GMES AND AFRICA Newsletter

April 2019, Volume 02 No. 01

Africa is the new Eldorado for space business

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African Union

Project co funded by the EUROPEAN UNION

Africa is the new Eldorado for space business

Left to Right: Dr. Tidiane Ouattara, Space Science Expert at AUC , Jean Yves Le Gall (the president of the French Space Agency - CNES) and Driss El Hadani (Director General of the Royal Center for Spatial Remote Sensing of Morocco) at GLEC2019

"Africa is the new Eldorado for space business. In addition to the established space agencies and institutions such as ASAL in Algeria, NARSADA in Nigeria, SANSA in South Africa, NARSS in Egypt, the African continent boasts of thriving space institutions and centers in Ghana, Ethiopia, and Kenya among other countries, with national remote sensing centers as well as research and development institutions involved in space matters", says Dr. Tidiane Ouattara, GMES and Africa Coordinator and Space Science Expert at the African Union Commission, who delivered a keynote at the Global Conference on Space for Emerging Countries (GLEC2019) on behalf of the Director of Human Resources, Science and Technology of the African Union Commission. The three-day conference kicked off Wednesday, 24 April 2019, in Marrakech, Morocco, under the theme Bridging the Space Divide in Emerging Countries.

Dr. Ouattara posited that Africa' s future is indeed intertwined with space, which has a role in addressing the knowledge gap, safety and security challenges, employment as well as innovation. The African Outer Space programme, he continued, will contribute to ensuring that Africa has its rightful share in the global commons, taking full charge of its space, land and oceans. The African Union's space model is designed to address the drawbacks and utilize space towards sustainable development for more than fifty emerging countries in Africa, Dr. Ouattara added.

The Conference featured the benefits of space technology and applications to socio-economic development. The GLEC 2019 brings together representatives of renowned players in the space and remote sensing industry from all over the world.

The Agenda 2063 has identified the African Outer Space Programme among the African Union flagship programmes. The African Space Policy and Strategy enable African countries to approach space activities with a common agenda, strategy and pool of resources to maximize the benefits derived from space and to harness space science, technology and innovations for Africa's growth and transformation. The Policy and Strategy offer a framework and aim to create the African Outer Space Programme as the platform to coordinate and harmonize all space activities in the continent for sustainable socio-economic development and to facilitate the development of skills as well as knowledge and expertise among Member States.

France and the African Union Commission to cooperate on Space, Education, Science and Technology

Left to Right: French Minister of Higher Education, Research and Innovation, Frédérique Vidal, and Professor Sarah Anayang Agbor, Commissioner for Human Resources, Science and Technology (HRST) at the AUC,

The Commissioner for Human Resources, Science and Technology (HRST) at the African Union Commission, Professor Sarah Anayang Agbor, has held bilateral talks with the French Minister of Higher Education, Research and Innovation, Frédérique Vidal, on enhancing cooperation on space, education, science and technology between France and the African Union Commission.

The discussions recalled the concrete efforts that both the African Union Commission and France made in 2018 to promote strategic dialogue and cooperation. The areas identified for cooperation and collaboration include enhancing the African Scientific, Research and Innovation Council (ASRIC); as well as operationalization of the Space Science Institute of the Pan African University.

The discussion further touched on the Space Climate Observatory (SCO) initiative, which is aimed at making climate data available and accessible to users globally. This initiative is led by the National Centre for Space Studies of France (CNES) in partnership with more than forty space agencies throughout the world. The African Union Commission, through its department of HRST, contributed to the technical preparatory meetings on the Observatory.

It was recommended during the meeting that the AUC signs a joint declaration on the Space Climate Observatory (SCO), on the sidelines of the G7 meeting to be held in France from 25 to 26 August 2019. The declaration will allow African institutions easy and free access to SCO data.

The meeting also recommended France contributes to the human capital development and institutional capacity building of African space through the CNES.

GMES and Africa is a concrete step towards realizing Agenda 2063

Director of Human Resources, Science and Technology at the African Union commission, Dr. Mahama Ouedraogo, has said that the GMES and Africa programme is one of the concrete steps initiated to realize Africa's Agenda 2063 through the African Outer Space Programme. Dr. Mahama, who is the Chair of the GMES and Africa Policy Coordination and Advisory Committee (PCAC), made the statement on Wednesday, 27 February, during the official opening of the PCAC in Nairobi, Kenya. According to Dr. Mahama, information and data from Space are important decision support tools for Africa's Sustainable Development.

GMES and Africa is a joint programme of the African Union Commission and the European Commission. A representative of the European Union Delegation to the African Union, Pietro NARDI, told officials at the opening ceremony that the programme contributes to achieving the goals that Africa and Europe have set themselves in broader frameworks such as the 2030 Agenda for Development; the Sendai 2015-2030 Action Framework for Disaster Risk Reduction, and the Paris Climate Agreement. He also pledged the European Union's full commitment to making GMES and Africa and related initiatives a success.

Dr. Tidiane Ouattara is the GMES and Africa Coordinator, as well as the expert for Space Science at the African Union Commission. He briefed members of the PCAC, which is GMES and Africa's governing body, on the current status and achievements of the programme, as well as the 2019 work plan on the five result areas of the programme both at the continental and regional levels. These include Data Access and Infrastructure; Service Development; Capacity Building; Project management; and Communications and Outreach.

The three-day meeting discussed progress made so far in the five result areas of GMES and Africa. The PCAC comprises representatives of the African Union Commission, the European Commission, African Regional Economic Communities, European partners including EUMETSAT, the European Commission Joint Research Centre (JRC) and the European Space Agency (ESA), as well as UN Agencies.

GMES and Africa Coordinator harps on the need for an integrated African Space Programme

The Coordinator of the Global Monitoring for Environment and Security and Africa (GMES & Africa) Programme and Space Science Expert at the African Union Commission, Dr. Tidiane Ouattara, has underlined the importance of Space Science and technology in ensuring the sustainable use of natural resources in Africa. Dr. Ouattara, who delivered the keynote Wednesday morning at the opening of the first international Workshop of the African Initiative for Planetary and Space Sciences (AFIPS), dwelt on the contributions of Space Policy and Strategy to enhancing Planetary and Space Sciences Programme in Africa. He highlighted the crucial need of a well-coordinated and integrated African Space Programme that is responsive to the social, economic, political and environmental needs of Africa. “Space-derived products and services are a decision support tool in addressing the economic, political, social and environmental challenges facing the continent”, Dr. Ouattara posited.

