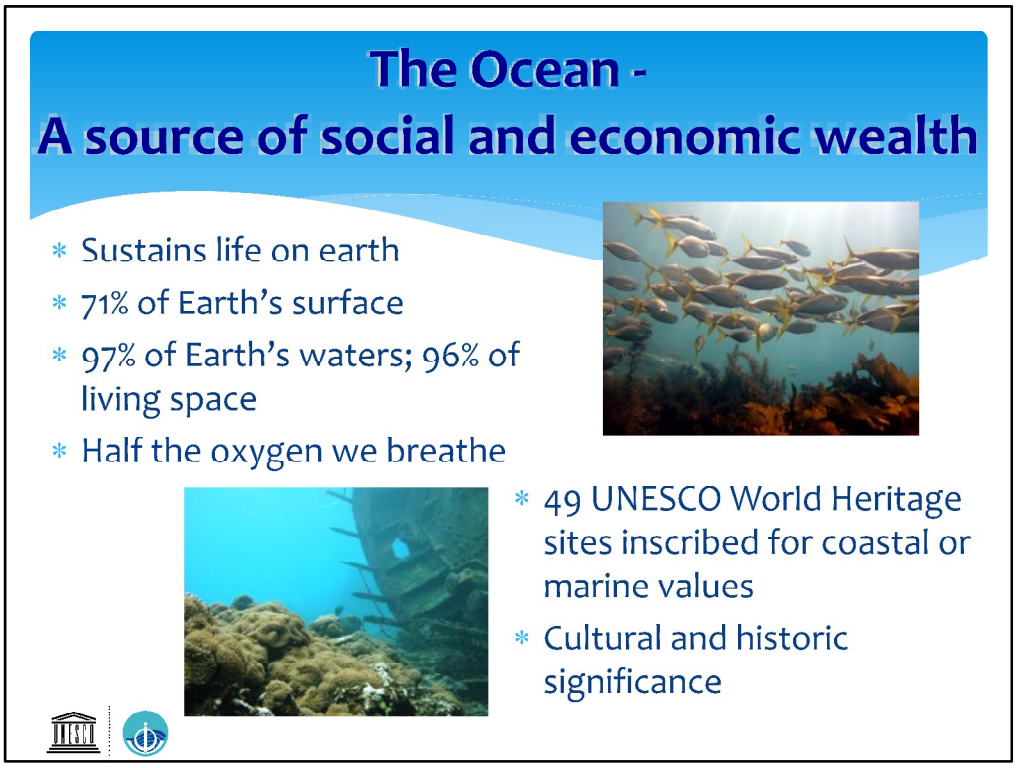
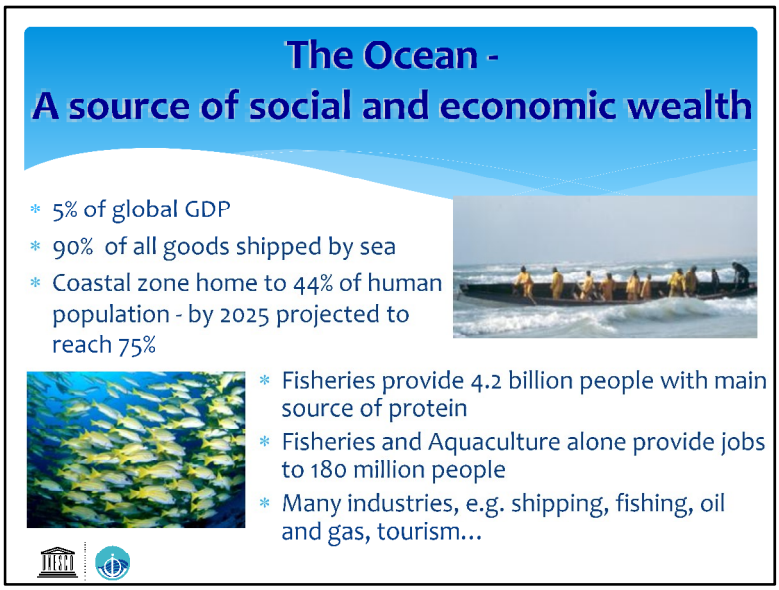
Thank you very much for the invitation to address the Geospatial World Forum of 2014. I am very pleased to be able to speak to you about the ocean, since most of you are not ocean people, about the Intergovernmental Oceanographic Commission or IOC of UNESCO's role in ocean science, and the importance of geospatial tools to IOC work.



