
3rd GEO
DATA
PROVIDERS
WORKSHOP
DATA PROVIDERS
MEET USERS
FRASCATI, ITALY
2-4 MAY 2018
GEO GROUP ON EARTH OBSERVATIONS
esa European Space Agency
CNR-IIA
UNIVERSITÉ DE GENÈVE
FGDC FEDERAL GEOGRAPHIC DATA COMMITTEE
#GEODATA18
bit.ly/GEOdataworkshop

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

International Initiative on Water Quality

3rd GEO DATA PROVIDERS WORKSHOP

DATA PROVIDERS MEET USERS

FRASCATI, ITALY 2-4 MAY 2018

UNESCO International Initiative on Water Quality

World Water Quality Portal

Monitoring water quality using EO

Sarantuyaa Zandaryaa, PhD / International Hydrological Programme / UNESCO

GEO GROUP ON EARTH OBSERVATIONS

esa European Space Agency

CNR-IIA

UNIVERSITÉ DE GENÈVE

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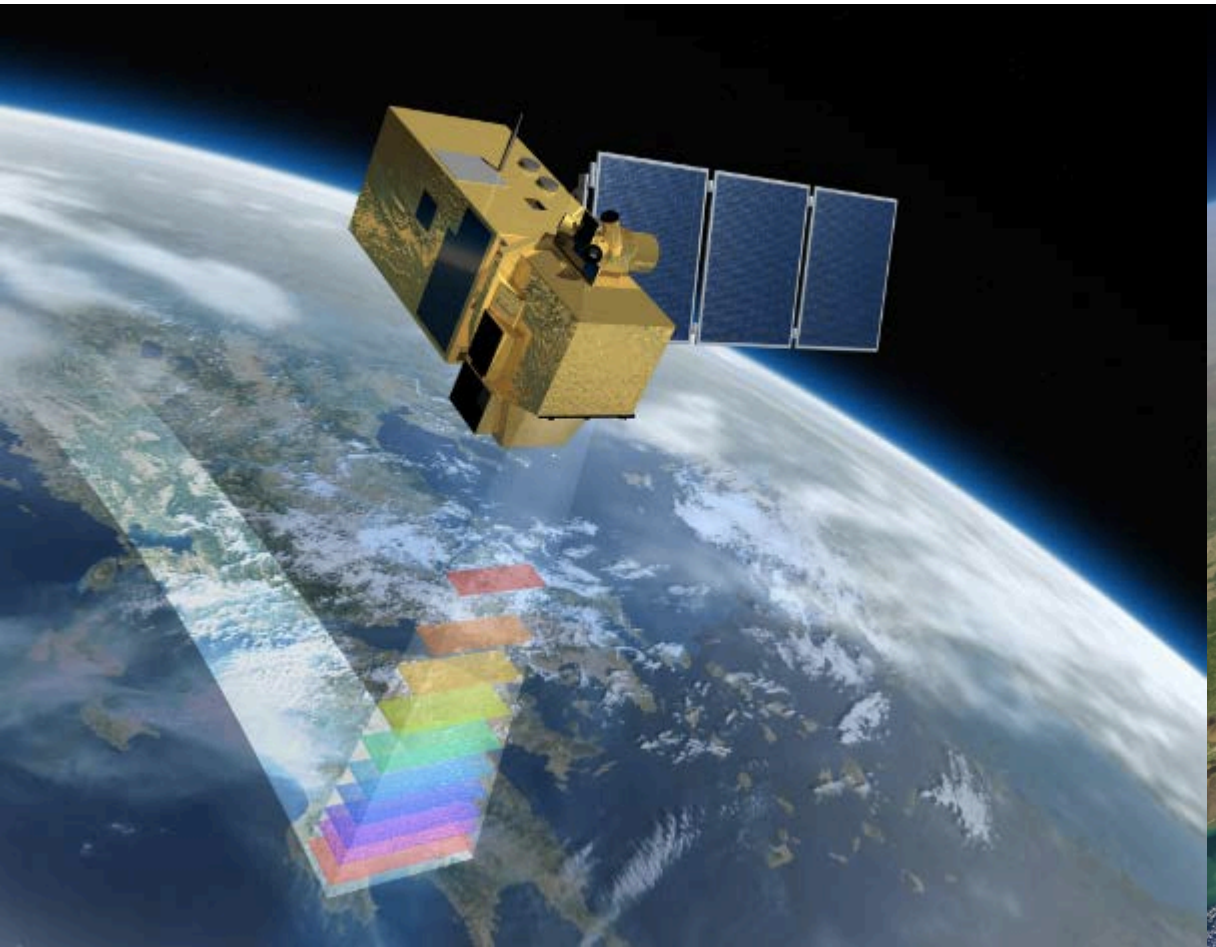
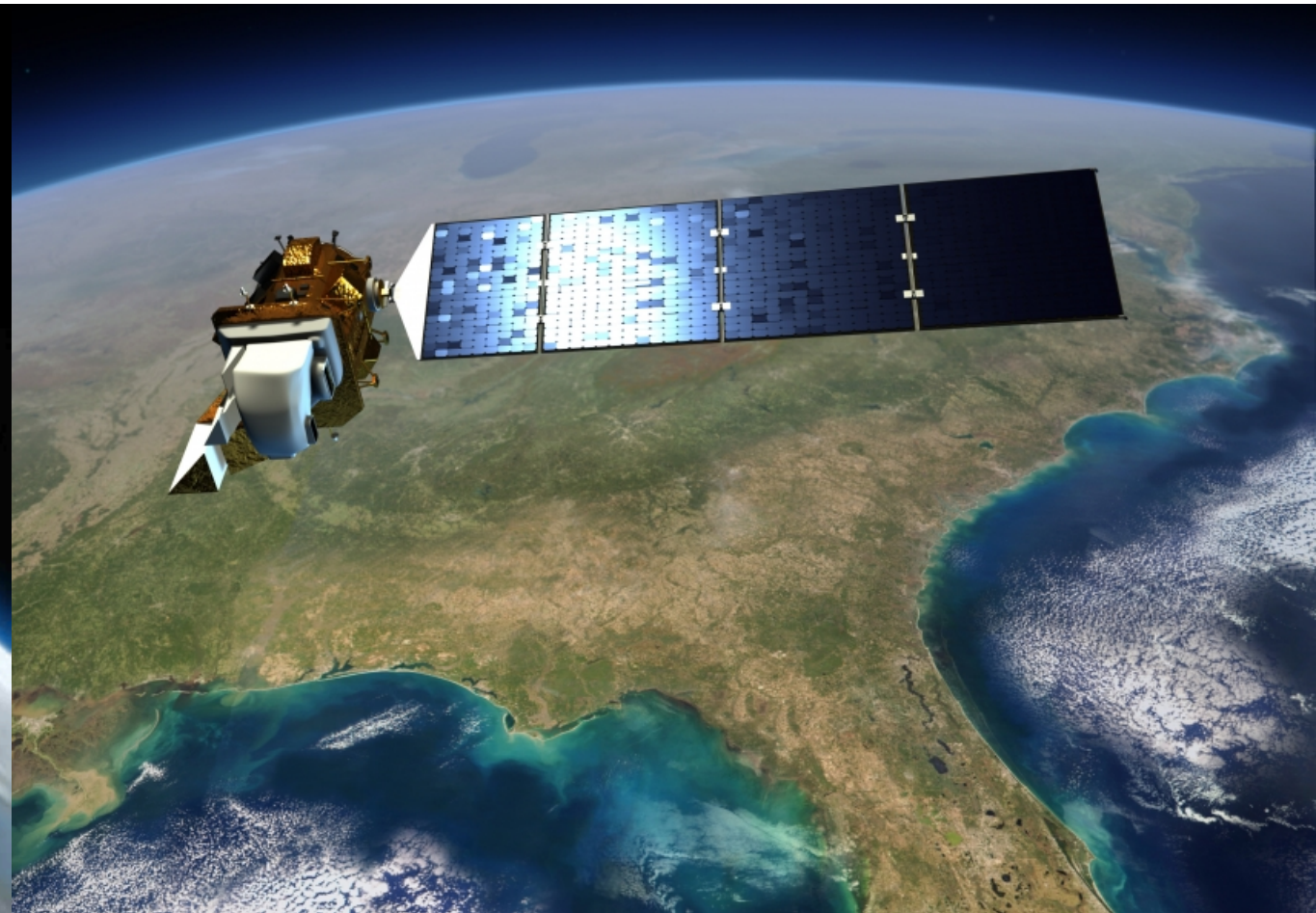
United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

International Initiative on Water Quality

Can Earth Observation fill the global water quality data gap for the SDGs monitoring?





UNESCO International Initiative on Water Quality (IIWQ)

Activities on water quality monitoring

UNESCO-IHP International Initiative on Water Quality

UNESCO World Water Quality Portal

- **A demonstration project on water quality monitoring, using Earth Observation** under the *International Initiative on Water Quality (IIWQ)* of UNESCO-IHP
- **Aims at improving global water quality information**, focusing on inland freshwater resources
  - ➢ A valuable tool to obtain water quality data and information, especially in remote areas and developing countries (Africa, Asia, Latin America, and SIDS) where water quality monitoring networks and laboratory capacity are lacking
- **Promotes the use using innovative scientific approaches and technologies** for better water management
  - ➢ Demonstrates the capabilities and use of Earth Observation (satellite-based data) for monitoring water quality in inland freshwaters
- **Supports the implementation and monitoring of the SDGS** at the global, regional, national and local levels.

