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SATELLITE-ENHANCED TELEMEDICINE AND EHEALTH FOR SUB-SAHARAN AFRICA: A DEVELOPMENT OPPORTUNITY

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ABSTRACT

Amongst the world's regions, Sub-Saharan Africa with its 48 countries¹ and 750 million inhabitants (2005 figures) suffers the highest burden of communicable diseases such as HIV/AIDS, tuberculosis and malaria, together with the lowest level of health care expenditure globally. The average life expectancy at birth was 46 in 2004. Health service coverage is low, with generally low immunisation coverage. The situation is exacerbated as the region faces as well a serious health workforce crisis, e.g. due to the migration of doctors and nurses from rural to urban areas.

Information and Communication Technology (ICT) has introduced significant new opportunities for extending the reach of health services, offering the potential to overcome some of the obstacles of health workforce shortages and to reach remote areas with training, support and remote consultation opportunities. eHealth, the combined use in the health sector of ICT for clinical, educational and administrative purposes, both locally and at a distance, is a key enabler for supporting health systems to deliver on their promise of good health for their citizens. Currently, however, overall ICT utilisation in most of the sub-Saharan countries is low, especially in remote and isolated areas.

ESA, in collaboration with the Luxembourg Agency for Cooperation and Development and with the co-funding of the Government of Luxembourg and of the European Union Africa Infrastructure Trust Fund, has recently launched a new programme with the aim of enabling the development of a satellite-enhanced eHealth and Telemedicine infrastructure for the benefit of the sub-Saharan Africa. This is a significant opportunity for the identified public health needs of the region. Satellite-based communication technologies can play a significant role especially in rural areas, where wired networks are non-existent and commercially unviable to roll out. Satellite

¹ Since 09/07/2011, the Republic of South Sudan is an independent state being the 48th country in the sub-Saharan region

solutions can enable a variety of services and rapidly unfold the potential of externalities, such as eLearning and eAdministration, which are of high interest for the region.

Apart from a deep understanding of the sub-Saharan situation at various levels, to increase the success potential it is necessary to develop a strong sense of African ownership towards this initiative. This can only be achieved by active collaboration with adequate sub-Saharan partners at all levels.

INTRODUCTION

Together with the EU-Africa Infrastructure Trust Fund (ITF) and Lux-Development (Lux-Dev) representing the Government of the Grand Duchy of Luxembourg, the European Space Agency (ESA) has launched the *Satellite-Enhanced Telemedicine and eHealth for Sub-Saharan Africa* (eHSA) Programme. This programme is the result of a number of initiatives, and has as major objective the development of an eHealth and Telemedicine infrastructure for the benefit of the sub-Saharan region. This goal should be reached in full coherence with the strategic priorities of the socio-economic development of the sub-Saharan region ensuring a strong African ownership of any achievement.



Figure 1: eHSA logotype

The present paper focuses on the eHSA initiative and its current status.



Figure 2: eHSA implementing partners

BACKGROUND

1. Situation in Sub-Saharan Africa

Sub-Saharan Africa, with its 48 countries and 800 million inhabitants (World bank 2007) has a significant social and economic potential but currently faces a number of barriers to realising it and playing a more significant role in the global economy. The poor health situation is one major barrier reflected both in high concentrations of communicable diseases (HIV/AIDS, malaria, tuberculosis, etc.) and the poor average health outcomes across the population. This is specially the case amongst disadvantaged groups such as rural dwellers, poor people, women and children.

Many places have insufficient human and financial resources to provide the required levels of healthcare needed to address these issues. This is often exacerbated in more remote areas where the current Information and Communication Technology (ICT) infrastructure has proved insufficient to facilitate the access of the population or their caregivers to healthcare services.

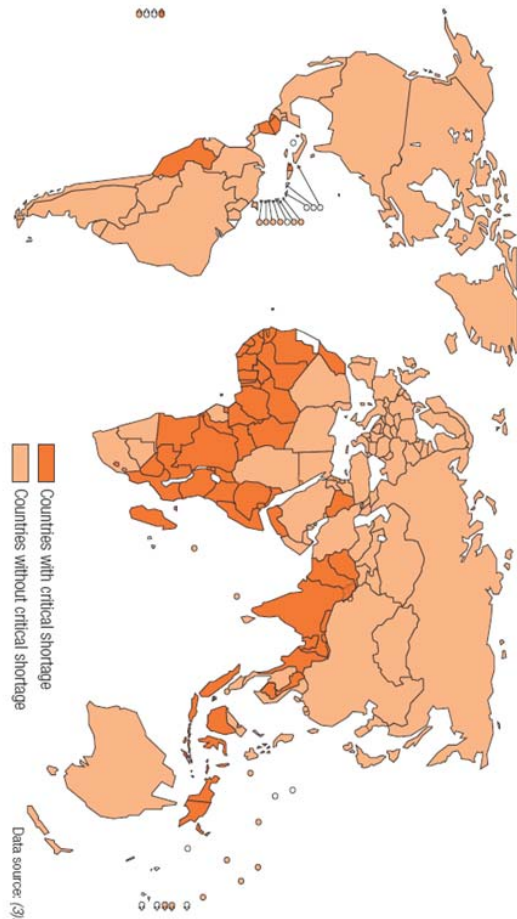


Figure 3: Countries with a critical shortage of health service providers (World Health Report 2006)