The Earth is truly, an ocean planet. To begin, the ocean covers 71% of Earth's surface and accounts for 97% of its water. It contains 96% of the living space, provides 2/3 of the value of all the natural services offered by the planet, and the oxygen for every second breath that we take. It has cushioned the blow of climate change by absorbing 25–30 percent of all anthropogenic carbon emissions and 80 percent of the heat added to the global system; it regulates our weather and provides food for billions of people.

The ocean and its resources are a part of our common heritage and an important part of many cultures, whose beliefs and practices are closely associated with the marine and coastal environment. 49 UNESCO World Heritage sites have been inscribed for their coastal or marine values.

The ocean is, in fact, priceless:



Worldwide, the ocean is a critical <u>economic</u> resource.

- The value of marine activities globally is estimated at 5% of global GDP, *or close to 3 trillion US dollars*
- 90% of all goods in the world are shipped by sea
- More than 40% the human population lives in the coastal zone, with projections that by 2025, this will reach 75%
- Fisheries and aquaculture provide about 4.2 billion people with more than 15% of their average per capita intake of animal protein, and more than 180 million jobs.

In fact, the ocean supports many Industries, not only fisheries and aquaculture, but also shipping, oil and gas, marine and coastal tourism and many others.

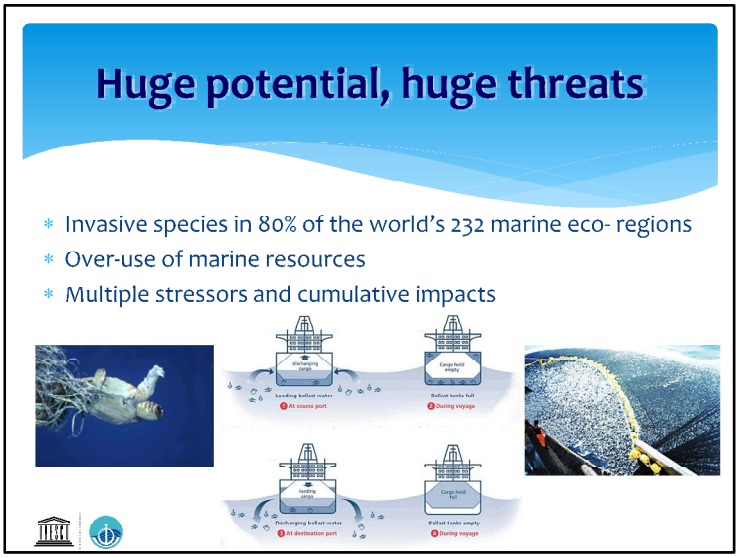
The ocean is an integral part of our planet and is an absolutely essential component of human lives, livelihoods and the environment that sustains us.

But despite our reliance on marine resources; ocean acidification, climate change, polluting activities and overexploitation of marine resources have made the ocean one of the Earth's most threatened ecosystems. I am going to give you a few examples of how human activities threaten the ocean and its precious resources

The ocean absorbs more than 26% of the carbon dioxide emitted to the atmosphere from human activities. The result is increased acidity (lowered pH) of the ocean. This can reduce the availability of calcium for plankton and shelled species, threatening their survival. Since many of these organisms serve as the base of much of the marine food chain the potential impact of acidification on entire ecosystems can be dramatic.

Land-based sources account for approximately 80% of marine pollution, globally. Excessive nutrients from sewage outfalls and agricultural runoff have contributed to the rise in the number of occurrences of Harmful Algal Blo (HAB), phenomena caused by both toxic and non-toxic phytoplankton that displace indigenous species, alter habitats, and accelerate oxygen depletion.

The unchecked dumping of waste from human activities into coastal zones has also led to a drastic increase in the number of dead zones (hypoxic areas) from 49 in the 1960s to over 400 in 2008, resulting in the collapse of some ecosystems. Nowadays, more then 245 000 km2 are affected, equivalent to the size of the United Kingdom.



Over 80% of the world's 232 marine eco-regions have reported the presence of invasive species which is the second most significant cause of biodiversity loss on a global scale.

The world's marine capture fisheries are in a severely troubled state. The FAO estimates that 85 percent of fish stocks are fully exploited, over- exploited, depleted or recovering from depletion.

