NEPAD African Union AfDB

C1354 – November 2011
Ref: ONRI.1/PIDA/2010/04

# Study on Programme for Infrastructure Development in Africa (PIDA)

## Phase III

## ➥ PIDA Study Synthesis

SOFRECO

in consortium with

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# PIDA: Interconnecting, Integrating, and Transforming a Continent

## The Regional Infrastructure That Africa Needs to Integrate and Grow through 2040

## Programme for Infrastructure Development in Africa

## PIDA Study Synthesis

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| $ | All dollar amounts are in U.S. dollars unless otherwise indicated. |
| AfDB | African Development Bank |
| AU | African Union |
| AUC | African Union Commission |
| CAPP | Central African Power Pool |
| COMELEC | Maghreb Committee for Electricity |
| COMESA | Common Market for Eastern and Southern Africa |
| EAC | East African Community |
| EAPP | East African Power Pool |
| ECCAS | Economic Community of Central African States |
| ECOWAS | Economic Community for West African States |
| ICA | Infrastructure Consortium for Africa |
| ICT | information and communication technology |
| IGAD | Intergovernmental Authority for Development |
| IXP | Internet exchange point |
| LLC | landlocked country |
| L/RBOs | lake/river basin organisations |
| NBI | Nile Basin Initiative |
| NEPAD | New Partnership for Africa's Development |
| NPCA | NEPAD Planning and Coordinating Agency |
| OECD | Organisation for Economic Co-operation and Development |
| OMVS | Organisation pour la Mise en Valeur du Fleuve Sénégal |
| PAP | Priority Action Plan |
| PIDA | Programme for infrastructure Development in Africa |
| PPP | public–private partnership |
| RBO | river basin organisation |
| REC | regional economic community |
| SADC | Southern African Development Community |
| SAPP | Southern African Power Pool |
| TAH | Trans-African Highway |
| TEU | 20-foot equivalent unit |
| TWR | transboundary water resources |
| TWRM | transboundary water resources management |
| UEMOA | Union Economique et Monétaire Ouest Africaine |
| UMA | Arab Maghreb Union |
| UN | United Nations |
| UNECA | United Nations Economic Commission for Africa |
| VoIP | Voice over Internet Protocol |
| WAPP | West African Power Pool |

# 1. WHY PIDA? WHY NOW?

This report summarizes the findings of the Study of the Programme for Infrastructure Development in Africa (PIDA), a programme dedicated to facilitating continental integration in Africa through improved regional infrastructure. Designed to support implementation of the African Union Abuja Treaty and the creation of the African Economic Community, PIDA is a joint initiative of the African Union Commission (AUC), the New Partnership for Africa's Development Planning and Coordination Agency (NPCA), and the African Development Bank (AfDB).

Infrastructure plays a key role in economic growth and poverty reduction. Conversely, the lack of infrastructure affects productivity and raises production and transaction costs, which hinders growth by reducing the competitiveness of businesses and the ability of governments to pursue economic and social development policies. Deficient infrastructure in today's Africa has been found to sap growth by as much as 2% a year (Calderón 2008). This is a continental problem that requires a continental solution.

The lack of infrastructure in Africa is widely recognised. The road access rate is only 34%, compared with 50% in other parts of the developing world, and transport costs are higher by up to 100%. Only 30% of the population has access to electricity, compared to 70–90% in other parts of the developing world. Water resources are underused. Current levels of water withdrawal are low, with only 4% of water resources developed for water supply, irrigation and hydropower use, and with only about 18% of the continent's irrigation potential being exploited. The Internet penetration rate is only about 6%, compared to an average of 40% elsewhere in the developing world.

Deficits like these have a clear impact on African competitiveness: African countries, particularly those south of the Sahara, are among the least competitive in the world, and infrastructure appears to be one of the most important factors holding them back.

The results of the PIDA study will enable African stakeholders to speak with one voice for continental and regional infrastructure development based on a common vision and agenda.

PIDA is grounded in regional and continental master plans and action plans as well as other relevant work undertaken by the African Union (AU), the regional economic communities (RECs), the regional and continental technical agencies (including the lake and river basin organizations (L/RBO) and power pools (PP)), and the concerned countries.

The proposed infrastructure development programme articulates short- (2020), medium- (2030), and long-term (2040) priorities for meeting identified infrastructure gaps in a manner consistent with the agreed strategic framework - based on long-term social and economic development visions, strategic objectives, and sector policies - and buttressed by an implementation strategy for the Priority Action Plan (PAP), 2012–20.

## 1.1 THE PROMISE OF REGIONAL INTEGRATION

Ensuring that growing demand for regional infrastructure is met, and that infrastructure deficits do not choke off growth, will require a determinedly coordinated regional approach. Because Africa's economic geography is particularly challenging, regional integration is the best, perhaps the only, way for Africa to realize its growth potential, participate effectively in the global economy, and share the benefits of globalisation. Getting there presents major challenges, as recent experience has shown, but promises ample rewards.

Many of Africa's 54 countries are small, with populations of fewer than 20 million and economies of less than $10 billion. Their infrastructure systems, like their borders, are reflections of the continent's colonial past, with roads, ports, and railroads built for resource extraction and political control, rather than to bind territories together economically or socially.

Integration was a goal of the continent's leaders in the struggle for independence. Kwame Nkrumah established the short-lived United States of Africa in the late 1950s, followed by the Organisation of African Unity (1963–2002), which was succeeded by the AU (2002–present). The process of economic integration gained traction with the 1991 Abuja Treaty that established the African Economic Community. Its article 28 proposed the creation of the RECs as the building blocks of African integration with continental integration to be achieved by 2028.

Integration efforts in Africa, including regional infrastructure, have already resulted in increased trade, as they have in other regions that followed a similar path (Box 1.1). Intra-African (and intra-REC) trade grew significantly from 2000 to 2009 in coastal and landlocked countries alike. But as a share of Africa's total imports, intra-African imports stagnated at 9% over the period 2000–07, during a time when Africa's share in world exports was growing (from 2.4% to 2.9%) (UNECA 2010).

The essential benefit of regional infrastructure is to make possible the formation of large, competitive markets in place of the present collection of small, isolated, and inefficient ones. Regional infrastructure does this by *slashing transport costs* (in particular to and from hinterlands and landlocked countries); *establishing connectivity* so that goods can reach markets and people can exchange information and reach jobs; *providing reliable, lower-cost energy* for agricultural, industrial, mining, and communications; and *developing and sharing water resources* in ways that simultaneously increase food production, generate electricity, and protect the continent's natural environment.

Shared regional infrastructure is the only solution to problems of small scale and adverse location. Economies of scale are particularly important in the power and ICT sectors. Big hydropower projects that would not be economically viable for a single country make sense when neighbours share their benefits. Connecting countries to submarine cables requires large up-front investments in cross-border backbone infrastructure. Regional air and seaports are a necessity for a continent with so many small and land-locked countries.

An important benefit of regional infrastructure is its effect on trade within Africa. As regional integration improves the competitiveness of African producers and brings millions more consumers within their reach, Africa will see a swelling of intra- and inter-regional trade as a share of all trade.

**Box 1.1. Regional integration around the world**

Successful examples of regional integration elsewhere in the world include the knitting together of the far-flung United States during and following its expansion. The interstate highway system begun in the 1950s fuelled a rapid increase in continental trade and honed the competitiveness of American firms.

The European Union, mapped out in the Treaty of Rome of 1957, is another example of the benefits of economic integration. The EU provides valuable guidance on how the essential concept of subsidiarity can be effectively implemented. Subsidiarity holds that each aspect of infrastructure (or any other policy matter) should be dealt with at the most appropriate level—continental, regional, subregional, or national.

Since its inception in 2000, the Initiative for the Integration of Regional Infrastructure in South America, which has many similarities with PIDA, has identified 514 infrastructure projects, totalling $69 billon, financed for 21% by local public funds, 25% by IFIs, 35% through PPP, and 19% by the private sector.

Regional infrastructure also exploits and advances synergies among sectors. One salient example is multipurpose dams that store water for irrigation, domestic and industrial consumption, hydropower generation, navigation, environmental needs, and flood control. Another example of synergy is provided by power transmission lines that carry fibre-optic cables and road projects that incorporate the laying of communications cables. A third is that of "virtual water trade strategies" that allow water-scarce countries to rely on water-rich countries for imports of water-intensive agricultural goods (Box 1.2). Only planning performed on a regional level can focus on and fully exploit such synergies.

**Box 1.2. Regional integration and cross-sector synergies—The example of "virtual water"**

Water resources are unevenly distributed across Africa. For that reason, some countries must continue to rely on food imports while others have huge potential to become food exporters (even when using mostly rain-fed agriculture).

In this context the possibility of so-called "virtual water trade strategies" should be explored. Virtual water refers to the quantity of water used in the production of a product. Trade in virtual water would allow water-scarce countries to mitigate their scarcity by importing large amounts of virtual water instead of building new water supply infrastructure. In other words, water-scarce countries could import grain (which requires significant amounts of water during production) instead of producing it locally. By exporting foodstuffs, on the other hand, water-rich countries could make use of their water abundance by exporting water-intensive goods, primarily agricultural products. While such virtual water trade is already practised, its implementation on a regional scale within Africa has just begun to be considered. The Nile Basin Initiative (NBI) has recently commissioned a study exploring the possibility of a virtual water trade strategy for Nile basin states.

Any trade-based solution, whether virtual water trade or other strategies, requires significant improvements in trade regimes and supporting infrastructure, mainly transport. Even if the countries with high export potential were able to produce enough foodstuffs for export interregional grain trade would be impeded by the numerous trade barriers still in place. Despite the establishment of free-trade areas (for example, the launch of a regional trade bloc comprising the members of SADC, EAC, and COMESA in June 2011), the elimination of tariff and non-tariff barrier has been neglected. Likewise, where large volumes of cereal must be moved, high transport costs will toll heavily on competitiveness. Africa's agricultural producers already

have to overcome disadvantages resulting from the distorted nature of international agricultural trade (largely related to agricultural subsidies in major developed economies). Regional initiatives to build a functioning and cost-effective regional transport network must be intensified to overcome these disadvantages by exploiting transport synergies.

Similar synergies are apparent in the links between investments in water infrastructure and energy. Water, used to generate hydropower, is already a substantial component of the continent's overall energy generation capacity and could become much greater. Because investments in irrigated agriculture are highly dependent on the availability of (cheap) energy for the pumping of water, exploitation of the continent's hydropower potential becomes that much more important.

In sum, investments in water infrastructure need to be well integrated into coordinated, cross-sectoral investment and infrastructure plans (primarily transport and energy) in order to achieve the desired outcomes.

## 1.2 THE CHALLENGES

The challenges of regional integration are illustrated by the pitfalls encountered in implementing regional infrastructure policies to date, as well as by the mixed experience of infrastructure and regional projects under preparation and implementation.

### 1.2.1 Unfinished business: the imperative of aligning infrastructure policies

Although Africa's framework of continental and regional policies is fundamentally sound, those policies have not been thoroughly and consistently written into national legislation, even after treaties are signed and ratified. Where regional and continental infrastructure policies do appear in national legislation, too often they are not enforced.

The iconic example is the axle load limit for trucks. Without a harmonised and enforced rule, international movement of trucks from a country or region with a higher load limit damages roads in countries with a lower load limit. Similarly, in ICT, the lack of harmonised regulation is a major obstacle to the construction of needed regional backbones by private operators.

At bottom, continental and regional policies approved by ministerial committees or conferences of heads of state are no more than declarations of intent—intent to improve the delivery of common goods through continental integration; intent to facilitate trade and connectivity through harmonised standards and regulations; intent to cooperate on planning and delivering essential parts of regional networks that all agree are desirable.

But at every step, harmonisation is voluntary. In the absence of formal legal authority to see that continental and regional policies are written into effective national laws and regulations and to compel national authorities and utilities to follow through on their commitments, the regional institutions must rely on cooperation, consensus, and good will, which too often are in short supply.

Missing, as a result, are consistent national policies, regulations, and norms among countries that share regional infrastructure. The ensuing profound lack of harmonisation of laws, standards, and regulations complicates the processes of planning and financing vital regional projects while impeding cross-border economic activity.

The transport sector provides a striking illustration of the economic impact of lack of harmonisation that goes way beyond the axle load limit problem. Conflicting policies and practices hinder international trade, compounding the impact of poor physical

infrastructure. As a result, transport costs in Africa are up to 100% higher than in other world regions.

Policy harmonization is a problem affecting all regional groupings, including the European Union and the Association of Southeast Asian Nations (ASEAN). Short of the judicial processes used extensively in Europe to achieve harmonization but not available in African regional groupings, a solution lies with peer review. Both the EU (under the Maastricht Treaty) and ASEAN are using the peer review process with a degree of success. NEPAD has experience with the African Peer Review Mechanism (APRM). An analogous approach may be useful in ensuring policy harmonization in infrastructure across African countries.

### 1.2.2 Difficulties in the physical implementation of regional projects

The PIDA Study assembled and reviewed a panel of case studies of the efficiency of current regional infrastructure in each sector, as well as regional projects and programs under preparation or under construction.

The review revealed that the lack of alignment and financial problems were the principal drags on efficiency.

*Lack of alignment* with national and regional priorities is a primary failure factor, as good ideas become orphan projects. For example, segments of the Trans-African Highways (TAH) that correspond to the priorities of the country involved have been built, but segments that do not fit country priorities have stagnated.

*Finding financing* is another problem. Raising finance and reaching financial closure are complicated for regional projects (even those undertaken in the public sector with grant financing) because of the number of actors involved. At every turn, there is the risk that the interest of one partner will waver or that a commitment will not be met. Experienced project promoters and developers are needed to help projects clear the many hurdles to financial closure.

Financial distress bedevils regional projects in the transport and power sectors. Regional railways, even those under private concession, earn revenue that is insufficient to cover operating expenses, provide maintenance, or support expansion. Road maintenance suffers from lack of financing even where roads funds have been established. Cash-starved utilities make unreliable offtakers for fledgling regional projects. The result has been steady deterioration of existing infrastructure to the point where portions of the network have become unusable.

There are exceptions to this dismal picture. Participants in the ICT sector enforce strict payment discipline through prepayment of services. Other examples are the well-maintained Maputo corridor (a toll road built and operated by a private group) and regional facilities (such as container ports) that cater to creditworthy clients.

Implementation of infrastructure is always complex—the more so in the case of regional projects with many stakeholders.

Africa's continental (AUC/NPCA) and regional organizations (RECs and their technical agencies) have been keen to assist in promoting and developing regional infrastructure. They have been successful in implementing "soft projects" (policy, planning and feasibility studies) financed by donor grants. However, their mandate, procedures, and staffing generally are ill adapted to infrastructure civil works. (A notable exception has been the OMVS, Box 1.3.) The continental and regional organizations, also generally lack the capacity to borrow.

**Box 1.3. Poor coordination and payment delays compromise regional projects: The case of the OMVS's Manantali dam**

The Organisation pour la Mise en Valeur du Fleuve Senegal (OMVS) illustrates the impact of national utilities' financial difficulties on the efficiency of operation of regional power infrastructure. While the Manantali Dam was completed in 1986, its electromechanical equipment and transmission lines to Dakar, Nouakchott, and Bamako were completed only in 2000. The main causes of the delay were the difficulty the member states had in agreeing on the routing of the power lines and in mobilizing financing. Since operation of the electrical facility started, OMVS has been plagued by the poor payment habits of client utilities, themselves suffering from arrears in payments from governments and the public sector.

Experienced developers in the private and public sectors have implemented successful regional projects.

Even with a competent developer regional projects encounter delays. One major cause is the time needed to establish a responsive and comprehensive contractual framework—whether or not the private sector is involved. Another has been the difficulty of mobilizing finance for project preparation (there are dozens of project preparation facilities with differing operating rules and insufficient resources on their own for the preparation of a large complex project) and for construction. Most successful projects have benefitted from the involvement of the full array of donors using a combination of equity, loans, and guarantees. This has been the only way to bring some projects to closure, but it is time-consuming.

# 2. A GROWING AFRICA

Africa has about 20% of the world's land mass and 16% of its population, but only 2.5% of its gross domestic product (GDP). The United Nations Development Programme (UNDP 2011) summarises the continent's socioeconomic situation as follows:

- Africa is endowed with rich resources. African economies are growing quickly, subdued recently only by the impacts of multiple crises. Africa has minerals, oil, and a resilient labour force that in difficult circumstances delivers innovation and growth.
- Yet Africa faces multiple challenges. It is highly fragmented, with a large number of landlocked countries and generally poor transport and communication infrastructure—particularly in central Africa. Africa is home to over two-thirds of the world's least developed countries, 12 of which have no access to the sea.

Africa ranks lowest of all continents on the UNDP's Human Development Index (UNDP 2010). Of the 50 African countries for which the HDI is computed, 35 are in the low human development group and only 4 are in the high human development group. In 2007, 23 countries had very low per capita GDP, below $2,000 in purchasing power parity (PPP), while 6 had per capita GDP in excess of $10,000.

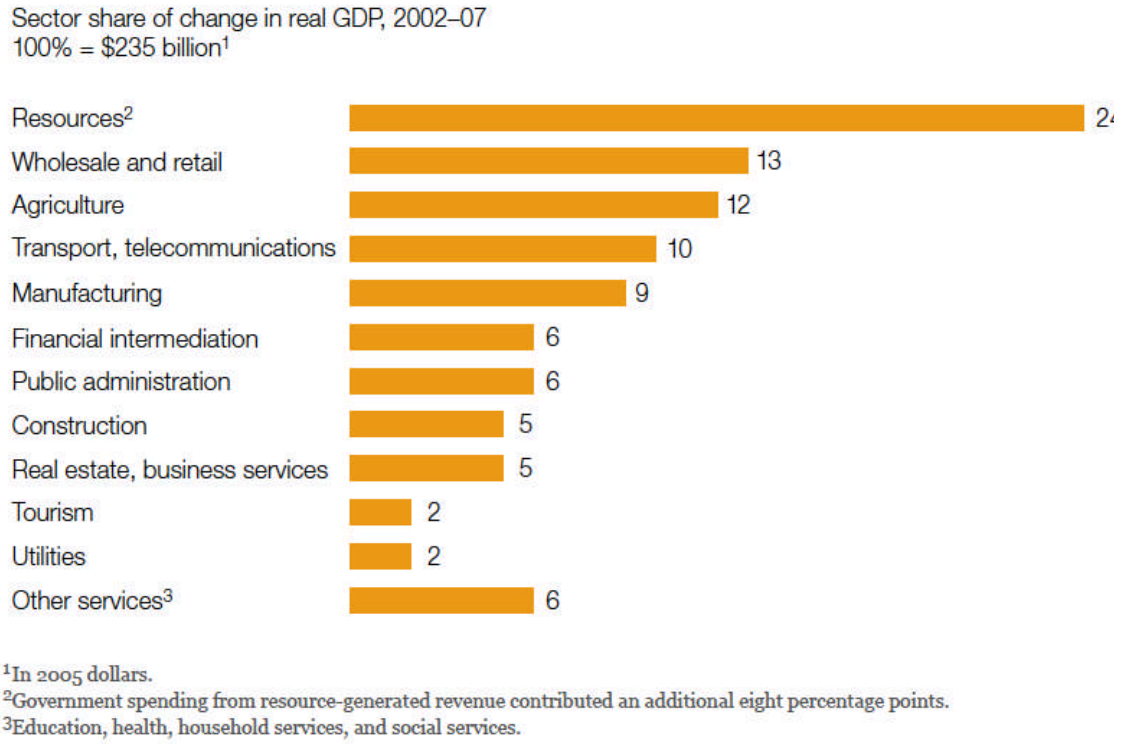
Other indicators confirm the diversity of the African continent. The World Bank's *Doing Business* report for 2011 ranks 183 countries on 5 dimensions of friendliness toward the private sector. Mauritius ranks 20th, ahead of Germany, Switzerland and Luxembourg and eight other African countries rank in the first 100 (World Bank 2010). Three African countries—Rwanda, Zambia, and Cape Verde—are recognised among the 10 "top reformers."

