



The African Union

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**DRAFT AFRICAN UNION SCIENCE AND TECHNOLOGY FRAMEWORK
FOR THE
DETECTION, IDENTIFICATION AND MONITORING OF INFECTIOUS DISEASES
OF HUMANS, ANIMALS AND PLANTS IN AFRICA**

**Scientific, Technical and Research Commission (STRC)
Department of Human Resources, Science and Technology (HRST)**

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Forward

I am pleased to present the *African Union Science and Technology Framework for the Detection, Identification and Monitoring of Infectious Diseases of Humans, Animals and Plants in Africa*¹. As we very well know, infectious diseases, whether they affect humans, animals or crops, continue to be a fundamental impediment to both economic development and human health in Africa. Until this challenge is met, the development of the continent will continue to be severely retarded. The continuing high incidence of infectious diseases compromise Africa's ability to meet her obligation to at least four of the eight UN Millenium Development Goals.

This policy framework draws heavily from the work of over fifty leading African experts from across the continent in collaboration with over four hundred of their counterparts in the United Kingdom and globally in a major Foresight study published as "*Infectious Diseases: Preparing for the Future – Africa*" (www.foresight.gov.uk). The study shows that the problem of infectious diseases poses a greater danger; and the biggest responsibility for addressing them must surely fall to those African leaders who develop and implement policies for disease control.

A series of consultations within the African Union and with the different African stakeholders including AU Member States to enabled us to arrive at agreement as to what ought to be done in Africa to deal with the infectious disease challenges. These areas of agreement have been packaged as different sections of the policy framework. The framework calls for a new paradigm for the risk management of infectious diseases in Africa and advocates for the creation of an enabling environment for implementation of disease surveillance initiatives, which start at grassroots level, progressively to nation, regional and continental levels, involving at each level a close inter-sectoral collaboration between public health, animal health, ecosystems health, and plant health. It provides a vision, mission, strategic objectives, strategies and institutional arrangements for infectious disease surveillance in Africa.

However, whilst Africa should rightly lead in these matters, it is important that the international community is also closely involved. Diseases can now travel the world in hours, and fighting them in Africa will also benefit countries around the world. Everyone will reap the rewards of working together to address these challenges. I therefore call upon the Member States of the Africa Union, the global development community and other stakeholders to come together and join hands with the African Union Commission in

¹ For the purpose of this study the term **animals** refers to terrestrial farmed and wild animals (i.e. mammals, birds and bees) as well as aquatic animals (fish, molluscs and crustaceans) as defined by the OIE www.oie.int. Also the term **plant** refers to crops, ornamental and forest plants and other vegetative organisms that make their food through photosynthesis

implementing the policy framework for the betterment of our people and the world over.

The African Union wishes to acknowledge the valuable contribution of the many experts and stakeholders involved in the development of the policy framework and those who provided resources to actualize the ideas. I would also like to thank the Foresight team for a very well researched report *Infectious Diseases: Preparing for the Future – Africa*. This policy framework has drawn heavily from the recommendations of the report.

Prof. Jean Pierre-Ezin
Commissioner Human Resources Science and Technology

ACKNOWLEDGEMENT

The AU/STRC is primarily responsible for this Framework and it was prepared by Team of experts from and around Africa and other development partners in the field of infectious diseases of human, animals and plants. It has also taken into consideration the inputs from other public and private sector experts. Although the primary purpose of this framework is to guide Africa's infectious disease activities in a coordinated, facilitated and strategized manner. The Framework is also designed to guide collective public health action at a time of resource constraints and difficult decisions, while advancing opportunities to improve the AU Member States' health through new ideas, partnerships, technical innovations, validated tools, and evidence- based policies along one health concept.

AU/STRC first and foremost wishes to thank the following people from the Government Office for Science (Foresight UK) Sandy Thomas, Jon Parke and Derek Flyn for sharing their experiences and expertise in the development of the framework and from London School of Hygiene Jeff Wage. The forty (40) leading African experts from 14 African countries including Rweyemamu Mark, William Otim-Nape, David Serwadda, Denis K. Byarugaba, William Bazeyo and many others for their willingness to share their experiences and insights, their cooperation in meetings sometimes rather tight deadlines, and for their readiness to volunteer their valuable time (thanks also to their employers for allowing them to take part in meetings that produced this framework). The hard work of these people is a good fortune for the continent.

AU/STRC would like to offer sincere appreciation to the following organizations/Agencies NEPAD, WHO, FAO, RECs, and OIE that support this framework through sponsorship and participation in various regional workshops that culminated in the production of this framework. The support of the top management of the African Union Commission for the express authorization in the preparation and organization, of meetings, workshops and working visit to Centres of Excellence in the course of production of framework was a turning point to be reckoned with.

iii. WHY THE FRAMEWORK

This framework is developed taking recognition of the growing challenges of high profile epidemics of human, animal and plant infectious diseases in Africa². Infectious diseases are a leading cause of illness and death throughout the world. The enormous diversity of microbes combined with their ability to evolve and adapt to changing populations, environments, practices, and technologies creates ongoing threats to health and continually challenges our efforts to prevent and control infectious diseases.

In low income countries of Africa particularly Sub-Saharan Africa, the impact of infectious diseases is often devastating, decreasing life expectancy, particularly among animals, human, and impeding opportunities for economic growth and development. In more developed countries, infectious diseases also continue to present significant health and economic concerns. Africa remains the continent with the lowest life expectancy in the world. Africa carries the burden of sixty percent of the global HIV/AIDS infected population, though the continent presents only fifteen percent of the world's population. Of the twenty countries with the highest maternal mortality ratios worldwide, nineteen are in Africa; and the region has the highest neonatal death rate in the world. Then there is strain on African health system imposed by the high burden of life threatening communicable diseases coupled with increasing rates of non-communicable diseases.

It has also been observed with great concern that only ten percent of financing for global health research is allocated to problems that affect ninety percent of the world's population. These clear disparities in economic strength, political will, scientific resources and capabilities and the ability to access global information networks will further widen the gap in knowledge and health between poor and rich nations. Due to poverty and lack of political will, disease-endemic countries lack the capacity to invest adequately in research and development for new medical interventions. Thus, poverty related diseases continue to ravage Africa with devastating impact on the quality of life and socio-economic development, creating a vicious circle of poverty and disease.

Emerging infectious diseases (EIDs) in animals and humans continue to spread across the world, with significant health, social and economic consequences. Diseases such as Influenza A virus subtype H5N1 (also known as 'bird flu') have led to estimated economic losses of more than US\$8 billion in East Asia and Africa, including the loss of income suffered, particularly by small farmers and producers, from decreasing production levels and more restricted access to markets. Lesser emerging and re-emerging infectious diseases such as rabies and brucellosis are major causes of morbidity and mortality, especially among poor people in the Asia Pacific and Africa region.

² For the purpose of this study the term **animals** refers to terrestrial farmed and wild animals (i.e. mammals, birds and bees) as well as aquatic animals (fish, molluscs and crustaceans) as defined by the OIE www.oie.int.

Also the term **plant** refers to crops, ornamental and forest plants and other vegetative organisms that make their food through photosynthesis

Some EIDs can lead to pandemics (that is, sustained community level outbreaks of disease in more than one region of the world) in terms of likelihood and severity of impact on human life, assets and the economy. The surveillance, detection, identification and control of pandemics and EIDs is a global public good which no one country or continent can provide on its own. Supporting countries in the region to respond to EIDs is both a humanitarian prerogative and in Africa's interest. A new disease can now emerge and spread with great speed across the world. Helping our neighbours detect and contain infectious disease threats at their source will contribute greatly to protecting Africa's bio-security.

Addressing pandemics and EIDs is also part of Africa's overarching commitment to the Millennium Development Goals (MDGs). It primarily addresses MDG 6 (combat HIV/AIDS, malaria and other diseases) but also has positive implications for MDG 4 (reduce child mortality) and MDG 5 (improve maternal health), particularly where children and pregnant women are vulnerable to EIDs. Addressing the causes and consequences of EIDs also supports MDG 1 (eradicate extreme hunger and poverty) and MDG 7 (ensure environmental sustainability).