Telemedicine and other eHealth initiatives could be a way to mitigate some of these shortages. However, there are millions of people in sub-Saharan Africa who live in areas that do not demonstrate the commercial potential to ensure an adequate investment in ICT infrastructure in the short-to-medium term, preventing the development of such initiatives. In addition, these vulnerable populations are also likely to live in areas with a lack of health and transport infrastructure, making a trip to the closest hospital a time intensive and also expensive journey [1].

II. The Telemedicine Task Force (TTF)

The Telemedicine Task Force (TTF) started in 2006 as a result of a workshop held in Brussels (Belgium) where the importance of satellite

telecommunications to complement existing landline and mobile infrastructure was stated. This can become a powerful asset for extending the reach of health services to remote areas and supporting the development of health infrastructure in Sub-Saharan Africa.

The mission of the TTF was to pool efforts between African and European stakeholders together with the World Health Organisation (WHO) towards the creation of a programme to build a sustainable satellite-enhanced telemedicine and eHealth network for the whole of sub-Saharan Africa, embracing as key elements:

- African ownership.
- Focus on UN's Millennium Development Goals (MDG).
- Counteracting the health workforce crisis.

In parallel to this mandate, two complementary studies on technical and cost-benefit aspects were carried out. The following sections present the key findings of the TTF activities [1].

II. Study on the Current Sub-Saharan African Situation (2007)

The TTF analysed the current situation in sub-Saharan Africa regarding health, health systems, ICTs and political priorities. The work carried out highlighted the great need in the further discussion and elaboration of implementation-related concepts such as:

1. Definition of health governance models.
2. User and demand-driven approaches to design and operate ICT services for eHealth.
3. Financing under the scheme of public-private partnerships (PPP).

A concrete action was recommended to demonstrate the feasibility of satellite technology to extend the reach of eHealth and to contribute to regional efforts to overcome health workforce shortages [2].

III. Cost-Benefit Study (2008)

The study analysed in an independent way the costs and benefits for investment in satellite enhanced telemedicine and eHealth services to support public health policy objectives in sub-

Saharan Africa. The analysis was based on the economic impact and cost-implications of up-scaling selected operational cases of: clinical services, eLearning initiatives as well as eSurveillance and health management [3].

Sub-Saharan Africa health impact	Lives Saved p.a.	One Year Value	Lifetime Value ¹
eCare in the Clinic	16,800	\$680 million	\$746 million
eCare in the Village	151,800	\$259 million	\$2,576 million
eLearning	85,100	\$145 million	\$1,444 million
eSurveillance	644,100	\$1,248 million	\$55,902 million
eAdministration/ eGovernance	477,900	\$934 million	
TOTAL	1,375,700	\$3,266 million	\$60,668 million

Figure 4: Examples of human and economic benefits associated to some of the identified telemedicine and eHealth programmes [3]

The conclusions triggered out of this study are clear: satellite-enhanced telemedicine and eHealth services can generate significant public health benefits reflected in substantial socio-economic benefits for the whole of the sub-Saharan Africa. However, the full potential of these benefits requires coordination with different parties / stakeholders to align and integrate the activities appropriately.

III. Organisation of a pan-African eHealth platform

Satellite-based communication technologies could address the lack of access in sub-Saharan Africa and provide a viable option for the expansion of eHealth initiatives. A faster

communication between the patients and the health workers will have significant benefits and can improve current health services.

Sub-Saharan Africa health impact	Impact Measure	Number
Kenyan Nursing (eLearning)	Additional Nurses Trained (total)	44,085
RAFT (eLearning)	Additional Physicians Involved in on-going training (total)	2,846
Pharmaceuticals Tracking (eAdministration/eGovernance)	Reduction in drugs lost	\$299mn - \$897mn p.a.

Figure 5: Examples of additional benefits of identified telemedicine and eHealth programmes [3]

However, the deployment of a successful eHealth infrastructure is a complex task, requiring a deep knowledge of the health system procedures and needs at various levels. Figure 6 shows a potential hierarchical organisation of such infrastructure at pan-African level.

Satellite communications can definitely constitute the solution to the demand of universal services (i.e. services available with a specified quality, for all users independently of their geographical location and specific national conditions, at an affordable price). Even more: once deployed, they can rapidly ensure the conditions for unfolding potential positive externalities such as eLearning and eAdministration outside the health context helping to reduce the digital divide of Africa with the rest of the world.

