

AFRICAN RESEARCH UNIVERSITIES ALLIANCE (ARUA)

Towards developing a Collaborative PhD Program across ARUA Member Universities

Experiences from Université Cheikh Anta Diop, Senegal

**A Research Report Produced for ARUA by the
Human Sciences Research Council (HSRC)**

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Table of Contents

1. Introduction to study and country overview.	1
1.1 Introduction	1
1.2 Country Socio-political Context.....	1
2. Overview of the Higher Education System	4
2.1. Size and Shape of the higher education System.....	4
2.2 HE governance in Senegal.....	5
2.3 Enrolment and graduation trends	8
2.4 Overview of Broad (humanities and natural science) PhD Programmes.....	10
2.5 Recent Developments in Research Policies	11
2.6 Policies on Regionalization, Harmonization and Internationalisation.....	11
2.7 Challenges facing the system.	12
3. Overview of the Case Study University: Cheikh Anta Diop University (UCAD) 15	
3.1 Cheikh Anta Diop University (UCAD)	15
3.2 Recap of research focus and objectives and Methodology	16
3.2 Key Study Findings.....	24
4. Example of Collaborative Doctoral Programme:.....	26
4.1 Doctoral Research Programme on Climate Change Economics.....	26
5. Recommendations and conclusions	28
5.1 Recommendations.....	28
5.2 Conclusions	29
References	31
Appendices	33

List of tables

Table 1. Senegal: socio-economic profiles.....	3
Table 2. Doctoral Schools in Senegal Public Universities and Doctoral Enrolments (2021).....	9
Table 3. Analysis of basic features of the PhD Programmes.....	18
Table 4. Summary of key characteristics of the WASCAL Collaborative Programme	26
Table 5. UCAD: ,2016-2021. Cumulative Doctoral Enrolments.....	33
Table 6. Graduation trends	33

1. Introduction to study and country overview.

1.1 Introduction

This report highlights the status of PhD education in Senegal, using the University Cheikh Anta Diop (UCAD) as a case study. The report provides an overview of Senegal's socio-economic status, which has a bearing on how universities tend to organize PhD programmes, and which may influence the direction and/or design of collaborative programmes as envisaged by ARUA. The report details the national and institutional policy and operational frameworks for PhD programmes in Senegal and explores the nature of student access and progression policies across the programmes, to finally consider opportunities for designing collaborative arrangements and challenges that need to be addressed.

The report is divided into five sections. The foreword is the first section. The proceeding section provides an overview of Ethiopia's socio-economic and political dynamics while section three provides a brief description of the Ethiopian higher education landscape. Section four delves into the case study university and the two selected programmes and presents findings from the collected data from the two case study programmes. Section five is a best-practice case study programme while the ultimate, section six provides some recommendations and conclusion.

1.2 Country Socio-political Context

Senegal is in western sub-Saharan Africa, between 12°41' and 16°41' north and 11°21' and 17°32' west. It covers a land area of almost 197,000 square kilometres with a population estimated to be around 15.7 million, about a quarter of which is concentrated in Dakar and up to half in other urban areas¹. Since 2008, Senegal has administratively been divided into 14 regions (see map 1). Senegal's economy ranks as the second strongest economy of the West African Economic and Monetary Union (UEMOA) and fourth in the Economic Community of West African States (ECOWAS). Senegal's GDP stood at \$24.9 billion in 2020 in current terms and its per capita Gross National Income (GNI) was \$1,430 in 2020, which makes it a lower-middle-income country (LMIC)². Oil and gas have recently been discovered but commercial production is not expected in enormous quantities until 2035. Senegal is a member of two critical economic communities: 1) the Economic Community of West African states

¹ Projections for 2018 by the National Agency of Statistics and Demography (*Agence Nationale de la Statistique et de la Démographie*, ANSD). Available at: <http://www.ansd.sn/index.php>

² World Bank (2022). Senegal. An overview. <https://www.worldbank.org/en/country/senegal/overview#1>

(ECOWAS), a regional bloc of 15 countries (with approximately 360 million inhabitants); and 2) the West African Monetary Union (UEMOA), a regional organization of 8 countries and 112 million inhabitants, whose mission is to promote economic integration by strengthening the competitiveness of their economies within the framework of an open and competitive market and a harmonized legal environment.

Despite this centrality to key economic communities within Africa, poverty remains a major challenge, with almost half of the population (46.7%) living in poverty³, and about a third of the population (33%) living below the international extreme poverty line of \$1.90 per day. School enrolment and completion rates also remain below the sub-Saharan African (SSA) average. Only one third of students complete primary school with sufficient competencies, and only one fifth of these students are from the poorest 40%, with average years of schools at 7.2 years compared to 8.1 in SSA and 10.2 among lower middle-income countries, and thus, translating into only 4.8 years of learning-adjusted years of schooling⁴. The lower completion and transition rates from primary to secondary school for students from the poorest family backgrounds implies that a high percentage of students from poor families are missing higher education.

In terms of Development strategy, the Senegalese President, Macky Sall, launched in 2014, the “*Emerging Senegal Plan*” (*PSE, Emergent Senegal Plan*)⁵. The objective is for Senegal to become an “emerging market” by 2035. The *PSE* has three strategic objectives: (a) transforming the structure of the economy to support strong and sustainable growth; (b) expanding access to social services and social protection and preserving the conditions for sustainable development; and (c) responding to the requirements of good governance, through institutional strengthening and promoting peace, security, and African integration. Implementation of each phase of the *PSE* is guided by a Priority Action Plan (PAP). Under objective (a) on transforming the structure of the economy, investment in human capital at all levels has been accorded a critical role. The drive for PhD-level collaboration within the ARUA

³ World Bank (2020). Poverty and Equity Brief, Senegal.
https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global_POVEQ_SEN.pdf

⁴ World Bank (2020). Country Partnership Framework for the Republic of Senegal for the period fy20–fy24.
<https://documents1.worldbank.org/curated/en/608781583719225540/pdf/Senegal-Country-Partnership-Framework-for-the-Period-FY20-FY24.pdf>

⁵ Senegal Presidency (2014) Plan Senegal Emergent:
https://www.sec.gouv.sn/sites/default/files/Plan%20Senegal%20Emergent_0.pdf

member universities captures the strategic objective of African integration as well as this aim towards investment in human capital development across all levels.

The second phase of *PSEs* implementation has a particular focus on the development of human capital, especially the youth. The government has committed a substantial percentage of resources from the oil and gas sector to the education and training of the youth⁶. Education and Training measures under the *PSE*, to foster economic growth:

- i. a focus on research and innovation by identifying and implementing Senegal’s research priorities as they relate to its socio-economic development,
- ii. an emphasis on tertiary education and building further education institutions, increasing access to education, the creation of a second University of Dakar (with a focus on S&T),
- iii. and the creation of the city of Knowledge, which will encompass creating a network of higher education, research, and business, education and training institutes, and University residences for over 40,000 students⁷.