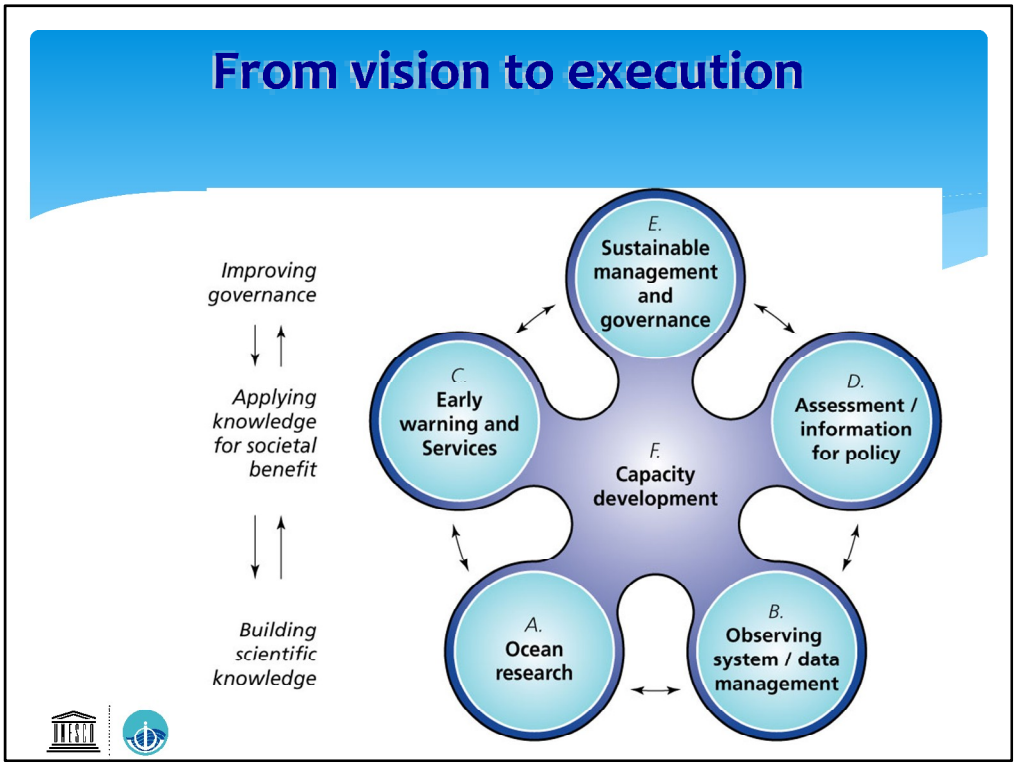
In fact, the ocean faces a multitude of interconnected threats that is unprecedented in modern human history. All regions of the ocean stand to be impacted by multiple stressors in the near future, while over 40 percent of marine ecosystems are already simultaneously facing several of the major pressures outlined before.

So where does the IOC fit? The IOC vision responds to these issues by recognizing that a sustainable Blue Planet will benefit all nations, and it is a global responsibility to establish sustainable global governance for a healthy ocean.

In particular the IOC Vision highlights the need for strong scientific understanding and systematic observations.

Our Medium Term Strategy has 4 High Level Objectives including:

1. Promoting Healthy ocean ecosystems
2. Developing Early warnings for ocean hazards, such as tsunamis
3. Assisting societies in Resiliency to climate change and variability and
4. Applying Enhanced knowledge of emerging issues for societal benefit and improved governance



The IOC works at the intergovernmental level within the UN to coordinate international action on marine science, global ocean observations and promotion of sustainable governance practices for the ocean.
It achieves its high level objectives by engaging its Member States and the larger ocean science community in different programmes that fall into the following functions:

A**. Fostering research** to strengthen knowledge of ocean and coastal processes and human impacts upon them *[Ocean research]*

B. **Maintaining, strengthening and integrating global ocean observing, data and information systems** *[Observing system / data management]*

