

THE EUROPEAN – AFRICAN PARTNERSHIP IN SPACE APPLICATIONS

CHRISTINA GIANNOPAPA

Resident Fellow, European Space Policy Institute

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Introduction

The African continent, with over one billion people, has the fastest growing population in the world. The majority of the population lives in poverty, and the 53 states on the continent are still classified by the United Nations and International Monetary Fund as developing countries. They are facing problems in meeting the basic needs of their people in basics such as food, water, housing, and in healthcare and education.

Sustainable development in Africa requires access to data, information, knowledge and in all of these areas space technologies through the use of satellites can provide tremendous benefit. The

transversal nature of space touches a wide range of policy issues, including environment, agriculture, health, security, education, and disaster management, and effective use of space assets can significantly facilitate growth and sustainable development across the continent.

Although there is much activity in the African continent regarding space applications, little is known about how space applications are utilized by African actors, and how cooperation between Africa and Europe is organized and conducted on various levels. Hence, this Chapter attempts to give such an overview.

It begins by discussing the various bodies involved in African-European cooperation, and the various African and European actors with a space interest in particular. It then examines the political, economic, social, technological and legal barriers to making greater use of space applications, before offering conclusions and outlook on how this situation can be improved, and space can be used more widely for sustainable development.

No other continent can benefit more fundamentally from space applications than Africa, and it will be through partnerships such as the one between Europe and Africa that will be instrumental for realizing this great potential and improving the living conditions and prospects of its vast population.

The Africa–EU Partnership

Africa and Europe as geographic neighbors share a long-standing history and traditions of cultural and social exchange. The cooperation at various levels between the European and African countries dates back centuries, but over the last decade it has been significantly strengthened and sealed by the political commitments of their leaders.

The first Africa-EU Summit took place in Cairo in 2000, setting the basis for a constructive dialog and joint action. Since then, with the establishment of the African Union (AU) in 2002, Europe has found an institutional partner, and over the last decade Africa and the European Union have developed common political strategies, policy documents, and action plans as a basis for their cooperation. These include the 2004-2007 Strategic Plan of the African Union [1], the 2005 “EU and Africa: Towards a Strategic Partnership” and the 2008 “The Africa-European Union Strategic Partnership” [2]. Subsequently, the First Action Plan (2008-2010) for the implementation of the Africa-EU strategic partnership was adopted in December 2007. The Third Africa-EU Summit took place in Libya on

the 29-30 November and the Second Action Plan (2011-2013) was adopted [3,4].

The joint Africa-EU strategic partnership defines long-term policy orientations, based on a shared vision and common principles, on human rights, freedom, equality, solidarity, justice, the rule of law, and democracy. It intends to bridge the efforts of the Africans and the European Union and its Member States for development in the African continent through coordination of economic cooperation and promotion of sustainable development. The joint strategy provides the basis for a long term approach, and is implemented via short term (three year) Action Plans with concrete and measurable outcomes.

In order to finance the Action Plans, financial instruments are used such as [1]: the European Development Fund (EDF), the Development Cooperation Instrument (DCI), the European Neighbourhood Policy Instrument (ENPI), the Instrument for Stability, as well as the Thematic Programmes and through EU financial institutions, such as the European Investment Bank (EIB). Individual European member states provide also support when needed. From the African side, African financial institutions are involved, as is the African Development Bank (ADB).

In particular, the Strategy's First Action Plan, which was adopted in December 2007, outlines eight areas for strategic partnership with priority action for the period 2008-2010:

1. Peace and Security
2. Democratic Governance and Human Rights,
3. Trade, Regional Integration and Infrastructure,
4. Millennium Developments Goals,
5. Energy,
6. Climate Change,
7. Migration, Mobility and Employment,
8. Science, Information Society and Space Partnership.

The eighth explicitly mentions space, and it is recognized that space applications provide an essential platform for Africa's regional and continental sustainable development and can assist in tackling the problems Africa is facing including monitoring climate change. The priorities within this area are to: support the development of an inclusive information society in Africa; support science and technology capacity building in Africa and implement Africa's science and technology consolidated plan of action; enhance cooperation on space applications and technology..

The aim is to fully integrate space related issues in specific dialogues

and cooperation initiatives in areas such as environment and resource management, climate change, peace and security. Various activities have been developed focusing on utilizing the potential of space applications to better manage natural resources, improve living conditions of populations, and promote sustainable development.

Areas of focus have been telecommunications to bridge the digital divide; use of the Global Monitoring for Environment and Security (GMES) for Africa for monitoring of climate change, desertification or fires, and water and food resources; use of the European Geostationary Navigation Overlay Service (EGNOS) and in the future Galileo for navigation applications. Integrated space applications have already been facilitating humanitarian aid operations and improving security of populations through integrated space applications.

Additionally, various projects have been focusing on space technologies and scientific applications as contributors to support creating knowledge based society for Africa. The main actors in for these activities and various projects mentioned in the action plan are the African Union Commission (AUC), EU, European Member States, the European Space Agency, EUMETSAT.

Figure 3 shows schematically the European and African Actors involved in space applications in Africa.

Due to the transverse nature of space there are also other areas which make use and benefit from space based information and satellite applications, such as Partnership 3 for infrastructures and Partnership 6 in climate change. In particular, climate change and space systems can contribute mainly in promoting climate observation for the African continent, enhancing links to global climate observatory systems, and strengthening climate-monitoring and forecasting capacities.

The Climate Information for Development in Africa Programme (CLIMDEV Africa) is one of the major programs implemented under this partnership, and recognizes the usefulness of space systems. It is a joint initiative of the AUC, United Nations Economic Commission for Africa (UNECA) and African Development Bank (ADB), and aims to find ways to overcome the lack of necessary climate information, analysis and options required by policy and decision-making at all levels.

