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ANNEX 19

to the Commission Implementing Decision on the financing of the multiannual action plan in favour of Sub-Saharan Africa for 2024-2025

Action Document for 'AfricaConnect 4"

MULTIANNUAL PLAN
This document constitutes the multiannual work programme within the meaning of Article 110(2) of the Financial Regulation, and an action plan within the meaning of Article 23 of the NDICI-Global Europe Regulation.

1 SYNOPSIS

1.1 Action Summary Table

1. Title **CRIS/OPSYS business reference** **Basic Act**	AfricaConnect 4 OPSYS number: ACT-62327 Financed under the Neighbourhood, Development and International Cooperation Instrument (NDICI-Global Europe)
2. Team Europe Initiative	Yes, D4D for Digital Economy and Society in Sub-Saharan Africa
3. Zone benefiting from the action	The action shall be carried out in Sub-Saharan Africa
4. Programming document	Multi-Annual Indicative Programme for Sub-Saharan Africa 2021-2027
5. Link with relevant MIP(s) objectives / expected results	Priority Area 4: Digital, Science, Technology and Innovation Specific Objective 1: Support an inclusive and human-centric Digital transformation in Africa Result 1.2: Equitable access to affordable, secure and quality digital infrastructures is enhanced.
PRIORITY AREAS AND SECTOR INFORMATION	
6. Priority Area(s), sectors	Sub-Saharan Africa Regional MIP Priority Area 4: Digital, Science, Technology and Innovation Digital Transformation 220 – Communications
7. Sustainable Development Goals (SDGs)	Main SDG (1 only): SDG 9 (Industry, Innovation, and Infrastructure) Other significant SDGs (up to 9) and where appropriate, targets: SDG 4 ("Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all") SDG 5 (Gender Equality)

	SDG 8 (Decent Work and Economic Growth) SDG 13 (Climate Action) SDG 17 (Partnerships for the Goals)			
8 a) DAC code(s)	22040 - Information and communication technology (ICT) 87 % 11120 - Education facilities and training 13 %			
8 b) Main Delivery Channel	European Commission - Development Share of Budget - 23000			
9. Targets	☐ Migration ☒ Climate ☐ Social inclusion and Human Development ☒ Gender ☐ Biodiversity ☒ Education ☐ Human Rights, Democracy and Governance			
10. Markers **(from DAC form)**	**General policy objective** @	**Not targeted**	**Significant objective**	**Principal objective**
	Participation development/good governance	☒	☐	☐
	Aid to environment @	☐	☒	☐
	Gender equality and women's and girl's empowerment	☐	☒	☐
	Reproductive, maternal, new-born and child health	☒	☐	☐
	Disaster Risk Reduction @	☒	☐	☐
	Inclusion of persons with Disabilities @	☒	☐	☐
	Nutrition @	☒	☐	☐
	RIO Convention markers	**Not targeted**	**Significant objective**	**Principal objective**
	Biological diversity @	☒	☐	☐
	Combat desertification @	☒	☐	☐
	Climate change mitigation @	☐	☒	☐
	Climate change adaptation @	☐	☒	☐
11. Internal markers and Tags:	**Policy objectives**	**Not targeted**	**Significant objective**	**Principal objective**
	Digitalisation @	☐	☐	☒
	digital connectivity digital governance digital entrepreneurship digital skills/literacy	YES ☒ ☐ ☐ ☒	NO ☐ ☒ ☒ ☐	

	digital services	☒	☐	
	Connectivity @	☐	☐	☒
	digital connectivity energy transport health education and research	YES ☒ ☐ ☐ ☒	NO ☐ ☒ ☒ ☐	
	Migration @	☒	☐	☐
	Reduction of Inequalities @	☒	☐	☐
	Covid-19	☒	☐	☐
BUDGET INFORMATION				
12. Amounts concerned	Budget line(s) (article, item): 14.020120 : EUR 7 000 000 14.020121 : EUR 13 000 000 14.020122 : EUR 20 000 000 Total estimated cost: EUR 40 000 000 Total amount of EU budget contribution: EUR 40 000 000 This action is contributing to the Regional TEI 'D4D for Digital Economy and Society in Sub-Saharan Africa' of which Belgium, Estonia, Finland, France, Germany, Lithuania, Luxembourg, the Netherlands, Portugal, Spain and Sweden are part. For the time being, there are no indicative TEI MS contributions available.			
MANAGEMENT AND IMPLEMENTATION				
13. Type of financing	**Direct management** through: - Grants **Indirect management** with the entity(ies) to be selected in accordance with the criteria set out in section 4.4.2			

1.2 Summary of the Action

AfricaConnect is a partner-driven initiative belonging to the area of digitalisation that has been funded by the European Commission since 2011. Over the years, the project has had a positive impact on the creation, evolution of African Regional and National Research and Education Networks (RENs) and supported the provision of connectivity networks, data/cloud infrastructures and e-services (incl. Moodle, Eduroam, videoconferencing, identity federation, open science platforms, cybersecurity) to over 1700 institutions and 4.5 million end-users in the research and education sector (incl. universities, research and education centers, public libraries, TVET schools, teaching hospitals etc).

In Africa, RENs are increasingly recognised as key enablers of sustainable development, being drivers of digital transformation of the Research and Education (R&E) sector and scientific/academic collaboration. They can be considered valuable partners for the delivery of EU's objectives in the area of Digitalisation, Science, Technology and Innovation.