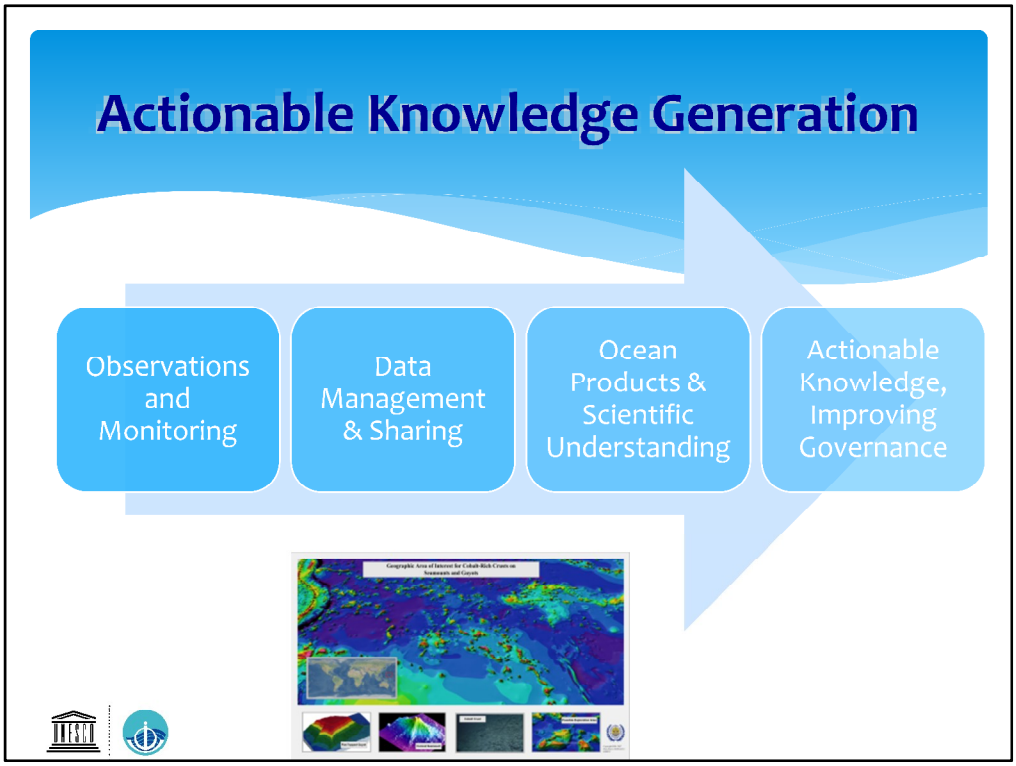
C. **Developing early warning systems, services, and preparedness** to mitigate the risks of tsunamis and ocean-related hazards *[Early warning and services]*

D. **Supporting assessments and information** to improve the science-policy interface *[Assessment and Information for policy]*

E. **Enhancing ocean governance** through a shared knowledge base and improved regional cooperation *[Sustainable management and governance],* and

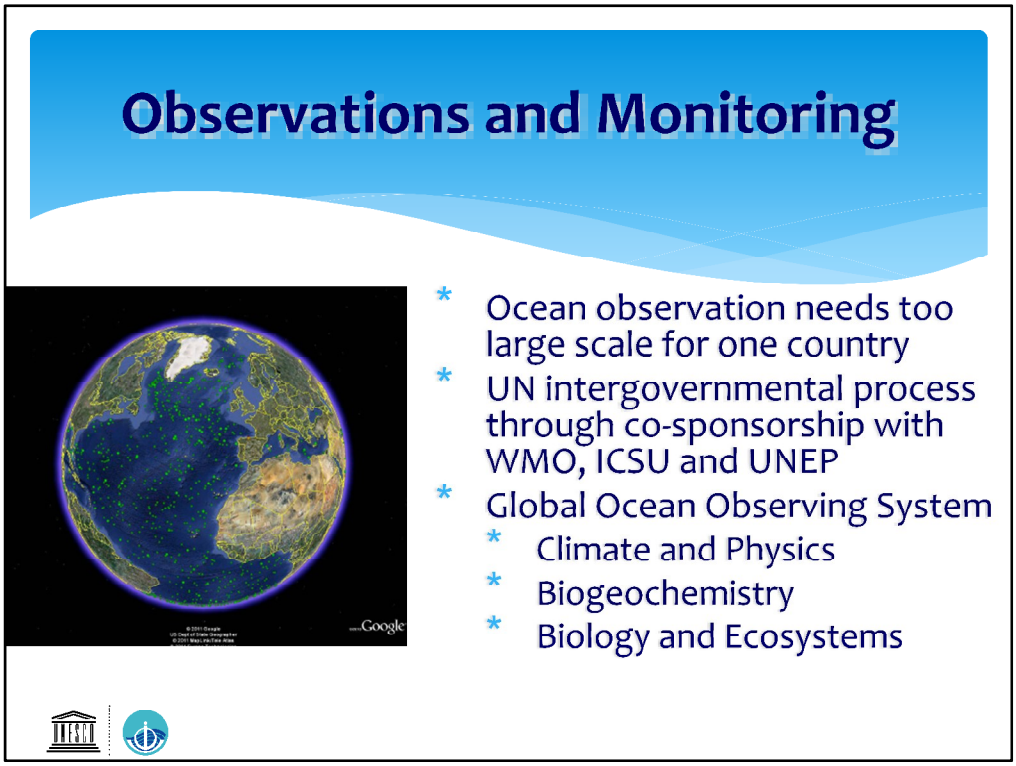
F. **Developing the institutional capacity** in all of the functions above, as a cross-cutting function *[Capacity Development]*

IOC does this in order to build knowledge, apply it for societal benefit and ultimately to improve governance.