Another project, the African Monitoring of the Environment for Sustainable Development (AMESD), is involved in the establishment of the necessary infrastructure for climate change information systems. This project is implemented by the AUC for Phase I, 2007-2012 and is aiming at strengthening the capacities of African institutions to use satellite-based

Earth Observation information for decision making in various environmental themes that are impacted by climate change (agriculture, land degradation, water management, etc). AMESD builds on the success of the preparation for the use of Meteosat Second Generation in Africa (PUMA) programs and paves the way for the Global Monitoring System for the Environment and Security (GMES) in Africa. The program is being executed in close cooperation with the Regional Economic Communities (RECs), EUMETSAT, UNECA, World Meteorological Organisation (WMO), United Nations Environment Programme (UNEP), European Commission (EC), EU and African Member States.

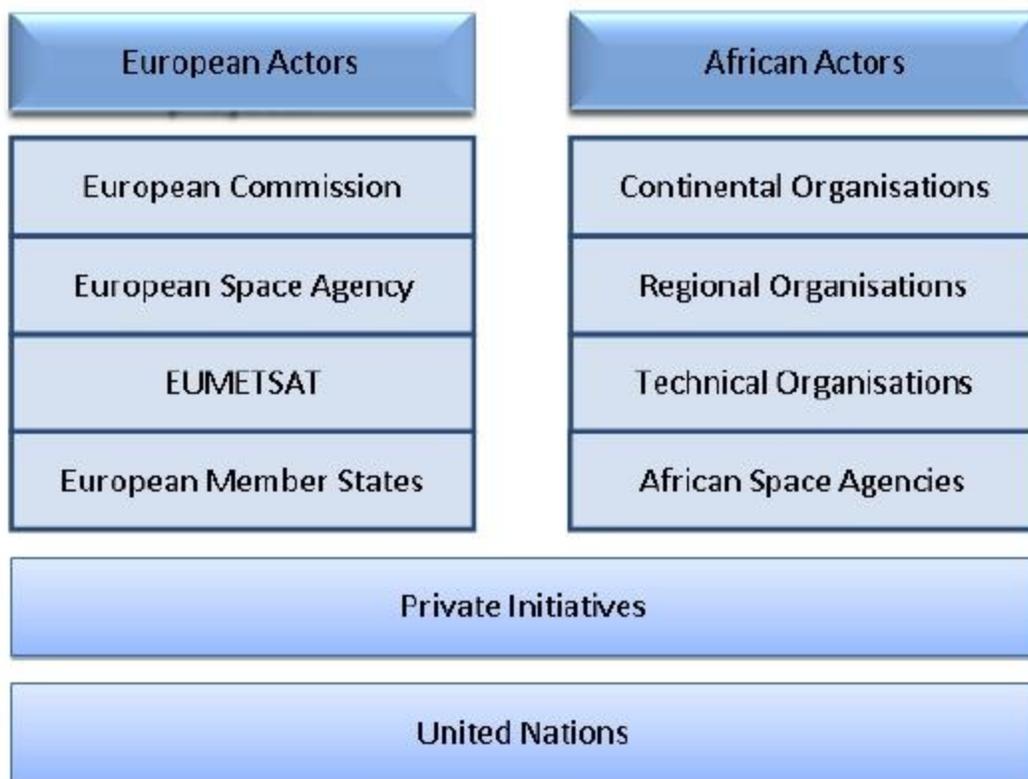


Figure 3: Main African, European and International Actors involved in space applications.

The Strategy's Second Action Plan covering the period 2011 to 2013 was adopted in November 2010 and maintains the eight areas for strategic partnership already identified by the First Action Plan. Under Partnership 8, where explicit reference is made for space, the progress made under the First Action Plan has been assessed, and during the third Africa-EU Summit and it was agreed to launch a high-level Science and Technology policy dialogue between senior officials at Ministerial level. Additionally,

the Summit agreed that for the implementation of the future activities it is essential to reinforce cooperation with the RECs, and coordination will take the form of meetings to take place every six months between the AU and the RECs. In Partnership 8 it is recognized that in order to achieve the Millennium Development Goals (MDGs) it is important to raise science and technology capabilities and use of Information and Communication Technologies (ICT) and applications.

African Actors

The African actors include organizations that operate at the continental level such as the African Union (AU), regional organizations typically the Regional Economic Communities (RECs), technical organizations such as specialized agencies and institutes in different areas and the African space agencies. Figure 4 shows the various policy relevant actors in Africa and the matrix relationship for cooperation between them.