Organized jointly by the Ethiopian Space Science and Technology Institutes (ESSTI) and Bahir Dar University, the four-day workshop seeks to strengthen the African vision for enhancing planetary and space science programmes. It centers on the theme “Strengthening the African Vision to Develop Planetary and Space Sciences”. Participants discussed the current status and challenges facing African planetary and space science. The high level panel discussion at the AFIPS workshop also touched on Planetary and Space Sciences in Africa, Planetary and Space Sciences Technology, Planetary and Space Science Training, as well as Research & Development for Space Applications.

Africa has embarked on the advancement of its Planetary and Space Science agenda to address socio-economic development problems and to tackle contemporary societal challenges. The Global Monitoring for Environment and Security and Africa (GMES and Africa), is a joint AU-EU operational programme, demonstrating how Earth Observation data from space serves as a decision support tool for users in managing land, marine and environmental resources in Africa.

Dr. Tidiane Ouattara, GMES and Africa Coordinator and Space Science Expert at AUC ,

Lake_Malawi_Great_Rift_Valley, Photo ESA

GMES and Africa Forum, High level panel discussion

Unlocking Africa's Earth Observation Potential

The 1st Forum of the GMES and Africa has kicked off in the Gabonese capital, Libreville. More than 400 delegates from Africa, Europe and other parts of the world have gathered to discuss new and innovative Earth Observation technologies supporting Africa's socio-economic development. Organized jointly by the African Union Commission and the government of Gabon, the Forum is the first gathering of all stakeholders involved in the GMES and Africa programme. The programme was jointly launched in 2016 by the African Union and the European Union to strengthen Africa's capacity for the optimal exploitation of Earth Observation systems, data and technologies.

Africa has significant aptitude to utilize the opportunities provided by Earth Observation, through satellites and other applications that improve environmental management, agricultural productivity, climate change mitigation, food security, health, and disaster risk reduction, among many of its developmental priorities. Limited investments and a fragmented approach has constrained the continent's ability to mobilize funding, develop local capacities, and provide the necessary infrastructure for a robust Earth Observation industry.

The African Union Commissioner for Human Resources, Science and Technology, H.E Professor Sarah Anyang Agbor said the Forum will evoke the aspirations envisioned by the people of Africa in Agenda 2063 for a prosperous continent with the means to harness its resources to drive its own development on a sustainable basis. She pointed out the pressing imperative for Africa to invest in technological innovation and harness its existing human capital for better health, education and infrastructure systems.

The Head of the European Union delegation to Gabon, Equatorial Guinea, Sao Tomé-et-Principe and CEEAC, H.E. Ambassador Helmut Rudolf KULITZ, stated that "GMES and Africa and its predecessor programmes represent more than 15 years of fruitful cooperation with Africa on Earth Observation and a European contribution of more than €100 million.

The 1st GMES and Africa Forum is centred on the theme "Unlocking the Potential of Earth Observation as a Key Driver of Africa's Sustainable Development", a reference to the existing imbalance between the continent's potential and the actual benefits it derives from Earth Observation dividend. The theme addresses the means of harnessing opportunities offered by Earth Observation to leverage Africa's socio-economic development.

'By putting end users at the heart of product and service development, GMES and Africa has become a vision for the sustainable and efficient management of natural resources and security in Africa', remarked Guy Bertrand Mapangou, Gabon's Minister of Digital Economy, Communication and Post Office, who is also the government spokesperson.

Forum delegates comprise African end users of Earth Observation services, policy makers, scientists, businesses and academia, who will use the five-day conference to discuss the challenges undermining the growth and expansion of the sector in Africa. They will devise strategies for closer communication, collaboration and engagement among industry experts and users of Earth Observation services. They will further explore the building of stronger partnerships and the deeper involvement of players especially from the private sector and academic institutions.

The Global Monitoring for Environment and Security and Africa (GMES and Africa) is a flagship programme of the African Union under the African Space Policy and Strategy. It prescribes a pathway for the continent to be globally competitive in space activities, including Earth Observation, and to develop a viable continental space programme. With continent-wide coverage, the programme is implemented through grants to African institutions under the banners of regional consortia. 13 consortia representing a total of 72 African institutions have been awarded grants through open competitive bidding to implement projects in water, natural resources, marine and coastal areas management.

GMES and Africa is supported by the European Union through its Pan-African Programme. It is also supported by the European Commission (EC) "COPERNICUS" Earth Monitoring Programme, which provides satellite data and products from the services through the satellite EUMETCAST system of EUMETSAT. Today, more than 300 users in Africa can directly receive Sentinel 3 data and Global Land products. A collaboration arrangement was also signed in June 2018 between the AUC and the EC for Copernicus information and data exchange with Africa. GMES and Africa Programme is another example of the long-standing partnership between the European Union and the African Union.

GMES and Africa Forum Press Conference

First phase of Land Services Design Workshop Participants at JRC Campus, in Ispra, Itally, from 18 February to 01 March 2019

JRC trains experts on eStations for land services in Africa

The technical arm of the European Commission, the Joint Research Center (JRC), has trained African experts on how to use the environmental Station - dubbed the eStation - for producing land based GMES and Africa services in the Eastern, Southern, Northern and Western regions of Africa. The two-week training which started on February 18th, was held at the JRC campus in Ispra, Italy.

During the training, GMES and Africa experts were guided through the latest version of eStation software, structure and coding environment. They reviewed the existing products, chains and underlying processes as well as troubleshooting procedures and guidelines, whilst listing new data sets needed for the land services as well as the new chains associated with them. The training was also an experience sharing platform among GMES and Africa experts and experts from the JRC for the future development of eStations.

The workshop had parallel sessions on specific thematic topics from other JRC programs such as the eWater Platform, Food & Security, Soil & Development, and others. At the training, the European Space Agency (ESA) also introduced the Research and User Support (RUS) platform for sentinel core products as a new project, as well as to demonstrate the various benefits of using cloud computing for this type of data-heavy work.