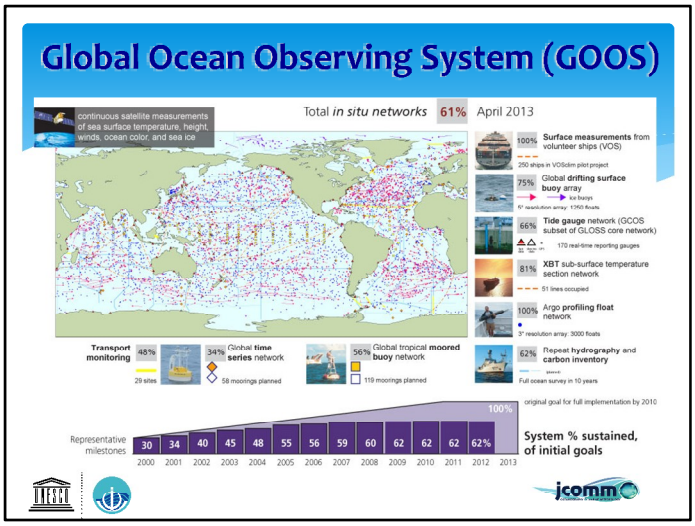


The goals of "Applying knowledge for societal benefit" and "Improving governance" are served by a process of generating scientific knowledge and developing methods to disseminate the use of that knowledge. Our goal is Actionable Knowledge, the science and tools which can make a difference and improve governance of ocean activities.

The IOC High Level Objectives all call for coordination toward the same goal: Actionable Knowledge. This is the required synthesis and understanding of the science of the ocean which will aid society and the people who depend upon the ocean for sustainable services. Managing sustainable ocean systems depends upon an unbroken chain from observations and monitoring through data management and information systems, to creation of ocean services, and finally to actionable knowledge designed by and for the end users.



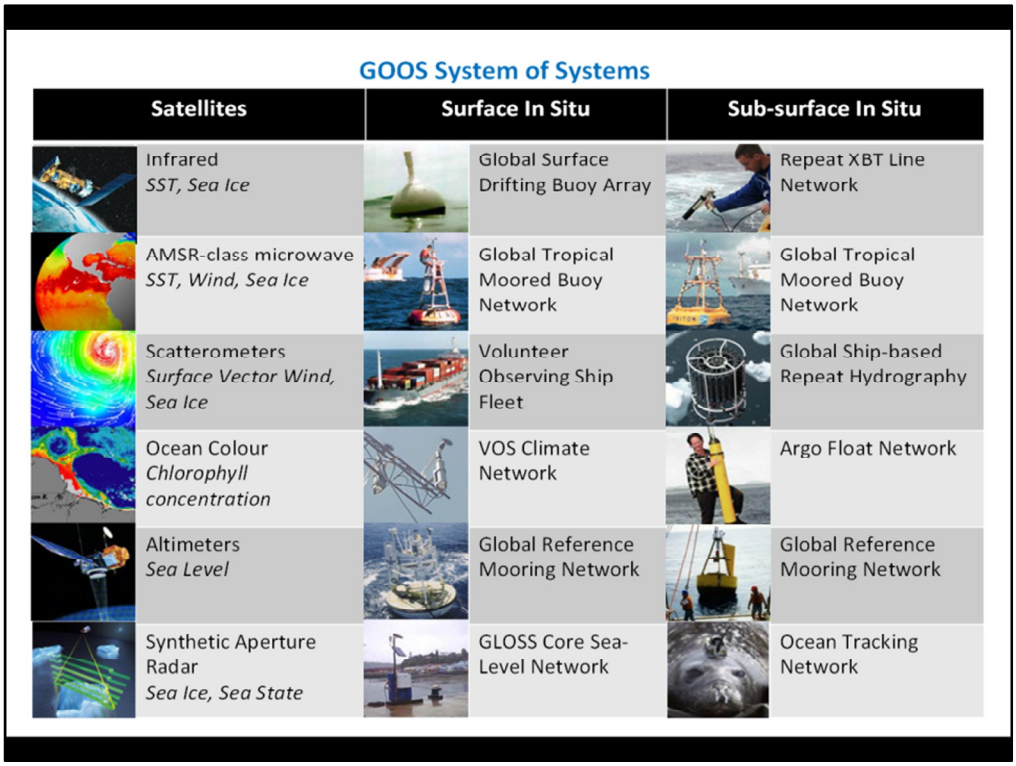
The first link of the chain, ocean observation systems, is coordinated by IOC through the Global Ocean Observing System, or GOOS, and related programmes. By seeking international agreements on the fundamental requirements of ocean observation systems through identifying Essential Ocean Variables, GOOS becomes the framework of unified ocean observations which encourages data sharing and utilization.



