



## WORKSHOP

Ocean Observation and  
Prediction for Coastal  
Sustainability in Africa



4 - 7 March 2024  
UNEP HQ, Nairobi, Kenya



**MERCATOR  
OCEAN**  
INTERNATIONAL

# Ocean Observation and Prediction for Coastal Sustainability in Africa

Copernicus Marine Service & Digital Twin Ocean (EDITO)

Nairobi, March 4-7, 2024

Mercator Ocean International is an ocean monitoring leader

Implementing the **Copernicus Marine Service**



EDITO: the European Digital Twin of the Ocean



European Digital Twin Ocean



European Digital Twin Ocean



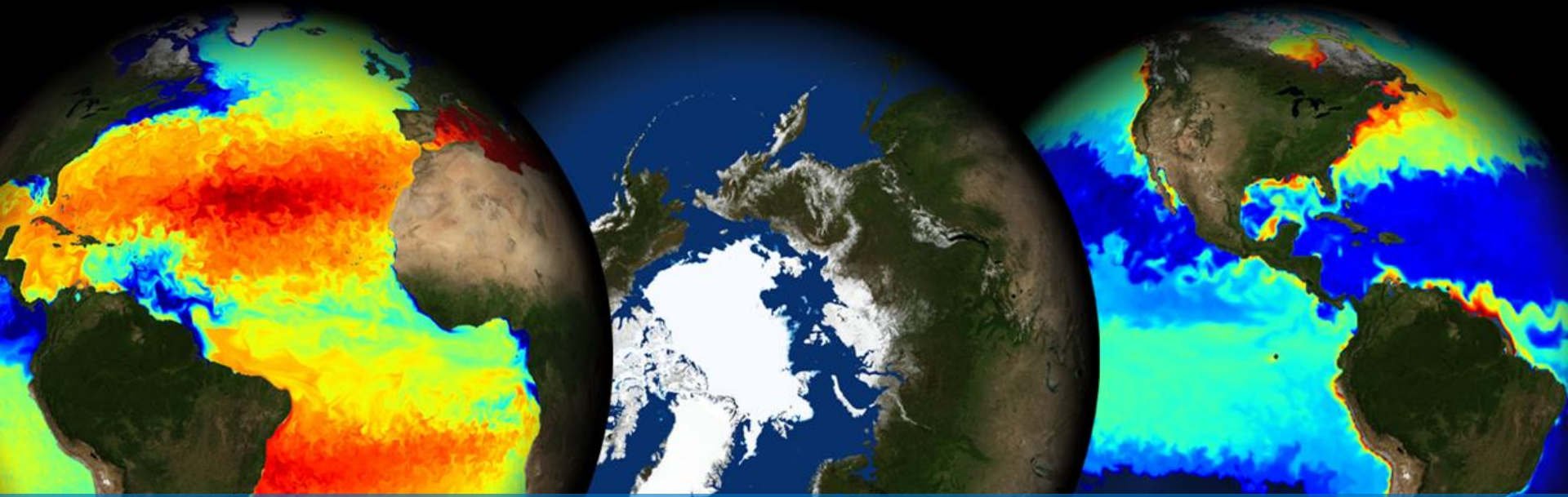
Ocean Prediction DCC, connecting the world around ocean forecasting



Coordinating **EU4OceanObs** with support of European Research Executive Agency, EC DGs: RTD, MARE, DEFIS, INTPA



# « The Ocean », according to [marine.copernicus.eu](http://marine.copernicus.eu)



Satellite, in situ observations and 3D models for Essential Ocean Variables, translated by experts into verified data, indicators, reports and training sessions, seen by 985,000 users worldwide/year, and integrated as regular information by more than 65 000 subscribers.



PROGRAMME OF  
THE EUROPEAN UNION



implemented by



MERCATOR  
OCEAN  
INTERNATIONAL







## Copernicus Marine Service

Providing free and open marine data and services to enable marine policy implementation, support Blue growth and scientific innovation.