The project is structured in two geographic clusters: East and Southern Africa, and West and Central Africa. The present action seeks to consolidate the results of the previous phase (AfricaConnect3) and to further expand the scope of the activities under the two geographic clusters in order to unlock the potential of research and education in Africa through access to digital infrastructures and technologies and the adoption of open science practices (Overall Objective). Particular attention will be given to: streamlining support to environment/climate change

adaptation and mitigation across the action's activities and boosting the regional e-learning offer.

More specifically, the action will support:

- the strengthening of African Regional Research and Education Networks (RRENs) and National Research and Education Networks (NRENs)'s capacity to serve R&E institutions and their end-users (Specific Objective 1);
- the expansion, upgrade and maintenance of high-speed digital connectivity networks provided by RENs for the benefit of R&E institutions and their fast-changing digital connectivity needs (Specific Objective 2);
- the provision by the RENs of data infrastructures for storage, management, analysis, exchange and re-use of research scientific data and the delivery of digital services pivotal to the work of R&E communities (Specific Objective 3).

The action is aligned with the EU Global Gateway Strategy, and a concrete deliverable of the Africa-Europe Investment Package announced at the EU-Africa Summit in February 2022. It reflects SSA Regional MIP Priority 4 Digital Specific Objective 1: Support an inclusive and human-centric Digital transformation in Africa, Result 1.2. Equitable access to affordable, secure and quality digital infrastructures is enhanced, supporting affordable access and use of connectivity for Research& Education Networks and their communities.

1.3 Zone benefitting from the Action

The Action shall be carried out in Sub- Saharan countries, all included in the list of ODA recipients.

2 RATIONALE

2.1 Context

Digital transformation is a key factor for the growth of the Research and Education (R&E) sector in Africa. The complexity of today's most pressing challenges, starting with the climate crisis, requires global, national, and local action informed by multidisciplinary research.

The ability of the Sub-Saharan Africa (SSA)'s R&E sector to feed the decision making process with evidence-based scientific data and to contribute to the global research and innovation output is highly dependent on the availability of digital means, notably the access to high-speed internet networks, data infrastructures and e-services pivotal to the work of students and researchers, their collaboration and knowledge sharing across different disciplines and locations. More broadly, it has become imperative to make education more accessible and inclusive through the use of innovative digital technologies.

In Africa, National and Regional Research and Education Networks (NRENs, RRENs) are increasingly recognised as key players for the realisation of this ambition. They play a critical role in the digitalisation of research and education in Africa by providing access to essential connectivity, digital resources, and training to R&E communities. They are community aggregators, catalysers of best practices and strong promoters of open science across the continent, whose main objective is to make African scientific research output publicly available and accessible. This enables knowledge production, research collaboration, and exchanges among researchers, policymakers and the public for concrete solutions to key sustainable development challenges.

Having acknowledged their strategic relevance, since 2011 the European Union (EU) has been supporting RENs and their delivery of high-quality connectivity networks, data infrastructures and e-services via AfricaConnect. Since its inception, the project has boosted the gradual expansion of African RRENs' networks, their capacity building offering to the NRENs and the overall open science movement in Africa, which aims to make scientific research accessible to all levels of society (including: women, people living in remote areas, disadvantaged and marginalised communities). Enabled by AfricaConnect, RRENs have acted as catalysers of growth and interconnection of NRENs within each sub-region, fostering research collaboration, digital transformation and digital skills development. Through digital partnerships, the EU seeks to develop a fair and inclusive digital economy that leaves no one behind. The EU's human-centric approach enshrines core values and principles such as

trust, security, openness, and inclusiveness in robust regulatory frameworks. These values ensure that local businesses can reap the benefits of the digital revolution, people's privacy is protected and democratic societies can prosper in the digital age.[1]

The importance of the role of RENs for the delivery of key infrastructures and tools for R&E has been embedded in key African continental and regional institutions' strategies/agendas.
At continental level, the Action aligns with Goal 10 of the Africa Union (AU)'s Agenda 2063 which specifies 'World class infrastructure criss-crosses Africa', as well as with the AU's Digital Transformation Strategy (DTS).[2] As per the AU Digital Education Strategy, the AU aims to build the capacity of AU Member States in digital infrastructure (networks and resources) for digital education and research, develop and implement an NREN roadmap and business plans by leveraging the expertise and experience of the African RRENs, and to support new and fledging NRENs (having an NREN in every country by 2027). AfricaConnect contributes to the achievement of Action 4 (Sustainable NRENs in Africa Initiative), Action 6 (Regional Support for Digital Content and e-learning Platforms), and Action 11 (Regional Platform for Digital Education Research and Knowledge Exchange).[3] Thanks to its role of open science enabler and catalyser, the AfricaConnect project supports African countries' implementation of the UNESCO Recommendations on Open Science.[4]

At regional level, Regional Economic Communities (RECs) such as the Southern African Development Community (SADC), the Eastern African Community (EAC), the Economic Community of West African States (ECOWAS) and the West African Economic and Monetary Union (UEMOA) promote the establishment and strengthening of NRENs as part of their regional strategic plans for boosting research and innovation capacity.

With regard to the EU agenda, the proposed action is a concrete deliverable of the EU Global Gateway Strategy, aiming to reinforce digital infrastructure and research, education and health systems in SSA partner countries. The Global Gateway Africa-Europe Investment Package announced at the EU-AU Summit in February 2022 stresses the strategic relevance of digital infrastructures for research, innovation and scientific cooperation. Support to RENs is highly linked with the Global Gateway investments in new digital infrastructure, RENs being close partners of the EU for the channelling of connectivity to targeted groups. It is also aligned with the 'EU Action Plan on Human Rights and Democracy 2020--2024' and the chapter "New Technologies: harnessing opportunities and addressing challenges".[5] The Action will contribute to the realisation of the EU Gender Action Plan 2021-2025 GAP III[6], in particular to its thematic area of engagement "Addressing the challenges and harnessing the opportunities offered by the green transition and the digital transformation" and "promoting economic and social rights and empowering girls and women".