## 2.1 DRIVERS OF AFRICA'S RECENT AND FUTURE GROWTH

Historically, a key driver of Africa's growth has been its richness in natural resources. Resource wealth has been the springboard for the continent's current momentum, catalysed by government spending (based on resource income), structural reforms, the winding down of many conflicts and civil wars, and economic diversification across many sectors—wholesale, retail, transportation, telecommunications and manufacturing (Figure 2.1). Among the countries taking great advantage of economic diversification based on natural resources are Nigeria, Côte d'Ivoire, and South Africa.

Africa's population is the other major driver of growth. The continent's population is projected to increase from 1 billion in 2010 to about 1.8 billion in 2040 (Figure 2.2)—much faster rate than for other continents—and to pass those of China in 2025 and India in 2030.

**Figure 2.1. Widespread growth across sectors**




*Source: Leke et al., 2010.*

Urbanisation will increase from 40% in 2010 to 56% in 2040, approaching but not reaching China's anticipated level of 68%. In 2010 Africa had 51 cities with more than a million inhabitants, and one city (Cairo) with more than 10 million. In 2040 it is expected to have more than 100 cities of more than one million inhabitants and 7 cities of more than 10 million. The largest city is projected to be Kinshasa, where the population is expected to reach 24 million. Overall, the continent's population is concentrated along the Mediterranean coast, along the Gulf of Guinea, through the Sahel, and in Central Africa (Figure 2.3).

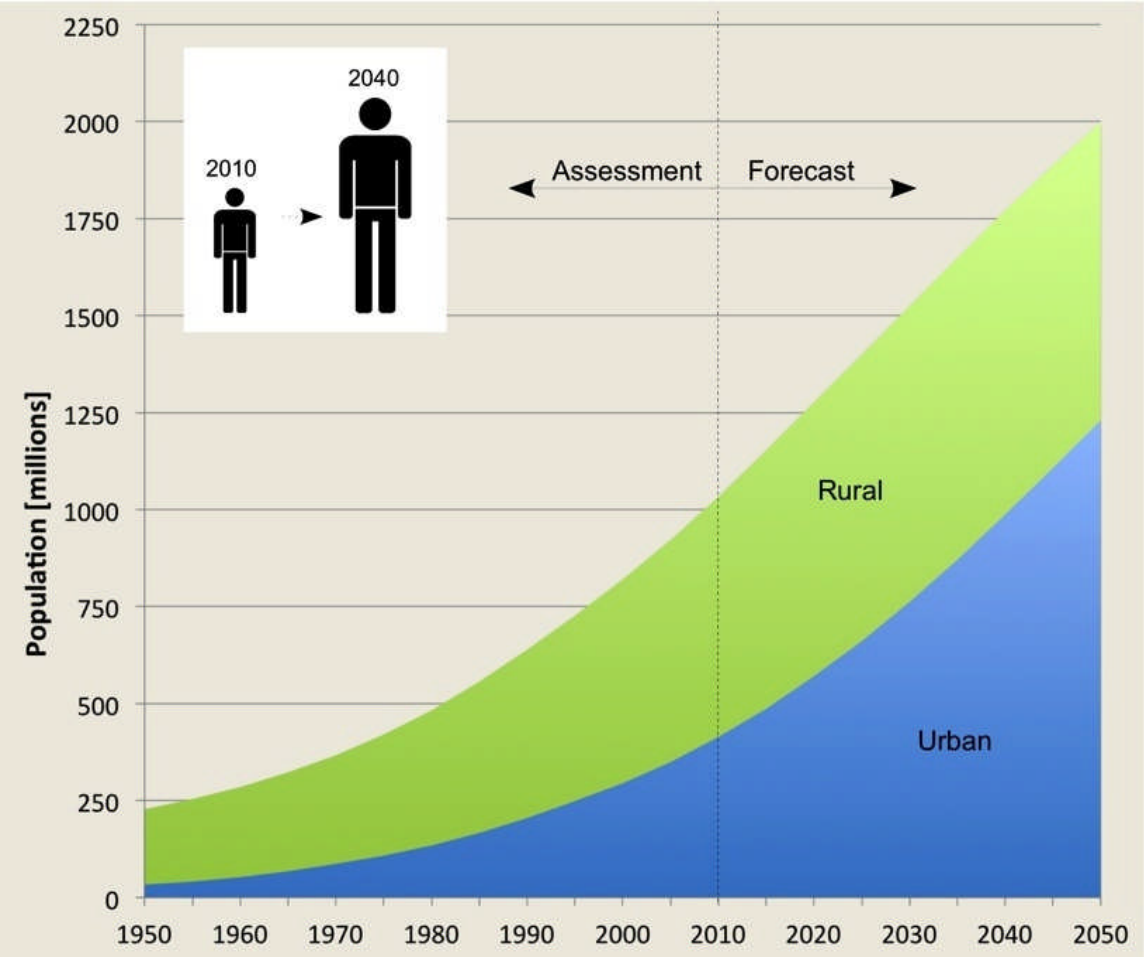
By 2040 the proportion of Africans aged 15–64 years, prime ages for consumption and production, in the world's population of this age group will reach 20%, second only to Asia (with 60%) and well ahead of Europe (8%) and the Americas (12%). Africa is poised to become a manpower reservoir for the world economy.

After a dismal performance in the 1980s, when real annual growth of GDP averaged only 1.87%, Sub-Saharan Africa's annual growth rate improved steadily, averaging 2.27% in the 1990s, 4% for 2000–08, and in excess of 6% for 2005–08 (Figure 2.4). Weathering the 2008 global financial and raw materials crisis better than most other regions, Africa achieved aggregate GDP growth of 4.7% in 2010 and is expected to finish 2011 with 5% growth (UNECA 2011).

Eight African countries were among the world's 20 fastest-growing countries during 2005–09: Angola (1), Ethiopia (3), Uganda (6), Rwanda (9), Sudan (10), Mozambique (15), Tanzania (16), and Malawi (20) (IMF 2011). Short-term prospects through 2015 exceed 5%.[1]

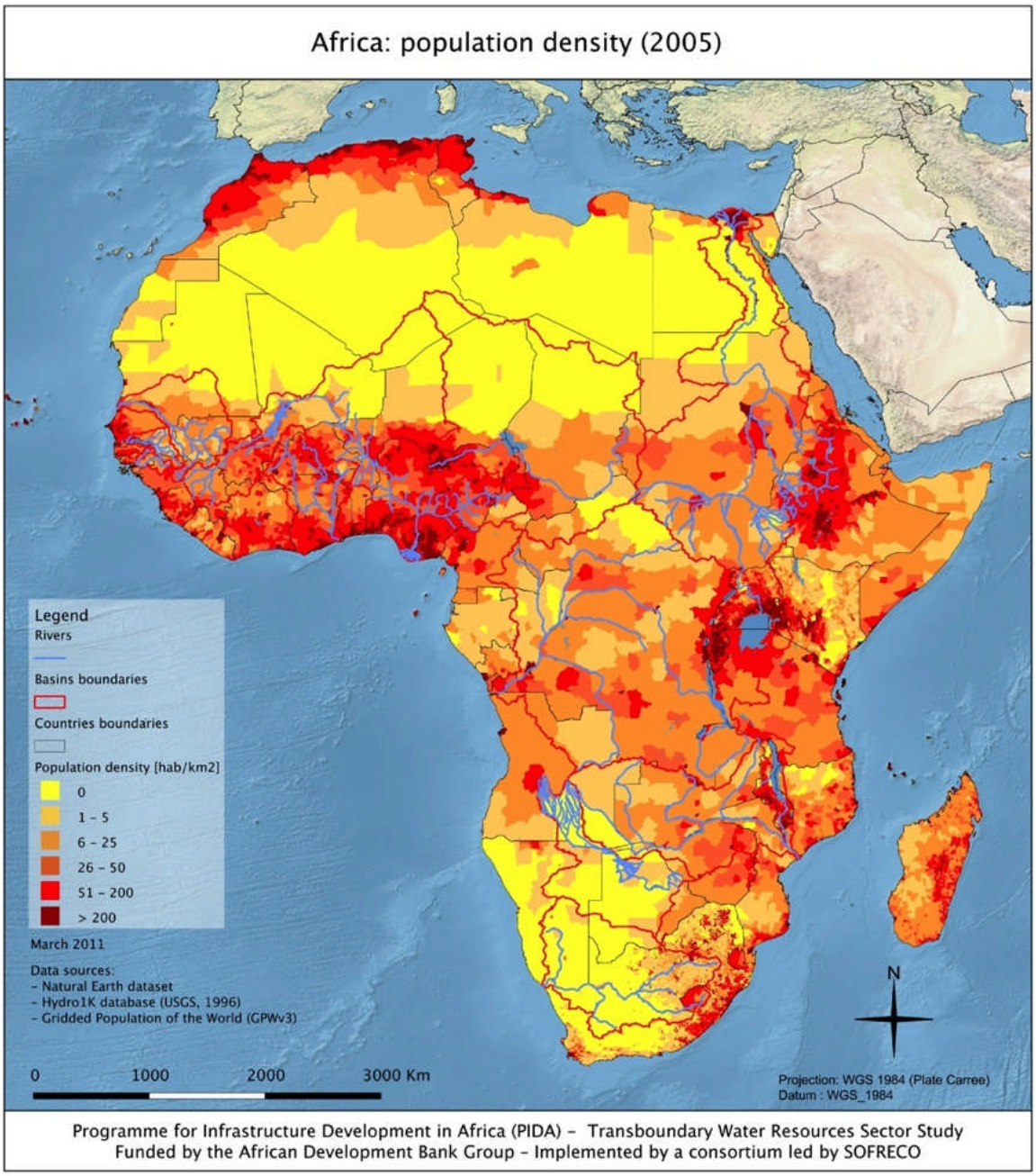
1 The International Monetary Fund (IMF 2011) expects Africa to grow at a rate of 5.2% in 2011 and 6% in 2012. The AfDB also projects 5.2% growth in 2011.

Figure 2.2. Historical and forecast population in Africa




*Source: United Nations, 2011.*

**Figure 2.3. Population density in Africa**




*Data source: Gridded Population of the World, GPWv3, 2005.*

**Table 2.1. GDP in Sub-Saharan Africa and other countries**

| | GDP constant, average annual growth rate (%) | | | | GDP per capita (constant at 2000 US$ prices) | | | |
|---|---|---|---|---|---|---|---|---|
| | 1980–90 | 1990–2000 | 2000–08 | **1980–2008** | 1980 | 1990 | 2000 | **2008** |
| Sub-Saharan Africa | 1.87 | 2.27 | 3.99 | **2.90** | 587 | 531 | 510 | **618** |
| India | 5.55 | 5.46 | 5.92 | **6.06** | 229 | 318 | 453 | **718** |
| Brazil | 1.55 | 2.54 | 2.85 | **2.48** | 3,539 | 3,355 | 3,701 | **4,448** |
| Malaysia | 5.98 | 7.11 | 4.02 | **6.11** | 1,919 | 2,608 | 4,030 | **5,151** |

*Source: World Bank, World Data Bank.*

## 2.2 GDP GROWTH PROSPECTS TO 2040

The PIDA Study envisages an outlook for the future based on a "stretch" macroeconomic scenario that mirrors the outstanding performance of countries such as India and Malaysia over the last 30 years and of Africa in recent years (sees Table 2.1). Such a scenario would be consistent with the assumption behind the Abuja Treaty, namely, that Africa will solve its major sector policy challenges in a satisfactory manner in the next few years and achieve continental integration as well as integration in the world economy.

Africa's potential for growth is indeed quite high. Using a methodology based on the Augmented Solow Growth Model, the PIDA Study estimates that the average growth rate for 53 African countries (GDP-weighted and expressed in U.S. dollars PPP) will be 6.2% per year between 2010 and 2040. A 6.2% rate of growth for Africa implies that over 30 years, the GDP of African countries will on average be multiplied six-fold (Table 2.2).

Thirty-seven countries should exhibit a growth rate higher than 5% per year on average for the period 2008–40. Twenty-six African countries should record an average growth higher than the continental average.

Eight countries will exhibit an average growth rate of between 5% and 6% per year. At the back of the pack, seven countries are expected to grow at a rate of less than 4% per year.

**Table 2.2. Projections of population and gross domestic product in Africa, 2010–40**

| | 2010 | 2020 | 2030 | 2040 |
|---|---|---|---|---|
| Population (millions) | 1,033 | 1,276 | 1,524 | 1,770 |
| Urban population (millions) | 413 | 569 | 761 | 986 |
| GDP (2005 PPP $ billions) | 3,300 | 6.010 | 11,639 | 20,334 |
| GDP/per capita ($) | 3,190 | 4,709 | 7,636 | 11,490 |

## 2.3 THE SMART WAY TO MEET GROWING DEMAND FOR INFRASTRUCTURE

Growth will require new infrastructure. But this presents a choice: Infrastructure can be supplied in an uncoordinated way as needs arise, or in a coordinated and programmatic manner that promotes regional integration and, in so doing, optimises long-term growth, which depends on continental integration. The next chapter summarises broad demand trends and the challenges they pose. The following one presents a strategic framework for supplying infrastructure in a smart way, a way that simultaneously optimises regional integration and growth potential while also satisfying demand.

On the basis of GDP projections, the Study determined each sector's demand for services through 2040 (or 2018 in the case of ICT), making it possible to assess the likely size of the gap between demand and supply at each step of the way. Efficiency gains from improved operation of existing continental and regional infrastructure and the completion of projects under implementation will fill a portion of the gaps identified below. The PIDA programs are designed to fill the remainder.

# 3. TRANSPORT OUTLOOK THROUGH 2040

Growth in Africa's population, economic output, and trade flows will combine through 2040 to raise demand at the regional and continental levels for freight transport, port facilities, and air passenger transport. The growth in demand is likely to outstrip development of the present African Regional Transport Infrastructure Network (ARTIN), opening up gaps between demand and supply that will retard future growth if allowed to persist.

ARTIN's purpose is to link large African centres of consumption and production (large cities, mining centres, large agriculture production projects, and so on) with the rest of the world via modern and efficient regional transport infrastructure networks and gateways (Figure 3.1 and map in chapter 8, section 8.2). Trade in ARTIN corridors is expected to grow faster than overall trade, expanding from 13% in 2009 to 18% of total trade in 2040.

As presently structured, the ARTIN roads are constituted by a series of national roads with different standard and characteristics. In the future, this network should be upgraded in order to arrive at a Regional African Road Network with modern characteristics (similar to the Trans-European Network) with efficient management and maintenance systems.

Four decades ago a continental network of roads linking the capital and the key cities of Africa was defined by African leaders to improve connectivity between African regions in the form of nine Trans-African Highways (TAH). Today about 25% of these TAHs are not, as yet completed, one key objectives of PIDA is to complete the construction of these TAHs during the next 30 years.

The Africa Transport Sector Outlook 2040 evaluated the regional transport demand and the resulting infrastructure gap taking into account the policies relevant to regional and continental transport, the existing infrastructure and the potential for efficiency gains.

There are sizable inefficiencies on many corridors as shown in the table 3.1.

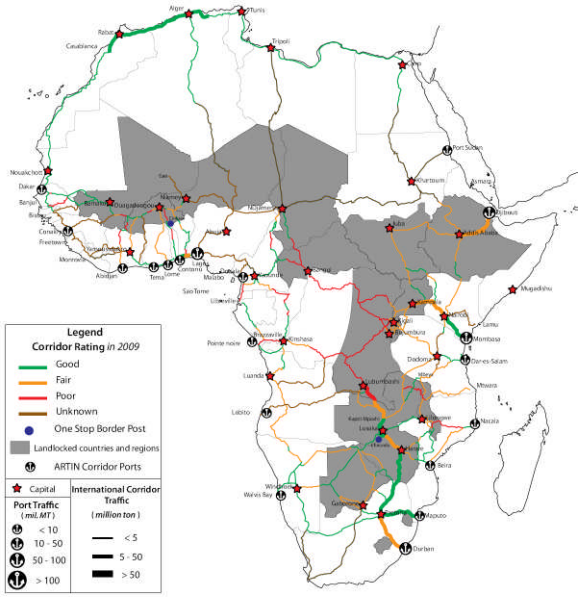
**Table 3.1. Economic cost of inefficiencies in ARTIN, 2009**

| Type of cost | Amount (US$ billion) | % |
|---|---|---|
| Total ARTIN corridor inefficiency costs | 75 | 43 |
| Total ARTIN air transport inefficiency costs | 25 | 15 |
| Total value of suppressed freight demand | 65 | 38 |
| Total value of suppressed air transport demand | 7 | 4 |
| **ARTIN total** | **172** | **100** |

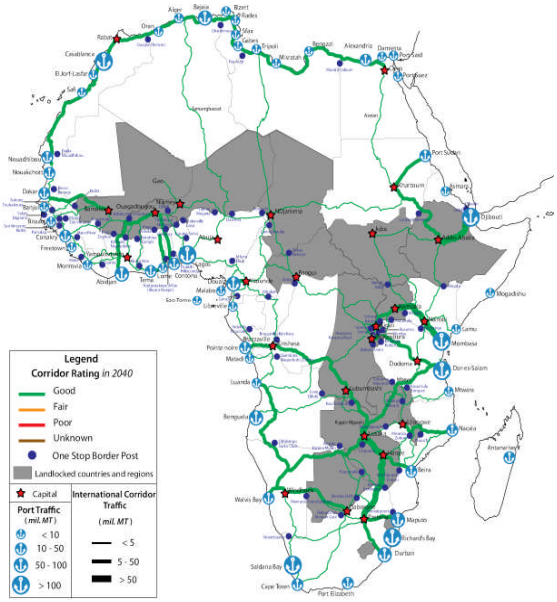
This inefficiency along the corridors is more due to the non-implementation of trade facilitation measures and to transport sector policies by member states than to the physical condition of the infrastructure. One key issue for example, is the customs facilities at borders and ports where too much time is lost in waiting. This requires the development of efficiency monitoring, smart corridor information systems and the creation of OSBPs.

**Figure 3.1. Africa's corridors of growth: ARTIN in 2009 and 2040**

*a. 2009*




*b. 2040*




*Source: PIDA.*

Over the next three decades, Africa's transport planners will have to deal with important changes in the transport environment. Demand presently suppressed by inefficiencies in the transport system will be unlocked by improvements in the system. Steady advances in regional integration will cause a shift from overseas trade to trade between countries within the same REC. Structural change in African economies will foster more value-added industries, changing the profile of goods traded and increasing regional integration. Demand for air passenger services will rise with per capita incomes and urbanization. Containerised cargo will come to dominate port traffic and port traffic growth, increasing the importance of multimodal transport of containers along ARTIN corridors. Transit traffic from landlocked countries will increase more than tenfold over the next 30 years.

Forecast demand is expected to exceed capacity in all areas of the ARTIN corridors by 2040, even with the completion of planned improvement projects.

## 3.1 FUTURE DEMAND FOR FREIGHT TRANSPORT

Future freight transport demand in Africa is tied to growth in international trade, which is expected to grow seven-fold (to 3.6 billion metric tons) over the next 30 years as countries increase the value added of their exports through processing, consumers with rising incomes import more-expensive goods, and manufacturing and mining businesses import more expensive processing equipment.

Future port tonnage is expected to grow at 6% to 6.8% per year, excluding large new mining projects and crude oil, and at 5.8 to 7.8% per year including new mining projects. Six ARTIN corridors face short-term port container capacity gaps by 2020 even after currently planned port and terminal expansion projects are completed in West Africa (Tema and Lagos), East Africa (Mombasa), and southern Africa (all Mozambique ports).

Growth in container traffic is expected to outpace total tonnage. Container growth will average 10.6% per year to 2020 (including some suppressed demand released by corridor improvements) and 7.9% from 2020 to 2040 on a sustained basis (with all suppressed demand released). The net result will be an increase in container traffic to 38 million 20-foot equivalent units (TEUs) by 2020 and 176 million TEUs by 2040, a 14-fold increase.

Bulk traffic growth will depend on mineral development, particularly iron ore and bauxite exploitation. New coal shipments are also expected in ARTIN corridors, as well as more copper metal from the Copper Belt countries, but at lower tonnages than for iron ore and bauxite, which will utilize special purpose-built transport facilities.