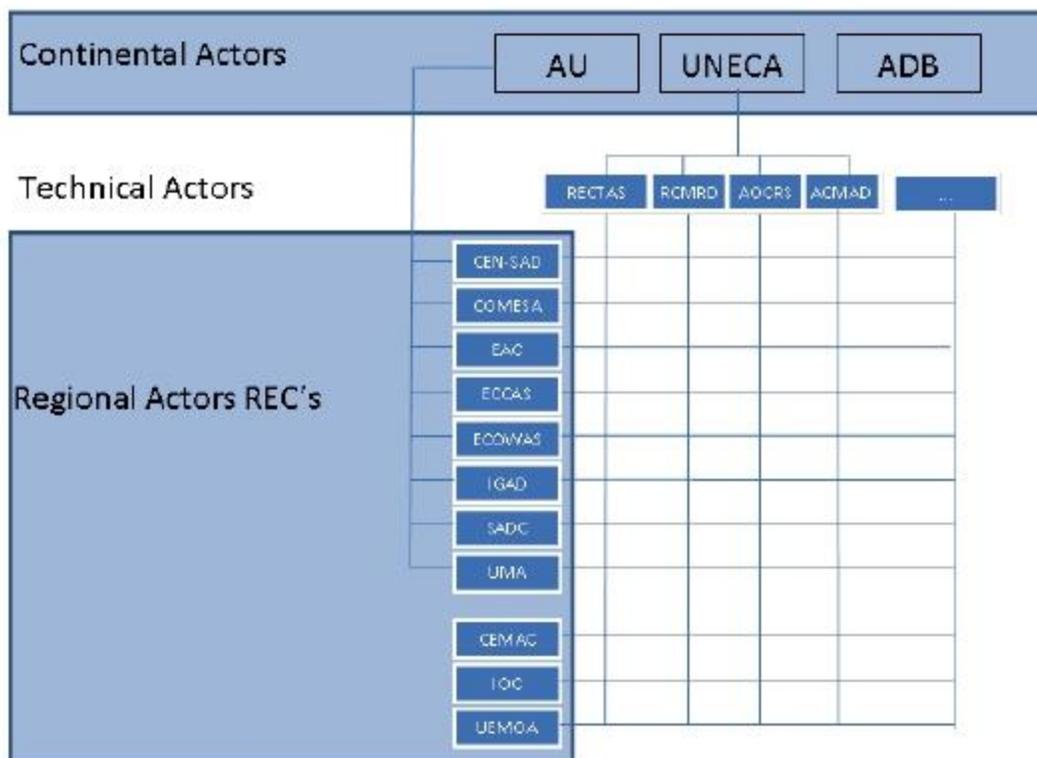


Figure 4: Policy Relevant Actors in Africa

Continental Actors

At the continental level the African Union (AU), the United Nations

Economic Commission for Africa (UNECA) and the African Development Bank (ADB) have a joint secretariat. These three institutions have distinct roles. The AU has the political mandate, the ADB has the financial mandate and the UNECA is responsible for economic issues. The three institutions largely operate independently, so the role of the secretariat is to assist in coordinating their actions and see how best to advocate for common policy positions.

Historically, the predecessor of the AU is the Organization of African Unity (OAU). Four Summits led to the establishment of the AU on July 9, 2002. In this process there has been the establishment of institutions such as the African Central Bank, the African Monetary Union, the African Court of Justice and especially, the Pan-African Parliament. Additionally, the Regional Economic Communities (REC's) have been strengthened and consolidated as the pillars for achieving the objectives of the African Economic Community and realizing the envisaged Union. The African Union Commission (AUC) is the Secretariat of the Union with executive functions. It represents the Union and protects its interests under the auspices of the Assembly of Heads of State and Government as well as the Executive Committee (See Figure 5). The headquarters of the Commission are located in Addis Ababa, Ethiopia. The role of the AUC is similar to its counterpart in Europe - the European Commission (EC) of the European Union (EU). The AUC consists of chairperson H.E Dr Jean Ping from Gabon, his deputy H.E. Erastus Jarnalese Onkundi Mwencha from Kenya, and a number of commissioners dealing with different policy areas. The space portfolio falls under the Commissioner for Human Resources, Science and Technology H.E. Dr Jean Pierre Onvehoun Ezin, from Benin. The AUC initiated the establishment of a pan-African University, which is a network of African higher education and research institutions, with thematic hubs in each of the five geographic regions of Africa (Eastern, Western, Central, Southern, and Northern). The space discipline has been fostered in South Africa. The first four thematic institutes are expected to be launched in 2011.

Many agencies, departments and programmes of the United Nations are active in Africa. A selected list includes the following:

- UN Secretary General
- UN Security Council
- UN Special Adviser on Africa
- UN Cartographic Africa Renewal
- UN African Missions
- Climate Change-Copenhagen

- FAO, Sustainable Development
- And many others.

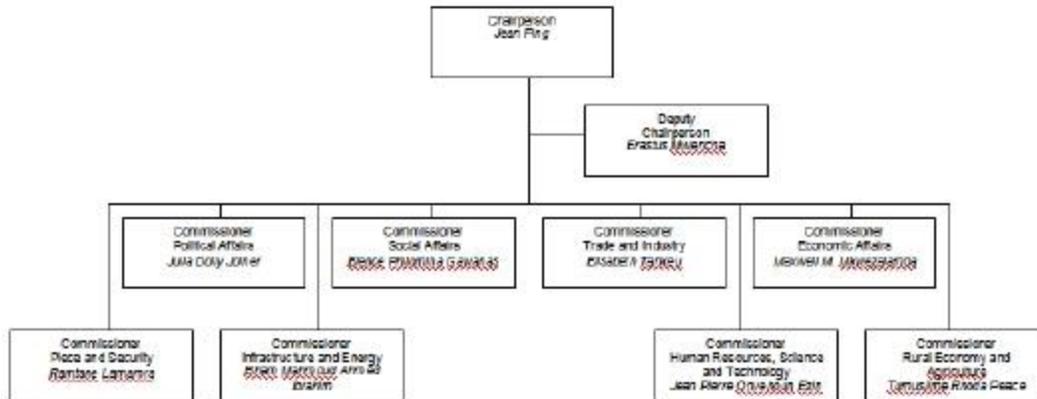


Figure 5: African Union Commission

Within the United Nations family of specialized agencies, the FAO (Food and Agricultural Organization), the ITU (International Telecommunications Union), WMO (World Meteorological Organization), IMO (International Maritime Organization) and UNESCO (United Nations Education, Scientific and Cultural Organization) have been actively involved with satellite remote sensing technology, space communications, satellite meteorology and space science as it pertains to Africa.

The United Nations Economic Commission of Africa (UNECA) is one of the UN's five regional commissions. UNECA plays a very active role in African development, particularly in the area of ICT and Science and Technology. However, UNECA does not have a specific space program; space technologies and their applications are part of other programs. The choice of activities it undertakes is based on needs expressed by Member States and the RECs. In that context, the focus of UNECA service delivery is at the regional and sub-regional levels with its five Sub-Regional Offices (SROs). The SROs serve as vital links between policy-oriented analytical work generated at headquarters and policy making at the sub-regional level. UNECA also provides technical assistance and policy advice to African countries and the RECs. Under its auspices the technical bodies RECTAS, RCMRD, AOCRS and ACMAD were created to achieve the technical implementation of various projects.