2.2 Problem Analysis

As a result of the AfricaConnect project, Africa has seen monumental growth in the research and education networks on the continent. Despite its achievements, several challenges remain.

i. Lack of mature and sustainable RENs and political prioritisation in support of the REN ecosystem

The REN landscape in African countries is heterogeneous, with different levels of maturity and capacity to deliver services and infrastructures. In some countries, NRENs are not established at all or have very weak capabilities to support R&E communities. In the Eastern and Southern Africa region of 26 countries, 10 countries do not yet have an NREN and in the West-Africa region, 9 are yet to be established as only 13 of the 22 countries have an NREN, with about half of them in early-stage development. Despite the progress made by the RRENs, there is a need to set

[1] Source:https://international-partnerships.ec.europa.eu/policies/digital-and-infrastructure/responsible-digitalisation_en#fostering-a-fair-and-responsible-digital-economy
[2] Africa Union Digital Tranformation Strategy 2020-2030 The Digital Transformation Strategy for Africa (2020-2030) | African Union (au.int)
[3] Africa Union Digital Education Strategy 2023-2028 Digital Education Strategyand Implementation Plan | African Union (au.int)
[4] UNESCO Recommendations on Open Science Implementation of the UNESCO Recommendation on Open Science | UNESCO
[5] Source:EU Action Plan on Human Rights and Democracy 2020-2024.
[6] https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/gender-equality/gender-equality-strategy_fr#strat%C3%A9gie-en-faveur-de-l%C3%A9galit%C3%A9-hommes-femmes-2020-2025

up NRENs where absent while strengthen the delivery capacity of existing ones, and to promote long term financial sustainability of the RENs.

The absence of substantial public sector support is also related to a lack of strategic outreach of RENs in Africa and general unawareness of the benefits brought by RENs, which also limits NREN service uptake among the end-users. With structured and strategic outreach initiatives, NRENs can convey their value proposition to potential end-users and stakeholders. Collaborating with governments and advocating for support is crucial to securing funding and regulatory backing, essential for sustaining NREN operations and infrastructure. More effective engagement with policy makers and government authorities is necessary to prevent NRENs from being underfunded or overlooked, ensuring they have the resources to serve their communities optimally.

ii. Demand for high-quality connectivity networks at international, regional and national levels

Digital connectivity is the basic infrastructure required for the use of services/applications and for collaboration but African R&E institutions are currently among the least connected in the world. While infrastructure availability has significantly progressed over the recent years, the current broadband offering within Africa is limited. It is therefore a priority to facilitate access to adequate connectivity at affordable prices for the R&E institutions. The continent is in its second wave of submarine cable rollout on the western, eastern, and southern coasts, presenting tremendous opportunities for interconnecting the R&E sector.[7] Significant economies of scale can be achieved at national level through the NRENs, and at regional level through RRENs.

Improvements in broadband connectivity have to be carried out across the broadband value chain—at the international level where connectivity enters the country, at cross-border and regional levels, nationally, and at the institution level. The main barriers to utilising this connectivity are the limitations and inadequacies in national and regional backbone networks on the supply side and the challenges related to poor campus networks (together with the very limited individual access to computers) on the demand side. Campus networks are crucial because all student and staff devices must connect through a local wireless or wired network to access the internet and other academic and research resources. Regionally, there is a need for strengthening RRENs, which provide regional connectivity as well as upward connectivity to other regional networks to Europe and worldwide.

Current gaps in broadband connectivity of higher education in Africa highlight the importance of connecting over 15 million students and about 500,000 staff in higher education.[8] The World Bank estimates that the total cost of connecting African higher education institutions over the 2021–2025 period was USD 52 billion in total. This estimation included the expense of providing devices to students and staff (USD 17.3 billion), the expense of upgrading campus networks (USD 27.3 billion), bandwidth cost for upstream connectivity (USD 7.3 billion), and NREN and RREN development/support (USD 538 million). The EU remains the key partner and contributor towards achieving this goal.

iii. Lack of critical digital resources hampering Teaching, Learning and Research (across disciplines)

As they become more digitally-driven, R&E institutions need specific services to support their collaboration activities and to access resources worldwide. The lack of enabling infrastructures and services for knowledge production, access to data and processing capacities, research exchange and collaboration, is, among others, one of the key factors hampering research output as well as the quality of teaching and learning in Africa.

NRENs' added-value lies on the fact that they provide more than dedicated bandwidth to each of their member institutions. They also offer higher levels of security and unique services that differentiate them from commercial Internet Service Providers (ISPs), such as authentication and authorisation infrastructure (AAI), software licenses, library subscriptions, cloud computing services, computing hardware, e-learning and e-science applications as well

[7] World Bank Feasibility Study Connecting Higher Education Institutions in Africa Feasibility Study to Connect All African Higher Education Institutions to High-Speed Internet (worldbank.org)
[8] idem

as technical support. In Africa, emerging NRENs have a very limited offer of added value services which could jeopardise their sustainability.[9] RRENs need to expand the delivery of these services to reach members and their underserved institutions and end-users. Also, the capacity to use and manage these services is something which requires action.[10]

