



**Masterspace  
SOLUTIONS**

# **Research and Situational Analysis Of IPv6 Adoption In Africa**

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**Prepared by: Masterspace Solutions Ltd**

**Start: 15<sup>TH</sup> September 2025**

**End: 28<sup>TH</sup> October 2025**

**Engagement Meeting: 6<sup>TH</sup> November 2025**

**Revised End: 14<sup>TH</sup> November 2025**

**Version 5.0**

## NOTES

# EXECUTIVE SUMMARY

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The Africa's population is projected to double by 2050. Africa's breadth and depth of economy like the rest of the world will be driven fully by a digital transformation. Digital transformation creates innovations such as Internet of Things (IoT), Artificial Intelligence (AI), blockchain, 5G and beyond technologies. These innovations will be enabled by a meaningful transition from IPv4 to IPv6. According to IPv6 traffic flows to Google, Africa's average IP6 adoption rate remains low at about 6.3% across 54 countries compared to the global average of about 44% as of October 2025. Key IPv6 adoption or deployment challenges mainly in Africa include but not limited to:

- ✓ Legacy system compatibility, in which many older router systems and devices operating on IPv4 addressing spaces do not support IPv6.
- ✓ Staff training requirements, whereby many network engineering or IT teams lack specialised training on IPv6 management.
- ✓ Dual-stack complexity, in which managing both IPv4 and IPv6 protocols simultaneously increases operational overhead.
- ✓ Vendor support gaps, whereby not all equipment manufacturers fully support IPv6.
- ✓ Cost considerations, in which infrastructure upgrades remain an expensive factor.
- ✓ Disparities across Africa in terms of market structure, institutional readiness and digital culture.
- ✓ Governance commitment (policy and regulatory) and financial challenges.

This phenomenon clearly shows the urgent need to overcome IPv6 adoption challenges and develop IPv6 adoption accelerators for Africa to stay competitive as a critical role player in the global digital economy. In this segment of the project, Masterspace Solutions Ltd undertakes a situational analysis of IPv6 adoption in Africa. Quantitative data was collected from Google's IPv6 adoption statistics as measured from Google users to determine the updated status of the IPv6 adoption per country in Africa. This timeous information proactively helps Internet providers, website owners, and policy decision makers as the industry rolls out IPv6. In the month of October 2025, Central African countries were leading the rest of Africa at 9.9% IPv6 adoption rate on average. This was followed by the West Africa's member states, average 7.0%, North Africa at 5.6% on average, East Africa average at 5.4%, and Southern Africa average rate at 4.6%. Several factors unique to each country have been highlighted as the main contributor to such statistics. The situational analyses using PESTEL and SWOT analyses were used to unpack factors that affect (enable and inhibit) IPv6 adoption in Africa. These analyses revealed that there was no universal solution to accelerate IPv6 adoption in Africa. While some countries or regions advocate for government intervention to accelerate IPv6 adoption, other regions underscore the role of regulatory frameworks, market forces and local priorities to shape the pace and methods of adoption worldwide.

In comparison to the rest of the world, country by country data shows that IPv6 adoption rate also varies significantly around the world. While some regions demonstrating higher adoption rates due to a combination of policy, industry leadership, and user demand enablers, yet other regions are still lagging. In most cases, larger address spaces, more efficient routing, and extensive networks have been accepted globally to constitute essential drivers for IPv6 adoption. Data shows that IPv6 traffic to Google, while increasing, is still below 50%. As of early 2025, a global IPv6 adoption stood at slightly over 43%, based on IPv6 traffic to Google. However, looking at the data by country as of the month of October 2025, the United States is only slightly above 53%, while France, Germany, and India have much higher average adoption rates at about 86%, 75% and 78% respectively.

In this study, key finding postulates an accelerated solution of IPv6 deployment as an ecosystem model underpinned by the spirit of coordination, co-operation and collaboration among multi-stakeholders.

The call for action is that African countries cannot avoid IPv6 deployment much longer. The diminishing utility of Network Address Translation (NAT), exhaustion of IPv4 addresses and migration by major content providers are converging factors. Delaying the move to IPv6 will only increase complexity and cost as more translation workarounds are required as well as widen the digital divide. Those who act now will benefit from direct, efficient connections to an increasingly IPv6-native internet, while those who delay will find themselves managing increasingly complex and expensive translation systems.

# TABLE OF CONTENT

Executive Summary	2
Table of Contents	4
List of Acronyms	5
1 Introduction	6
2 Problem Statement	9
3 Aim of this task	10
4 Methodology	11
5 Status of IPv6 adoption in Africa	14
5.1 North Africa	14
5.2 West Africa	18
5.3 Central Africa	18
5.4 East Africa	20
5.5 Southern Africa	24
6 Status of IPv6 adoption: In the Rest of the World	26
6.1 North America	26
6.2 Central America	27
6.3 South America	28
6.4 Oceania	28
6.5 Caribbean	29
6.6 Europe	30
6.7 Asia	31
7 Situational analyses on transition from IPv4 to IPv6 in Africa	32
7.1 PESTEL Analysis	34
7.2 SWOT Analysis	37
8 Conclusions and Recommendations	42

# LIST OF ACRONYMS

AFNOG  
AFRINIC  
AI  
APNIC  
ARIN  
ATU  
DNS  
ICANN  
ICT  
IET  
IoT  
IP  
IPv4  
IPv6  
ISOC  
ISPs  
ITU  
LACNIC  
MSS  
NAT  
PESTEL  
RPKI  
SWOT  
5G  
6G

Africa Network Operator Group  
African Network Information Centre  
Artificial Intelligence  
Asian Pacific Network Information Centre  
American Registry for Internet Numbers  
African Telecommunication Union  
Domain Name System  
Internet Corporation for Assigned Names and Numbers  
Information and Communication Technology  
Internet Engineering Task Force  
Internet of Things  
Internet Protocol  
Internet Protocol version 4  
Internet Protocol version 6  
Internet Society  
Internet Service Providers  
International Telecommunication Union  
Latin America and Caribbean Network Information Centre  
MasterSpace Solutions Ltd  
Network Address Translation  
Political, Economic, Social, Technical, Environmental and Legal  
Resource Public Key Infrastructure  
Strengths, Weaknesses, Opportunities and Threats  
Fifth Generation Network  
Sixth Generation Network

# 1. INTRODUCTION

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In today's shift to a digital economy, IPv6 adoption is critical in driving a digital transformation. As a result, governments worldwide continue to establish policies which enable this transition from IPv4 to IPv6 across various sectors since IPv4 has reached its maximum capacity exhaustion. Digital transformation is creating innovations such as Internet of Things (IoT), Artificial Intelligence (AI), blockchain, 5G and beyond, among others. IPv6 is a fundamental enabler to such innovations<sup>1</sup>. Ipv6 has a 128-bit address format that allows for a vastly larger number of unique IP addresses than its predecessor, IPv4<sup>2</sup>. The latter uses a 32-bit address format and has an address catalogue sufficient for only 4.3 billion devices.

However, with a looming explosion of gadgets estimated at 30 billion devices by 2030, IPv4's limited address capacity falls short. In contrast, IPv6 is expected to generate an estimated 340 trillion ( $3.4 \times 10^{38}$ ) addresses, more than enough to accommodate the projected surge of devices. In sub-Saharan Africa, mobile internet subscribers reached 320 million in 2023 and are projected to grow to 528 million by 2030, according to GSMA.<sup>3</sup> Despite this growth, penetration is expected to hover around 37%, leaving nearly 900 million people unconnected. The number of licensed connected devices is also forecast to rise from 27 million in 2023 to 51 million by 2030<sup>4</sup>.

Although IPv6 has been available for over two decades and offers several technical benefits over IPv4, its global adoption rate, especially in Africa has not accelerated due to many challenges<sup>2</sup>. In a bid to conscientize stakeholders on the urgency of IPv6 adoption in Africa, ATU and HUAWEI in October 2022 released an Africa's IPv6 development white paper that presents the way forward for Africa's digital future<sup>5</sup>.

<sup>1</sup> NiTDA 20 August 2025, Nigeria's IPv6-driven Digital Public Infrastructure: The Road Towards Net5.5G-based Future Network, Available from: <https://nitda.gov.ng/wp-content/uploads/2024/11/NITDA24-ITIS-IPv6-WHITEPAPER-compressed.pdf>

<sup>2</sup> The New Stack, Tucker Preston 2023, Available from: <https://thenewstack.io/why-is-ipv6-adoption-slow/>

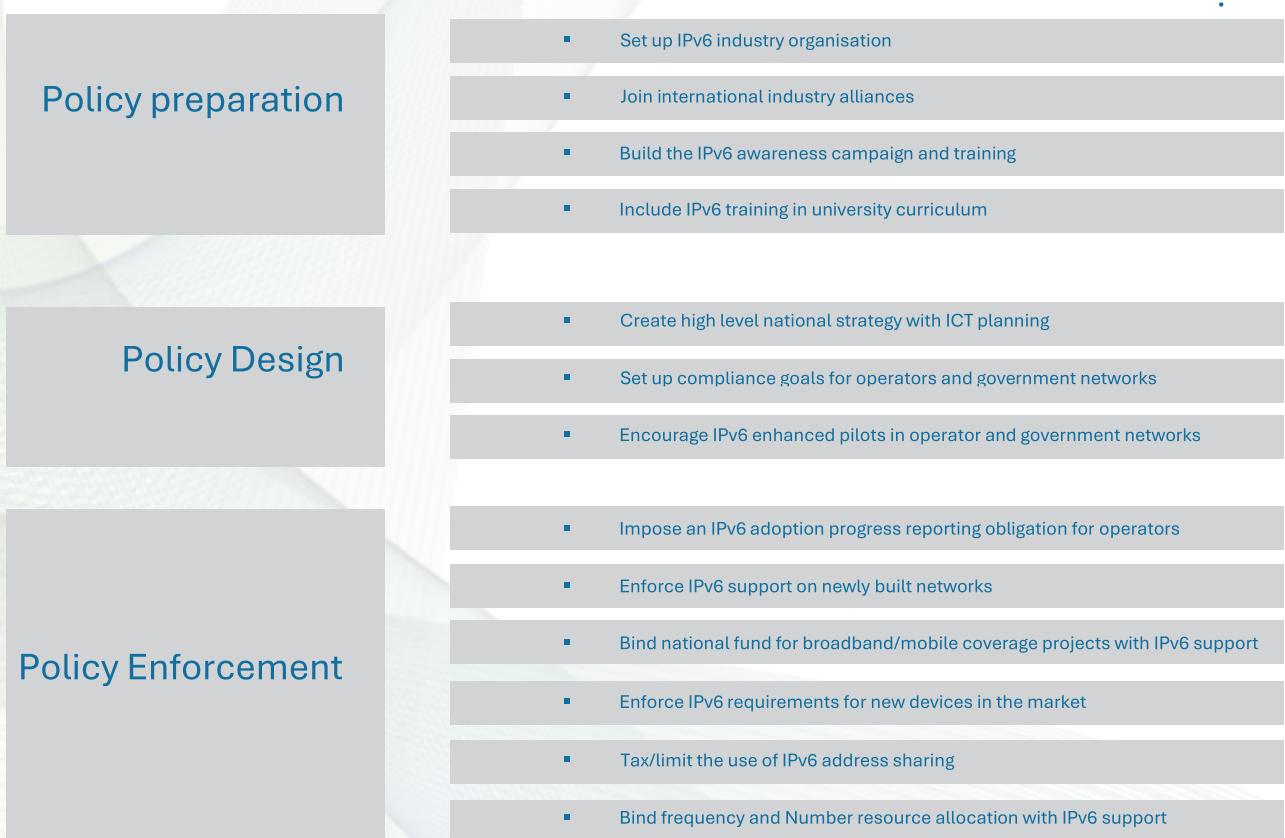
<sup>3</sup> GSAMA Intelligence 2024, Available from : <https://www.gsma.com/solutions-and-impact/connectivity-for-good/external-affairs/mobiles-impact-on-the-sdgs-in-sub-saharan-africa/>

<sup>4</sup> Ecofin Agency June 2025, Available from: <https://www.ecofinagency.com/news-digital/1106-47212-atu-secures-icann-grant-to-accelerate-ipv6-migration>

<sup>5</sup> ATU and Huawei October 2022, Africa IPv6 Development White Paper : The Way Forward for Africa Digital Future, Available from: [https://atuuat.africa/wp-content/uploads/2022/11/Africa-IPv6-Development-White-Paper\\_double-page-version.pdf](https://atuuat.africa/wp-content/uploads/2022/11/Africa-IPv6-Development-White-Paper_double-page-version.pdf)

This paper recognises IP as the basic protocol that enables the rapid growth of the Internet alongside access technologies like 4G/5G, fiber, etc. As the IPv4 address pool is already exhausted and the standards around IPv4 gradually stop evolving, IPv6 has become the only choice for sustainable development of the Internet.

However, according to this white paper by the ATU and Huawei, not every country was aware of the trend with most of the African countries were showing less than 5% IPv6 adoption rate. The deployment in most of the countries was still low, and the regional development was well below the world average (13.92% in western Asia and 1.36% in Africa). The experiences from different countries in the world had shown that the government's industry policy plays a critical position in the IPv6 transition. Figure 1 below lists a set of policy actions and tools that the government could apply to accelerate the IPv6 migration process from policy preparation to policy enforcement.



**Figure 1: IPv6 Industry Policy Tools (Source: ATU and Huawei White Paper, October 2022)**

In October 2025, ICANN Org also published an intriguing Name Collision IPv6 research study for public comments<sup>6</sup>. The study proposed a controlled interruption, in which certain DNS resource records, designed to interrupt resolution processes, are temporarily published at and below the generic top-level domain to reduce the risk of name collision. The content of these DNS records was intended to minimize any harm

<sup>6</sup> ICANN ORG October 2025, Name Collision IPv6 Research Study, Available from: <https://www.icann.org/en/public-comment/proceeding/name-collision-ipv6-research-study-20-10-2025>

<sup>7</sup> AFRINIC, October 2025, IPv6, Available from: <https://afrinic.net/resources/ipv6>

that arises from such interruption. Such collisions would likely be common in depleted IPv4 addressing protocol creating traffic overheads and economically non-viable solution in the long run, thus the urgent need for the IPv6 deployment, especially in the African continent.

