Other key stressors include commercial shipping, ocean based pollution, pelagic low-bycatch commercial fishing, and all three types of demersal commercial fishing (demersal destructive, non-destructive low-bycatch, and non-destructive high-bycatch).

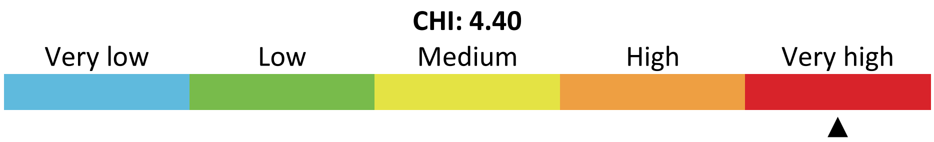




a) Demersal Non-destructive High Bycatch Fishing
c) Pelagic High Bycatch Fishing
b) Demersal Non-destructive Low Bycatch Fishing
d) Pelagic Low Bycatch Fishing

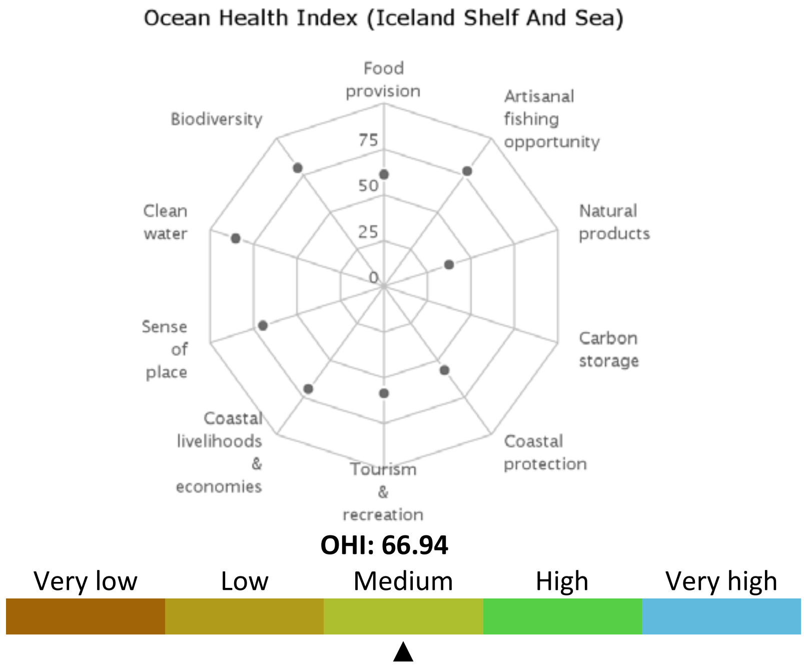






Ocean Health Index

The Iceland Shelf and Sea LME scores above average on the Ocean Health Index compared to other LMEs (score 74 out of 100; range for other LMEs was 57 to 82), but still relatively low. This score indicates that the LME is below its optimal level of ocean health, although there are some aspects that are doing well. Its score in 2013 increase 1 point compared to the previous year, due in large part to changes in the scores for food provision and coastal economies. This LME scores lowest on coastal protection, coastal economies, and lasting special places goals and highest on artisanal fishing opportunities and clean waters goals. It falls in risk category 2 of the five risk categories, which is a moderate level of risk (1 = lowest risk; 5 = highest risk).



Socio-economics

Indicators of demographic trends, economic dependence on ecosystem services, human wellbeing and vulnerability to present-day extreme climate events and projected sea level rise, are assessed for this LME. To compare and rank LMEs, they were classified into five categories of risk (from 1 to 5, corresponding to lowest, low, medium, high and highest risk, respectively) based on the values of the individual indicators. In the case of economic revenues, the LMEs were grouped to 5 classes of revenues from lowest, low, medium, high and highest, as revenues did not translate to risk.

Population

The coastal area stretches over 90 140 km^2. A current population of 324 thousand in 2010 is projected to increase to 404 thousand in 2100, with a density of 36 persons per 10 km^2 in 2010 increasing to 45 per 10 km^2 by 2100. About 29% of coastal population lives in rural areas, and is projected to be increase in share to 37% in 2100.

Total population		Rural population	
2010	**2100**	**2010**	**2100**
324,366	404,432	93,375	150,804

Legend: Very low | Low | Medium | High | Very high

Coastal poor

The indigent population makes up 6% of the LME's coastal dwellers. This LME places in the very low-risk category based on percentage and in the very low-risk category using absolute number of coastal poor (present day estimate).

Coastal poor
20,390

Revenues and Spatial Wealth Distribution

Fishing and tourism depend on ecosystem services provided by LMEs. This LME ranks in the medium-revenue category in fishing revenues based on yearly average total ex-vessel price of US 2013 $488 million for the period 2001-2010. Fish protein accounts for 29% of the total animal protein consumption of the coastal population. Its yearly average tourism revenue for 2004-2013 of US 2013

$471 million places it in the very low-revenue category. On average, LME-based tourism income contributes 19% to the national GDPs of the LME coastal states. Spatial distribution of economic activity (e.g. spatial wealth distribution) measured by night-light and population distribution as coarse proxies can range from 0.0000 (totally equal distribution and lowest risk) to 1.0000 (concentrated in 1 place and most inequitable and highest risk). The Night Light Development Index (NLDI) thus indicates the level of spatial economic development, and that for this LME falls in the category with high risk.

Fisheries Annual Landed Value	% Fish Protein Contribution	Tourism Annual Revenues	% Tourism Contribution to GDP	NLDI
488,226,129	29.1	471,060,000	19.3	0.8044

Legend: Very low | Low | Medium | High | Very high

Human Development Index

Using the Human Development Index (HDI) that integrates measures of health, education and income, the present-day LME HDI belongs to the very high HDI and very low-risk category. Based on an HDI of 0.898, this LME has an HDI Gap of 0.102, the difference between present and highest possible HDI (1.000). The HDI Gap measures an overall vulnerability to external events such as disease or extreme climate related events, due to less than perfect health, education, and income levels, and is independent of the harshness of and exposure to specific external shocks.

HDI values are projected to the year 2100 in the contexts of shared socioeconomic development pathways (SSPs). This LME is projected to assume a place in the very low risk category (very high HDI) in 2100 under a sustainable development pathway. Under a fragmented world scenario, the LME is estimated to place in a medium-risk category (medium HDI) because of reduced income levels and increased population values from those in a sustainable development pathway.