African RRENs should also tackle unique regional challenges and offer "new" services beyond the essential network service offers to its members. Taking the case of e-learning: the few textbooks and learning materials available for universities are often unaffordable for the vast majority of students, further exacerbating the social exclusion of economically disadvantaged students. Due to budgetary constraints, the required textbooks are often not available in the universities' libraries with those on the shelves, frequently out of date or not directly relevant to the courses on offer. The e-learning platforms and services offered by the RENs offer a solution to these issues. In addition, as proven during the covid-19 pandemic, the video tools provided by RENs enable educators to provide engaging and interactive content and facilitate communication and collaboration between students and teachers.

iv. Weak Engagement of Women in REN ecosystem and more generally in STEM (Science, Technology, Engineering and Mathematics)

Despite progress made in recent years, women in all their diversity and people with disabilities in STEM fields in Africa continue to face significant challenges such as gender stereotypes, lack of role models and mentorship, limited access to education and training, and discrimination in the workplace. These barriers not only limit women's individual opportunities but also hinder the overall progress and development of the continent. Specifically in relation to the REN ecosystem, women are still heavily unrepresented with gender equality far from being reached. It is crucial to address these issues and promote gender equality in the REN ecosystem, with great potential for women to become leaders within the REN ecosystem, to ensure that Africa's scientific and technological advancements are inclusive and representative of its diverse population. Women participation in decision-making and leadership positions are essential in order to achieve gender-responsive regulatory frameworks to unleash women's digital innovatory and entrepreneurship potential.[11]

v. Boost green innovation within the REN ecosystem and RENs contribution to climate change mitigation and adaptation

Climate change is a global challenge with Africa particularly vulnerable to its impacts. To cope with its effects African countries must implement adaptation strategies, such as improving water management, enhancing agricultural practices, diversifying livelihoods, and strengthening disaster risk reduction[12]; and mitigation strategies, such as promoting renewable energy, increasing energy efficiency, reducing deforestation[13]. Many African countries have developed Intended Nationally Determined Contributions (INDCs) which outline their commitments and plans for adaptation and mitigation and reflect the national priorities and circumstances of each country, as well as the opportunities and challenges for climate action. A review of the INDCs of 53 African countries found that the energy and agricultural sectors dominate in mitigation and adaptation actions, respectively.

[9] https://compendiumdatabase.geant.org/reports/nrens_services Examples of relevant services include videoconferencing, eduGAIN (enabling of information related to identity authentication and authorisation between participating federations to support access to services globally) and eduroam (provides an international roaming service for users in research and tertiary education, thereby facilitating students, staff and researchers' mobility by providing them with secure network access when visiting an institution other than their own), both developed by the Pan European RREN GÉANT.

[10] E.g., in the case of Trust and Identity, in order to have a functioning identity federation, Idp must be well managed at a campus/ institutional level

[11] EU GENDER ACTION PLAN (GAP) III with a specific focus on DigitalisTION

[12]Besada, H. and Sewankambo, NK. (2009) *Climate Change in Africa: Adaptation, Mitigation and Governance Challenges*. The Centre for International Governance Innovation. https://www.cigionline.org/publications/climate-change-africa-adaptation-mitigation-and-governance-challenges/.

[13]*Climate Change Adaptation in Africa.* United Nations Development Programme. https://www.undp.org/publications/climate-change-adaptation-africa.

The review also identified implementation gaps and needs, including financing, capacity building, technology transfer, and policy support.[14] The availability of R&E data sharing platforms together with open data publishing can play a critical role in addressing Africa's most pressing challenges such as climate change and its effects. RENs have the potential to be key promoters of green innovation and green technologies and support climate change adaptation/mitigation efforts in Africa via their delivery of infrastructures and services.

The key stakeholders of the AfricaConnect project are the **African Regional and National Research and Education Networks** (RRENs, NRENs). RENs are increasingly at the forefront of digital development in Africa. Beyond providing educational institutions with affordable and high speed internet connectivity and enabling R&E communities worldwide to connect with each other, RENs play critical roles in promoting open science, sharing open data and computational resources, and facilitating collaboration on global challenges like climate change and epidemics. They allow instructors, researchers, scientists and students to seamlessly access a wealth of invaluable R&E resources.

NRENs are mostly not-for-profit organisations that provide dedicated internet connectivity and services to education and research institutions in a country that are connected to the national R&E network, including universities, colleges and research centers, and sometimes even schools and teaching hospitals, depending on their mandate. The organisation behind an NREN operates a high performance communications network, owned and operated for -and by - the R&E community of a country. As such, they act as a "niche" Internet Service Provider (ISP) for R&E. They act as a buying consortium, enabling lower prices for their member institutions.

At regional level, **RRENs** interconnect NRENs by leasing international and cross-border capacity on fibre infrastructure and providing connectivity to commodity Internet, thereby facilitating cross-border exchanges of data and collaboration. They are community aggregators, having the ability to promote best practices within their constituencies. Their mission is to establish and operate high quality network infrastructure at regional level, develop and roll-out tailor-made services for the R&E communities, promote collaboration among national, regional, international research and education communities and build the capacity of the REN community.

The final beneficiaries of this Action are the R&E communities: the **end-users (students, teachers, researchers etc.)** from **institutions connected to the NRENs** (including public libraries, teaching hospitals, secondary schools, etc. depending on mandate/coverage of the NREN in each country).

The **UbuntuNet Alliance** is the regional association of NRENs in Eastern and Southern Africa. It was established in 2005 and currently comprises participating NRENs in 17 countries.[15] The UbuntuNet Alliance manages UbuntuNet, the regional network backbone that interconnects NRENs and connects them to other regional networks, such as the pan-European Research and Education Network GÉANT.