Although they do not have specific space programs, some organizations and programs of the UN use satellite-provided information and applications to achieve their goals. The World Food Programme (WFP) is the world's largest humanitarian agency that fights hunger around the

world, and is very active in Africa. Satellite and radar imagery provides the WFP and its partners with valuable information regarding climate change, early warning, disaster management and emergency response. It can also provide information for food security. The UN Food and Agriculture Organization (FAO) has the mandate to raise levels of nutrition, improve agricultural productivity, better the lives of rural populations, and contribute to the growth of the world economy. The UN Environment Program (UNEP) has the mandate to coordinate the development of environmental policy consensus by keeping the global environment under review and bringing emerging issues to the attention of governments and the international community. The UN Human Settlements Program (UN-HABITAT) is the UN agency responsible for human settlement, and focuses on promoting socially and environmentally sustainable towns and cities, with the additional goal of providing adequate shelter for all.

The World Meteorological Organization (WMO) coordinates environmental satellite matters and activities, and provides guidance on the potential of remote-sensing techniques in meteorology, hydrology and related disciplines and applications. The United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) aims at ensuring that all countries and international and regional organizations have access to and develop the capacity to use all types of space-based information to support the full disaster management cycle. UN-SPIDER has been involved in a number of initiatives that make space technologies available for humanitarian and emergency response.

In order to avoid fragmentation in the UN actions, since January 2007, eight countries have been piloting approaches to delivering as “One” according to the circumstances of the countries. Among these, four are in Africa: Cape Verde, Mozambique, Rwanda, Tanzania.

Regional Actors

From the 1960s to the 1990s, African nations created regional economic communities targeting economic cooperation and integration. Today there are numerous regional blocks in Africa, also known as Regional Economic Communities (RECs), which facilitate mutual economic development among various African states. Many functioned for some years, and then after decades were revised and re-established. Africa has the highest number of such cooperation and integration agreements. There is no country in Africa that does not belong to at least one grouping, and most belong to two or more of these groups.

Africa's regional integration was given a boost in 1991 by the adoption of the Abuja Treaty, which established the African Economic Community (AEC) with the objective "to promote economic, social and cultural development and integration of African Economies in order to increase economic self-reliance and promote an endogenous and self-sustained development."¹ The foundation of the Treaty states that the African Economic Community must be established largely through the coordination, harmonization and progressive integration of the activities of the RECs.²

Technical Actors

In Africa there are various technical actors including the space agencies of some countries, the technical institutions which have been created under the auspices of UNECA, as well as numerous other local technical centers, institutes, organizations, and associations.

Five African countries have their own space agencies:

1. Algeria (Agence Spatiale Algérienne ASAL),
2. Egypt (National Authority for Space Science and Remote Sensing, NARSS),
3. Morocco (Centre Royal de Télédétection Spatiale, CRTS),
4. Nigeria (National Space Research and Development Agency, NASRDA) and
5. South Africa (South Africa National Space Agency SANSA).

Discussions about the establishment of a continental institution which would work in cooperation with the AU date back to 1991, and the AU project for the establishment of an African Space Agency was finally launched in 2010.

Various technical institutions act as the technical executive for

¹ OAU, Abuja Treaty, Article 4.

² The REC's that have become pillars of the African Union are: Community of Sahel-Saharan States (CEN-SAD), Common Market for Eastern and Southern Africa (COMESA), East African Community (EAC), Economic Community of Central Africa States (ECCAS), Economic Community of West African States (ECOWAS), Intergovernmental Authority on Development (IGAD), South African Development Community (SADC), and Union du Maghreb Arabe (UMA). The other REC's, often described as sub-regional economic communities (SECs), are: Communauté Économique et Monétaire de l'Afrique Centrale (CEMAC), Indian Ocean Commission (IOC), Union Economique et Monétaire Ouest Africaine (UEMOA), Communauté Economique de Pays des Grands Lacs (CEPGL), Mano River Union (MRU), Southern Africa Customs Union (SACU), West African Monetary Zone (WAMZ).

various projects under the auspices of UNECA. They cooperate in a matrix-like relationship with UNECA, the AU and the RECs. These are:

- Centre for Training in Aerospace Surveys (RECTAS), focusing on geo-informatics, remote sensing, geographic information systems and cartography,
- The Regional Center for Mapping of Resources for Development (RCMRD), focusing on geo-information and information technology,
- The African Organization of Cartography and Remote Sensing (AOCRS), focusing on cartography and remote sensing and
- The Centre of Meteorological Application for Development (ACMAD), focusing on information for weather, climate and environment.

European Actors

The main European Actors highlighted for the African-EU partnership that are mentioned in the first and second Action Plan are the European Commission, the European Space Agency (ESA), EUMETSAT, and the European Member States. Apart from these, there are also many NGOs that are operating in African and various private bodies and companies.

The European Commission (EC) under various directorates is working very closely with the African Union Commission (AUC). With the establishment of the European External Action Services (EEAS) the role of the EU delegations in Africa and RECs capitals has been strengthened. In particular, the permanent delegation of the EU to the AU in Addis Ababa has an important role in coordinating EU policy and action relating to the AU, helping and supporting the AU in the areas outlined in the Africa-EU strategy. There are numerous projects in Africa, including two very important projects in relation to space that are associated to the EU's space Flagship Programs, Galileo together with the European Geostationary Navigation Overlay System (EGNOS), and Global Monitoring for Environment and Security (GMES).

EGNOS is Europe's precise positioning and timing system, augmenting satellite signals currently using the GPS signal. In the future they will use Galileo to combine space, ground and control system components which can potentially cover all of Africa to provide augmented navigation signals supporting aviation, maritime, road, farming, mining, energy, land planning, and search and rescue efforts. EGNOS has already

been tested in cooperation with the Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA) for the aviation sector, demonstrating benefits including safer landings, increased efficiency, more reliable air services for passengers, and better access to remote regions of Africa.

The GMES and Africa initiative was initiated by the Lisbon declaration on GMES and Africa (2007) in response to the Maputo Declaration (2006). It aims at strengthening the capacities and developing infrastructure for the intense and coherent exploitation by African users of Earth Observation (space and in-situ), data, technologies and services in support of the environmental policies for sustainable development in Africa. The GMES and Africa Action Plan was expected to be adopted by the end of 2011.