Access Data >

DATA	EXPERTISE	TRENDS	EXPLORATION
<p><b>OCEAN PRODUCTS</b></p> <p>A robust ocean data catalogue, to download or visualise data including hindcasts, nowcasts and forecasts.</p>	<p><b>OCEAN STATE REPORT</b></p> <p>Extensive annual analysis on the state of the ocean over nearly 20 years and severe/notable annual events.</p>	<p><b>OCEAN CLIMATE TRENDS</b></p> <p>Monitoring the health of the ocean.  <a href="#">Ocean Monitoring Indicators</a>  <a href="#">Ocean Climate Portal</a></p>	<p><b>OCEAN VISUALISATION</b></p> <p>Dive into our 4D digital oceans through our 3 visualisation tools for beginner, intermediate and advanced users</p>

### Quick Links

-  **User corner**  
 All the info you need as a new or experienced user. Get trained, get support and more.
-  **Policy tools**  
 Learn about EU and international maritime policies and how the Copernicus Marine Service supports them.
-  **Services**  
 See Copernicus Marine Use Cases, the blue markets we support, and the wide range of free and open support and services we provide.
-  **User learning services**  
 Find all the information you need to harness our service through workshops, trainings and online resources.

Online catalogue  
[marine.copernicus.eu](https://marine.copernicus.eu)

Nearly 300  
scientifically qualified  
products & Ocean  
monitoring indicators

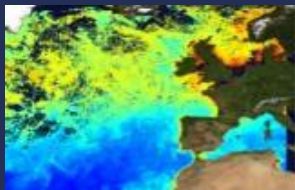
User driven

Common format  
(Netcdf)

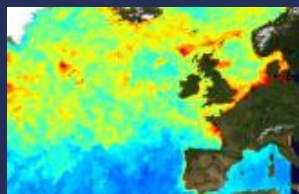
Open and Free

## Satellite observation data

- **L3** – daily composite products, single/multi sensor (Along Track or gridded product)



- **L4** – daily interpolated and weekly/monthly composites



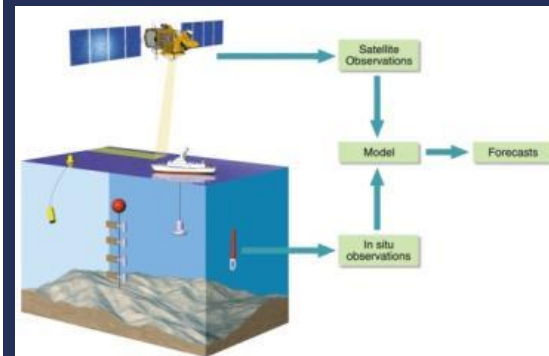
## InSitu observation data

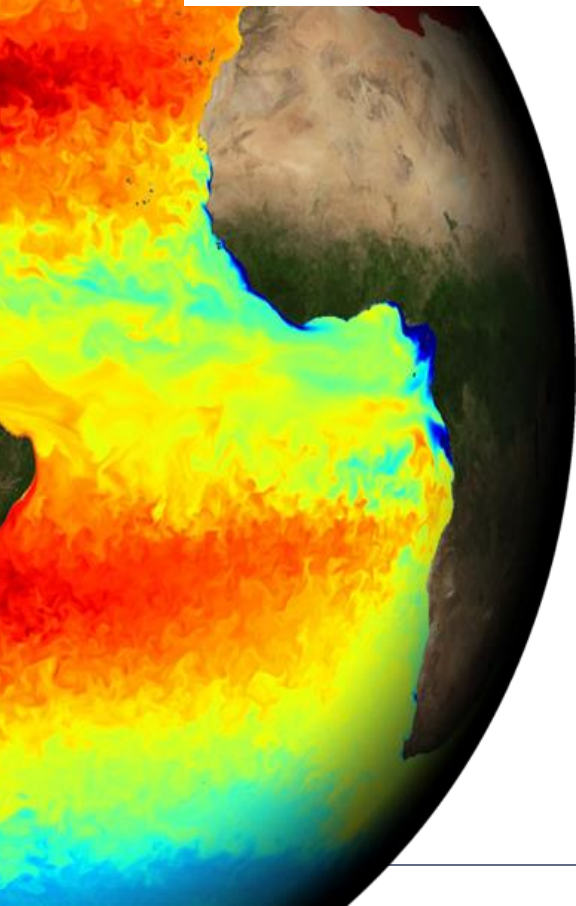
From different networks and platforms



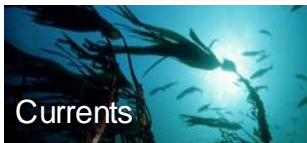
## Model data

From 3D numerical representation of the ocean with an assimilation of « real » data