There are numerous number of challenges that have necessitated to the production of this framework but not limited to the following;

1. The difficulty in ensuring predictable and sustainable financing of infectious disease initiatives;
2. Weak planning partly due to lack of institutional and human resources capacity at AU Member State level;
3. The health crisis reflected in weak health system, infrastructures, inadequate laboratory network for diagnosis of diseases, human resources in terms of numbers, mix of skills, motivation, and retention which have become major barrier ;
4. Inadequate access to essential medicines, preventive commodities and technologies across much of the continent;
5. Lack of adequate policies and harmonization;
6. Poor or inadequate coordination of regional and national and international partnership;
7. Conflict that result in mass displacement, violence, loss of livelihood and property as well as major breakdown in essential services;
8. Other cross cutting issues such as ensuring food security, internal and inter-country migration for reason other than conflict ;
9. Policy planning and programming for addressing health in national development framework;
10. An increasing burden of disease and other development challenges;
11. weak and fragmented human and animal disease surveillance and control systems, particularly at the grass root level;
12. lack of collaboration between the human and animal health sectors, across various line ministries, and with others such as the private sector;
13. limited knowledge and capacity for primary prevention of infectious threats in communities;
14. incomplete implementation of pandemic plans; and

15. Failure to incorporate available evidence into the design and implementation of EID interventions.

1. INTRODUCTION

This framework is a follow up on Africa's common position to the high level meeting of the UN General Assembly special session on HIV/AIDS in June 2006 which aimed at reviewing the 2000 and 2001 Abuja Declarations and Plans of Action on Malaria and HIV/AIDS, Tuberculosis and other related infectious diseases respectively. It also builds on the recommendations of the World Summit on the review of the Millennium Development Goals (MDGs) in 2005 which noted that infectious diseases are a challenge to the attainment of the MDGs particularly in sub-Sahara Africa.

This framework is developed with a view of addressing some of the concerns and recommendations of the above high level meetings and to ameliorate the present and future challenges and risks posed by infectious diseases in Africa. It is done after having thorough assessment of future disease threats and their management. The assessment concluded that a new paradigm shift on infectious disease management was necessary and it proposed a vision and strategy for addressing the challenges and risks of infectious disease of plants, animals and humans along the one health approach which advocates both inter-sectoral collaboration and the recognition of the shared environment. It pointed out that the scourge of human, animals and plants infectious disease including HIV/AIDS in Africa constitutes a time bomb. An estimate of 26 million people now infected with HIV is likely to develop AIDS over the next decade. In the livestock sector, the most important industry across sub-Saharan Africa, the study concluded that disease is its biggest constraint, and yet the sector contributes twenty five percent of the gross domestic product (GDP) of the region.

Twelve of the fifteen diseases that were formerly considered by the World Animal Health Organisation (OIE) as the most contagious are found in Africa. This constitutes an impediment to the international market access for African livestock commodities. It also pointed out that crop diseases and pest are major threats to African food security. While resistant varieties are the only realistic control, developing resistant varieties takes long, making early detection and eradication of new diseases particularly important. Since the majority of Africans depend on subsistence farming for livelihood, any impact of pest or diseases on staple food comes with devastating consequences like the one caused by the recent cassava mosaic disease pandemic in Eastern Africa.

The assessment of future diseases of animals, plants and human risks are based on collective opinion of leading experts in several studies and workshops and evidence based scientific papers underscored by risk and drivers for each infectious disease. The proposed science and technological solutions to improve our capability to detect, identify and monitor the infectious diseases is a centre point of this framework.

2.0 THE SCOURGE OF INFECTIOUS DISEASE IN AFRICA

During the last two decades there have been incidents of high profile epidemics of human, animal and plant diseases worldwide, which have stimulated a growing interest amongst policy makers to understand the changing nature of the global

infectious disease threat, its drivers, and the scientific, technological and social activity that should be started now to prevent future epidemics.

The G8 Summits in Gleneagles in the UK in 2005 and St Petersburg in Russia in 2006 concluded that major infectious diseases continue to exact a heavy toll on economies and societies around the world, particularly in developing countries, impeding the achievement of Millennium Development Goals (MDGs). Accordingly, these Summits called for a vigorous response to the threat of infectious diseases as being essential to global development and to the well-being of the world's population.

The burden of infectious diseases in Africa is the worst of all continents. With respect to humans, such infectious diseases as HIV/AIDS, malaria, tuberculosis and measles are rampant. Thus HIV has been described as constituting a 'time bomb'. It has killed more people in Africa than all the civil conflicts that have beset the continent. This one disease, which has been known for only a period of about 30 years has now touched on most families in sub-Saharan Africa and now affects productivity in all forms of economic life, including the administrative and security fabrics of governments. In some parts of Southern Africa prevalence levels of about 40% in certain categories such as women attending pre-natal clinics, or sexually active age-groups in some areas or in certain industries have been recorded. In the SADC region alone it has been estimated that some 22,000 people die every week in the mainland SADC region and that since 2003 about 500,000 individuals have died from the disease.

In the animal sector, diseases situation is not any better. Africa has the highest burden of infectious animal diseases in the world. Twelve of the fifteen most contagious diseases (formerly OIE List A) are found in Africa. Furthermore, the spread of livestock diseases in Africa has worsened in recent years. For example, contagious bovine pleuropneumonia (CBPP), which was reasonably controlled in the 1970s and 1980s, has again become widespread. Serious animal diseases, such as foot-and-mouth disease (FMD) are also the most important impediment to international market access for African livestock commodities. Infectious diseases, such as epizootic ulcerative necrosis (EUS) and *Streptococcus iniae* threaten wild and farmed fish and are likely to be an important constraint to aquaculture development in Africa. Animal protozoal diseases such as African trypanosomiasis transmitted by tsetse are also serious and cause illness and death of millions of people in Africa. According to FAO estimates trypanosomiasis occurs in 37 sub-Saharan countries and the lives of 60 million people and about 50 million head of cattle.

A serious aspect of animal diseases is not only their impact on human health, but the zoonotic nature of some animal diseases.. For example, according to WHO, the recent epidemic of Rift Valley fever (December 2006 to May 2007) in Eastern Africa resulted in a total of 684 human cases including 155 deaths in Kenya, 264 human cases and 109 deaths in Tanzania, and 114 cases including 51 deaths in Somalia. This contrasts seriously with 195 worldwide human deaths from H5N1 avian influenza in 5 years (2003 to 23/08/2007). The increasing wildlife-livestock-human interface has therefore resulted in many serious diseases being transmitted from either wildlife or livestock to humans. Examples include bovine tuberculosis, ebola and other haemorrhagic diseases in humans.

Zoonoses (i.e. infectious diseases which are transmissible between humans and animals) are no longer to be sidelined. The majority of infectious diseases of humans (about 65%) originate from animals and about 75% of those emerging infectious diseases of humans that have been recognised over the last 4 decades, have been shown to have originated from animals (wildlife and domesticated) or animal products. So with respect infectious diseases there is a convergence of a shared problem, represented by the pathogen flow, between the public health and animal health, within the shared environment. This is what has led the World Bank to make reference to People, Pathogens and Our Planet. Such a realisation is particularly relevant to policy in Africa, considering that, for example, Southern and Eastern Africa probably have the highest human-livestock-wildlife interaction in the world. In the plant sector, diseases and pests are major threats to African food security. Cassava mosaic disease (CMD), for example, attacks one of the most important subsistence crops in sub-Saharan Africa and a particularly severe form of the disease was identified in Uganda in 1988. Since then it has attacked large tracts of eastern and central Africa, affecting millions of people who depend on the crop for survival – particularly in times of drought. However, rapid mobilisation of mosaic-resistant varieties, aided by biotechnology, and action at both local and international levels has now helped to control the disease in many places.

Despite the above, challenges, experience has shown that when there is concerted effort by African governments and society, which is adequately supported by the international community, spectacular successes in controlling infectious diseases can be achieved. The control of cassava mosaic disease in Uganda and neighbouring countries is an example of the impact of focusing technology, societal, governmental and international community can have on containing or even eliminating a transboundary disease. For human diseases examples include the eradication of small-pox and the on-going programmes for polio eradication and child immunisation. For animals the most notable success has been the global eradication of rinderpest the so-called 'cattle plague', whose achievement was declared jointly by FAO and OIE in June 2011. However, spectacular as these successes have been, infectious diseases constitute the greatest health impediment to African human life, welfare, food security and economic development.