The European Space Agency (ESA) promotes cooperation in space research, technology and applications, and is broadly involved in international cooperation with other spacefaring nations and also developing regions including Africa. Two important projects strengthen the cooperation between Africa and ESA, which are the GMES and TIGER initiatives. The TIGER initiative started in 2002 in response to the urgent need for action stressed by the Johannesburg World Summit on Sustainable Development (WSSD) regarding water resources. It is an ESA-funded project aimed at helping Africa through the use of Earth observation technologies to overcome problems in collecting, analyzing and disseminating water-related geo-information.

EUMETSAT's main activity to deliver weather and climate-related satellite data provides support in developing countries including those in Africa. Since 1996, EUMETSAT has been active in Africa, cooperating with ASECNA in training activities on satellite meteorology in Africa. With the regional center AGRHYMET, which focuses on food security and increasing agricultural production, it cooperates to foster the use of satellite data for operational and development activities, including rainfall estimates, training and agro-meteorological and hydrological applications. It cooperates also with ACMAD for the use of METEOSAT data and in the PUMA project. In 2008 it signed a cooperation agreement with the African Union Commission regarding the African Monitoring of the Environment for Sustainable Development (AMESD) program, which focuses on extending the operational use of Earth observation technologies and data to environmental and climate monitoring applications. EUMETSAT also participates in the GMES initiative and in a user forum for Africa to reinforce the well-established dialogue with the African user community in order to optimize the use of EUMETSAT satellite data.

Many European member states also have direct cooperation agreements or memoranda, and are funding projects directly with various African countries. This cooperation generally occurs without the involvement of the United Nations, the European Union or any other intergovernmental organization residing in Europe. Here we will provide four examples among the many existing agreements and projects.

An intergovernmental agreement between France and Algeria was signed on February 1, 2006, which was implemented by the French National Centre for Space Studies (CNES) and the Algerian Space Agency (ASAL). It aims to support and promote scientific, technical, industrial and commercial cooperation between the two states in the study and use of outer space for peaceful ends.

In 1995, Germany's Aerospace Centre (DLR) signed a framework agreement with the Council of Scientific and Industrial Research (CSIR) of South Africa, focused on cooperation in research and technology, and has been used since then as a basis for additional forms of cooperation.

Italy has had agreements with the government of Kenya since 1964, and maintains a presence in Malindi, Kenya, where the San Marco Base has been set up. The "Agreement between the Government of the Republic of Kenya and the Government of the Republic of Italy concerning the Satellite Tracking and Launching Station at the San Marco Malindi, Kenya" was signed in Nairobi on March 14, 1995, and was subsequently renewed until June 30, 2012; as of this writing it is currently under renegotiation. Under Italian Legislative Decree 128/03, as amended by the Statute approved under Legislative Decree 213/09 the responsibility for managing the base has been entrusted to the Italian Space Agency (ASI) since January 1, 2004. Previously, the responsibility resided with the University of Rome "La Sapienza," through the CRSPM (Centro Ricerche Progetto San Marco). The location of the San Marco Base, which has been recently renamed "Luigi Broglio Space Center (BSC)," on the Indian Ocean is ideal for launch and support of equatorial satellites that provide TT&C activities and acquire Earth observation data over Central and Eastern Africa.

In 2006 the United Kingdom entered into a Memorandum of Understanding between the British National Space Centre (BNSC) and the Algerian Space Agency (ASAL). This MOU provides a framework of collaborative activities and review areas of common interest in the civil aspects of space, and facilitates the interchange of information, technology and personnel in areas of mutual interest. The United Kingdom had previously cooperated with Algeria on its national satellite AISAT-1.

The African Environment

To assess the environment under which the African-EU partnership in space applications is realized, we examine the issues that facilitate or impede progress in political, economic, social, technological and legal factors.

Political Factors

Although the political commitment of African leaders to work together and with other international partners to solve problems for African citizens, and to achieve societal, economic and political integration, is being realized step by step through the African Union and various Regional Economic Communities (RECs), the political commitment for space and satellite applications remains lacking, which seems largely to be due to the fact that there is insufficient understanding of the benefits, and a lack of communication of the success stories.

Consequently, space policy remains uncoordinated at the continental level, as well as at the regional level. Further, there are insufficient links generally between the space initiatives and policies and other policy areas, including agriculture, environment, health, transport, and security, and a broad understanding of how space can assist in achieving policy objectives is missing. At the continental level the appropriate institutional mechanisms exist for realizing the benefits of space, there is often insufficient coordination between various operational institutions.

Economic Factors

During the past 10 years there have been significant efforts by the RECs to integrate the various markets, but many of them are still fragmented. The African space market is mostly dominated by government activities largely because low income levels and limited economies of scale make Africa unattractive for Foreign Direct Investment. License fees for satellite systems are generally high, and coupled with the high cost of satellites, this makes it difficult for companies to survive in a limited market environment. Hence, there is a need for low cost systems to facilitate improved access to expand the market for African entrepreneurs and non-African companies.

Social Factors

Space applications can assist in providing solutions to the African population addressing basic needs such as food and water security, health care, education, early warning, disaster management and emergency response, etc. Nevertheless, the benefits of space applications are not sufficiently understood by decision makers as well as the wider population, and there are few people educated in the management and operation of space-based assets. Various space projects in different areas have been developed for Africa but very few are sustainable beyond the pilot phase because often the local community of the end users is not involved from the beginning and does not have the feeling of ownership.

In many cases, appropriate government bodies have not been identified to take responsibility for running and maintaining a project and its maintenance, and as the projects developed in Africa are often conceived by developed countries without full awareness of the infrastructure restrictions of the under-developed countries.

Technological Factors

Most African countries focus their space activities in three main categories, infrastructure development, use of satellite applications, and capacity building. The majority of the projects focus on space applications, but there is clearly a need for more capacity building in order to improve local technical skills. A Pan-African University is currently being established, and space will be covered by the South Africa unit.