IOC is the lead for GOOS.

It is quite a complex system, and you can see its in situ components here; it is made up of observations from many different types of platforms: research and volunteer ships, moorings, profiling floats, surface drifters and tide gauges.

The map in the center of this graphic shows you a snapshot of where these observations are taken in the global ocean .



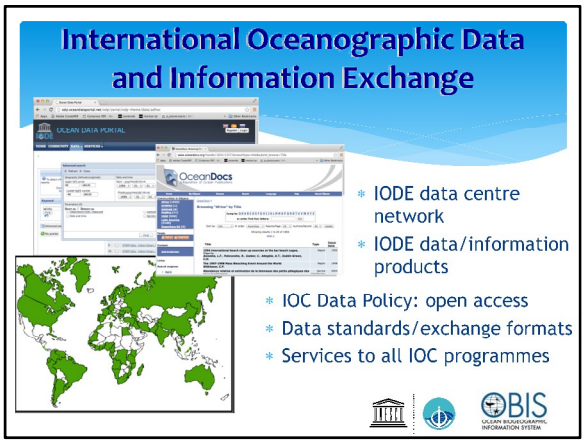
These components are complemented by surface observations of the ocean physics and colour from satellites, as seen in the left of this slide.

The observations themselves are funded by national research and other ocean observing funding.

The IOC and the World Meteorological Organization together sponsor a **Joint Commission, unique in the UN system, for Oceanography and Marine Meteorology, JCOMM, the implementation coordinating branch of GOOS.**

JCOMM works with the operators from many countries of the elements of GOOS, providing coordination of data streams, standards setting, observation best practices, advice on deployment opportunities, development of data products.

The second link in the chain is the collection and sharing of data. The technical accomplishments of the past few decades are very impressive for collecting data at sea, communicating it in near real time to shore for analysis, storage and distribution. However much of the potential of the technology is not realized due to incoherent data policies and lack of complete coordination among Nations and institutions.



The IOC's IODE has been working for more than 50 years on these problems and has achieved great progress, including the establishment of Ocean Data Information Networks, ODINS, and National Oceanographic Data Centres, NODCs in dozens of countries. A wide spectrum of stakeholders depend critically on the availability of an international data exchange system that provides strategic information from all available sources.
Its purpose is to facilitate the exchange of oceanographic data and information among participating Member States, and to meet the needs of users for data and information products.

While in 1961, IODE had 2 data centres, in 2014 the network, which is centred in Oostende, Belgium, is well established with more than 80 NODCs around most of the globe.

Now we come to the point on the path toward Actionable Knowledge which I believe has the most resonance with this conference. Observations and shared data begin to realize their scientific purposes only when combined and synthesized with other quality controlled data, and ocean products are created which incorporate scientific understanding. Geospatial tools highlighted at this conference are an important aspect of this process, and we heard yesterday from Juergen Dolo about the applicability of Lidar for improving coastal knowledge.