Arguably, the greatest threat in Africa does not stem from any single disease, but from the combined effect of the wide range of diseases in humans, animals and plants which interact with societies, the natural environment and with each other. These interactions are many and complex and can produce a spiral of social, economic and environmental decline. This will involve a concerted collaborative effort between the natural and social sciences, between sectors, between institutions and a clear recognition the value of ecosystems. Understanding these interactions will be vital in developing cost-effective strategies to break out of the trend. The policy framework is aimed at addressing these challenges.

3.0 THE SITUATIONAL ANALYSIS AND RISK ASSESSMENT ON INFECTIOUS DISEASES

Many considerations were taken into account on this study and analysis particularly on comparative studies but the review and investigative studies conducted by Foresight UK was used as a major reference in developing this framework. The comparative

analysis shows that Asia and Africa are worse hit by infectious diseases on many occasions and was concurred globally by many experts.

3.1 The key findings and conclusion from Foresight

The global concern with infectious diseases has led to several policy-based studies on the likely impact of infectious diseases on society in different parts of the world. These studies have taken different perspectives, associated with particular sectors (e.g. human health, animal health, plant health, livestock and agricultural sector development), or addressing particular categories of diseases (e.g. HIV/AIDS, foot-and-mouth disease and avian influenza), different drivers (e.g. bioterrorism, trade) or different technologies (e.g. diagnostics, control contingencies).

The Foresight Project [www.foresight.gov.uk] on Detection, Identification and Monitoring of Infectious Diseases, which published its findings as the '**Infectious Diseases: preparing for the future**' report in April 2006, took a broad approach by considering future disease threats to human, animal and plant health, and by considering UK, sub-Saharan Africa and (to a lesser extent) China. Thus while coordinated by the UK Government Office of Science, its scope was global. It involved over 300 leading experts in infectious diseases of humans, animals and plants and stakeholders from 30 countries as well as international organisations such as the World Health Organization (WHO), the United Nations Food and Agriculture Organization (FAO), the World Organisation for Animal Health (OIE), the World Bank, NEPAD, the African Union, the Bill and Melinda Gates Foundation, the Wellcome Trust, and the Gatsby Foundation.

At every stage of the study, which examined relevant future sciences, future risks and the societal context the specific needs of Africa were analysed and African scientists were involved. The widest involvement was the convening of some 50 African scientists, specialists in infectious diseases of humans, animals and plants, to a workshop in Entebbe in August 2005. The Foresight report has also been discussed at several African forums such as the Directors for Animal Resources of AU Member Countries in Kigali, Rwanda, the Congress of African Scientists and Policy Makers in Alexandria, Egypt, the meeting of Directors of Vaccine Production Laboratories in AU Member Countries in Addis Ababa, Ethiopia, and the meeting of SADC Chief Veterinary Officers plus experts in infectious diseases of livestock, wildlife and humans (zoonoses) in Arusha, Tanzania. The pinnacle of these consultations was the AU-Foresight meeting of African scientists and representatives of African institutions which took place in Pretoria, South Africa, in September 2007.

Thus the approach and consultations adopted by the Foresight project, sets this study apart from the others in that its findings are likely to be relevant to the African Union vision.

The study took as its key question:

- *How can we use science and technology to improve our capability to detect, identify and monitor infectious diseases in order to better manage the risk from them?*

Thus the study focused particularly on the future role of systems for detection, identification and monitoring of disease. It concluded that, across these sectors (human, animal and plant health), the greatest future risk would come from yet unknown diseases, the wide spread of known epidemics and resistance to antimicrobials. It also observed that future epidemics are likely to originate from either Africa or Asia. From the global perspective, Africa was perceived as having the highest burden of infectious diseases be they of humans, animals or plants.

The overall conclusion of the Foresight study was that:

- Many existing diseases will remain important, but new diseases will emerge in the future – noting that in the last 25 to 30 years some 80% of new/emerging infectious diseases of humans had originated from animals;
- Major infectious diseases are endemic in Africa and Asia;
- Substantial advances in infectious disease prevention and management will be made through integration of research across sectors (human, animal, plant) and disciplines (natural and social science);
- New technological systems for early detection, identification and monitoring of infectious diseases have the potential to transform our capabilities in managing future disease risks, especially if challenges of international development are met;
- Societal contexts will be crucial in realising the benefits of the new technological systems.

The report of the African strand of the Foresight study has been published under the title: **Infectious Diseases: preparing for the future - Africa**³ [www.foresight.gov.uk]

The African strand of this study, including the Entebbe workshop, drew the following further conclusions that are specific for Africa, namely that:

- Culture and governance issues are often under-rated in disease management programmes;
- Infectious Diseases constitute a high risk for future marginalisation of Africa;
- Human mobility and access to international markets for African animal and plant commodities could be severely constrained by infectious diseases in Africa; and
- Convergence of technologies for detection, identification, monitoring of infectious diseases offers opportunity for innovative approaches in managing infectious disease risks.

Therefore, the Foresight workshop in Entebbe in 2005 and the AU-Foresight meeting in Pretoria in September 2007 concluded that the continuing heavy burden of infectious diseases in Africa constitutes a serious threat to the realisation of the **Vision for the African Union**⁴, as pronounced by the African Heads of State and

³ Rweyemamu, M., Otim-Nape, W., Serwadda, D. (2006). Foresight. Infectious Diseases: preparing for the future. Africa. Office of Science and Innovation, London

Governments at the inauguration of the African Union, in Durban, South Africa in 2002. The AU-Foresight meeting endorsed the recommendation from the Entebbe workshop and reiterated that in order to overcome the infectious disease impediment to African development, there needs to be a specifically pronounced statement of a Vision for the Management of Infectious Diseases and that its realisation will require Africa to take a quantum leap in the capacity building for the adoption of modern and future technologies of the detection, identification and monitoring of infectious diseases.

3.2 Shared Principles for Risk Management of Infectious Diseases

The Foresight study has shown that when infectious diseases are examined from the perspective of risk drivers, the technologies for the detection, identification and monitoring as well as the basics for risk management there are many shared principles between the approaches for human, animal and plant infectious diseases.

Thus future underlying risk drivers for infectious diseases of humans, animals and plants were identified as: (i) culture and governance, including legislation and systems of government; (ii) technology and innovation; (iii) conflict and law; (iv) human activity and social pressures; (v) economic factors – including globalisation; and (vi) climate change. These can readily be seen as being relevant to African development. When examined in detail by African scientists during the Entebbe workshop, the immediate risk drivers could be further fine tuned as: (i) governance as reflected in weaknesses in health management systems in the three sectors as a result of policy variations, including civil strife; (ii) movement either in the form of human migrations or transhumance or trade; (iii) human behaviour, whether reflected as sexual behaviour or customs for eating bush meat or settlements in areas encroaching on wildlife habitats or changes in animal and crop farming systems and (iv) changes in the disease causing agents either in the form of the emergence of anti-microbial resistant agents or new or re-emerging infectious agents. Poverty, gender and HIV/AIDS were seen for Africa as being areas of particular vulnerability.

The impact of climate change on infectious diseases in Africa is already a reality as cycles of flooding and drought have been witnessed in Southern Africa, Eastern Africa and the Sahel. These changes have had an impact on the incidence and distribution of insect vectors and the diseases that they transmit such as malaria, Rift Valley fever, trypanosomosis, cassava mosaic disease, banana bacterial and coffee wilts and bean blight diseases. They have also been indirectly responsible for the spread of certain epidemic animal diseases which result from the resultant close contact between wildlife and livestock such as foot-and-mouth disease.

For all the three sectors (human, animal and plant) the risk management of infectious diseases relies on four prime elements, namely: (a) early detection and surveillance leading to early warning; (b) early and prompt response to disease; (c) coordination at national, regional and international levels of the disease control programme; and (4) enabling research. All four prime elements have to be underpinned by sound science and technology. As infectious diseases are a prime constraint to the African Union Vision, it is important, therefore, that African science and technology should give

⁴ The Vision of the African Union is “to build a peaceful prosperous and integrated Africa that will be a dynamic force in world affairs”.

priority to the detection, identification and monitoring of infectious diseases that will lead to a science, evidence based continental strategy for the risk management, and ultimately elimination, of this primary constraint.