**Table 3.1. Trade forecasts by region (millions of metric tons)**

| Region | 2009 | 2020 | | 2030 | | 2040 | |
|---|---|---|---|---|---|---|---|
| | | Volume | Avg. growth (%) | Volume | Avg. growth (%) | Volume | Avg. growth (%) |
| North Africa | 20 | 235 | 6.3 | 410 | 6.3 | 760 | 6.4 |
| West Africa | 7 | 176 | 6.7 | 300 | 6.0 | 556 | 6.3 |
| Central Africa | 21 | 43 | 6.8 | 77 | 6.4 | 145 | 6.5 |
| East Africa | 45 | 96 | 7.1 | 181 | 7.1 | 360 | 7.1 |
| Southern Africa | 240 | 408 | 4.9 | 617 | 4.7 | 1,001 | 5.0 |
| **Total Africa Base** | **513** | **958** | 5.8 | **1,585** | 5.7 | **2,823** | 5.9 |
| **With suppressed demand** | **513** | **1,056** | 6.3 | **1,822** | 6.1 | **3,397** | 6.4 |
| **With new minerals** | **513** | **1,175** | 7.8 | **1,998** | 5.5 | **3,630** | 6.2 |

*Source: Africa Transport Outlook 2040, Annex 3.2, excluding crude oil.*

Six of 11 cross-border railway lines will need physical expansion by 2020 even if their operations and equipment are greatly improved to reach good efficiency before then. All 11 cross-border railways will need to be expanded by 2040 to meet demand with efficient mode shares for rail services.

Over the period 2012–20 all ARTIN road corridors will need modernisation to improve their efficiency and capacity through facilitation measures (including OSBP and "smart corridors") and road improvements (including standards modification, round about at intersections, bypasses of urban areas and passing and climbing lanes). Large port expansions will have to be implemented.

There is scope for building new, modern rail lines in nine of the 11 corridors, where demand by 2040 is expected to exceed 10 million tons. These forecasts assume that the railways will be run as efficiently as Transnet railways in South Africa.

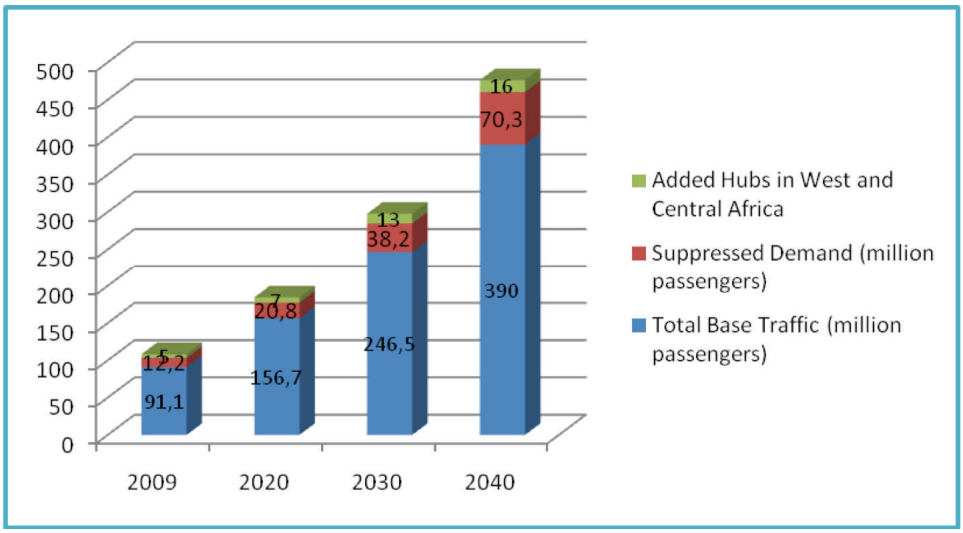
Regional rail master planning needs to be linked to new and expanded port development—a major departure from existing approach to rail planning. Regional traffic along various corridors to and from landlocked countries are forecast to reach volumes that could justify the building of new, modern railway lines to link these landlocked countries to the sea, assuming that the development of the additional port capacities are concentrated in a few efficient locations.

## 3.2 FUTURE DEMAND FOR AIR PASSENGER TRANSPORT

International air passenger flows are forecast to increase 40–90% by 2020 and by factors of 2.5 to 6 by 2040, including suppressed demand. Air passenger flows increase for all countries and RECs but will continue to be dominated by nine countries that are major tourist destinations and major regional air transport hubs. Demand for transport to Europe will be substantial for all RECs, with demand for transport to the Middle East strong for several RECS and to Asia and North America for a few.

Surging demand will expose gaps in the ARTIN air transport system in the areas of air passenger service, air navigation systems, and airport capacity.

**Figure 3.2. Forecast air passenger traffic through 2040**




*Source: Africa Transport Outlook 2040, Annex 3.5.*

Seven airports face demand of more than 3 million air passengers per year by 2040 (over 2 million by 2030). They will need to be expanded. Two of these (Johannesburg and Cairo) may reach over 10 million passengers by 2040.

The capacity of 17 airports will be exceeded by 2020 under base case forecasts. Four are already programmed for expansion, but all airports on the continent will need to be expanded or supplemented by additional airports by 2040 in order to handle the anticipated growth in air traffic (350% to 600% over current air passenger levels).

The high-level air traffic control system will reach saturation between 2020 and 2030 and will need to be replaced with a satellite-based air traffic control system. Gaps in the communications systems at and between airports in many areas of the continent will have to be patched.

This system is obsolete and leads to inefficient use of aircraft and higher costs of air transport. A Single African Sky approach using satellite navigation is being considered.

## 3.3 MAIN CHALLENGES STEMMING FROM THE OUTLOOK 2040

Africa will need to implement large investment programs in the short, medium, and long term for the transport sector in order to raise transport infrastructure efficiency and capacity along ARTIN corridors and for the ARTIN air transport system to efficiently satisfy the expected transport demand, even with the added capacity from planned projects.

The problem faced by the African continent is to select the best, more efficient corridors together with the best combination of transport modes in order to minimize total economic costs and reduce prices to shippers and passengers.

Two sets of challenges face the transport sector:

First, how to create programs and projects that will:

- Expand existing operations to handle 2020 trade forecasts (which involve increases by 100%-200% in many cases)
- Provide options to cope with future traffic increases beyond 2020 to 2040 (where growth rates of 6-10% per year lead to increase factors of 6-10 from current trade levels)

This challenge concerns especially transit traffic from landlocked countries, which in some cases is expected to increase by 10–14 times over the next 30 years.

Second, how to develop regional corridor infrastructure in a way that includes:

- The identification and development of new port locations, in combination with railway and/or road transport
- The potential introduction of standard gauge railway lines
- The increased use of multimodal transportation
- The best use of PPP initiatives, particularly for providing infrastructure investment for both port and rail facilities and for roads where the traffic justifies it.
- The development of efficient air services and air hubs, which will increase service levels and decrease costs.
- Policy challenges to ensure the funding and maintenance of infrastructure and efficient coordination of road and rail transport across borders, as well as border crossing facilities and processes that facilitate trade and regional integration.

# 4. ENERGY OUTLOOK THROUGH 2040

Although it will not lower significantly investment costs, regional integration has the potential to save Africans billions of dollars in operating costs, savings that can make investments affordable. The fuel savings that could be obtained from regional integration represent fully 75% of investment costs. An additional 800 million Africans could gain access to electrical power for a relatively modest investment.

## 4.1 WITH GROWTH, BURGEONING DEMAND FOR ENERGY

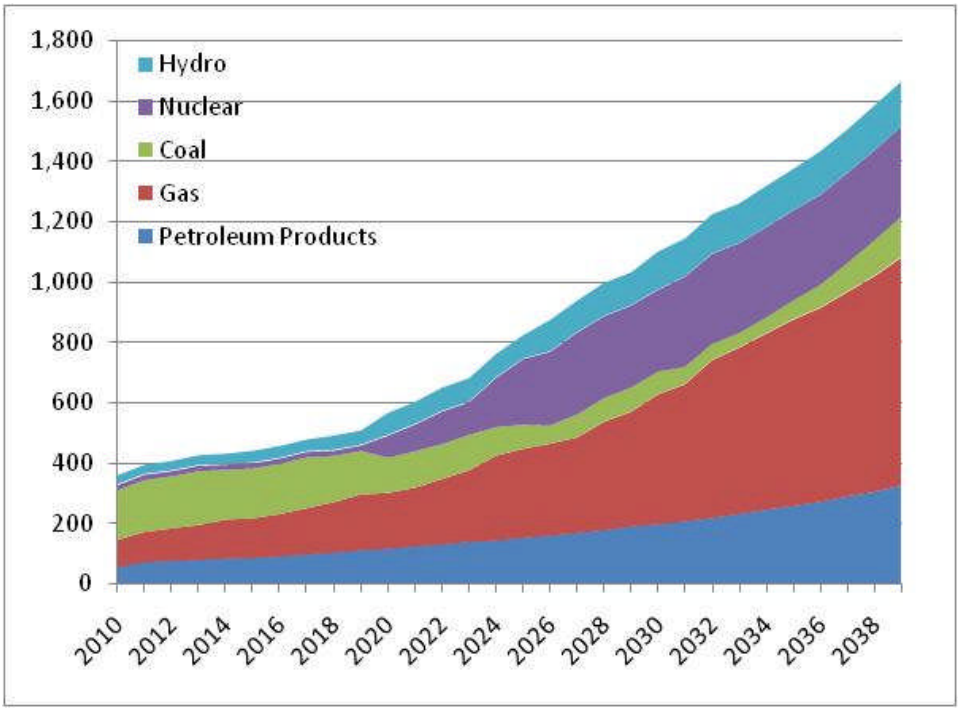
The modernization of Africa's economies, coupled with social progress and a commitment to widening access to electricity, will boost energy demand in Africa by an average 5.7% annually through 2040 to 3,188 TWh, a 5.4-fold increase. The projected rate of increase in demand for electricity is much greater than in the past, when demand was heavily constrained by shortages and rationing. The continent's per capita energy consumption is expected to rise from its present level of 612 kWh per capita in 2011, the lowest of any world region, to 1,757 kWh per capita by 2040. This translates to an unprecedented 3.7% increase per year.

The total demand from industry is projected to increase from 431 TWh in 2011 to 1,806 TWh by 2040, an annual growth rate of 5.1%. This trend does not clash with the expected rapid development of extractive industries, as the bulk of the demand from these industries is projected to be met by self-generation.

To keep pace, generation capacity must increase by 6% per year to 694 GW in 2040, a six-fold increase. Presently, The whole of Africa has just 125 GW of generating capacity (comparable to that of the United Kingdom) and just 90,000 km of power transmission lines. The gas and petroleum product pipeline systems are limited. Low rates of access to basic energy services, especially in Sub-Saharan Africa, where access rates are barely 30%, throttle socio-economic development.

Africa's demand for primary energy (excluding biomass used by households) is expected to increase by 8.9% annually through 2040. The role of coal will fall, as gas and nuclear power are developed (Figure 4.1). The rapid increase in consumption of liquid petroleum products reflects growing transport demand. Even as nuclear power supplements existing energy sources and known hydropower potential is fully exploited, the continent will continue to rely on fossil fuels. A major challenge for Africa will be to meet the continued and increasing dependence on petroleum products from continental resources through the development of refineries supplied by African crude, and of pipelines to transport increasing volumes of petroleum products.

**Figure 4.1. Consumption fossil and hydro primary energy of Africa (in million TOE)**



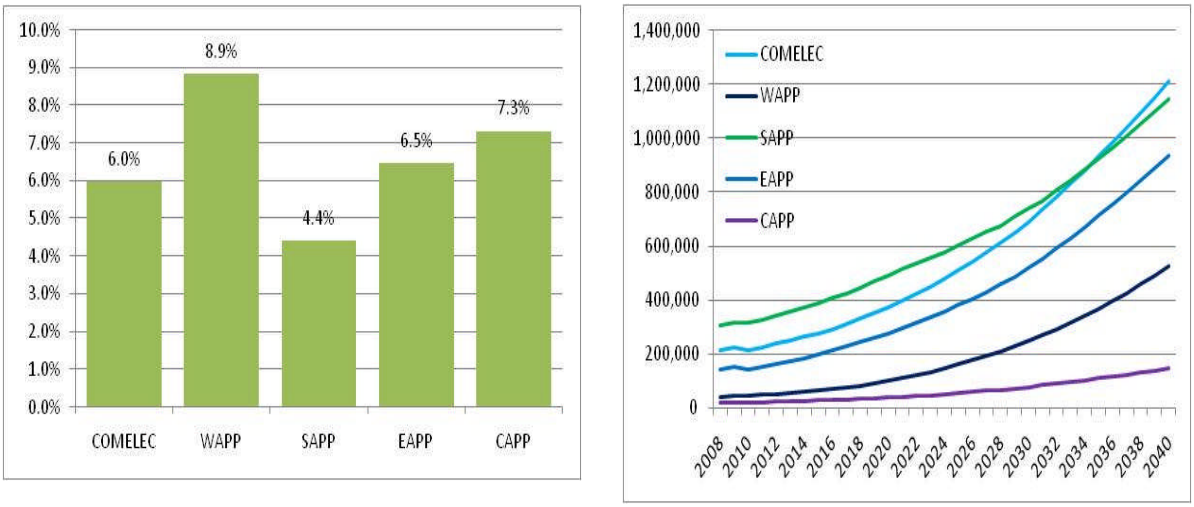

*Source Africa Energy Outlook 2040.*

Energy efficiency policies have the potential to save 139 MW (16.7%) in capacity needs and 634 TWh in energy produced (16.6%), highlighting the importance of diligent implementation of energy efficiency policies.

## 4.2 ENERGY OUTLOOK BY REGION

Demand will increase faster in WAPP and CAPP than in the other pools because demand growth in large countries such as South Africa and Egypt is expected to be slower than in less-developed areas (Figure 3.5). In terms of consumption per capita, the rapid demographic growth of Sub-Saharan Africa will pull down the per capita consumption of electricity.

**Figure 3.5. Annual growth rate (%) and increase in demand (in GWh) by power pool, 2011–40**




*Source Africa Energy Outlook 2040*

Through 2040 COMELEC will experience an increase in demand by 6.2% per annum. Demand from new connections will be limited because access is already close to 95%. It is expected that 298 GW of capacity will have to be added.

Total demand in SAPP will increase by just 4.4% because of lagging growth in South Africa. The region will still have to add 129 GW in capacity (a 250% increase) to meet projected demand over the 2011–40 period. Access is expected to swell from 25% to 64%.

With rapid growth in WAPP's low-income countries, demand will increase rapidly (by 8.9% annually), requiring an additional 90 GW of capacity, a 1,200% increase from the current level. Access will rise from 45% to 67%, reflecting gains in Ghana and Nigeria.

Some 26 GW of new capacity (a 670% increase) will be needed to meet CAPP's growing demand for power. Access to electricity in the region will increase from 21% to 63%.

EAPP's demand is expected to grow by a moderate 6.5% per year because of relatively slow growth in Egypt. Meeting that demand will require 140 GW of new capacity, a 525% increase. The access rate will increase substantially from 37% to 68%, largely due to gains in Egypt.

The RECs will continue to have very diverse primary energy mixes, with COMELEC and EAPP (Egypt) relying heavily on gas and petroleum products, while WAPP will have a more balanced mix of petroleum products, gas, and coal. CAPP will rely essentially on petroleum products. SAPP will reduce its consumption of coal as nuclear energy expands.

## 4.3 REGIONAL INTEGRATION AND THE UNDEREXPLOITATION OF ENERGY SUPPLIES

Africa's abundant energy resources in oil, gas, coal, and especially hydropower are unevenly distributed across a compartmentalised continent, resulting in under exploitation in some areas and scarcity and inordinately high expenses in others. As energy resources go unexploited, demand goes unserved, impeding Africa's human development and taxing its businesses.

Steering the evolution of the fuel mix in optimal directions is the paramount challenge in Africa's energy sector. Meeting that challenge hinges on successful regional integration, specifically the expansion of intra- and interregional power trade so that efficient producers can export their relatively low-cost energy, lowering costs for all and improving reliability, both of which are essential for industrial growth, ICT development, effective irrigation, and efforts to expand access to electricity.

Behind the under exploitation of energy resources lies poor capacity to mobilize financing for investment, especially from private sources, owing to the poor creditworthiness of countries and utilities and high political risks.

The degree of regional integration achieved during the period will affect investment patterns, the energy mix, and energy costs. Greater Integration will lower fuel costs but require more capital investment because integration increases the economic viability of large hydropower plants, which are more expensive and time-consuming to build than thermal plants and are vulnerable to drought but produce cheaper power and cost less to maintain and operate. Hydropower presently accounts for 20% of generating capacity on the continent, the highest share of any continent, but supplies come primarily from small, inefficient units.

A realistic integration scenario would save $860 billion over the 2014–40 period—17% of the cost of electricity. This would represent an average annual gain of $33 billion.

## 4.4 INVESTING TO MEET DEMAND

The main conclusions of the Africa Energy Outlook 2040 in terms of spending needs are:

- An estimated $43.6 billion per year will be needed to meet forecast energy demand for Africa to the year 2040 as follows:
- The average annual investment needs for the power sector are estimated at $42.2 billion, with $33.1 billion for generation, $5.4 billion in interconnections, and $3.7 billion in access.
- Interconnection investment is urgent and needed up front to meet the forecast energy demand in 2020 for an average of $5.4 billion per year..
- A relatively small investment—$3.7 billion per year—is needed to ensure no country has an access rate below 60% by 2040.
- An estimated $1.3 billion per year will be needed for gas and petroleum product pipelines.

- No significant increase in average wholesale tariff is required to finance the sector programme, which would remain around $0.10/kWh. Tariff estimates assume a major improvement in collection performance and much larger sector cash flow volumes generated by the utilities

The main challenge will be financing the large capital investment requirements of the power sector, especially the need to increase private sector financing and sector cash flow by some 7–10 times their current levels.

# 5. OUTLOOK FOR TRANSBOUNDARY WATER RESOURCES THROUGH 2040

Africa's transboundary water resources, although unevenly distributed, have the potential to contribute to food and energy production and to poverty reduction—if they can be properly tapped and exploited. But in the absence of advances in regional cooperation, burgeoning demand for water will cause many areas of the continent to experience greater water stress and scarcity.

The total internal renewable water resources (IRWR)—the long-term average annual flow of rivers and recharge of aquifers generated from endogenous precipitation—in Africa as a whole are estimated to be 3931 km3 per year. Africa represents 9.2% of the world IRWR, compared to 28% and 29.1% in Asia and South America respectively. The IRWR in Africa is distributed between surface water (more than 3,800 km3 per year) and groundwater (about 1,400 km3 per year) with an overlap of more than 1,300 km3 per year.

Africa's water requirements are expected to increase significantly by 2040, with irrigated agriculture by far the largest consumer. Although much of Africa has abundant water resources, water requirements of the domestic, agricultural and industrial sectors are catching up with availability at the continental scale.

In some African basins water demand will soon outstrip available resources if no improvements in management and efficiency of use are made. As demand strains resources, the competition between water use sectors and the environment is likely to increase.

As Africa's population grows—it is expected to almost double between now and 2040—the demand for food (notably cereals such as wheat, maize, and rice) will double as well. Meeting that demand depends on successful expansion of irrigated agriculture, as well as improvements in rain-fed agricultural practices and increased cereal imports.

Presently, however, Africa has the lowest level of irrigated agriculture of any world region. Water storage (e.g., behind new hydroelectric dams) will have to increase if large-scale irrigation schemes are to succeed.

The PIDA study focuses on 10 lake and river basins—Lake Chad, Congo, Gambia-Geba-Koliba, Niger, Nile, Okavango, Orange-Senqu, Senegal, Volta and Zambezi and three underground water systems (Nubian sandstones system, Northwest Sahara system and the Illumeden). The selected basins border on most of the African countries and account for 51.5% of African land area and 80% of the total area of the African international basins.

## 5.1 IRRIGATION, WATER WITHDRAWALS, AND WATER REQUIREMENTS AT THE CONTINENTAL LEVEL

In the selected PIDA basins the area equipped for irrigation at present stands at around 6.2 million hectares, which represents around 20% of the estimated potential in these basins.

Critically, the biggest challenge for the expansion of agricultural production in Africa (both irrigation and rain fed) is the low efficiency of production. Thus, in addition to increasing the area under production, significant investments need to be made in improving production efficiency if food production targets for 2040 are to be met.

The water requirements reported here will vary with population growth and the degree of expansion of irrigation over the next three decades.[2] Those variations are the basis for alternate scenarios for the African continent.