Table 1. Senegal: socio-economic profiles

Name of Country	Senegal
National Population	16.74(2020).
GDP per capita	USD 1,471.831(2020).
Human development index	0.512(2019).
Unemployment rate	3.623% (3.49 Male and 3.05 Female)-2020
Main economic sectors	Agriculture and fishing (12.3% of export earnings), followed by services, telecoms, and tourism.
Gross primary enrolment ratio	83.009(88.916 Female and 77.251 Male)-2020
Gross secondary enrolment ratio	46.561(50.09, female and 43.1, Male)-2020
Gross tertiary enrolment ratio	14.034(% 12.324, Female and 15.742 Male)-2020
Number of public universities	8
Number of private universities	300+
Name of Participating University	Universite Cheikh Anta Diop (UCAD)
Total Number of Doctoral Enrolments (National)	13,529 (12,293 UCAD)
Higher Education Expenditure as % of GDP	1.5% (2018).
Doctoral Production per Million Population	564.3 (2015)

Source: *UIS/World Bank (2020)*.

⁶ AfDB (2021)

⁷Pointel et al (2020)

2. Overview of the Higher Education System

2.1. Size and Shape of the higher education System

The higher education landscape of Senegal consists of university level institutions, research and training institutions established by various ministries and linked to universities, and regulatory bodies. This three-tier system constitutes the eco-system for higher education and training in Senegal and provide important insights to the nature of PhD training in the country. In terms of the number of public institutions, the system consists of eight (8) public universities, and over 300 private universities. However, only five of the public universities offer doctoral training. The eight public universities are:

- University Cheikh Anta Diop (UCAD).
- University Gaston Berger, Saint-Louis, (UGB).
- University Iba Der Thiam de Thiès,
- University Assane SECK de Ziguinchor,
- University Alioune Diop de Bambey,
- University EL Hadj Ibrahima Niass de Kaolack (USSEIN),
- University Ahmadou Mbow (UAM)and,
- University Virtuelle du Senegal (UVS).

Senegal also hosts four (4) World Bank centres of excellence (CoE) within two public universities. The CoE are:

- the African CoE in Mathematics and ICT (CEA MITIC), Gaston Berger University, Senegal
- the CEA pour la Sante de la Mere et de L'enfant (CEA-SAMEF in Maternal and Child Health) at Universite Cheikh Anta Diop, UCAD.
- the CEA: Agir en Environnement et Sante, Cheikh Anta Diop University, Senegal
- the CEA: Agriculture pour la Securite Alimentaire et Nutritionnelle (CEA AGRISAN), Cheikh Anta Diop University, Senegal

Public and private research institutions exist within the higher education eco-system and influence PhD training in the universities. Some of the institutes include the Senegalese Agricultural Research Institute (ISRA), the Institute of Food Technology (ITA), the Dakar PASTEUR Institute (DPI), the Fundamental Institute of Black Africa (IFAN), the National Institute of Paedology (INP), and the Ecological Monitoring Canter (CSE). Senegal also hosts

regional research institutions which have working relationships with the universities and therefore influence the quality and direction of PhD. These centres include, the Development Research Institute (IRD), the Centre for International Cooperation on Agronomic Research for Development (CIRAD) and a team of researchers from Africa Rice (formerly WARDA), based in Saint Louis. There is also the “African Institute for Mathematical Sciences” in Senegal (AIMS Senegal) an independent pan-African non-profit institute that focuses on training, research, and public engagement in mathematics and its applications. AIMS-Senegal is part of the Pan African network of AIMS Next Einstein Initiative (AIMS-NEI), consisting of a CoE to identify and train the best African scientists in the continent. AIMS-Senegal has linkages with the public universities in Senegal and Europe. Importantly, Senegal is a member of the Partnership to support the development of skills in Applied Sciences, Engineering and Technology (PASET), an initiative by African governments to address fundamental gaps in skills and knowledge necessary for long-term, sustained economic growth in sub-Saharan Africa (SSA). Under the PASET Regional Scholarship and Innovation Fund (RSIF), Senegal benefits from PhD scholarships that are offered on a competitive basis. RSIF aims to train quality PhD students and post-doctoral researchers at selected African universities (‘African Host Universities’) to address the human resources gap in highly qualified specialists in the fields of applied sciences, engineering, and technology (ASET) and to contribute to improving research and innovation capacities in those fields in Africa.

2.2 HE governance in Senegal

In terms of quality assurance and the legal framework for Higher education and training, the Ministry of Higher Education, Research, and Innovation (MESRI) provides overall oversight for the higher education sector. MESRI is supported by a National Council of Higher Education, Research, Innovation, Science and Technology, established in 2015. The council acts as a consultative mechanism for the Minister of Higher Education and Research (UNESCO, 2016). MESRI is also supported by other allied agencies that promote research activities in the country. The National Agency for Applied Scientific Research (ANRSA) created in 2008 through a presidential decree and linked to MESRI works to “*transform knowledge and know-how into products, goods and services, and producing skill centres and niches of opportunity in strategic sectors,*” such as biotechnology. The National Quality Assurance Authority for Higher Education (Autorité Nationale d'Assurance Qualité de l'enseignement Supérieur, ANAQ-Sup), established in 2012, as an agency of the State under

the administrative and technical supervision of MESRI is responsible for ensuring and improving the quality of higher education programmes and institutions in Senegal. The National Academy of Science and Technology (ANSTS) is an advisory organization that provides consultation and assistance to public and scientific authorities and is a centre of excellence for the design and renewal of knowledge and thinking. ANSTS conducts studies to advise decision makers in four areas: agriculture, social sciences, health, and STI.

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At the institutional level, Senegal has institutionalized the academic model of the Bologna process on three levels, *licence-Master-Doctorate* (LMD) to facilitate harmonisation of degree structures, credit systems and quality assurance procedures in all of Senegal's higher education programmes, and indeed in all 15 countries in ECOWAS. Before the LMD reform, the structure of higher education in Senegal, and indeed that of all Francophone countries was aligned to that of France. A student undertaking undergraduate studies, for example started around the age of 19 for a course taking four years, but with diplomas awarded along the way and allowing the student to exit the system before the 4-year cycle was accomplished. For example, after the first two years, a student would be awarded a diploma certifying that the student had undergone general university training (*diplôme d'études universitaires générales*, DEUG). At the third year, a student would be awarded another diploma of more specialized studies (*licence*) and the final degree after the fourth year of specialized studies (*maîtrise*) (Samb et al, 1999). Most students quit studies after the first diploma and had difficulties getting employed or proceeding with higher education elsewhere because of misalignment. Once France joined the rest of Europe in the Bologna process, Francophone countries were also forced to harmonise their higher education systems to those of Europe, and indeed the rest of Africa.

The adoption of the LMD structure has resulted in a new way of organising teaching at the universities, reconfiguring the higher degrees based on the three qualifications (LMD), as well

as research programmes in multi-disciplinary Doctoral School frameworks comparable to international systems. The transition of Senegalese higher education to the LMD system means that the collaborative arrangements in terms of academic programmes that ARUA has is envisaging across the continent is now possible. The LMD model compares well to the model of higher education provided in Anglophone countries. Mobility in learning forms part of the Arusha convention and a major objective of LMD reform which many universities of the Sub-Region are implementing. Senegalese Universities are also members of the African and Madagascan Higher Education Council (CAMES) system which acts as a standard for the assessment of researchers at all educational and research institutions, including work by doctoral students.