3.3 Convergence of Future Technologies for the Detection, Identification and Monitoring of Infectious Diseases

The Foresight study examined in detail the relevance of 10 streams of future science and technologies. These were:

- Intelligent sensor networks
- Data mining and fusion
- Non-invasive scanning and screening
- Genomics and bioinformatics
- Interrogation of natural signals/biomarkers
- Biosensors/biomarkers
- Predictive and real-time epidemiological modelling
- Earth observation
- Host genetics and engineering
- Immunological techniques/responses

By integrating these studies, the future evolution of technologies for disease detection, identification and monitoring was predicted. These opportunities were set against future risks and demands, in consultation with user groups, including African experts and international human, animal and plant health organizations. From this process four priority technology systems or “User Challenges (UC)” were identified. These were:

- UC1: Novel information technology for the capture, analysis and modelling of data for the early detection of infectious disease events.
- UC2: Early detection and characterisation of new or newly resistant/virulent pathogens using genomics and post genomics.
- UC3: Taking technology for identification and characterisation of infectious diseases to individuals by designing smart swabs, hand-held or portable devices that analyse fluids.
- UC4: High throughput screening for infectious diseases of people, animals and plants using surrogate, non-invasive markers (e.g. electromagnetic radiation, volatiles), for example in airports, containers and livestock markets.

The African strand of the Foresight study viewed these as offering both an unprecedented opportunity and a challenge to African science and technology. For example, a combination of UC1 and UC3 would make disease alert and specific diagnosis far less dependent on physical infrastructure than now and could take

advantage of the expanding mobile telephony to bring expert focus at the point of outbreak, which may be very distant from capital cities.

The following were identified as challenges that science and technology in Africa needs to address as a matter of urgency:

UC1: Novel information technology

- Currently the practice in Africa is largely limited to reasonable disease reporting for human and animal diseases but grossly inadequate for plant diseases. There is as yet little predictive modelling and data mining. So issues of access to technology, to data and interoperability of systems are likely to pose some challenge in Africa.

UC2: Genomics, post-genomics and proteomics.

- The science for this User Challenge will be at the discovery level and will underpin the technologies for UC3 and UC4. African involvement will depend on cultivating 'smart partnerships' with centres of excellence in the industrial countries of the North.

UC3: Hand-held devices - nanotechnology based

- This User Challenge could be prime target for Africa, but it will be important that Africa be involved at the design stage in order for the specification of the new devices to take adequate account of the conditions in Africa. There are questions to be addressed like: Is Africa commercially attractive? Is international funding available to fund the development of such tools for African specifications as a contribution to the international public goods? Again interoperability and affordability will be important considerations for Africa.

UC4: High throughput screening

- This User Challenge has the potential for enhancing epidemiological surveillance and inspection services. But, if inappropriately applied and if science and technology and policy systems in Africa are not fully engaged at the design stage, there could be challenges with respect to ethics and/or unfair technical barriers, which result in further marginalisation of Africa.

4.0 A NEW PARADIGM FOR RISK MANAGEMENT OF INFECTIOUS DISEASES IN AFRICA

Considering the high burden of infectious diseases of humans, animals and plants in Africa, the risks, drivers and the opportunities offered by the emerging technologies, it is imperative that there be a quantum leap in the capacity for African institutions for the detection, identification and monitoring of infectious diseases. The achievement of such a target should be a prime objective for the science and technology policies in Africa. To ignore the "health warning" of such studies as that by Foresight or the

realisation of the G8 communiqué on Infectious Diseases⁵ as well as the Declaration on Science and Technology policy by the AU Summit in January 2007 would seriously compromise the contribution of science and technology in Africa to the realisation of the **African Union Vision**.

In order for Africa to make the requisite quantum leap in the detection, identification, monitoring of infectious diseases and thereby rational disease control strategies, new and innovative approaches are needed to be introduced. In particular, it is imperative to create an articulated pan-African vision for managing infectious diseases of human, animal and plants. To be effective, such a vision needs to be accorded a high priority at the national, regional and continental levels and integrated into the national and continental development plans in addition to the current donor-supported programmes, such as those addressing HIV/AIDS/malaria/tuberculosis, polio, rinderpest, the AU-IBAR PACE Programme, the cassava mosaic disease (CMD) pandemic in the Great Lakes region, or the coffee wilt disease programme in East Africa.

The detection, identification, monitoring, and thereby surveillance of infectious diseases, should be primarily rooted in scientifically strong national systems. These should in turn have effective sub-national or community-based foci for primary diagnosis close to the point of primary (animal, plant or human) healthcare. As the most serious infectious diseases of humans, plants and animals are transboundary in nature (i.e. can easily spread to other countries and reach epidemic proportions, and their control requires collaboration between countries) and since many African communities reside in ecological systems that transcend national boundaries, it is important that disease surveillance systems in Africa be co-coordinated through an African Programme on Infectious Diseases in Africa'. Such a programme could operate on the basis of regional co-operation among countries within a common ecosystem, i.e. an epidemiological cluster each with at least one laboratory that is able to undertake the identification and genetic characterisation of infectious disease agents from the national surveillance programmes. These could be regarded as sub-regional centres of excellence in infectious diseases, capable of recognition by the World Health Organization (WHO), the OIE, the Food and Agricultural Organization (FAO), AU/IBAR and the Inter African Scientific and Technical Research Commission (AU/ISTRIC) as regional reference laboratories or collaborating centres.

The new approach to the detection, identification, monitoring of infectious diseases in Africa should strive to be cross-sectoral (i.e. linking health systems for plants, animals and humans) at the national and epidemiological cluster (or Regional Economic Community (REC)) level. This was considered by the Entebbe workshop to be novel and would promote the optimal utilisation of resources in order to make the quantum leap that is required to address the infectious disease burden in Africa. It was also considered desirable since the new and emerging detection and identification technologies are increasingly common for the three sectors. There would therefore be benefits in technical resource development, cross-fertilisation and in maintaining a critical mass of expertise in this fast-developing field. It would also promote the

⁵ G8 Communiqué on Infectious Diseases: Fight against infectious diseases, *St.Petersburg, July 16, 2006*
<http://en.g8russia.ru/docs/10.html>

development of technology relevant to African problems and not merely as a derivative of technology from the developed countries. Furthermore, this novel approach would provide the kind of scientific challenge to the new generation of African scientists that should propel them to undertake work in Africa that will both address a central issue to African development and be conducted at the global cutting edge of science.

The -African Programme on Infectious Diseases in Africa would be co-coordinated at national, cluster, sub-regional and pan-African levels. The Programme would operate through a system of partnership and networking, via virtual (rather than physical) centres in order to focus funding primarily on detection, identification, monitoring activities and to minimize spending on constructing new infrastructures with consequential high overhead costs that might prove to be unsustainable.

5.0 THE FRAMEWORK

This Framework incorporated lessons learned from many countries around the world and by other development partners in responding to infectious diseases and highly pathogenic including SARS and avian influenza. These experiences points to the need to move from an emergency to longer term systemic approach which strengthens capacity to deal with emerging infectious diseases broadly, rather than just dealing with a single disease.

The Framework was developed to provide a roadmap for improving Africa's ability to detect, identify and monitor infectious diseases of human, animals and plants and to recognize and control rare, highly dangerous, and newly emerging threats, through a strengthened, adaptable, and multi- purpose virtual network of centres of excellence in the field. Tripartite networks, ranging from continental, regional and national centres interwoven across human, animals and plants under one health and approach mechanism that focuses on surveillance, detection, identification and monitoring. This will clearly and evidently inform policy and decision makers on how the response is going to be on a multi faceted level.

Today's difficult economic environment has affected individuals, businesses, industries, and governments throughout the world. Budgetary and other constraints have, in turn, had a major impact on public health, requiring difficult decisions at the continental, regional and national levels. Ensuring that these important decisions do not negatively affect human health due to weakened public health capacities will require broad and well-coordinated collaborative efforts to determine the best use of limited resources.

The framework proposes technological solutions as well as policy strategies for addressing this scourge for Africa. The solution lies primarily in science and technology. Accordingly, this policy framework has been termed the *AU Science and Technology Framework for the Detection, Identification and Monitoring of Infectious Diseases in Africa*.

5.1 The Focus on Infectious Disease Surveillance

Disease surveillance, which is underpinned by both laboratory based expertise and epidemiological analyses is the pre-requisite to effective disease control and management. The concept of a Centre for Disease Control (CDC) which started in the USA has now been replicated in other parts of the world such as Europe, China and Australia. It has been an effective instrument for Infectious Disease Surveillance and disease intelligence for those countries.

Ironically, Africa, which has the heaviest burden of infectious diseases, does not yet have such a facility. Therefore, the centre piece of the strategy for realising the African Vision for Infectious Diseases will be the establishment of a African Centre for Infectious Disease Surveillance (ACIDS), to act as the African CDC.