	HDI 2100	
HDI	SSP1	SSP3
0.8978	0.9889	0.7466

Legend: Very low | Low | Medium | High | Very high

Climate-Related Threat Indices

The Climate-Related Threat Indices utilize the HDI Gaps for present-day and projected 2100 scenarios. The contemporary climate index accounts for deaths and property losses due to storms, flooding and extreme temperatures incurred by coastal states during a 20-year period from 1994 to 2013 as hazard measures, the 2010 coastal population as proxy for exposure, and the present day HDI Gap as vulnerability measure.

The Contemporary Threat Index incorporates a Dependence Factor based on the fish protein contribution to dietary animal protein, and on the mean contribution of LME tourism to the national GDPs of LME coastal states. The HDI Gap and the degree of dependence on LME ecosystem services define the vulnerability of a coastal population. It also includes the average of risk related to extreme climate events, and the risk based on the degrading system states of an LME (*e.g.* overexploited fisheries, pollution levels, decrease in coastal ecosystem areas).

The 2100 sea level rise threat indices, each computed for the sustainable world and fragmented world development pathways, use the maximum projected sea level rise at the highest level of warming of 8.5 W/m^2 in 2100 as hazard measure, development pathway-specific 2100 populations in the 10 m × 10 km coast as exposure metrics, and development pathway-specific 2100 HDI Gaps as vulnerability estimates.

Present day climate threat index of this LME is within the very low-risk (very low threat) category. The combined contemporaneous risk due to extreme climate events, degrading LME states and the level of vulnerability of the coastal population, is low. In a sustainable development scenario, the risk index from sea level rise in 2100 is very low, and remains the same even under a fragmented world development pathway.

2010		2100	
Climate Threat	**Contemporary Threat**	**SSP1**	**SSP3**
0.0000	0.2667	0.1544	0.4271

Legend:

Very low | Low | Medium | High | Very high

Governance

Governance architecture

In this LME, none of the transboundary fisheries arrangements (NEAFC, ICCAT, NAMMCO and NASCO) appear to be integrated while the three arrangements for pollution and biodiversity appear to have the Arctic Council as an integrating arrangement for one set of issues and the OSPAR Convention for a second set of similar issues relating to pollution and biodiversity. Additionally, the specific biodiversity arrangements for marine mammals and polar bears do not appear to have any formal linkages.

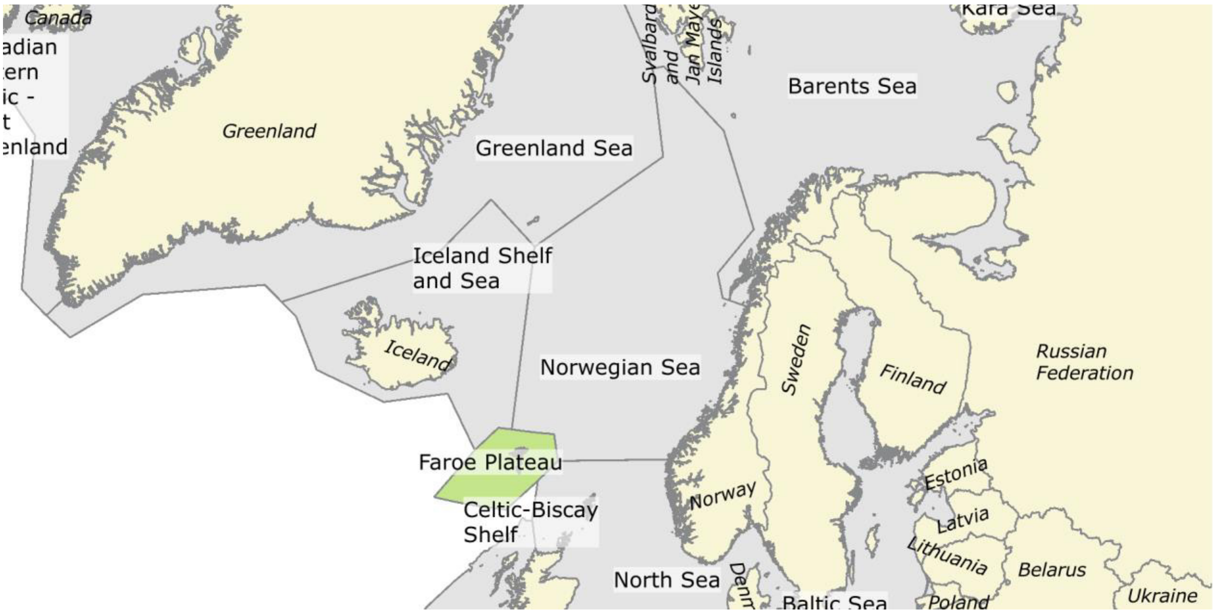
The overall scores for the ranking of risk were:

Engagement	Completeness	Integration
90	**78**	**0.1**

Legend:

Very low | Low | Medium | High | Very high

LME 60 – Faroe Plateau



Bordering country: Faroe Islands.
LME Total area: 151,005 km^2

List of indicators

LME overall risk

This LME falls in the cluster of LMEs that exhibit low to medium levels of economic development (based on the night light development index) and medium levels of collapsed and overexploited fish stocks.

Based on a combined measure of the Human Development Index and the averaged indicators for fish & fisheries and pollution & ecosystem health modules, the overall risk factor is very low.