Legal Factors

African markets for telecommunications and satellite imaging are fragmented, and license requirements and regulations vary from country to country. The current regulatory environment hinders private initiatives by African and foreign investors, and thus delays the benefits that space systems could offer in support of sustainable development. Furthermore, as noted, there is little coordination between various policy and regulatory frameworks in most African countries regarding space and the space component of other sectors, and it often happens that different ministries purchase the same information assets from satellites, a duplication that increases administrative and economic overhead. Current taxation systems on imports can affect the development of satellite applications since nearly all equipment, devices and services need to be imported. It also appears that taxation is duplicated for the same goods and services at various levels resulting in accumulative excessive burden for the importer.

Conclusions and outlook

Our analysis of the key factors leads to broad recommendations for five key areas.

1. The discussion of political factors indicates that the needs of African states have to be translated into concrete topics and goals where space can assist in meeting them, and then it's necessary to identify the responsible actors, and establish links with the appropriate governments.
2. The national needs of the African countries that do have existing capabilities in space competence need to be better reflected in other national policies in areas such as agriculture, environment, health, transport, and security in a coherent manner. Coordination should be achieved at three levels, national, regional and continental. This can be facilitated by coordination meetings, workshops and conferences.
3. The AU, ECA and REC's are important actors in Africa, and coordination among them regarding space based information and applications should be strengthened and formalized.
4. In addition, the development of a pan-African space policy would streamline the current fragmented policy environment and support all African countries in working together at the regional and continental levels to tackle their common goals. One area in which there is a vital need is disaster management and emergency response, and this would make a suitable first topic for a pan-African space policy. This topic is affecting regionally a number of countries and joining efforts would significantly contribute to sustainable development and poverty eradication.
5. For the implementation of policies, formalized institutional relations for space based information and applications are needed. The first point of coordination should be access, use, and sharing of space based information. In particular, maps and GIS would be the first step to formalize inter-actions and institutionalize use of these assets on the regional level. In this area an early focus should be in early warning and emergency response for disaster management.

Over the long term this should lead to institutionalization at the continental level. The establishment of pan-Africa institutions could take the form of a Space Agency that would be beneficial for centralized purchase of space-generated data including maps and satellite images. This should be a long term plan starting first at national and regional levels, as different countries have different needs in the short term, as well as differing levels of development and capacity to use this information.

Success stories concerning the use of satellite applications for the benefit of African citizens and for sustainable development need to be communicated in way that political figures are able to build support. Relevant information needs to be prepared by consortia that would include representatives from technical experts, end users, entrepreneurs, administrators, societal and political groups, etc.

The current institutional framework in Africa is appropriate but concrete links of cooperation need to be established between the main African actors like the AU, UNECA and the REC's. Common strategic partnerships between them are essential to support sustainable development. Adequate resources in the form of funding, personnel and technical expertise are essential, and funds provided from the United Nations, European member states, and various private groups should be better aligned in terms of funding, time scale, and expected targets in order to better utilize the available resources, avoid duplication, and create complementarities. The funding mechanisms should also be aligned such that they cover the entire cycle of a satellite applications project, from pilot project to hand-over, operation, capacity building, and ongoing maintenance.

The improvement of the economic regulatory frameworks to support foreign direct investment will also make the African countries far more open, permitting profit repatriation and providing economic measures and other incentives to attract investment in the space sector and other sectors as well.

In order to enhance awareness of the social benefits that space applications can bring it is necessary to increase communication. Appropriate information mechanisms need to be set up to communicate the benefits at the local level, and education regarding space and its applications should be enhanced in schools and universities, supported by learning materials on the benefits of space and its contribution to development should be provided. Educational programs are of course long-term measures with many social benefits. The pan-African University, currently under establishment, is expected to play an important

role in the development of sustainable development of Africa.

From a legal perspective it's important to implement coordination with policies, harmonize licensing procedures and improve taxation laws. Regarding the implementation of appropriate regulations, it is necessary to foster initiatives to build institutional capacity in making treaties, setting standards, formulating policy, drafting regional integration protocols and alignment of regulations at a pan-Africa level. African governments should coordinate their policies and regulations regarding commercial and non-commercial space applications (e.g., data policy). They should foster policy and regulatory harmonization to create larger common markets based on regional economic communities while increasing private sector participation. This would facilitate exchange of assets and reduced duplication in purchasing the same asset. With regard to the purchase of information from satellites, it is important to facilitate cross border exchange and harmonize information infrastructure, to minimize cost and maximize the relevant benefits. Initiatives should be promoted for investment in access and cross-border information infrastructure through effective partnerships between public, private and not-for-profit sectors, in order to achieve universal access and full inter-country exchange of information and data.

Aligning licensing procedures would remove administrative bottlenecks, which suggests that common licensing and authorization procedures is preferable to the current situation of differing rules country by country. An internet-based license application and dissemination of regulatory information would significantly assist potential investors.

In addition, a more coherent taxation system would enhance growth, so African countries are being encouraged to accelerate the conclusion of double taxation treaties (DTTs), which can make it more attractive for foreign investors by helping them to avoid paying taxes twice on the same transaction.³ Taxation is a leverage to support demand for satellite services in terms of tax-emption or negative taxation – financial support - in order to improve citizens' rights as members of society (freedom of self-expression, right to be informed, freedom of press, etc).

³ The majority of African countries have signed multilateral agreements dealing with the protection of FDI, such as the Convention establishing the Multilateral Investment Guarantee Agency (MIGA) and the Convention on the Settlement of Investment Disputes between States and Nationals of Other States.