The African Centre for Infectious Disease Surveillance will differ from the others, at least initially, in that it will be a virtual centre coordinating the work of either physical or virtual national/regional institutes/networks for infectious diseases. It will link governmental and academic research establishments. It will operate as an Africa-driven 'smart partnership' linking African institutions with those of industrialised countries, especially UK/European in order to address the burden of infectious diseases in Africa. It will focus on surveillance for infectious diseases of humans, animals and plants.

Accordingly, this African Centre for Infectious Disease Surveillance will be, conceptually similar to the US and European Centres for Diseases Control but with the following unique characteristics:

- a. An African virtual centre linking African networks of institutions involved in infectious diseases of humans, animals and plants
- b. International collaboration with WHO, FAO and OIE
- c. African 'smart partnerships' with UK and other OECD science centres

It will evolve through actions at three tiers: national, regional and continental.

5.2 The Framework Enabling Context

The science and technology policy framework for infectious diseases also highlights that the societal context of the development and deployment of detection, identification, monitoring systems are pivotal to their effectiveness. Policies and their implementation must have the support of governments, civil society and individuals alike. Ethical and legal issues surrounding data capture, storage and access must be addressed as should concerns of fairness and social vulnerability and the public perception of risk.

For policies to deliver the Africa vision for infectious disease to work optimally, they will require the creation and support of novel, institutional infrastructures and legislative or regulatory reforms that will deliver regulatory harmonization for infectious disease within the continent on one health. Without these enabling mechanisms to underpin cohesive and integrated strategic thinking, and the use and maintenance of detection, identification, monitoring technologies and systems, the benefits to be gained from the joint use of resource, and sharing of data and information, would be compromised or even lost.

There is an overarching need to break down the political, institutional and research silos which act as a bar to the effective mitigation of risks. In order to achieve this, we will need to create a climate of innovation which would enable the development of cross-sectoral and interdisciplinary approaches to research and to policy development. These objectives, which have clear linkages, can only be realised through the far-sighted and enlightened alignment of a) research priorities and their associated funding streams; and b) policy goals and procedures at a national, regional and continental level.

Fiscal incentives and the development of national and international regulatory frameworks would encourage, support and direct commercial and government research and development. Importantly, the exploitation and use of appropriate technology supported by such measures and policies would encourage the development of complementary technical and non-technical interoperable systems.

For progress to be made to embed the Africa vision for infectious diseases in AU policy development, the concept, and its associated high-level 'plan of action' which sets out key priorities, goals, activities and indicators of success must be considered and further refined. This will be done in the first instance at a meeting of experts and REC representatives.

5.3 VISION AND MISSION FOR INFECTIOUS DISEASES FRAMEWORK IN AFRICA

5.3.1 The Vision

In order to embark on an accelerated programme for the detection, identification and monitoring of infectious diseases which will lead to their effective risk management, it is important that there be an articulated African Vision for the Management of Infectious Diseases, which is shared by AU Member States, and which reflects the needs of the African society and is supported by the international community. Such a vision needs to be aligned and to support the **African Union Vision**, which is *“to build a peaceful prosperous and integrated Africa that will be a dynamic force in world affairs”*.

Therefore, the **Vision Statement** for managing infectious diseases in Africa shall be:

“An African society protected from the ravages of dangerous infectious diseases that compromise human health or livelihoods, agriculture/livestock and economic development, including market access.”

This vision statement for infectious diseases in Africa recognises the risk that infectious diseases pose to the realisation of the African Union Vision and the achievement of the UN Millennium Development Goals.

5.3.2 The Mission

The realisation of the above vision through science and technology will be governed by the mission statement which is:

“Harnessing innovation in science and technology to improve Africa’s capacity to detect, identify and monitor infectious diseases of humans, animals and plants, as well as ecosystems, in order to better manage the risk from them.”

The ingredients of the mission include:

1. The effective prevention of the spread of currently African endemic, introduced or exotic and emerging or evolving diseases (and pests) in Africa or parts of Africa
2. Enhancing African capacity and participation in scientific and technological developments for the early detection, specific diagnosis, early warning of evolving disease events and national/regional capacities for early response. The aim would be to contain unusual disease episodes so as to break the cycle of each such episode turning into a serious epidemic
3. Application of science-based and socio-economically sound strategies either for disease containment, or for the progressive control of those diseases that most threaten society – either as human disease problems or as an impediment to food security or the tradability of plant and animal commodities and products.

5.3.3 The Objectives

1. Promoting adherence to international standards of animals, human and plants health.
2. Strengthening systems for the, detection, identification and monitoring of infectious diseases, particularly at the grass root level.
3. Building an evidence base for the response to infectious diseases through network of Centres of Excellence.

5.3.4 The Guiding Principles

The implementation of the science and technology framework for realising the above vision is the primary responsibility of the AU Member States and the AU Commission through various African organs. Nevertheless, because of the global nature of the problems of infectious diseases, Africa’s concern for controlling infectious diseases of humans, animals and plants in Africa should be viewed also as serving the international public goods, and thereby meriting international support. In the increasingly globalised world, it is in the self interest of the industrialised countries to be concerned about the persistence of dangerous infectious diseases in Africa. Therefore, the vision should be implemented in collaboration with the global technical actors in the human, animal and plant health domains, namely, the WHO, FAO and OIE as well as the donor community, international civil society and any other institutions or countries that share similar vision. To this effect the implementation of the vision shall be governed by the following guiding principles:

1. A quantum leap in the application of detection, identification, monitoring in Africa

2. Serving national, regional and international public goods
3. African-led and universally owned vision and implementation of activities
4. Smart partnership between African institutions and scientists with those in the industrialized countries of the “North”
5. Rooting implementation through national systems
6. Regional and sub-regional coordination
7. Implementation through inter-institutional networks
8. Rapid optimization of available human and other resources
9. Integration and cross-sectoral approach to detection, identification, monitoring
10. Efficiency and cost- effectiveness
11. Leadership through the highest scientific and political levels possible
12. Inclusiveness and empowerment of stakeholders and beneficiaries

The implementation of the vision will be based on three thrusts namely:

1. A disease/infection surveillance-based research approach that is rooted in effective national systems but coordinated through sub-regional epidemiological clusters and ultimately at the continental level.
2. Taking advantage of the evolving convergence in the technologies for the surveillance of infectious diseases of humans, animals and plants to promote, at both the national and regional levels, the formation of inter-institutional networks in the form of virtual institutes for infectious diseases, linking governmental, academic and research institutions in human, animal and plant infectious diseases. This is seen as a mechanism for rapid optimisation of available human expertise and other resources. It is also seen as a mechanism that could facilitate the required quantum leap in African capacity building.
3. Exploiting ‘smart partnerships’ between African institutions and scientists (the continent where the endemic infectious disease problem lies) with those in the industrialised countries, especially the UK, Europe and the United States of America (where expertise lies but major diseases are ordinarily absent, i.e. not endemic). The prime objective of ‘smart partnerships’ would be capacity building in Africa and joint research programmes on the infectious disease burden in Africa.

5.4 STRATEGIES FOR ACHIEVING THE FRAMEWORK VISION

5.4.1 The Rationale for the Strategy for Achieving the Vision

The evidence provided calls for a step change (quantum leap) in approach for infectious disease risk management in Africa. The Vision and strategy outlined sets out how the quantum leap could be achieved. While challenging in terms of organising research networks, the concept of virtual centres/institutes, is cost-effective and can commence soon after the realisation of seed funding. It does not involve any major constructions and the resultant operational overheads. Therefore, funds can be channelled directly into research programmes.

A concerted effort for the risk management of infectious diseases of humans, animals and plants in Africa is both to the good of Africa and a contribution to the international public good. An enhanced capacity for national laboratories to undertake DNA-based diagnostic work will progressively reduce the need for international transport of fully virulent disease causing agent for referral diagnosis

The realisation of the Vision will require a concerted effort to mobilise opinion and resources from within Africa but also the support of the international community.

5.4.2 The Role of AUC/STRC in the Establishment of the Virtual Networks

The STRC is championing the implementation of the AU project on Infectious Disease surveillance and is at forefront in the conceptualization of the idea on the African Union Science and Technology Framework on the Detection, Identification, and Monitoring of Infectious Diseases of Human, Animals and Plants in Africa. It will provide a platform for the establishment of the regional virtual networks, nationals and Pan African network and will play a coordinating role pending the full establishment of continental network. The STRC will assist the networks in identification and linkage with prospective development partners as well as resource mobilization.