UNESCO-IHP International Initiative on Water Quality

UNESCO World Water Quality Portal

www.worldwaterquality.org

Water quality parameters

- Turbidity (sedimentation)
- *Chlorophyll-a*
- HAB indicator
- Total absorption
- Surface temperature

- **Global layer** (90-meter/mixed resolution)
- **Regional layers/demonstration basins** (30-meter resolution):
  - Lake Sevan in the Caucasus highlands - *Armenia, Azerbaijan*
  - Itaipu and Parana River Basins - *Argentina, Brazil, Paraguay*
  - The Mecklenburg Lake Plateau - *Germany*
  - River Nile and Aswan Reservoir - *Egypt, Sudan*
  - The Mekong Delta - *Vietnam*
  - Florida Lakes - *USA*
  - Zambezi River - *Zambia, Zimbabwe*

in partnership with EOMAP

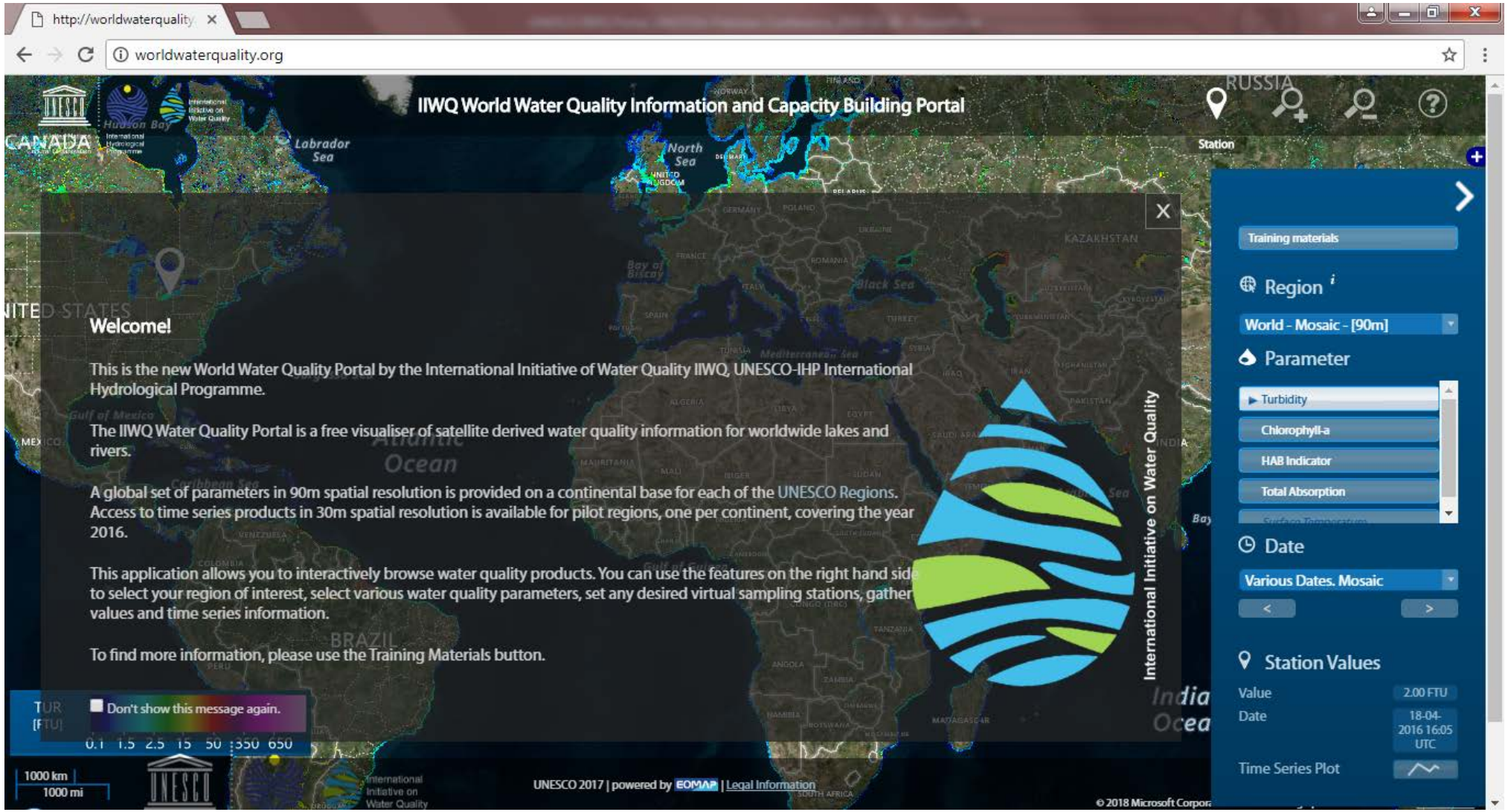
United Nations Educational, Scientific and Cultural Organization · International Hydrological Programme

International Initiative on Water Quality

UNESCO-IHP International Initiative on Water Quality

UNESCO World Water Quality Portal

www.worldwaterquality.org



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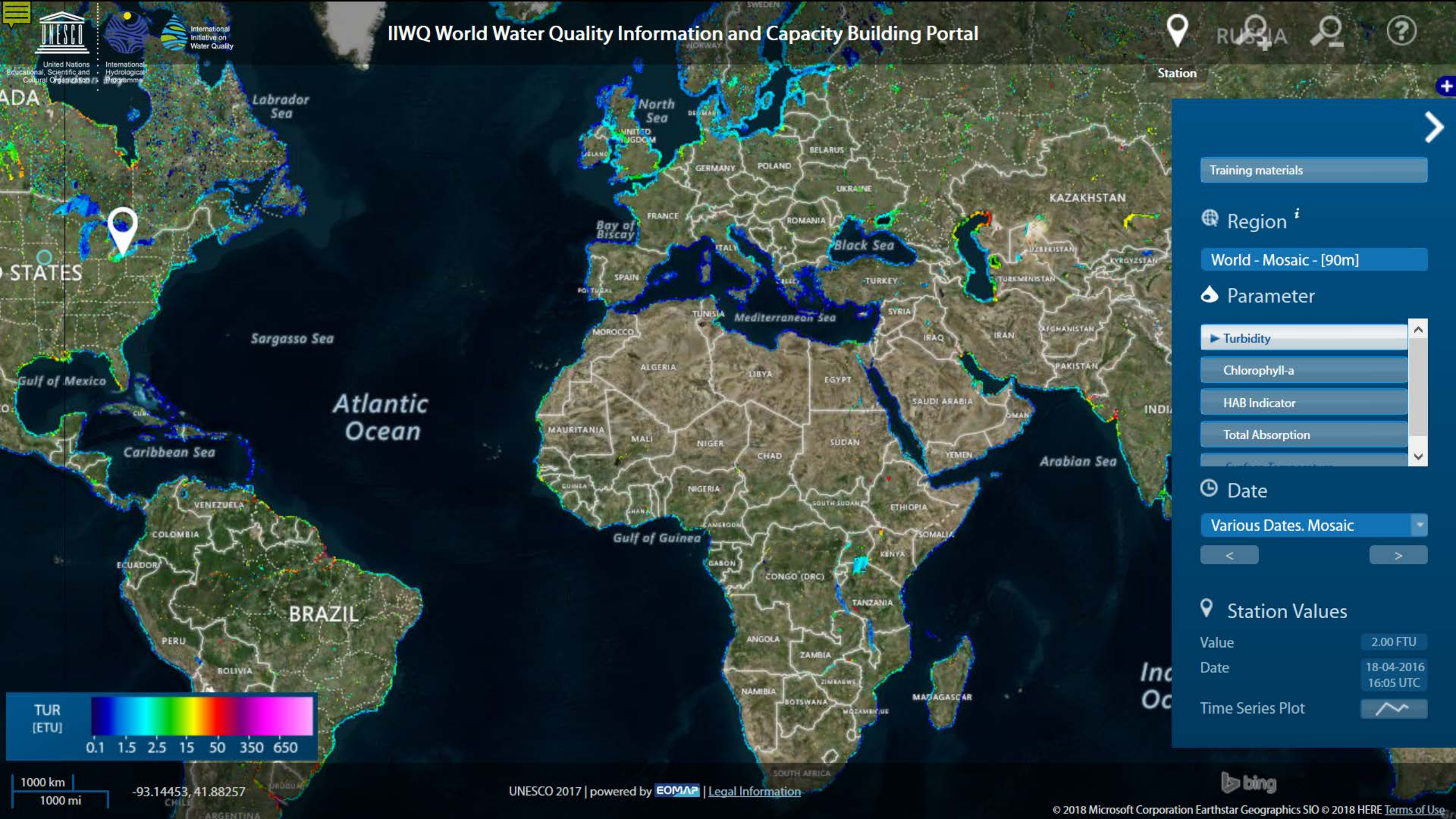
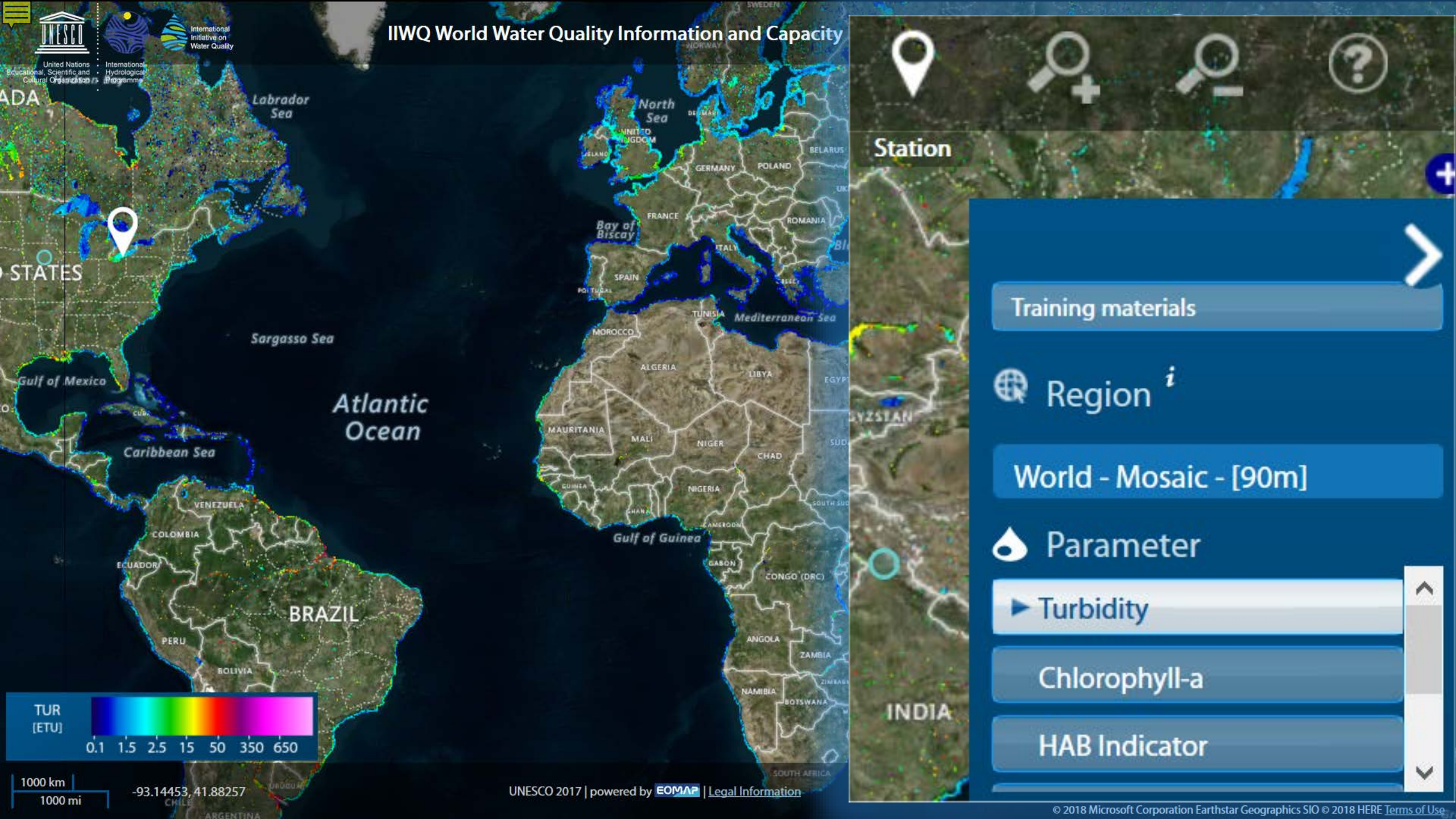