WACREN is the West and Central African Research and Education Network whose mandate is to provide high quality infrastructure and services for the West and Central African Research and Education community for development, covering an area of over 22 countries. WACREN was established in 2010. It has as of end 2023 members, with 13 NRENs established in 12 countries of the region, and as UbuntuNet Alliance it is connected to GÉANT.

The **pan-European Research and Education Networks (GÉANT)** interconnects NRENs across Europe, enabling collaboration on projects ranging from biological science, to earth observation, to arts and culture, connecting 50 million users in over 10,000 institutions. It links to research networks in other world regions: beyond WACREN and UbuntuNet Alliance and ASREN, to Internet2 in the US, TEIN in Asia-Pacific, and RedClara in Latin America. The African RRENs interconnect with GÉANT for access to R&E global networks.

The Arab States Research and Education Network (ASREN – North Africa/ Eastern Med), WACREN and UbuntuNet Alliance have worked together as implementing partners of AfricaConnect3, alongside

[14] *Climate Change in Africa* African Development Bank. https://www.afdb.org/en/cop25/climate-change-africa

[15] The Ubuntunet Alliance participating member countries are: Botswana, Burundi, Democratic Republic of Congo, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Namibia, Rwanda, Somalia, Sudan, South Africa, Tanzania, Uganda, Zambia and Zimbabwe.

GÉANT.Throughout AfricaConnect, GÉANT has been responsible of the project coordination and the procurement of the connectivity links for UbuntuNet Alliance, WACREN and ASREN, providing also technical assistance to the RRENs and connecting European NRENs with African counterparts for twinning exercises.

Similarly and in partnership with GÉANT, **NORDUnet** interconnects the Nordic national research and education networks (overall connecting more than 400 R&E institutions, with over 1.2 million users), connecting them to the worldwide network for research and education. It provides technical assistance and advisory via its international partnerships with RENs.

European NRENs twinning with African RRENs and NRENs will be sought, fostering peer-to-peer cooperation on key matters in which European NRENs have developed specific technical expertise.

Key institutional groups which will be highly involved throughout the Action are:

The **African Union Commission (AUC)**, through its Departments of Infrastructure and Energy (DIE) and Human Resources, Sciences and Technology (HRST). AUC, which has the mandate to implement the pan-African ICT policy and the Higher Education and Research policy and shall be kept informed of the progress made in establishing a dedicated network for African education and research communities. AUC can also provide an important platform for dialogue with national decision makers and facilitate the continental cooperation/integration.

Regional Economic Communities (RECs), with their convening and agenda setting roles, have the mandate to steer REN development at sub-regional level and to boost prioritisation in member countries. Over the years, supporting the REN ecosystem has been increasingly high in the agenda.

SSA National Ministries for ICT/ STI/ Higher Education and Research/ Education which will be sensitised about the role of NRENs and the importance of institutional recognition and public finance to make them sustainable;

Internet service providers (ISP) are private sector companies from which connectivity is leased and which will be engaged about the importance of providing adequate and affordable connectivity to education and research institutions;

African regulatory agencies which should be sensitised about the need to promote and enforce an adequate regulatory framework; in some cases these are also in charge of universal access funds, a potential relevant source of sustainable financing.

Civil Society Organisations (including women's human rights organisations, youth organisations) are also relevant for the action.

Cooperating partners, in particular those who support complementary programmes in the field of higher education or research and with whom increased synergies should be sought: among these it is worth mentioning **international/multilateral institutions** such as The World Bank, United Nations (UNESCO, ITU) etc.

3 DESCRIPTION OF THE ACTION

3.1 Objectives and Expected Outputs

The Overall Objective of this action is to increase African Research and Education (R&E) communities' access to and use of information and communications technology and to enhance international cooperation on science, technology and innovation to address global challenges.

The Specific Objectives of this action are to:

1. Enhance the delivery capacity and the financial and institutional sustainability of African Regional and National Research and Education Networks (RENs);
2. Ensure African R&E communities' access to affordable, reliable, high-speed connectivity infrastructure

and connection to the global R&E community;

3. Strengthen the delivery of over-the-network services by RRENs and NRENs to R&E communities in Sub-Saharan Africa, with particular focus on supporting e-learning and climate change science and related disciplines.

The **Outputs** to be delivered by this action contributing to the corresponding Specific Objectives are:

1.1. contributing to Outcome 1 (or Specific Objective 1) Institutional governance and operational capacity of RRENs are improved;
1.2. contributing to Outcome 1 (or Specific Objective 1) Institutional governance and operational capacity of existing NRENs are improved and new NRENs, where appropriate, are established;
1.3. contributing to Outcome 1 (or Specific Objective 1) Awareness of the added-value of NRENs and RRENs through advocacy, support to policy development, and multi- level engagement is raised;
1.4. contributing to Outcome 1 (or Specific Objective 1) Women leadership within REN ecosystem and contribution to green innovation is increased.

2.1. contributing to Outcome 2 (or Specific Objective 2) International and regional connectivity networks for the benefit of R&E institutions are strengthened and maintained with resilience increased, adhering to green procurement criteria;
2.2. contributing to Outcome 2 (or Specific Objective 2) National connectivity networks in targeted countries adopting where possible the use of green technologies are expanded for the benefit of R&E institutions.

3.1. contributing to Outcome 3 (or Specific Objective 3) Data infrastructures and tools are developed for the benefit of R&E communities;
3.2. contributing to Outcome 3 (or Specific Objective 3) Over-the-network services for cross-cutting or sector specific use cases (focusing on e-learning and climate change research and related disciplines) and digital applications in particular addressing climate mitigation and adaptation are developed;
3.3. contributing to Outcome 3 (or Specific Objective 3) User communities of NRENs services and collaborative practices within targeted education and research institutions in SSA are developed.