Moreover, AFRINIC recognises that by design, devices connecting to the Internet with only an IPv4 address cannot directly communicate with devices connecting with only an IPv6 address<sup>7</sup>. To ensure that networks continue to run seamlessly, and all devices worldwide can continue to communicate with each other, IPv6 must be deployed in parallel with IPv4, which means that IPv4 and IPv6 will coexist and be operated in parallel for the time it takes to deploy IPv6 on a global scale fully. It is now becoming imperative that African network operators also start transitioning to IPv6 as soon as possible to continue to grow faster. It is also necessary to establish innovative methods to overcome transition barriers to foster an accelerated IPv6 adoption in Africa.

In this phase of the project, we endeavour to present an updated situation of an IPv6 adoption in Africa and the rest of the world. The scope involves a critical desktop review of literature sources consisting of existing related reports from partners and/or other stakeholders as well as from internet sources. The envisaged outcomes from the situational analysis are a set of recommendations which may assist decision makers across multistakeholder ecosystems in formulating the necessary policies and regulatory frameworks for transitioning from IPv4 to IPv6 in Africa.

## 2. PROBLEM STATEMENT

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IPv6 adoption in Africa is stagnating at an average about 6.3% compared to the global average of 44%<sup>8</sup> as of October 2025 in accordance with the IPv6 traffic to Google. Key IPv6 adoption or deployment challenges include but not limited to<sup>9</sup>:

- ✓ Legacy system compatibility: Many older router systems and devices operating on IPv4 addressing spaces do not support IPv6.
- ✓ Staff training requirements: Many network engineering or IT teams need specialised training on IPv6 management.
- ✓ Dual-stack complexity: Managing both IPv4 and IPv6 protocols simultaneously increases operational overhead.
- ✓ Vendor support gaps: Not all equipment manufacturers fully support IPv6.
- ✓ Cost considerations: Infrastructure upgrades remain an expensive factor.
- ✓ Disparities across Africa in terms of market structure, institutional readiness and digital culture.
- ✓ Governance commitment (policy and regulatory) and financial challenges.

Thus, the need to overcome IPv6 adoption challenges and leverage opportunities that accelerate IPv6 adoption in Africa.

Aligned to this problem statement are the following research questions:

- ✓ What is the updated status of IPv6 adoption in Africa?
- ✓ How does IPv6 adoption in Africa compare with the global IPv6 adoption?
- ✓ What is the successful process of IPv6 adoption in the other areas and the key to this successful adoption?
- ✓ What are the key enablers and barriers of IPv6 adoption in Africa?
- ✓ How can key barriers be overcome to accelerate IPv6 adoption in Africa?

<sup>8</sup> Google, September / October 2025, IPv6 Statistics, Available from:  
<https://www.google.com/intl/en/ipv6/statistics.html#tab=per-country-ipv6-adoption>

<sup>9</sup>

The New Stack, July 2025, Available from: [https://thenewstack.io/mythbusting\\_ipv6\\_why\\_adoption\\_lags\\_and-what-will-change-it/](https://thenewstack.io/mythbusting_ipv6_why_adoption_lags_and-what-will-change-it/)

### 3. AIM OF THIS TASK

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To establish a situational analysis of IPv6 adoption in Africa in relation to the global environment and to further propose innovative methods to overcome key barriers to IPv6 adoption in Africa.

Aligned to this aim are the following objectives:

- ✓ To describe the updated status of IPv6 adoption in Africa.
- ✓ To understand IPv6 adoption status globally.
- ✓ To establish the successful process of IPv6 adoption in the other areas and the key to this successful adoption.
- ✓ To identify key enablers and barriers of IPv6 adoption in Africa by applying the PESTEL and SWOT analyses.
- ✓ To recommend innovative methods for accelerating an IPv6 adoption in Africa.

## 4. METHODOLOGY

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The overarching research methodology for this task constitutes a systematic presentation of each country's or regional situational analysis of IPv6 adoption. A situational analysis is a research methodology used to understand the internal and external environment of an organisation, an industry, a market or a process. The ongoing statistics about IPv6 adoption statuses per country, regions and globally are continuously monitored by and found in the following sites<sup>10</sup>

<https://pulse.internetsociety.org/en/technologies/>  
<https://stats.labs.apnic.net/ipv6>  
<https://www.worldipv6launch.org/measurements/>  
<https://www.vyncke.org/ipv6status/>  
<https://6lab.cisco.com/stats/>  
<https://www.google.com/intl/en/ipv6/statistics.html>

With regards to the use of Pulse, the Internet Society (ISOC) collates various measurements to illustrate the deployment of critical Internet technologies at a country level and across global networks<sup>11</sup>. ISOC publishes various posts, including reviewing notable changes in IPv6 deployment in each region over the past 12 months. Internet Society Pulse presents measurements of IPv6 adoption to raise awareness of the different levels of IPv6 adoption in different countries and networks around the globe, and to encourage greater adoption of this important enabling technology<sup>12</sup>.

Asia Pacific Network Information Centre (APNIC) labs apply a population sampling methodology to provide a 30-day average IPv6 measurements concerning IPv6 capable and IPv6 preferred users. Using this tool, the rate of IPv6 capable users in Africa was 4.58% compared to the world's 41.34%, while the rate of IPv6 preferred users in Africa was 6.3% compared to the world's 44% during the month of October 2025. The World IPv6 Launch on the other hand undertakes its measurement activities by tracking different aspects of IPv6 deployment on the global Internet. The different measurements show various dimensions of the answer to the question of how broadly IPv6 is being used on the global Internet. The tables, charts, and links provide answers to questions such as:

- ✓ which websites have enabled IPv6,
- ✓ how many visitors to a specific website are using IPv6,
- ✓ how many networks have significant IPv6 deployment, and
- ✓ how much traffic at an Internet exchange is using IPv6?

<sup>10</sup> Internet Society (ISOC), September / October 2025, IPv6 Statistics, Available from: <https://www.internetsociety.org/deploy360/ipv6/statistics/>

<sup>11</sup> Robbie Mitchel, ISOC Governments and Industry Driving IPv6 in 2023. Available from: <https://pulse.internetsociety.org/blog/governments-and-industry-driving-ipv6-in-2023>

<sup>12</sup> <https://pulse.internetsociety.org/en/technologies/>

Such measurements are taken over longer period intervals to improve data reliability but would not be an appropriate tool for understanding a daily situation of a rapidly changing context of an IPv6 adoption globally.

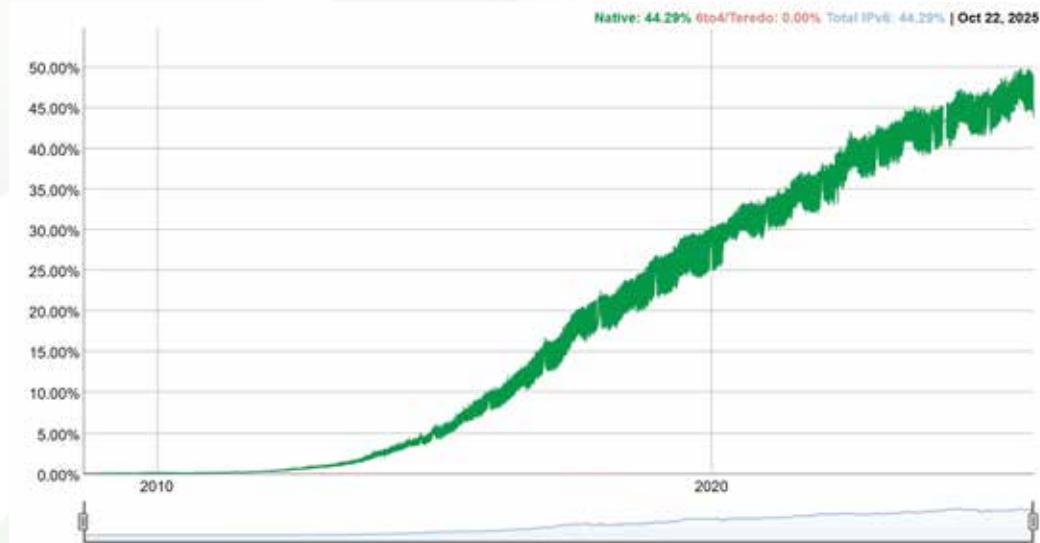
The Vyncle tool provides IPv6 deployment aggregated status of a country by country globally based on worldwide sampling of IPv6 enabled Web, Email and Domain Name System (DNS) extracted data from the free Alexa top 1 million web sites in comparison to data from IPv6 enabled google users. Using this methodology, Norway ranks first globally with 62% Web on IPv6 adoption, Anguilla ranks first globally with 80% on Email on IPv6 adoption, Germany ranks first globally with 98% DNS on IPv6 adoption, while France tops the world at 85.70% of Google Users on IPv6 adoption as of September 2025. In Africa, Nigeria leads with 56% on Web (Alexa), Ghana leads with 70% on Email (Alexa), South Africa leads with 80% on DNS (Alexa), while Congo (Brazzaville) leads the rest of African countries at 30.71% of IPv6 enabled users (Google).

The 6lab CISCO provides technical data on IPv6 deployment such as the IPv6 prefixes allocations, IPv6 transit Autonomous System (AS), percentage of web pages available over IPv6 and Google search / APNIC data on users on IPv6 enabled platforms. For example, using 6lab CISCO methodology, South Africa IPv6 deployment stands at 26.94%, comprising 50% Prefixes allocations, 81.93% Transit AS, 45.72% content and 1.62% Users on IPv6 platforms.

Google collects statistics about IPv6 adoption on the Internet users daily on an ongoing basis. This timeous information proactively helps Internet providers, website owners, and policy decision makers as the industry rolls out Ipv6. Google continuously measures the availability of IPv6 connectivity among Google users.

Each of above IPv6 adoption monitoring tools serve a different purpose. ISOC Pulse aligns more to Policy and Advocacy, APNIC Labs offers technical research and measurement, WorldIPv6 Launch presents a past event that spurred adoption, and Cisco and Google are major technology companies with ongoing IPv6 deployment and data. For purposes of understanding the Africa's situation on IPv6 adoption rates or statistics, this segment of the project will consistently follow the Google IPv6 adoption data methodology and augment its presentation from time to time with data from other tools. This choice of the Google methodology will not only provide statistics of users level with Ipv6 enabled internet but also indications of the IPv6 deployment readiness of the ISPs and Coud Service Providers.

The graph in Figure 2 shows the percentage of global users that access Google over IPv6 in the past 15 years.



**Figure 2:** Percentage of users globally that access Google over IPv6 (**Source:** <https://www.google.com/intl/en/ipv6/statistics.html>)



**Figure 3:** The chart above shows the availability of IPv6 connectivity around the world (**Source:** Google IPv6 statistics as of October 2025).

The chart in Figure 3 is interpreted according to the underlying legend.

Dark Green	Regions where IPv6 is more widely deployed (the darker the green, the greater the deployment) and users experience infrequent issues connecting to IPv6-enabled websites.
Orange	Regions where IPv6 is more widely deployed but users still experience significant reliability or latency issues connecting to IPv6-enabled websites.
Light Green	Regions where IPv6 is not widely deployed, and users experience significant reliability or latency issues connecting to IPv6-enabled websites.
White	Regions where IPv6 is not deployed or thinly deployed, and users experience very significant reliability or latency issues connecting to IPv6-enabled websites where available.

In this segment of the project, relevant data is collected from internal and external sources, including primary and secondary research. Secondary data is collected through undertaking desktop literature reviews of published data in websites or policies or strategies or white papers made available by service providers or regulators, or government or other related stakeholders. For the purposes of consistency and illustrative exploration, this report will extract updated data from Google IPv6 users and augment from time-to-time data extracted from other monitoring tools mentioned earlier. Primary data will be collected from the duly organised partners and stakeholders' meetings, whereby expert inputs gathered from stakeholders are incorporated in developing the situational analysis report.

## 5. STATUS OF IPv6 ADOPTION IN AFRICA

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### 5.1 North Africa

North Africa member states including Tunisia, Sudan, Egypt, Libya, Tunisia, Algeria and Morocco have an average IPv6 adoption rate 5.6% as of October 2025 according to Google Statistics<sup>13</sup>. Tunisia leads the region with an average IPv6 adoption rate of about 21.48%, followed by Sudan at about 6.31%, Egypt at about 4.48% and Libya just about 1%. Algeria and Morocco have the least IPv6 adoption rate below 1% each as of October 2025. The leap in IPv6 adoption rate by Tunisia can be explained by the fact that in September 2023, Tunisie Telecom, the incumbent telecom operator in Tunisia, announced that it had become the country's first operator to migrate to the IPv6 protocol. Tunisie Telecom underscored its role in contributing to the successful launch of the IPv6 migration in Tunisia. The company also shared that 400,000 customers are already benefiting from this IPv6 protocol through the Tunisie Telecom's mobile network<sup>14</sup>.

<sup>13</sup> Google, Sep/Oct 2025, IPv6 Statistics, Available from:

<https://www.google.com/intl/en/ipv6/statistics.html#tab=per-country-ipv6-adoption>

<sup>14</sup> Pulse ISOC, October 2025, Available from: <https://pulse.internetsociety.org/blog/tunisie-telecom-announces-transition-to-ipv6-protocol>

In Sudan, Telecommunications and Post Regulatory Authority of Sudan agrees to the notion that IPv6 deployment in Africa is lagging the world's average<sup>15</sup>. Expanding infrastructure to cover all locations is a challenging and costly task, as most related equipment is outdated and requires replacement. Furthermore, a lack of expertise in IPv6 and IoT-related issues slows the process of bridging the digital divide for development in the Arab region. The absence of a data culture for IoT further compounds the issue. Due to these challenges Sudan accelerates IPv6 adoption through several approaches such as forming a taskforce to promote IPv6, organising intensive training programmes, and establishing a regional IPv6 and IoT training centre, which is hosted by Sudan in partnership with the ITU. Moreover, Sudan developed a national migration plan, collaborates closely with its national research network, SudREN. Through these efforts Sudan has begun recording a growth in the IPv6 implementation by ISPs.