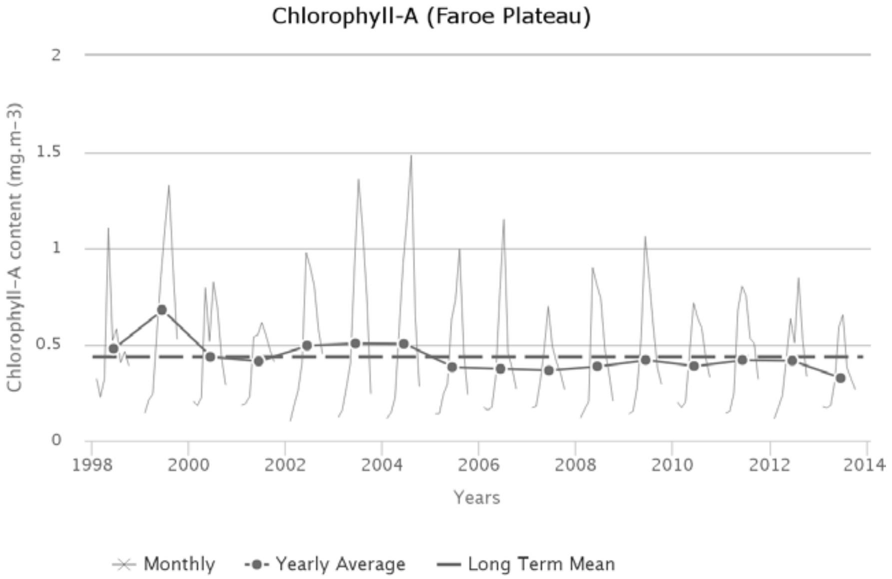
Very low Low Medium High Very high

▲

Productivity

Chlorophyll-A

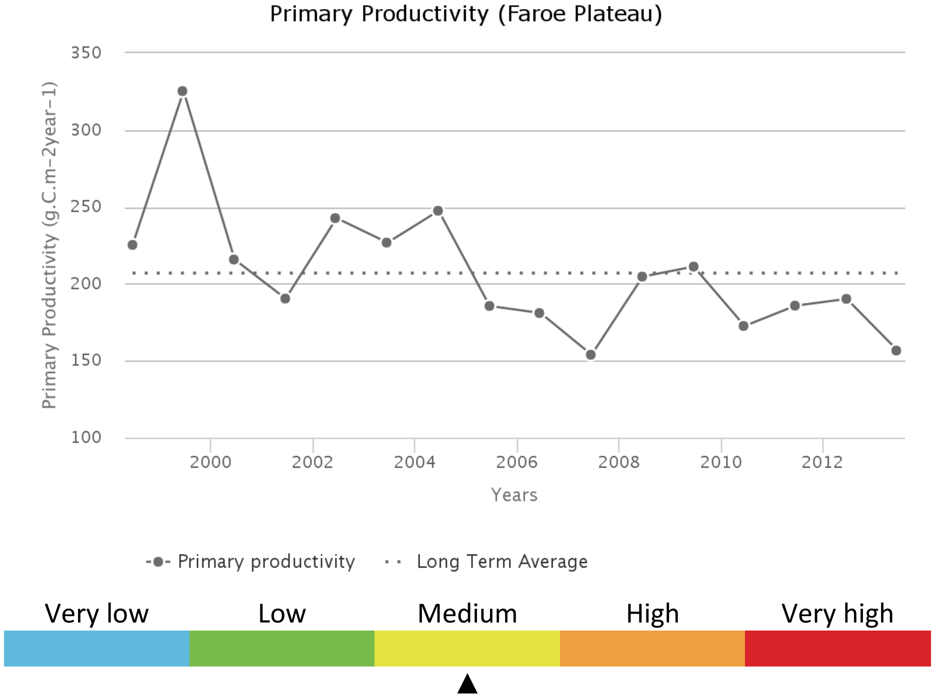
The annual Chlorophyll a concentration (CHL) cycle has a maximum peak (0.782 mg.m^{-3}) in July and a minimum (0.149 mg.m^{-3}) during February. The average CHL is 0.434 mg.m^{-3}. Maximum primary productivity (325 g.C.m^{-2}.y^{-1}) occurred during 1999 and minimum primary productivity (154 g.C.m^{-2}.y^{-1}) during 2007. There is a statistically insignificant decreasing trend in Chlorophyll of -38.3 % from 2003 through 2013. The average primary productivity is 207 g.C.m^{-2}.y^{-1}, which places this LME in Group 3 of 5 categories (with 1 = lowest and 5= highest).



Very low Low Medium High Very high

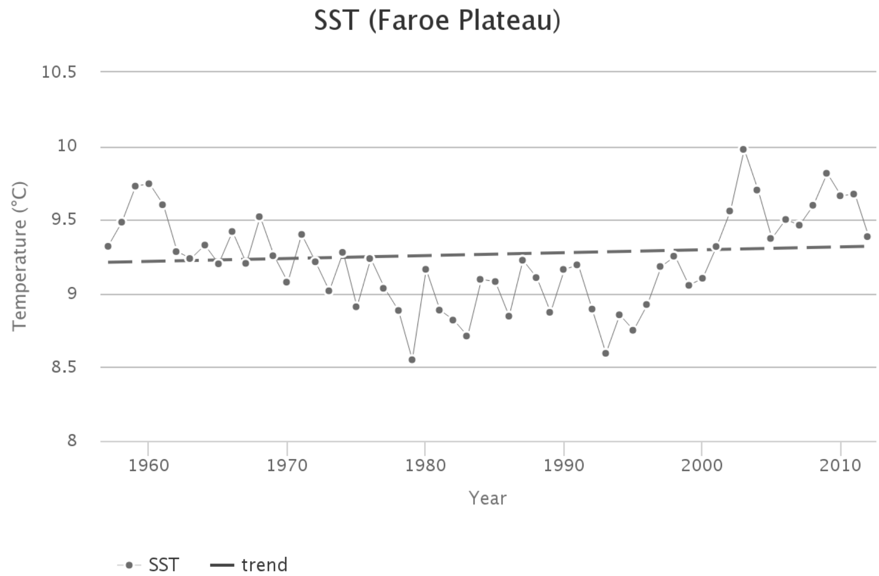
▲

Primary productivity



Sea Surface Temperature

From 1957 to 2012, the Faroe Plateau LME #60 has warmed by 0.10°C, thus belonging to Category 4 (slow warming LME). There are strong similarities between the climate changes in this LME and around Iceland. SST in both LMEs peaked in 1960 and declined afterward. Yet in the Faroe Plateau LME the SST decline was much more gradual, albeit no less consistent. After >30 years of decline, SST has bottomed out at 8.6°C in 1993 and has risen to nearly 10.0°C in 2003, the same year when SST peaked off Iceland. Thus, SST rose by 1.4°C in 10 years and remained relatively high afterward. The similarity between SST variations around the Faroes and those off Iceland are accounted for by the domineering influence of the North Atlantic Current and its main northwestern branch, the Irminger Current. These currents transport warm and cold anomalies that largely determine SST distribution around these islands.

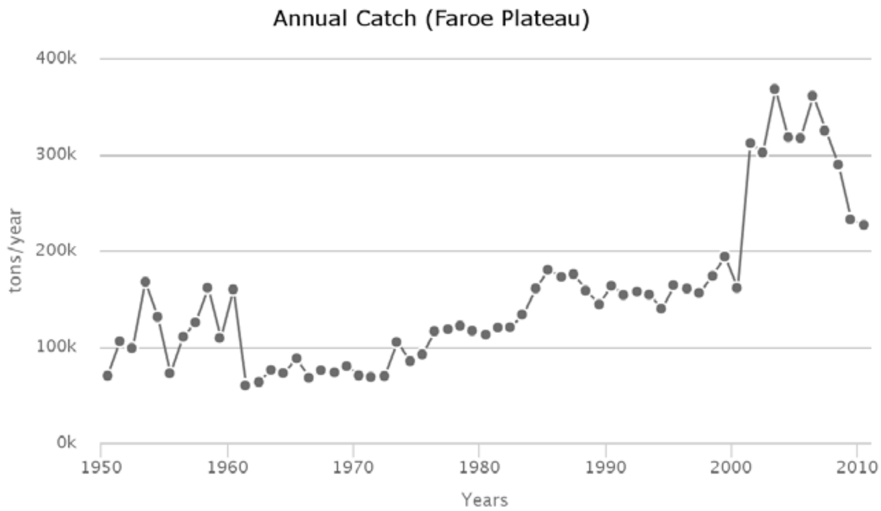


Fish and Fisheries

Climatic variability has a major impact on fish landings in this LME. The most important species group in terms of shelf catches is pelagic fish, representing on average 52% of the total catch, and cod, saithe and haddock, representing more than 30% of the catch. The long-term average annual landings of cod fluctuate between 20,000 and 40,000 t, while those of haddock fluctuate between 15,000 and 25,000 t per year.