Actor	Proposed Actions
European Union (European Commission and other European institutions)	<ul style="list-style-type: none"> <li data-bbox="618 279 1417 472">□ Strengthen its neighbor policy towards Africa focusing on Space as a strategic leverage crossing different thematic issues, such as extension of infrastructure, extra-EU transport, energy, industrial development and trade, etc <li data-bbox="618 485 1276 552">□ Enhance thematic coordination of European activities of European Actors <li data-bbox="618 564 1325 674">□ Enhance coordination of EU financial instruments, European Investment Bank and Member States' contributions <li data-bbox="618 686 1300 753">□ Establish a closer dialogue with the UN agencies present and active in Africa and coordinate funding <li data-bbox="618 766 1325 875">□ Establish direct dialogue with Regional Economic Communities in Africa, the eight pillars of the AU and the others <li data-bbox="618 888 1300 955">□ Promote the use of space in other areas of the strategic partnership for the 2011-2013 Action Plan <li data-bbox="618 968 1354 1203">□ Promote the benefits of space for Africa's sustainable development to African politicians through the High Representative of the European Union for Foreign Affairs and Security Policy and External Action Service representatives in African countries <li data-bbox="618 1215 1300 1283">□ Regularly maintain an overview mapping of funded projects, bilateral agreements, best practices, etc. <li data-bbox="618 1295 1300 1362">□ Assist the African Union with obtaining adequate resources for its targets <li data-bbox="618 1375 1390 1484">□ Move towards a co-funding (Africa-European) system with African states and the Africa Development Bank to increase sustainability <li data-bbox="618 1497 1300 1564">□ Perform assessments of public funding activities and share best practices with European Member States <li data-bbox="618 1577 1300 1644">□ Implement better mechanisms for follow-up impact assessment of pilot projects

EU Member States	<ul style="list-style-type: none"> <input type="checkbox"/> Improve coordination between national activities in Africa and EU activities <input type="checkbox"/> Maintain an overview of national activities regarding space based information and applications for Africa <input type="checkbox"/> Perform assessments of public funding activities and share best practices with other European Member States and the EU
European Space Agency	<ul style="list-style-type: none"> <input type="checkbox"/> Ensure that the actors involved in ESA projects properly deal with the transition from pilot projects to operational projects and assure the commitment of African government relevant bodies to continuation and local acquisition in terms of knowledge end technology transfer <input type="checkbox"/> Promote the coordination of space efforts through African space agencies for the space faring nations of Africa and through other governmental and technical bodies where space is relevant for those that are users of space and those that are not <input type="checkbox"/> Participate in education regarding the use of space at different levels
EUMETSAT	<ul style="list-style-type: none"> <input type="checkbox"/> Promote coordination of space efforts on a regional level through its links with African government bodies and technical agencies <input type="checkbox"/> Increase support for capacity building efforts in Africa <input type="checkbox"/> Enhance the role of Africa to acquire data in-situ in order to merge with satellite data
United Nations	<ul style="list-style-type: none"> <input type="checkbox"/> Promote the use of space at the level of decision makers and through UNECA for the sustainable development of Africa <input type="checkbox"/> Coordinate the efforts between the different UN agencies and programs regarding space use as “one UN” <input type="checkbox"/> Establish in UNECA a specific department for space and coordinate and support the RECs in this area <input type="checkbox"/> Establish coordination mechanisms with the EU regarding space activities in Africa <input type="checkbox"/> Perform cost benefit analysis of the use of space as part of awareness campaigns in order to underline shadow-prices and cross-sectional benefits <input type="checkbox"/> Increase coordination of activities through the joint

	secretariat between the AU, UNECA and AfDB
African Union	<ul style="list-style-type: none"> <input type="checkbox"/> Enhance its international relationships in order to show local needs that could be satisfied through space technology <input type="checkbox"/> Enhance its role as a catalyzer of Africa's Vision for Space. The main objectives of space policy for Africa would be to focus on implementing those policy aspects that would allow successful use of space based information and applications for sustainable development <input type="checkbox"/> Increase the resources of the AUC in relation to space <input type="checkbox"/> Establish a position responsible for space as a shared competence among African Member States which deals with space topics such as telecommunications, navigation, remote sensing, etc and is responsible for maintaining a database of African capabilities and projects and promoting the use of space for sustainable development <input type="checkbox"/> Encourage Africa entrepreneurship <input type="checkbox"/> Promote a bottom-up approach to projects <input type="checkbox"/> Establish closer coordination with the RECs and establish policies that cover regional needs and identify how space can assist in development <input type="checkbox"/> Develop a capacity-mapping database at the continental level (experts, institutions, data, information, infrastructure, etc.) <input type="checkbox"/> Map the different ongoing activities conducted by regional and international agencies and identify end users <input type="checkbox"/> Collect in a systematic way and disseminate case studies and lessons learned, promoting the benefits of space with arguments to inform politicians and assist them in supporting a case for space <input type="checkbox"/> Promote cost benefit analysis of projects that use space assets <input type="checkbox"/> Increase coordination of activities through the joint secretariat between the AU, UNECA and AfDB <input type="checkbox"/> Develop mechanisms for increasing co-funding activities with African capital <input type="checkbox"/> Promote education on space at all levels of education: primary, secondary, tertiary and continuous learning

	<p>(e.g., school, university, on the job training, etc.)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Perform studies on the economic benefits of space for African development <input type="checkbox"/> Promote the implementation of space policy and space components in other policies for capacity building at various institutional levels and different actors (end-users, decision makers and trainers) <input type="checkbox"/> Ensure sustainability by continuous training to mitigate “brain drain” <input type="checkbox"/> Prepare and conduct workshops for key decision makers
Regional Economic Communities	<ul style="list-style-type: none"> <input type="checkbox"/> Promote a fair investment climate in order to attract FDI for development and deployment of space <input type="checkbox"/> Take space up as a topic for sustainable regional development <input type="checkbox"/> Create a map of existing mechanisms and capacities in the region (experts, institutions, data, information, infrastructure, etc.) <input type="checkbox"/> Conduct an evaluation of the use of space from different mechanisms in the region <input type="checkbox"/> Promote space based information and applications as a key development component for sustainable development <input type="checkbox"/> Promote the development and adoption at the regional level of a space policy reflecting the needs of the regions <input type="checkbox"/> Open intra-regional dialogues for continental integration <input type="checkbox"/> Perform cost benefit analysis of the use of space for development and comparison with no use of space. A particular case would be disaster management and disaster forecasting <input type="checkbox"/> Establish regional centers for single point acquiring of data and maintaining a common database <input type="checkbox"/> Promote regional development in download capabilities, information processing and capacity building <input type="checkbox"/> Facilitate the establishment of a critical mass of providers and users at the regional level <input type="checkbox"/> Organize regionally early warning and emergency response in disaster management and coordinate with UN efforts <input type="checkbox"/> Facilitate cooperation between universities, schools, technical centers and the local community for training