In 2025, the Egyptian government officially launched its "National Strategy for IPv6". This announcement took place at a regional conference, a collaborative effort among the National Telecommunications Regulatory Authority (NTRA), the International IPv6 Forum, and the Arab Information and Communication Technology Organization (AICTO). Egypt is working on preparing plans and adopting the necessary future strategies to implement IPv6, including security standards, scalability, and meeting the growing demand for connectivity in the era of big data, machine-to-machine communication, and the Internet of Things (IoT). The strategy aims for full readiness of both public and private infrastructure to support IPv6 over the next three years, with a goal of achieving over 80% national reliance on the IPv6 protocol by 2030.

In addition, the National Strategy for IPv6 plans to enable internet service providers to fully support IPv6 by the end of 2026<sup>16</sup>. Although there have been early attempts since 2009 to establish a pilot IPv6 infrastructure in Egypt, commercial deployment efforts have remained limited due to the availability of IPv4 addresses and the lack of required support in some legacy equipment<sup>17</sup>. Egypt, like many African countries, is not free from the IPv6 transition challenges.

The transition to IPv6 in Egypt represents a complex path fraught with technical, commercial, and regulatory challenges. Despite recognizing the necessity of this shift, practical realities reveal obstacles for multiple reasons. One of the most significant barriers lies in the investment costs and the uneven technical readiness among service providers.

<sup>15</sup> TPRA Sudan, October 2025, Available from: <https://tpra.gov.sd/en/projects/iot-and-ipv6-regional-center/>

<sup>16</sup> Follow ICT News, Egypt, May 2025, Available from: <https://followict.news/en/egypts-national-ipv6-strategy-a-game-changer-for-internet-speed-security-and-iot/>

<sup>17</sup> Masaar, Egypt, July 2025, Available from: <https://masaar.net/en/ipv6-and-digital-rights-in-egypt-towards-a-more-efficient-free-and-inclusive-internet/>

Some legacy networks in Egypt still rely on equipment or software that does not support IPv6. This necessitates costly upgrades, particularly for smaller or local service providers. Additionally, technical operations teams may lack the necessary expertise to handle IPv6, requiring further investment in training and capacity building. The lack of direct commercial incentives is also a significant barrier. End users in Egypt like in the rest of African countries often do not pay attention to the type of protocol used; instead, they focus on service speed and cost. This absence of public awareness and market demand causes service providers to be complacent. Companies see no urgent need to market IPv6 as a competitive advantage, especially given the absence of any major market player clearly adopting the protocol and positioning it as a distinctive marketing brand.

There are also concerns related to cybersecurity and privacy. Although IPv6 includes built-in support for encryption technologies such as IPsec, improper configuration can create serious vulnerabilities. Many information security teams still rely on traditional protection models based on IPv4. Therefore, the introduction of IPv6 requires revising security policies and adjusting protection settings, such as firewalls and policies combating Distributed Denial of Service (DDoS) attacks.

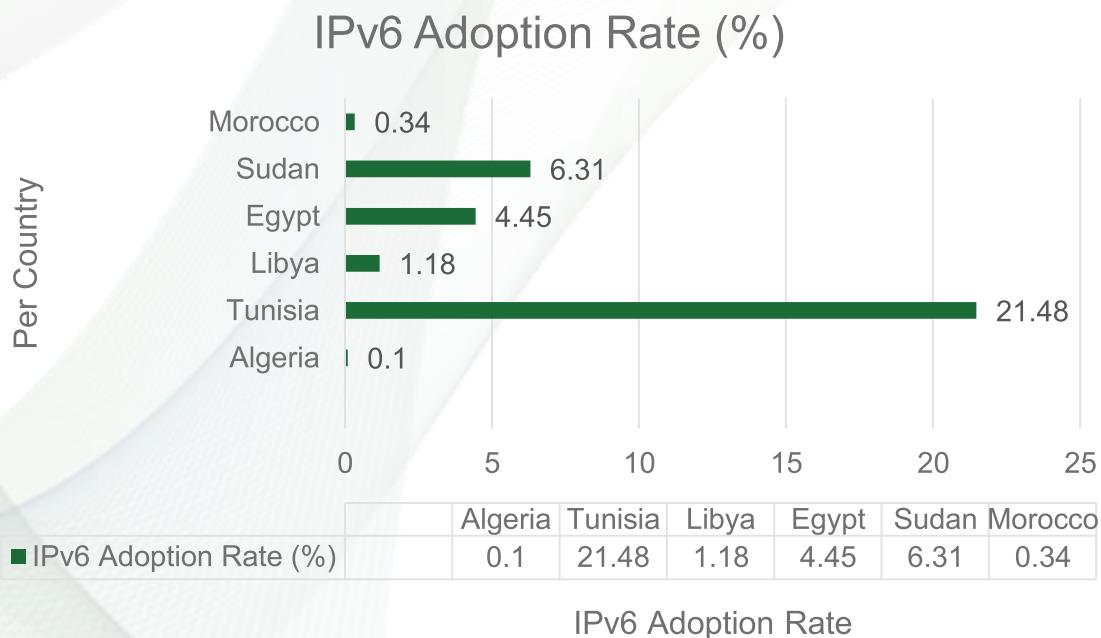
In addition, the challenges are compounded by the low level of societal and technical awareness about IPv6. Technical knowledge of the protocol remains confined to narrow circles, and educational and training curricula have yet to effectively integrate IPv6. This knowledge gap affects system administrators, developers, content providers, and sometimes even end users. This results in a slow adoption of the protocol, despite the availability of the necessary technical capabilities.

Finally, institutional coordination among the stakeholders presents a challenge. Enabling IPv6 requires collaboration between service providers, data centre operators, government entities, and digital content providers. Any disruption in this coordination negatively affects the quality of the experience. For example, if service providers offer IPv6 to their users while government websites or local content providers do not support the protocol, the actual value of using IPv6 will remain limited. Such disparities in progress among the parties involved may lead to a slowdown in the protocol's adoption.

*Therefore, the challenges hindering the transition to IPv6 are not limited to technical issues alone; they are related to market structure, institutional readiness, and digital culture. Addressing these challenges requires multi-level interventions to break the current stalemate.*

In August 2023, the IPv6 Forum in Libya welcomed the formation of a new IPv6 initiative with the establishment of the Libya IPv6 Council under the leadership of Mrs. Wafa Elterieki, as its President and Dr. Omar Abouabdalla as its Vice President. The prime objective of the Libya IPv6 Council and its members was to promote deployment and coordinated uptake of the IPv6 with support from industry, education, research communities and government agencies enabling equitable access to technology and knowledge<sup>18</sup>.

Algeria and Morocco show less than 1% of users can access online resources using IPv6. This low adoption rate is explained by an undeveloped regulatory framework, insufficient public and technical knowledge for digital platforms, a lack of investment, and the need for advanced digital infrastructure to serve remote areas<sup>18</sup>.



**Figure 4: IPv6 Adoption Rate – North Africa (Source: Google IPv6 Adoption Statistics October 2025)**

<sup>18</sup> IPv6 Forum, Libya, October 2023, Libya IPv6 Council Has Been Founded, <https://www.ipv6forum.com/dl/presentations/Libya%20IPv6%20Council%20Press%20Release%202023%20v6.1.pdf>

<sup>19</sup> The Maghreb Times, January 2025, IPv6 Tunisia leads ahead of Morocco and Algeria, Available from: <https://themaghrebtimes.com/ipv6-tunisia-leads-ahead-of-morocco-and-algeria/>

## 5.2 West Africa

West Africa region is gradually transitioning to IPv6, with an average of 7.0% IPv6 adoption rate as of October 2025 according to the Google IPv6 statistics<sup>20</sup>. Togo is leading West Africa with an IPv6 adoption rate at about 28.56% on average, followed by Senegal at about 23.22%, Cote d'Ivoire at about 15.54% and the rest trailing behind. Guinea-Bissau and Western Sahara have 0% IPv6 adoption rate as of October 2025. Togo implements its digital transformation strategy dubbed "Prodigit" 2025-2030. This strategy positions Togo to become a regional technology hub in West Africa<sup>21</sup>. In December 2024, Togo received \$100 million in funding from the World Bank to accelerate digital transformation initiatives<sup>22</sup>. Togo envisages using digital technologies as a key lever to accelerate growth, job creation, and competitiveness of priority sectors. This series of projects on digital acceleration in Togo represents a programmatic engagement of the World Bank to foster digital inclusion through broadband connectivity, digital skills, digital entrepreneurship, and climate resilience through technology.

Guinea-Bissau and Western Sahara are at the tail end of the West African countries in IPv6 adoption, as in much of Africa, due to a lack of developed ICT infrastructure, insufficient digital plans, low affordability of internet services, and limited digital literacy, which hinders investment in IPv6 upgrades by Internet Service Providers (ISPs)<sup>23</sup>.

On 20 August 2024, Nigeria released a white paper that examines the pivotal role of IPv6 in driving Nigeria's digital transformation<sup>1</sup>. It delves into the benefits of IPv6, industry trends, global deployment statuses, and deployment cases in the African region, specifically focusing on Nigeria. As of September 2025, google IPv6 adoption statistics show that Nigeria's IPv6 adoption rate is at 4.74% as at October 2025. With this published white paper, Nigeria advocates for IPv6 adoption which will support its renewed National Digital Economy Policy, develop critical sectors, and provide a safer, more efficient, and more connected digital ecosystem. These enablers will ensure that Nigeria's IPv6 adoption rate grows faster in coming years.

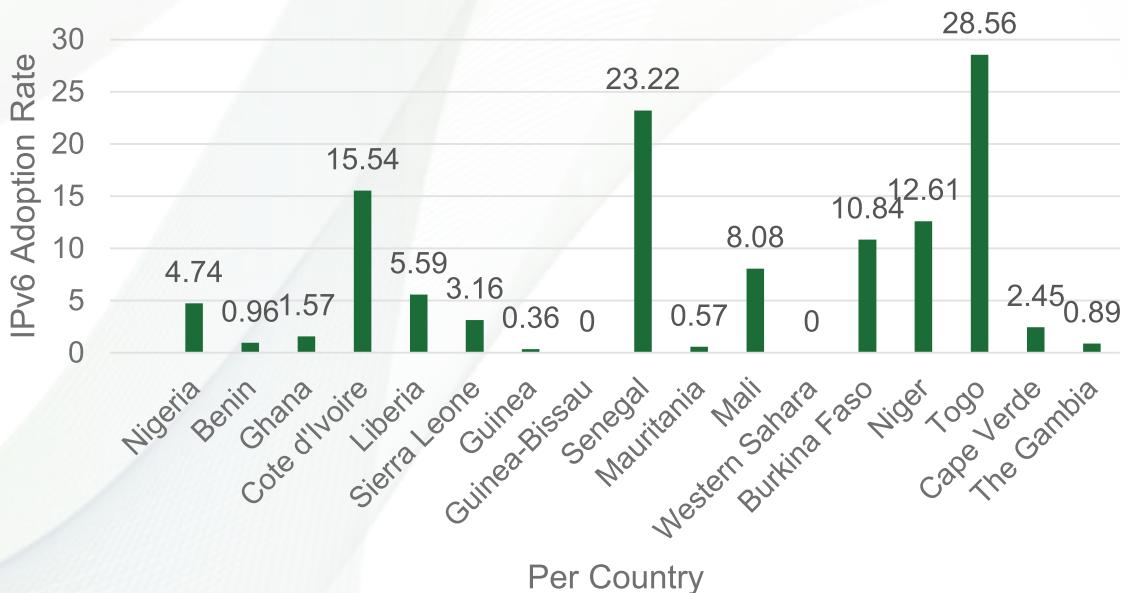
<sup>20</sup> Google, October 2025, IPv6 adoption Statistics, Available from:

<https://www.google.com/intl/en/ipv6/statistics.html#tab=per-country-ipv6-adoption>

<sup>21</sup> LuxDev, May 2025, Togo Digital 2025 Strategy, Available from: <https://luxdev.lu/en/projects/digital-transformation-togo-prodigit>

<sup>22</sup> World Bank, December 2024, Available from: <https://www.worldbank.org/en/news/press-release/2024/12/19/togo-100-million-in-funding-to-accelerate-digital-transformation>

<sup>23</sup> ISOC Pulse, October 2025, Country Report for Guinea-Bissau, Available from:  
<https://pulse.internetsociety.org/en/reports/GW/>