STRC will be in the Member Board of Trustee of the regional and the continental networks as well as serving in their Scientific Steering Committee. Upon establishment of the Pan African Centre for Infectious Disease surveillance (ACIDS) the coordinating role of the STRC will be transferred to the ACIDS but will continue to serve on the board and steering committee membership. The ACIDS will be structured within AU/STRC.

5.4.3 National Centres for Infectious Diseases Surveillance

As already described, the strategy for the realisation of the Vision for Infectious Diseases in Africa has to be rooted in national disease surveillance systems. Therefore, the realisation of a Pan-African Centre for Infectious Disease Surveillance will ultimately depend on the effectiveness and efficiency of disease surveillance at the national level. The success and impact of the Vision and Strategy for infectious diseases will hinge on the acceptance and responsibility by AU Member States for their own disease detection and control. Therefore, it is suggested that the starting point for implementing the Vision and Strategy for the Management of Infectious Diseases would be at the national level.

A major finding of the Foresight report has been that, despite having the highest burden of infectious diseases, Africa has a fairly low activity in general surveillance of infectious diseases. For human and animal infectious diseases, surveillance is generally limited to activities of specific projects or targeted disease control programmes, e.g. polio or rinderpest. For plants, there is little or no regionally co-ordinated surveillance for pests and diseases and the quarantine system is poorly operated in many African countries. So the capacity for early detection, early warning and early response to changing patterns of new or old diseases in Africa is weakening

and increasingly infectious disease control strategies (whether of plants, humans or animals) are becoming late reactive emergency programmes.

Furthermore, Africa has excessive compartmentalisation of specialists either according to sector (human, plant and animal) or according to administrative boundaries (government, academic and private institutions). Accordingly, there is sub-optimal utilisation of the meagre available resource that could drive a surveillance-based programme. The new approach to the detection, identification and monitoring of infectious diseases in Africa should strive to be cross-sectoral, i.e. integrated between plants, animals and humans, at the national and epidemiological cluster (or regional/sub-regional) level.

Accordingly, the framework and AU policy on the science and technology for infectious diseases will encourage Member States to set up an inter-ministerial national institute for infectious diseases, that is, a virtual centre, not a physical one. This should function as a networking mechanism for infectious disease surveillance programmes that pool resources from both government and academic establishments across the three sectors (animal, human and plant). In line with the stated new paradigm, the virtual centre should have a coordinating unit for all infectious disease surveillance programmes using existing infrastructures, concentrating new funds on equipment, reagents and operational expenses far more than on new constructions. It is acknowledged, however, that in some cases it may be necessary to upgrade existing constructions in order to make them compatible with the safety requirements for handling infectious agents.

This approach is both novel and should promote the optimal utilisation of national resources in order to make the quantum leap that is required to address the infectious disease burden in Africa. This approach also takes account of one of the key conclusions from the Foresight study that the new and emerging technologies for surveillance of infectious diseases are increasingly common for the three sectors.

There are benefits in technical resource development, cross-fertilisation and in maintaining a critical mass of expertise in this fast-developing field and in the ability to influence the development of technology packages that are relevant to African conditions and not merely derivatives of those developed for the needs of the industrialised countries of the “North”. Furthermore, this novel approach should provide the kind of scientific challenge to the new generation of African scientists that should propel them to undertake work in Africa that will both address a central issue to African development and be conducted at the global cutting edge of science. Therefore, sustainable management of infectious diseases calls for reforming sector-based policies and institutional frameworks for effective, integrated and inter-sectoral approach on infectious disease surveillance and risk management.

It is important that AU Member States recognise the risk posed by the persistence of infectious diseases to the realisation of the African Union Vision and accord the surveillance and control of infectious diseases of humans, animals and plants a high national priority. Countries should seek to provide appropriate budgetary allocations, infrastructure and incentives that will result in effective application of technologies to the surveillance and control of infectious diseases.

The main actions to support this pillar are:

- a. review of policies, legislative frameworks and institutional arrangements for detection, identification, monitoring and management of infectious diseases that will encourage collaboration and inter-sectoral and inter-institutional technology networking in the form of National Virtual Centres for Infectious Diseases;
- b. Instituting a harmonized policy, legislative frameworks and institutional arrangements for effective and sustainable detection, identification and monitoring of infectious diseases. From the perspective of human and animal health protection, it will be important to give emphasis to the 'One Medicine' approach for surveillance of infectious diseases of animals and humans in the livestock-wildlife-human interface ecological systems
- c. Establish new or strengthen existing national and regional bodies for detection, identification, monitoring of infectious diseases and encourage sharing of information among all stakeholders;
- d. Ensuring access to suitable facilities (in-country or outside) for effective detection, identification, monitoring of infectious diseases; and
- e. Implementation, monitoring and evaluation of the impact of the policies, legislative framework and institutional arrangements.

5.4.4 In-Country Grassroots-based Disease Surveillance

It is important that Member States encourage stakeholder involvement and participatory approaches to disease surveillance. So there need to be specific mechanisms for community empowerment and networking for the supply and delivery of samples for analysis and information. It is in the interest of both governments and communities that diseases are controlled and that new epidemics are detected rapidly and prevented from spreading widely. The responsibility for community networks should be at the national level – there is obviously national advantage in such effective networks. It is envisaged that the sub-national primary diagnostic centres would remain client-based and linked to the separate primary healthcare systems for humans, animals and plants.

The key actions to support and bring about the realisation of this pillar are:

- a. Identify the sub-national hub and establishing a focal points,
- b. Establish national networks to community levels
- c. Implement sub-national Programmes on detection, identification and monitoring of infectious diseases
- d. Mounting community awareness programmes on infectious diseases of humans, animals and plants
- e. Monitoring, evaluation and lesson learning

5.4.5 Regional Centres for Infectious Diseases Surveillance

The coordination of effective disease surveillance based on the application of modern and future technologies for the Detection, Identification and Monitoring of infectious diseases will need to be at the regional level.

Accordingly, each Regional Economic Community (REC) will be encouraged to develop its own node of the African Centre for Infectious Disease Surveillance. These regional nodes will ultimately form one Pan-African Virtual Centre. They will focus on the surveillance of infectious diseases of humans, animals and plants.

The regional nodes will work with the national hubs (i.e. the national virtual institutes for infectious diseases) in:

- monitoring infectious diseases of humans, animals and plants in their region, progressively creating a pan-African surveillance network;
- helping countries in the region to control disease outbreaks (through advice and assistance to disease management professionals and to African governments);
- coordinating research into infectious disease surveillance technologies and their inter-sectoral application based on the One Medicine⁶ principle;
- promoting the spread of relevant technology and capability for disease control in their respective regions
- cross fertilization of ideas and synergies between the continental, regional, national networks as well as capacity building
- scientific capacity building through training of all cadres of staff in the detection, identification, monitoring/surveillance, epidemiology and control of infectious diseases.

The key actions to support and bring about the realization of this pillar are:

- a. Putting in place a legal and regulatory framework for the sub-regional centre,
- b. Establishing structures and management of the centre,
- c. Develop links with national nodes and establish Africa-“North” ‘smart partnerships’;
- d. Develop and implement a regional programme on infectious disease surveillance
- e. Monitoring, evaluation and lesson learning

5.4.6 Pan-African Centre for Infectious Disease Surveillance

This will focus on the surveillance of infectious diseases of humans, animals and plants. At the continental level, the African Centre for Infectious Disease Surveillance will be a coordinating secretariat with enabling facilities for handling, processing and analysis of infectious disease data and trends

The actions to realise this pillar will include:

- i. Encouraging each REC that is ready, to set up a light secretariat for the regional node of the African Centre for Infectious Disease Surveillance, which should be

⁶ The term **One Medicine** is used in this policy document to denote: “the science of health and disease without considering species differences between humans and animals in broader zoological context” - as described by Virchow in the 19th century and Schwabe in the 1960s

- located in proximity to a national or regional institute with at least Biosafety Level 3 facility;
- ii. Encouraging the formation of inter-institutional networks into National Virtual Institutes/Centres for Infectious Diseases with three prongs:
 - a. **Diagnostic Technology** linking plant-human-animals – infectious agent detection and identification;
 - b. **Surveillance** being piloted through human-animal-plant infectious diseases approaches, i.e. one medicine concept.
 - c. **Backstopping** institutions/agencies/Ministries responsible for infectious disease control
 - iii. Encouraging surveillance-driven research which is based on either in-country or inter-country epidemiological/ecological clusters;
 - iv. Encouraging common theme research networks e.g. inter-species infection transmission;
 - v. Promoting disease surveillance-based projects that are implemented on the basis of inter-sectoral, inter-country African networks in research partnership with UK/European institutions;
 - vi. Identifying competent regional coordinating centres of technology/excellence or a regional consortium of institutes for capacity building and referral identification of disease causing agents;
 - vii. Capacity development of African scientists and institutions in order that they be effective partners and even assume scientific leadership of the Africa-UK/Europe partnership for research on what is primarily an African problem, namely the infectious disease burden in Africa;
 - viii. Organising regular Africa-UK/Europe and other collaborators 'smart partnership' scientific and management coordination meetings.