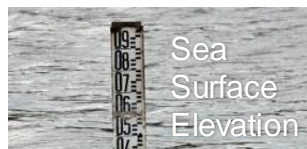




Temperature  
Salinity



Currents



Sea  
Surface  
Elevation

Waves



Surface Wind

3D T S

- Temperature
- bottomT
- Salinity
- Sea surface density
- Mixed Layer Depth

UV 3DUV

- Geostrophic velocity
- Barotropic velocity
- Stokes drift
- Tidal velocity (current tides)
- Vertical velocity

SSH

- Sea surface height above geoid
- Sea surface height above sea level
- Mean Dynamic Topography

WAVE

- Significant wave height
- Mean wave period and direction
- Stokes drift
- Wind wave (period, height, direction)
- Primary and Secondary swell waves

WIND

- Wind speed
- Stress



MODEL



SATELLITE



IN SITU

2 to 25 km

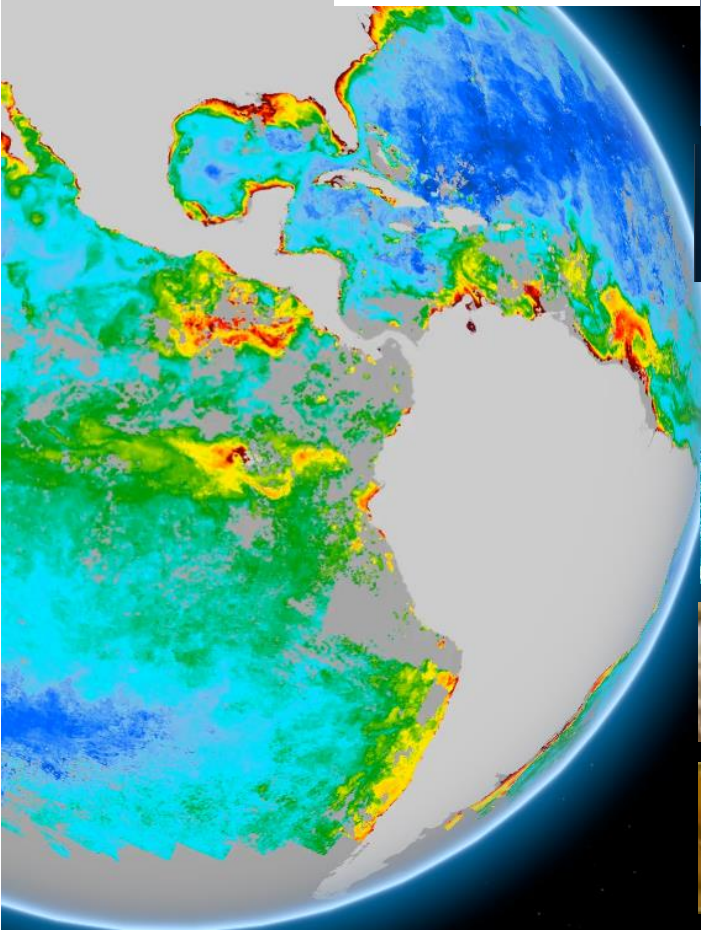
Hourly  
Daily  
Monthly  
Mean

10-day Forecast  
every day

30 years  
Past Time series

Daily update





Primary  
Production

Low & mid-  
trophic levels

Oxygen

Transparency  
Turbidity  
Reflectance

Carbonate  
system

Nutrients

**CHL** Chlorophyll-a  
**PP** Primary production  
**PHYC** Phytoplankton  
**PFT** Phytoplankton Functional Types  
**PSC** Phytoplankton Sizes Class Types

**ZOOC** Zooplankton  
**MNKC** Micronekton

**O2** Dissolved oxygen

**RRS** Reflectance - Transparency  
**CDM** Absorption coefficient  
**BBP** Back scattering coefficient  
**KD** Light attenuation **ZSD** Secchi depth  
**SPM** Suspended matter **TUR** Turbidity

**pH** Potential Hydrogen **ALK** Alkalinity  
**spCO2** Surface partial pressure of CO2  
**fgCO2** Surface flux of CO2  
**fuCO2** fugacity of CO2  
**DIC** Dissolved Inorganic Carbon