**Figure 5: IPv6 Adoption Rate – West Africa** [Source: Google IPv6 Statistics, October 2025]

### 5.3 Central Africa

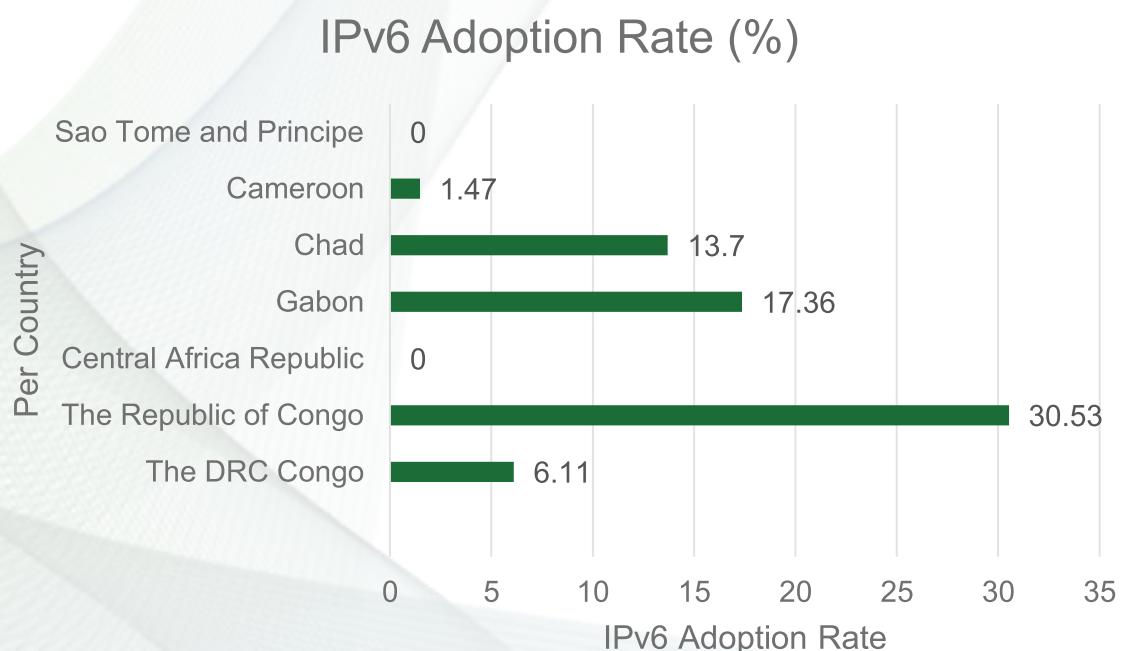
By the last week of October 2025, an average IPv6 adoption rate in The Republic of Congo (Brazzaville) was sitting at about 30.53% being one of the highest in the Continent. In Central Africa region, Gabon followed the Republic of Congo – Brazzaville with Gabon's IPv6 adoption rate at about 17.36%, Chad at about 13.7%, The Democratic Republic of Congo (Kinshasa) at about 6.11%, Cameroon at about 1.47%, while Central Africa Republic and Sao Tome and Principe each at about 0%. The overall average of IPv6 adoption in this region sits at about 9.9% as of last week of October 2025.

The Republic of Congo (Brazzaville) demonstrates a high IPv6 adoption rate spurred by the need for more IP addresses, the potential for innovation and scalability on the Internet of Things (IoT) era. According to Data Reportal<sup>24</sup>, a total of 6.33 million cellular mobile connections were active in the Republic of the Congo in early 2025, with this figure equivalent to 98.7% of the total population. There were 2.46 million individuals using the internet in the Congo at the start of 2025, when online penetration stood at 38.4 percent. The Congo was home to 1.10 million social media user identities in January 2025, equating to 17.1% of the total population. Global trends in African Internet development, with new factors like Starlink's use of IPv6 even disrupting

<sup>24</sup> DataReportal, March 2025, Digital 2025: The Republic of the Congo, Available from: <https://datareportal.com/reports/digital-2025-republic-of-the-congo>

traditional models. As in October 2025, the Republic of Congo has launched 20 high-speed Internet connectivity sites in rural areas<sup>25</sup>. This bold initiative aimed at democratizing Internet access across the country and bridging the digital divide. Announced during a visit by a World Bank delegation for the Africa Region to Brazzaville, the deployment forms part of Congo's Digital Transformation Acceleration Project (PATN) and aligns with the broader goals of its 2030 digital strategy.

However, an IPv6 adoption rate is low in the Central African Republic and Sao Tome and Principe due to slow transition, reliance on workarounds like Network Address Translation (NAT), and lack of government policies and awareness programs. Key factors contributing to the slow adoption include the initial success of these IPv4 workarounds, the cost and complexity of maintaining dual-stack networks (which run both IPv4 and IPv6), and a general lack of awareness about IPv6's importance for digital transformation and the vast expansion of the Internet of Things (IoTs).



**Figure 6: IPv6 Adoption Rate – Central Africa (Source: Google IPv6 Adoption Statistics October 2025)**

<sup>25</sup> Connecting Africa, October 2025, Congo boosts Internet access in rural areas, Available from: <https://www.connectingafrica.com/connectivity/congo-boasts-internet-access-in-rural-areas>

<sup>26</sup> ISCO Pulse, June 2025, Africa's IPv6 Deployment is Taking Off, Available from: <https://pulse.internetsociety.org/blog/africas-ipv6-deployment-is-taking-off>

## 5.4 East Africa

As of October 2025, East Africa's average IPv6 adoption rate was about 5.4%. South Sudan leads the pack with 18.66% because of Starlink rollout as from May 2025<sup>26</sup>, followed by Rwanda 20.70%, Burundi 9.39%, Uganda at 1.92%, Kenya at 1.31% and the rest each below 1% according to IPv6 traffic to Google. IPv6 adoption is low in some East Africa countries due to the high cost of upgrading legacy IPv4 equipment, a shortage of skilled engineers to manage IPv6 networks, a lack of government policies and incentives for migration, and a perceived lack of urgency as long as IPv4 addresses remain available. These factors combine to create a significant barrier to adoption, leaving countries vulnerable to technical debt and future dependence on costly IPv4 markets.

East Africa regional strategy on migration from IPv4 to IPv6 was released by the East African Community in July 2021. The strategy made provisions for other things amongst them were the IPv6 implementation considerations such as equipment investment, dual stack supporting IPv4 and IPv6, local domain, IPv6 features, native IPv6 support and IPv6 costs. This strategy outlined an IPv6 adoption plan guideline in terms of business planning and technical planning. It also included IPv6 network transition mechanisms and strategies<sup>27</sup>.

In July 2022, the Communications Authority of Kenya (CA) introduced the National IPv6 Migration Strategy to boost IPv6 adoption in Kenya<sup>28</sup>. This National IPv6 Migration Strategy mandates IPv6 compliance for new devices and network resources, emphasising regulatory intervention and awareness campaigns. To mitigate against the possible identified implications of non-adoption or delayed adoption, CA applied the following approach.

- ✓ **Regulatory interventions** such that only devices with IPv6 capability would be type approved for use in Kenya effective July 2023.
- ✓ **Communications and Stakeholder Management Plan:** the Authority would develop an awareness campaign plan targeting the operators, vendors and the consumers as appropriate. This would be done through online platforms, pamphlets, newspapers, radios and any outreach programs.
- ✓ **Trainings:** The Authority would continually organize hands-on physical training, where trainees from the service providers will be taken through hands-on training on IPv6 migration and related technologies by Authority sourced experts.
- ✓ **Report Submissions:** To monitor adoption rates, the Authority would define reporting templates, on mechanisms on how service providers will be reporting on the steps taken to adopt IPv6 including equipment inventories and a plan towards full adoption of IPv6.

<sup>27</sup> EACO, 2021, East Africa Regional Strategy on Migration from IPv4 to IPv6, Available from: <https://eaco.int/admin/docs/publications/Regional%20Strategy%20for%20the%20Transition%20from%20IPv4%20to%20IPv6..pdf>

<sup>28</sup> Communications Authority of Kenya , July 2022, IPv4 to IPv6 Migration Strategy, Available from: <https://www.ca.go.ke/sites/default/files/2023-06/IPv4-to-IPv6-Migration-Strategy-.pdf>

As a result of this strategy, Kenya's IPv6 adoption rate stands at 1.31% as of October 2025. This figure is expected to improve in the coming years as Kenya implements the migration strategy in a coordinated, cooperative and collaborative approach involving ISPs, data centre operators, digital content providers, vendors, government entities and the RIRs.

In March 2024, the National Communications Authority of Somalia in collaboration with ATU and various stakeholders produced a National IPv6 transition strategy for Federal Republic of Somalia<sup>29</sup>. This strategy is essential for Somalia to achieve its national goal of 25% internet penetration by 2030. Recognizing the importance of capacity building, this strategy prioritizes training, awareness campaigns, and stakeholder engagement to equip local institutions with the necessary skills for IPv6 deployment.

The Somali government is also dedicated to developing suitable regulatory frameworks and technical standards to facilitate a smooth and coordinated transition. Establishing an IPv6 Task Force, collaborating with regional organizations like AFRINIC, and participating in international IPv6 initiatives will be vital for the success of this strategy. In this strategy, SWOT analysis of IPv6 adoption in the Federal Republic of Somalia is outlined. With the barriers identified as limited availability of skilled professionals with expertise in IPv6 deployment, which requires investment in training and capacity building initiatives. Legacy system compatibility using IPv4 might pose challenges during the transition to IPv6 and lack of legal framework and policies to promote IPv6 so that reliable internet services can be provided in Somalia.

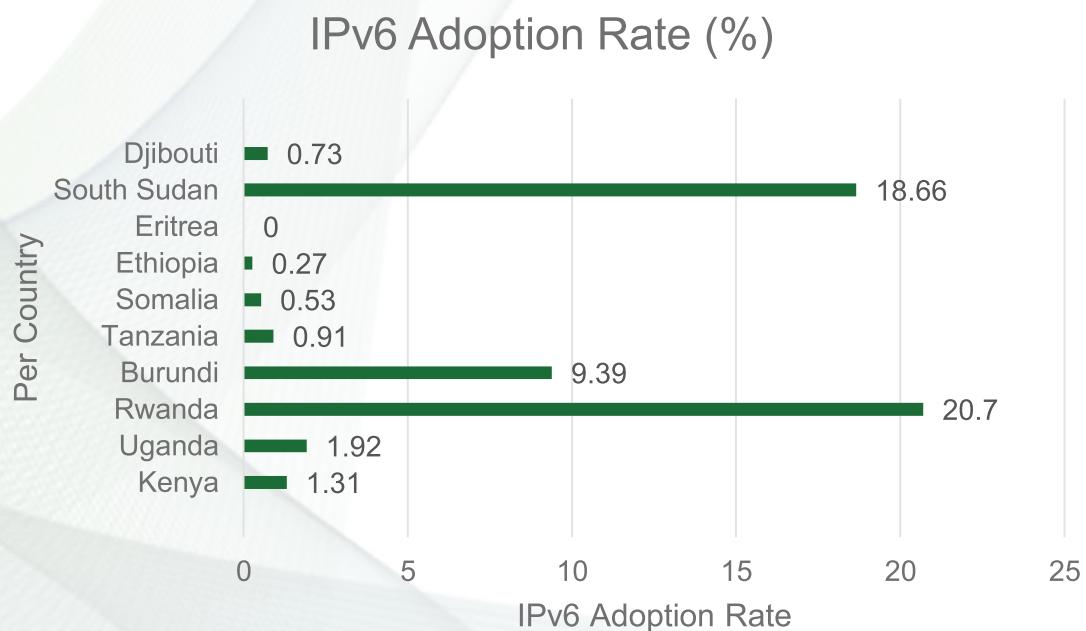
As far as Ethiopia is concerned, Addis Ababa University in March 2019 developed an IPv6 migration framework for an ISP, the Ethio Telecom, which has an IPv4 only core network<sup>30</sup>. This framework was meant to enable the core network of the ISP to avail and be able to handle IPv6 enabled services. IPv6 Ethiopia is an initiative aimed at raising awareness about IPv6, its importance, and its adoption across the country. IPv6 Ethiopia understands that the future internet will be founded on IPv6, which ensures scalability, security, and connectivity for the next generation of digital services and innovation.

<sup>29</sup> NCA, March 2024, National IPv6 Transition Strategy for Federal Republic of Somalia, Available from: <https://nca.gov.so/wp-content/uploads/2025/02/National-IPv6-Transition-Strategy-7Feb25final.pdf>

<sup>30</sup> Nahom Gizachew, March 2029, IPv6 Migration Framework for Ethio Telecom, Available from: <https://etd.aau.edu.et/items/8edaee00-befe-4d34-be56-0f542d4603d6>

However, time and different network's structure, usage and the deep integration of IPv4 makes it hard to automatically transition to IPv6, it may take time and resources to make a complete transition from IPv4 to IPv6 as the two protocols are not compatible. Even though attempts are made in IPv6 migration, scholars<sup>13</sup> observed that the transition needs a framework that will help in migrating IPv4 to IPv6 with a minimum complication while allowing a room to co-exist until the IPv4 network fully transits.

These challenges like routing, maintaining duality till all IPv4 services are transitioned and the performance factor of having both protocols to run in the same network could have a major effect in the way Ethio telecom is providing its service. IPv4 was running for a long time, most networks were following the best practice to deploy IPv4 and the services that utilized it. So is the current network layout or configuration ready for the transition, keep in mind IPv6 is not backward compatible.



**Figure 7: IPv6 Adoption Rate – East Africa [Source: Google IPv6 Statistics, October 2025]**

## 5.5 Southern Africa

The average IPv6 adoption rate sits at about 4.6% as of the last week of October 2025. Zimbabwe leads the region with an average IPv6 adoption rate at about 18.14%, followed by Angola at about 14.03%, Madagascar at about 7.84%, Zambia at about 6.5%, Botswana at about 5.4%, Mozambique at about 3.6%, Eswatini at about 2.46%, South Africa at about 1.69%, Malawi at about 1.68%, Seychelles at about 1.63% and the rest showing below 1% each an IPv6 adoption rate as of October 2025.

Zimbabwe is one of the leading countries in IPv6 implementation in the Southern Africa Development Community (SADC) region following Liquid Telecom's intentional roll out of the technology to its customers by an ISP subsidiary, ZOL. Zimbabwe's high IPv6 transition is largely due to the aggressive, bottom-up approach by Liquid Telecom (including its home fibre provider, ZOL) to roll out IPv6 to its massive home fibre subscriber base, a strategy supported by a comprehensive government IPv6 strategy document and driven by the global need for more internet addresses to accommodate the growing number of connected devices.