The *PSE* plan has also triggered developments in the higher education sector focused on preparing the country for the 4IR. Policies focusing on increasing access to ICT education at all levels of the education system and increasing the quantity and quality of network connectivity have been designed. The Digital Senegal Strategy, *Stratégie Sénégal Numérique 2025 (SSN2025)*⁸, was, for example, passed in 2016, and focuses on, enhancing broadband connectivity for all and promoting high-quality, affordable and reliable telecom services; digitally connecting public entities to digitize operations to facilitate administrative procedures, while ensuring synergies, reduced costs and the elimination of transaction delays; creating an enabling environment for a thriving local digital private sector, promoting investment and facilitating exports; and promoting the innovative use of digital resources to increase productivity and competitiveness of the overall economy.

In terms of the institutional framework to anchor the 4IR ambitions, the *Programme for Improving the Quality, Equity, and Transparency of the Education and Training (PAQUET) Sectors (2013-2025)*⁹ is under implementation. The programme focuses on promoting employment-oriented vocational education, strengthening the use of ICT in higher education, creating a “virtual university with open digital space,” and enhancing the utilization of the results of R&D and technology in strategic industry areas. With support from the government of Korea, several Technical, and Vocational Education and Training (TIVET) centres of

⁸ Ministry of Communications, Telecommunications, Postal Services, and the Digital Economy of Senegal (2016). *Strategie Senegal Numerique*. October 2016.

⁹ *Program for Improving the Quality, Equity, and Transparency of Education and Training (PAQUET) (2013). Program for Improvement of Quality, Equity and Transparency of the Education and Training Sector 2013–2025. Rep. of Senegal.*

excellence (CoEs) are being established in the different administrative regions of the country. On the other hand, the Ministry of Higher Education, Research, and Innovation (MESRI) is leading a reform programme to promote digital and STEM education¹⁰. A decentralization plan for higher education has commenced with the opening of 14 specialized universities and graduate schools and the launch of the Virtual University of Senegal (UVS). To cope with the qualitative and quantitative shortage of digital training in the Senegalese ecosystem, private digital training providers have been licensed to complement the digital training offered by Senegalese higher education institutions. The government is also building a Knowledge City to house a science and technology research complex, a higher Institute of Vocational Education (ISEP), a headquarters of the Virtual University of Senegal, an open digital space, the African Institute of Mathematical Sciences (AIMS), and the Francophonie Institute for Training¹¹.

The development ambitions of Senegal under the PSE Plan and the developments in the higher education sector, especially broadening access through ICTs and virtual universities have implications for the design of collaborative programmes. In the first instance, government investments in the ICT sector and the support for the creation of virtual capacities offers baseline supportive infrastructure that may be needed to support collaborative programmes like the ones envisaged by ARUA. ICT capacity facilitates learning across all academic programmes. Offering some aspects of the collaborative programmes will reduce the cost of programmes while broadening access.

2.3 Enrolment and graduation trends

Gross Tertiary enrolment rates for Senegal remain low despite recent expansion of the system. By 2020, the gross enrolment ratio in tertiary education was 14 %, up from 7% in 2017 (12.32% female and 15.74% male)¹². Enrolment in private Tertiary institutions was at 34.4 % in 2019, down from 36.2% in 2018¹³. UCAD remains the largest university in terms of student enrolment and staff compliment, enrolling about 80% of Senegal's tertiary students. The number of private universities enrolling students for tertiary level qualifications was estimated at over 300 in 2019. Most of the private institutions are however small scale, each enrolling

¹⁰ World Bank. (2019). Information and Communication for Development, 2018. Data-Driven Development overview booklet. Information and Communication for Development. World Bank. Washington DC

¹¹ World Bank, Ibid.

¹² World Bank (2022). World Bank Data (2022). Educational Enrollment, Tertiary, Senegal;

<https://data.worldbank.org/indicator/SE.TER.CUAT.ST.MA.ZS?locations=SN>

¹³ World Data Atlas (2022)<https://knoema.com/atlas/Senegal/topics/Education/Tertiary-Education/School-life-expectancy-in-tertiary-education>

fewer than 200 students in single programmes. In 2019, inbound mobility in tertiary education for Senegal was 7.6%. while outbound mobility was 7.5 %.¹⁴ In terms of tertiary level graduation and educational attainment trends, only 4.03% (6.94% male and 1.38% female) of the population in Senegal aged 25+ years had completed a cycle of tertiary education by 2017, the latest year in which data is available.

In terms of PhD (doctoral) enrolments, the numbers are smaller to what the country aspires for. PhD training is offered in doctoral schools (as opposed to programmes). There are 13 doctoral schools in the five universities. UCAD has seven doctoral schools; UGB and the University Assane Seck Ziguinchor both have two and University Iba Der Thiam (Thies), one, and the University of Bambey, has one. By 2017, the latest year for which data is available, the cumulative percentage of the population in Senegal with doctoral qualifications (25 years+), was 0.07% (0.099 male and 0.039 female). None of the private universities offers doctoral education¹⁵. Table 2 below summarises data on PhD enrolments across the public higher education system.

Table 2. Doctoral Schools in Senegal Public Universities and Doctoral Enrolments (2021)

	Doctoral Schools	Doctoral Enrolments		
		Male	Female	Total
University Cheikh Anta Diop of Dakar (UCAD).	Physics, Chemistry, Earth and Universe Sciences and Engineering (ED- PCSTUI)	7,941	2,413	10,354
	Mathematics and Computer Science (ED-MI)			
	Environmental, Health and Life Sciences (ED-SEV)			
	Water quality and Water Use (ED-EQUE)			
	Legal, Political, Economic and Management Sciences (ED-EDJPEG)			
	Arts, Cultures and Civilizations (ED-ARCIV)			
	Studies on the Human Being and Society (ED-ETHOS)			
University Gaston Berger of Saint-Louis (UGB)	Human and Social Sciences (ED-SHS)	596	180	776
	Science and Technology (ED-ST)			
University Iba Der Thiam of Thies	Sustainable Development and Society (ED-2DS)	143	34	177

¹⁴ World Data Atlas, *ibid*.

¹⁵ World Bank (2022). *Ibid*.

(UIDT				
University Assane Seck of Ziguinchor (UASZ)	Science Technology and Engineering (ED-STI)	80	19	99
	Economic and Social Sciences (ED-SES)			
University Alioune Diop of Bambey (UADB)	Science, Technology and Social Sciences (ED ST2S)	140	44	184
Totals		8,900	2,690	11590

2.4 Overview of Broad (humanities and natural science) PhD

Programmes.

Broadly, from the 13 doctoral programmes offered in the doctoral schools in the five universities, six of the programmes (46%) can be classified as natural science-based, five (38.5%) as humanities and social sciences and one (7.6%) as hybrid humanities and natural sciences (See table 2, above). The Doctoral schools are multidisciplinary and are research-focused, meaning students must enrol through a research laboratory, and each Doctoral school is constituted by several research laboratories. Doctoral Schools are overseen by research lecturers, researchers, research teams, and research laboratory staff and conduct projects on training, research, and expertise. The projects are multidisciplinary, supported by broadly-based, high-quality teams drawn from interfaculty collaboration and professionals drawn from the corporate world. The focus is on a consistent scientific and teaching policy aimed at preparing PhD graduates to take on their professional activities.