3.2 Indicative Activities

Activities related to Output 1.1

- Developing RRENs sustainable business models and adequate public finance mobilisation strategies; increasing capacity of RRENs to deliver strategic plans (incl. via strategy accelerator programs) and strengthening of MEAL frameworks
- Capacity building on maintenance, standards and business development via exchange programs established with European counterparts (knowledge sharing / exchanges of best practices intra-Africa&Africa-Europe)
- Technical assistance support to strengthen the capacity of RRENs with regard to connectivity procurement

Activities related to Output 1.2

- NRENs capacity building/training programs (tailor made support according to NREN's stage of development) based on NREN maturity matrix , streamlining approaches to integrating climate change and environmental considerations into decision making
- Contributing to the identification and development of sustainable business models and adequate public finance mobilisation strategies to support NRENs
- Reinforcement of targeted NRENs and capacity building to end-users communities
- Support feasibility and need analysis for the establishment of new NRENs
- Exchange programs between African and European RENs and between African RENs according to area of expertise
- Support institutional set up and dialogue with African governments/ministries to establish new NRENs where relevant and advocacy towards NRENs to join RRENs
- Strengthening cybersecurity activities and coordination within REN ecosystem

Activities related to Output 1.3

- Annual regional gatherings of key R&E stakeholders and multi-stakeholder dialogue ensuring inclusion of sessions on R&E community initiatives tackling climate change adaptation and mitigation
- Advocacy with governments, policy-makers, and decision-makers for RRENs to be an active participant in discussions, design, and implementation of ICT-based initiatives and policies supporting R&E in Africa
- RRENs to support NREN advocacy strategies and initiatives
- Publishing policy briefs, impact studies, articles on topical issues relevant to the REN community to increase public awareness of benefits brought by RENs including about REN community initiatives addressing climate change adaptation and mitigation

Activities related to Output 1.4
- Promotion of RENs within existing African women empowerment organisations
- Organisation of women hackfests, innovation prices for women in STEM to promote active contribution to service development, with a focus on green innovation (supporting the development of solutions for climate change adaptation and mitigation)
- Training and exchange/mentorship/internship programmes on REN-related disciplines and on leadership in REN ecosystem

Activities related to Output 2.1
- Connection of unconnected NRENs to RRENs
- RRENs backbone upgrades and maintenance of backbone and edge circuits of the networks
- Establishment of redundant links to Europe and Global Exchange Points (GXPs) for regional connections, Point of Presence (POPs)
- Connection to targeted regional R&E institutions by adopting thematic approach (for instance: scale up regional sensor network of WMO-certified weather stations, identification of organizations funded under other EU programmes serving them with connectivity with prioritisation to ones related to green transition)
- Connection to IXPs, data centres, establishment of content delivery platforms
- Technical advisory support to EU Global Gateway Digital Infrastructure Investments

Activities related to Output 2.2
- Expansion and upgrade of campus networks in selected institutions in targeted countries to enable increased capacity absorption adopting where relevant the use of green technologies (i.e. solar panel powered solutions)/use of green electricity
- Promote and support the utilisation and uptake of available national bandwidth capacity to the benefit of public institutions
- Support the connection of new institutions to the NRENs based on country action plans in selected countries
- Provision of connectivity equipment for end-users and institutions; set up of key local infrastructures (such as LMS platform or video infrastructure)
- Interconnection and federation of High-Performance Computers between African countries to provide operational processing power to deliver high resolution products

Activities related to Output 3.1
- Identification and deployment of required data tools
- Upgrade of Cloud infrastructure run by RRENs for higher computing capacity and storage

Activities related to Output 3.2
- Identification of R&E communities' e-services and applications needs, quality evaluation of services provided Deployment of agreed upon service portfolios, cross-cutting and for specific uses cases (particular thematic focus should be given to: e-learning/digital education, and climate science/agriculture). These can include:
- Essential network services – Identity and trust, eduroam, cybersecurity
- Open source-based videoconferencing
- cloud-based services, platform hosting, computing resources, collaboration/open data repositories platforms
- video-on demand courses, mobile-friendly online teaching and learning material (availability of material

FR/ENG/PT)
- On-continent development and uptake of innovative digital solutions in support of R&E communities promoted through developer/vendor pitch sessions at RREN regional conferences
- Provision of mutualised NREN services to users
- Provision of technical support for the deployment and effective use of the services provided
- Development of digital mitigation and adaptation solutions to climate change from established "proof-of-concepts" through annual competitions (awardees would leverage on the extensive RREN computing and digital storage infrastructure)

Activities related to Output 3.3
- Creation of a community of practice of end-users (i.e. lecturers) to promote the use of NRENs services and linkage to the regional community

The commitment of the EU's contribution to the Team Europe Initiative to which this action refers, will be complemented by other contributions from Team Europe members. It is subject to the formal confirmation of each respective member's meaningful contribution as early as possible. In the event that the TEIs and/or these contributions do not materialise, the EU action may continue outside a TEI framework.

3.3 Mainstreaming

Environmental Protection & Climate Change

Outcomes of the SEA screening (relevant for budget support and strategic-level interventions)
The Strategic Environmental Assessment (SEA) screening concluded that no further action was required.

Outcomes of the EIA (Environmental Impact Assessment) screening (relevant for projects and/or specific interventions within a project)
The EIA (Environment Impact Assessment) screening classified the action as Category C (no need for further assessment.