Trainees were drawn from five of the lead consortia who had won the GMES and Africa grants to provide land-based services in their respective regions as well as officials from the African Union Commission. The lead consortia that attended the training were the Centre de Suivi Ecologique du Sénégal (CSE) based in Senegal (Western Africa); IGAD Climate Prediction and Application Centre (ICPAC) and the Regional Centre For Mapping Resource For Development (RCMRD), both based in Kenya (Eastern Africa); l'Observatoire du Sahara et du Sahel (OSS) based in Tunisia (Northern Africa); and the SADC Climate services Centre (SADC-CSC) based in Botswana (Southern Africa).

The second phase of Land Services Design Workshop also took place at JRC in Ispra from the 18th to the 29th of March 2019, with the participation of experts from four consortia (AGEOS, CICOS, CSSTE and SASSCAL), the AUC and Technical Assistance Team. The main goal of the Workshops was to work together with staff from the Consortia on the practical implementation of environmental monitoring services, in the framework of GMES and Africa Program.

Second phase of Land Services Design Workshop participants at JRC Campus, in Ispra, Italy, from 18 -29 March 2019

GMES and Africa equips its 13 consortia with robust **Monitoring and Evaluation tools**

The first inter-agency meeting on the development of the Space Climate Observatory (SCO) was held during the symposium on Aeronautics and Space Applications for Health in Paris at the headquarters of France National Center for Space Studies (CNES).

The initiative to create a Space Climate Observatory (SCO) as a key contribution to monitoring climate change and its social impacts was endorsed during the session of the One Planet Summit on 12 December 2017. The African Union Commission was represented at this meeting by Dr. Tidiane Ouattara, Space Science Expert and the GMES and Africa Programme Coordinator at the Commission.

At the meeting, participants discussed the founding document of the SCO and a preliminary draft agreement, with a view to collectively building up an international SCO and to take timely decisions leading to the signing of an agreement.

The experiences of various institutions in Climate Change impact assessment as well as in Climate Change Service, Satellite-based Disaster Early Warning Systems and Climate Change impact indicators were shared during the meeting.

Earth Observation: A Panacea for Environment Conservation

The IGAD Climate Prediction and Application Centre (ICPAC), leads one of GMES and Africa's consortia in Eastern Africa. ICPAC covers eleven member countries: the eight IGAD member states – Djibouti, Eritrea, Ethiopia, Kenya, Uganda, South Sudan and Somalia, as well as Rwanda and Tanzania. Leaders and partners in the consortium believe GMES and Africa is poised to serve as a catalyst in Africa's developmental endeavors, especially through the packaging and delivery of Earth Observation information to stakeholders.

ICPAC Deputy Director and GMES and Africa project manager, Zachary Atheru, reveals that the objective of the programme in the East African region is to promote a more sustainable long-term management of natural resources. "The project seeks to understanding the dynamic nature and interaction between natural resources and human activities," he said, adding that such information was essential for decision-making aimed at avoiding, minimizing, or mitigating environmental threats.

"Earth Observation has greatly alleviated some of the problems we have been experiencing in the management of natural habitats," said Grace Waiguchu of Kenya Wildlife Service (KWS). Waiguchu, who also serves as a GMES and Africa focal person, noted that satellite-based remote sensing offers cheaper and timely options for natural habitat monitoring through the different satellite products. Many challenges facing natural habitat conservation result from population pressure, leading to competition for resources and pressure on natural habitats. Using EO products for monitoring can enhance timely, effective and informed actions in addressing some of these challenges.

"Through Remote Sensing, we are able to effectively monitor the condition of vegetation in protected areas and their surroundings all year round. We can also develop land cover and land cover change maps which help monitor the status of parks" Waiguchu said, noting that satellite-based information has also helped to efficiently monitor fires in protected areas as well as map hotspots for human wildlife conflicts.
A senior thematic Expert, Eugene Kayijamahe, adds that GMES and Africa provides decision-makers with information and tools that will increase their confidence and improve their ability to manage natural resources needed for sustainable socio-economic development.

Deforestation and forest degradation are environmental challenges affecting tropical and dry-land forests in the region. By utilizing satellite information, GMES and Africa is strengthening Tanzania Forest Services agency in Tropical Forest Surveillance (TFS) Monitoring and Assessment. Jared Otieno, the GMES focal person of TFS said Tanzania is endowed with vast forest resources with an estimated total forest area of 48.1 million hectares (ha) representing 55% of the total land area". He added that a range of challenges face the forests which stands among those suffering the highest deforestation rates in the region at 469,420 hectares. The most notable factors for immediate deforestation have been identified as agricultural expansion, overuse of wood energy, especially charcoal production, and frequent forest fires.

This makes the GMES and Africa IGAD applications key in enabling TFS deliver and meet its commitments in global reporting for the REDD+ forest carbon emission monitoring. Agriculture is the mainstay of the economies of the region. Agriculture and rangeland applications, seasonal and early warning assessment aim at filling information gaps with a view to supporting decision making at various levels of the food security chain, policy level, and distribution and extension services. With 80% of the total population in the region relying on agriculture, Earth Observation effectively contributes to addressing the region's pertinent issue of food security. Approximately, 60% of the East Africa Region is Arid and Semi-Arid Land (ASAL). This makes the need to provide timely information for timely decision making a very crucial tool for the prevention of food insecurity.

ICPAC is using satellite and other information to provide timely services. Systems administrator Viola Otieno reveals that this is done by providing up-to-date timely early warning seasonal information that ensures a regional food situation overview. He said forage balance estimation for rangelands through satellite information will inform resource availability and guide on equitable distribution of pasture which has been a constant contributor to instability among pastoralist communities.

RCMRD Embarks on Needs Assessment for its GMES and Africa Partners and Associates

The GMES & Africa Support Programme Delegation Agreement requires the African Union Commission (AUC) to coordinate training activities and implement courses that cut across various needs of all consortia. The AUC developed the GMES and Africa Training Strategy which is aimed at ensuring that Africa's human and institutional capacities in accessing, processing and utilizing Earth Observation products and services are improved and information is communicated through the right channels to inform decision making throughout Africa.

The Training Strategy underscores the need for continuous trainings in EO for the following reasons: EO technology is dynamic in terms of infrastructure and instrumentation; novel sensors are being continuously developed on emerging technologies; data specifications are varying with changing instrumentations, hence the need to keep up with the dynamics; and processing software are changing or being updating on a continuous basis, hence the need to update users and to satisfy the dynamic user requirements and ensure effective ingestion in the daily decision process.