Actual water withdrawals for agriculture (the largest user) will depend on a series of economic, technical, climatic, and political choices and factors that are difficult to estimate. However, the four modelling scenarios for the development of irrigated agriculture provide a good indication of the expected order of magnitude of future withdrawals for irrigation.

Under all but the upper-bound scenario (in which irrigation expansion would account for 100% of increases in food requirements), the gap between food production and demand would be filled by rain-fed agriculture and international imports. In 2005, cereal consumption in Africa (production + imports – exports) was 192 million tons, of which 34 million tons were produced under irrigation. The difference was provided by rainfed agriculture (108 million tons) and net imports (50 million tons).

By 2040, under the "business as usual" irrigation-development scenario and assuming medium population growth, irrigated cereal production will be about 67 million tons against cereal requirements of about 319 million tons. As a consequence, 252 million tons of cereal will have to be provided by rainfed agriculture or imported.

Intensifying food production will require raising agricultural productivity, finding the right balance between rainfed and irrigated agriculture, expanding irrigated areas where doing so is especially advantageous, increasing irrigation efficiency (e.g., through the use of drip systems), increasing the yield of stressed river basins, and weighing the possibility of interbasin water transfers.

## 5.2 WATER STRESS: GAPS BETWEEN NET WATER REQUIREMENTS AND AVAILABLE WATER RESOURCES

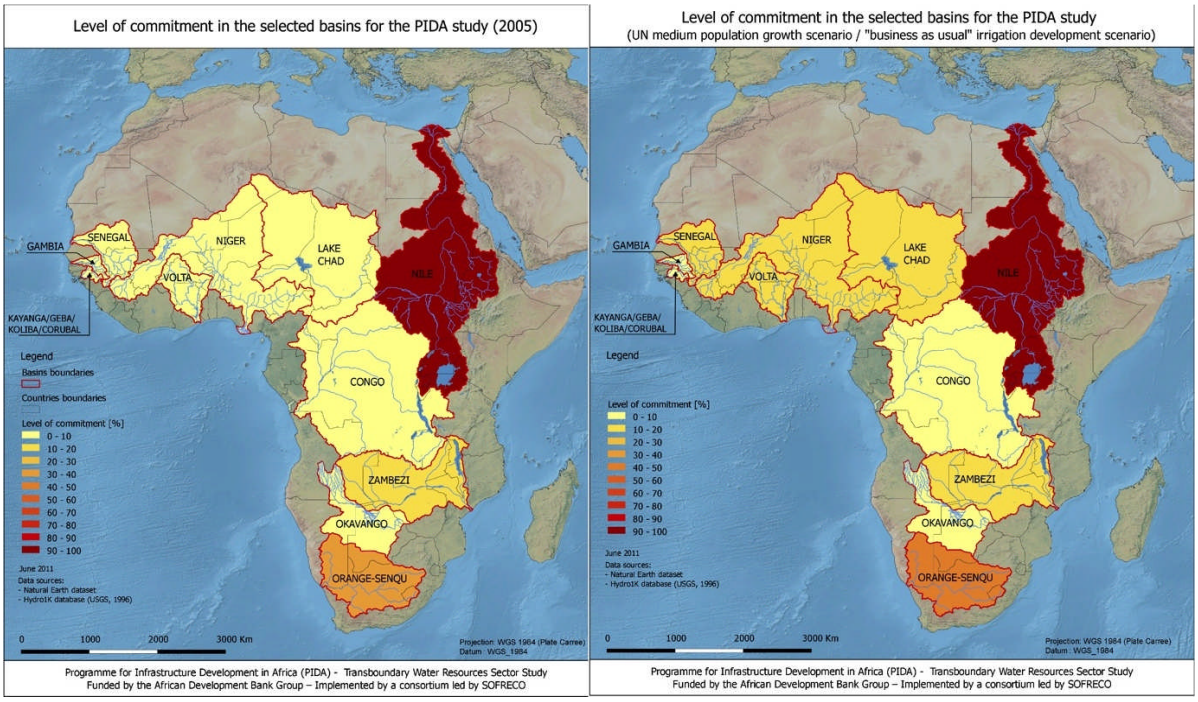
Under the irrigation-development scenarios, the residual volume in the Nile basin, now about 3 $km^3/y$, would fall to zero, as the water resources of the basin are already almost fully committed (Figure 5.1, left).[3] By 2040, the level of commitment of the other PIDA

2 The "low", "medium", and "high" variants of the World Population Prospects database are used. http://esa.un.org/unpp/index.asp?panel=3

3 The level of commitment of a river basin is the ratio between water consumption and the natural renewable resource available in the river basin.

basins will range from a low of 0.8% in the Congo to 20%% in the Volta and Zambezi basins (Figure 5.1, right).

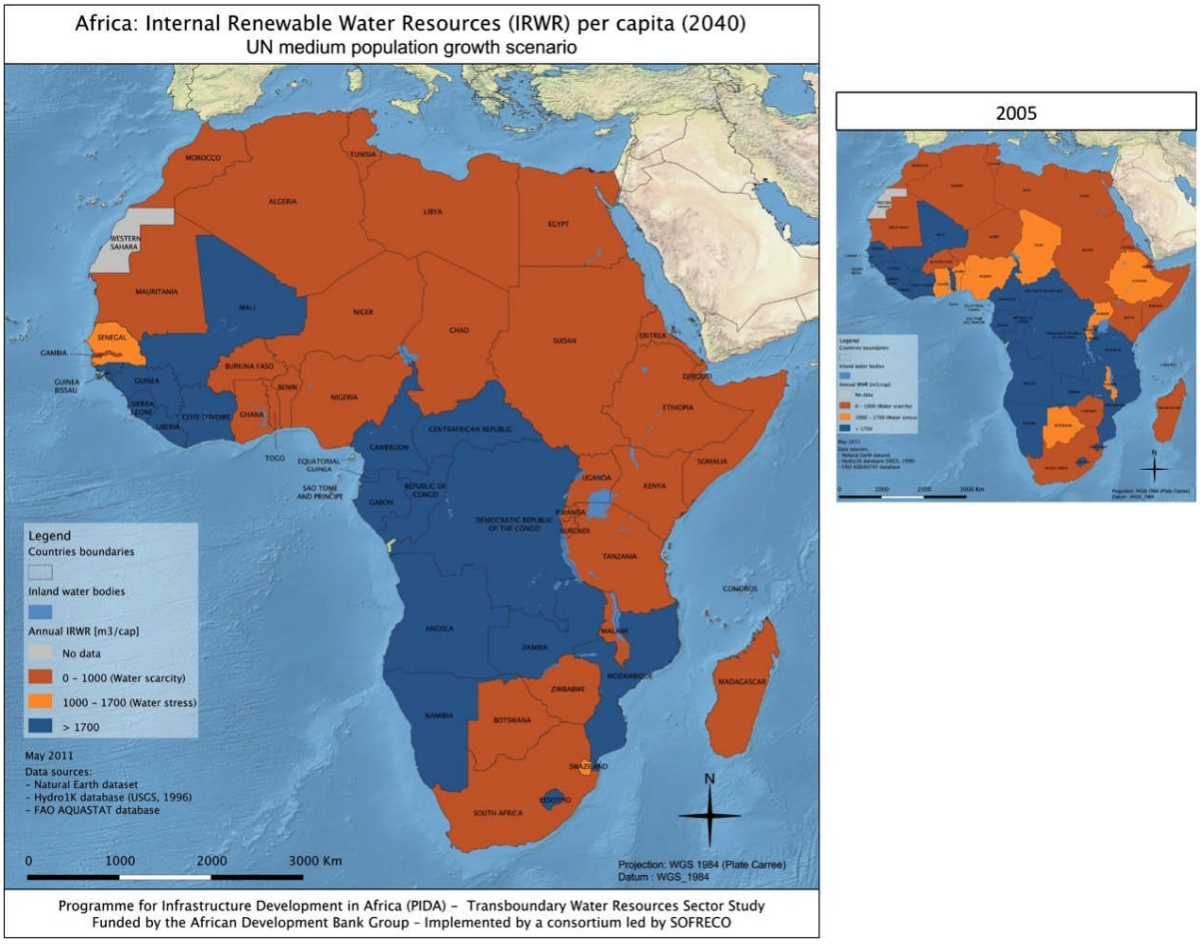
**Figure 5.1. Level of commitment of selected basins in 2005 (left) and in 2040 under a medium population growth scenario and the "business as usual" irrigation development scenario (right)**




Although the Nile is the only basin where future requirements are likely to rapidly exceed the available resources, in several other basins it will be difficult to meet projected requirements without damaging the environment, which calls for well-informed political decisions.

At present about half the African continent faces some sort of water stress or water scarcity (Figure 5.2). The situation is predicted to become significantly more aggravated in 2040 by when the only regions where the IRWR per capita is considered as sufficient are the Congo River basin and the Western Gulf of Guinea area. Several countries that were in a situation of vulnerability in 2005 will become water stressed or water scarce in 2040. Most of the countries sharing international river basins (except Congo) are likely to face severe water scarcity in 2040.

**Figure 5.2. Map of Internal renewable surface and groundwater resources per capita in Africa, 2005 and 2040**




*Data sources: UN Food and Agriculture Organization's AQUASTAT database and UN World Population Prospects.*

## 5.3 THE LIMITS OF HYDROPOWER

Most of Africa's dams were built with hydropower generation as a primary purpose (followed by irrigation water supply). Nonetheless, at present, only 8.4% of the total estimated hydropower potential in the 10 PIDA basins are exploited with the total installed capacity at about 15,800 MW. Eighty-four percent of that capacity is concentrated in four river basins (Nile, Zambezi, Niger, and Volta). The bulk of the estimated (and currently unexploited) potential is also located in these basins, with only a small percentage of estimated potential in the remaining PIDA target basins.

Similar to the situation described for installed hydropower capacity, the bulk of the currently existing storage capacity is concentrated in a few basins. Of the total storage capacity in the PIDA basins of 670 billion $m^3$, two-thirds are in the Kariba, Cabora Bassa (both Zambezi basin), Akosombo (Volta basin) and High Aswan dams (Nile basin). Despite the comparatively low storage capacity in absolute terms (given the relatively small total annual run-off) the Orange-Senqu River basin is noteworthy in that it is one of

the most developed river basins in the world, with several large dams and the world's largest international inter-basin-transfer.

By 2040, the planning model of the PIDA Study estimates that an additional 72,500 MW will have been commissioned in the selected basins, two-thirds in the Congo basin alone.

Once this significant increase in hydropower production is realised, however, hydropower will represent less than 20% of installed capacity (about 694 GW in 2040). Even if the full hydropower potential of the selected basins were exploited—unlikely for a variety of reasons ranging from social and environmental concerns to political instability and associated lack of security of investments—hydropower would cover no more than 35.1% of the forecast demand.

## 5.4 RIVERS AND LAKES TRANSPORT INFRASTRUCTURE

The main regional inland waterways in Africa are limited to five rivers, the Nile, the Congo, the Niger, the Senegal and the lower Zambezi Rivers, and three lakes, Lake Victoria, Lake Tanganyika and Lake Malawi. Currently, river and lake transport serve essentially only the people living directly along rivers while river and lake based long haul traffic has practically completely disappeared. The main reason is that the rivers and lakes are not appropriately maintained for navigation and transport purposes. Dredging is not carried out, the navigation systems are not correctly maintained, and the fleets are old and in very poor condition.

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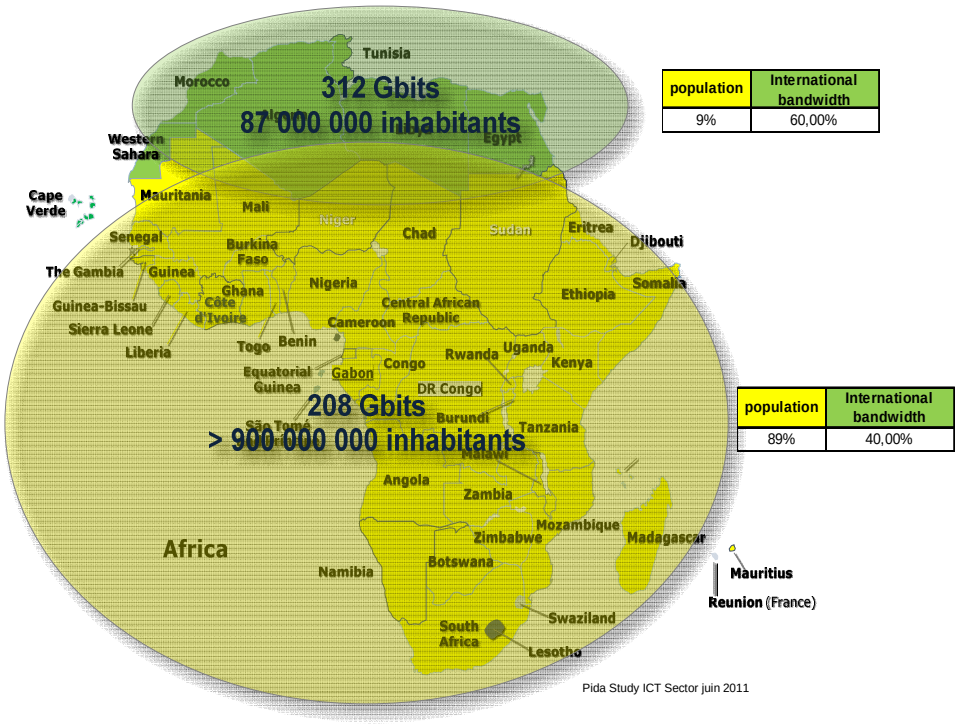
# 6. OUTLOOK FOR ICT SERVICES THROUGH 2018

High-speed broadband has become the lifeblood of the knowledge economy and is fast becoming a human right, as well as a significant contributor to economic growth. The World Bank estimates that a 10% increase in broadband penetration could raise GDP by 1–2%.

Africa's ICT sector will continue to grow rapidly over the coming decades, with the lion's share of investment coming from private enterprise. Those investments can have immense economic benefit, as healthy competition brings prices down and helps close the digital divide that has left most Africans without services that are taken for granted in much of the world, including North Africa (Figure 6.1). But those benefits depend on the fulfilment of several conditions, as discussed below.

**Figure 6.1. The digital divide between North Africa and Sub-Saharan Africa (end 2010)**




| population | International bandwidth |
|---|---|
| 9% | 60,00% |

| population | International bandwidth |
|---|---|
| 89% | 40,00% |

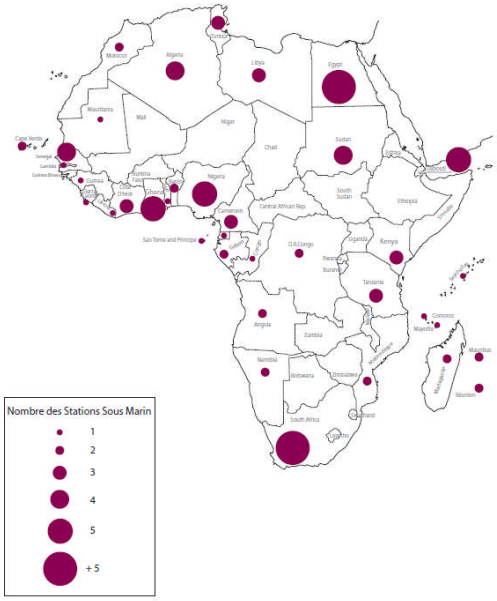
## 6.1 REQUIREMENTS FOR BROADBAND DEVELOPMENT

Africa was long deprived of access to submarine data-transmission cables. But the rapid expansion of such cables off Africa's east and west coasts over the past several years has brought ample international bandwidth within easy reach of every country in Africa.

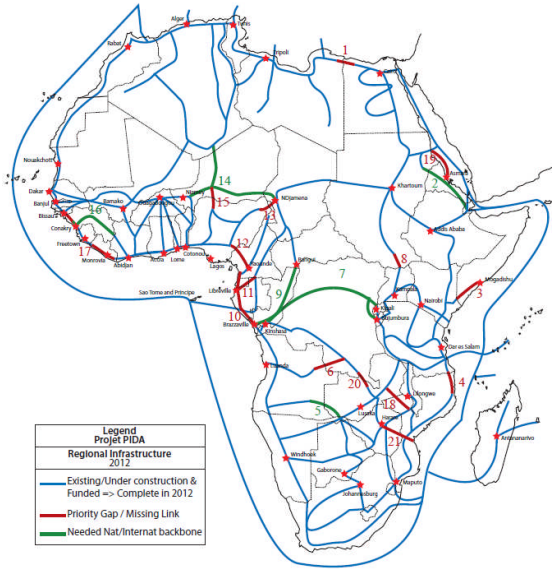
By 2012, with the landing of two more cables on the west coast of Africa, all coastal countries will have access to at least one submarine cable, there will be hubs with 4 or more landing stations in all of the regions, except perhaps Central Africa (Figure 6.2). On land however, a few important gaps remain in fibre connections between neighbouring countries and between regions.

**Figure 6.2. Current status of trans-national fibre optic infrastructure in Africa**

*Submarine cable landing stations in Africa*




*Fibre optic cables linking Africa's capitals*




With ample intercontinental bandwidth available offshore, the expansion of access to high-speed Internet in Africa will depend on (i) the degree of competition in the delivery of that bandwidth to telecommunications companies, (ii) the presence of land-based optical infrastructure capable of moving large quantities of data between the submarine cable landing stations and the 3G/LTE transmitters that serve consumers in the absence of wired networks, and (iii) governments' willingness to grant 3G/LTE licenses to competitive telecommunications operators and to make spectrum available at an affordable price. The first two points are expanded below.

### 6.1.1 Access to intercontinental bandwidth on competitive terms

Broadband development cannot occur unless a large quantity of reliable intercontinental bandwidth is available to telecommunications companies *at a reasonable cost*. That requirement is sometimes impeded by de facto or de jure monopolies created or tolerated under a country's legal and regulatory framework.

To meet the criteria of open access and promotion of competition, regional infrastructure needs: (i) interconnection points at which operators can physically connect their equipment; (ii) sites along its entire length that allow operators to install optic amplifiers or other equipment required for transmission; and (iii) information on prices and technical specifications for the use of the regional infrastructure should be published in an interconnection catalogue.

### 6.1.2 Construction or expansion of optical backbone and backhaul networks

According to Africa Bandwidth Maps, a total of 300,000 km of fibre optic was operational in Africa in 2010, with another 50,000 km under construction and 80,000 km planned. Often that infrastructure is underused or not fully interconnected and hampers the development of a dynamic regional network.

The private sector will finance much of Africa's international infrastructure needs where the required enabling policy and regulatory environment is in place, especially if the massive but almost entirely unrealised cost savings of fibre deployment by using so-called alternative infrastructure (road, rail, and power lines) can be realised. Land-use planning rules have also not yet been widely adopted to encourage or force the deployment of fibres or ducts on new transport or energy infrastructure.

## 6.2 BANDWIDTH PROJECTIONS (2015–18)

Although projecting bandwidth needs even a few years into the future is an uncertain undertaking, there is no doubt that broadband connectivity and traffic in Africa are growing rapidly, following the trail blazed by mobile voice services. Continental demand for intercontinental bandwidth is likely to swell by a factor of 20 from the 308 Gigabits per second (Gbps) used in 2009 to more 6,000 Gbps in 2018 (Table 6.1 and Figure 6.3).

The bandwidth demand projections presented here assume that intercontinental bandwidth will be available in sufficient quantity (60 kbps per connection) in all countries at a competitive price. By the end of 2012 ample intercontinental bandwidth is indeed likely to be available to all coastal countries, leaving only the key questions of price and competition to be resolved.

The projections are also based on the assumption that land-based backbone and backhaul infrastructure sufficient to carry national and international bandwidth reliably and economically will be in place. Finally, it is assumed that 3G/LTE service will be available in densely populated areas (capitals, large cities) and that high-speed service will affordable enough to attract 10% of the population, with 20–30% having at least reasonable access to the Internet.