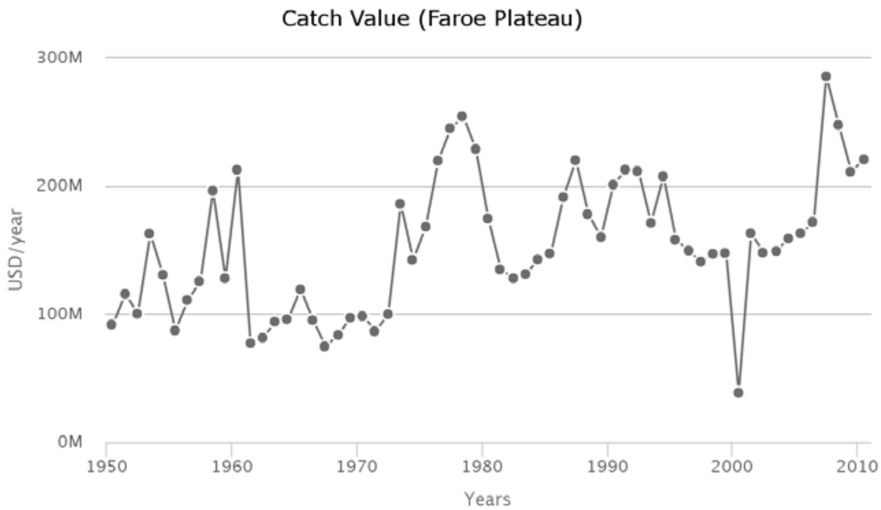
Annual Catch

Total reported landings have been on a rise, recording about 300,000 t in recent years. Blue whiting account for the largest share of the landings since the late 1970s, with 75% of the total landings in 2004.



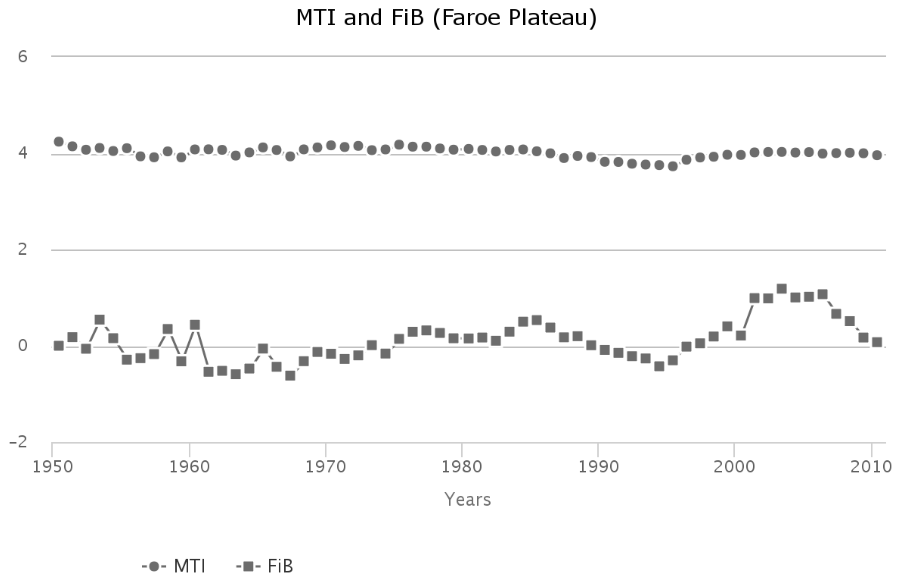
Catch value

The value of the reported landings recorded 230 million US$ (in 2005 real US$) in recent years.



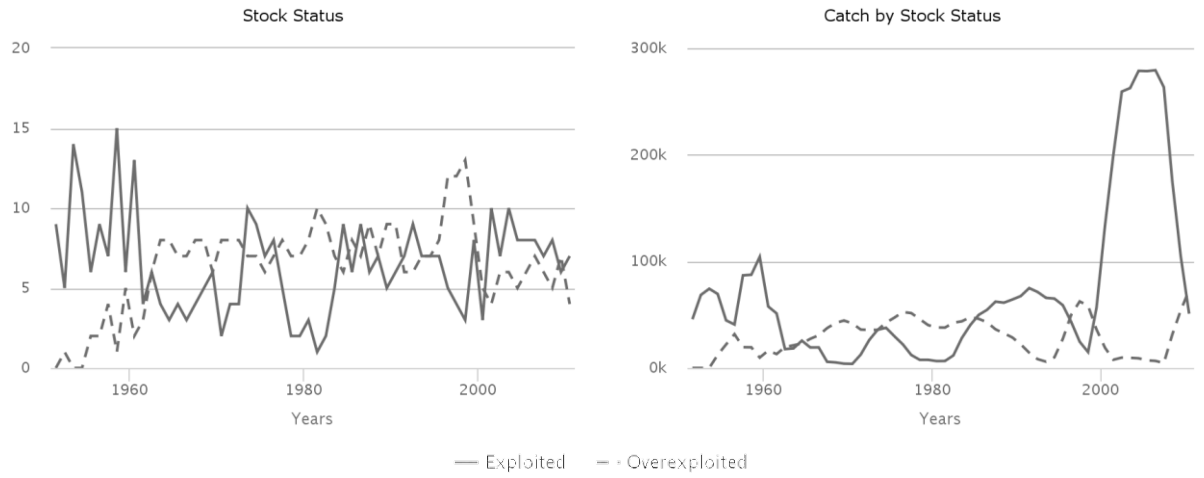
Marine Trophic Index and Fishing-in-Balance index

No clear trend can be observed in the MTI until mid-1990. Since then, however, the MTI levels appear to increase, presumably due to the almost exclusive, and increasing landings of blue whiting, which could be masking any possible 'fishing down' effect in the LME. The expansion of the blue whiting fisheries is also evident in the FiB index.