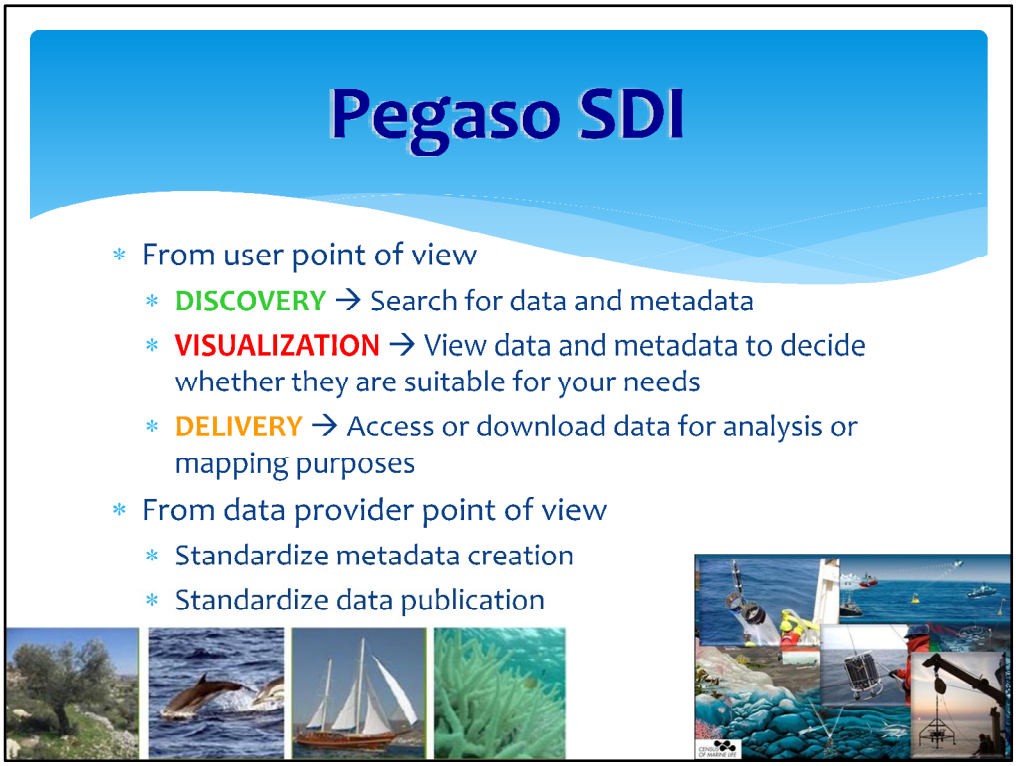
The IOC has been very involved in integrated coastal zone or area management and Marine spatial planning, especially in developing countries. IOC has developed and promoted ICAM as a tool to pursue Sustainable Development, the goal of the UN Rio+20 process, in coastal zones. Also related to integrated management, Marine spatial planning is a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process.

The past several years IOC has been a coordinating agency in the EC programme PEGASO. The PEGASO is a complete end to end demonstration of the value of creating geographic information systems for Integrated Coastal Area Management and Marine Spatial Planning.

The central principle of the Pegaso project, which stands for People for Ecosystem Based Governance in Assessing Sustainable Development of the Ocean and Coasts, was that sharing data and methods would improve all products and that by creating a community of users, expertise, knowledge and data will be easily shared among nations and contribute to the participation of developing states.

The collaborative project of the PEGASO Spatial Data Infrastructure, SDI, created a practical tool, accessible via the Internet, acting as a central repository for geographical information that improves the understanding of coastal features and issues.

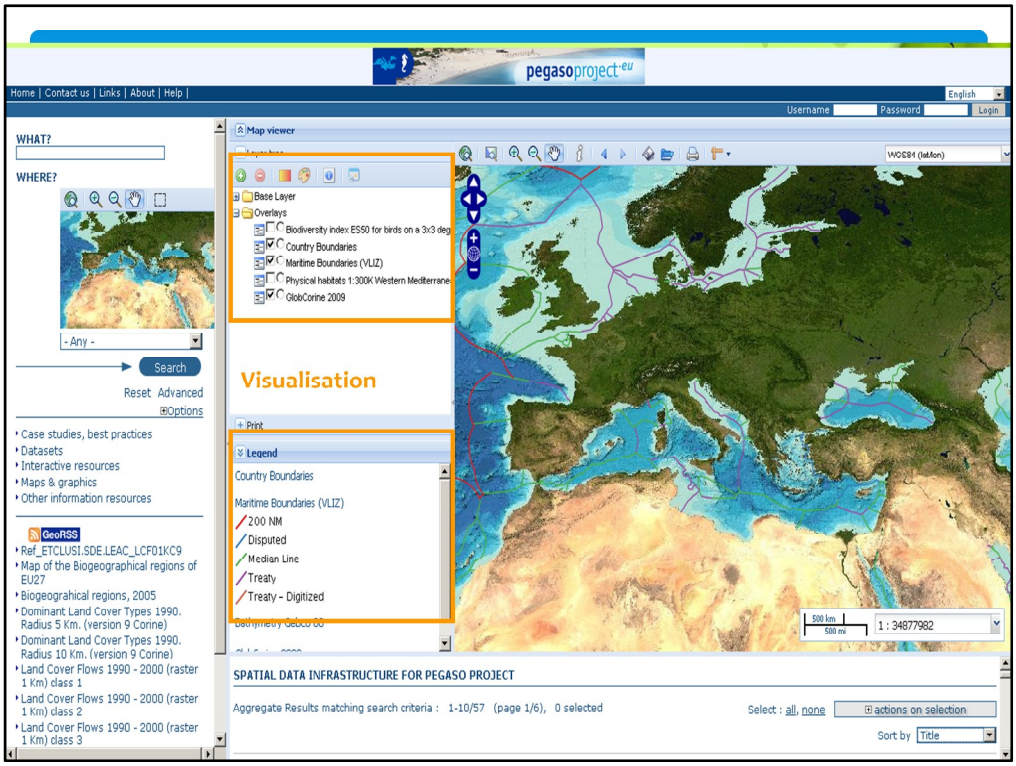
The Pegaso SDI has been designed to support of Integrated Coastal Area (Zone) Management, and the integrated assessments of coastal zones and marine areas in the Mediterranean and the Black Sea.