**Table 6.1. Projected international bandwidth by REC and for Africa as a whole**

| International bandwidth | Africa | COMESA | SADC | EAC | ECOWAS | CEEAC | UMA | LLC | IGAD |
|---|---|---|---|---|---|---|---|---|---|
| 2009 (Gbps) | 308 | 125 | 42 | 15 | 26 | 4 | 118 | 6 | 20 |
| 2015–18 (Gbps) | 6,000 | 3,000 | 2,000 | 800 | 2,000 | 800 | 500 | 1,500 | 500 |
| Growth factor | 20 | 24 | 50 | 50 | 80 | 200 | 4 | 250 | 25 |

*Source: Africa ICT Outlook 2030.*

*Note: LLC = landlocked countries.*

The projections offered here are realistic objectives for African leaders. The most advanced or determined countries could meet the objective by 2012–14, whereas those that have the farthest to go in reforming their legal and regulatory framework or in building their national backbone and backhaul infrastructure may need until 2015–18 to reach it.

## 6.3 FACETS OF INTERNET DEMAND IN AFRICA

Lessons from the growth of Internet usage in African countries offer hints about the likely profile of future demand.

Household traffic is becoming more important than business traffic in countries where operators offer high-speed Internet access in residential areas. There is great similarity between the bandwidth consumed by African users of mobile high-speed Internet and users of xDSL in the advanced countries.

High-speed 3G box Internet double-play plans offering VoIP access have, along with single-play plans, assumed the role of similar schemes in industrialised countries based on xDSL or cable-modem technologies, with similar usage patterns. Their uptake by African consumers has been much faster, however, given the pressure of pent-up demand. In Africa, offerings of mobile high-speed Internet are not correlated with 3G voice and smartphone offerings, as they are in the advanced countries, because in Africa the former are a substitute for (unavailable) land-based services.

## 6.4 CONCLUSION

Africa's late entry into the Internet race may prove an opportunity by allowing the continent to avoid overinvestment, bad investments, and the burden of legacy infrastructure while skipping ahead to the next generation of technologies.

Europe has its Digital Agenda for Europe–2020; Australia its RNHD programme. The United States, Korea, Japan, and Singapore all have strategies to achieve very high speed coverage between 2020 and 2030. The goal of ICT policy in the advanced countries is no longer access to broadband but universal access to services offering speeds of 30 to 100 Mbps through the use of new infrastructure, particularly FTTH technology, capable of carrying the rapidly growing data streams generated by new applications used on an exploding base of new digital devices.

Africa, too, should pursue the goal of very high speed broadband, so as to allow it to close the digital divide more quickly, leapfrogging over existing technologies. By ensuring that even short-term investments are consistent with the longer-term goal of very high speed access it should be possible to lower overall investment costs over the 2020–30 horizon.

Taking advantage of the present opportunity to close the digital divide within Africa and between Africa and the rest of the world requires further legal and regulatory reform in many countries, both to attract new investment and to optimize the use of existing infrastructure. Further liberalisation will encourage construction of fibre-optic backbones and other cross-border infrastructure, to which all operators, including those in land-locked countries, should have free and non-discriminatory access.

Governments and regulators that create and maintain a favourable framework for investment and competition and that ensure, through subsidies and other incentives, that isolated parts of their territories are not forgotten are likely to reap the greatest growth-stimulating rewards of the telecommunications revolution.

# 7. DOING THINGS DIFFERENTLY: A STRATEGIC FRAMEWORK FOR REGIONAL INFRASTRUCTURE PROJECTS

The PIDA process is anchored in a strategic framework for the selection and implementation of infrastructure projects that will "build an integrated Africa, a prosperous and peaceful Africa, driven by its own citizens and representing a dynamic force in the international arena." (Vision statement of the AUC's 2004 Strategic Plan)

The PIDA strategic framework presented here is grounded in the African consensus that integrating infrastructure is a prerequisite to unleashing the continent's growth potential.

The extensive diagnostic work summarised in chapters 3–6 has identified key components of the strategic framework:

- The outlook for infrastructure demand in four sectors through 2040 (or through 2030 for ICT)
- The projected gaps and bottlenecks created by mismatches in demand and supply
- Institutional deficiencies that impede the adoption of optimal actions to fill gaps and remove bottlenecks
- Inefficiencies in infrastructure provision ($172 billion in transport and $33 billion in energy)
- Options for identifying, preparing, and funding infrastructure projects that will advance regional integration and promote long-term growth.

The way in which regional and continental infrastructure programs are managed today does not optimize infrastructure provision and will not meet the future demand estimated in the outlook for 2040. A new framework for choosing and building regional and continental infrastructure is needed. PIDA's strategic framework, based squarely on the shared vision for Africa, articulates general principles to guide policy and operational decisions about the construction and operation of future infrastructure. The programmes that make up PIDA's Priority Action Plan (PAP), discussed in chapters 8 (selection) and 9 (financing and implementation), were selected based on the strategic framework discussed here.

The strategic frameworks for the four sectors are summarised below:

## 7.1 TRANSPORT

VISION

An integrated African continent where transport infrastructure and services enable the free movement of goods and passengers by providing efficient, safe, secure, reliable, and seamless transport options and reducing costs to support environmentally and economically sustainable regional development.

OBJECTIVES

***Objective 1***

Support a healthy, strong, and competitive regional economy

***Objective 2***

Maximize access to a modern, safe, and efficient transport system that supports regional integration and meets future transport demand in the most cost-effective manner

***Objective 3***

Promote improved transport and logistics systems for African businesses and the well-being of the travelling public

***Objective 4***

Support a sustainable natural environment

***Objective 5***

Support synergy with other infrastructure and economic investments.

STRATEGIES

***Strategy 1***

Improve the connectivity of African capitals and major centres with modern paved roads

***Strategy 2***

Satisfy demand on ARTIN routes at the least economic cost, with priority for landlocked countries, while minimizing the environmental impact of transport infrastructure and services and improving transport safety, and

***Strategy 3***

Develop modern ARTIN corridors and air transport services to bring the performance of ARTIN components up to best world practice in efficiency, cost, reliability, and safety

## 7.2 ENERGY

VISION

Efficient, reliable, cost-effective, and environmentally friendly infrastructure to promote the physical integration of the continent and enhance access to modern energy services for the majority of the African population.

OBJECTIVES

***Objective 1***

Ensure energy security for economic and social development

***Objective 2***

Achieve energy integration by increasing regional and continental energy trade

***Objective 3***

Lower the cost of energy to improve access to basic energy services for Africa's population

***Objective 4***

Create a conducive climate for direct investment

***Objective 5***

Reduce greenhouse gas emissions and address climate change issues

STRATEGIES

***Strategy 1***

Develop fully Africa's energy resource potential in hydropower, petroleum, geothermal, coal, and renewable energy

***Strategy 2***

Foster regional and continental cooperation and by highlighting the importance of regional projects, especially electricity interconnections

***Strategy 3***

Diversify the energy mix and by pooling national energy resources so as to deliver energy production at affordable costs

***Strategy 4***

Harmonize legal and regulatory frameworks for energy trade

***Strategy 5***

Promote the development of renewable energy, in particular solar energy

## 7.3 TRANSBOUNDARY WATER RESOURCES

VISION

Transboundary water infrastructure projects and strong transboundary management frameworks that promote regional integration and ensure water security for socioeconomic development of the African continent while protecting the environment and mitigating and adapting to the impacts of climate variability and change.

OBJECTIVES

***Objective 1***

Strengthen the institutional basis for efficient transboundary cooperation on shared water resources.

***Objective 2***

Develop transboundary water infrastructure to meet the increasing water demands while protecting people and the environment.

***Objective 3***

Strengthen the financial base for transboundary water resources development and management.

***Objective 4***

Improve water knowledge on transboundary water basins and shared aquifers.

STRATEGIES

***Strategy 1***

Maximise efficiency gains by increasing the efficiency of existing infrastructure

***Strategy 2***

Build new infrastructure

***Strategy 3***

Find the appropriate balance between supply and demand policies

***Strategy 4***

Strengthen transboundary water management frameworks

## 7.4 INFORMATION AND COMMUNICATION TECHNOLOGIES

VISION

A continent with a modern Information society and an integrated e-economy in which every government, business, and citizen has access to reliable and affordable broadband—an E-Africa

OBJECTIVES

### *Objective 1*

Double the ICT sector's contribution to GDP from the present level of about 5% to 10% in 2025.

### *Objective 2*

Satisfy African broadband demand at the least cost, while increasing accessibility and security of access from all African countries to the e-World, ensuring the landlocked and small countries are not left behind

### *Objective 3*

Promote intra-African e-commerce.

### *Objective 4*

Increase physical integration at the regional and continental levels.

STRATEGIES

### *Strategy 1*

*Guarantee of international access*: Provide each country with fibre access to at least two different submarine cables

### *Strategy 2*

*Guarantee of secure terrestrial routes*: Provide each country with access to its choice of submarine landing stations via at least two different terrestrial infrastructures to minimise costs and ensure reliability and security

### *Strategy 3*

*Landlocked countries charter*: Guarantee landlocked countries access to submarine landing stations at a cost similar to that enjoyed by coastal countries

### *Strategy 4*

*Continental interconnectivity*: Connect every country to its neighbours via terrestrial fibre infrastructure based on the most economic criteria

### *Strategy 5*

*Optimal International and national bandwidth use*: Provide all countries with a national IXP and access to regional exchange points for the purposes of ensuring local interconnection between national operators, reducing the level of external interconnection, improving performance, encouraging local applications development, and building economies of scale to attract off-continent operators to peer locally, thereby reducing the need for African operators to pay transit fees to foreign operators

### *Strategy 6*

*Competitive open markets*: Ensure a competitive market in broadband services in every country based on a combination of private and public infrastructure provided on an open access non discriminatory approach

### *Strategy 7*

*Sustainable new infrastructure*: Ensure that all new infrastructure has sufficient capacity (fibres) to support the medium-term vision (more than 10 years)

# 8. THE PRIORITY ACTION PLAN: A PORTFOLIO OF PROJECTS THAT WILL PROMOTE INTEGRATION AND GROWTH

Major outputs of the PIDA Study are the Infrastructure Development Plan to 2040 and the associated 2012–20 Priority Action Plan (PAP). Proposed PIDA investments were selected in accordance with a process arrived at in the course of painstaking consultation with stakeholders. The projects and programmes retained for the PAP respond to the challenges identified in the Africa Sector Outlooks 2040 and in the strategic framework presented in the previous chapter. They include "hard" and supporting "soft" projects.

## 8.1 TOWARD CONSENSUS: THE PIDA CONSULTATION PROCESS

One of the original features of the PIDA Study is the extent of its reliance on consultations with stakeholders.

The PAP is the result not only of the analytical work but also of an intensive consultation process carried out in cooperation with the RECs and their specialized agencies, as well as the lake and river basin organizations, which provided the Study with the details of their investment programmes, master plans, and so on.

Consultations were held at each milestone to reach consensus on the rationale and methodology of the Study:

- The kick off meeting in Addis Ababa (July 2010) discussed the overall Study methodology.
- The methodological workshop in Johannesburg (September 2010) validated the methodology used to prepare the macroeconomic and sector outlooks.
- The Phase 1 validation workshop in Libreville (April 2011) validated the findings of the Phase 1 diagnostic and the outlooks.
- The high-level technical meeting in Tunis (July 2011) covered the strategic framework and the project selection criteria discussed in the next section.

The draft Priority Action Plan (PAP) was reviewed at regional workshops in Nairobi, Libreville, Abuja, Yamoussoukro and Rabat (September and October 2011). Those consultations assembled more than 300 representatives of the RECs and their agencies, along with representatives of 36 governments. The consensus surrounding the PAP is expected to translate into greater ownership of the PIDA programme and processes by national governments.

## 8.2 FROM STRATEGIC FRAMEWORK TO THE PIDA PORTFOLIO: SELECTION AND PRIORITISATION CRITERIA

### 8.2.1 Selecting the programmes and projects of the PIDA Priority Action Plan

PIDA's project selection process was discussed and agreed among stakeholders during the workshop held in Tunis on June 2011. Eligibility and ranking criteria and their weightings were agreed on for each of the four PIDA infrastructure sectors. The criteria were then applied to a large pool of candidate programmes and projects coming from the infrastructure master plans of the RECs and their member countries. In this respect more than 200 transport projects and more than 400 energy projects were considered.

The first step in the screening process was to winnow from the pool of candidate projects not eligible for PIDA (e.g., because they are inconsistent with the agreed vision for their sector, with the outlook for the sector or with the priorities of the RECs). The eligibility criteria were applied on a pass/fail basis. For instance all the power generation projects considered for inclusion in PIDA were drawn from the Continental Least-Cost Plan with moderate integration.

The next step was to rank the PIDA-eligible projects and programmes according to sector-specific PIDA criteria of socio-economic optimality, cross-sector synergies, impact on regional integration and environmental performance, among others.

Within the larger pool of PIDA programmes and projects selected through application of the criteria described above, the PIDA Priority Action Plan was extracted. The PAP comprises projects to be implemented by 2020. The projects are discussed in the next section and listed, by sector, in Annex 1.

Items chosen for the PAP had to have a *viable institutional framework for implementation* (such as a project-development special-purpose entity involving representatives of the participating countries) and a viable plan for project preparation and financing.

Projects which had already reached financial closure were not included in the PAP, as they are already well advanced and do not require a boost or special attention.

## 8.3 THE PIDA INFRASTRUCTURE DEVELOPMENT PLAN TO 2040 AND PAP 2012–20

The physical infrastructure to be built under the PIDA Infrastructure Development Plan to 2040 is summarised in Table 8.2.

The sector-specific features of the PIDA Infrastructure Development Plan to 2040 and PAP 2012–20 are discussed below and mapped in Figures 8.1–8.4.

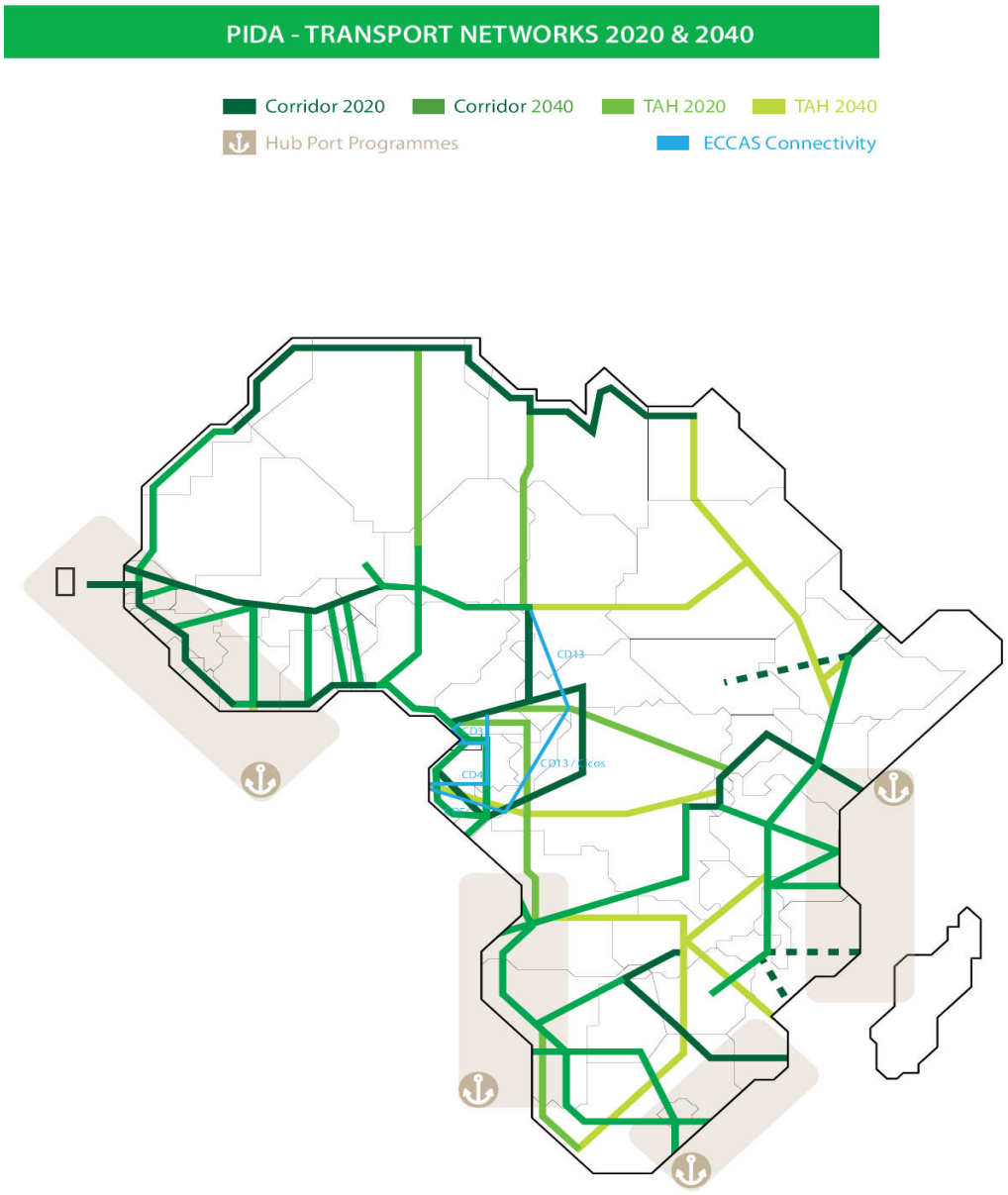
Table 8.2. Additional infrastructure to be built under PIDA Infrastructure Development Plan to 2040

| | |
|---|---|
| Modern highways | 37,300 km |
| Modern railways | 30,200 km |
| Port capacity | 1.3 billion tons |
| Hydroelectric power generation | 54,150 MW |
| Interconnecting power lines | 16,500 km |
| New water storage capacity | 20,101 hm3 |

### 8.3.1 Transport

The PIDA surface transport infrastructure links Africa's major production and consumption centres, provides connectivity among the major cities, and opens the landlocked countries to interregional and intercontinental trade (Figure 8.1). Proposed port and railway studies will define the best location for hub ports and modern railways to the interior. Similarly air transport studies will define the location of West and Central Africa hubs as well as the preferred continental high altitude control system.

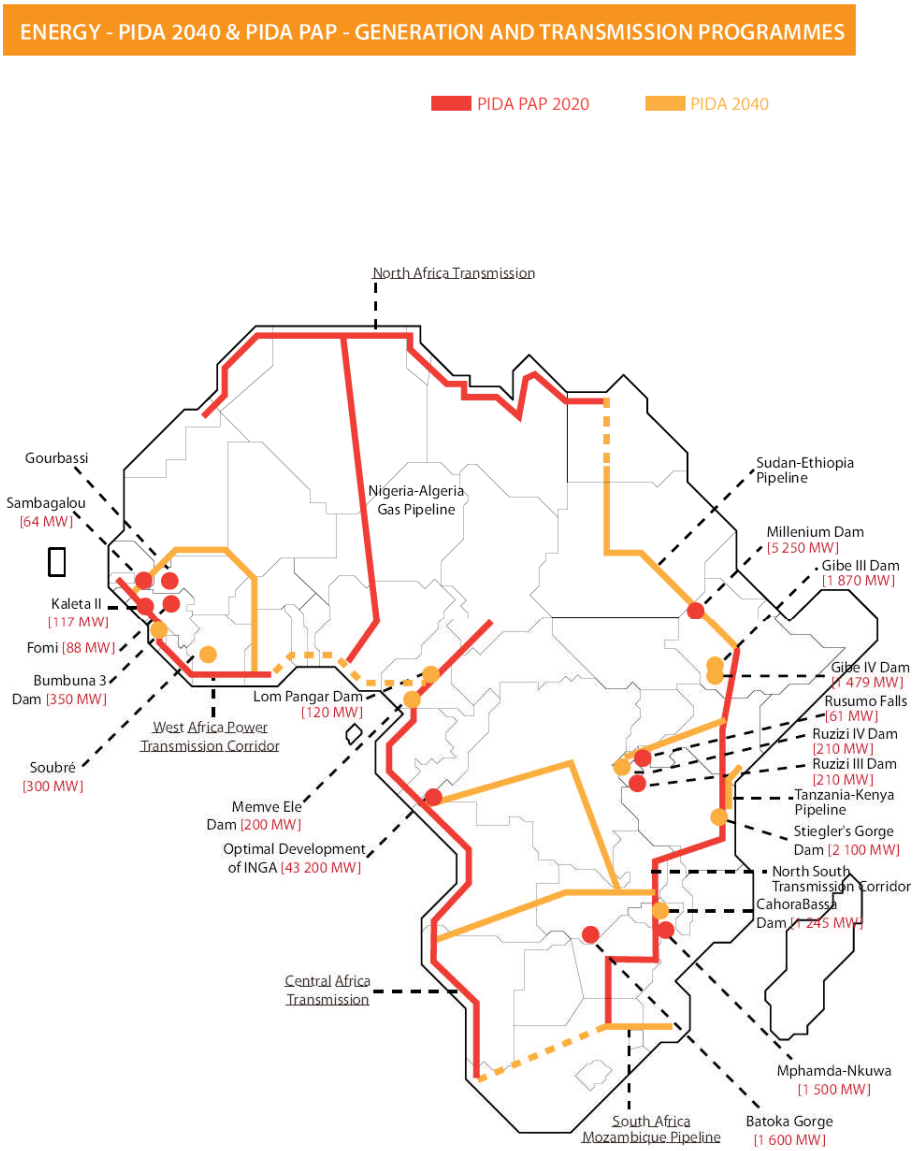
**Figure 8.1. PIDA transport networks in 2020 and 2040**



### 8.3.2 Energy

The PIDA energy infrastructure plans call for the development of major hydroelectric projects to generate the electricity needed to meet forecasted increases in power demand resulting from increased consumption of households, industry, and agriculture, as well as wider access to electricity. PIDA's plans also include transmission lines to connect the continent's power pools and permit a large increase in interregional energy trade. One regional petroleum-product pipeline and the Nigeria-Algeria gas pipeline are also included in the PIDA plans.