IIWQ World Water Quality Information and Capacity Building Portal
United Nations Educational, Scientific and Cultural Organization
International Hydrological Programme
International Initiative on Water Quality
Station
Training materials
Region
World - Mosaic - [90m]
Parameter
Turbidity
Chlorophyll-a
HAB Indicator
Total Absorption
Date
Various Dates. Mosaic
Station Values
Value 2.00 FTU
Date 18-04-2016 16:05 UTC
Time Series Plot
TUR [ETU]
0.1 1.5 2.5 15 50 350 650
1000 km
1000 mi
-93.14453, 41.88257
UNESCO 2017 | powered by EOMAP | Legal Information
© 2018 Microsoft Corporation Earthstar Geographics SIO © 2018 HERE Terms of Use
Atlantic Ocean
Mediterranean Sea
Black Sea
Caribbean Sea
Gulf of Mexico
Sargasso Sea
Gulf of Guinea
Arabian Sea
Bay of Biscay
North Sea
Labrador Sea
BRAZIL
KAZAKHSTAN


IIWQ World Water Quality Information and Capacity
United Nations Educational, Scientific and Cultural Organization
International Hydrological Programme
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Region
World - Mosaic - [90m]
Parameter
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1000 km
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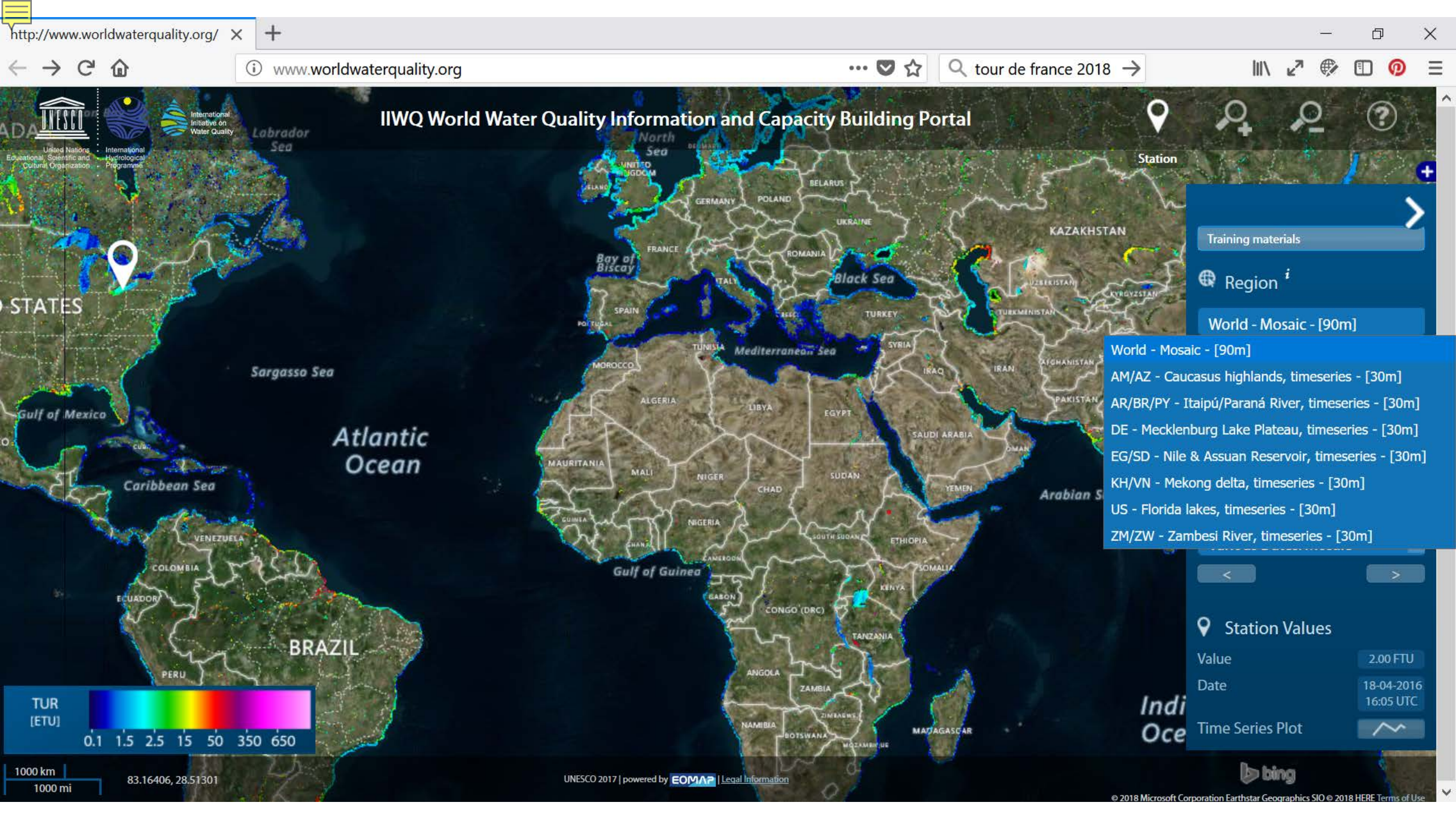
Labrador Sea
North Sea
Bay of Biscay
Sargasso Sea
Gulf of Mexico
Atlantic Ocean
Caribbean Sea
Mediterranean Sea
Gulf of Guinea
BRAZIL
INDIA
STATES
FRANCE
SPAIN
GERMANY
POLAND
ROMANIA
ITALY
MOROCCO
ALGERIA
LIBYA
TUNISIA
MAURITANIA
MALI
NIGER
CHAD
NIGERIA
VENEZUELA
COLOMBIA
ECUADOR
PERU
BOLIVIA
ANGOLA
ZAMBIA
NAMIBIA
BOTSWANA
SOUTH AFRICA
CONGO (DRC)
GABON