The Regional Centre for Mapping of Resources for Development (RCMRD) signed an agreement with the AUC as well as partner organizations to implement the GMES project on three service areas, namely: Land Degradation Monitoring and Assessment, Wetlands Monitoring and Assessment, and Open Geographical Regional Reference Vector Database for water and agro-ecological zonings. Stakeholders' needs assessment is one of the activities of the GMES and Africa program. To this end, RCMRD organized needs assessment workshops for its GMES and Africa Partners and Associates to provide a synopsis of the RCMRD-led proposal for GMES and Africa; explain the proposed methodologies and work plans; highlight specific roles and responsibilities of different stakeholders at the national level; and discuss and agree on the way forward.

All stakeholders dealing with the three service areas met, shared and discussed the way forward in workshops conducted at Marasa Umubano Hotel in Kigali, Rwanda, on November 26 and 27, at Makerere University in Kampala, Uganda, on November 28 and 29, as well in Addis Ababa, Ethiopia, on December 7 and 8 2018. The workshops were targeted at participants from Rwanda government and non-government institutions including academia, dealing with land degradation, wetland monitoring and management as well as geographic database. The participants were actively involved in the GMES & Africa service development cycle, from development to delivery. The workshops involved presentations from the RCMRD-GMES and Africa team on the background, objectives, methodologies and approaches of each service/thematic area. Participants then discussed in groups and forwarded their observations and recommendations through presentations.

RCMRD is among 13 successful consortia of institutions that were selected by the African Union Commission to serve as regional implementing centres for the GMES and Africa programme. GMES and Africa is an initiative contributing to the Earth Observation domain of the African Outer Space Flagship programme. It builds on the existing projects in the continent that have generated intellectual and infrastructural capacities for the use of Earth Observation applications to enhance decision making in environmental management, through the provision of evidence-based information.

The expanded rationale of the programme is to continue addressing the growing needs of African countries to access and use space-derived data for sustainable development policies through the deployment and integration of Earth Observation systems responding to African requirements and needs in identified thematic areas.

MarcoSouth Fisheries sector stakeholder engagement

Early this year, he Council for Scientific and Industrial Research (CSIR), co-hosted the annual MarcoSouth Fisheries Workshop with the Joint Research Centre (JRC) of the European Commission in Cape Town, South Africa. The event had a focus on the national as well as regional pelagic and demersal sectors, and featured both technical demonstrations and informal discussion of stakeholder requirements. It was attended by consortium partners from the Benguela Current Commission (BCC) and stakeholders from the South African Department of Agriculture, Forestry and Fisheries, as well as several commercial fisheries representatives.

The proceedings included demonstrations of existing capabilities and examples of earth observation tools for fisheries support in Europe and South Africa. Both the JRC and CSIR showcased environmental and oceanographic products including high resolution regionally optimized sea surface temperature, ocean color, frontal products, ocean physics forecast products available through Copernicus Marine Environment Monitoring Services, and preliminary pelagic fisheries catch analyses. User feedback was positive from both industry and management, who regularly use such information to locate species specific environmental envelopes as part of tactical planning during daily operations or stock surveys.

The CSIR also demonstrated its vessel monitoring products and applications. These services, which are based upon region specific vessel location information from both transponder (AIS) and freely available Synthetic Aperture Radar (SAR) data, can serve various agencies and decision makers within the maritime sector, including fisheries, maritime authorities, and environmental agencies. Apart from vessel monitoring applications for fishing fleet management, analytics based on ship speed and movement provide the ability to assess catch effort, an indirect measure of the abundance of a target species. These types of analyses are vital for both fisheries and management.

User requirements included the need for a technical platform that combines high resolution (≤1km) regionally optimized environmental information with smart vessel tracking analytics for fleet management. A great deal of emphasis was placed on the ability to query and analyze historical earth observation parameters in order to assess changes in spatial patterns. Other discussions touched upon the commercial and competitive impact of potential fisheries support tools. It was important to have a clear understanding of the most appropriate public and private service models in a competitive industry with a wide range of existing investment in business intelligence. For example, datasets and tools that could be assimilated in-house into existing environmental models could avoid infringing on existing commercial intellectual property within the industry.

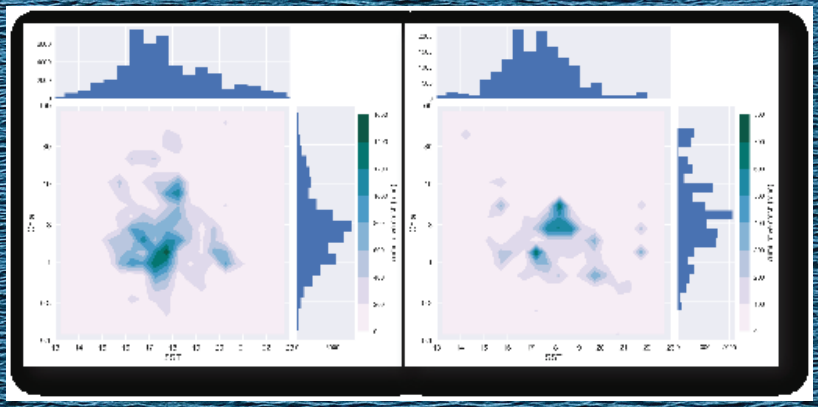
A key objective for the commercial demersal fisheries is obtaining and maintaining the Marine Stewardship Council (MSC) certification for their specific fishery. The MSC certification is an international status indicator for fisheries that have been independently assessed and shown to meet a science-based set of requirements for sustainable fishing.

SATELLITE SYNTHETIC APERTURE RADAR (SAR) INTEGRATION AND OVERLAY

VESSEL MONITORING APPLICATIONS FOR FISHING FLEET MANAGEMENT AND ANAYTICS BASED ON SHIP SPEED AND MOVEMENT

The blue MSC label not only provides fisheries with an enhanced reputation and better visibility, but also provides access to new markets. Currently, only the South African hake fishery is MSC certified. However, several pelagic species including yellowfin tuna, albacore tuna, and sardine, have been pre-assessed in order to encourage these sectors to obtain the MSC certification. Although the MSC certification has the potential to provide a competitive advantage, it is initially expensive to implement and requires cooperation and compliance from industry partners, governing authorities, and environmental agencies. MSC certified fisheries need to show sustainability of the fish stocks, effective fisheries management, whilst minimizing environmental and ecosystem impacts.