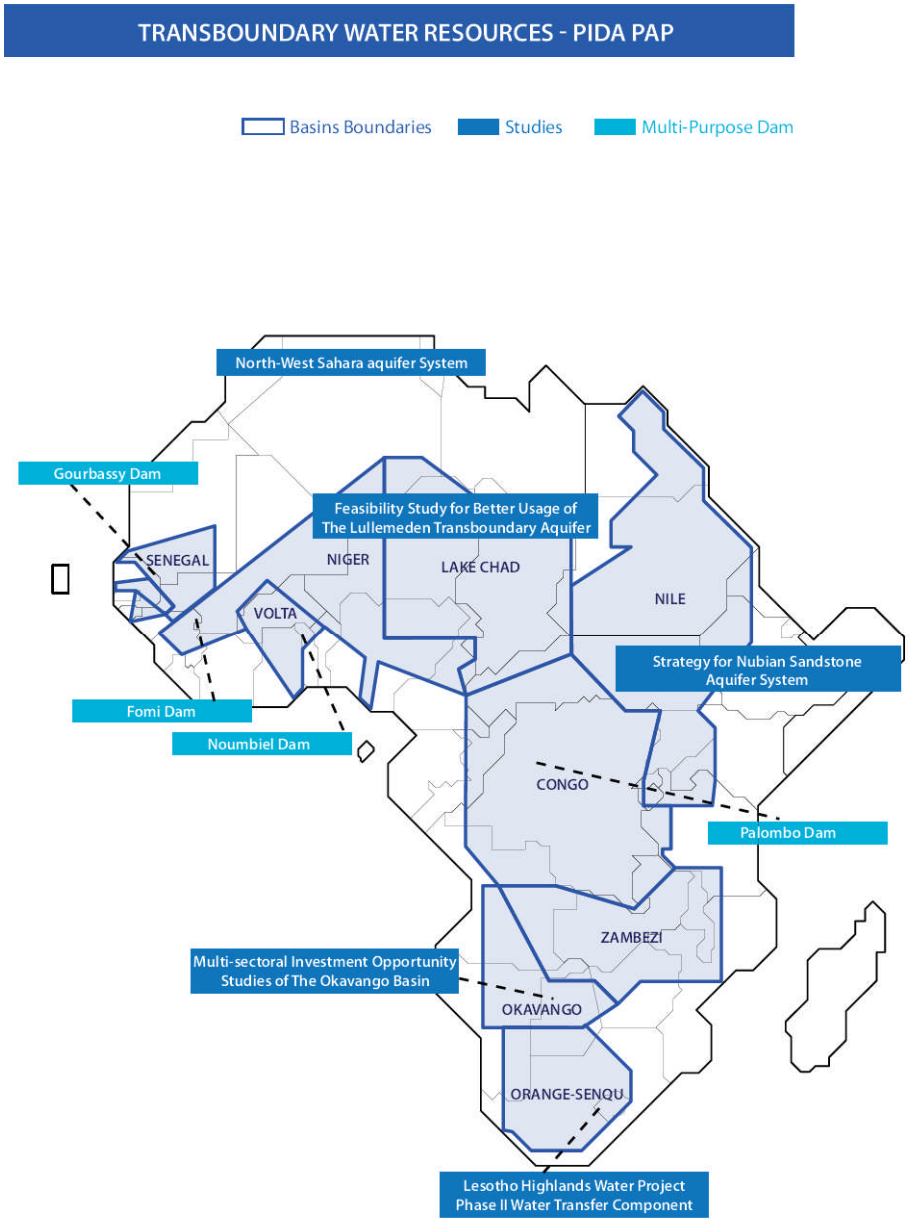
**Figure 8.2. PIDA energy generation and transmission programmes for 2020 and 2040**



### 8.3.3 Transboundary water resources

The PIDA TWR programme aims at developing multipurpose dams and building the capacity of the L/RBOs to plan and develop hydraulic infrastructure (Figure 8.3). The programme will help address the looming food deficit.

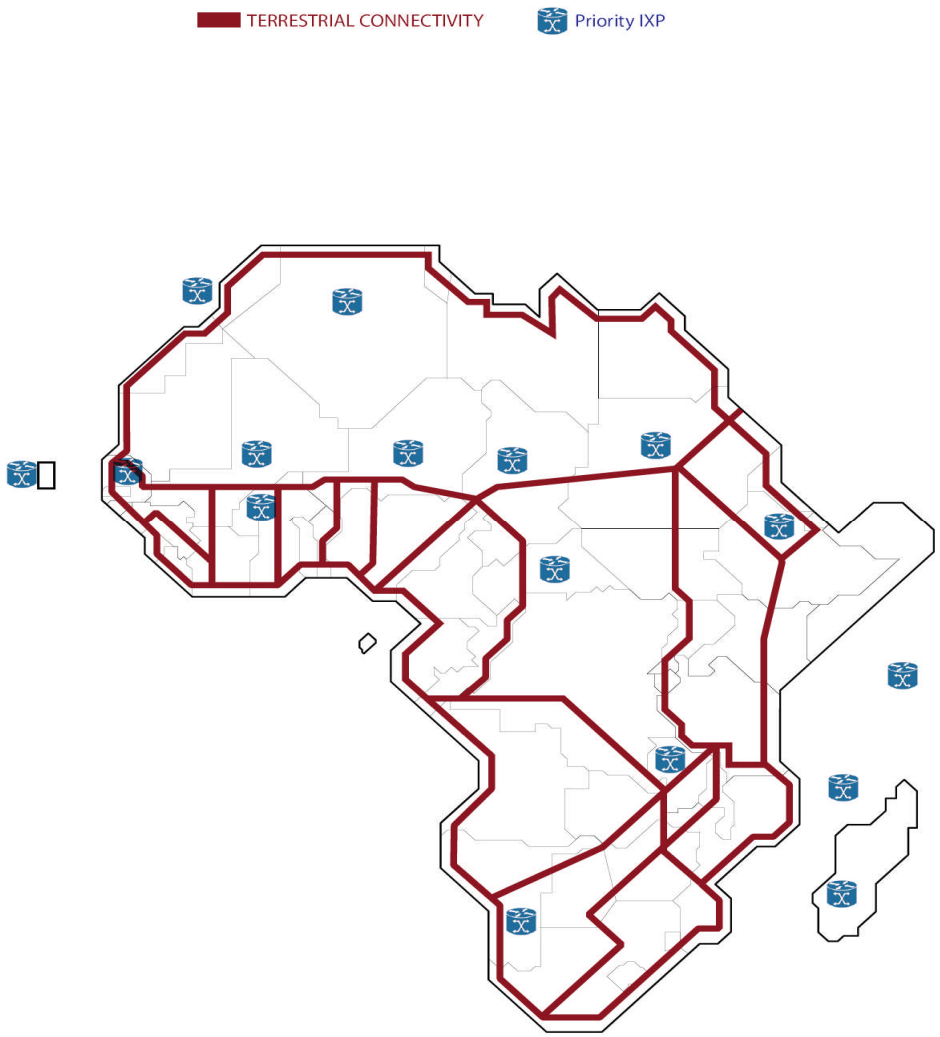
**Figure 8.3. PIDA programmes and projects on transboundary water resources**



### 8.3.4 ICT

The ICT component of PIDA will help establish an enabling environment for completing Africa's terrestrial fibre-optic infrastructure and installing Internet exchange points (IXPs) in countries that now lack them. It will connect each country to two different submarine cables to take advantage of the capacity newly established around Africa, interconnect countries and establish Internet exchange points.

**Figure 8.4. PIDA's ICT programmes**



## 8.4 DISTRIBUTION AND COST OF PAP PROJECTS

The PAP includes 51 programmes in four sectors, with several project categories in each sector:

- *Transport*: Connectivity, corridor modernization, ports and railways modernization, air transport modernization
- *Energy*: Hydropower, interconnections, pipelines
- *Water*. Multipurpose dams, capacity building, water transfer
- *ITC.* Capacity building, land interconnection infrastructure, Internet exchange points.

Summary information on the PAP programmes appears in Annex 1.

### 8.4.1 Distribution of PAP programmes by region and sector

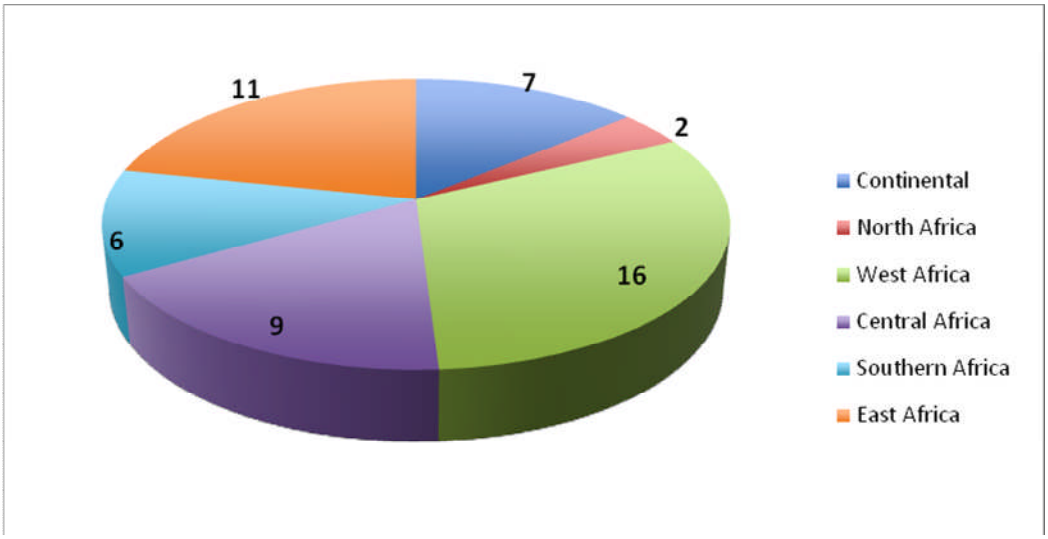
The distribution of PAP programmes by region and sector reflects the realities of regional integration in Africa.

Half of PAP programmes is in West Africa (16) and East Africa (11), in part because these regions contain the largest number of countries. (Figure 8.5a.)

The transport and energy sectors account for three quarters of the programmes (Figure 8.5b) because these sectors are key drivers for integration[4].

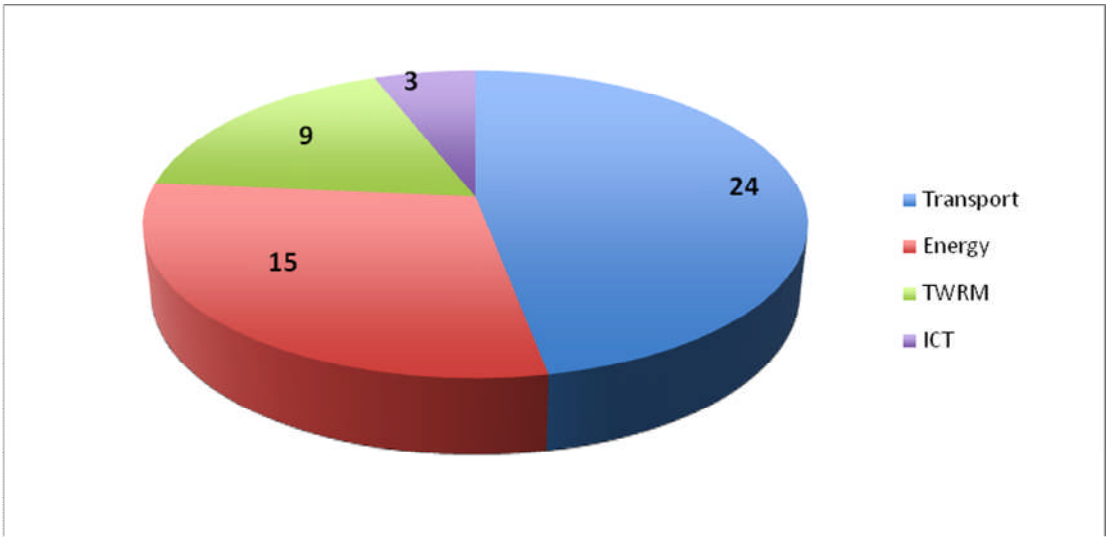
**Figure 8.5. Distribution of projects by region and by sector**

*a. Number of projects by region*




[4] Hydroelectric projects are classified with the energy sector, although they obviously are related to the TWR sector. The only projects grouped under the TWR sector are multipurpose dams with a relatively small power component and water transfer schemes.

*b. Number of projects by sector*




### 8.4.2 Investment costs

The cost of the PAP projects is estimated at $65 billion, or $8 billion per year (Table 8.3). That is less than 0.2% of Africa's estimated combined 2010 GDP, or 1% of national budgets and 5% of investment budgets. The investment programme appears affordable on a continental basis. On a country-by-country basis, however, the picture is not uniform. For example, the Democratic Republic of Congo, with the proposed Inga hydroelectric installation and transmission system, would have to contribute in excess of 3% of its GDP, or 10 times the continental average. The principle of solidarity will have to come to play, with such countries being assisted by neighbours.

**Table 8.3. Number and cost of PAP projects by sector and region**

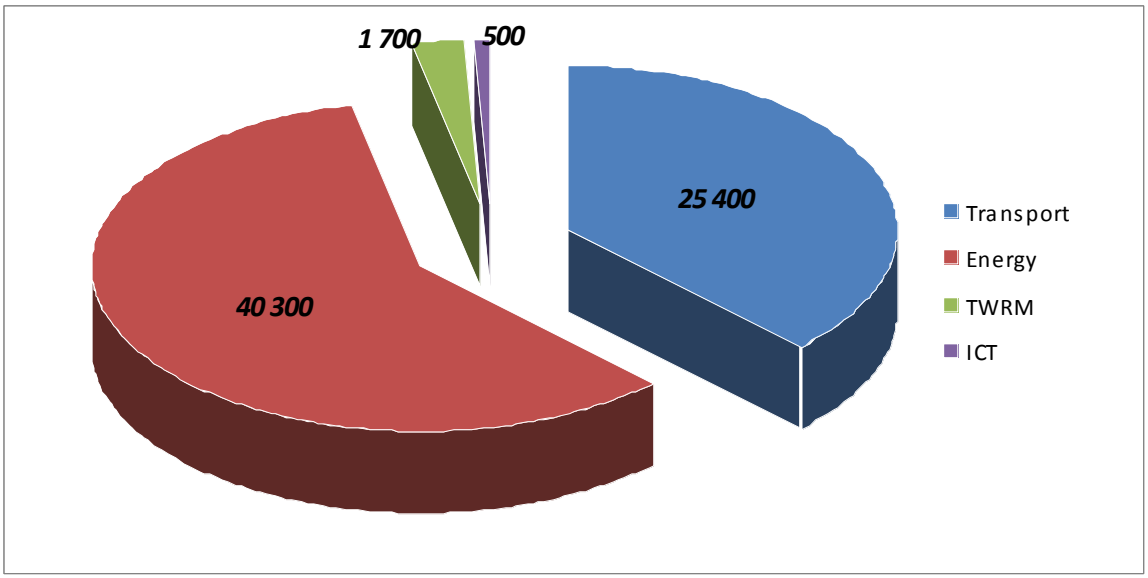
*US$ billions*

| Sector | Number of projects | Cost | | Region | Number of projects | Cost |
|---|---|---|---|---|---|---|
| Transport | 24 | 25 | | Continental | 7 | **3** |
| Energy | 15 | 40 | | North Africa | 2 | **1.5** |
| TWR | 9 | 2 | | West Africa | 16 | **6** |
| | | | | Central Africa | 9 | **21.5** |
| ICT | 3 | 0.5 | | Southern Africa | 6 | **12.5** |
| | | | | East Africa | 11 | **20,** |
| **Total** | **51** | **67.5** | | | **51** | **64.5** |

The uneven distribution of spending by sector (Figure 8.6) is explained by the size of projects in transport and energy, and by the fact that the private sector provides most of the investment in the ICT sector. TWR is an emerging sector with several important capacity-building components. Also the hydropower projects grouped under the energy heading in the PAP have a substantial TWR component.

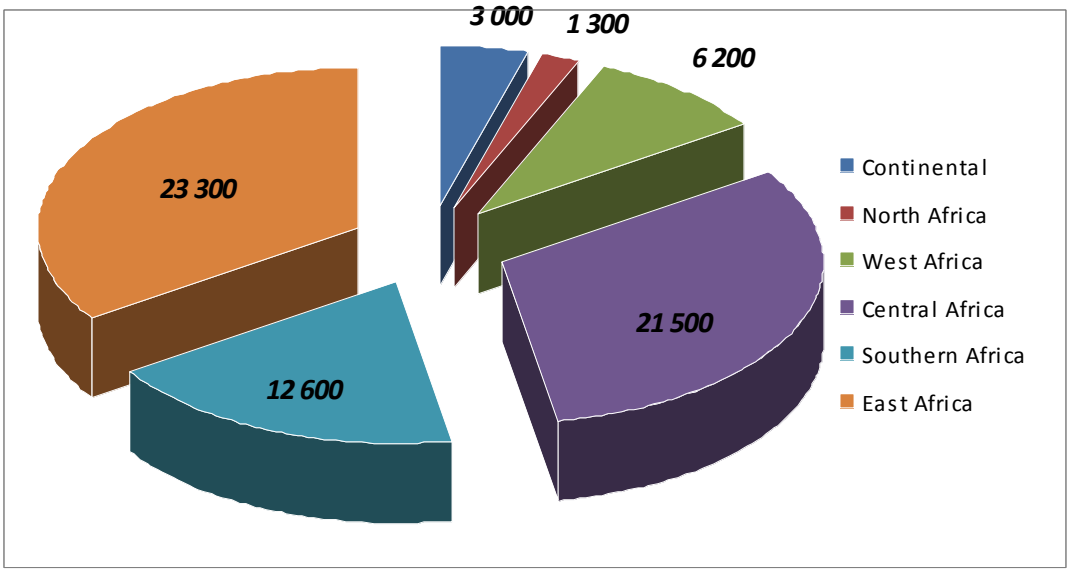
The uneven regional distribution reflects the weight of large projects in East, Central, and Southern Africa, as well as a large number of smaller projects in West Africa.

**Figure 8.6. Breakdown of costs of PAP, by sector**




The regional distribution in Figure 8.7 shows the relatively small weight of West Africa in the investments proposed. This is primarily due to the fact that the projects proposed in the region have smaller funding requirements than those for Central Africa or East Africa).

**Figure 8.7. Breakdown of costs of PAP, by region**



# 9. IMPLEMENTING THE PAP: INSTITUTIONAL ARRANGEMENTS TO OVERCOME FRAGMENTATION

The challenges of implementing PIDA go beyond the usual challenges of project implementation (financing, project management) and include:

- Combining the not necessarily convergent interests of the countries
- Harmonising national legislation and regulations as necessary to accommodate regional projects
- Taking into account inter-sectoral synergies and conflicts
- Providing compensation for losers in the integration process.