5.4.7 Enhancing International Cooperation for the Surveillance of Infectious Diseases in Africa

Tackling the burden of infectious diseases in Africa is a global as well as an African responsibility - it serves the international public good and therefore justifies international cooperation. In the increasingly globalised world, it is in the interests of industrialised countries to participate in the management of infectious diseases in Africa. This offers opportunities for 'smart partnerships' between African and industrialised countries that might offer both expertise and training in relevant scientific technology and financial support.

Furthermore, the existence of international agricultural research centres located in Africa with an animal or plant health mandate offers opportunities for collaborations. They constitute an excellent technological asset for the disease surveillance programme for infectious diseases. For animal and plant systems, there are AU and sub-regional institutions (e.g. IBAR, the AU-Inter-African Phytosanitary Council, and the SADC-Livestock Technical Committee) that work closely with and are supported by the FAO and the OIE. Current international agricultural research centres or NEPAD Centres of Excellence in Biosciences could act as centres of technology that could support the regional and national centres, especially in training and genetic identification of polymerase chain reaction products of infectious agents – where the

mandates of these centres permit such collaboration. It is also important that the WHO, the FAO and the OIE be associated with the African Vision and Strategy for the Management of Infectious Diseases, as these organizations have global mandates for human, animal and plant health.

Financial institutions and international donor agencies (both official governmental or inter-governmental and philanthropic) will also be important partners for the realisation of the strategy for the realisation of the African Vision for Infectious Diseases. Thus international cooperation will be required to harness these opportunities.

The private sector should be cultivated as an important partner in the realisation of the Vision strategy. Many of the tools for infectious disease surveillance and disease control are likely to be developed by the private sector. It is important therefore that the African Centre for Infectious Disease Surveillance (at the regional and continental level) should develop collaborative arrangements with both Africa-based and external innovators and actors in the private sector, particularly those involved with diagnostics or vaccine or therapeutics development.

The key actions to support and bring about the realisation of this pillar are:

- a. Identify institutions and cooperating partners
- b. Develop and adopt mechanism for development cooperation and partnership
- c. Establish a forum or forums to facilitate international collaboration for the African Vision on Infectious Diseases
- d. Implement and monitor cooperation agreement

5.4.8 Strengthening National and Regional Capacity for Infectious Disease Surveillance

Sustainable management of Infectious diseases in Africa can only be created if there is adequate human resource capacity, at all levels, to implement policies, programmes and legislative frameworks that can bring about sustained efforts and impacts on infectious diseases. This is weak in nearly all Member States, despite the fact that large numbers of highly skilled Africans are in the Diaspora, contributing to development of those societies. The weak African human capital base severely limits its capacity to effectively address infectious disease issues. Africa's quest for a quantum leap in the detection, identification, monitoring of infectious diseases needs to be underpinned by the development of human capital skills and capabilities. In order to achieve this, Member States should as a matter of urgency, establish programmes and activities that bring about accelerated human resource capacity and should strive to create an enabling environment and infrastructure for the application of modern and future technologies for detection, identification, monitoring of infectious diseases.

The activities to achieve this will include:

- (i) Refurbish, recreate, re-equip and strengthen the educational and training institutions that generate technicians and mid-level careers and experts in infectious disease management.

- (ii) Review curricula to reflect demands and aspirations of beneficiaries, emphasising innovations and infectious disease management at all levels;
- (iii) Recognise that implementation of detection, identification, monitoring of infectious diseases will require a sustained involvement of highly trained and skilled individuals who will continue to be in high demand inside and outside Africa, and therefore review the remunerations of such individuals to be competitive at least within Africa;
- (iv) Ensure appropriate reward for excellence, and implement a career incentives programme that will attract and retain capable trained personnel and experts.
- (v) Strengthen and where necessary establish or rehabilitate educational, research, and capacity-building institutions that address detection, identification, monitoring of infectious disease issues;
- (vi) Implement scholarship schemes, and overseas post-graduate training under a programme that will ensure the return of trainees upon completion of their training, as well as adequate career incentives to keep them in Africa,

6.0. CREATING AN ENABLING ENVIRONMENT FOR EFFECTIVE INFECTIOUS DISEASE SURVEILLANCE IN AFRICA

Member States are yet to fully integrate detection, identification, monitoring into infectious diseases policies. Most Member States treat detection, identification, and monitoring policy in isolation from other programmes, in for example, agriculture, human and animal health, and yet there are potential benefits from an integrated approach. Further attention is generally focused on the more apparently visible and politically more sensitive issues of control without addressing the primary stages such as detection, identification, monitoring and prevention. This has made sustainable management of infectious disease reactive and expensive. However, detection, identification, monitoring must be fully integrated into the national infectious disease management policy and be made to play the catalytic role in all the other sectors, as the engine that drives the control.

6.1 An AU Policy Framework that Supports Effective Implementation of Infectious Disease Surveillance by Member States

Infectious diseases transcend national boundaries. For instance, HIV/AIDS, ebola, foot-and-mouth disease or an epidemic of cassava mosaic in one country can spread and infect many countries in the region, continent or globally, causing devastating effects. Whereas Member States have policies on infectious diseases, the policies are different in scope and their impacts are limited to the countries concerned, thus making a harmonised approach to infectious diseases management within the continent difficult. An African policy framework on the management of infectious diseases would guide and ensure coherence by Member States in their approach to the management of infectious diseases in the continent.

The key actions to realise this principle are:

- a. Adoption by an AU Summit resolution of the “*Science and technology framework for the detection, identification and monitoring of infectious diseases of humans, animals and plants in Africa*”;
- b. Implementation of the provisions of the framework by Member States;
- c. Monitoring and review of the implementation of the framework by both the AU Commission and Member States; and
- d. Lesson learning and sharing of best practices.

6.2 Ensuring Ownership of the Infectious Disease Vision by All Stakeholders.

In order for the strategy for the African Vision for Infectious Diseases to be realised, it is essential to have a sustained programme of creating awareness, buy in, ownership, and championship by local, national, regional, and international communities to be implemented through various mechanisms, such as lobbying, advocacy, publicity. This will require a decade of sustained efforts. The framework therefore calls on all nations in Africa and their global partners to initiate and sustain a decade of actions on infectious diseases. During this period a new and broader policy context, institutional arrangements that address integrated and multi-sectoral approaches to detection, identification, monitoring and disease management must be created, and comprehensive programmes for disease management implemented. The AU could usefully champion the vision and strategy now and in the future. However, to be effective, it is imperative that the governments of Member States, the civil society and the private sector ‘sign up’ to the vision and strategy, thereby strengthening the control of those epidemic diseases that do not respect national boundaries, namely transboundary diseases of humans (e.g. HIV/AIDS), animals (e.g. FMD) and plants (e.g. CMD).

Surveillance and control of infectious diseases in Africa is also a contribution to the international public good. Therefore the international donor community, including philanthropic organisations, the global health agencies (FAO, OIE and WHO), the private sector involved in developing diagnostics and other tools for the surveillance or control of infectious diseases in Africa as well as governmental, non-governmental and religious organisations involved in the delivery services for the surveillance and control of infectious diseases all have a stake in the successful implementation of the Strategy for the African Vision for Infectious Diseases.

The leadership that provides the vision for future approaches to infectious diseases would need to be at the highest scientific and political level, particularly since it would cut across human, animal and plant diseases. At this level, there is opportunity to engage with governments and the relevant African agencies, as well as the international development and funding bodies. Individual governments and African society would need to share the goals of such an African Vision and Strategy for the Management of Infectious Diseases. The principles and actions to achieve this objective are outlined below.