One of the most significant outcomes of the fisheries user engagement meeting was the clear overlap between the industry needs and the environmental earth observation and vessel tracking capabilities and analytics that are being developed through GMES and Africa. Some of these include promoting compliance through monitoring of Illegal Unreported and Unregulated (IUU) fishing, and ensuring sustainable management by guiding and improving the efficiency of stock assessment surveys towards delineating sensitive versus potential fishing zones. Aligning the future development of these fisheries tools with the MSC certification requirements not only promotes sustainable industry growth, but ensures continued stakeholder uptake of the products and services.



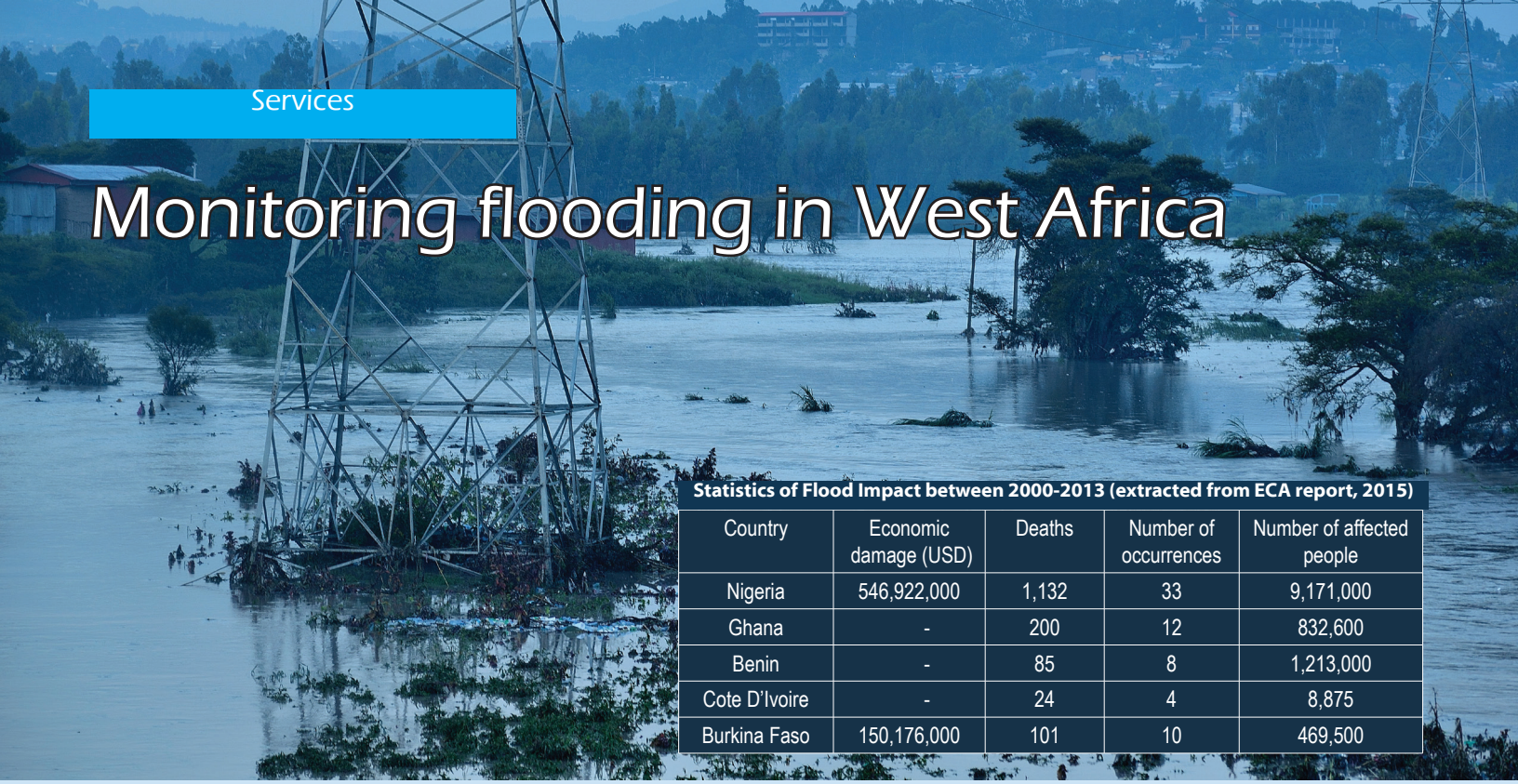
SARDINE CATCH HEAT MAPS SHOWING THE RELATIONSHIP BETWEEN CATCH YIELDS, SATELLITE CHL A, AND SATELLITE SEA SURFACE TEMPERATURE (MODIS). CONTRASTING HIGH CATCH (2013, LEFT) AND LOW CATCH (2017) YEARS ARE SHOWN

Monitoring flooding in West Africa using Earth Observation derived services

Flood disasters across West Africa are a leading cause of socio-economic problems. According to the 2012 World Risk Report, 7 out of the 15 most vulnerable countries in the world are in the ECOWAS sub-region. Globally, flooding accounts for 42% of natural disasters. No wonder the advent of the rainy season across West Africa is met with mixed feelings. As much as it is a break from the heat of the dry season, necessary for the abundance of food and other necessities, it can also herald a season of destruction and loss, as well as prolific mayhem. The turbulence depicted in the anecdote below, is a typical rainy season scenario:

"In the past, I could look into the sky and predict whether it would rain, to a fair level of accuracy; but in recent times, my predictions have failed. On this particular day, the sky was clear and it was sunny; it was a bright day. Since it had rained consecutively for three days and three nights, I did not expect any rain. So I went out, dressed for recreation. But I always kept an umbrella. Suddenly, within two hours, and without any signs, the sky turned blue, then grey, then black. The winds gradually became heavy, raising dust and throwing up objects. Car horns increased as drivers started driving fast to get to their destinations. As the horns increased, so car screeches increased, as pedestrians attempted to cross roads with less care. It was like a pandemonium, as people shouted on one another, cursed, and scrambled for shelter. Then the downpour started again. Soon, the potholes on the roads started filling up; the drainages started filling up and spilling their contents on the road. We waited one hour, two hours, then three hours, but the rain would not stop. The water on the roads kept increasing. Vehicles started breaking down on the road. People who had hidden under shelters were no safer there and so had to wade through the water towards their destinations." page 14

Monitoring flooding in West Africa



Statistics of Flood Impact between 2000-2013 (extracted from ECA report, 2015)

Country	Economic damage (USD)	Deaths	Number of occurrences	Number of affected people
Nigeria	546,922,000	1,132	33	9,171,000
Ghana	-	200	12	832,600
Benin	-	85	8	1,213,000
Cote D'Ivoire	-	24	4	8,875
Burkina Faso	150,176,000	101	10	469,500

Raining days un-end or one terrific downpour is a familiar precursor to flooding in most communities. Farming activities, fishing, trading and other outdoor activities all get disrupted. In the past few years, the region has been having an increased volume of rain for longer periods. Many have attributed this to climate change.