**NO3** Nitrate  
**PO4** Phosphate  
**SI** Silicate  
**FE** Iron  
**NH4** Ammonium

**100m to 25 km**

**Hourly Daily  
Monthly  
Mean**

**10-day Forecast  
every day**

**30 years  
Past Time series**

**Daily update**



MODEL



SATELLITE

2 to 25 km

Hourly Daily  
Monthly  
Mean

10-day Forecast  
every day

30 years  
Past Time series

Daily update

Sea Ice  
Concentration

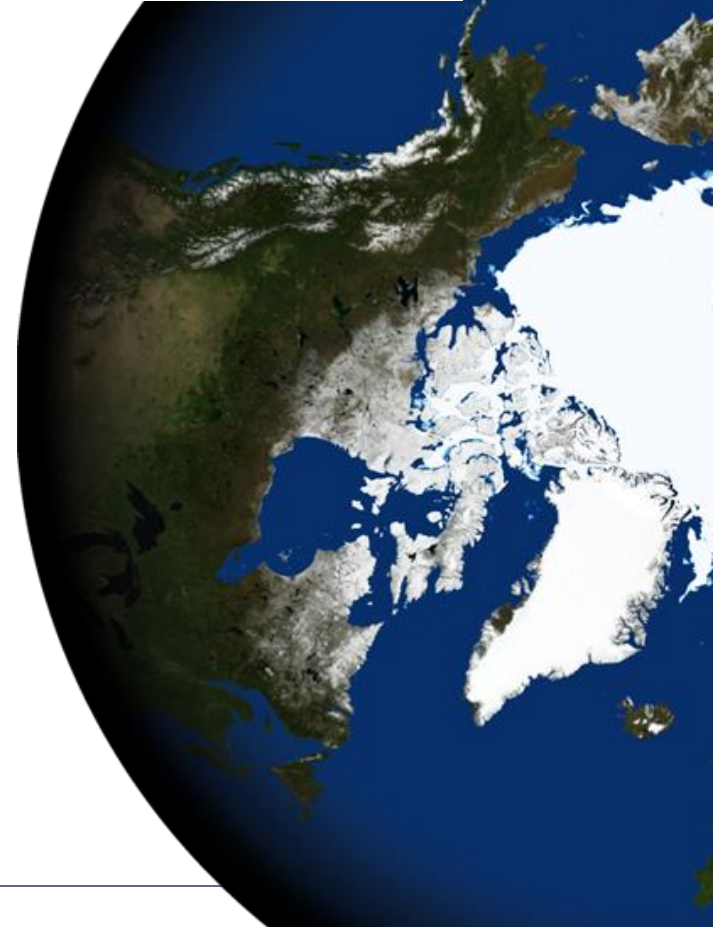
Sea Ice  
Thickness

Sea Ice  
Velocity

Snow

**SIC** Sea ice concentration  
**SIT** Sea ice thickness  
**SIUV** Sea ice velocity Sea ice drift  
**SIE** Sea ice edge  
**SNOW** Snow  
**ICBG** Iceberg  
**SIAGE** Sea ice age  
**IST** Ice Surface Temperature