Outcome of the CRA (Climate Risk Assessment) screening (relevant for projects and/or specific interventions within a project)
The Climate Risk Assessment (CRA) screening concluded that this action is no need for further assessment).

The action is expected to have positive environmental and climate change effects by:

- providing adequate network infrastructures for the use of services and applications in the environmental and climate change areas, e.g. climate adaptation and mitigation, resilience, disaster early-warning systems, disaster handling and recovery, etc. Throughout AfricaConnect4, a thematic stress on connecting and providing services to climate change, agriculture and related disciplines institutions will be sought; the connectivity procured should adhere to green procurement criteria;
- promoting green innovation, technology solutions and practices that are environment/climate change sensitive within the REN ecosystem and broader R&E sector;
- reducing the need for education and research professionals to travel to meet and rather encourage them to cooperate through digital tools, such as video-conferencing facilities or online collaboration tools.

Gender equality and empowerment of women and girls
As per the OECD Gender DAC codes identified in section 1.1, this action is labelled as G1. This implies that the Action is relevant to the promotion of gender equality and women empowerment and girls, in all their diversity. Not only the action will allow access to digital tools and services for the benefit of women and their participation to the digital economy and to science, research and innovation, but through targeted capacity building activities it will boost active participation and women leadership within the REN ecosystem, as well as more broadly in science, technology, engineering, and mathematics (STEM) fields. Specific attention will be placed on ensuring a gender balance participation at output level, ensuring women's and men's equal participation to events, forums, structured dialogues etc. Gender data will be collected in order to track progress and identify potential hubs for unconscious gender bias as well as conducting and using updated gender analyses to inform decision-making on future action

and integrating these into all relevant dialogues, policies, strategies, programmes and operations.[16]

Human Rights

In all activities, as well the planning of implementation modalities, a human-rights based approach will be mainstreamed. The action will be taking into account the principles of non-discrimination, meaningful participation, transparency, accountability and respect to all human rights. Human Rights mainstreaming will equate with implementing the programme in accordance with defined EU values that are relevant to protection and promotion of fundamental rights in the digital economy. With humans at the centre of the digital economy and society, accelerating the digital economy should also tackle the existing—and otherwise growing—digital divide in many countries, paying special attention to the inclusion of all genders, unserved and underserved population, persons with disabilities (PwD), refugees and displaced people. All measures should be based on the principle of "leave no one behind" by ensuring that access to affordable broadband connectivity, digital skills and eServices is inclusive and does not reinforce or sustains existing inequalities.[17] In today's rapidly advancing technological landscape, it is critical that human rights considerations are at the forefront of technological development. Women's involvement in technology can help to ensure that these considerations are taken into account, leading to more equitable and just outcomes for all. Therefore, it is not just a matter of gender diversity, but a matter of human rights to encourage and support women's participation in technology development.[18]

Disability

As per OECD Disability DAC codes identified in section 1.1, this action is labelled as D0. This implies that the Action does not principally targets to specifically advance inclusion of people with disability, although individuals with disability might be among beneficiaries of this Action. Whenever possible, the Action will contribute to making visible the situation of persons living with disability by using indicators disaggregated by disability status, and by promoting the collection and use of disaggregated data for policy making. It will ensure that rights of persons with disabilities will be respected, and the planned activities related with formulation of projects, evaluations and others are disability inclusive. The action will encourage partners and programme participants to take the initiatives to protect persons with disabilities and invite organisations representing people with disabilities.

Reduction of inequalities

By boosting the digital transformation of the R&E sector in Africa, the action will contribute to bridging the digital divide within the SSA region, within SSA countries and among people. Access to connectivity networks, combined with services and applications enabled by the connectivity will boost socio economic development and contribute to the participation of underserved communities to the SSA digital economy. It will increase Africa's contribution to the international science and research output on key global challenges.

Democracy

The action is an enabler of open science in Africa, which has the potential of making the scientific process more transparent, inclusive and democratic. It is increasingly recognized as a critical accelerator for the achievement of the United Nations Sustainable Development Goals and a true game changer in bridging the science, technology and innovation gaps and fulfilling the human right to science.

Conflict sensitivity, peace and resilience

There is no direct link between conflict sensitivity, peace and resilience and the probable interventions of this Action.

Disaster Risk Reduction

Digital technologies and open data can be used to amplify and better coordinate policy responses, for example around the tracking of disease or natural disasters. Predictive data analytics (embedding gender sensitive monitoring, use of sex-disaggregated data, and gender sensitive indicators) can help increase disaster preparedness in Africa. The action might explore potential activities and collaborations with relevant stakeholders addressing this topic.