http://www.worldwaterquality.org/
www.worldwaterquality.org
tour de france 2018
IIWQ World Water Quality Information and Capacity Building Portal
United Nations Educational, Scientific and Cultural Organization
International Hydrological Programme
International Initiative on Water Quality
Station
Training materials
Region
World - Mosaic - [90m]
World - Mosaic - [90m]
AM/AZ - Caucasus highlands, timeseries - [30m]
AR/BR/PY - Itaipú/Paraná River, timeseries - [30m]
DE - Mecklenburg Lake Plateau, timeseries - [30m]
EG/SD - Nile & Assuan Reservoir, timeseries - [30m]
KH/VN - Mekong delta, timeseries - [30m]
US - Florida lakes, timeseries - [30m]
ZM/ZW - Zambesi River, timeseries - [30m]
Station Values
Value
2.00 FTU
Date
18-04-2016 16:05 UTC
Time Series Plot
Atlantic Ocean
Sargasso Sea
Gulf of Mexico
Caribbean Sea
Bay of Biscay
Black Sea
Mediterranean Sea
Gulf of Guinea
Arabian Sea
North Sea
Labrador Sea
BRAZIL
KAZAKHSTAN
TUR [ETU]
0.1 1.5 2.5 15 50 350 650
1000 km
1000 mi
83.16406, 28.51301
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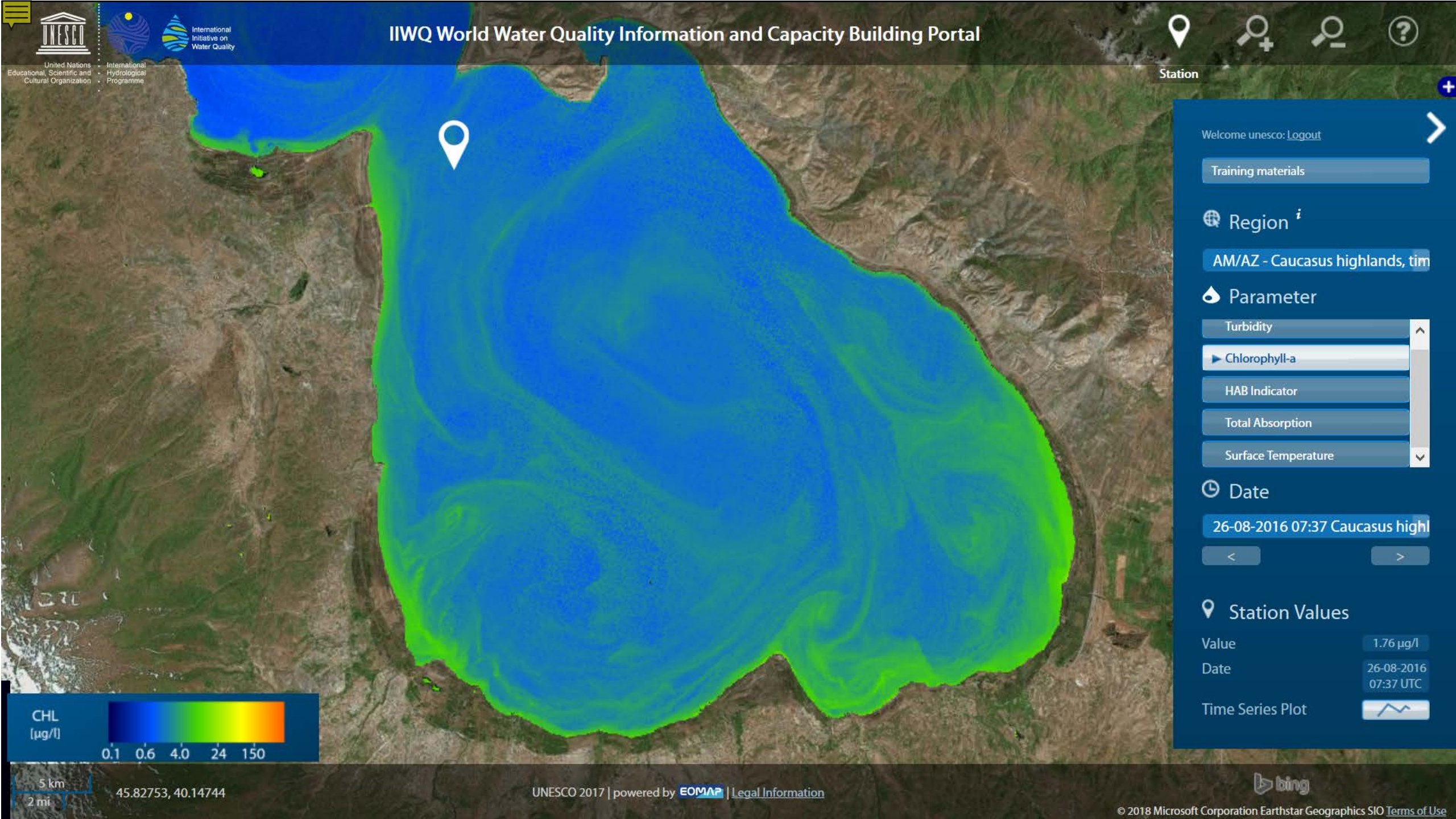
United Nations Educational, Scientific and Cultural Organization
International Hydrological Programme
International Initiative on Water Quality
IIWQ World Water Quality Information and Capacity Building Portal
Station
Welcome unesco: Logout
Training materials
Region
AM/AZ - Caucasus highlands, tim
Parameter
Turbidity
Chlorophyll-a
HAB Indicator
Total Absorption
Surface Temperature
Date
26-08-2016 07:37 Caucasus highl
<
>
Station Values
Value
1.76 µg/l
Date
26-08-2016 07:37 UTC
Time Series Plot
CHL [µg/l]
0.1 0.6 4.0 24 150
5 km
2 mi
45.82753, 40.14744
UNESCO 2017 | powered by EOMAP | Legal Information
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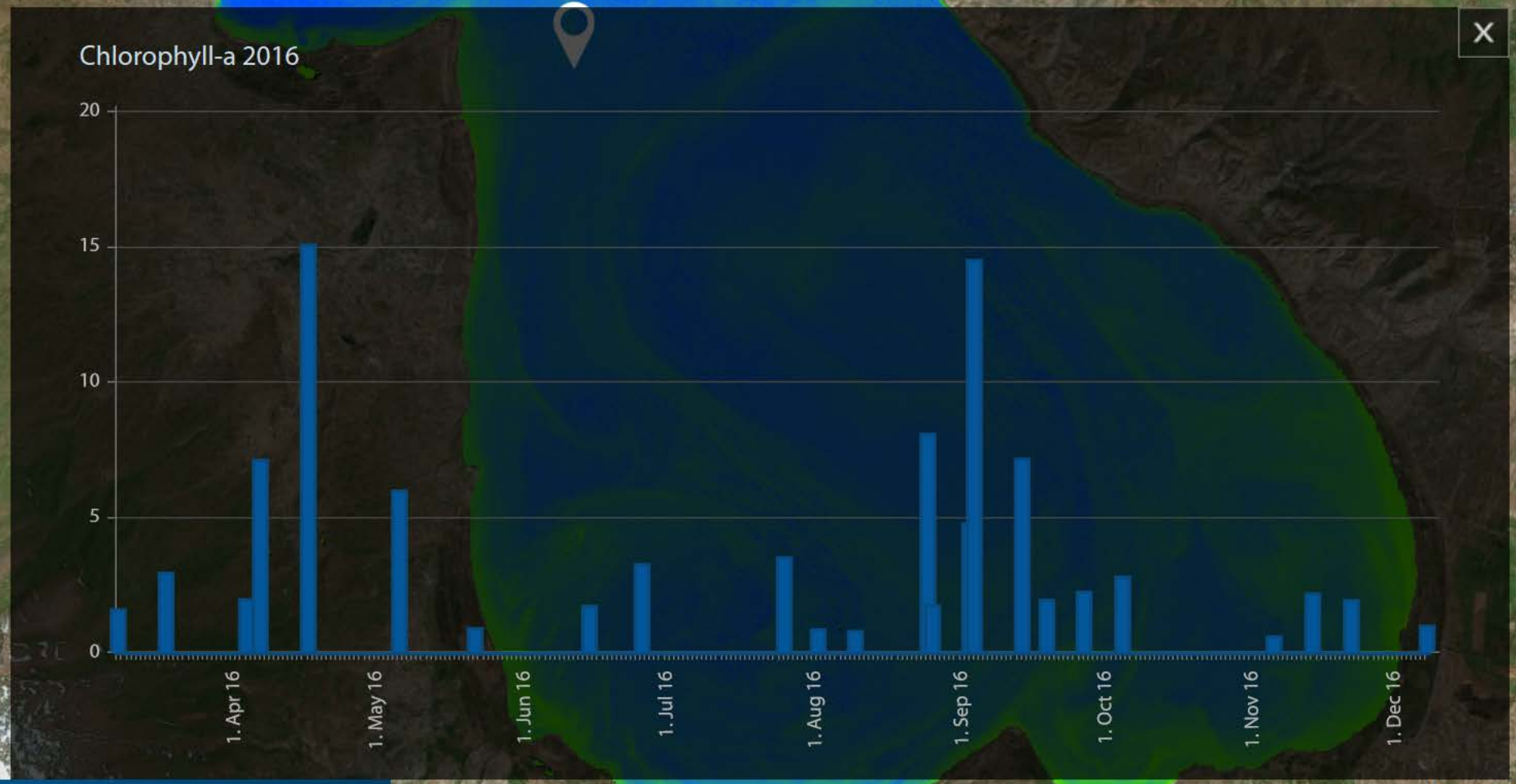
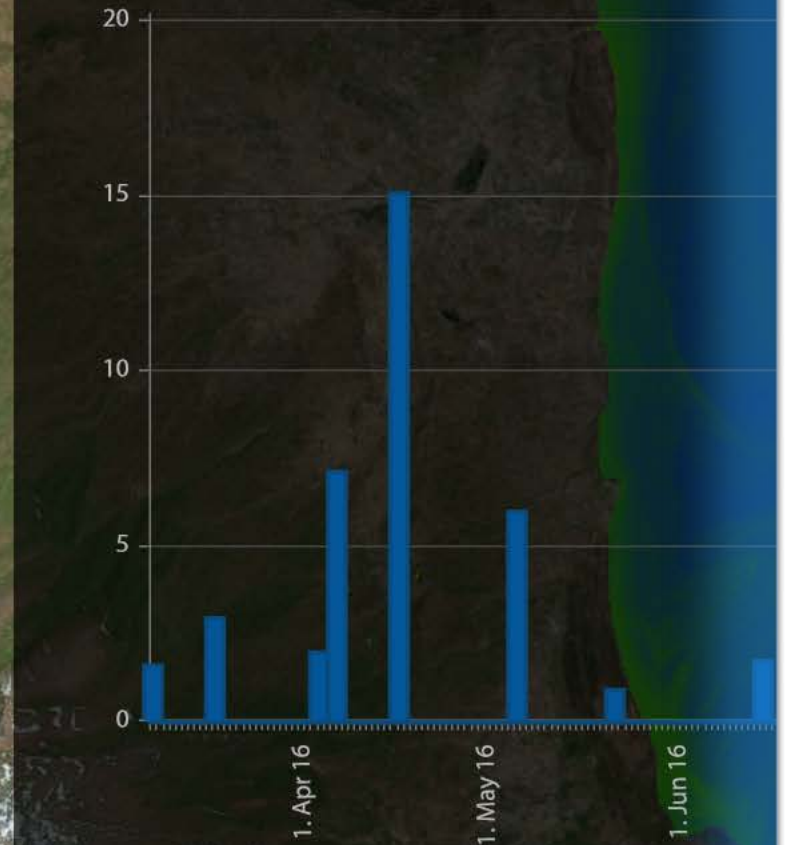


Welcome unesco: Logout
Training materials
Region
AM/AZ - Caucasus highlands, tim
Parameter
Turbidity
Chlorophyll-a
HAB Indicator
Total Absorption
Surface Temperature
Date
26-08-2016 07:37 Caucasus highl
< >
Station Values
Value 1.76 µg/l
Date 26-08-2016 07:37 UTC
Time Series Plot
Click here to generate a time series plot.
Report

CHL [µg/l]
0.1 0.6 4.0 24 150

5 km
2 mi
45.80624, 40.14691



WATER QUALITY REPORT

Generated at: 2018-01-21 Time 17:41:40
Parameter: Chlorophyll-a
Unit: µg/l
Product: eoWater (satellite based)

Region: AM/AZ - Caucasus highlands, timeseries - [30m]
Station lat/lon: 40.41433 / 45.26688
Year: 2016
Median: 2.24
Mean: 3.97
Minimum value: 0.62
Bottom quintile: 1.38
Top quintile: 6.46
Maximum value: 15.09

Trophic State Index (according to Carlson 1977): Oligotrophic
Oligotrophic: 54.17%
Mesotrophic: 33.33%
Eutrophic: 12.50%

Report

Welcome unesco: Logout

Training materials

Region

AM/AZ - Caucasus highlands, tim

Parameter

Turbidity
Chlorophyll-a
HAB Indicator
Total Absorption
Surface Temperature

Date

26-08-2016 07:37 Caucasus highl

< >

Station Values

Value 1.76 µg/l
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Time Series Plot

Click here to generate a time series plot.