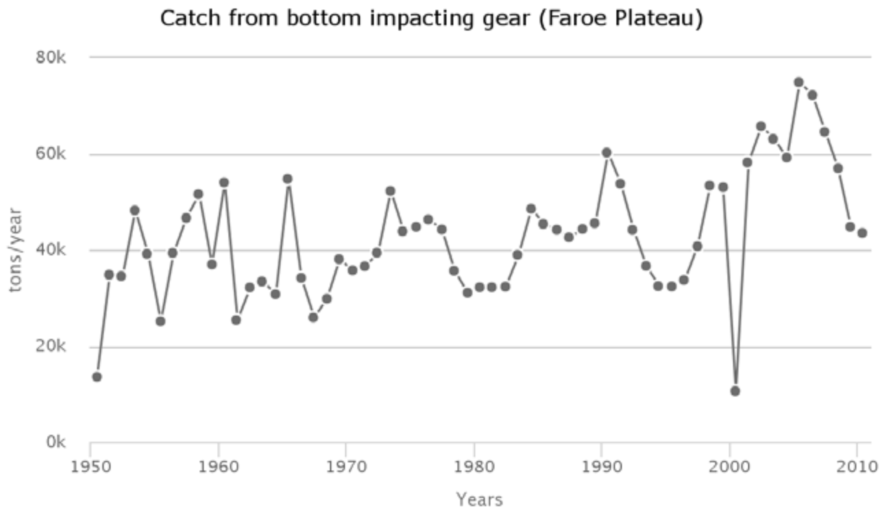
Stock status

The Stock-Catch Status Plots indicate the high proportion of stocks defined as 'collapsed' in the LME. However, overexploited stocks and fully exploited stocks contribute 40% and 30% of the reported landings biomass, respectively, a result of the increase in the blue whiting landings.



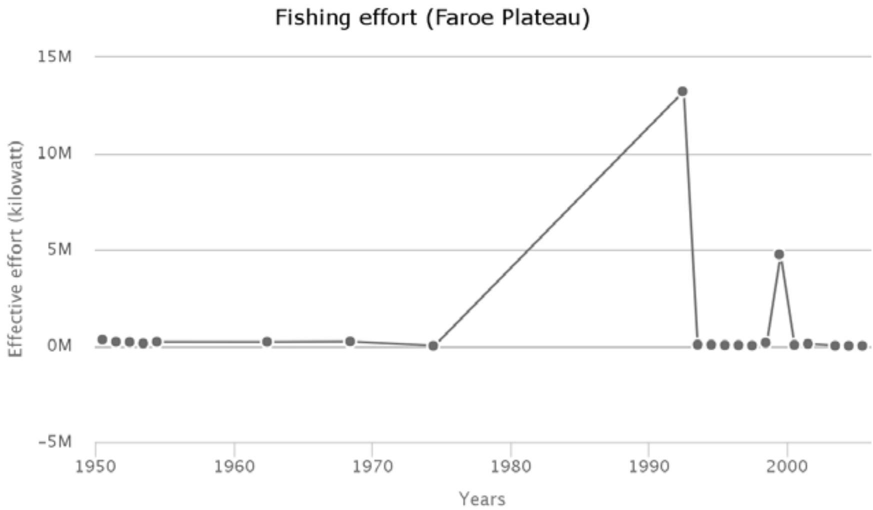
Catch from bottom impacting gear

The percentage of catch from the bottom gear type to the total catch reached its first peak at 62% in 1964 and then have a decreasing trend. Then, the percentage fluctuated around 20% in recent decade.



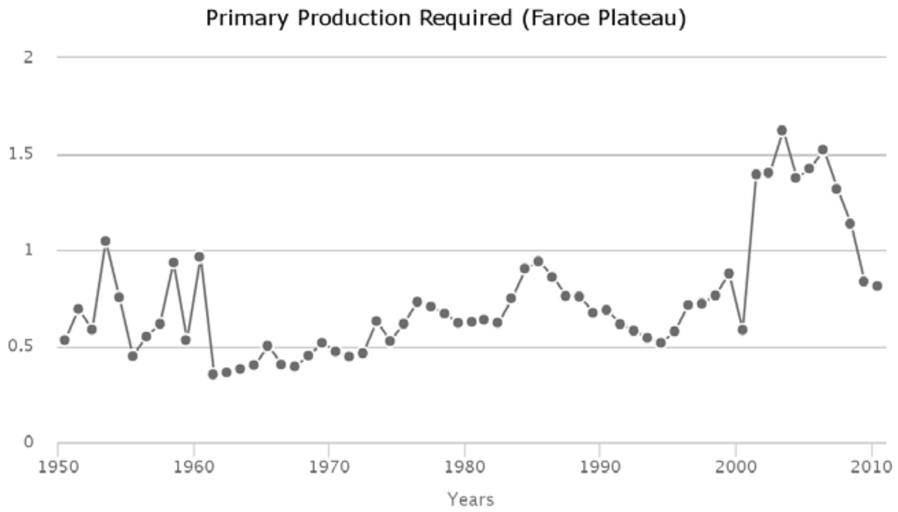
Fishing effort

Reliable effort data for this LME could not be obtained.



Primary Production Required

The primary production required (PPR) to sustain the reported landings in this LME has reached a level that far exceeds the observed primary production of the region. This it is probably due to fish being caught in the LME recruiting from and/or feeding outside the LME, which thus subsidize the productivity of the Faroe Plateau LME.



Pollution and Ecosystem Health

Pollution

Nutrient ratio, Nitrogen load and Merged Indicator

Human activities in watersheds are affecting nutrients transported by rivers into LMEs. Large amounts of nutrients (in particular *nitrogen load*) entering coastal waters of LMEs can result in high biomass algal blooms, leading to hypoxic or anoxic conditions, increased turbidity and changes in community composition, among other effects. In addition, changes in the *ratio of nutrients* entering LMEs can result in dominance by algal species that have deleterious effects (toxic, clog gills of shellfish, etc.) on ecosystems and humans.

An overall nutrient indicator (*Merged Nutrient Indicator*) based on 2 sub-indicators: *Nitrogen Load* and *Nutrient Ratio* (ratio of dissolved Silica to Nitrogen or Phosphorus - the Index of Coastal Eutrophication Potential or ICEP) was calculated.

Nitrogen load

The Nitrogen Load risk level for contemporary (2000) conditions was very low. (level 1 of the five risk categories, where 1 = lowest risk; 5 = highest risk). Based on a “current trends” scenario (Global Orchestration), this remained the same in 2030 and 2050.