In 2024 Botswana Communications Regulatory Authority<sup>31</sup> released IPv6 migration guidelines that aimed at providing guidance to service providers and the industry at large for successful adoption and deployment of IPv6 in their respective networks. Three main techniques that have been identified by the Internet Engineering Task Force (IETF) that service providers shall use during IPv6 adoption. These techniques are aimed at allowing the existing IPv4 network to co-exist and interoperate with IPv6 networks, systems, and services. Transitional techniques include dual stack, where IPv6 is introduced in existing IPv4 architectures to allow hosts, routers, applications to implement and support both IPv4 and IPv6 protocol stacks. Tunnelling technique allows IPv6 packets to be sent over existing IPv4 networks by encapsulating them in IPv4 packets, the opposite applies for IPv4 packets sent over IPv6 networks. Translation technique allows the translation of an IP version to another by changing the header of the IP packets, it facilitates communication between IPv6 and IPv4 hosts and vice versa. Using these IPv6 transition techniques Botswana outlined a migration plan that would ensure Botswana fully transitioned by 2026. The plan considered the current realities, including the state of infrastructure in Botswana, the technical expertise available for IPv6 and the cost of transitioning.

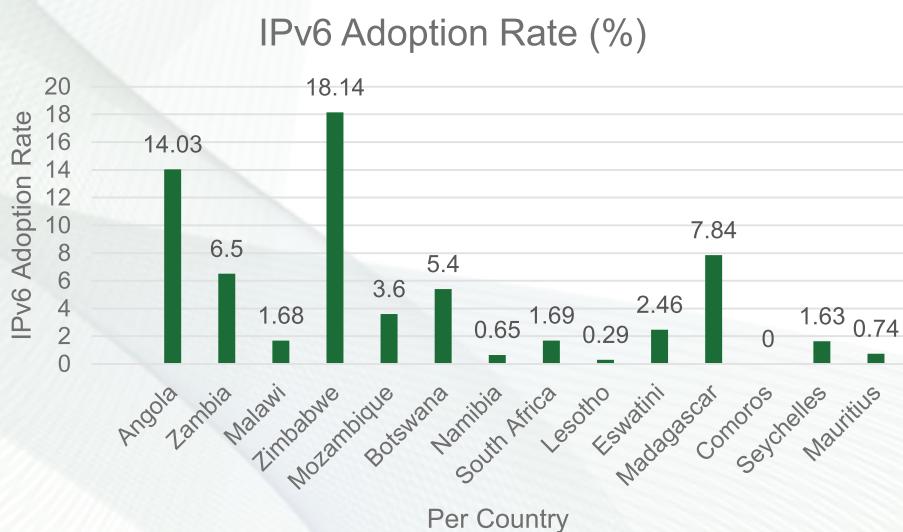
A study by Mamushiane et al. in 2021 shows<sup>32</sup> that IPv6 adoption in South Africa is slowed by lack of network engineers who are trained on IPv6 network planning, deployment and management. ISPs do not see any quantifiable and compelling benefits of IPv6 to businesses strategy. They are reluctant to invest money and time on training their engineers. With an IPv6 protocol inherently not backward compatible with legacy IPv4 protocol, ISPs are unwilling to forklift their current infrastructure investment. Initial cost of transitioning to IPv6 and the operating costs of managing it while supporting legacy IPv4 systems are viewed by ISPs to be prohibitive.

Internet service users choose their internet service providers based on three factors: price, bandwidth and reliability, IPv6 availability is non-existent in the consumers' mind when making such decisions and lastly, the political challenges where democracy plays a pivotal role in IPv6 adoption in South Africa. In overcoming these barriers, South Africa has regulatory interventions, including the government led advocacy to passionately promote the adoption of IPv6 in the country.

However, South Africa government agencies should do more to respond to and engage with relevant stakeholders such as ICT standard development organisations, the regional internet registry (AFRINIC) and network operators' groups to find information and resources on IPv6 deployment and transition techniques. Further, the South African government should support IPv6 research and development, to foster IPv6 adoption, the government should make budgetary provisions to support Research and Development (R&D) around IPv6 related technologies. R&D is necessary to build advanced IPv6 testbeds which for instance, can demonstrate performance, security, and cost implications of different transition mechanisms. It is essential that the government declares IPv6 adoption a national priority by emphasizing its importance in the future of society and the economy.

In Mauritius<sup>33</sup>, IPv4 is still widely used so there are no incentives to move to IPv6. Seychelles and Mauritius stand dramatically apart from the continental pattern, with IPv4 allocations that are 50-200 times higher than even the next tier of countries with IPv4 allocation per capita ranging from 0.10 to 0.64<sup>34</sup>. Seychelles has 60.18 IPv4 addresses per capita, while Mauritius has 3.05 IPv4 address per capita. These Island nations benefit from well-developed infrastructure, tourism driven economies requiring robust Internet connectivity, and favourable regulatory environments for technology investment.

In a similar situation lies Lesotho, where a combination of factors contributes to a low IPv6 adoption<sup>35</sup>. These factors include low overall internet access, regulatory and market bottlenecks, lack of awareness and strong policy drivers, and slow adoption by internet service providers (ISPs) for both broadband and mobile networks. Overcoming these requires coordinated efforts in policy, market reforms, and infrastructure investment to encourage broader uptake of the newer protocol.



**Figure 8: IPv6 Adoption Rate – Southern Africa** (Source: Google IPv6 Adoption Statistics October 2025)

<sup>33</sup> ISOC Pulse, October 2025, Country Report for Mauritius, Available from:

<https://pulse.internetsociety.org/en/reports/MU/>

<sup>34</sup> Ben Roberts, <https://www.digitaleconomy.ke/post/ipv4-address-allocation-in-africa-are-you-above-or-below-the-ip-address-poverty-line>

<sup>35</sup> ISOC Pulse, October 2025, Country Report for Lesotho, Available from:

<https://pulse.internetsociety.org/en/reports/LS/>

## 6. STATUS OF IPv6 ADOPTION: IN THE REST OF THE WORLD

Although the IPv6 technology is well-established, IPv6 adoption varies significantly around the world, with some regions demonstrating higher adoption rates due to a combination of policy, industry leadership, and user demand. Larger address spaces, more efficient routing, and extensive networks are essential drivers for IPv6 adoption. However, global adoption has lagged. Data shows that IPv6 traffic to Google, while increasing, is still below 50%. As of early 2025, global IPv6 adoption stands at slightly over 43%, based on IPv6 traffic to Google. Looking at the data by country, the United States is only slightly above 50%, while France, Germany, and India have much higher adoption rates at about 86%, 75% and 79% respectively as of October 2025.

The adoption rate is higher in other countries for numerous reasons. France has benefited from mobile network operators increasing IPv6 subscriptions and support from major Internet Service Providers (ISP). Germany's ISPs offer native IPv6 support for their customers. In India, the tremendous growth of IPv6 deployment has been largely driven by one network operator, Reliance Jio, which entered the market in 2016 as the first LTE, all-IP mobile network in India<sup>36</sup>. This, combined with its aggressive strategy to become the leading mobile carrier, required Reliance Jio to deploy IPv6 from the outset. Slowly, other providers and economies have also come to realize the benefits that IPv6 offers their business, specifically the ability to accommodate growth given IPv4 addresses have been exhausted. In the United States, ISP hesitancy, fuelled by effective use of Network Address Translation (NAT), remains a hurdle for increased adoption.

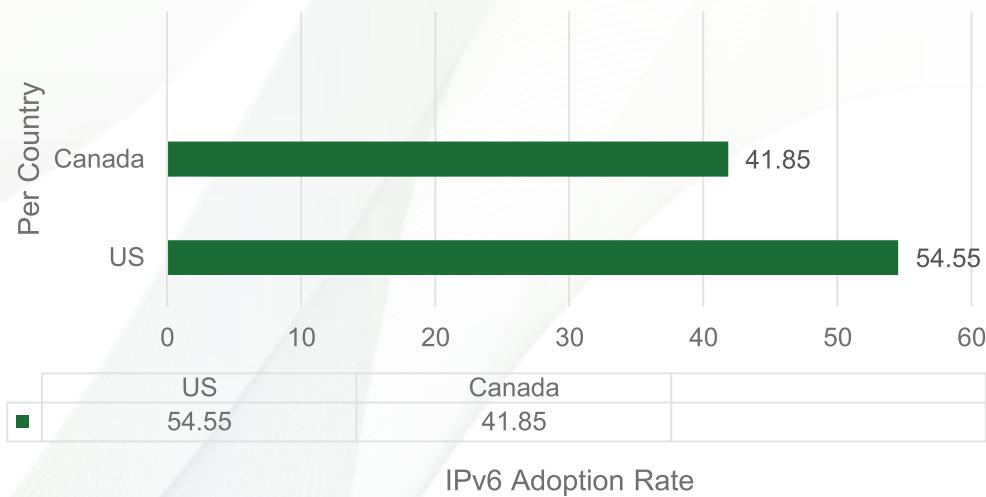
### 6.1 North America

The United States (US) of America shows an IPv6 adoption rate at 54.55% as of September 2025, while that of Canada is at 41.85% with an average of 48.2% in the North America region. Google adopted IPv6 in the US and globally primarily due to the exhaustion of IPv4 addresses, which are insufficient for the growing number of internet-connected devices. Other reasons include enabling direct, end-to-end connectivity for devices, the Internet of Things (IoT), and 5G environments, and supporting the US government's mandate for IPv6-only federal networks by 2026. However, this figure could be higher except for the widespread, effective use of Network Address Translation (NAT), which extended the life of IPv4<sup>37</sup>; the high costs and technical complexity of replacing existing infrastructure; a lack of immediate, compelling business benefits for many organizations; and the significant number of small-to-medium businesses (SMBs) that haven't been able to keep pace with the transition, slowing the overall process<sup>38</sup>.

<sup>36</sup> APNIC Blog, June 2023, Four of the world's top 10 populous economies driving IPv6 adoption, Available from: <https://blog.apnic.net/2023/06/05/four-of-the-worlds-top-10-populous-economies-driving-ipv6-adoption/>

<sup>37</sup> DNS Made Easy, March 2025, The State of IPv6 adoption in 2025 progress pitfalls and pathways forward, Available from: <https://dnsmadeeasy.com/resources/the-state-of-ipv6-adoption-in-2025-progress-pitfalls-and-pathways-forward>

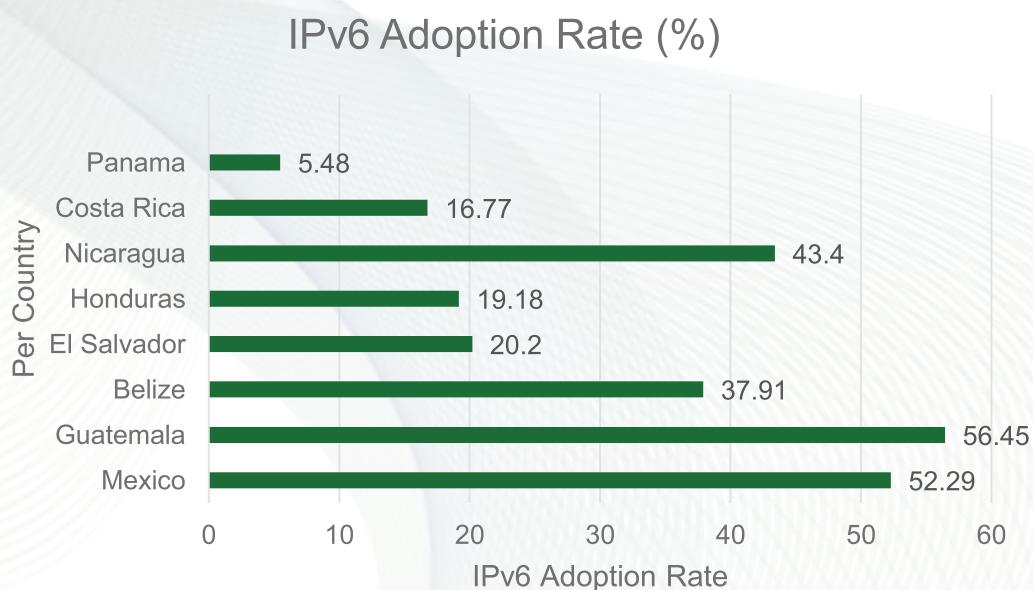
<sup>38</sup> BGPmon, January 2011, The state of IPv6 in Canada, Available from: <https://www.bgpmon.net/the-state-of-ipv6-in-canada/>



**Figure 9:** IPv6 Adoption Rate – North America (Source: Google IPv6 Adoption Statistics September 2025)

## 6.2 Central America

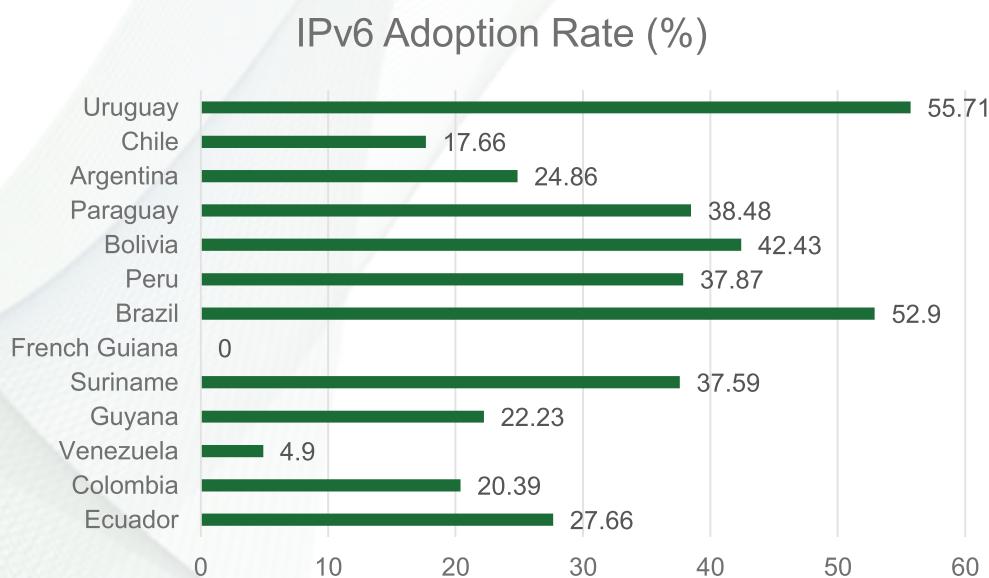
In Central America, Guatemala leads the rest of the countries with an IPv6 adoption rate at 56.45%, followed by Mexico at 52.29% and Panama at the tail end at 5.48% as of September 2025. On average the region IPv6 adoption sits at 31.46%. The reasons for increased adoption in Central America are driven by the region's unique factors, such as the scarcity of IPv4 addresses, the exponential growth of connected devices (especially for IoT and 5G), and the strategic importance of IPv6 for digital government initiatives and economic competitiveness.