CHL [µg/l]
0.1 0.6 4.0 24 150

5 km
2 mi

45.80624, 40.14691

UNESCO-IHP International Initiative on Water Quality

UNESCO World Water Quality Portal

www.worldwaterquality.org

- A useful tool to assess the interlinkages between the human and natural (ecological) systems.

- Provides information on impacts and pressure on water quality from other sectors:
  - urban areas,
  - agriculture
  - energy sectors (dams and reservoir management)
  - climate change

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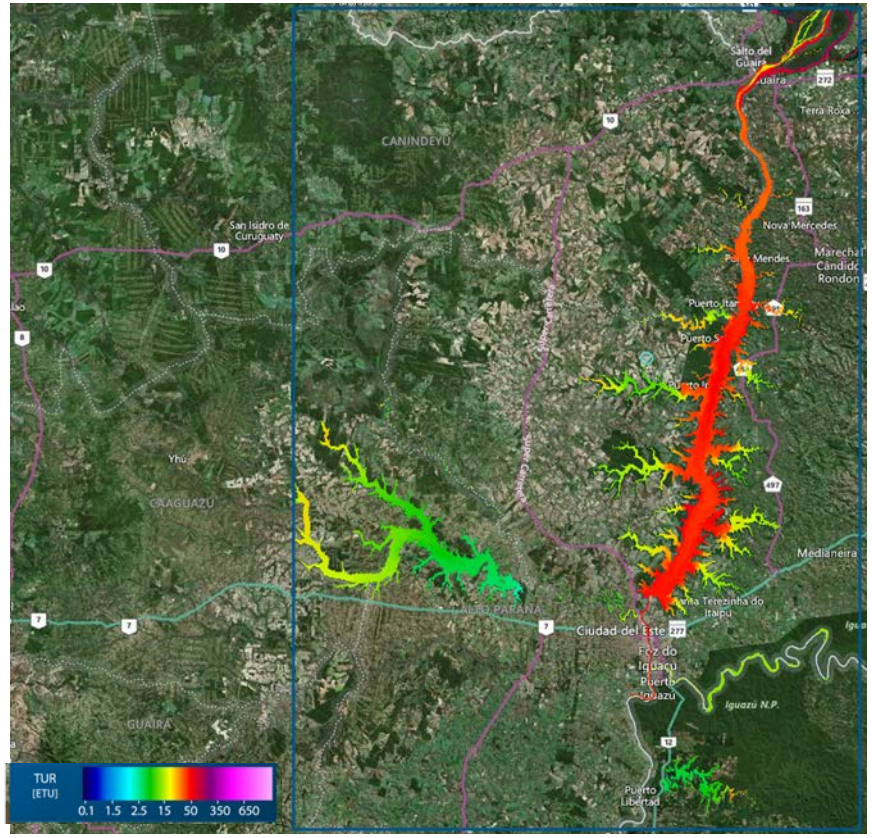

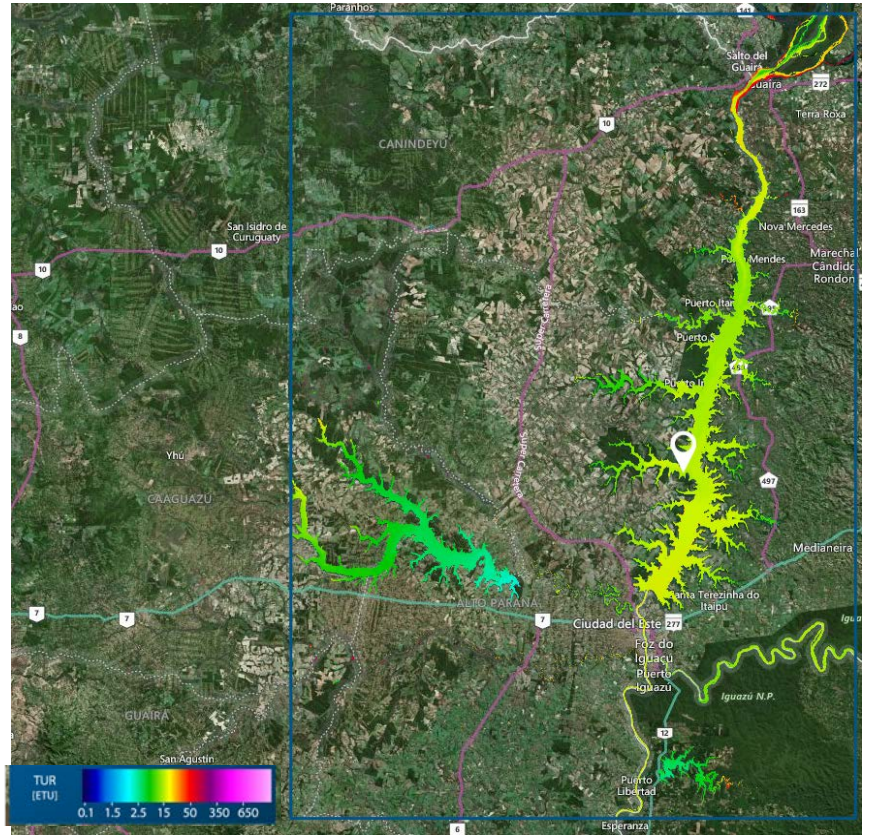

Paraná River Basin: Sedimentation distribution in the Itaipu reservoir zone (08 June & 11 August 2016)

Brazil, Paraguay, and Argentina

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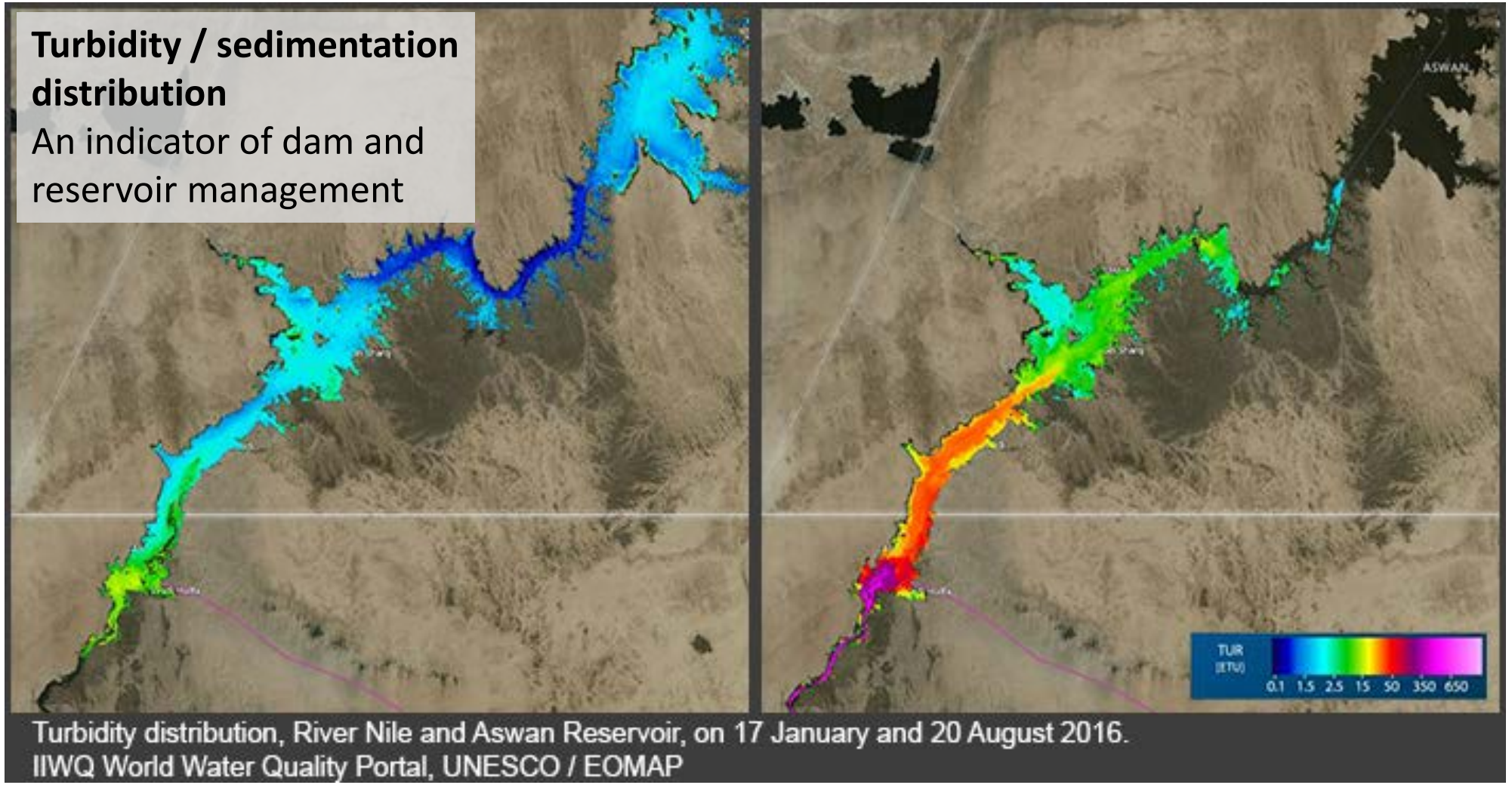
Turbidity / sedimentation distribution