Meeting these challenges and ensuring successful implementation of PIDA's Priority Action Plan (PAP) for 2012–20 will require improvements to the existing regional institutional and policy framework.

## 9.1 IMPROVING THE EXISTING REGIONAL INSTITUTIONAL AND POLICY FRAMEWORK

For a decade or more, Africa's main continental and regional bodies have been putting in place a sound policy and institutional framework for promoting regional trade, connectivity, and exchange. So far, however, good institutional progress has not led to effective regional integration in operational terms.

Despite strong commitment and impressive progress made in putting in place sophisticated regional institutional and regulatory frameworks, institutional capacity and staffing problems continue to be serious constraints, severely limiting the capacity of the regional institutions to drive the development of regional infrastructure. Electricity trade, for example, remains a small share of power generation in all regions (< 5%) and has not grown measurably over the past decade.

### 9.1.1 Integrate regional planning and national plans

A key problem is that regional priorities are not yet well integrated in national strategies. Regional plans need to reflect continental strategies and national plans should take into account regional priorities.

Although they have the authority to prepare regional investment plans, regional bodies lack a clear mandate and the capacity to coordinate and promote the implementation of investments in support of regional integration. As a result, regional plans are often put aside, despite offering significant benefits in investment cost savings when compared with the alternative costs of national investment programs. For this to change, national investment decisions must be guided primarily by economic considerations in a regional

and continental perspective. Continental and regional priorities and options must be built into national plans, after proper consultation.

### 9.1.2 Joint planning by the RECs and the governments

Effective coordination of national and regional planning priorities can be enhanced by expanding the joint planning role of the RECs, power pools, water basin authorities, telecom regulators, and transport corridor authorities. Thus, the recommended course of action is to transfer more planning responsibility to the regional level and to develop joint multisector planning and development of regional projects.

Key roles of the regional institutions include developing continental and regional frameworks, policies, and master plans; establishing the legal and regulatory conditions for regional infrastructure (drawing on best practices developed in other RECs[5]); involving all actors in regional infrastructure projects through public consultation or other appropriate forums; optimising investments in regional infrastructure by sharing costs between sectors, (ICT, transport, energy).

The complementary responsibility of governments is to develop and update sectoral master plans synchronized with regional and continental plans; to incorporate regional directives into their national legal and regulatory frameworks; to coordinate land-use planning to accommodate regional infrastructure developments, facilitating access to rights of way; and to ensure that national regulatory authorities have sufficient financial resources and legal tools to enforce adherence to the regulations that make up the enabling environment for regional infrastructure.

### 9.1.3 Implementing the "soft" measures: a shared responsibility

As has been indicated above, implementation of the PIDA PAP needs to be accompanied by "soft" policy measures, which can yield considerable efficiency gains at no cost except political (there are always losers). Their implementation is a shared responsibility between the continental and regional entities on one side and the governments on the other.

The continental and regional bodies share the responsibility of (i) initiating policies; (ii) ensuring their transposition in national texts (harmonization), and (iii) monitoring their implementation, if necessary through a mechanism of peer pressure..

The countries have the responsibility to harmonize their policies with the regional guidelines and to enforce them.

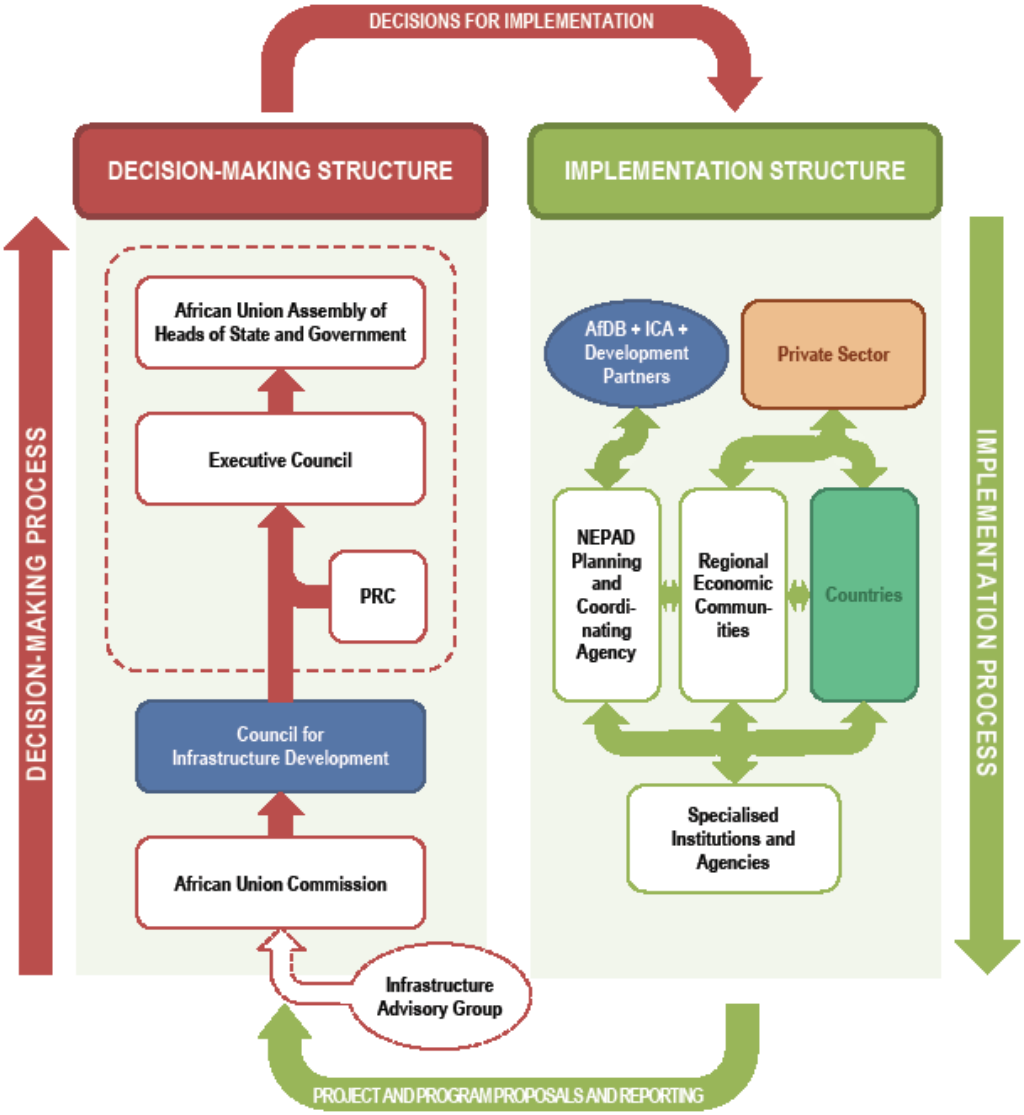
## 9.2 IMPLEMENTING THE PAP AT THE CONTINENTAL AND REGIONAL LEVELS

At the continental and regional levels, the PAP will be implemented within the framework of the Institutional Architecture for Infrastructure Development in Africa (IAIDA), which is

5 As an example ECOWAS has developed regulations on access to submarine cables, and EAC has developed cross border interconnection guidelines which could be adopted in other regions with little additional changes to localise them

being established by the African Union. The IAIDA will support implementation of the PAP by "creating an integrated and enabling management environment capable of enhancing the capacity of the African Union and its institutions" to produce tangible achievements from PIDA (AUC 2011). The IAIDA process is illustrated in Figure 9.1.

**Figure 9.1. Implementing PIDA: The IAIDA decision-making and implementation structure**




IAIDA puts in place a key element for the successful implementation of the PAP: a mechanism for reviewing performance and renewing the programme with access to the highest level of the AU and the RECs. This will raise PIDA's profile within high-level forums such as the G-20.

The RECs are well placed to:

- Mediate the possibly divergent interests of the countries involved in regional infrastructure. Mediation may include devising mechanisms to compensate losers from regional integration.
- Carry out planning on an intersectoral and regional basis, taking into account the interests of all countries—especially those of landlocked countries as concerns access to the sea (harbours and submarine cables). Successful planning of regional projects is by necessity a joint affair. Joint planning will have to become the rule, rather than the exception.
- Harmonise divergent national infrastructure policies, as discussed in section 9.1, in particular those policies that are at the basis of major inefficiencies. Harmonisation need not entail costs—the best way of encouraging harmonisation appears to be through peer pressure.
- Monitoring performance (of projects and harmonisation efforts) and reporting to the AUC and to Africa's heads of state.

## 9.3 IMPLEMENTING THE PAP AT THE NATIONAL AND PROJECT LEVELS

The leadership of national governments will be instrumental in implementing the PAP. The progress of the Presidential Infrastructure Champion Initiative has already shown how involvement at the highest level has been able to move complex regional projects forward by removing barriers to progress.

The same degree of involvement is needed to ensure progress on mobilisation of domestic financing and resolution of key "soft" issues (see above).

### 9.3.1 The RECs and early project development

The capacity of RECs and their agencies is geared toward reaching timely political consensus, coordinating general policy, developing regional regulatory frameworks, and preparing regional project studies.[6] But they are not cut out to implement projects. Even early project development should be entrusted to project-specific development entities established under the joint auspices of the RECs and, where relevant, the specialized agencies, as well as the countries involved. In the energy sector for instance, implementation of generation and transmission projects should be entrusted to special-purpose regional companies (under PPP, wherever possible) or regional transmission companies operating autonomously on a commercial basis. The case of Ruzizi 3 (Box 9.1) illustrates how the process of devolution of responsibility can be carried out.

6 Regional institutions often lack the minimum funding contributions promised by member states and key staff to undertake their basic mandate. The end result is that regional institutions frequently become dependent on external funding from bilateral and multilateral agencies to finance minimum administrative and operating costs.

**Box 9.1. Project profile: Ruzizi 3**

Ruzizi 3 is a $400 million 145 MW hydropower plant on the Ruzizi river between Lake Kivu and Lake Tanganyika. The first regional PPP power project in Africa, it will supply electricity to Rwanda, Burundi, and the Democratic Republic of Congo. The PPP project structure developed by Energie des Grands Lacs (EGL) has attracted financing commitments from major international investors as well as international financial institutions (IFIs). Despite its complexity, the project was successfully developed over a period of just 18 months. Contributing to the speed of development were the following factors:

- The early appointment of a project pre-developer (EGL) at the initiative of CEPGL (Communauté Economique des Pays des Grands Lacs), a regional economic community accountable only to the three countries with a direct interest in the success of the project
- The presence within EGL of professionals with prior experience in large international hydro project development (Ruzizi 2 in the 1980s)
- The balance between the delegation of project management authority from the countries to EGL, and EGL's frequent reporting to the political authorities to maintain the commitment of the countries to the project
- The recruitment of project structuring advisors early in project preparation and the overlapping execution of preparatory studies (feasibility, environmental impact, project structuring), which avoided the common problem of long delays between studies
- The decision of EGL to keep the countries with a stake in the project fully informed and consulted at each stage of development, and its provision of training and capacity building for the partner countries directly linked to a project considered as a high priority by all countries
- The availability of substantial project preparation funds at the EGL (regional) level rather than through each country
- From the outset, incorporation of the mode of intervention, instruments, and procedures of IFIs, coupled with an understanding of the expectations and risk assessment of the private partners derived from experience with recent PPP projects
- EGL's successful communication efforts, which made governments aware of the position and concerns of private partners and presented practical solutions.

Issues that came up during project development were:

- The time and effort needed to secure financing for the complex project studies and for EGL's own operation, whereas a single source of financing would have saved time and effort
- Insufficient focus of IFI teams on the project and over commitment of scarce staff resources with experience relevant to the project, which led to episodic involvement of and lack of continuity in IFI teams, attenuating the value of IFIs in project structuring.

The Ruzizi 3 project demonstrated that with a compact, dedicated, and experienced project pre-development team, good communication with countries to maintain support for the project, and targeted capacity building, a structure for a large regional PPP can be developed under terms acceptable to private investors. Over a period of 18 months, the necessary studies can be completed, reputable international transaction advisors can be recruited, and developers and investors can be pre-qualified, demonstrating that with effective project management, the development of a PPP need not require more time than a traditional public sector structure.

The project is expected to leverage more than 50% commercial financing (debt and equity), with 70% private equity and a weighted average cost of capital of about 8% (including a return on equity of about 20%).

The locus of project implementation will be national: Very few regional projects are built across borders. This simple fact leads to the distribution of shared responsibility for regional projects. The host country is responsible for administrative tasks (permitting and compliance with legislation). Coordination from a regional point of view may be ad hoc or preferably ensured by the REC.

The early establishment of a project development special purpose entity (PDSPE), possibly at the initiative of the REC, is aimed at reducing the long interval between project identification and the emergence (through an informal consultation process) of a consensus among stakeholder countries. The role of the PDSPE is not the full development of the project, but the initial phase up to selection of the project sponsor or establishment of the entity that will be responsible for raising financing and supervising implementation and operation of the project. The responsibility for full development and implementation of the project would be entrusted to a commercial company under PPP or to a public sector project company.

In the case of regional roads, for example, the relevant national entity on either side of the border (public works departments or their concessionaires) builds or upgrades the regional road on its side of the border. In power, each utility constructs its segment of a transborder power transmission line.

Non-network infrastructure, such as hydroelectric installation, has usually been handled by a multinational entity (in a corporate form with the participation of the concerned countries and, often, of the private sector) to mobilize financing, manage the construction process (prepare bidding documents, call for bids, evaluate bids, award contracts, supervise, commission), and operate and maintain the completed works.

### 9.3.2 A PIDA exclusive: ownership

The PAP projects were selected because they are consistent with the PIDA strategic framework, which in turn is based on a common vision for Africa's future and a well-established consensus concerning the infrastructure the continent needs for sustainable long-term growth. Because the PAP is designed to close a well-documented infrastructure gap and to respond to the announced priorities of the RECs and their member countries, there is every reason to expect that they will be fully owned by their stakeholders, thus avoiding the major pitfall of previous regional infrastructure programmes—namely, the lack of ownership.

## 9.4 THE OUTLOOK FOR FINANCING PIDA'S PRIORITY ACTION PLAN

The PIDA sponsors are interested in seeing quick progress in construction and commissioning of facilities. The inclusion in the PAP of several shovel-ready projects[7] provides an early test of the expected value added of the PIDA process. A quick start with the shovel-ready projects will allow the continental and regional entities responsible for leading PIDA to build up their experience and confidence while dealing with concrete projects and developing their monitoring and related processes.

In considering the financing outlook for the PAP, a distinction must be made between project preparation and project construction. Attention must be paid, too, to the financing of the continental and regional institutions responsible for implementing PIDA.

### 9.4.1 Funding for project preparation: toward a continental project preparation facility

The current framework for preparing regional investments is ineffective. Project preparation financing funds are scattered among more than 20 entities. A recommendation of the Study is that a special fund federating all existing funds needs be put in place and reserved for regional project preparation, or at least, a single window to access the various funds be put in place.[8]

A rule of thumb is that project preparation (through completion of the bidding process) amounts to 6–9% of total project costs. A larger amount may apply to projects structured as PPPs, which require costly legal and finance expertise.

These funds are scarce, because most project preparation activities do not lead to projects that can repay the costs of preparation.

Annual expenditures for PAP preparation activities could reach more than $500 million by 2020, when the PIDA implementation should be going at full speed.

Fortunately, a large share of the PAP projects are at an advanced stage of preparation, so that in the early years preparation expenses will be unusually smaller (beginning at $200 million per year), before building up gradually. But even $200 million per year is beyond the capacity of the existing African Project Preparation Facilities (PPF), including the NEPAD infrastructure PPF.

A continental or regional project development financing facility that allowed faster preparation of projects for regional integration would avoid delays between the successive phases of preparation and ensure that the full preparation of selected projects was adequately funded from the start. The trick to managing such a mechanism will be to keep funding focused on the PIDA PAP and to avoid the moral hazard trap.

7 They include eight projects: Millennium Dam, Rusumo Falls, Ruzizi 3, Kaleta, Sambagoulou, Gambia Bridge (on the Praiai-Abidjan Corridor), Lamu Port, ICT land infrastructure and IXP.

8 For example, the model of PPIAF or ESMAP for pooling of funds from different sources may be considered..

### 9.4.2 Funding for construction: closing the gap

As established in chapter 8, the PAP is expected to cost $65 billion. Of that, some $26 billion is expected to be available for regional projects from the Infrastructure Consortium for Africa (ICA).[9] An additional $2 billion may be generated by the power utilities, leaving a funding gap of some $37 billion—more than half of the total expected cost of the PAP. Closing the gap will be the major challenge facing PIDA.

#### *Funding from abroad*

The Study has taken into account the various nonlending products (guarantees, carbon funds, green funds) of the multilateral development banks have been taken into account in the above estimate of available ICA funding. Increases in official development assistance from new donors (as opposed to at present cash-strapped traditional donors) have also been included in the ICA figure.

Are there other non-African sources of finance that have not yet been tapped for African infrastructure? Sovereign wealth funds are often mentioned, as are international equity funds, which, until the financial crisis, had been sharpening their focus on Africa. Such sources may indeed contribute to the financing of PIDA to the extent that projects are financially viable and present acceptable risks. Several PAP projects (renovation of heavily travelled roads, power generation, fibre optic infrastructure) may fall into this category. But a limiting factor maybe the need to provide credit support from multilateral institutions.

A continent-wide risk guarantee facility funded by donors is an alternative to direct financing of regional projects. Several regional guarantee mechanisms have been explored recently. One proposal would be that a pool of multilateral and bilateral institutions backs the guarantee fund, which would be managed by an offshore trustee protected from political interference. Another option is to finance the fund through a levy on regional trade. The facility will help attract commercial financing for regional projects. The extended guarantee approach is preferable to direct financing of regional projects by donors, which may not contribute significantly to leveraging additional commercial financing for regional projects.

In recent years African institutions have become adept at mobilising finance, taking advantage of good macroeconomic conditions and improvements in public financial management. Several African countries are now present on the capital market. As their economic situation strengthens, their international rating should improve and their access to markets should become easier. Some examples are provided below;

By 2007, Ghana had issued $750 million in sovereign bonds. Kenya, for its part, has raised nearly $1 billion through infrastructure bonds over the past four years to fund road, energy, water, and irrigation projects. Kenya's Central Bank is selling a 12-year infrastructure bond valued at $195 million, targeted at Kenyans living abroad. The Tripartite is considering issuing regional infrastructure bonds in 2012.

#### *Funding from within Africa*

Experience in China, India, and Latin America shows that the bedrock of infrastructure financing is domestic savings either public or private.

9 Assumes 6% annual growth of ICA funding. Includes OECD plus multilaterals, new donors, regional development banks, and private foreign investment.

A now routine approach is for regional banks (such as the Development Bank of Southern Africa for SADC and the ECOWAS Bank for Investment and Development to issue bonds on regional markets and use part of the proceeds for infrastructure.

The Africa Finance Corporation is an example of an African-owned investment fund (with ownership concentrated in West Africa) active in infrastructure since 2008. With paid-in equity in excess of $1 billion, it has financed the Main One Cable linking West Africa and Europe and toll roads in South Africa, among other projects.

Another way to mobilise domestic finance is to increase the contributions from utilities raised from operating profits—a real prospect, provided the financial position of national utilities, weakened by governments' pricing and payment policies, can be improved. Unless this policy issue is addressed in each region, it may remain an insurmountable constraint to mobilizing the resources needed to finance regional (as well as national) energy investment programs. This prospect is real over the longer term. As has been explained in the Africa Energy Outlook 2040, with a few exceptions, the power utilities have a negative cash flow. It is possible to turn around their performance as has been shown in the case of Rwanda. But it will take between 5-10 years until the combined cash flow of the utilities contributes significantly to PIDA PAP investments.

### 9.4.3 Financing the continental and regional institutions

The continental and regional organisations depend for their infrastructure activities on member states' payments and on donor funding. Although member dues are low, arrearages are common. As a result, the operations of the continental and regional institutions are limited to what donors are willing to finance.

This state of affairs cannot continue. The continental and regional bodies will need additional discretionary funding if they are to implement a mechanism to provide compensation for countries that sustain short- and medium-term losses arising from integration. Payment of compensation may be essential to maintain consensus and cement solidarity around the shared goal of greater regional integration through more and better regional infrastructure.