The 2012 LMD reform also led to reforms in the structure of doctoral education in Senegal. The operation, regulatory requirements, role definitions and organisation of doctoral studies, as well as the requirements and structure of the doctoral programmes, are stipulated in the *Decree on the Doctorate* (Law No. 2011-05). According to this law, the nature and structure of doctoral education is nationally regulated. The law stipulates that the doctorate is a ‘postgraduate higher education degree certifying a level corresponding to obtaining 180 credits after the master’s degree and gives its holder the Doctor’s degree’. The law also reinforced the alignment of the doctorate degree in Senegal to the License, Master, Doctorate (LMD) system in higher education institutions, creating a single doctorate that replaced previous existing doctorate programs in the Senegalese higher education system. The law provides for:

- A 3-year duration for doctoral degrees from the time of registration.

- Fixing the duration of preparation for the doctorate to three years with the possibility for the doctoral student to benefit from an additional period by way of derogation.
- a newly introduced diploma of Doctor of Engineering.
- doctoral education to be offered through an integrated system of lectures/coursework, seminars, workshops, conferences and writing and successful defence of a thesis, in interdisciplinary doctoral schools as opposed to individual disciplines/programs
- a joint thesis supervision procedure between Senegalese higher education institutions, on the one hand, and their counterparts in other countries, aimed at establishing and developing cooperation in science and promoting the mobility of doctoral students.

2.5 Recent Developments in Research Policies

Under the *Plan Sénégal Emergent* (PSE), Senegal has designed several policies and interventions to improve the research and development (R&D) environment and increase skills development in relevant areas. The Higher Education and Research Development Strategy (HERDS) 2013-2022, designed by the MOHER, and the Higher Education and Research Development Plan (HERDP) 2013- 2017, for example, sought to enhance the capacities within universities to promote access, diversify the training offer and ensure quality, while boosting research and innovation cultures. Besides, the Program for Improving the Quality, Equity and Transparency (PAQUET) of the Education and Training Sectors (2013-2025), triggered reform measures focusing on expanding existing universities and the construction of new universities, the promotion of STEM, arranging new governance of universities, involving the private sector on the boards, improvement in the use of ICT, and a new impetus for research. A Development Plan for Higher Education and Research (PDESR) was designed to support reform implementation and the government committed to investing more than \$600 million USD. The government is currently building a Knowledge City in which they plan to establish a science and technology research complex. While not yet operational, the Cite du Savoir (Knowledge City) plan includes laboratories, spaces for shared working and equipment, including a molecular genetics platform as part of the City of Knowledge (MESRI, 2019). This could be a strategic site for collaboration across ARUA member universities in doctoral training.

2.6 Policies on Regionalization, Harmonization and Internationalisation.

Senegal has pursued policies on harmonization and internationalisation and ratified several agreements to foster greater higher education harmonization in West Africa. UCAD has

traditionally served as a focal point for undergraduate and graduate training for French Speaking West African countries. It is a member of the African and Malagasy Council for Higher Education or (CAMES) – a regional body responsible for higher education accreditation and quality assurance, and for the implementation of higher education and research policies in several Francophone African countries. Since 2005, Senegal implemented the LMD (Licence-Master-Doctorate), which has made higher education uniform both to French and English-speaking countries. At a regional level, Senegal’s higher education system has been harmonized with that of other countries within the West African Economic and Monetary Union (WAEMU) countries.

Senegal is also a member of the Francophone University Agency (AUF), which supports university partnerships to promote Higher Education and Research in countries whose official language is French. The AUF develops support programmes for the universities (particularly those in the southern hemisphere) based on three principles:

- Institutional consolidation.
- Scientific and university mobility; and
- Support for associative networks and structures.

Senegal is benefitting from numerous AUF initiatives, including an important virtual campus (e-learning, teleconferencing,) and several mobility grants for students and research lecturers.

2.7 Challenges facing the system.

Several interconnected challenges face higher education, more generally and PhD training, more specifically in Senegal. The key challenges broadly captured are:

2.6.1 Lack of diversified and dedicated funding for PhD training and research: The public remains the key fund of research, especially that focused on supporting PhD training in universities. A total of 0.75% of the country’s GDP is allocated to R&D (MESRI, 2019). The State provides grants to various research structures, including universities, public scientific institutions, and high schools as well as through postgraduate scholarships and competitive funds (Cissé et al., 2019). But this funding is never adequate and has resulted to weak capacities in labs and research units across the country. In terms of subsidy for PhD students the government provides a modest stipend of CFA 70,000(about USD 106) per month to all

enrolled PhD students. But this is hardly enough to cover the cost of training. For students enrolled in PhD they must undertake some part-time work to supplement government subsidy. Overall, the quality of PhD education remains uneven across locations and disciplines, depending on resources and sources of funding. The Senegal situation reflects that of other systems throughout Africa where ambition to produce PhD graduates are not supported with adequate national resources, and thereby leaving financial support for PhD training to individuals or external support in ways that detach the type and quality of PhD training from institutional and national level priorities.

2.6.2 The challenge of expanding the system in ways that create equity and quality: Increasing university access at all levels remains a challenge to and has implications to the overall environment for offering PhD training. Only a small percentage of the population (around 10%) have access to higher education (MESRI, 2019). This has forced the government to concentrate resources in expanding undergraduate enrolments at the expense of resourcing postgraduate training. Expanding undergraduate enrolments without quality postgraduate training however creates a dysfunctional cycle where poorly prepared undergraduate students are seeking to study Masters' and doctoral programmes, and therefore in essence undermining the quality of the entire system. Gender disparities are also widespread in the system with only 29% of researchers with PhD qualifications being women in 2018(MESRI, 2019).

2.6.3 Governance, fragmentation and weak coordination of higher education and research system: As has been detailed in the report, several research institutions are linked to specific sectors, but the provision of opportunities for PhD training does not exist. However, the external research institutions are not directly under MESRI and align more with their parent ministries for policy and operational issues including budgets. In terms of designing collaborative programmes, the situation means that ARUA will have to negotiate with the different ministries and sectors where these institutions fall. This will be complicated as it will require multiple collaborative agreements and as the institutions are not degree awarding institutions.

2.6.4 Outdating quality infrastructure: Interviews with the VC(UCAD) and the director of academic research (UCAD) did reveal the seriously poor state of physical and human infrastructure for PhD education. Despite some investment in infrastructure, often supported by international donor financing or private sector partnerships, the necessary physical

environment and equipment to conduct high-quality research in Senegal universities remain a challenge. The human component of the infrastructure is also weak, both in terms of researchers supervising PhD students and qualified administrative professionals to manage the day-to-day affairs of PhD students and programmes. While the supervision guidelines require one lecturer to supervise not more than 10 post-graduate students, the inadequate number of qualified supervisors has resulted in situations where one supervisor is allocated up to 40 students in some programmes. This complicates the quality of supervision and completion rates.

2.6.5 Language: Most of the PhD programmes are offered in French, with course materials also in French. This limits the capacity for designing collaborative programmes with universities in Anglophone countries. UCAD has however started addressing the challenge by introducing semester long language courses for all those registered for PhD programmes. This means that for Francophone students, working knowledge of English is imperative. This is also the requirement for students coming from Anglophone countries who must undertake part of their work in French.