Within the past decade, Nigeria accounted for a significant proportion of disasters (324) in the sub-region, with fatalities of 15,492 persons, 9.34 million people affected and about US$ 690 million in assets and livelihood destroyed (ECA 2015 report). According to the World Bank in 2012, droughts and floods account for 80% of loss of life and 70% of economic losses in sub Saharan Africa. In 2018, NADMO reported that 32 people died in Ghana as a result of floods, and over 100,000 displaced. In Nigeria, NEMA recorded 141,369 displaced people, 108 deaths, 192 injured and 13,031 houses destroyed across 8 states. In June 2018 alone, the National Civil Protection Office of Ivory Coast, recorded up to 18 flood-related deaths.

The severity of flooding at times can be attributed to rapid urbanisation and over-population, poor planning, poor infrastructure, overused facilities, bad drainage systems, and lack of public awareness. The trend can be minimised or mitigated when governments and institutions are empowered with the right information and capability.

The good news is that the Multiscale Floods Monitoring and Assessment Services (MIFMASS) project (a project under the GMES and Africa programme) is here to bridge the gap in managing floods by using Earth Observation and providing technical know-how to relevant stakeholders. It is expected that the negative impact of flooding will be mitigated and the losses that accompany every rainy season significantly reduced. MIFMASS is the project of the CSSTE-consortium, made of 7 Partner institutions from five West African countries (Nigeria, Benin, Ghana, Burkina Faso and Cote D'Ivoire). It is responsible for taking on the great challenge of providing and integrating solutions that are satellite services-based into the traditional and conventional ways of managing the challenge of flooding.

One of the key objectives of this project is to ensure continuity through ownership by State, national governments and institutions. This will be achieved through training and building the capacity of the relevant stakeholders in the use of Earth Observation (EO) data. It will also involve satellite data transformed into flood hazard maps that can provide early warning, people receiving flood alerts around flood prone zones, establishing an updatable flood event database, damage assessment services to governments, insurance companies and NGOs in providing timely and effective relief services to affected population. The study sites across the five countries for this project are: Ogun-Osun River basin, Oueme Basin, Abidjan, Black Volta and Bobo-Dioulasso. It is crucial to collaborate with existing national institutions, NGOs, the media and academia as well as interact with the residents around trouble spots across the aforementioned countries to address flooding challenges and ensure a sense of ownership. The project's overriding focus is to develop capabilities in the use of EO to solve local challenges to ensure longevity, continuity and sustainability.

The expected results of this project are compliant with four of the seventeen Sustainable Development Goals (SDGs) for transforming our world. They also align with the sustainable development activities of the ECOWAS Disaster Risk Reduction (DRR) division. These include the development of programmes focusing on developing institutional capacities for disaster forecasting, prevention, early warning, mitigation of effects and rebuilding for future risk reduction.

Ocean state early warning made sustainable in the Gambia by policy makers

Satellite Earth Observation (EO) technology is making impacts in the life of Gambian artisanal fishers. The Gambia is a small West African country, bounded by Senegal, with 80 km narrow Atlantic coastline; where the fisheries sector plays a critical role in poverty alleviation. Not only does it provide a source of revenue and foreign exchange earnings for the country, it also contributes significantly to food and livelihood security towards achieving the Sustainable Development Goals 1 (No poverty) and SDG 2 (Zero Hunger). The fishery sector is the third largest food provider and is the main supplier of animal protein in the diets of most Gambians. The country is part of the GMES and Africa West Africa Consortium led by the University of Ghana.

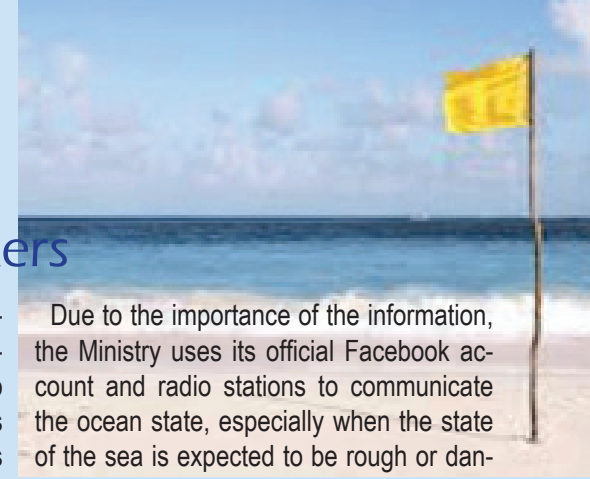
As part of measures to ensure safety at Sea for fishermen, the Department of Fisheries in collaboration with its line Ministry of Environment, Climate Change & Natural resources, and the National Sole fishery Co-management Committee (NASCOM), embraced the dissemination of ocean state via SMS to fishing communities in The Gambia.

The initiative began under the Monitoring for Environment and Security in Africa (MESA) project sponsored by the EU and is now made sustainable from funding by the Gambian Fisheries Department. It is aimed at sending forecast of daily ocean conditions with the objective of informing artisanal fishermen on dangers at sea prior to embarking on their fishing expeditions. This reduces accident at sea and protects lives and property of fishermen, from dangerous ocean weather conditions.

Fishermen, Fire and Rescue officers, and fisheries officers of various landing sites were purposely selected and trained to receive, interpret, monitor and communicate the daily ocean weather forecast by use of various flags after receiving the SMS messages. The daily Forecasts messages come as “1” for CALM, “2” for ROUGH, and “3” for DANGEROUS

To broaden the scope of the ocean state information receivers, three different colors of flags were issued to either the Fire and Rescue Service officers or the head of the fishermen association at each landing site. The flag colors were White, Yellow and Red.