	<ul style="list-style-type: none"> on space assets and sustainability <input type="checkbox"/> Coordinate with member states to harmonize appropriate rules and regulations, licensing procedures, taxation etc. regarding space <input type="checkbox"/> Facilitate horizontal cooperation to establish institutional groups <input type="checkbox"/> Strengthen multi-institutional mechanisms
African Member States	<ul style="list-style-type: none"> <input type="checkbox"/> Develop a map of national needs and space relevance <input type="checkbox"/> Develop a map of national capabilities (experts, institutions, data, information, infrastructure, etc.) <input type="checkbox"/> Facilitate local activities and commitment to build up capacity and avoid reliance on foreign actors <input type="checkbox"/> Conduct an evaluation of the use of space from different mechanisms in the country <input type="checkbox"/> Explore ways to promote and benefit from public-private partnerships <input type="checkbox"/> Facilitate courses in space based information and applications and recognize such professionals in civil service positions <input type="checkbox"/> Coordinate with other member states to harmonize appropriate rules and regulations, licensing procedures, taxation etc. regarding space <input type="checkbox"/> Strengthen multi-institutional mechanisms <input type="checkbox"/> Coordinate through the RECs to develop a common strategy on needs and how space can provide solutions and share costs for data acquisition, processing and capacity building <input type="checkbox"/> For passive users and active users⁴ <ul style="list-style-type: none"> ○ Identify other policy areas where space could be beneficial ○ Promote the development and adoption at the regional level of a space policy or space policy component in other policy areas reflecting the needs of the nation ○ Establish a centralized national approach and

⁴ Passive users are African countries that do not have any space capabilities. They only receive passively information already processed by others. Active users are Africa countries that have the capacity to process information offered.

Active developers: are those African countries that themselves have the capacity in space activities and typically have a space agency and more advanced space policy components either self-standing or as parts of other policies.

	<p>creation of centers for acquiring, distributing and maintaining databases of space information to avoid duplication of acquisition</p> <ul style="list-style-type: none"> ○ Promote the implementation of space policy and space components in other policies for capacity building at various institutional levels and ensure sustainability by continuous training to mitigate “brain drain” ○ Promote on-the-job training ○ Facilitate communication between information providers and users in the country to bridge the gap between the two communities. <ul style="list-style-type: none"> □ For active developers <ul style="list-style-type: none"> ○ Promote cases of success to other countries and assist them in development ○ Develop mechanisms to attract FDI
African Space Agencies	<ul style="list-style-type: none"> □ Coordinate their efforts on a regional level □ Establish links with other technical bodies in Africa that could benefit from space □ Establish links with academic networks □ Coordinate their efforts on a continental level □ Strategically inform and assist in making politicians and decision makers aware of the benefits of space and provide them with arguments and cases □ Identify a strategic plan for international relationships with European entities such as EU, ESA and EUMETSAT
African Technical Organizations	<ul style="list-style-type: none"> □ Strengthen existing networks and create new networks for cooperation and coordination of activities between the technical actors □ Strengthen the existing institutions to be able to take up new technologies □ Map and monitor the current local degree of technical feasibility for space □ Focus on GIS and mapping activities □ Strengthen capacity building in radar and image processing technologies □ Explore opportunities to acquire information via African receiving stations □ Promote and lobby professionals in the fields of space

- based information and applications
- Increase the involvement of the local community
- Strategically inform and assist in making politicians and decision makers aware of the benefits of space and provide them with arguments and cases
- Facilitate data sharing among institutions

This review of African actors and activities regarding space utilization and satellite applications may come as a surprise to those who see Africa as a continent that is not engaged in technology development. Africa, to the contrary, is a continent on the rise, and while it will be still some time in the future before Africa will see full-fledged space powers (either nations or regions), it will steadily increase the use of space applications for economic and societal development. The first “African” International Astronautical Congress, which took place in late 2011 in South Africa also represents a positive trend.

Long term success will depend on a strong and sustained effort from all actors to reach agreed upon and still more ambitious goals. Space applications as an instrument for development have a particularly strong potential in Africa, and in partnership with existing spacefaring nations and alliances this will become reality.

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Christina Giannopapa, Ph.D.



Christina Giannopapa has been Resident Fellow at the European Space Policy Institute (ESPI) since January 2010. Prior to joining ESPI, she had ten years experience in engineering. From 2007–2009, she served as Technical Officer for the European Space Agency (ESA), where she was responsible for overseeing projects in the field of life and physical science instrumentation. Previously, she held positions in academia in Eindhoven University of Technology, the Netherlands, where she currently holds an Assistant Professor position.

She has worked as a consultant to various high-tech industries in research and technology development. In policy she worked briefly in DG Research, European Commission. In her academic years she has received various academic scholarships and has numerous publications in peer reviewed journals. She holds a Ph.D. in Engineering and Applied Mathematics from the University of London, UK and an MEng in Manufacturing Systems Engineering and Mechatronics, University of London, UK. Additionally, she has attended professional education in Law and International Management.

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This Chapter is based on research undertaken by the author for ESPI Report 26 “European-African Partnership in Satellite Applications for Sustainable Development. A Comprehensive Mapping of European-African Actors and Activities,” September 2010, download at www.espi.or.at, and the article “Improving Africa’s benefit from space applications: The European-African partnership”, *Space Policy* 27 (2011), 99-106. Updates have been made, in particular in view of the Third Africa-EU Summit, which took place in November 2010.

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