**Figure 10:** IPv6 Adoption Rate – Central America (Source: Google IPv6 Adoption Statistics September 2025)

### 6.3 South America

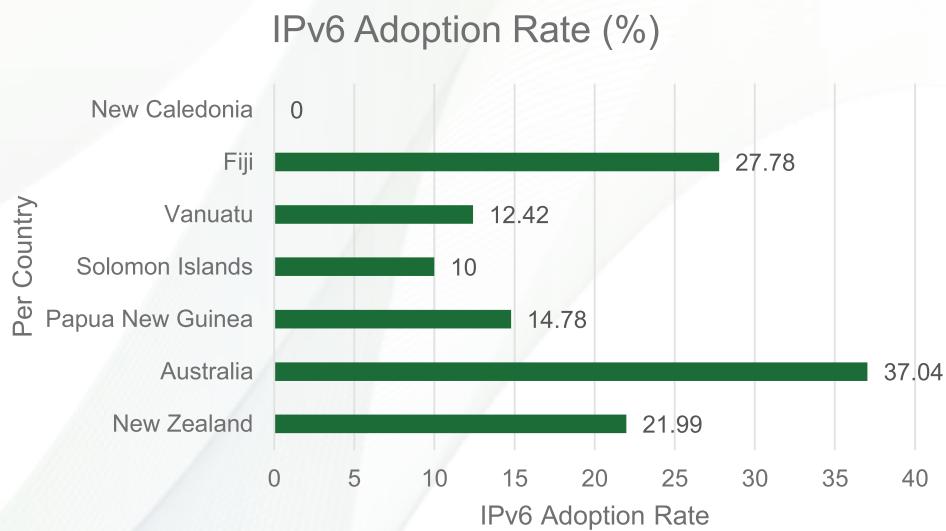
Uruguay leads the rest of the region with an IPv6 adoption rate at 55.71% followed by Brazil at 52.9%, while Venezuela at 4.9% and French Guiana at 0% are at the tail end with the region's average at 29.44%. South America is experiencing an exhaustion of the IPv4 addresses as the exponential growth of connected devices continues to explode, especially with the emergence of IoT and 5G networks. Regional organizations like LACNIC have also contributed through a bottom-up approach focused on operator training and collaboration, leading to sustained growth and surpassing global averages in some countries like Uruguay, Brazil, Peru, Paraguay, Bolivia, Suriname and Ecuador.



**Figure 11:** IPv6 Adoption Rate – South America (Source: Google IPv6 Adoption Statistics September 2025)

### 6.4 Oceania

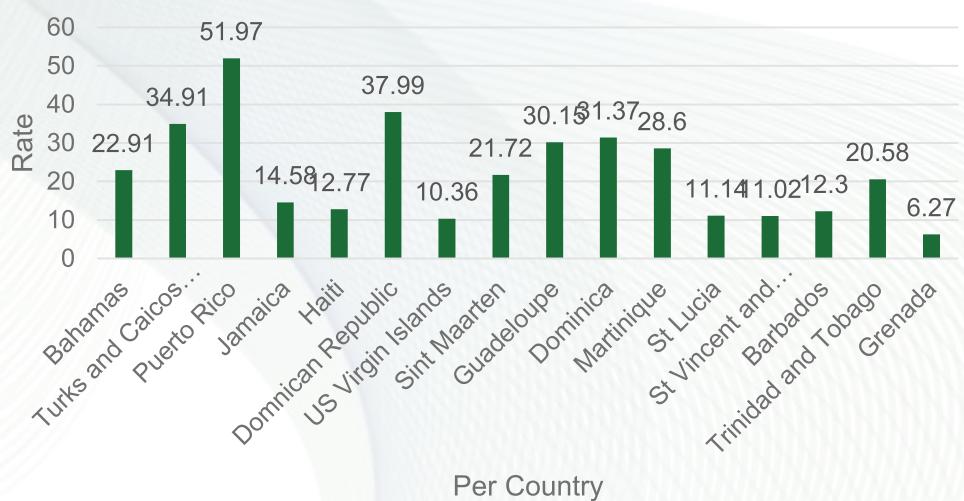
In the Oceania continent, Australia leads the rest of the countries with an IPv6 adoption rate at 37.04%, Fiji follows at 27.78%, New Zealand at 21.99% and the rest follows New Zealand. The region's average IPv6 adoption rate is at 17.71%. Australia's IPv6 adoption is rising due to significant IPv6 deployments by major Internet Service Providers (ISPs) like Telstra and Aussie Broadband, the increasing need for IPv4 addresses driven by global IPv4 exhaustion, and industry-wide shifts toward cloud services and new network technologies. The effectiveness of the IPv6 protocol in modern applications, combined with user demand and supportive government and industry policies, further accelerates this trend<sup>39</sup>.



**Figure 12:** IPv6 Adoption Rate – Oceania (Source: Google IPv6 Adoption Statistics September 2025)

## 6.5 Caribbean

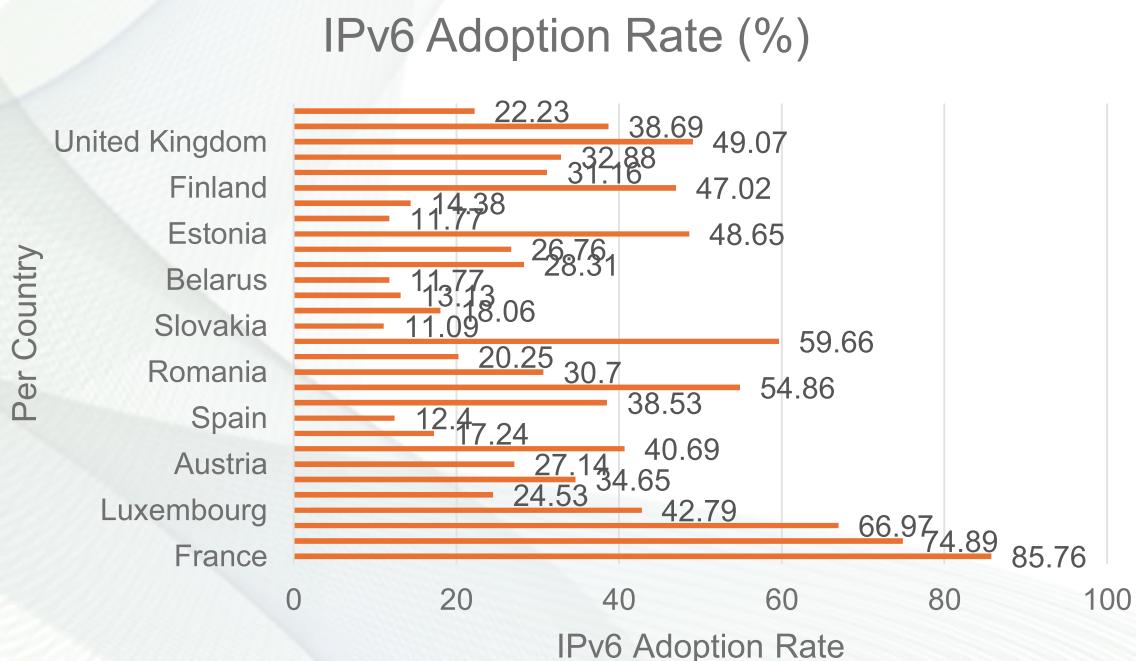
In the Caribbean region, Puerto Rico IPv6 adoption rate is at 51.97% being the highest, Grenada at 6.27% being the least. The average IPv6 adoption rate in the region is 22.45% as of September 2025. These statistics are influenced by the global scarcity of IPv4 addresses, the necessity for digital growth and IoT expansion, and the strategic role of government and regional bodies like ARIN and LACNIC in promoting its adoption as a requirement for modern digital infrastructure and economic success.



**Figure 13:** IPv6 Adoption Rate – Caribbean (Source: Google IPv6 Adoption Statistics September 2025)

## 6.6 Europe

France sits at the top globally with an IPv6 adoption rate at about 86.13%, followed by Germany at about 75.43%, then Belgium at about 68.68% on average as of the month of October 2025. The European region's average IPv6 adoption rate is at 34.53% and at least 18 countries in this region have their IPv6 adoption rate below average. France<sup>40</sup> is leading in IPv6 adoption primarily due to its mobile network operators rapidly deploying the new protocol, particularly with the massive increase in adoption by Free Mobile in early 2025, significantly boosting the national total. Other factors contributing to this upward trend include government and regulator-led initiatives to promote IPv6, the increasing adoption of IPv6 by major web hosting companies, a rise in IPv6-enabled domain names, and the inherent benefits of IPv6 like improved scalability for the growing Internet of Things (IoT)<sup>41</sup>. In 2016, the European Commission (EC) created a common framework to support EU countries in managing the transition from IPv4 to IPv6<sup>42</sup>. The plan was dubbed as ISA<sup>2</sup> - Interoperability solutions for public administrations, businesses and citizens. By developing next generation digital networks, the EC achieved creating guidelines for the implementation of the Local Internet Registry, that acted as a national address provider for public administrations. Technical IPv6 profiles were developed, IPv6 transition roadmaps and guidelines were also developed as well as training materials were prepared that would enable public administrations to start planning the transition.



**Figure 14:** IPv6 Adoption Rate – Europe (Source: Google IPv6 Adoption Statistics September 2025)

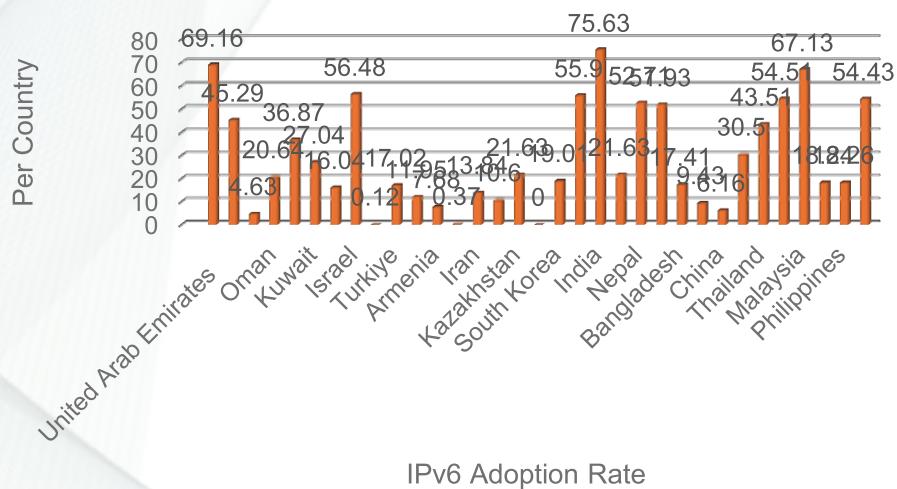
<sup>40</sup> DNS Made Easy, March 2025, The state of the IPv6 adoption in 2025: progress, pitfalls and pathways forward, Available from: <https://dnsmadeeasy.com/resources/the-state-of-ipv6-adoption-in-2025-progress-pitfalls-and-pathways-forward>

<sup>41</sup> Arcep, 2024, the state of the internet in France, Chapter 2: Continuing to accelerate the transition to IPv6 pp 26-84, 2024. Available from: [https://en.arcep.fr/uploads/ttx\\_gspublication/ARCEP-RA2024-TOME\\_3-UK-Norme\\_A.pdf](https://en.arcep.fr/uploads/ttx_gspublication/ARCEP-RA2024-TOME_3-UK-Norme_A.pdf)

<sup>42</sup> European Commission, 2016, Developing next generation digital networks, Available from: [https://ec.europa.eu/isa2/actions/developing-next-generation-digital-networks\\_en/](https://ec.europa.eu/isa2/actions/developing-next-generation-digital-networks_en/)

## 6.7 Asia

In this broader region, India tops the list as of September 2025 with an IPv6 adoption rate at 75.63%, followed by Saudi Arabia at 69.16%, Malaysia at 67.13%, Israel at 56.48%, Japan at 55.9%, Vietnam at 54.51%, Taiwan at 54.43% and then the rest of the countries follow. More than 60% of the countries in this region have an IPv6 adoption rate below the region's average at 28.96%. India's leadership in increasing IPv6 adoption stems from the critical shortage of IPv4 addresses and strong government policy and support, coupled with the proactive efforts of major service providers to meet demand for internet services<sup>43</sup>. This initiative is driven by the need for more addresses to support the country's massive broadband and mobile growth and is facilitated by cloud infrastructure and the potential for new technologies like IoT, which require a vast number of IP addresses.