3. Overview of the Case Study University: Cheikh Anta Diop University (UCAD)

3.1 Cheikh Anta Diop University (UCAD)

The University of Cheikh Anta Diop (UCAD) is Senegal's oldest and largest institution, by student numbers and number of programs. Established on 24 February 1957 as the University of Dakar, and officially inaugurated on 9 December 1959 the university has evolved through phases; from a single African School of Medicine in 1918; to the creation of the French Institute of Black Africa (IFAN) in 1936; the creation of a Certificate of Physics, Chemistry and Biology (PCB), preparatory to medical studies; and the opening in the early 1950s of higher schools academically attached to the University of Bordeaux within the framework of what was called the Institute of Higher Studies of Dakar. To date, the academic programmes of UCAD are organised in the following:

- 48 institutions
- 12 institutions with faculty rank
- 22 university institutes
- 14 Faculty institutes
- 73 Departments
- Seven doctoral schools
- the Interstate School of Veterinary Sciences and Medicine which is scientifically dependent on the university.

UCAD is the largest French-speaking university in West Africa with nearly 90,000 undergraduate students. The research system at UCAD is structured around a Research Directorate, which is the steering body, a Scientific Council, the Cooperation Directorate, the Intellectual Property and Research Results Valorisation Service, and the Research Ethics Committee.

UCAD houses three (3) World Bank centres of excellence:

- CEA-SAMEF (Mother and Child Health)
- CEA-AGRISAN (Agriculture for Food and Nutritional Security)
- CEA-AGIR (Environment, Health, Societies)

In terms of existing infrastructure for collaboration in doctoral training, UCAD promotes itself as both an African university and a university open to the world. UCAD cooperates with partner

universities worldwide, and is a member of international mixed structures of training and research:

- International Mixed Unit (UMMISCO): UCAD-IRD-UGB-Université Pierre et Marie Curie-Université Yaoundé 1- Université Cadi Ayyad Marrakech- Institut de la Francophonie pour l'Informatique Hanoi
- International Joint Unit "Environment-Society-Health": UCAD-CNRS France-CNRST Burkina Faso-University of Bamako
- Partnership Research Unit Pastoral Drylands (PPZS): CIRAD-UCAD-ISRA-CSE-ESEA

The university also has more than 90 ongoing research projects funded by various partners (USAID, H3 Africa, IDRC, European Commission) and more than 100 cooperation agreements (47% Europe; 36% Africa; 10% America and 7% Asia). The Directorate of Cooperation is responsible for the management of research projects. Competitive funds are made available to the University in the framework of national and international cooperation. They are intended to finance research activities but also to pay for mobility grants. The university thus serves as an important nucleus for external support to higher education in Francophone Africa.

3.2 Recap of research focus and objectives and Methodology

The overarching objective of this research report is to respond to ARUA's objective to create globally competitive collaborative PhD programmes among ARUA member universities. More specifically the research seeks to identify selected PhD programmes at ARUA member universities, review the programmes and make recommendations to ARUA towards better collaboration across the Alliance. Data for the report has been obtained through a review of national level and institutional data sets and reports, external reports evaluating the academic programmes of higher education institutions in Senegal, government regulations on university academic programmes, internal institutional reports on PhD programmes, reports on the operations of Science Granting Councils and regional higher education reports within the context of ECOWAS. This information has been complemented by face-to-face interviews with the Vice-Chancellor (UCAD), the Deputy Vice-Chancellor (Research), and the Dean of the Legal, Political, Economic and Management Sciences (ED-EDJPEG) Doctoral School. The data has been analysed and reported according to three main themes: access to the programmes, structure of the programme and experience through the programme.

As the only member of ARUA from Senegal, UCAD was included as the sample institution to be studied in the project. Two PhD programmes were selected; one from the humanities and one from the natural sciences. However, the PhD programmes were selected through a negotiated approach between the research team and UCAD research office. While a set of criteria were proposed, the university had the discretion to suggest a preferred programme from the humanities and another from the natural science. These are the:

- Programme on Maternal and Child Health) in the Environmental, Health and Life Sciences doctoral school (ED-SEV). It is within this doctoral school that the CEA pour la Sante de la Mere is housed. This program was selected because it is part of the World Bank Centres of Excellence (CoE), and already has collaborative arrangements for doctoral education within the West African Region.
- Programme on Judicial Sciences in the Legal, Political, Economic and Management Sciences doctoral School. This programme was selected because of what is considered the centrality of legal training to higher levels, especially given the centrality of legal studies in negotiating internal treaties and agreements.

Tables 3 and 4 provided as appendices, show trends in PhD enrolment and graduation rates from UCAD. Note that the two programmes that have been selected have the highest enrolments and graduation rates over the last 5 years.

Table 3. Analysis of basic features of the PhD Programmes

	STEM	HUMANITIES
Name of program	Mother and Child Health	Doctor of Judicial Sciences
Academic home	Environmental, Health and Life Sciences (ED-SEV) Doctoral School	Doctoral School of Legal, Political, Economic and Management Sciences.
<i>Access features</i>		
Entry requirements	<p>Regulated by National Decree on Doctoral studies which stipulates that:</p> <ul style="list-style-type: none"> • To register for a doctorate, the candidate must hold at least a master’s degree, or a diploma deemed equivalent. • For registration, the candidate submits a file to the Director of the Doctoral School, and admission is determined by the Scientific and Pedagogical Council of the Doctoral School. • During initial registration, a thesis agreement is signed by the doctoral student, thesis director, the person in charge of doctoral training and the director of the Doctoral School. • Agreement defines the commitments, rights, and duties of each party. • Doctoral students need to be attached to a doctoral laboratory before admission. 	<p>Regulated by National Decree on Doctoral studies which stipulates that:</p> <ul style="list-style-type: none"> • To register for a doctorate, the candidate must hold at least a master’s degree, or a diploma deemed equivalent. • For registration, the candidate submits a file to the Director of the Doctoral School, and admission is determined by the Scientific and Pedagogical Council of the Doctoral School. • During initial registration, a thesis agreement is signed by the doctoral student, thesis director, the person in charge of doctoral training and the director of the Doctoral School. • Agreement defines the commitments, rights, and duties of each party. • Doctoral students need to be attached to a doctoral laboratory before admission.
Five-year enrolment trends	25 students on scholarship in the program (1559) within the Cluster	3826-Cluster highest number of enrolments.
Last five-year graduation Trends	162 from total Cluster (2 nd highest graduation rate.	271-Cluster with highest number of Graduations
Application Dates	Applications are open to 30 th November of each year for studies to commence in January of the following year	Applications are open to 30 th November of each year for studies to commence in January of the following year