An indicator of dam and reservoir management



Turbidity distribution, River Nile and Aswan Reservoir, on 17 January and 20 August 2016.
IIWQ World Water Quality Portal, UNESCO / EOMAP

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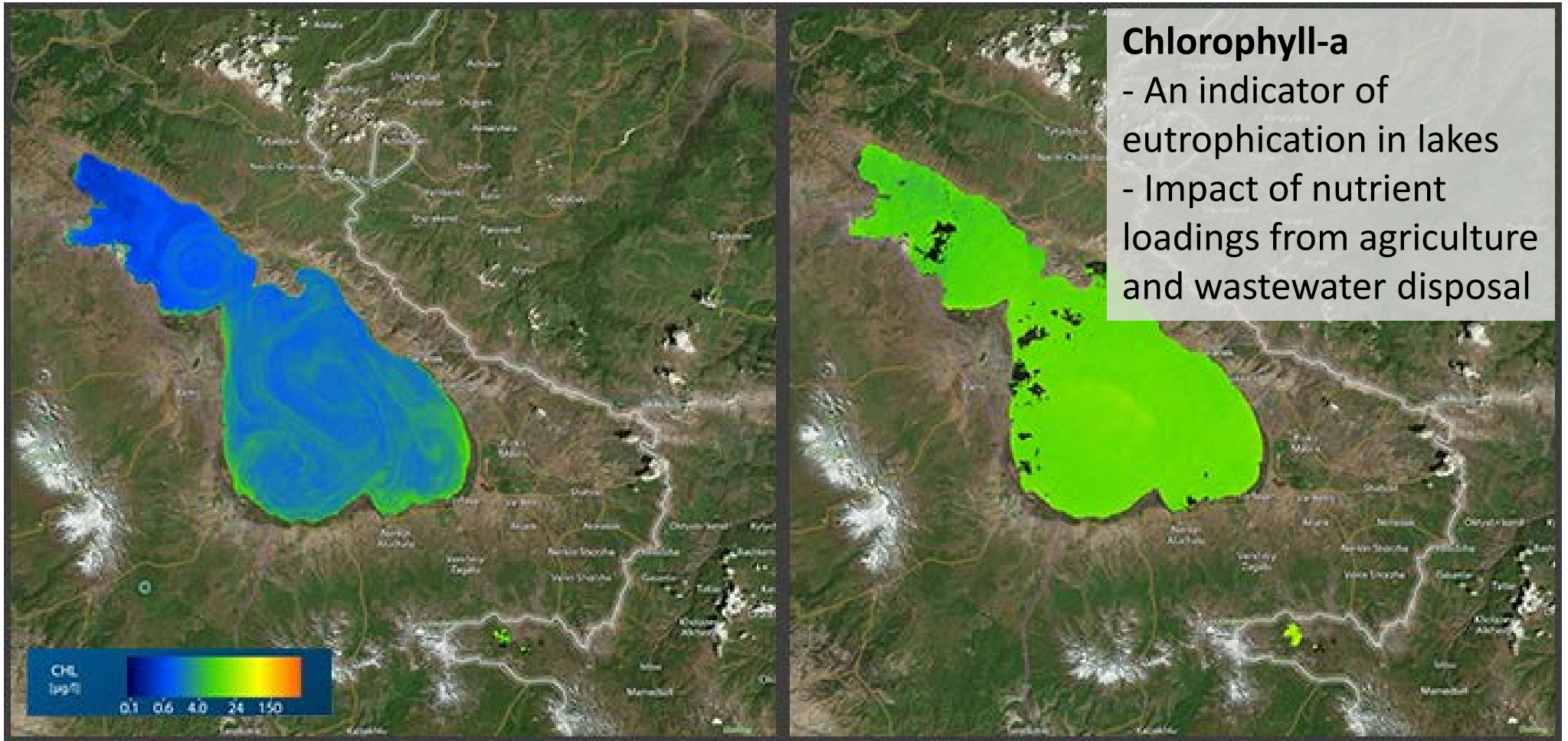

Chlorophyll-a
- An indicator of eutrophication in lakes
- Impact of nutrient loadings from agriculture and wastewater disposal

Chlorophyll-a levels in Lake Sevan on 26 August and 04 September 2016.
IIWQ World Water Quality Portal, UNESCO / EOMAP

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Florida Lakes (USA)

Harmful Algae Bloom (HABs)

- An indicator of antropogenic nutrient enrichment / Eutrophication in surface waters
- Impact of agricultural activities and wastewater discharges on water quality

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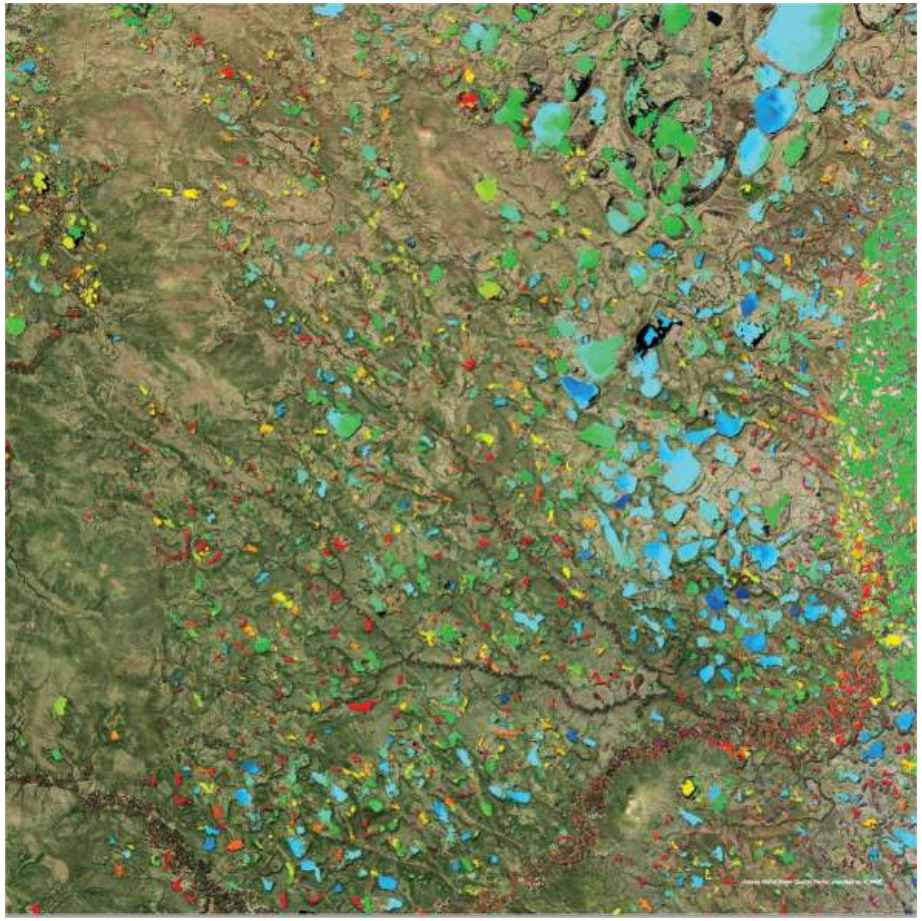


The Sakha Region (Russia)

Dissolved organic substances

- Permafrost melting
- Impact of climate change on water quality

The technology behind the UNESCO IIWQ portal

Satellite sensors: Landsat 8, Sentinel-2

Combined approx. 2 records per week, 10m/20m & 30m resolution

Data processing: MIP - Modular Inversion and Processing System

Fully physics based, sensor generic, globally harmonized measures

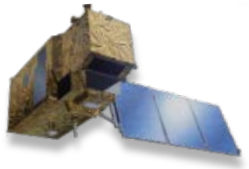
Data portal: Online web application & Geoserver

based on **EOMAP** eoApp web application technology

Satellite sensors used for the UNESCO IIWQ portal (Version 2017)

Landsat 8 (from USGS)

spatial resolution 30m, 2x/month



Sentinel-2 a/b (from ESA)

spatial resolution 10m&20m, 3x/month per sensor

Combined temporal resolution Landsat 7&8, Sentinel 2a&b:

10x/month

Sensors used for the IIWQ portal: Landsat 8, Sentinel-2

Temporal resolution

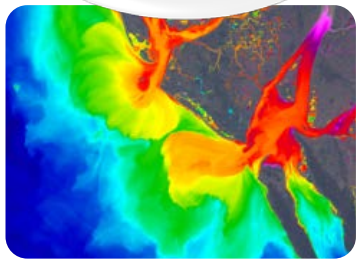
Daily

Weekly

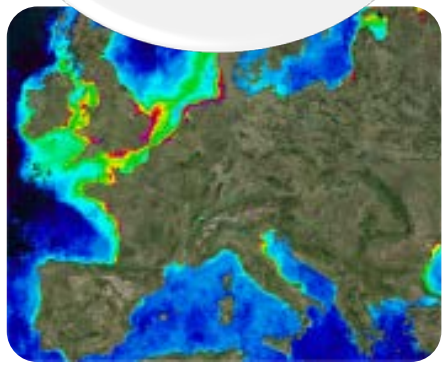
Monthly

PlanetLabs Doves
WorldView-2,3
Pleiades,
KOMPSAT
RapidEye,
SPOT…

Landsat 5, 7 & 8
Sentinel 2 a/b



Sentinel 3,
MODIS Aqua & Terra
MERIS†2012



2 m

30 m

300 m

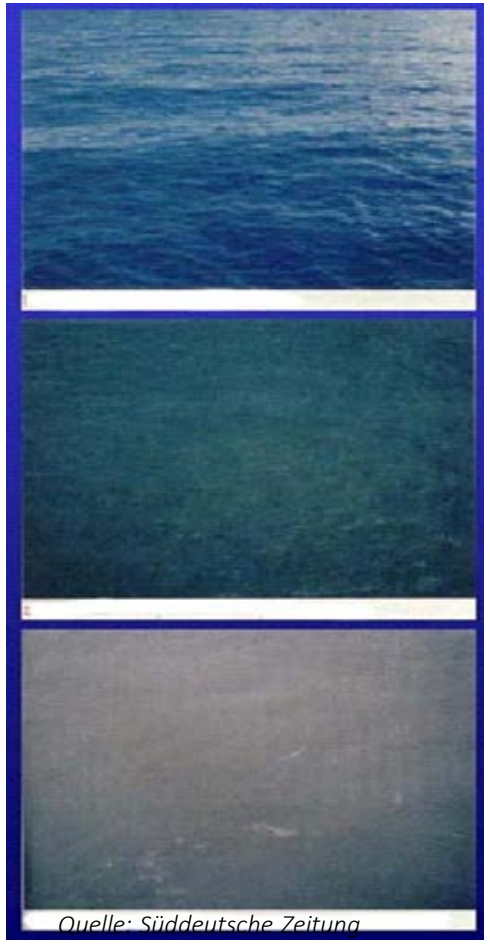
Spatial resolution

EOMAP

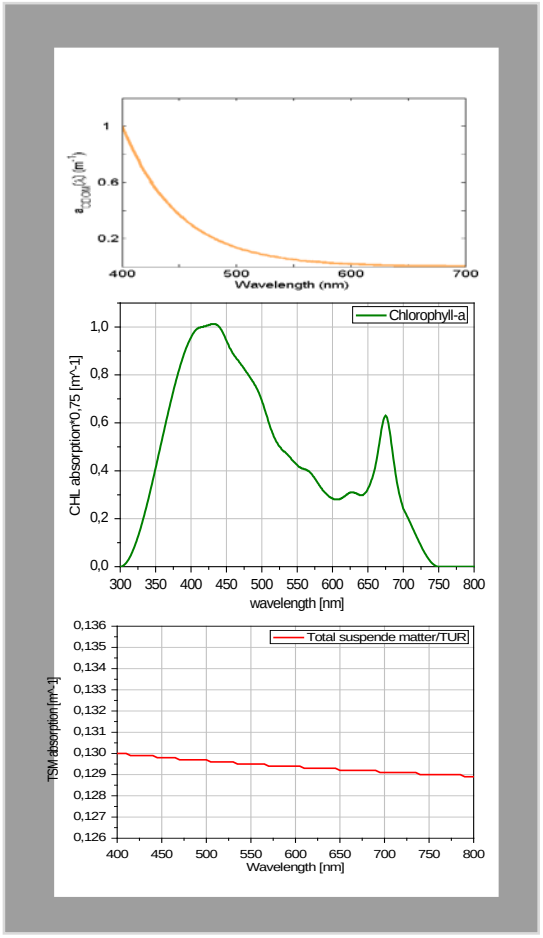
EO derived water quality properties

- *Reference properties: Spectral absorption and scattering coefficients*
- *Interface to establishe hydro-biological measurements*

water color « absorption and scattering « water constituents



Quelle: Süddeutsche Zeitung



turbidity

- TSM, Secchi depth, k …

organic-/anorg. absorption

- CDOM , organic/anorganic

pigment absorption

- Chlorophyll a

specific pigment indicators

- Blue algae indicator

  harmfull algae bloom HAB

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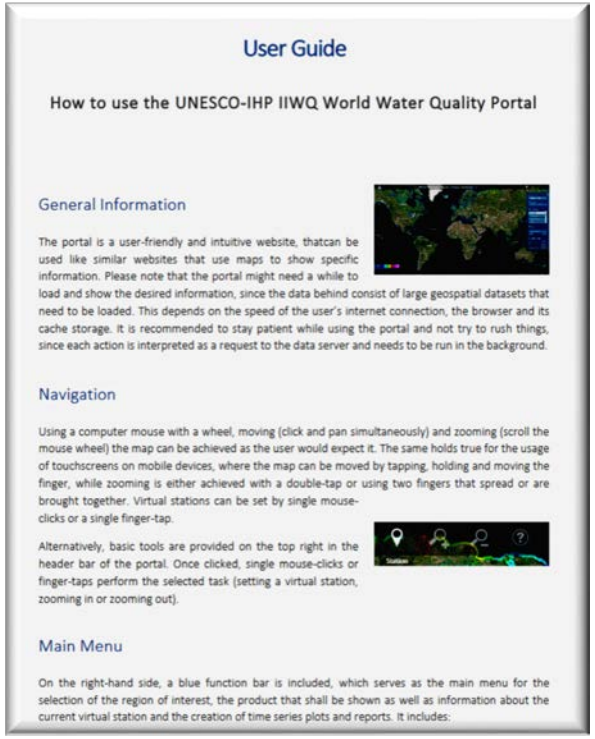
Capacity building and training on monitoring water quality using Earth Observation



User Guide

How to use the UNESCO-IHP IIWQ World Water Quality Portal

General Information

The portal is a user-friendly and intuitive website, thatcan be used like similar websites that use maps to show specific information. Please note that the portal might need a while to load and show the desired information, since the data behind consist of large geospatial datasets that need to be loaded. This depends on the speed of the user's internet connection, the browser and its cache storage. It is recommended to stay patient while using the portal and not try to rush things, since each action is interpreted as a request to the data server and needs to be run in the background.

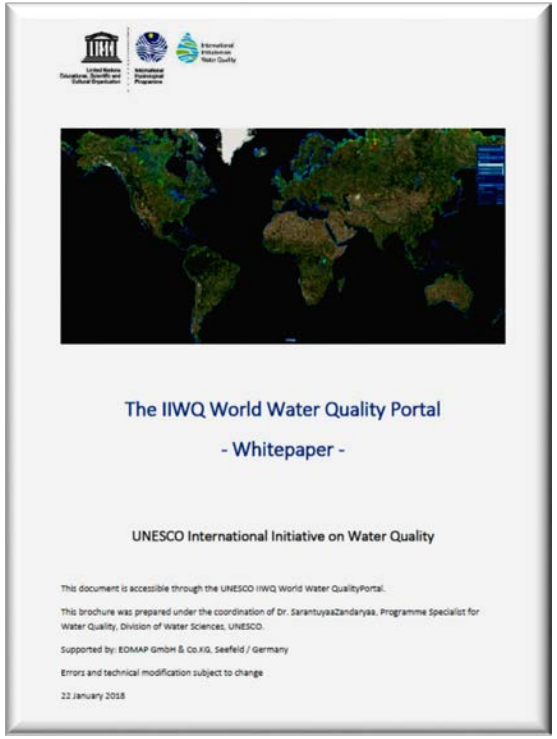
Navigation

Using a computer mouse with a wheel, moving (click and pan simultaneously) and zooming (scroll the mouse wheel) the map can be achieved as the user would expect it. The same holds true for the usage of touchscreens on mobile devices, where the map can be moved by tapping, holding and moving the finger, while zooming is either achieved with a double-tap or using two fingers that spread or are brought together. Virtual stations can be set by single mouse-clicks or a single finger-tap.

Alternatively, basic tools are provided on the top right in the header bar of the portal. Once clicked, single mouse-clicks or finger-taps perform the selected task (setting a virtual station, zooming in or zooming out).

Main Menu

On the right-hand side, a blue function bar is included, which serves as the main menu for the selection of the region of interest, the product that shall be shown as well as information about the current virtual station and the creation of time series plots and reports. It includes:



The IIWQ World Water Quality Portal

- Whitepaper -

UNESCO International Initiative on Water Quality

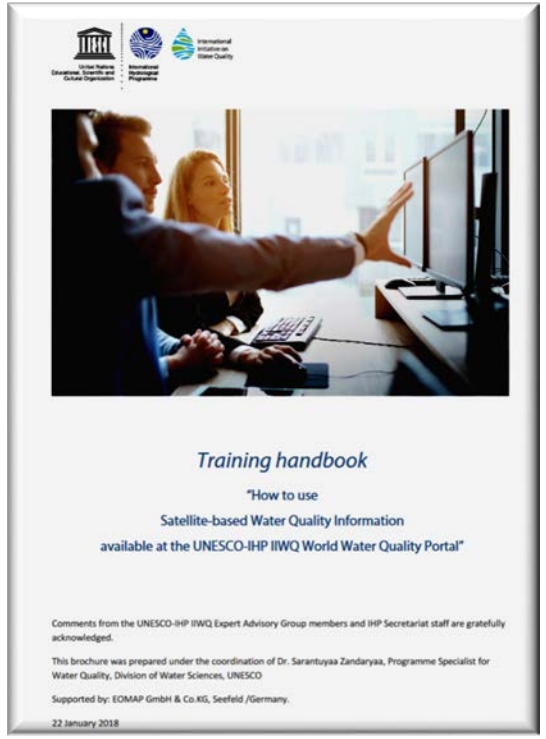
This document is accessible through the UNESCO IIWQ World Water QualityPortal.

This brochure was prepared under the coordination of Dr. SarantuyaaZandaryaa, Programme Specialist for Water Quality, Division of Water Sciences, UNESCO.

Supported by: EOMAP GmbH & Co.KG, Seefeld / Germany

Errors and technical modification subject to change

22 January 2018



Training handbook

"How to use

Satellite-based Water Quality Information

available at the UNESCO-IHP IIWQ World Water Quality Portal"

Comments from the UNESCO-IHP IIWQ Expert Advisory Group members and IHP Secretariat staff are gratefully acknowledged.