Nutrient ratio

The Nutrient Ratio (ICEP) risk level for contemporary (2000) conditions was very low (1). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

Merged nutrient indicator

The risk level for the Merged Nutrient Indicator for contemporary (2000) conditions was very low (1). According to the Global Orchestration scenario, this remained the same in 2030 and 2050.

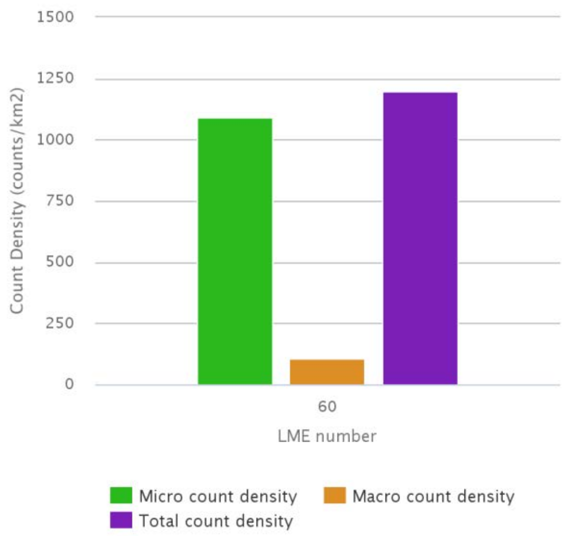
2000			2030			2050		
Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator	Nitrogen load	Nutrient ratio	Merged nutrient indicator
1	1	1	1	1	1	1	1	1

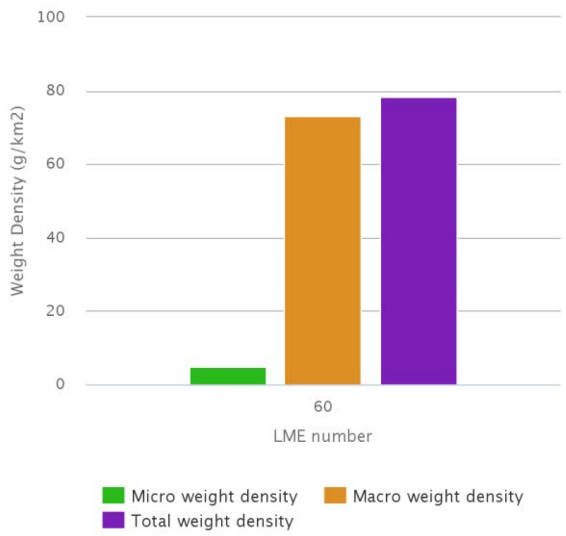
Legend:

Very low Low Medium High Very high

POPs
No pellet samples were obtained from this LME.

Plastic debris
Modelled estimates of floating plastic abundance (items km^{-2}), for both micro-plastic (<4.75 mm) and macro-plastic (>4.75 mm), indicate that this LME is in the group with relatively low levels of plastic concentration. Estimates are based on three proxy sources of litter: shipping density, coastal population density and the level of urbanisation within major watersheds, with enhanced run-off. The low values are due to the relative remoteness of this LME from significant sources of plastic. The abundance of floating plastic in this category is estimated to be on average over 40 times lower that those LMEs with the highest values. There is good evidence from sea-based direct observations and towed nets to support this conclusion.





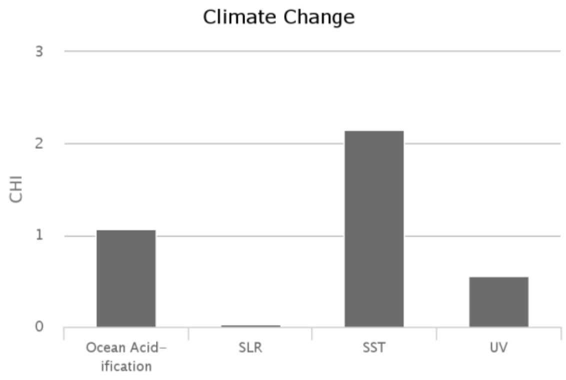
Ecosystem Health

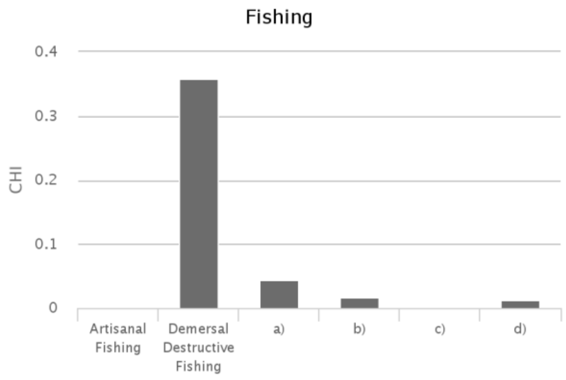
Mangrove and coral cover
Not applicable.

Reefs at risk
Not applicable.

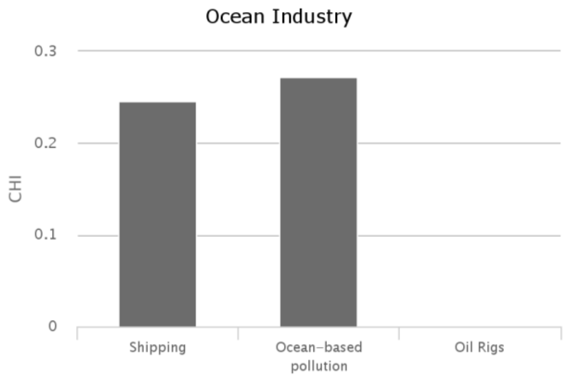
Marine Protected Area change
No change.

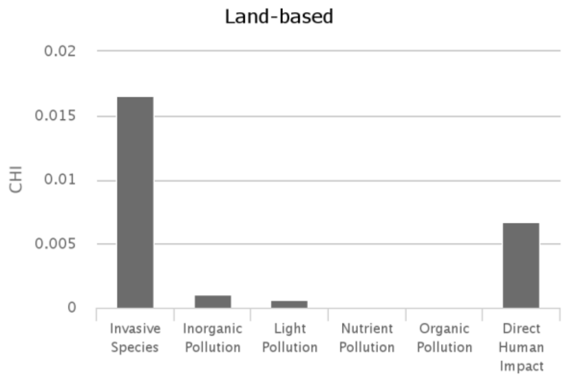
Cumulative Human Impact
The Faroe Plateau LME experiences one of the highest overall cumulative human impact (score 4.79; maximum LME score 5.22),. It falls in risk category 5 of the five risk categories (1 = lowest risk; 5 = highest risk). This LME is most vulnerable to climate change. Of the 19 individual stressors, three connected to climate change have the highest average impact on the LME: ocean acidification (1.07; maximum in other LMEs was 1.20), UV radiation (0.56; maximum in other LMEs was 0.76), and sea surface temperature (2.16, the maximum value for any LME). Other key stressors include commercial shipping, ocean based pollution, and demersal destructive commercial fishing.