Application process.	Detailed application guidelines provided by the National Decree on Doctoral Education Which include: <ul style="list-style-type: none"> • Open Calls from the school. • Registration authorization is given by the head of the institution on the proposal of the Director of the Doctoral School after consultation with the Scientific and Pedagogical Council of the Doctoral School. Registration must be renewed at the beginning of each academic year. • Students need to be attached to doctoral laboratory as a basis for admission. 	Detailed application guidelines provided by the National Decree on Doctoral Education Which include: <ul style="list-style-type: none"> • Open Calls from the school. • Registration authorization is given by the head of the institution on the proposal of the Director of the Doctoral School after consultation with the Scientific and Pedagogical Council of the Doctoral School. Registration must be renewed at the beginning of each academic year. • Students need to be attached to doctoral laboratory as a basis for admission.
Program cost	<ul style="list-style-type: none"> • Senegalese students and those within the WAEMU Region pay CFA 750,000(about \$1200) per year. • Senegalese students are given scholarships if they do not exceed the age of 30 when they first register. <p>For international students.</p> <ul style="list-style-type: none"> • internationals are governed by the same pedagogical rules as nationals but pay differentiated pedagogical fees according to their origin or the agreements that the State of Senegal has with their countries of origin. • All educational costs are managed by the accounting structures of UCAD 	About \$ 1500 per year -International students pay different rates
<i>Structure of the programme</i>		
Credit system	The National decree for Doctoral Education provides that: <ul style="list-style-type: none"> • The Doctoral Schools are accredited by the Rector, after consulting the scientific council of the University and the Assembly of the University, for a renewable period of six years after evaluation by the Scientific Council of the University. The Scientific Council of the University is composed of:	The National decree for Doctoral Education provides that: <ul style="list-style-type: none"> • The Doctoral Schools are accredited by the Rector, after consulting the scientific council of the University and the Assembly of the University, for a renewable period of six years after evaluation by the Scientific Council of the University. The Scientific Council of the University is composed of:

	<ul style="list-style-type: none"> • The Director or Head of Research, President. • The Director of Education and Reform. • The Director of Cooperation • Directors of Doctoral Schools. • ten (10) teacher-researchers and rank A researchers chosen by the Rector for their scientific skills after consultation with the select council • The accreditation of a Doctoral School may be requested by one or more teaching establishments of the Cheikh Anta DIOP University of Dakar. • By agreement, other higher education or research establishments in Senegal or abroad can be partners of the accredited doctoral schools, by providing teaching within these doctoral schools and/or by hosting students in training in their laboratories. The list of these establishments appears in the application for accreditation. 	<ul style="list-style-type: none"> • the Director or Head of Research, President. • the Director of Education and Reform. • the Director of Cooperation • Directors of Doctoral Schools. • ten (10) teacher-researchers and rank A researchers chosen by the Rector for their scientific skills after consultation with the select council • The accreditation of a Doctoral School may be requested by one or more teaching establishments of the Cheikh Anta DIOP University of Dakar. • By agreement, other higher education or research establishments in Senegal or abroad can be partners of the accredited doctoral schools, by providing teaching within these doctoral schools and/or by hosting students in training in their laboratories. The list of these establishments appears in the application for accreditation.
Duration of program	<ul style="list-style-type: none"> • The preparation of the Doctorate is conducted in three years. • An additional period may be granted by way of derogation by the head of the establishment on the proposal of the Director of the Doctoral School after consulting the scientific and educational council of the Doctoral School. • Students though take up to 7-10 years due to funding and supervisory challenges. 	<ul style="list-style-type: none"> • The preparation of the Doctorate is conducted in three years. • An additional period may be granted by way of derogation by the head of the establishment on the proposal of the Director of the Doctoral School after consulting the scientific and educational council of the Doctoral School. • Students though take up to 7-10 years due to funding and supervisory challenges.
Course design (thesis only)	<p>The preparation of the Doctorate includes:</p> <ul style="list-style-type: none"> • theoretical, methodological, and practical lessons. • research work and the writing of a thesis. • The organization of theoretical, methodological, and practical 	<ul style="list-style-type: none"> • Coursework that usually covers 60 credits, while the writing and defence of the thesis accounts for 120 credits. The doctoral schools have scientific councils responsible for the development and adoption of internal rules and regulations, the examination of PhD applications.

	<p>teaching is determined by the Doctoral School.</p> <ul style="list-style-type: none"> • The research work is conducted individually under the control and responsibility of a thesis supervisor. • Doctoral students participate in training, teaching, seminars, and internships provided by the Doctoral School and in student tutoring. • During their doctoral training, doctoral students participate in courses, seminars, conferences, workshops, missions, and internships organized by the Doctoral School <p>The Doctorate degree sanctions a level corresponding to the obtaining of 180 credits distributed as follows:</p> <ul style="list-style-type: none"> • Teaching (theoretical, methodological, and practical) and work or research activities: 60 credits. • Thesis (written document and defence): 120 credits. • All students take mandatory English Language Lessons. 	<ul style="list-style-type: none"> • Course divided into core modules involving methods, procedures, and systems, Constitutional and Administrative Law, Contract Law, and Criminal Law as compulsory units. Year 2 and 3 provides a variety of options to pick. • All students take mandatory English Language Lessons • During their doctoral training, doctoral students participate in courses, seminars, conferences, workshops, missions, and internships organized by the Doctoral School.
Supervisory model	A Collaborative supervisory model where one supervisor must come from outside the institution/international is provided.	A Collaborative supervisory model where one supervisor must come from outside the institution/international is provided.
Graduation requirement (paper, etc)	<p>Detailed procedure provided by the national Decree on Doctoral Education includes:</p> <ul style="list-style-type: none"> • The doctorate is issued after evaluation of the candidate's knowledge, of his work or research activity and of the defence of his thesis. • The methods of control of knowledge and work or research activities are decided by the Doctoral School • The terms and conditions for the defence of a thesis are determined by the Rector after consultation with the University Assembly. • The candidate's thesis is examined by three rapporteurs belonging to 	<ul style="list-style-type: none"> • The doctorate is issued after evaluation of the candidate's knowledge, of his work or research activity and of the defence of his thesis. • The methods of control of knowledge and work or research activities are decided by the Doctoral School • The terms and conditions for the defence of a thesis are determined by the Rector after consultation with the University Assembly. • The candidate's thesis is examined by three rapporteurs belonging to the body of teacher-researchers or researchers of rank A. The Thesis Director may be rapporteur.