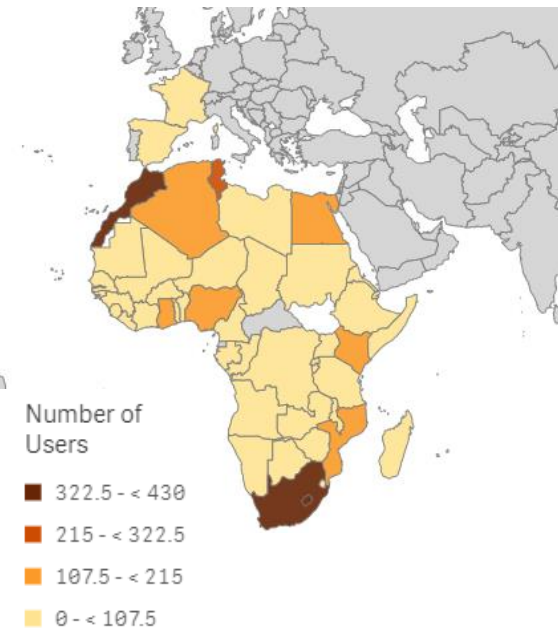
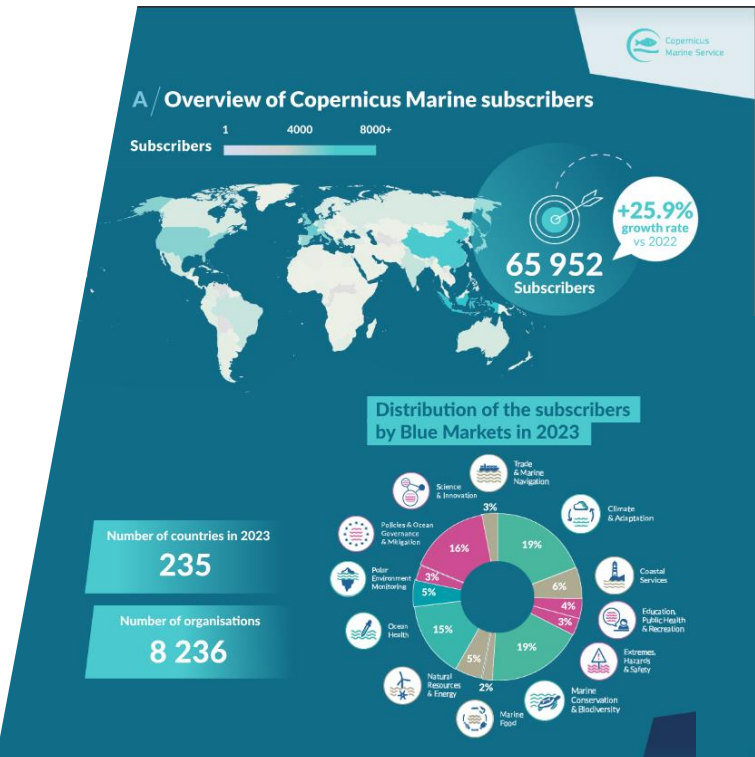
WHITE OCEAN





Thanks to a powerful user support, the Copernicus Marine Service now counts about 66 000 subscribers.

→ A growing African community of users

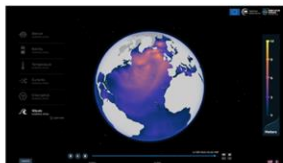


Many activities to support users in the exploration and exploitation of the marine data:

- Ocean literacy and explainers
- Visualisation tool demo
- Training sessions and material (jupyter notebooks)

## MYOCEAN LEARN

(BEGINNER) GLOBE

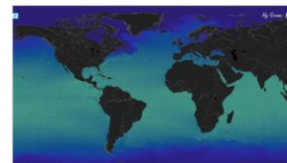


Understand key variables

[Explore MyOcean Learn](#)

## MYOCEAN LIGHT

(INTERMEDIATE) PLANISPHERE



Access key variables

[Explore MyOcean Light](#)

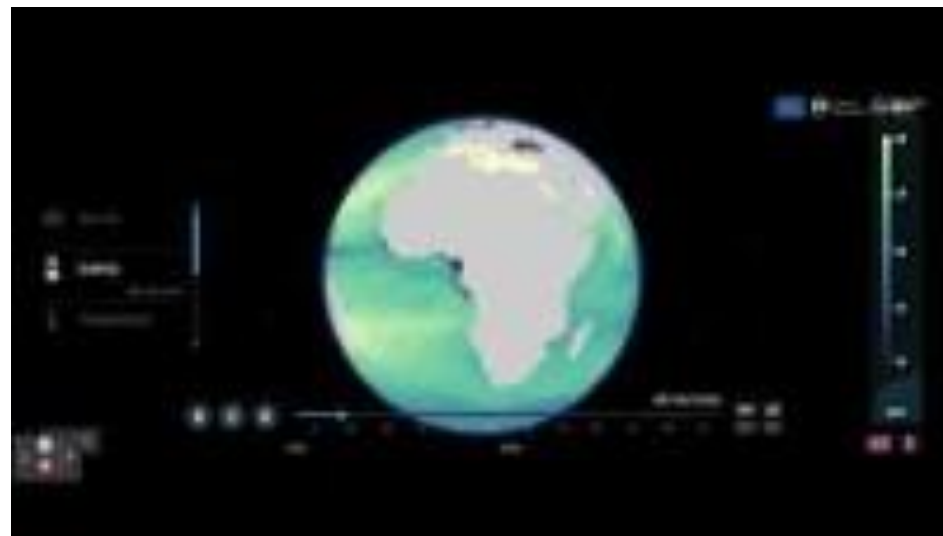
## MYOCEAN PRO

(EXPERT) PLANISPHERE



Access full catalogue

[Explore MyOcean Pro](#)



# Digital Twin Ocean, The European Perspective



At European level: hundreds of initiatives, Regional, National and European marine projects and infrastructures, Private initiatives, Monitoring services, Citizen science campaigns, etc. are committed to study and protect marine ecosystems and use marine resources in a sustainable way.