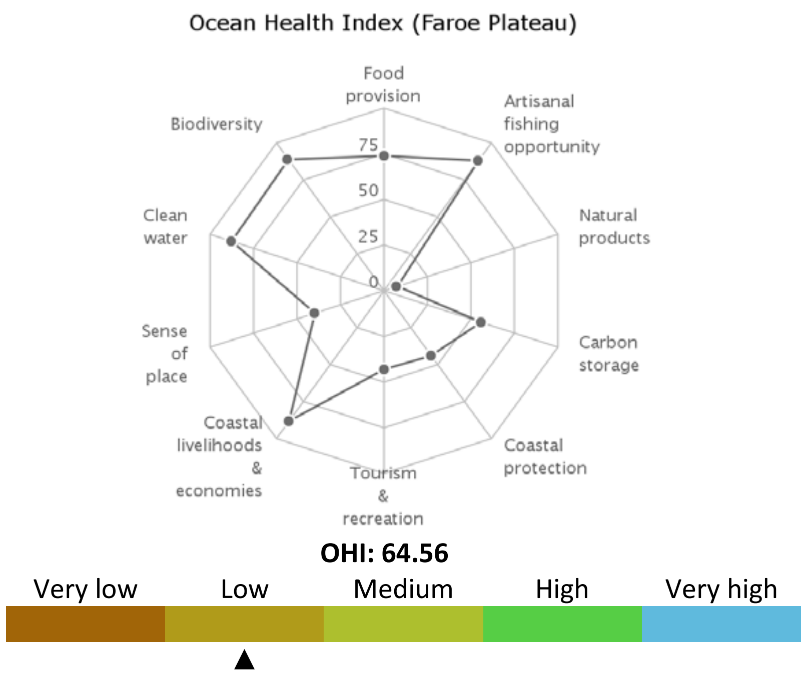
a) Demersal Non-destructive High Bycatch Fishing
c) Pelagic High Bycatch Fishing
b) Demersal Non-destructive Low Bycatch Fishing
d) Pelagic Low Bycatch Fishing





Ocean Health Index

The Faroe Plateau LME scores below average on the Ocean Health Index compared to other LMEs (score 67 out of 100; range for other LMEs was 57 to 82). This score indicates that the LME is well below its optimal level of ocean health, although there are some aspects that are doing well. Its score in 2013 increased 3 points compared to the previous year, due in large part to changes in the scores for natural products and coastal protection. This LME scores lowest on coastal protection, carbon storage, tourism & recreation, and lasting special places goals and highest on mariculture, artisanal fishing opportunities, coastal economies, and habitat biodiversity goals. It falls in risk category 5 of the five risk categories, which is the highest level of risk (1 = lowest risk; 5 = highest risk).



Socio-economics

Indicators of demographic trends, economic dependence on ecosystem services, human wellbeing and vulnerability to present-day extreme climate events and projected sea level rise, are assessed for this LME. To compare and rank LMEs, they were classified into five categories of risk (from 1 to 5, corresponding to lowest, low, medium, high and highest risk, respectively) based on the values of the individual indicators. In the case of economic revenues, the LMEs were grouped to 5 classes of revenues from lowest, low, medium, high and highest, as revenues did not translate to risk.

Population

The coastal area stretches over 1 408 km^2. A current population of 49 thousand in 2010 is projected to decrease to 44 thousand in 2100, with a density of 35 persons per km^2 in 2010 decreasing to 31 per km^2 by 2100. About 54% of coastal population lives in rural areas, and is projected to be decrease in share to 46% in 2100.

Total population		Rural population	
2010	**2100**	**2010**	**2100**
48,863	43,668	26,177	20,117

Legend: Very low, Low, Medium, High, Very high

Coastal poor

There are no poverty statistics for this LME.

Revenues and Spatial Wealth Distribution

Fishing and tourism depend on ecosystem services provided by LMEs. This LME ranks in the low-revenue category in fishing revenues based on yearly average total ex-vessel price of US 2013 $228 million for the period 2001-2010. Fish protein accounts for 43% of the total animal protein consumption of the coastal population. Its yearly average tourism revenue for 2004-2013 of US 2013 $264 million places it in the very low-revenue category. On average, LME-based tourism income contributes 0.1% to the national GDPs of the LME coastal states. Spatial distribution of economic activity (e.g. spatial wealth distribution) measured by night-light and population distribution as coarse proxies can range from 0.0000 (totally equal distribution and lowest risk) to 1.0000 (concentrated in 1 place and most inequitable and highest risk). The Night Light Development Index (NLDI) thus indicates the level of spatial economic development, and that for this LME falls in the category with high risk.

Fisheries Annual Landed Value	% Fish Protein Contribution	Tourism Annual Revenues	% Tourism Contribution to GDP	NLDI
228,384,131	43.2	264,520,000	0.1	0.8462

Legend: Very low | Low | Medium | High | Very high

Human Development Index

Using the Human Development Index (HDI) that integrates measures of health, education and income, the present-day LME HDI belongs to the very high HDI and very low-risk category. Based on an HDI of 0.950, this LME has an HDI Gap of 0.050, the difference between present and highest possible HDI (1.000). The HDI Gap measures an overall vulnerability to external events such as disease or extreme climate related events, due to less than perfect health, education, and income levels, and is independent of the harshness of and exposure to specific external shocks.

There are no projected HDI values for this LME using the Shared Socioeconomic Development Scenarios.

HDI	HDI 2100 SSP1	HDI 2100 SSP3
0.9500	No data	No data

Legend: Very low | Low | Medium | High | Very high

Climate-Related Threat Indices

The Climate-Related Threat Indices utilize the HDI Gaps for present-day and projected 2100 scenarios. The contemporary climate index accounts for deaths and property losses due to storms, flooding and extreme temperatures incurred by coastal states during a 20-year period from 1994 to 2013 as hazard measures, the 2010 coastal population as proxy for exposure, and the present day HDI Gap as vulnerability measure.

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The 2100 sea level rise threat indices, each computed for the sustainable world and fragmented world development pathways, use the maximum projected sea level rise at the highest level of warming of 8.5 W/m^2 in 2100 as hazard measure, development pathway-specific 2100 populations in the 10 m × 10 km coast as exposure metrics, and development pathway-specific 2100 HDI Gaps as vulnerability estimates.