This brochure was prepared under the coordination of Dr. Sarantuyaa Zandaryaa, Programme Specialist for Water Quality, Division of Water Sciences, UNESCO

Supported by: EOMAP GmbH & Co.KG, Seefeld /Germany.

22 January 2018

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International Initiative on Water Quality

UNESCO-IHP International Initiative on Water Quality

UNESCO World Water Quality Portal

Supporting the SDGs monitoring and implementation

Targets	Indicators
6 CLEAN WATER AND SANITATION 6.3: **Improve water quality by reducing pollution**, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.2: Proportion of bodies of water with good ambient water quality
6.6: **Protect and restore water-related ecosystems**, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1: Change in the extent of water-related ecosystems over time • spatial extent • quantity of water • state if ecosystem health (water quality)
14 LIFE BELOW WATER **14.1: Prevent and significantly reduce marine pollution** of all kinds, in particular from land-based activities, including marine debris and **nutrient pollution**	14.1.1: Index of **coastal eutrophication** and floating plastic debris density

United Nations Educational, Scientific and Cultural Organization · International Hydrological Programme

International Initiative on Water Quality

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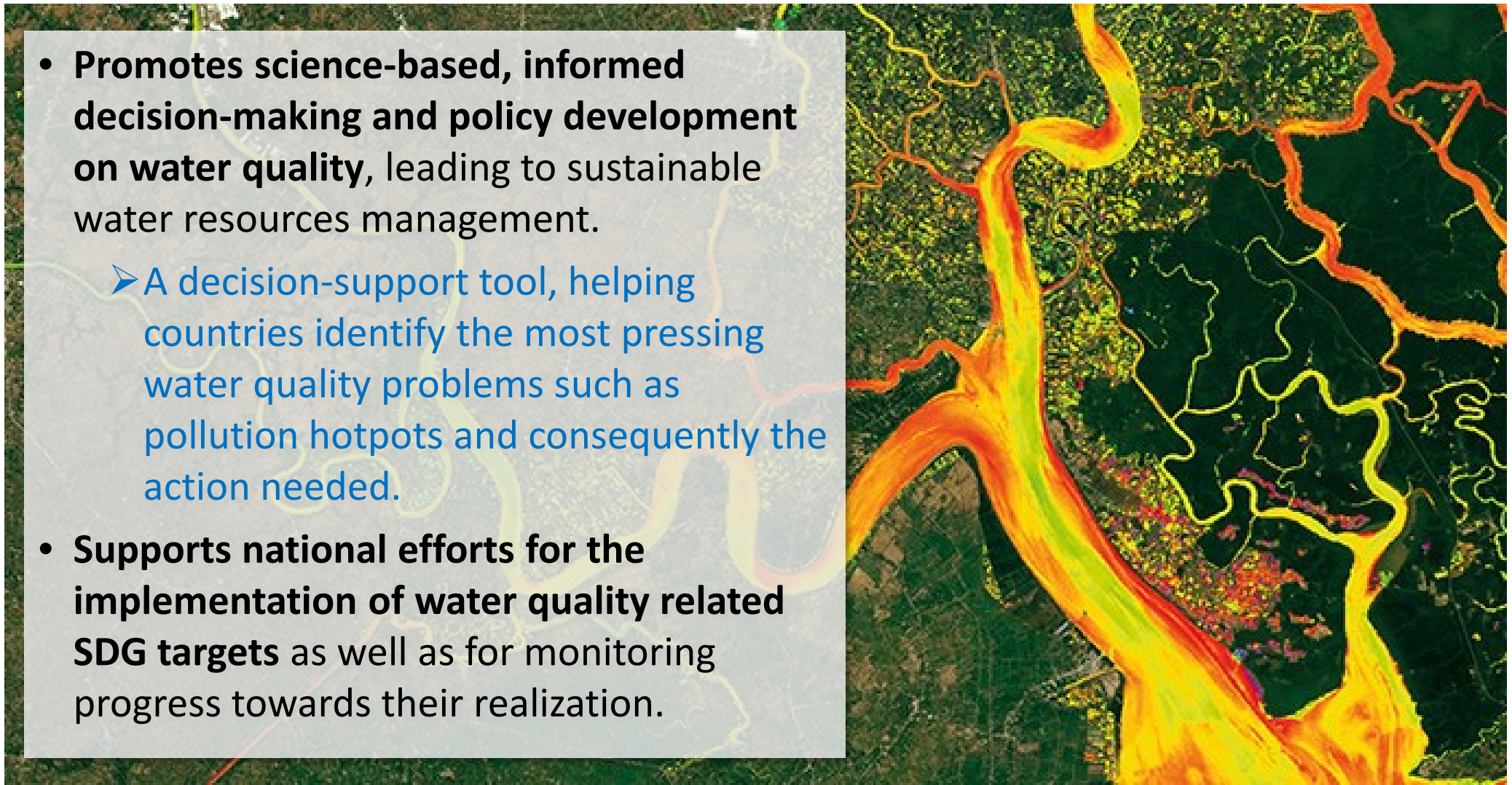
UNESCO World Water Quality Portal:

Supporting science-based decision-making

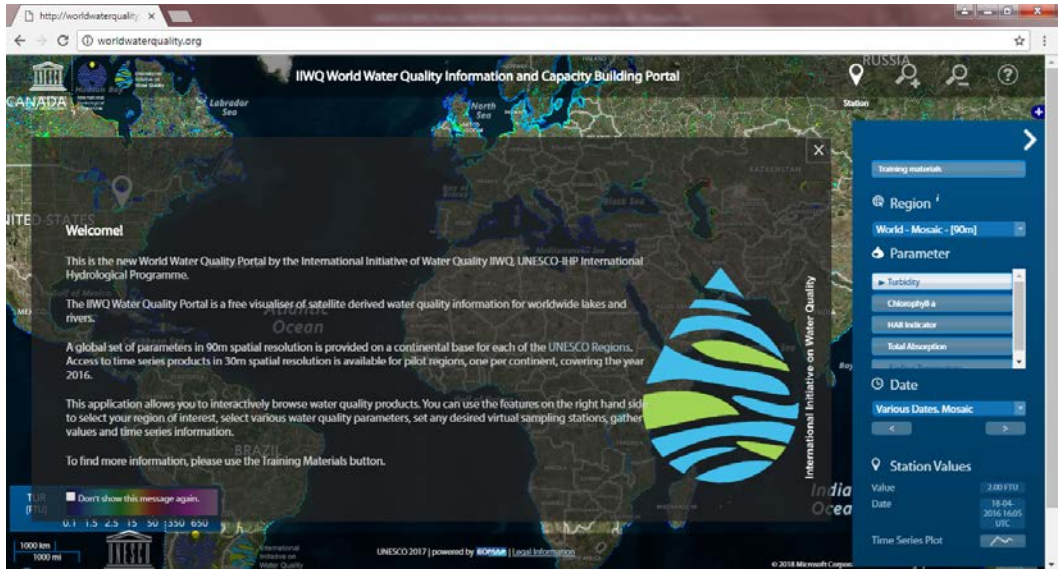


- **Promotes science-based, informed decision-making and policy development on water quality**, leading to sustainable water resources management.
  - A decision-support tool, helping countries identify the most pressing water quality problems such as pollution hotpots and consequently the action needed.
- **Supports national efforts for the implementation of water quality related SDG targets** as well as for monitoring progress towards their realization.

For more information

UNESCO World Water Quality Portal

www.worldwaterquality.org



UNESCO International Initiative on Water Quality

http://en.unesco.org/waterquality-IIWQ

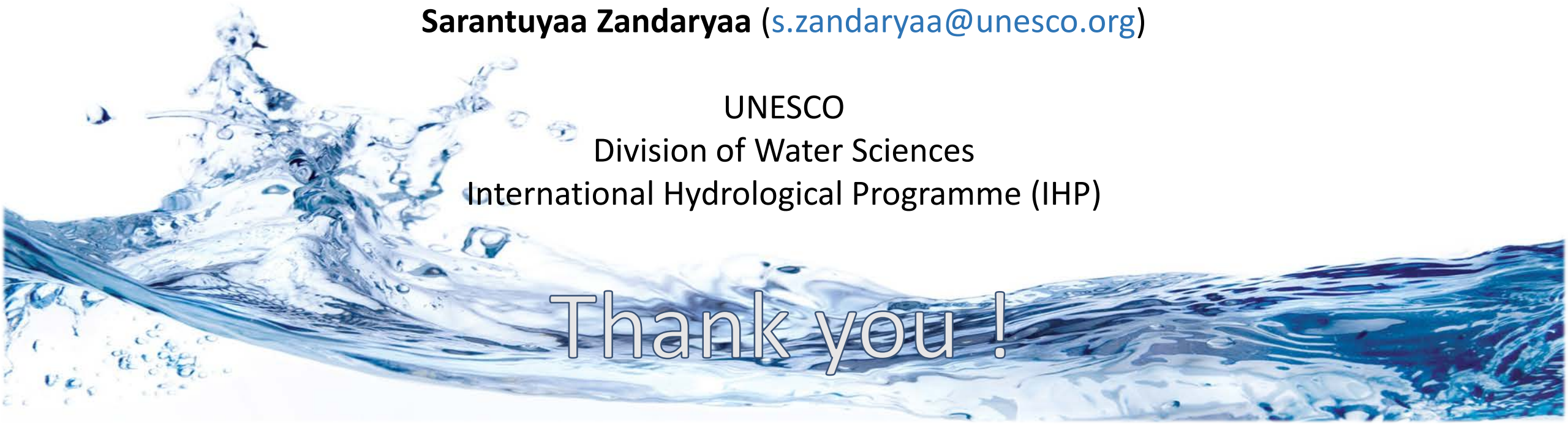
United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

International Initiative on Water Quality (IIWQ)

Sarantuyaa Zandaryaa (s.zandaryaa@unesco.org)

UNESCO
Division of Water Sciences
International Hydrological Programme (IHP)



Thank you !