

Topic 1b - The Copernicus Programme and CMEMS

The Copernicus service is built on a range of data providers. So you've got ESA. You've got EUMETSAT. So we look after the fundamental data. So providing that the satellite data that's then used by the Ocean Service, CMEMS.

This Copernicus data set is made freely available to everybody. This data is then used by business. People who will develop services that will be used by users around Europe. It's used by research. So people like Hayley, who are going to explore how the Earth system works and better understand the Earth's marine environment for our better use in the future.

It's also used by public service. So people providing governments and institutions within public trying to provide services to communities and you individuals. So curious people who want to find out more about what's going on in the earth environment. All of this data is made available to you, so that you can make choices about what you do and how we together, as a society, look after and use the marine environment.

The Copernicus Programme is, for sure, one of the biggest Earth's observation programmes in the world. It's the European Union Earth's Observation Programme and it started, let's say, 18 years ago, I think the birth was '98. It was in a small village on the side of Lake Maggiore, where I'm coming from. It's called the Baveno, that place.

And I think that, that moment people would have not thought to be where we're standing today. So with an operational programme. At the moment it was called GMES, Global Monitoring for Environment and Security. And it was mostly, I would say, a research project but after several years, we manage, through legal documents, raising budgets, and so on, to come today with this fully fledged programme that is operational and successful one.

When we look into the Copernicus Programme, we have to see two different elements, what we call a space component, so satellites basically that are looking to the earth, and then the services component. The space component is based mostly on the fleet of Sentinels. So we have six families of Sentinels from one to six. And the services are based on six elements. Six elements are land, marine, atmosphere, emergency, security, and climate change.

One thing we have to be careful, is not because we have six Sentinels and six services, that one Sentinel is for one service. Actually, every service can use a different Sentinels. The space components, so meaning all the satellites that are used for the services, is not limited to the Sentinels. We are also buying data from existing missions, and these are called contributing missions. And for example, can cover some elements that cannot be seen through the Sentinels.

So what is important about all the services, is that we delegated the services to some competent entities. One of the six services that we are dealing with, is the marine service. And it was decided to delegate the management of this service to a competent entity that is Mercator Ocean in France.

I think we can summarise the areas of the service in four topics. The first one, is marine safety. So practically giving information to those needing information about ship routing, this is an example.

The second area, is about marine resources. So, for example, the fisherman, so to try to understand where the better fish stock could be identified. The third one, is the marine environment. So, really looking into the ecosystem all the situation, the pollution of the oceans. And the fourth one, what is the role of the oceans and then the sea in aspects like weather forecasting, weather events, or climate change. Because we are looking at, for example, the changes of the temperature of the sea.

And some of the satellites of the Sentinels that we are using, are more than other, use in this respect. Here you have an example of three satellites, so you see the big one is in the Sentinel-1. You have Sentinel-3 here, and Jason 3 that is used to look mostly about the sea level. So thanks to these satellites and to order from which we purchased some data, we are really able to look into the situation of our seas and our oceans.

There's a huge amount of data. And this is all very collaborative. There's lots of different satellites. There's lots of different agencies. Tell me about the Copernicus system.

While this is very true that we miss observations. We need observations. We are really looking for observations. So from satellites, from all the satellites that are observing the oceans, we want them. We want this data. For all of the observations that are from sea campaigns, from tide gauges, from moorings, et cetera.

And it is very, very difficult to have everything. And thanks to Copernicus, we have a framework where we have operational agencies such as EUMETSAT working closely with ESA, gathering everything-- but not only this data, but also the one from the US, from China, from Japan from everywhere. And we get this data. And we do the same for the Institute. And then we have secured as well the operational monitoring of the ocean, based on this operational modelling, these 3D models with different centres. And we gather all the information.

So Copernicus said to the world, this is very important. This is a priority. You have to be organised. And you have to be organised to sustain these informations. This is the message of Copernicus for us, being operational, and for the users you can trust this service will continue.

And it does change everything, really. Because then you can start teaching with a long term view, investing on something that will remain after this normal life of the project. We know that this Copernicus is really setting up a real operational service.

And who are the users of the Copernicus data and of your data at Mercator?

We have thousands of users on all continents, so this is a worldwide service. This is a European service. The European users are the more active, so this is very true that Copernicus is really benefiting the European economy. But this is used worldwide.

So we have US guys that are downloading the data from Europe. And this is because they liked it, the quality of this. I said before that the research community is very active. They need today to have someone comparing this very-- this huge simulation. This is very difficult to simulate the ocean. This is very expensive in a way that you need supercomputers, et cetera.

So they are very happy to have it, scientists. People who are living or working at sea, sea operations, fisherman, offshore industry, ship routing, all of these communities-- looking for real time wave

forecast, current forecast, temperature, oil pollutions, all these people. Then you have all the coastal community.

We do not really monitor the very local situation. It's very specific. But we provide all the boundary conditions, all the open ocean conditions. And they are looking for this.

And the fourth one is the climate. The climate because we cannot say anything about the climate if you're not able to monitor the ocean, the atmosphere and the ocean and the coupling. And thanks to this operational oceanography, we have today people that are looking at the trends of the sea level, the trends of the ocean heat content, and the climate people are happy with it.

But for instance the heat content, this is the energy of the ocean. The people, the operational people monitoring the cyclone disaster that we all know, they need this information about the heat content. Because they know that in this case that this cyclone will find energy in the ocean.

So there is this multiple facets of users that are from research, operational, and the different communities. We understand also that today there is an evolution between what we were doing, which is really monitoring the physical ocean, physical means the temperature, the salinity, the currents to the biogeochemistry industry, moving to living resources through ecosystems. And this is a new community emerging, a huge community. So we are going this way.

Copernicus is really an example of European programme, because actually it is involving many European entities. And also the funding came in the development of all the satellites, of all the services from different sources. From our side, so European Commission, actually would say that the key point is in 2014 when we adopted a piece of legislation that is called the Copernicus Regulation that helped us to mobilise \$4.3 billion euros that will cover the period between 2014 and 2020. This is complementing funding that was, in any case, used before.

What concerned the space component, we have two major entities-- a European Space Agency and EUMETSAT. And in particular EUMETSAT is looking into the operation of some Sentinels, so the marine part of Sentinel-3, the future Sentinel 4 and 5 concerning the atmospheric composition and monitoring and Sentinel-6, so the follow up of Jason. What we are doing today with Copernicus is not something out of the blue.

I think in Europe we can concede that we have a long experience, so European Space Agency has been there already for many years, bringing their capacity and building up many capacity also in the Airbus observation, and EUMETSAT is this year actually celebrating 30 years of operation. And they're worldly recognised as leaders in weather forecasting and weather observation. So in that respect, I have to say we are using as partners those that have really the technical knowledge.

So these people, these engineers, these policy makers also on the side of ESA and EUMETSAT are really helping us in building programme. And I think I have the pleasure actually to work with these competent people every day. And it's very important for someone like me as managing such a programme to trust people I'm working with everyday.