The payment of compensation is a part of the rationale for the European Structural Funds. An African example is provided by the "community solidarity levy" collected by the Union Economique et Monétaire Ouest Africaine (UEMOA), which was originally aimed at compensating importing countries for losses from regional free trade (Box 9.2). Now that the period of compensation is over, the funds collected are used for infrastructure, including a one-stop border post between Togo and Burkina. ECOWAS, ECCAS, and CEMAC have adopted UEMOA's idea with mixed success.

It is worth examining the feasibility of similar schemes to support the implementation of PIDA.

**Box 9.2. The solidarity levy and structural fund of the Union Economique et Monétaire Ouest Africaine (UEMOA)**

The UEMOA treaty establishes a "community solidarity levy" equal to 1% of the value of third-country imports. The levy is collected by national customs services on behalf of UEMOA upon entry of goods into the UEMOA free trade area. The importer of the goods writes a separate check in UEMOA's name to be deposited in the UEMOA account at the West Africa Central Bank (BCEAO).

Because all countries use a common electronic system to which UEMOA has access, UEMOA follows transactions in real time and has knowledge of the amounts due from each country. It carries out periodic inspection missions to correct anomalies, in particular amounts erroneously paid into treasury accounts.

Proceeds of the levy were used originally to compensate some countries for losses of customs revenue resulting from the removal of duties on community imports.

Now that the compensation period has ended, the levy is used to finance UEMOA activities, including FAIR (Fonds d'appui à l'intégration régionale), a fund to support regional integration through infrastructure projects, among other actions.

A similar solidarity levy is found in the European Union, where a share of customs duties on third-party imports helps fund the EU budget.

# 10. RISKS TO PIDA—AND TO AFRICA

Capturing the considerable potential benefits of regional infrastructure will require political leadership, effective regional institutions and regulatory frameworks, and measures to facilitate cross-border project preparation and financing. Acting in concert, Africa will have to mobilize sizable funds to build the PIDA infrastructure needed to accommodate and sustain growth. Continental and regional policies will have to be written into national codes—and enforced. Bureaucratic battles must cease.

Regional infrastructure involves a high level of trust between countries, not least because of the implied dependence on neighbours for key resources such as water and energy. That trust must be built.

The major risk faced by PIDA relates to difficulties in achieving consensus among the stakeholders on the location of urgently needed transport infrastructure (in particular hub ports and airports). Political leadership is needed because political obstacles and expediencies often trump the economic case.

In the absence of leadership, PIDA is doomed to become a "top down" theoretical exercise poorly aligned with the priorities of the RECs and their member countries and unlikely to generate the needed infrastructure investment.

Success can be achieved if in the coming years certain major recognised policy weaknesses across infrastructure sectors have been resolved with:

- *Transport*. All the corridors reaching full efficiency through successful implementation of well-documented and generally accepted trade facilitation measures such as one-stop border posts and “smart” corridors; restoration of the creditworthiness of railways and road-maintenance institutions; and full implementation of the 1999 Yamoussoukro Decision.10
- *Energy*. The creditworthiness of electricity utilities restored and payment discipline enforced.
- *Transboundary water resources*. The African countries that share international rivers, lakes, and aquifers displaying the political will to support their basin organisations in the preparation, implementation, and operation of joint investments.
- *ICT*. Monopoly control ended on land-based infrastructure and international gateways, with “right of way” provisions for landlocked countries to reach submarine cable landing stations.

Provided these policy changes are timely and effective, the outlook presented in this report paint a plausible future for Africa and its regional infrastructure. The findings of the PIDA study provide the RECs with a detailed roadmap for action in the infrastructure sectors.

10 The Yamoussoukro Decision of 1999 was an effort to liberalize international air travel within Africa. Although implementation has varied significantly from region to region, liberalization has generally been successful. Two-thirds of African countries have applied the standards to some extent.

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# ANNEX 1: PIDA PRIORITY ACTION PLAN, BY SECTOR

## TRANSPORT

| | Project title | Summary description | Stage | Total cost in US$ millions | Location | REC(s) | Region |
|---|---|---|---|---|---|---|---|
| 1 | TAH programme | Phase I of the continental connectivity program which focuses on completion and standardisation of the TAH missing links by 2030 | S2/ S3 | 2,150 | Africa | Continental | **Continental** |
| 2 | Single African Sky Phase 1 (Design and Initial Implementation) | A continental programme to create a high-level, satellite-based air navigation system for the African continent | S3 | 250 | Africa | Continental | **Continental** |
| 3 | Yamassoukro Decision implementation | Accelerate Yamoussoukro Decision Implementation by identifying countries that are ready to fully implement the YD; and discussing and agreeing with governments and airlines to launch the voluntary club on a full membership basis | S4 | 5 | Africa | Continental | **Continental** |
| 4 | Smart Corridor Program, Phase I | Develop model smart corridor technology and design / implement a continental and regional corridor efficiency monitoring system | S1 | 100 | Africa | Continental | **Continental** |
| 5 | Northern Multimodal Corridor | Modernise the highest priority multimodal ARTIN corridor in East Africa to modern standards (climbing lanes and urban bypasses). Facilitate travel by people and goods across the borders between Kenya, Uganda, Rwanda, Burundi and Dem. Rep. Congo, with a spur to South Sudan | S3/ S4 | 1,000 | Kenya, Uganda, Rwanda, Burundi | COMESA EAC | **Eastern** |
| 6 | North-South Multimodal Corridor | Modernise the highest priority multimodal ARTIN corridor in southern Africa to modern standards and facilitate travel of people and goods across the borders between South Africa, Botswana, Zimbabwe, Zambia, Malawi, and Dem. Rep. Congo | S3/ S4 | 1,025 | Rep. Congo, Zambia, Zimbabwe, South Africa, Mozambique | COMESA EAC SADC | **Eastern** |
| 7 | Djibouti-Addis Corridor | Revive the rail system in a high-priority multimodal ARTIN corridor in eastern Africa and increase the flow of goods across the border between Djibouti and Ethiopia. Design and implement a smart corridor system for both road and rail transport | S3/ S4 | 1,000 | Djibouti, Ethiopia | COMESA IGAD | **Eastern** |

| | Project title | Summary description | Stage | Total cost in US$ millions | Location | REC(s) | Region |
|---|---|---|---|---|---|---|---|
| 8 | Central Corridor | Modernise the third priority ARTIN corridor in East Africa and facilitate travel for people and goods across the borders between Tanzania, Uganda, Rwanda, Burundi, and Dem. Rep. Congo | S3/ S4 | 840 | Tanzania, Uganda, Rwanda, Burundi, Dem. Rep. Congo | COMESA EAC | **Eastern** |
| 9 | Moatize to Sea Rail/Lake/River Corridor | Modernise and upgrade the rail and port system serving a major coal export area at Moatize. Part of the Beira Corridor and the Nacala Corridor | S3/ S4 | 500 | Mozambique, Malawi | COMESA SADC | **Eastern** |
| 10 | Lamu Gateway Development | Develop sufficient port capacity to handle future demand from both domestic sources and landlocked countries, with priority given to Lamu gateway | S3/ S4 | 3,900 | Kenya, Uganda, Rwanda, Burundi | COMESA SADC EAC | **Eastern** |
| 11 | Southern Africa Hub Port and Rail Programme | Develop sufficient port capacity to handle future demand from both domestic sources and landlocked countries | S1 | 2,270 | REC members | SADC | **Southern** |
| 12 | Abidjan-Lagos Coastal Corridor | Modernise heavily travelled ARTIN corridor in West Africa. Trade facilitation, OSBPs, capacity enhancement and implementation of PPP for five countries | S3/ S4 | 290 | Nigeria, Benin, Togo, Ghana, Côte d'Ivoire | ECOWAS | **Western** |
| 13 | Dakar-Niamey Multimodal Corridor | Modernise heavily travelled ARTIN corridor in West Africa. Trade facilitation, OSBPs, capacity enhancement and implementation of PPP) for four countries | S3/ S4 | 590 | Senegal, Mali, Burkina Faso, Niger | ECOWAS | **Western** |
| 14 | Praia-Dakar-Abidjan Multimodal Corridor | Improve marine transport and the connection between island and mainland countries by creating a new maritime service between regional ports and a modern information system to link the maritime service with ports and roads in the Dakar-Abidjan Corridor. Would also modernise one of the most heavily travelled ARTIN corridors in West Africa. Trade facilitation, OSBPs, capacity enhancement (possibly through PPP) for eight countries | S2 to S4 | 200 | Capo Verde, Senegal, Gambia, Guinea Bissau, Guinea, Sierra Leone, Liberia, Côte d'Ivoire | ECOWAS | **Western** |
| 15 | Abidjan-Ouagadougou/Bamako | Modernise and rehabilitate mutlimodal corridor damaged by civil war in Côte d'Ivoire | S3/ S4 | 540 | Côte d'Ivoire, Burkina Faso, Mali | ECOWAS | **Western** |
| 16 | West Africa Hub Port and Rail Programme | Address future capacity problems in West African ports with two components: (a) a regional hub port and rail linkage master plan and (b) port expansion | S1 | 2,140 | 15 countries, PMAWCA | ECOWAS | **Western** |
| 17 | West Africa Air Transport | Increase air transport service levels in West Africa, which are currently limited by the lack of a regional air hub | S1 | 420 | 15 countries | ECOWAS | **Western** |

| | Project title | Summary description | Stage | Total cost in US$ millions | Location | REC(s) | Region |
|---|---|---|---|---|---|---|---|
| 18 | Pointe Noire, Brazzaville, Kinshasa, Bangui, N'djamena Multimodal Corridor | Revive river transport in the Congo-Ubangi River Basin, and modernise road transport along the corridor | S3/ S4 | 300 | Rep. Congo, Dem. Rep. Congo, CAR | ECCAS | **Central** |
| 19 | Kinshasa-Brazzaville Bridge Road and Rail Project and Rail to Ilebo | Improve the regional transportation and trade systems by building a crossing linking Kinshasa and Brazzaville, thereby ensuring continuity in railway traffic from Matadi and Pointe-Noire to the eastern border of the DRC and eastern and southern Africa | S2 | 1,650 | Rep. Congo, Dem. Rep. Congo | ECCAS | **Central** |
| 20 | Douala-Bangui Douala-Ndjamena Corridor | Modernises the highest priority multimodal ARTIN corridor in Central Africa and facilitate travel for people and goods across the borders between Cameroon, Chad, and the Central African Republic | S3 | 290 | Cameroon, CAR, Chad | ECCAS | **Central** |
| 21 | Central African Inter-Capitals Connectivity | Provide several missing intercapital connectors | S2 | 800 | Cameroon, Chad, CAR, Rep. Congo, Dem. Rep. Congo, Gabon, Burundi, Angola | ECCAS | **Central** |
| 22 | Central Africa Air Transport | Raise air transport service and improve airports in Central Africa, which are currently limited by the lack of a regional air hub. | S1 | 420 | | ECCAS | **Central** |
| 23 | Central Africa Hub Port and Rail Programme | Responds to emerging capacity problems in Central African ports through two components: (a) a regional hub port and rail linkage master plan; (b) port expansion. | S1 | 1,400 | Cameroon, Chad, CAR, Rep. Congo, Dem. Rep. Congo, Gabon, Burundi, PMAWCA | ECCAS | **Central** |
| 24 | Trans-Maghreb Highway | Improve travel for people and goods across the Maghreb, where trade and travel are limited by artificial barriers. Design and implement a smart corridor system along the highway and install one-stop border posts | S3 /S4 | 75 | Morocco to Egypt through Algeria, Tunisia and Libya | AMU | Northern |

*S1: Early concept proposal;*
*S2: Feasibility/needs assessment;*
*S3: Program/project structuring and promotion to obtain financing;*
*S4: Implementation and operation*

# ENERGY

| | Project title | Summary description | Stage | Total cost in US$ millions | Location | REC(s) | Region |
|---|---|---|---|---|---|---|---|
| 1 | Great Millennium Renaissance Dam | Develop a 5,250 MW plant to supply domestic market and export electricity on EAPP market | S4 | 8,000 | Ethiopia, Nile basin | COMESA/ IGAD | **Eastern** |
| 2 | North South Power Transmission Corridor | 8,000 km line from Egypt through Sudan, South Sudan, Ethiopia , Kenya, Malawi, Mozambique, Zambia, Zimbabwe to South Africa | S2 | 6,000 | Kenya, Ethiopia, Tanzania, Malawi, Mozambique, Zambia, Zimbabwe, South Africa | COMESA EAC SADC IGAD | **Southern** |
| 3 | Nphamda - Nkuwa | Hydroelectric power plant with a capacity of 1,500 MW for export on the SAPP market | S2 | 2,400 | Mozambique, Zambezi basin | SADC | **Southern** |
| 4 | Lesotho HWP Phase II - hydropower component | Hydropower programme for power supply to Lesotho and power export to SA | S2 | 800 | Orange-Senqui River Basin | SADC | **Southern** |
| 5 | Inga Hydro Phase 1 | 4,200 MW capacity run of river hydropower station on the Congo river with eight turbines. | S2 | 6,000 | DRC Congo River | ECCAS | **Central** |
| 6 | Central African Interconnection | 3,800 km line from DRC to South Africa through Angola, Gabon, Namibia and to the North to Eq. Guinea, Cameroon and Chad | S1 | 10,500 | South Africa, Angola, Gabon, Namibia, Ethiopia | ECCAS | **Central** |
| 7 | Sambagalou | 128 MW of hydropower capacity, 930 km from the mouth of the Gambia River to supply Senegal, Guinea, Guinea Bissau and Gambia | S3 | 300 | Senegal, OMVG | ECOWAS | **Western** |
| 8 | West African Power Transmission Corridor | 2,000 km line along the coast connecting with the existing Ghana Nigeria line with a capacity of 1,000 MW | S2 | 1,200 | Guinea, Guinea Bissau, Gambia, Sierra Leone, Liberia, Côte d'ivoire, Ghana | ECOWAS | **Western** |
| 9 | North Africa Transmission | 2,700 km line from Morocco to Egypt through Algeria, Tunisia and Libya | S2 | 1,200 | Morocco, Algeria, Tunisia, Libya, Egypt | AMU | **Northern** |
| 10 | Kaleta | Hydropower generation of 117 MW | S3 | 179 | Guinea - OMVG | ECOWAS | **Western** |
| 11 | Batoka | Hydroelectric plant with a capacity of 1,600 MW to enable export of electricity | S3 | 2,800 | Zambia, Zimbabwe, Zambezi basin | COMESA EAC | **Eastern** |
| 12 | Ruzizi III | Hydroelectric plant with a capacity of 145 MW to share power between Rwanda, Burundi and DRC promoted by CEPGL | S3 | 450 | Rwanda/DRC | COMESA EAC | **Eastern** |

| | Project title | Summary description | Stage | Total cost in US$ millions | Location | REC(s) | Region |
|---|---|---|---|---|---|---|---|
| 13 | Rusumo Falls | Hydropower production of 61 MW for Burundi, Rwanda and Tanzania | S3 | 360 | Nile River Basin | COMESA EAC | **Eastern** |
| 14 | Uganda-Kenya Petroleum Products Pipeline | 300 km pipeline for a lower-cost mode of transport of petroleum products | S4 | 150 | Uganda Kenya | COMESA EAC | **Eastern** |
| 15 | Nigeria - Algeria Pipeline | 4100 km gas pipeline from Warri to Hassi R'Mel in Algeria for export to Europe | S2 | N/A | Nigeria, Niger, Algeria | UMA ECOWAS | Northern, Western |

*S1: Early concept proposal;*
*S2: Feasibility/needs assessment;*
*S3: Program/project structuring and promotion to obtain financing;*
*S4: Implementation and operation*

# TRANSBOUNDARY WATER RESOURCES

| | Project title | Summary description | Stage | Total cost in US$ millions | Location | REC(s) | Region |
|---|---|---|---|---|---|---|---|
| 1 | Palambo | Regulation dam to improve navigability of Obangui River with added hydropower component | S2 | 155 | Congo River Basin | ECCAS | **Central** |
| 2 | Fomi | Hydropower station in Guinea with irrigation water supply for Mali and regulation of the Niger river (9 Countries) | S3 | 384 | Niger River Basin | ECOWAS | **Western** |
| 3 | Multisectoral Investment Opportunity Studies | Identification and preparation of investment programmes in the basin | S1 | 1 | Okavango River Basin | SADC | **Southern** |
| 4 | Lesotho HWP Phase II - water transfer component | Water transfer programme supplying water to Gauteng Province in SA | S3 | 1,100 | Orange-Senqul River Basin | SADC | **Southern** |
| 5 | Gourbassy | Multipurpose dam located in Guinea: regulation of the Senegal river (4 Countries) | S2 | NA | Senegal River Basin | ECOWAS | **Western** |
| 6 | Noumbiel | Multipurpose dam with hydropower generation (for Burkina Faso and Ghana) component | S1/S2 | NA | Volta River Basin | ECOWAS | **Western** |
| 7 | Nubian Sandstone Aquifer System | Implementation of regional strategy for the utilisation of the aquifer system | S4 | 5 | Nubian Sandstone Aquifer System | UMA | **Northern** |
| 8 | North-West Sahara Aquifer System | Pre-feasibility studies for improved use of the aquifer system | S2 | 2.5 | North West Sahara Aquifer System | UMA | **Northern** |
| 9 | Iullemeden Aquifer System | Pre-feasibility studies for improved use of the aquifer system | S2 | 10 | Iullemeden and Taoudeni/ Tanezrouft Aquifer System | UMA | **Northern** |

*S1: Early concept proposal;*
*S2: Feasibility/needs assessment;*
*S3: Program/project structuring and promotion to obtain financing;*
*S4: Implementation and operation*

# INFORMATION AND COMMUNICATION TECHNOLOGIES

| | Project title | Summary description | Stage | Total cost in US$ millions | Location | REC(s) | Region |
|---|---|---|---|---|---|---|---|
| 1 | ICT Enabling Environment | This programme would improve the environment for the private sectors to invest in high speed broadband infrastructure | S2 | 25 | Continental | Continental | **Continental** |
| 2 | ICT Terrestrial for Connectivity | This programme has two main components:<br>(a) secure each country connection by at least two broadband infrastructure<br>(b) ensure the access to submarine cable to all landlocked countries | S3 | 320 | Continental | Continental | **Continental** |
| 3 | Internet Exchange Point (IXP) programme | The aim of this programme is to provide the continent with adequate internet node exchange to maximise internal traffic | S3 | 130 | Continental | Continental | **Continental** |

*S 1* *Early concept proposal*
*S 2* *Feasibility/needs assessment*
*S 3* *Program/project structuring and promotion to obtain financing*
*S 4* *Implementation and operation*

# ANNEX 2: LIST OF DOCUMENTS PRODUCED DURING PIDA STUDY

| | |
|---|---|
| **Inception Report** | **5 July 2010** |
| **Methodological Brief** | **15 September 2010** |
| Macro | |
| Transport | |
| Energy | |
| TWRM | |
| ICT | |
| **Phase I report** | **30 March 2011** |
| Phase I overview | |
| Report on Policies (4 Sectors) | |
| Report on infrastructures (4 Sectors) | |
| Report on Outlook (4 Sectors) | |
| Outline of development programme (4 Sectors) | |
| Phase I Annexes | |
| **Africa Sector Outlooks 2040** | **15 August 2011** |
| Macroeconomic Outlook 2040 | |
| Africa Transport Outlook 2040 | |
| Africa Energy Outlook 2040 | |
| Africa TWRM Outlook 2040 | |
| Africa ICT Outlook 2040 | |
| **Strategic Briefs** | **15 June 2011** |
| Transport Sector Brief | |
| Energy Sector Brief | |
| TWRM Sector Brief | |
| ICT Sector Brief | |
| **Phase II Report** (Draft Strategic framework & Draft Infrastructure development programme & Draft Implementation strategy) | **15 September 2011** |
| Transport | |
| Energy | |
| TWRM | |
| ICT | |
| **Phase III report** (Final Strategic framework & Final Infrastructure development programme & Final Implementation strategy) | **15 November 2011** |
| Transport | |
| Energy | |
| TWRM | |
| ICT | |
| **PIDA Study Synthesis** | **25 November 2011** |