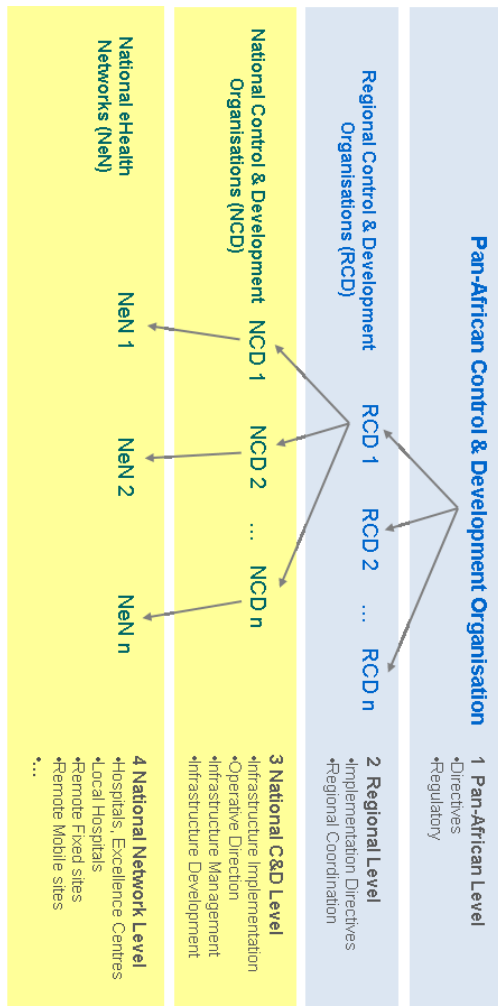


Figure 6: Possible organisation of a pan-African eHealth network

IV. SAHEL Project (2010 -2012): Short-term demonstration project

One of the recommendations of the TTF was to propose a concrete short-term action to demonstrate the feasibility of satellite technology to extend the reach of eHealth. Three areas were proposed: support of health workforce production and training; clinical services; strengthening of the capacity of eHealth systems and their ability to use information for decision making.

In 2011, ESA, with the funding from the African Union (AU) and the European Commission (EC), launched the SAHEL demonstration project (Satellite Africal eHealth vaLidation),

focused on deploying a solution in selected underserved areas of Senegal and Kenya for *health working training, clinical services* and *eHealth information management*.

To ensure the user-demand of the developed solutions and the African ownership of the results, the project is supported by two organisations:

- *Le Kinkeliba*, a Non-Governmental Organisation (NGO), providing medical, educational and economic aid in Eastern Senegal.
- *The African Medical and Research Foundation (AMREF)*, one of the leading centres of medical excellence in Africa, offering a full range of medical and health-related services, and located in Kenya.

The project started effectively in January 2011 and will last for 18 months. The activity is proceeding according to the project plan, in order to duly preserve the user driven nature of the activity AMREF and le Kinkeliba have distributed a questionnaire addressed to the sub-Saharan relevant stakeholders to better validate the user demands. Results of the questionnaire were already presented to ESA and they are under analysis. Currently, two workshops are planned in October in Dakar and in Nairobi to present these results to the local authorities and relevant stakeholders, aiming to reach their final endorsement on the conclusion in order to proceed to Service Definition and Design.

THE eHSA PROGRAMME

The final recommendation of the TTF was to develop a programmatic framework outlining actions in a step-wise development of sustainable eHealth infrastructure and services for the whole of the sub-Saharan Africa to support improved health to the population.

That was the idea of ESA when a proposal on satellite-based telemedicine programme was presented to the second meeting of the Steering Committee of the EU-Africa Partnership on Infrastructure, held in Addis Ababa on 20-21 November 2008. After the approval of the Steering Committee, the first phase of the programme was submitted to the EU-Africa Infrastructure Trust Fund (ITF) and was

approved and financed in September 2010 with the co funding of the Government of the Grand Duchy of Luxembourg through the Luxembourg Agency for Development and Cooperation (LUX-DEV).

The programme, named *Satellite-Enhanced Telemedicine and eHealth for Sub-Saharan Africa (eHSA)*, aims at enabling the development of a satellite-enhanced eHealth platform capable of supporting the delivery of services to the sub-Saharan citizens and health workers services for:

- Clinical services.
- Education.
- Surveillance.
- Management.

This goal should be reached in full coherence with the strategic priorities of the socio-economic development of the sub-Saharan African region.

I. Programme Structure

The eHSA programme covers six years. The programme is divided into two phases, the first one comprising four horizontal studies, the second one comprising four fertilisation projects from four thematic areas (eCare, eLearning, eSurveillance and eAdministration / eGovernance) per year. Figure 7 shows the overall structure of the eHSA programme.