6.2.1 Ensuring African Scientific Leadership of Infectious Disease Surveillance in Africa

The key actions to support this pillar are the following:

- a. Leadership by the AU. Detection, identification and monitoring of infectious diseases are both a political and a technical process. Therefore, the AU, as the premier body charged with providing leadership in the continent, and in the continent's relations with others, should provide strategic leadership and oversight of these processes. This would include setting continental policy and frameworks, and the terms of engagement of all actors involved in infectious disease detection, identification, monitoring efforts on the continent;
- b. Support, cooperation and implementation from Regional Economic Communities and Member States. Regional Economic Communities and Member States should provide support and cooperation in the field of detection, identification, monitoring and management of infectious diseases;
- c. Addressing needs and aspirations of the African people. The implementation of infectious disease surveillance activities should be guided by African definitions and perceptions of their own needs and aspirations;
- d. Promoting African leadership and global participation in the implementation of infectious disease surveillance activities; and
- e. Using infectious disease surveillance as a tool for social, political, economic and physical well being and prosperity of the people of Africa.

6.2.2 Promoting Broad National and Local Ownership of Infectious Disease Surveillance Activities

The key actions to support this pillar are the following:

- a. Rebuilding of legitimate state authority and the enhancement of national ownership of infectious disease surveillance as a central concern;
- b. Applying national leadership in all aspects of detection, identification and monitoring implementation;
- c. National state- and non-state actors should work together to determine the priorities of the infectious disease surveillance processes, and the implementation thereof; and
- d. Ownership of the programmes and activities by local beneficiaries who should be involved in their design and implementation, and include vulnerable groups such a women, children and the disabled.

6.2.3 Inclusiveness of Stakeholders in all Infectious Disease Surveillance Activities

The key actions to support this pillar are the following:

- a. Ensuring an organic link between those managing infectious disease surveillance processes and the users and beneficiaries of activities;
- b. All infectious disease surveillance activities should be based on the principles of equity and fair distribution of resources;
- c. infectious disease surveillance activities should be based on human rights of both individuals and of minority and other groups; and
- d. Special efforts should be made to promote gender equality and women's participation.

6.2.4 Ensuring Coherence of Infectious Disease Surveillance Efforts

The key actions to support this pillar are the following:

- a. Early definition of roles and responsibility of actors engaged in infectious disease surveillance activities to ensure accountability and ownership;
- b. Ensure coordination of actors and activities to optimise the use of resources, increase effectiveness and efficiency, and improve timeliness of response to the development needs of the Continent;
- c. Enhance trust between the various local, national and international actors involved, through the promotion of transparency and exchange of information; and
- d. infectious disease surveillance activities should ensure environmental sustainability and the optimal utilisation of African resources.

6.2.5 Consolidation of Infectious Disease Surveillance Efforts

The key actions to support this pillar are the following:

- a. Since all infectious disease surveillance efforts should have as their goal the attainment of sustainable development, infectious disease surveillance activities should seek to build and/or strengthen national and local capacities;
- b. All infectious disease surveillance activities should strengthen and empower the capabilities of society to support and legitimise national processes;
- c. All infectious disease surveillance activities should utilise local expertise, and where it is weak, leverage relevant African capacity at the regional and continental levels, as well as from the Diaspora;
- d. Creating awareness, buy in, ownership of the vision, strategy and programmes;
- e. Mounting a lobbying and advocacy strategy to create awareness, buy-in and ownership; and
- f. Implementing information and public awareness programmes that impact on stakeholders.

7.0 THE FRAMEWORK CATALYST: ENSURING COMMITMENT AND IMPLEMENTATION

A number of actions have been proposed in this framework which are all aimed at bringing about a realisation of the African Vision for Infectious Diseases as being that of *'a society protected from the ravages of infectious diseases that undermine their human health, prosperity, well being and development'*. Nevertheless, the framework will not work without a mechanism to stimulate the actions proposed here. For this reason, four of the actions namely (a) the AU Declaration of 2013-2023 as an African Decade on Infectious Diseases; (b) a Panel of Experts on Infectious Disease Surveillance; (c) Mobilising financial support and donor coordination; and (d) the plan of action, have been singled out as catalytic i.e. actions that must be undertaken quickly and at relatively low cost in order to set off a cascade of subsequent actions by various sectors and institutions.

7.1 POLITICAL STATEMENT AND GOVERNANCE

The vision, as set out in the Framework can only be realised through strong political sponsorship at continental and regional level, and through a wide range of partnerships within the stakeholder community. The AU and the Regional Economic Communities (RECs) will have leading roles in developing robust, integrated and sustained policies to enable its successful delivery. In addition to these supra-national initiatives, a raft of complimentary and supporting national and local policies are envisaged which have the endorsement of the governments of Member States and the grass-root support of their institutions and people

7.2 An AU Summit Resolution Declaring 2013-2023 Decade for the Management of Infectious Diseases in Africa

The Declaration by the AU Summit, 2013-2023 as an African Decade for the Management of Infectious Diseases in Africa would greatly increase awareness about the threats of infectious diseases in Africa and the need to take serious actions to manage them. The Declaration would also signal the intent of Member States to act to manage the threats posed by infectious diseases and would provide a tool for citizens to use in encouraging their governments to take action. It would help to coordinate and intensify the work of the AU and Member States on the management of infectious diseases. Further the AU Decade would provide impetus for many of the national and regional actions called for in the framework, including the establishment of an AU Expert Committee on Infectious Diseases, and its secretariat.

The key actions to realize this would be:

1. Adoption by the AU Summit, a resolution declaring 2013-2023 an African Decade for the Management of Infectious Diseases in Africa;
2. Development and implementation of the decade plan of action on the Management of Infectious Diseases in Africa;
3. Monitoring and evaluating the implementation and impact of actions undertaken during the decade; and
4. Knowledge management and sharing lessons learnt from implementing the decade plan of action on infectious diseases.

7.3 An AU Panel of Experts on Infectious Diseases in Africa

Growing national and regional awareness about the threats of infectious diseases at the community, national and regional levels do call for a lot of demands on actions and resources. This make it imperative that resources are allocated to where they are most needed and appropriate technical guidance and policy advice are given to those who need them. An AU Panel of Experts on Infectious Diseases would serve this purpose and should therefore be established. This should include experts consisting of scientists, policy makers and Civil Society Organizations (CSOs) to provide technical guidance, policy advice and priorities for the detection, identification, monitoring and the sustainable management of infectious diseases in the continent. It would also provide a forum for regional debate on issues concerning infectious diseases in the continent. Further it would disseminate knowledge and call for action on detection, identification, monitoring of infectious diseases. The panel would be supported by a technical secretariat. It is important that the composition of the Panel of Experts should reflect the three sectors of humans, animals and plants; it should mainly comprise experts appointed in their individual capacity and drawn from academia, research institutions, governmental and non-governmental systems, the private sector, civil society and non-affiliated individuals. The main criteria should be expert knowledge of infectious diseases and familiarity with strategic issues for detection, identification, monitoring and infectious disease risk management.

The key actions to realise this would be:

1. Adoption of an AU Summit resolution establishing the Panel of Experts as an organ of the AU;
2. Development of the terms of reference, composition and operational modalities of the Panel and appointment of members;
3. Establishment of the secretariat to service the Panel and other needs

7.4 Funding and Resources Mobilization through Partner Coordination for Infectious Disease Surveillance in Africa

The implementation of the strategy outlined herein calls for funding levels that are far above the present allocations by Member States. Inadequate allocation of funds for activities on infectious disease surveillance has been a major problem for Africa. Clearly much more fund commitment would be needed for effective and sustainable implementation of this framework. It is therefore imperative that additional and creative sources of funding be identified for implementation of activities proposed in this framework.

The key actions to implement this pillar are:

- a. Increased budget allocation to infectious disease surveillance by Member States
- b. Increased private sector involvement in infectious disease surveillance activities;
- c. Encouragement of external donors and investors in infectious disease surveillance;

- d. Development of innovative mechanisms for funding infectious disease surveillance programmes and activities: for example, endowments; percentage taxes; levies on imports and exports commodities; tax relief and other incentives for the private sector that invest in infectious disease surveillance; percentage of debt relief; and
- e. Promotion of public-private partnership in infectious disease surveillance.