**Figure 15: IPv6 Adoption Rate – Asia (Source: Google IPv6 Adoption Statistics September 2025)**

## 7. SITUATIONAL ANALYSES ON TRANSITION FROM IPv4 TO IPv6 IN AFRICA

The stagnating situation of IPv6 transition in Africa is best explained by a situational analysis of IPv6 technology adoption. This type of analysis is a methodical assessment of the internal and external factors that influence an individual's or organization's decision to adopt or reject an IPv6 technology. Situational analyses make use of frameworks like PESTEL and SWOT analysis to inform strategic planning and ensure successful implementation<sup>44</sup>. PESTEL (Political, Economic, Social, Technological, Environmental and Legal)<sup>45</sup> analysis constitutes a contextual analysis, which examines the global market trends and macro-environmental factors. PESTEL can be used in a range of different scenarios and can guide professionals and senior managers in strategic decision making. By assessing the external environment, a PESTEL analysis can detect and understand broad, long-term trends of a situation. This can further support a range of business planning phenomena, such as: strategic business planning, workforce planning, marketing planning, product or service development and organisational change. PESTEL helps recognise the context for change and is most effective when used in association with a SWOT analysis a bid to understand opportunities and threats around the concerned situation

On the other hand, a SWOT analysis is a planning tool which seeks to identify the **Strengths, Weaknesses, Opportunities and Threats** involved in a project or organisational situation. It's a framework for matching an organisation's goals, programmes and capacities to the environment in which it operates<sup>46</sup>

A SWOT analysis process generates information that is helpful in matching organisations or group's goals, programs, situations and capacities to the environment in which it operates. The framework consists of:

- ✓ **Strengths:** positive tangible and intangible attributes, internal to an organisation or situation and within the organisation's control
- ✓ **Weaknesses:** internal factors within an organisation's control that detract from the organisation's ability to attain the desired goal. Which areas might the organisation improve?
- ✓ **Opportunities:** external attractive factors that represent the reason for an organisation to exist and develop. What opportunities exist in the environment, which will propel the organisation? Identify them by their 'time frames'.
- ✓ **Threats:** external factors beyond the organisation's control which could place the organisation mission or operation at risk. The organisation may benefit from having contingency plans to address them if they should occur. These can be classified by their severity and probability of occurrence.

<sup>44</sup>AQ Ebrahim, CL van den Berg, 11 October 2024, The barriers to technology adoption among business in the informal economy in Cape Town, South African Journal of Information Management, vol. 26, no. 1. Available from <https://sajim.co.za/index.php/sajim/article/view/1872/2998>

<sup>45</sup> CIPD 21 March 2025, What is a PESTEL analysis used for, Available from: <https://www.cipd.org/en/knowledge/factsheets/pestle-analysis-factsheet/#what-is-a-pestle-analysis-used-for>

It's important to note that the strengths and weaknesses are the intrinsic value-creating skills or assets, or lack of these, relative to competitive forces. Opportunities and threats are external factors which are not created by the organisation but emerge because of the competitive dynamics caused by future gaps in the market.

In addition to PESTEL and SWOT analysis exist several adoption models and frameworks employed to examine the adoption of digital technologies and ICTs<sup>47</sup>. These include, for example, the innovation diffusion theory (IDT) and the technology acceptance model (TAM). The IDT seeks to elucidate the process by which new technologies are adopted. It consists of five characteristics: relative advantage, compatibility, observability, trialability and perceived complexity. However, IDT does not sufficiently explain environmental and organisational factors. TAM on the other hand, was developed based on the Theory of Reasoned Action framework, and its purpose is to understand a user's behavioural intention in adopting new technology. TAM is limited in explanatory and predictive power; it is trivial in nature and lacks practical value in understanding the stagnating IPv6 adoption in Africa. These limitations are that TAM fails to adapt to the evolving technological landscape and overlooks the role of social influence in the implementation of technology. Due to these drawbacks of other technology adoption models, this phase of the project applies PESTEL and SWOT analysis to assess the situation of IPv6 adoption in Africa as a continental organisation.

<sup>46</sup> CIPD 21 March 2025, SWOT analyses, available from:

<https://www.cipd.org/en/knowledge/factsheets/swot-analysis-factsheet/>

<sup>47</sup> AQ Ebrahim, CL van den Berg, 11 October 2024, The barriers to technology adoption among business in the informal economy in Cape Town, South African Journal of Information Management, vol. 26, no. 1.

Available from: <https://sajim.co.za/index.php/sajim/article/view/1872/2998>

## 7.1 PESTEL Analysis

PESTEL analysis presents the context in which Africa's IPv6 transition operates, focusing on both external and internal factors, obtained from literature review, that influence Africa's current IPv6 transition rates. Table 1 presents the key issues emerging from this analysis.

**Table 1: PESTEL Analysis<sup>48</sup> of Africa's IPv6 transition from IPv4**

External Factors (Outside Africa)	Internal Factors (In Africa)
<p><b>Political</b></p> <ul style="list-style-type: none"><li>▪ As IPv4 addresses rapidly deplete, global trend shifts to IPv6 unique addressing adoption.</li><li>▪ The rapid pace of IPv6 adoptions across different countries and continents are accelerated by their different technological consumption habits.</li><li>▪ France and India have the highest adoption rates according to Google, this is enabled by the governments' incentives and rise in technological advancements.</li></ul>	<p><b>Political</b></p> <ul style="list-style-type: none"><li>▪ Instability in some African countries, inhibiting ISPs roll-out of IPv6.</li><li>▪ Political instability negatively affects IPv6 deployment in Africa. This causes governance issues within Regional Internet Registries (RIRs) like AFRINIC, which are crucial for address distribution.</li><li>▪ Prevalent issues of stalled elections, administrative paralysis, and a lack of community-led technical progress in Africa, undermine efforts to expand IPv6.</li></ul>

<sup>48</sup> HostStage, April 2024, Implementing IPv6: Challenges and Opportunities, Available from: <https://www.host-stage.net/case-study/implementing-ipv6-challenges-and-opportunities/>

<p><b>Economical</b></p> <ul style="list-style-type: none"> <li>▪ Highest investors in IPv6 are telecommunication companies, Cloud Service Providers (CSPs), and Internet Service Providers (ISPs), in response to the constantly growing number of devices.</li> <li>▪ Content Delivery Networks (CDNs) like Cloudflare, Akamai and Google Cloud take advantage of routing capabilities and polished network systems to deliver content globally.</li> <li>▪ Initial investment for employee training, software upgrades and infrastructure costs are prohibitive.</li> <li>▪ Long term cost savings through improved network efficiency and simplified management.</li> <li>▪ Exhaustion of IPv4 addresses and increasing costs.</li> <li>▪ Government intervention through financial incentives such as tax breaks for IPv6 ISPs adopters.</li> </ul>	<p><b>Economical</b></p> <ul style="list-style-type: none"> <li>▪ High deployment costs of IPv6.</li> <li>▪ No direct financial incentives for ISPs to deploy IPv6.</li> <li>▪ Cheaper alternatives like NAT that fuels IPv4 lifeline continuity.</li> <li>▪ Limited user demand for IPv6 resulting in no recognisable return on investment.</li> <li>▪ Businesses are reluctant to migrate to IPv6 as the priorities of their customers align to the need for high bandwidth, low latency and low cost of Internet service regardless of the addressing protocol in use.</li> <li>▪ Costs overhead with IPv4, with IPv6 the risk of name collision is reduced, resulting into deployment cost savings.</li> </ul>
<p><b>Social</b></p> <ul style="list-style-type: none"> <li>▪ Increased social awareness campaigns.</li> <li>▪ Initiating projects focusing on educating diverse communities and addressing knowledge gaps.</li> <li>▪ Government Policy and support.</li> <li>▪ Creating collaborative industry efforts like World IPv6 Day.</li> </ul>	<p><b>Social</b></p> <ul style="list-style-type: none"> <li>▪ Skills gap due to a lack of trained IPv6 professionals.</li> <li>▪ Technical knowledge of the protocol remains confined to narrow circles, and educational and training curricula have yet to effectively integrate IPv6.</li> <li>▪ Limited government support to IPv6 adoption initiatives.</li> <li>▪ A lack of awareness amongst stakeholders about the urgent need for upgrade from IPv4 to IPv6.</li> <li>▪ Overreliance on existing IPv4 creating resistance to change to IPv6.</li> </ul>

<p><b>Technical</b></p> <ul style="list-style-type: none"> <li>Deeply rooted IPv4 legacy equipment over decades.</li> <li>Cost of manpower, money and time.</li> <li>Dual stacking results in compatibility issues and higher operational costs.</li> <li>Hurdle of complexity, change from IPv4 to IPv6.</li> <li>Investment in tools, strategies and expert personnel for change is required.</li> <li></li> </ul>	<p><b>Technical</b></p> <ul style="list-style-type: none"> <li>Specialised skills required amongst IPv6 network operators; the continent does not have sufficient specialised skilled workforce.</li> <li>Incompatibility issues currently with transition from IPv4 to IPv6.</li> <li>No standardised deployment roadmaps across the continent, various countries possess unique localised strategies.</li> </ul>
<p><b>Environmental</b></p> <ul style="list-style-type: none"> <li>IPv6 address space is considered more energy-efficient than IPv4 due to its larger address space, simplified header, and removal of the need for Network Address Translation (NAT).</li> <li>The absence of NAT reduces processing burden on network equipment, and the streamlined header format leads to faster packet forwarding and lower power consumption, improving overall network performance and efficiency.</li> </ul>	<p><b>Environmental</b></p> <ul style="list-style-type: none"> <li>IPv6 protocol presents a potential environmentally safer than IPv4 by reducing energy consumption in network equipment.</li> <li>IPv6 enables more efficient energy-saving technologies like the Internet of Things (IoT).</li> <li>Risks of increased energy demand still exist due to a proliferation of connected devices, and a full transition is necessary to realize IPv6's full energy-saving benefits.</li> </ul>
<p><b>Legal</b></p> <ul style="list-style-type: none"> <li>Government mandates and Policy supportive to IPv6 adoption, like in China, where specific schedules for agencies have been set concerning an IPv6 adoption.</li> <li>Government support for an open internet, in which Policies and legislations are instituted to foster an open, accessible and innovative internet platform for IPv6 adoption.</li> <li>Regulatory compliance and standard institutions may need to comply with new regulations concerning IPv6 adoption.</li> <li>Strategic Policy for emerging internet technologies such as AI, IoT, 5G, 6G and beyond technologies which drive an IPv6 adoption.</li> </ul>	<p><b>Legal</b></p> <ul style="list-style-type: none"> <li>Lack of sufficient legal frameworks and policies to promote IPv6 so that reliable Internet services can be provided in Africa.</li> <li>In Kenya and a few other African countries, there exists legal frameworks supportive to IPv6 transition. It is mandatory for operators to comply with IPv6 compliant equipment.</li> <li>Governance disputes with organisations such as AFRINIC (Regional Internet Registry in Africa), derails IPv6 adoption.</li> </ul>

## 7.2 SWOT Analysis

The Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis presented in Table 2 provides a specific level summary of the key strategic factors influencing Africa's current position and future IPv6 adoption prospects. It reflects a synthesis of insights derived from literature reviews consisting of policies, white papers, expert blogs, key stakeholder engagements and strategy documents available at the time of undertaking this task.

**Table 2:** SWOT Analysis

Strengths (what enables IPv6 adoption in Africa)	Opportunities (what potential benefits exist if IPv6 is adopted in Africa)
<b>In North Africa</b> <ul style="list-style-type: none"> <li>▪ Strategic leadership directions from the National Telcos like in Tunisia.</li> <li>▪ Strategic leadership directions from National Regulatory Authorities like in Sudan.</li> <li>▪ Establishing regional IPv6 and IoT training centre like in Sudan.</li> <li>▪ Publishing National Strategy for IPv6 like in Egypt.</li> </ul>	<b>IPv6 technological Advancement Opportunities:</b> <ul style="list-style-type: none"> <li>▪ IPv6 overcomes barriers of limited unique addresses with its 128 – bit structure.</li> <li>▪ IPv6 has a larger address space and simpler header format: This enables smoother flow of routing and packet handling, thus reduces latency and speeds up things.</li> <li>▪ IPv6 has end to end connectivity: no need for Network Address Translation (NAT), thus devices communicate directly with each other, more simpler network configurations and more secure as any potential points of failure are eliminated.</li> </ul>
<b>In West Africa</b> <ul style="list-style-type: none"> <li>▪ Government Policies and White Papers on Digital Transformation like in Nigeria.</li> </ul>	
<b>In Central Africa</b> <ul style="list-style-type: none"> <li>▪ Network capability and access in central Africa countries, continue to gradually uptake an IPv6.</li> <li>▪ Congo's (Brazzaville) Digital Transformation Acceleration Project (PATN) and aligns with the broader goals of its 2030 digital strategy.</li> </ul>	<ul style="list-style-type: none"> <li>▪ IPv6 has commendable scalability and direct addressing capabilities. This enables technologies like IoT, 5G and Cloud computing.</li> <li>▪ IPv6 has unlimited address spaces: Ability to accommodate billions of devices that can potentially connect to IoT deployments.</li> </ul>
<b>In East Africa</b> <ul style="list-style-type: none"> <li>▪ Migration from IPv4 to IPv6 strategy</li> </ul>	<ul style="list-style-type: none"> <li>▪ IPv6 has direct addressing capabilities:</li> </ul>