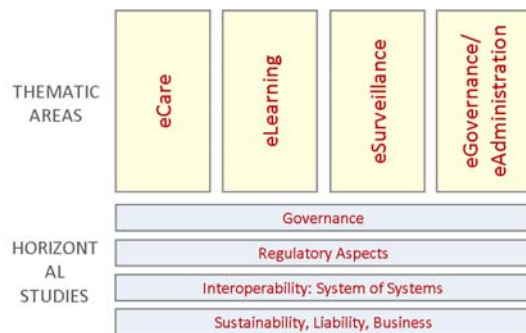


Figure 7: eHSA Programme Structure

The first phase of the programme (horizontal studies) has been approved and ESA is working on its implementation since February 2011.

I. Horizontal Studies

The programme focuses on activities towards the implementation of sustainable services on a scalable eHealth platform. In order to optimize the chances for success in this challenging task it is crucial to determine the major critical success factors

These factors will in depth be analysed through four horizontal studies, each of them with a budget of 1 million EUR, investigating the four major aspects of success

Governance. In general, governance comprises a wide range of tasks, including financial administration, aggregation and reporting of administrative data (quality, outcomes, public relations, dissemination strategies, advocacy of new sources, etc.). The governance study will have to address the challenge of examining the basic conditions for the implementation of new eHealth services in sub-Saharan Africa, as being set by governments or by private parties, depending on their competences.

Regulatory Aspects: One of the major barriers for the development of eHealth services is the current lack of regulations, unlike other aspects of the health system. The study on regulatory aspects will have to make a deep assessment of the existing regulations concerning ICTs and how they impact the provision of eHealth services. Regulations in this context go far beyond legal frameworks: social behaviours, ethnic considerations, religious beliefs, traditions and other common practices have to be considered.

Interoperability: In order to implement eHealth services, systems must communicate, contents must have a common semantics (medical and non-medical content), different organisations must share responsibilities and workflows and countries as well as regions must interoperate on a political level to organise a complete platform. Not only this, but any eHealth platform deployed should build on existing infrastructure, making it necessary to study what is currently in place to avoid overlaps or duplications. This includes an assessment on technical and organizational impacts, costs and risks.

Sustainability: In the long term, potential newly deployed eHealth services will be maintained only if they are economically sustainable. Development of suitable economic models for long-term sustainability is a major challenge. It is

mandatory to concretely demonstrate whether and how business opportunities and liabilities can be produced through the new eHealth platform with a possible return of investment.

II. Projects on Thematic Areas

Once the studies are finalised, and assuming positive results, ESA will discuss the implementation of the second phase of the programme with different relevant stakeholders. The study outcomes should not only proof the potential feasibility of an eHealth platform and its sustainability, but they shall also help ESA in the identification of the most promising areas to run the projects.

The target during this second phase of four years of duration is to launch four projects per year, one from each of the thematic area (eCare, eSurveillance, eLearning, eAdministration / eGovernance) with a maximum budget of 2 million EUR per project, always ensuring a strong African involvement as mandatory aspect.

It is expected that these projects can show the benefits of eHealth and become the first seeds of more projects that can pave the way towards a future eHealth platform all across the continent for the benefit of the sub-Saharan populations, and along with this development also opening new opportunities for other services and businesses of the information society.

III. Current Status

ESA received authorisation to proceed with the implementation of the first phase of the eHSA programme (horizontal studies) in February 2011. The approach followed to award the contracts for the studies is an Open Competitive process open to companies and organisations belonging to 109 states worldwide (including EU and ESA member states, sub-Saharan countries as well as the represented Asia-Pacific-Caribbean countries).

The current status of the studies is the following (October 2011):

1. *Study on Governance*: Invitation to Tender (ITT) closed. Proposals under evaluation.

2. *Study on Regulatory Aspects*: ITT issued, waiting for proposals. ITT closing date: end October 2011.
3. *Study on Interoperability*: Statement of Work (SoW) under revision, ITT to be released end-November.
4. *Study on Sustainability*: SoW under preparation.

All ITTs are announced through ESA's electronic tendering system (EMITS)[4] as well as LuxDev [5] and ITF's websites [6].

CONCLUSIONS

The development of new eHealth infrastructure and services is considered mandatory in order to allow the sub-Saharan population to have access to health services in an affordable way. Due to the current situation in Africa concerning ICTs and their lack of coverage of large portions of the population, satellite telecommunications can play a major role in achieving the provision of universal healthcare services for the whole sub-Saharan Africa.

The eHSA programme is the result of previous initiatives as well as the efforts of a number of organisations and stakeholders. The aim of this programme is to help building an African-owned framework together with a set of initial tools that can lead to the development of an pan-African eHealth platform together with the provision of health services in a sustainable way that can help to reduce the health workforce crisis on the African continent and help to meet the Millennium Development Goals.

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