A White hoisted flag depicts a “calm” condition; a yellow flag goes for a “moderate” condition, while red signifies a “dangerous” condition. All the ten coastal fishing communities in The Gambia, from Banjul to Kartong received the flags and poles, which are planted at visible key areas for sharing the information on the ocean state.



Due to the importance of the information, the Ministry uses its official Facebook account and radio stations to communicate the ocean state, especially when the state of the sea is expected to be rough or dangerous.

According to the fishermen, this initiative, which started in January 2017, has been very beneficial in saving their lives and property. Before this service started in The Gambia, they were dependent on Senegal to provide a forecast of ocean weather, which sometimes delayed their fishing trips. This service has made The Gambia self-reliant and helped reduce the time and cost of disseminating information to the fishermen. No accident has been recorded since the commencement of this initiative. The early warning messages also have local economic implications, whereby the local communities anticipate when fish at the market could be scarce or expensive, depending on daily fishing activities.

With the EO information that is made available through GMES and Africa, the Gambia will continue benefiting from the forecasting of ocean state, monitoring of potential fishing zones maps and vessel traffic. The country also expects to extend the use of EO data to the monitoring of its mangroves and erosion hotspots.

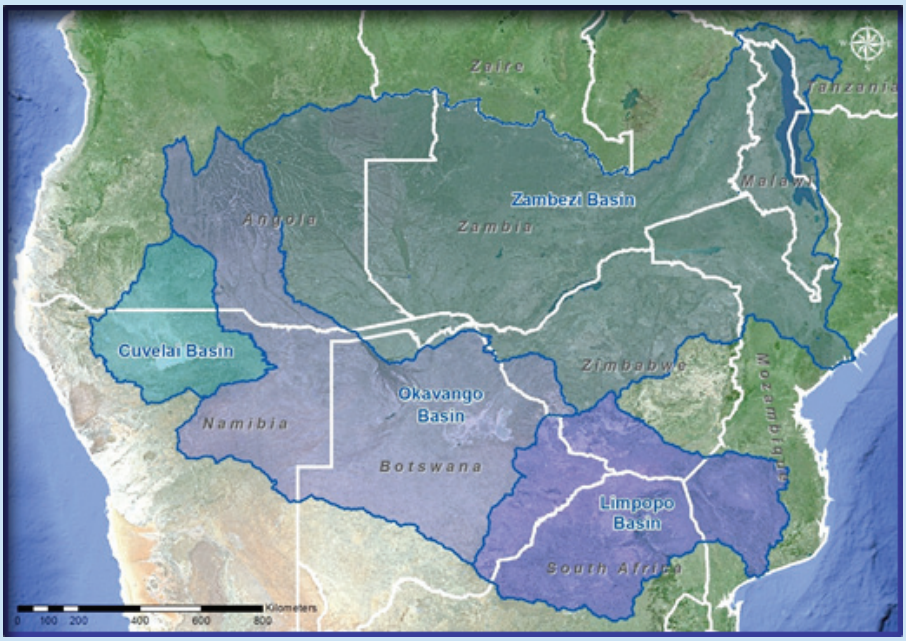
Officials from the Fisheries Department sensitizing Fire & Rescue officers and Fishermen on the use of Flags to disseminate ocean state information that they receive via SMS, Bakau landing site, the Gambia

The SASSCAL-GMES and Africa Project: Developing an Integrated Platform for Wetland Monitoring and Assessment for Southern Africa

The Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL), leads one of GMES and Africa's Southern Africa Consortia. The consortium includes ten partner universities and research institutions including the University of Zambia, University of Zimbabwe, University of Botswana, University of Limpopo, University of Western Cape, Copperbelt University, University of Namibia, Botswana International University of Science & Technology, Midlands State University and Namibia University of Science & Technology) and two key service developers –South African National Space Agency (SANSA), and the Zambia National Remote Sensing Centre (ZNRSC).

The Wetland Monitoring and Assessment Service for Transboundary Basins in Southern Africa (WeMAST) is the dedicated GMES and Africa project that will develop and implement an earth observation-based online platform that supports Sustainable Wetland Assessment and Monitoring Services, promotes policy implementation and management practices in the SADC region, and utilizes free satellite-based EO data and existing free software. The online platform will be integrated into the WeMAST website (http://wemast.sasscal.org/).
WeMAST aims to create products and services in line with the concept of "with the Users for the Users".

The objectives of WeMAST are to identify existing assessment and monitoring methods applicable to southern Africa; design, develop and operationalize an integrated platform that can provide wetland information services to target groups and end users; and extend existing EO capabilities to SADC decision makers for wetland assessment and monitoring through capacity building and leveraging awareness.



Map of Transboundary River Basins in Southern Africa

WeMAST Products & Services

The following WeMAST products and services will be made available via the online web portal:

- Wetland inventory (mapping extent floodplains, swamps, marshes, and other surface water bodies),
- Information on water cycle regimes (duration, extent and timing of flooding),
- Information on vegetation dynamics,
- Inland water quality mapping (algal blooms and total suspended matter),
- Wetland utilization and land cover information that will support sustainable management of selected transboundary river basins.

The platform will integrate existing data products and tools to implement a sustainable wetland management system, by drawing on the experience from the SASSCAL-led consortium, partners and other key stakeholders across regional, national and local institutions.

Project Basins

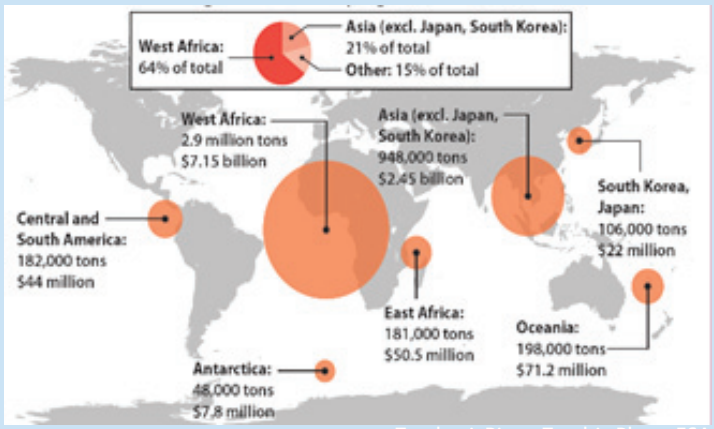
The WeMAST project will provide products and services for the management of the wetlands of the transboundary river basins in Southern Africa (table below)

To this end, the SASSCAL-GMES and Africa WeMast project will collaborate with the applicable river basin commissions active in these basins.