The Pegaso SDI is the Shared Data Infrastructure that supports ready access to geographic information.

From a technical standpoint it is a distributed geographic database, with standardized protocols and a tool for data sharing and distribution.
From a collaborative standpoint it is the means to co-ordinate actions of nations and organizations to establish the necessary policies, laws, agreements, financial support, etc.

The SDI provides the users a readily accessible tool for Discovery, Visualization and Delivery. Marine observations, data and science are combined with socio-economic data of concern to coastal communities, greatly facilitating knowledge based decision making.



A primary output of Pegaso is the Atlas, a systematic collection of maps that describes some aspects of the knowledge of a specific territory, and is usually complemented with text, images, tables or charts. The Atlas contains cartographic and decision support tools, all of which are accessible via the Internet.

The Atlas online information resources help build collaborative relationships within and across state, regional, national, and international areas to foster more effective management of coastal and ocean resources and activities. [**click**]

While the Atlas serves the use of a stand-alone data viewer, its full potential lies in its use as a collaborative decision support tool. Understanding the benefits of SDI has increased the willingness of partners to share data and contribute more datasets that are easily accessible through the web portal. As stakeholders use the resources they become supportive of the value in sharing data and are motivated to make the whole system more robust.

[redacted]

On a wider scale than the Pegaso project, the IOC also identifies needs at global scale for ocean products. Users of ocean knowledge products are too often left out of system designs until the final step. We have seen the danger of delivering data products without fully understanding the cultural needs of the recipients. Wasted time and expense can be the result instead of reduction of redundancy and synergies of knowledge generation.

Recognizing that ocean data must be converted into Decision Making Knowledge by listening to the needs of our member nations, the IOC convenes nations in ocean science programmes to define service requirements and needs. The IOC is one of the few fora where developing states, in particular SIDS, can participate in these programmes.

Key to accomplishing IOC's goals, Capacity Development has special importance as demonstrated by our Commitment at the Rio+20 Conference on 'Building Global Capacity for Marine Sciences, Observation and Transfer of Marine Technology'.

The IOC Capacity Development goals are to promote knowledge and capacity of developing nations to bolster scientific understanding of ocean and coastal processes to improve the management of the human relationship with the ocean; to reduce the risks and impacts of ocean-related hazards; to take climate change adaptation and mitigation measures; and to develop and implement policies for healthy ocean ecosystems by reinforcing and further developing Member States' institutional capacities to protect and sustainably manage ocean and coastal resour

IOC sees the development and use of Geospatial tools such as Pegaso and ICAM as instrumental in achieving these goals..

How inappropriate to call this planet Earth when it is quite clearly Ocean

In closing, I would like to come back to the importance of the ocean to the world and in particular, to the very things that drive human kind forward.

The ocean community is indebted to space based technologies for demonstrating that we really do live on an ocean planet, as aptly pointed out by Arthur C. Clarke. Now I believe the ocean and the geospatial communities have an opportunity and a need to work much more closely together to protect, restore and SUSTAINABLY develop this ocean which allows us to live.


Thank you!
Merci beaucoup!
http://ioc.unesco.org