The complexity is to help them to **work together** and with other international initiatives.



Need for user-driven **powerful tools**, fit for the digital age, to strengthen ocean knowledge and sustainable ocean management: by integrating and connecting wide range of data and models (from physics to socio-economics) with cloud infrastructures, HPC, AI and services.

**A core infrastructure, conceived as a public good and service, to support the implementation of the marine EU Green Deal objectives**



The European Commission launched the **European Digital Twin of the Ocean** at the One Ocean Summit in Brest, France, in February 2022.

As a main element of the **Digital Ocean Knowledge System** under the European Union's "Mission Restore our Ocean and Waters"

Its ambition is to make **ocean information readily available** to all – international policymakers, national governments, researchers, innovators, businesses, entrepreneurs, activists, and citizens.



# EDITO European Digital Twin Ocean

Innovative set of user-driven, interactive and decision-making tools, backed by the best science and data. Its core development is funded from the European Union (EU) .

Two sister projects will build the operational infrastructure of EDITO.

EDITO will further construct and evolve a thriving digital ecosystem through a number of other relevant, complementary actions, aiming for an operational Digital Twin of the Ocean by 2024.



**Building** the public infrastructure backbone  
**Integrating** key data service  
**Sharing** cloud processing and capabilities and software into a **single digital framework**

<https://edito-infra.eu/>



**Developing** the next generation of ocean models  
**Combining** AI and HPC  
**Providing** access to focus application and simulations of different **what-if scenario**

<https://edito-modellab.eu/>

# European Digital Twin of the Ocean

A leap in ocean knowledge and sustainable action

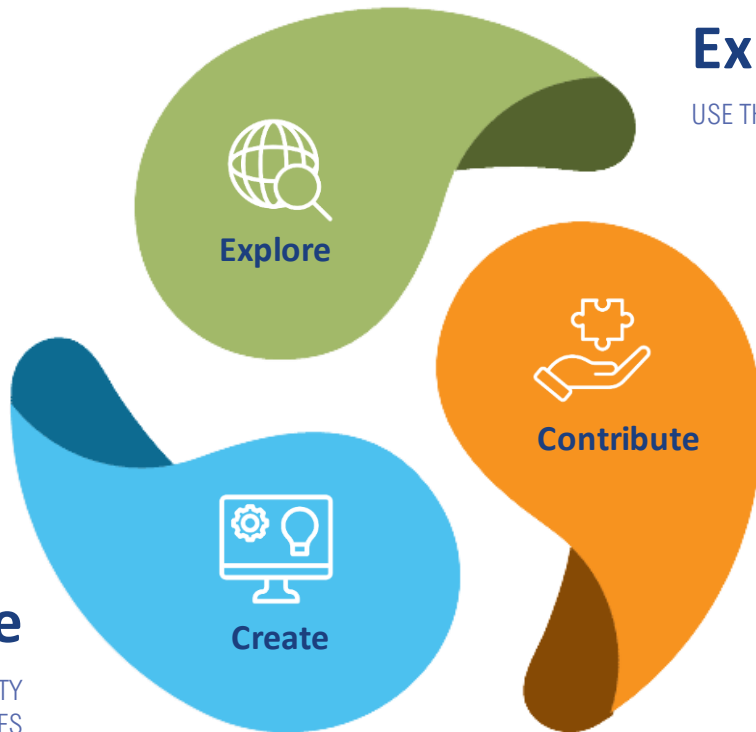






## Create

BUILD YOUR EXTERNAL THIRD-PARTY  
SERVICES



## Explore



USE THE DIGITAL TWTN OCEAN PLATFORM

## Contribute



ADD DATA & SERVICES TO THE DIGITAL TWIN  
OCEAN PLATFORM