The SASSCAL GMES and Africa Project Transboundary River Basins in Southern Africa

Basin	Basin area	Riparian Countries
Cuvelai Basin	173 686 km2	Angola & Namibia
Limpopo Basin	411 553 km2	Botswana, Mozambique, South Africa & Zimbabwe
Okavango Basin	704 275 km2	Angola, Botswana, Namibia & Zimbabwe
Zambezi Basin	1 383 498 km2	Angola, Botswana, Namibia, Malawi, Mozambique, Tanzania, Zambia & Zimbabwe

African Blue Economy, Marine Sustainability and Economic Growth



Zambezi_River_Zambia Photo ESA

Sustainable Development Goals (SDGs) is a global framework for economic growth and sustainable use of resources by 2030. Blue economy by the numbers, the United Nations Environment Program estimates that half the world's population lives within 60 kilometers of the sea. It also estimate that three quarters of all large cities are located along the coast. According to the International Maritime Organization, the sea facilitates global trade by up to 70% by value, and up to 90% by volume. The blue economy relates to the sustainable use and conservation of marine and aquatic resources, including: Seas, oceans, lakes, and rivers. Blue economy relates directly to SDG14 and indirectly to many others such as SDG1, SDG2, SDG3, SDG13, and SDG15.

The northern African countries have a long coastal shoreline that is wealthy, and full of natural resources that attract local community and governments to development. Currently, there are more than 140 cities distributed on this coastline that accommodate more than 170 Million inhabitants. There is a growing need to maximize the value and benefit of coastal resources for societal benefits and socio-economic development. This could be through accurate mapping and efficient quantification of the coastal ecosystems and their economic value and at the same time assess the vulnerability of these ecosystems to both natural and environmental threats. GMES and Africa is fostering the work towards developing an operational tool for coastal ecosystems mapping, monitoring and assessment of the North African countries based on time series information by funding projects of this direction including the NAfCOAST project (North African Coastal Zone). This could be easily achieved by earth observation rather than through other localized or limited coverage source. The project will also build synergy and integration for operational services in the Northern African region.

Blue Economy includes many activities such as fishing, tourism, maritime transport, exploration of natural resources such as gas and oil, as well as emerging activities such as fish farming, extractive activity of seabed minerals and marine biotechnology, as well as other activities. It aims to develop and promote economic growth, fight poverty and improve the quality of life by exploiting the wealth of the sea, whilst striving for its sustainability and preservation. The Food and Agriculture Organization estimates that blue economy industries assure the livelihoods of 660 to 820 million people worldwide. It estimates that women account for about 15% of people directly engaged in fisheries. The World Bank estimates that oceans absorb about 25% of the extra carbon dioxide added to the atmosphere by burning fossil fuels. Oil and gas remain major sources of world energy with roughly 30% of production being offshore.

A big and fruitful African event has been established in Kenya (November, 2018) seeking and unifying efforts for a sustainable blue economy in Africa http://www.blueeconomyconference.go.ke/. Another conference with the same purpose is to be held in Egypt during September, 2019 organized by Suez University and will gather all the African countries with experts and scientists to achieve the sustainable development and the African agenda 2063.

However, there are regulatory challenges including; lack of shared prosperity, weak legal, policy, regulatory and institutional frameworks, exclusion of those most affected in decision-making processes, and lack of consideration for ecosystem service values to support sustainable policy decisions. To overcome these challenges and seize growth opportunities, we must allocate more resources to sustainable investment. One of the main advantages of the "Blue Economy" is its economic efficiency and reliance on low carbon emissions in various activities. The objective is to reduce carbon emissions, reduce pollution and make good use of energy resources, in addition to the good exploitation of natural resources and the conservation of biodiversity and other environmental services provided by

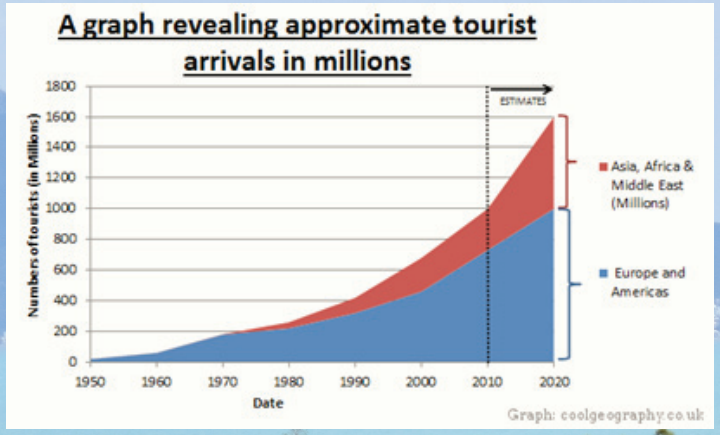
African Blue Economy, Marine Sustainability and Economic Growth

the ecosystem.

The blue economy in the Mediterranean region can be a major source of new employment opportunities and economic growth. It is considered a new incubator for sustainable growth in Egypt due to the large maritime area extending over four thousand kilometers between the Mediterranean Sea and the Red Sea, as well as the lakes and the Suez Canal. In this frame, Egypt participated in the European Initiative "Sustainable Development of the Blue Economy in the Western Mediterranean", among which objectives includes the preservation of Mediterranean biodiversity; especially with the ecological reports that convey that the area has lost about 50% of its biological diversity over the past 50 years.

Egypt has taken great strides in the area of development associated with the blue economy, since some of Egypt's coastal tourist destinations are considered among the most successful destinations having special attractiveness at the global level and generates a large income that contributes significantly to the country's national economy. On the other hand, Egypt has adopted a special policy related to the development of fish farming and has established one of the most successful systems in different parts of the country. The Development Project of the Suez Canal represents a driving force and an integrated example of the Blue Economy, exploiting the potential of the unique marine environment of the Suez Canal. By 2022, wind power will be 3.53 GW, representing 8.8% of the total 40.2 MW of the total power generation expected at that time.

Egypt and three other African countries are sharing the research and modeling the data of the northern coast of Africa under the umbrella of the African Union to develop appropriate services on the coastal ecosystems to maximize the use of the blue economy of the northern coast for social and economic development.



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