	<p>the body of teacher-researchers or researchers of rank A. The Thesis Director may be rapporteur.</p> <ul style="list-style-type: none"> • Rapporteurs from outside higher education or research establishments may be called upon. • The rapporteurs make known their opinion in writing. The quality of the thesis, both in substance and in form, is considered in this assessment. • The reports are analysed by the Thesis Curator of the Doctoral School who draws up a report for the attention of the Director of the Doctoral School. • Authorization to defend is granted by the Rector after consulting the Head of the establishment, the Director of the Doctoral School, the Curator of Doctoral School theses, the person in charge of doctoral training, on the proposal of the Director of thesis. • The duties of the thesis director are exercised by teacher-researchers or rank A researchers from higher education or research establishments. • The defence jury is appointed by the Director of the Doctoral School on the proposal of the head of doctoral training and the thesis director. • It is made up of four to six members, including the thesis director. One of the members of the jury must be outside the Doctoral School. • All the members of the jury must be teacher-researchers or researchers of rank A or external personalities chosen by the Director of the Doctoral School because of their skills, on the proposal of the head of doctoral training and the thesis director. • The president of the jury must be a teacher-researcher or a researcher 	<ul style="list-style-type: none"> • Rapporteurs from outside higher education or research establishments may be called upon. • The rapporteurs make known their opinion in writing. The quality of the thesis, both in substance and in form, is considered in this assessment. • The reports are analysed by the Thesis Curator of the Doctoral School who draws up a report for the attention of the Director of the Doctoral School. • Authorization to defend is granted by the Rector after consulting the Head of the establishment, the Director of the Doctoral School, the Curator of Doctoral School theses, the person in charge of doctoral training, on the proposal of the Director of thesis. • The duties of the thesis director are exercised by teacher-researchers or rank A researchers from higher education or research establishments. • The defence jury is appointed by the Director of the Doctoral School on the proposal of the head of doctoral training and the thesis director. • It is made up of four to six members, including the thesis director. One of the members of the jury must be outside the Doctoral School. • All the members of the jury must be teacher-researchers or researchers of rank A or external personalities chosen by the Director of the Doctoral School because of their skills, on the proposal of the head of doctoral training and the thesis director. • The president of the jury must be a teacher-researcher or a researcher from the Cheikh Anta Diop University of Dakar. The thesis
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	<p>from the Cheikh Anta Diop University of Dakar. The thesis director cannot be president of the jury.</p> <ul style="list-style-type: none"> • The defence is public. Before the defence, the summary of the thesis is distributed within the University. • Admission is pronounced after deliberation by the jury. Admission results in the awarding of one of the following honours: <ul style="list-style-type: none"> - Honourable - Very honourable • The president of the jury draws up a defence report, countersigned by all the members of the jury. • The Doctorate degree is issued by the Cheikh Anta Diop University of Dakar on the assent of the jury, after the defence of the thesis. • On the doctoral degree issued, appear the seal of the University Cheikh Anta Diop of Dakar, the title of the thesis, the field, the mention or the discipline, the specialty and the mention obtained by the candidate. • Obtaining the doctoral degree confers the rank of doctor 	<p>director cannot be president of the jury.</p> <ul style="list-style-type: none"> • The defence is public. Before the defence, the summary of the thesis is distributed within the University. • Admission is pronounced after deliberation by the jury. Admission results in the awarding of one of the following honours: <ul style="list-style-type: none"> - Honourable - Very honourable • The president of the jury draws up a defence report, countersigned by all the members of the jury. • The Doctorate degree is issued by the Cheikh Anta Diop University of Dakar on the assent of the jury, after the defence of the thesis. • On the doctoral degree issued, appear the seal of the University Cheikh Anta Diop of Dakar, the title of the thesis, the field, the mention or the discipline, the specialty and the mention obtained by the candidate. • Obtaining the doctoral degree confers the rank of doctor
<i>Experience through the program</i>		
Quality of staff% PhD / Professors	Each supervisor is supposed to have 10 students annually, though others have up to 40 due to staff shortages	<ul style="list-style-type: none"> • Each supervisor is supposed to have 10 students annually, though others have up to 40 due to staff shortages
Quality of infrastructure (library, labs, ICT etc)	<ul style="list-style-type: none"> • 133 research Laboratories for the whole doctoral school 	<ul style="list-style-type: none"> • Not established. Teaching is multi-disciplinary
Program highlight.	One of the World bank Centres of Excellence, the program has undergone the process of accreditation first at the national, regional, and internationally through the French accreditation agency and through the Royal College of Physicians and Surgeons of Canada.	Critical to training high level legal skills especially in Senegal/Africa's extractive sector
Any compulsory components?	No. Teaching is multidisciplinary drawing from all programs of the school.	

Aspirations towards collaboration	Yes. Collaborative structures exist	
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3.2 Key Study Findings.

In terms of access, policies are fully developed and UCAD does provide ease of access for national and regional students. Policies on regionalization, harmonization and internationalization have also been developed. The adoption of the LMD reform, though it faced resistance at the beginning, has now been fully implemented and has broadened access options for national, regional, and international students.

Access to PhD programmes however remains constrained by funding and internal institutional capacity. As has been discussed on the general options for accessing PhD education in, the doctoral school is central. Each Doctoral school is linked to a number of laboratories which are entry points for students seeking admission to PhD training. The relationship between a student seeking admission and a doctoral laboratory is somehow informal. It requires a student to identify a supervisor/mentor at the laboratory whose availability will determine the acceptance of the student’s application for admission to a doctoral school through the graduate school. This lack of capacity at the level of the doctoral laboratory (supervisors and mentors) may present a problem to ARUA in terms of negotiating collaborative programmes. What this means is that the issue of capacity at the doctoral laboratory will need to be addressed as part of the whole collaborative arrangement. Like it is in most African countries, the UCAD situation shows a contradiction between robust policies to broaden access into PhD programmes and constrained actual admissions due to capacity.

In terms of programme **structures** and design, the adoption of the LMD reform has harmonised programme duration to a minimum of three years. It has also made it possible for systems of credit transfers from other institutions to UCAD. This is positive in terms of ARUA ‘s desire for flexible entry and exit structures. Programme progression is however multidisciplinary where a doctoral school draws faculty from different related disciplines and engage the students through workshops, seminars and symposia before the student registers the proposal and proceeds for fieldwork. A PhD by course work and thesis does not exist as such, but the preparatory work of the PhD student revolves around a series of seminars organised by the doctoral schools. The process of PhD training is standardised through a decree for doctoral

education issued by the government, and this governs the structure and process throughout all the higher education institutions in Senegal. The decree provides for intricate details such as processes of thesis defence which in the other universities, is a function undertaken by the university or faculty.

In terms of **structures** for designing collaborative programmes, UCAD has a developed framework in place. The university has more than 200 international cooperation agreements all duly entered through MOUs. The university has several ongoing inter-university collaborations on various academic disciplines for the purposes of staff exchange and theses supervision. These types of collaboration are formal or informal, depending on whether the recipient institutions approached the Department or the researcher directly. UCAD sets up cooperation agreements based on the capacity needs of its various faculties and units.

The quality of student **experience** however remains wanting. This is because of low funding for PhD programmes, low supervisory capacity, and lack of proper coordination between the different funding streams and institutions that collaborate with the university and play a vital role in the PhD training eco-system. UCAD however has a framework for collaborative supervision where each doctoral student must be supervised by one supervisor from an external institution. Table 5 below summarises some of these key characteristics related to access, programme structure, and student experience which would be key elements to guide specifically the inclusion of UCAD as part of collaborative PhD programmes across the alliance.

4. Example of Collaborative Doctoral Programme:

4.1 Doctoral Research Programme on Climate Change Economics

The doctoral programme in Climate Change Economics highlighted here is a collaborative programme under the auspices of the West African Science Service Centre on Climate change and Adapted Land use (WASCAL) and funded by the Germany Federal Ministry of Education and Research. The focus is capacity building by facilitating academic exchanges and doctoral training for universities in 10 West African countries in collaboration with German institutions through the Graduate Studies Programme (GSP). WASCAL is majorly funded by German Federal Ministry of Education and Research (BMBF). The head offices are in Accra, Ghana. The programme selects students from each of the WASCAL member countries through open calls for applications (scholarship and fee-paying students). Table 6 below summarises the key features of the programme that might be of interest to ARUA for purposes of benchmarking.