<p>like in East Africa.</p> <ul style="list-style-type: none"> <li>▪ National IPv6 migration strategy like in Kenya.</li> <li>▪ National IPv6 transition strategy like in Somalia.</li> <li>▪ IPv6 migration framework for National ISP like in Ethiopia.</li> </ul> <p><b>In Southern Africa</b></p> <ul style="list-style-type: none"> <li>▪ Published IPv6 migration guidelines like in Botswana.</li> <li>▪ Utilisation of IETF's published three main IPv6 transition techniques for ISPs.</li> <li>▪ Government led advocacy like in South Africa.</li> <li>▪ Main Telco led strategic leadership direction like in Zimbabwe.</li> <li>▪ International connections with ICT infrastructure advanced countries like Reunion's connection with France.</li> </ul>	<p>Enablers for cloud computing as it enables dynamic communications between devices, applications and cloud platforms.</p> <ul style="list-style-type: none"> <li>▪ IPv6 provides smooth data routing that allows it to maintain fast and efficient transfers.</li> <li>▪ IPv6 supports ultra reliable low latency communications (URLLC) like remote surgery and autonomous vehicles and satellites communications due to its direct addressing capabilities.</li> <li>▪ IPv6 is an essential basis for new technologies such as IoT, 5G, AI, 6G and beyond with exponential growth in the number of connected devices and sensors.</li> <li>▪ IPv6 adoption enables companies to invest in a wide range of applications from smart homes to smart cities.</li> </ul> <p><b>IPv6 Security Opportunities:</b></p> <ul style="list-style-type: none"> <li>▪ IPv6 adoption offers significant cyber security improvements over IPv4.</li> <li>▪ IPv6 adoption is a platform for organisations to update their internet security policies, capable of handling IPv6 threats.</li> <li>▪ Organisations can counter privacy concerns of IPv6 through Dynamic Host Configuration (DHCPv6), which randomizes the IP address of devices.</li> <li>▪ IPv6 adoption creates an opportunity for organisations to conduct regular security assessments to proactively identify and mitigate any randomly occurring security vulnerabilities from time to time.</li> </ul>
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Weaknesses (what limits IPv6 adoption in Africa)	Threats (what prevents IPv6 transition in Africa)
<p><b>ISPs / CSPs / Telcos in Africa</b><sup>49</sup>.</p> <ul style="list-style-type: none"> <li>▪ According to a study in 2009, top three key responses from APNIC, NRO and 33 ITU members on barriers to IPv6 uptake identified were<sup>50</sup>: <ul style="list-style-type: none"> <li>○ Lack of market demand to achieve business cases, hence no urgency to accelerate adoption.</li> <li>○ Lack of confidence in IPv6.</li> <li>○ Developing countries expressed lack of awareness raising and capacity building.</li> </ul> </li> <li>▪ Lack of incentives to foster transition from IPv4 to IPv6.</li> <li>▪ Continuation to use IPv4 by employing NAT to mitigate address shortages.</li> <li>▪ The deployment cost of IPv6 is prohibitive. While endpoints (desktops, laptops, tablets, smartphones) are frequently replaced, it is not true with new hardware routers and switches. Many organisations in Africa do not have such initial costs.</li> <li>▪ Lack of backward compatibility for IPv4, no single standard way to communicate between IPv4 and IPv6 devices.</li> <li>▪ Organisations are leveraging a dual-stack router to accommodate both protocols, which creates additional work for internal teams.</li> </ul>	<p><b>IPv6 security implications:</b></p> <ul style="list-style-type: none"> <li>▪ IPv6 offers a wider address range, this opens an increase in the cyber-attack surface.</li> <li>▪ IPv6 dual-stack configuration could double an attack surface, threats could enter their devices with poorly configured IPv6.</li> <li>▪ IPv6 auto-configuration capabilities could become an advantage for attacks to execute address spoofing or man in the middle attacks.</li> <li>▪ IPv6 is globally routable and permanently reveals device location and network affiliation creating security concerns.</li> </ul>

<sup>49</sup> DNS Made Easy, March 2025, The State of IPv6 Adoption in 2025: Progress, Pitfalls, and Pathways Forward, Available from <https://dnsmadeeasy.com/resources/the-state-of-ipv6-adoption-in-2025-progress-pitfalls-and-pathways-forward>

<sup>50</sup> ITU Concerns on IPv6 as a public issue. Available at: [https://www.itu.int/dms\\_pub/itu-t/oth/06/2c/t062c0000010001pdfe.pdf](https://www.itu.int/dms_pub/itu-t/oth/06/2c/t062c0000010001pdfe.pdf)

- DNS Considerations: Configuring a DNS server in an IPv6 network can be demanding for network administrators. Ensuring compatibility with existing IPv6 infrastructure, managing address resolution, and handling the various IPv6 specific settings require a deep understanding of both network protocols.
- DNS server providers still prioritise IPv4 because of its widespread use but continue advocating clients to transition to IPv6.

#### **In North Africa**

- Investment costs are prohibitive.
- Uneven technical readiness among ISPs.
- Lack of necessary expertise.
- Insufficient public and technical knowledge.
- Challenge with institutional coordination among key stakeholders (ISPs, data centre operators, government entities, digital content providers).
- Market structure – a lack of collaboration among stakeholders
- Institutional readiness across multiple stakeholders.
- Digital culture – services providers willingness to offer IPv6 to users and so should the government websites support it.

#### **In West Africa**

- No developed ICT infrastructure.
- Insufficient digital transformation plans or strategies.
- Low affordability of internet services
- Limited digital literacy.

<p><b>In Central Africa</b></p> <ul style="list-style-type: none"> <li>▪ Over reliance on NATs (Network Address Translations).</li> <li>▪ Lack of government policies guiding IPv6 transition.</li> <li>▪ Lack of government awareness programmes educating the public on the importance of IPv6.</li> <li>▪ The investment cost to transition is high.</li> <li>▪ Low internet service penetration rate.</li> </ul> <p><b>In East Africa</b></p> <ul style="list-style-type: none"> <li>▪ Shortage of skilled engineers.</li> <li>▪ Insufficient government policies and incentives for migrations.</li> <li>▪ Perceived lack of urgency.</li> <li>▪ Low internet penetration rate.</li> <li>▪ Lack of capacity building initiatives.</li> <li>▪ Lack of IPv6 advocacy.</li> <li>▪ No sufficient regulatory frameworks.</li> <li>▪ Incompatibility between IPv4 and IPv6.</li> </ul> <p><b>In Southern Africa</b></p> <ul style="list-style-type: none"> <li>▪ Lack of awareness and skills in many countries.</li> <li>▪ The cost of upgrading is prohibitive.</li> <li>▪ Low overall internet access and penetration rate.</li> <li>▪ Regulatory and market bottlenecks.</li> <li>▪ Internet service users' preference on QoS, IPv6 is not a priority.</li> <li>▪ Political democracy in certain countries, enforcement of transition is constrained.</li> </ul>	
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## 8. CONCLUSIONS AND RECOMMENDATIONS

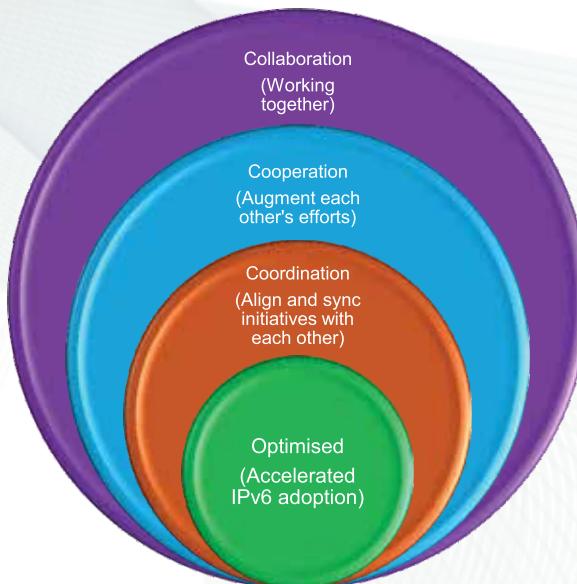
As Africa's population is projected to double by 2050, it is paramount to ensure adequate distribution of resources for the AFRINIC community who needs to proactively address this challenge by employing efficient resource management policies, exploring avenues for IPv6 adoption, and advocating for sustainable growth<sup>51</sup>. Nonetheless, IPv4 exhaustion is increasingly becoming a reality in African continent just like in the rest of the world. This necessitates a need for an accelerated adoption of IPv6, particularly because IPv6 adoption in Africa is much slower than in other regions of the world.

The findings from the PESTEL and SWOT Analyses reveal that there is no universal solution to accelerate IPv6 adoption in Africa. While some counties or regions advocate for government intervention to accelerate IPv6 adoption, other regions underscore the role of regulatory frameworks, market forces and local priorities to shape the pace and methods of adoption worldwide.

*The accelerated solution of IPv6 deployment in Africa can only be achieved through embracing an optimal ecosystem model underpinned by the spirit of coordination, co-operation, and collaboration among multi-stakeholders.*

The accelerated ecosystem model of multi-stakeholders will define a constituent of IPv6 adoption multiple stakeholders who align or synchronize (i.e., coordinate) their distinctive efforts to create IPv6 adoption or deployment efficiency, they co-operate to perform their portion of a shared vision as planned and they co-labour (i.e., collaborate) in an act of co-creating and innovating IPv6 adoption as influenced by the input of all the contributors.

<sup>51</sup> AFRINIC Blog, August 2023, IP address and ASN allocations in Africa, Available from: <https://blog.afrinic.net/ip-address-and ASN-allocations-in-africa>



**Figure 16:** An optimised ecosystem model for coordination, cooperation and collaboration towards accelerating IPv6 adoption in Africa.

Aligned to such an optimised ecosystem are the underlying recommendations which may support different stakeholders<sup>52</sup>

For Network Operators:

- ✓ Begin with IPv6 training for technical staff.
- ✓ Audit existing infrastructure for IPv6 compatibility.
- ✓ Develop a phased implementation plan.
- ✓ Consider the financial benefits of reduced NAT complexity.

For Business Leaders:

- ✓ Understand that IPv6 adoption is inevitable, not optional.
- ✓ Budget for infrastructure upgrades and staff training.
- ✓ Evaluate vendor IPv6 support when making purchasing decisions.
- ✓ Consider the competitive advantages of early adoption.

For Government Entities:

- ✓ Prioritize IPv6 adoption in national ICT strategies.
- ✓ Enable new private sector entrants fostering IPv6 to become licenced where possible.
- ✓ Implement policies encouraging local content hosting and development.
- ✓ Develop region-appropriate policies that encourage adoption.
- ✓ Invest in IPv6 education and awareness programs.
- ✓ Lead by example in government network deployments.
- ✓ Support international coordination efforts.

<sup>52</sup> The News Stack, July 2025, Myth busting IPv6: why adoption lags and what will change it, Available from: <https://thenewstack.io/mythbusting-ipv6-why-adoption-lags-and-what-will-change-it/>

## For Regional Internet Registries (RIRs)

The primary function of RIRs is to manage and distribute critical internet number resources; IP addresses and Autonomous System Numbers (ASNs) within a service region. In Africa, AFRINIC (African Network Information Centre) as the RIR, should:

- ✓ Continue to be a beacon of support for network operators in Africa, offering expert guidance and assistance through its IPv6 deployment initiatives.
- ✓ Strengthen Deployment programs delivered by experts, ensuring that the implementation of IPv6 follows the best common practices of the industry.
- ✓ Foster expert guidance to operational engineers so they can collaborate with their peers from different networks to confidently implement IPv6, Resource Public Key Infrastructure (RPKI) and other Internet technologies or services on their networks.
- ✓ Implement rules proposed in the Number Resources Transfer Policy once ratified by the Board<sup>53</sup>. This is essential considering the limited IPv4 space initially made available to AFRINIC. The Policy will allow for transfer of unused IPv4 space out from other regions to move into the AFRINIC service region without necessarily depleting the AFRINIC's thin amount of IPv4 addresses. Such a transfer would lay a foundation for supporting certain translation mechanisms towards IPv6 adoption in Africa.
- ✓ Support Internet Infrastructure development in underserviced regions.
- ✓ Facilitate resource sharing and peering agreements.

## For Network Operator Groups (NOGs)<sup>54</sup>:

- ✓ **Growth Market Focus:** Establish IPv6-first deployments in high-growth regions to demonstrate viability and create operational experience. Growth market success creates operational templates for other regions. Investment in infrastructure in emerging and poverty-tier markets would see Africa's IPv6 adoption map expands.
- ✓ **Policy Framework Development:** Implement national IPv6-first policies that create market incentives and requirements. Policy frameworks provide economic incentives that support technical implementation.
- ✓ **Infrastructure Leverage Points:** Deploy IPv6-only capabilities at IXPs and core ISP networks to create ecosystem pressure. Infrastructure simplification reduces operational barriers to adoption.
- ✓ **Enterprise and Content Acceleration:** Implement geographic and segmented deployment strategies that optimize resource allocation while maximizing impact.
- ✓ Develop business models suited to constrained address environments.
- ✓ Partner with governments on digital inclusion initiatives.

Masterspace Solutions Ltd (MSS) in a strong collaboration with multi-stakeholders for promoting an accelerated IPv6 adoption in Africa will consider and implement the following interventions during the next phases (2, 3, 4 and 5) of the project.

In phase 2: Training and capacity building interventions.

In phase 3: Policy and Regulatory frameworks interventions.

In phase 4: Technical Assistance Package and Pilot Deployment Support.

In phase 5: Advocacy, Collaboration, Monitoring and Evaluation.

The call for action is for the African countries to avoid delaying IPv6 deployment much longer. The diminishing utility of NAT, exhaustion of IPv4 addresses and migration by major content providers are converging factors. Delaying the move to IPv6 will only increase complexity and cost as more translation workarounds are required. Those who act now will benefit from direct, efficient connections to an increasingly IPv6-native internet, while those who delay will find themselves managing increasingly complex and expensive translation systems.

<sup>53</sup> GO Ehoumi, N Maina, AAP Aina for AFRINIC, August 2022, Available from: <https://afrinic.net/policy/proposals/2020-gen-006-d3#proposal>

<sup>54</sup> Terry Sweetser, May 2025, Strategic frameworks for accelerating IPv6 adoption: A position paper, Available from: [https://medium.com/@terrystsweetser\\_90287/strategic-frameworks-for-accelerating-ipv6-adoption-a-position-paper-c2cab1c0e130](https://medium.com/@terrystsweetser_90287/strategic-frameworks-for-accelerating-ipv6-adoption-a-position-paper-c2cab1c0e130)

## NOTES

## Masterspace Solutions Limited

Ramis Center, 2nd Floor, Suite # A, Mombasa Road, NAIROBI 

[info@masterspace.co.ke](mailto:info@masterspace.co.ke) 

+254 754 906577  
+254 758 045348 



**Masterspace**  
SOLUTIONS