There are no data available to compute the Climate-Related Threat Indices for this LME.

Governance

Governance architecture

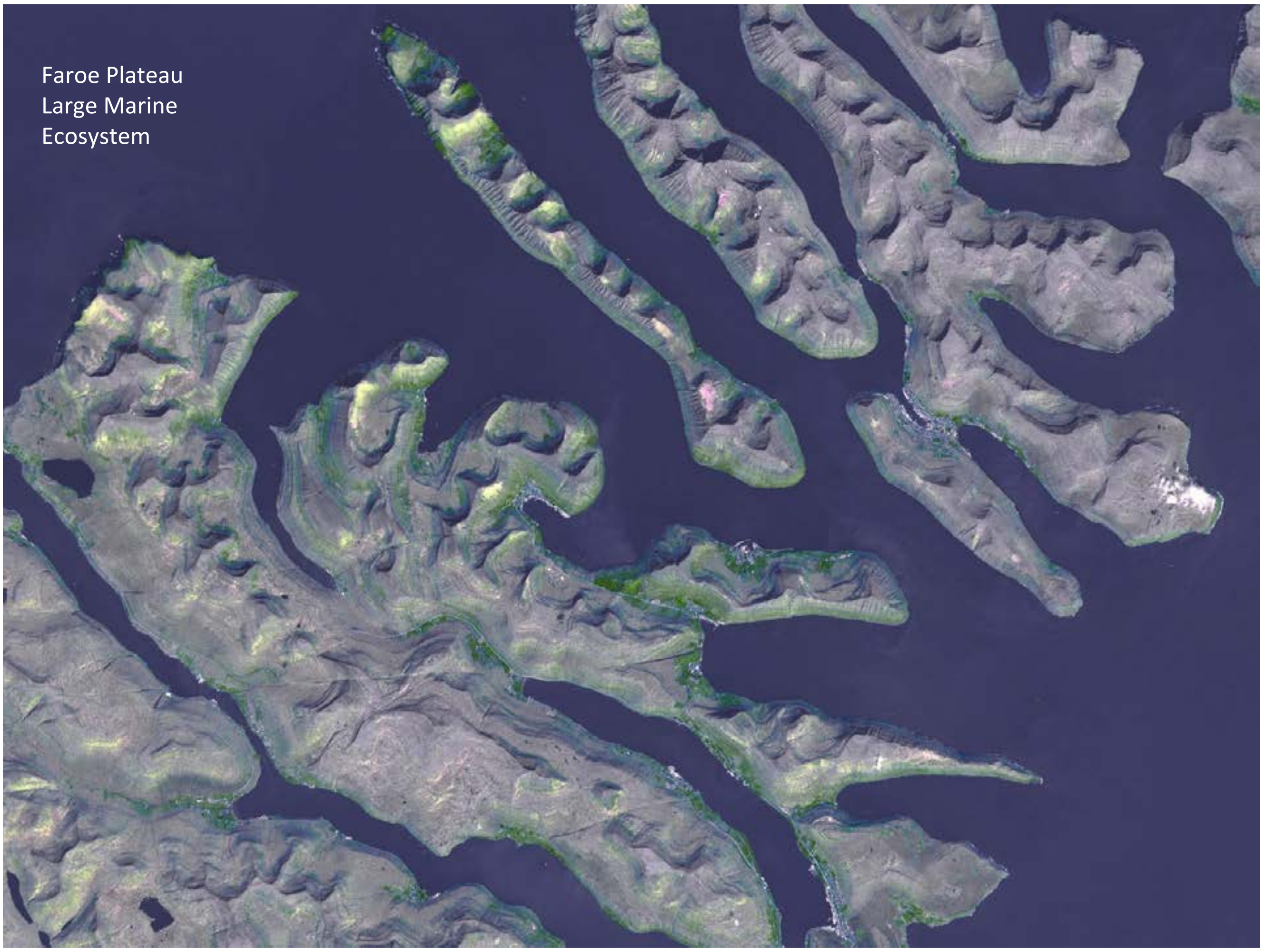
In this LME, the policy cycles relating to the key issues of fisheries and pollution are associated with well-established transboundary arrangements that are among the strongest globally. However, there does not appear to be much integration among these processes. Since the LME is largely a single country one and Denmark has a focus on EBM, the integration may be taking place at the national level. Nevertheless, this LME has been assigned an overall integration score of 1.0 due to the European Union Maritime Policy which can function as an overall policy coordinating mechanism for the key transboundary issues within the LME.

The overall scores for the ranking of risk were:

Engagement	Completeness	Integration
71	77	1

Legend:

Very low | Low | Medium | High | Very high



NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan Aster Science Team

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The water systems of the world – aquifers, lakes, rivers, large marine ecosystems, and open ocean- sustain the biosphere and underpin the socioeconomic wellbeing of the world's population. Many of these systems are shared by two or more nations. These transboundary waters, stretching over 71% of the planet's surface, in addition to the subsurface aquifers, comprise humanity's water heritage.

Recognizing the value of transboundary water systems and the reality that many of them continue to be degraded and managed in fragmented ways, the Global Environment Facility Transboundary Waters Assessment Programme (GEF TWAP) was developed. The Programme aims to provide a baseline assessment to identify and evaluate changes in these water systems caused by human activities and natural processes, and the consequences these may have on dependent human populations. The institutional partnerships forged in this assessment are envisioned to seed future transboundary assessments as well.

The final results of the GEF TWAP are presented in the following six volumes:
Volume 1 – ***Transboundary Aquifers and Groundwater Systems of Small Island Developing States: Status and Trends***
Volume 2 – ***Transboundary Lakes and Reservoirs: Status and Trends***
Volume 3 – ***Transboundary River Basins: Status and Trends***
Volume 4 – ***Large Marine Ecosystems: Status and Trends***
Volume 5 – ***The Open Ocean: Status and Trends***
Volume 6 – ***Transboundary Water Systems: Crosscutting Status and Trends***

A *Summary* for Policy Makers accompanies each volume. All TWAP publications are available for download at http://www.geftwap.org

This annex – Transboundary waters: A Global Compendium, Water System Information Sheets: Northern, Western & Southern Europe, Volume 6-Annex D -- is one of 12 annexes to the Crosscutting Analysis discussed in Volume 6. The global compendium organized into 14 TWAP regions, compiles information sheets on 765 international water systems including the baseline values of quantitative indicators that were used to establish contemporary and relative risk levels at system and regional scales. Over the long term, it is envisioned that these baseline information sheets will continue to be updated by future assessments at multiple spatial and temporal scales to better track the changing states of transboundary waters that are essential in sustaining human wellbeing and ecosystem health.

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