Table 4. Summary of key characteristics of the WASCAL Collaborative Programme

Access and Admission and membership	Programme Structure and Focus	Funding and management
<ul style="list-style-type: none"> • Open to doctoral students from 11 WASCAL partner countries. • The countries are Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Ghana, Gambia, Mali, Niger, Nigeria, Senegal, and Togo, plus their ministries of education and Research • 16 universities drawn from the 11 West African Member Countries. • 8 German Universities. • 6 National Meteorological services West Africa. • 6 National Water Resource management authorities. • 6 National Agricultural Research systems. • 13 international and Regional Research institutions. • Language of all the programmes is English, but applicants are not rejected should they only have a 	<ul style="list-style-type: none"> • Research strengthening the research infrastructure and capacity in West Africa related to climate change. • Pools the expertise of ten West African countries and Germany. • Graduate Studies Programme involves creation of ten graduate schools in West Africa, each hosted at a member University. • Doctoral Centre for Climate Change Economics hosted by UCAD. • The (10) Doctoral programmes and six (6) Master's programmes are autonomous and based at one lead university selected in a consultative process • The graduate programmes pool the scientific and educational strength of faculties in the West African region and thereby facilitate high quality research and education. • Interdisciplinary Approach cross-linking experts and university institutes between the sixteen (16) identified priority fields across the host universities. 	<ul style="list-style-type: none"> • Funded by the German Federal Ministry of Education and Research (BMBF). • 16 Board members drawn from all the member countries and institutions, including Germany. • 11 Scientific Advisory members, drawn from member universities and Germany. • Both Board membership and Scientific advisory committee has membership from governments in both West Africa and Germany. • The overall programme is coordinated by the Capacity Building Department located at WASCAL Headquarters in Accra.

<p>limited command of the English language. Language training programmes for graduate students are provided for both English and French.</p>	<ul style="list-style-type: none">• German partner universities collaborate with the Doctoral and Masters' Programmes through curriculum development, visiting professorships and co-supervision of graduate students.• West African students and faculty members are given the opportunity to conduct research at German universities or to visit counterpart research institutions.	
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5. Recommendations and conclusions

5.1 Recommendations

In closing, the report considers the key findings from this investigation, while also reflecting on emerging international practices in designing collaborative doctoral education programs. Literature on establishing a General Framework which provides a set of principles around the research environment, outcomes, admission policy and criteria, PhD training programs, supervision, content of PhD theses, theses assessment, and graduate school structure from the following existing programs have been referenced.

- In the EU, the Organisation for PhD Education in Biomedicine and Health Sciences in the European System, or ORPHEUS, which was founded in 2004.
- International Collaboration in Doctoral Education through the European PhD Hub project.
- Existing initiatives in Africa, for example the AERC, RISE and RUFORUM.

The following appears as the most important considerations to be made.

- At the National level, two issues need to be considered. The first is the issue of regulation, and the second is the issue of funding. The case of Senegal, where doctoral programs are broadly regulated at the national level and institutions left to implement the details of the program provides an example of good practice in instances where institutions attenuate the quality of programs when they are left to self-regulate. In this case, *collaborative doctoral programs may need to be submitted to oversight by supra-national institutions linked to higher education quality assurance bodies*. Institutions in the collaborative arrangement will need to apply through the supra-national bodies.
- Regarding funding, even where existing collaborative arrangements are working, the *dependency on external funding could compromise the success of the programs*. Hence exploring other possibilities of African governments funding the programs through a tax mechanism remitted to the African Union and shared among the collaborating institutions is recommended. Regional organisations supported by governments and hosted in universities such as UCAD show more resilience, capacity to attract external support and influence national policies in relevant areas. This is a potential role ARUA could play in coordinating collaboration and funding opportunities for member universities.

At the institutional level, the issue is what form should collaborative models take in terms of institutional level structures for collaboration, program design, format, and delivery. Two models are recommended for consideration.

- First is ***where program collaboration between universities is administered by an external body to the collaborating institutions but offered/hosted within universities***. The strength of such an arrangement is that the external entity takes responsibility for fundraising and selecting students while the universities focus on delivering the curriculum jointly developed. Several existing collaborative programs on the continent, for example, WASCAL, RISE, RUFORUM, AERC, are based on this model. The academic aspects of the program are overseen by an advisory board constituted by all the collaborating institutions. This means that students from a number of universities will be supported to pursue their program in a host university, which is a member of the collaborative arrangement.
- The other model, ***where institutions initiate and manage collaborative arrangements almost bilaterally appears to be weak and unsustainable in its funding and program duration***. Most often the emphasis is on private benefits from individual academics or the partnering institutions with the welfare of the students not always the main driver of the collaboration. ARUA can use its centre of excellence vehicle to integrate some of the bilateral collaboration programs with its member universities. This will ensure sustainability and quality.
- In terms of program delivery, especially for programs that entail a course work component, ***a virtual design will be the better alternative to cut costs for centralized curriculum delivery***. The advent of Covid-19 has emphasized the range of possibilities for distance and ICT integration in collaboration across space and time.

5.2 Conclusions

This report, based on the case of UCAD, demonstrates the existing capacity to offer collaborative academic programs between African universities. This capacity has been developed at a regional level. UCAD hosts several doctoral/research programs that serve the ECOWAS region. While the capacity for managing such programs at a regional level is now established, few initiatives exist to show how this can be undertaken at a pan-African level.

The impact of the collaborative programs also seems to be limited by a number of factors. While there is much potential for UCAD to play an active collaborative role within the West African region, it can also enhance its role on the continent through active collaboration within the ARUA fraternity. How successful this is will depend on a number of factors dependent on the Senegalese government, the UCAD as an institution and ARUA as the umbrella body.

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Appendices

Appendix 1

Table 5. UCAD: ,2016-2021. Cumulative Doctoral Enrolments

Doctoral Schools	2016-2017			2017-2018			2018-2019			2019-2020			2020-2021			Grand Total
	F	M	Total	F	M	Total	F	M	Total	F	M	Total	F	M	Total	
Arts, Culture and Civilizations (ED-ARCIV)	48	151	199	41	162	203	58	220	278	60	203	263	53	217	270	1,213
Water Quality and Water Use (ED-EQUE)	17	59	76	15	65	80	16	67	83	15	58	73	13	51	64	376
Studies on Human Beings and Society (ED-ETHOS)	53	150	203	46	169	215	49	178	227	53	206	259	52	185	237	1,141
Mathematics and Computer Science (ED-MI)	30	134	164	28	145	173	29	162	191	26	121	147	12	103	115	790
Physics, Chemistry, Earth and Universe Sciences and Engineering (ED-PCSTUI).	50	280	330	58	278	336	59	257	316	35	193	228	44	195	239	1,449
Environmental, Health and Life Sciences (ED-SEV).	103	190	293	124	202	326	129	205	334	113	174	287	119	200	319	1,559
Legal, Political, Economic and Management Sciences (ED-EDJPEG).	164	538	702	180	616	796	176	628	804	183	627	810	162	552	714	3826

Table 6. Graduation trends

Doctoral School	Enrolment Trends					Total
	2016	2017	2018	2019	2020	
Arts, Cultures and Civilizations (ED-ARCIV)	11	30	25	14	29	109
Water quality and Water Use (ED-EQUE)	8	8	9	9	5	39
Studies on the Human Being and Society (ED-ETHOS)	23	14	12	17	7	73
Mathematics and Computer Science (ED-MI)	25	13	10	20	30	98
Physics, Chemistry, Earth and Universe Sciences and Engineering (ED- PCSTUI)	26	54	27	32	23	162
Environmental, Health and Life Sciences (ED-SEV)	26	54	27	32	23	162
Legal, Political, Economic and Management Sciences (ED-EDJPEG)	76	51	54	50	40	271