[16]Source: EU GENDER ACTION PLAN III

[17] New Africa - Europe Digital Economy Partnership

[18]Source: EU Action Plan on Human Rights and Democracy 2020-2024

Other considerations if relevant
N/A

3.4 Risks and Lessons Learnt

Category	Risks	Likelihood (High/ Medium/ Low)	Impact (High/ Medium/ Low)	Mitigating measures
Planning, processes and systems	Low uptake of broadband capacity by NRENs: Occasioned by unit price sensitivities and in-country competition from ISPs for institutional connectivity	Medium	Medium	Ensure price competitiveness in all countries through spirted negotiations with RREN suppliers; bundle valued products and services with connectivity, helping NRENs furtherer differentiate themselves from ISPs.
	Low uptake by NRENs of capacity-building activities: Content of trainings may not be relevant or of priority to the NRENs.	Medium	High	Ensure NRENs are directly involved in the planning of the capacity-building programmes to ensure relevance and importance. Apply NREN Maturity Matrix to set targets and monitoring progress of NREN development.
External environment	Political risks and instability, external shocks: Governments may not prioritise support to NRENs, making it difficult to establish NRENs where none exist or weakening of the position of existing NRENs. Educational budgets: Reduction in per/student university budgets across the continent making it difficult for universities to meet existing or desired increased broadband Internet capacities.	Medium	High	Continue to actively engage governments directly and through regional economic communities, advocating on behalf of R/NRENs, increasing awareness of their importance and the negative impacts increased taxation has on countries' education digitalisation aspirations. Ensure flexibility in undertaking project activities online, where possible and redirect activities if country situation does not allow undertaking of Action; Continue advocacy, outreach and multi-level engagement with public authorities.
	Natural disasters: resulted in interruptions in service; cable cuts	Medium	High	Place equipment in standard collocation facilities that are built safely above the water line; ensure backup power sources are present at colocation facilities;

	from landslides.			implement geo-redundancy in the network backbone to enable traffic redirection to alternative Points of Presence while the affected sites are repaired.
People and Organizations	Skills and training gaps: Researchers or educators may not have the necessary skills or training to use the new digital tools effectively.	Medium	High	Promote training programs and resources to help researchers and educators develop the necessary digital skills; including online training courses, workshops, gender sensitivity training and mentorship programs.
	Cybersecurity risks: The use of digital technologies and platforms can pose cybersecurity risks (data breaches, hacking, cyber-attacks), which can expose sensitive research data, personal information, and intellectual property.	High	High	Implement robust cybersecurity and establish clear data governance policies and procedures to ensure that sensitive data is protected; NREN CSIRT communities to mitigate cybersecurity risks and leverage cooperation among CSIRTs and other organizations for sharing threat intelligence, coordinating incident response efforts, and developing common cybersecurity standards and practices.
	Vendor and supplier risks: Third-party vendors or suppliers can pose risks such as vendor lock-in, vendor bankruptcy, and vendor non-performance.	Low	High	Use transparently developed community supported open source software to mitigate vendor lock-in; conduct due diligence on potential vendors and suppliers, including reviewing their financial stability, customer references, and compliance with relevant regulations. Contracts that outline service level agreements, responsibilities, and liabilities.

Lessons Learnt:

Throughout the previous phases of AfricaConnect, significant progress has been achieved.

In Eastern and Southern Africa, UbuntuNet Alliance has 16 active member NRENs. 14 of these members are connected to the UbuntuNet Network resulting in over 1,000 institutions and 3.48 million students and staff that benefit from high quality internet connectivity. The first phase of AfricaConnect (2011-2015) laid the foundation for the UbuntuNet Regional Backbone network and resulted in significant price reductions for internet services and increase in available internet bandwidth. AfricaConnect2 (2015-2019) upgraded the UbuntuNet Network to a higher capacity, extended it to 5 additional countries and made the network resilient by procuring diverse links to increase availability. It also supported the development of value added services. AfricaConnect3 (2020-2024) extended the number of connected countries to 16 and provided a network upgrade, resulting in member available capacities increasing between 50% to 200% with a corresponding unit price reduction between 50% up to 70%.

In West and Central Africa, 15 NRENs from 13 countries are members of WACREN. The WACREN network started under AfricaConnect2 with three NRENs from Nigeria, Ghana and Togo connected to the regional backbone and to the GÉANT network. Three additional NRENs from Côte d'Ivoire, Benin and Burkina Faso increased the number to 6 connected NRENs in AfricaConnect3, with plans to add other NRENs the regional backbone and

improve the resilience of the region's connections with global R&E communities. WACREN offered services such as eduroam and Zoom to its community from its cloud data centre in Lagos.

Ubuntunet Alliance			WACREN	
AfricaConnect	**AfricaConnect2**	**AfricaConnect3**	**AfricaConnect2**	**AfricaConnect3**
DRC (Eb@le) Rwanda (RwEdNet) Kenya (KENET) South Africa (TENET) Uganda (RENU) Mozambique (MoRENet)	Burundi (BERNET) Malawi (MAREN) Somalia (SomaliREN) Tanzania (TERNET) Zimbabwe (ZARNet) Zambia (ZAMREN)	Ethiopia (EthERNet) Botswana (BotsREN) Zimbabwe (ZIMREN)	Nigeria (NgREN) Ghana (GARNET) Togo (TogoRER)	Benin (RBER) Burkina Faso (FasoREN) Côte d'Ivoire (RITER)

Table 1: Countries/NRENs connected to UA and WACREN backbone

Several lessons learnt can be drawn from the previous phase, AfricaConnect3, to feed and improve the proposed action:

- Need to adopt a more tailor-made approach to capacity building delivered by RRENs: NRENs should be further involved in the planning of the capacity-building programmes to ensure relevance and importance. The use of the NREN Maturity Matrix (developed by French Development Agency AFD and French NREN RENATER in partnership with African RENs) to set targets and monitoring progress of NREN development will be introduced in this action; overall, a stronger community-driven approach to the project should be pursued;
- Need for a more strategic approach to connectivity and service delivery by RRENs: in AfricaConnect4, thematic prioritisation where possible should be given to fostering e-learning as well as on climate change and related disciplines;
- Foster closer ties with Regional Economic Communities and their agencies: in AfricaConnect3 these exchanges significantly strengthened RRENs ability to increase awareness on and build the case for NRENs. These engagements shall be expanded under this action;
- Need for piloting support beyond the regional level: AfricaConnect has so far been focusing on providing support at regional level,19 with no direct financial support to African NRENs nor specifically for the provision of connectivity at national/institutional level.20 This still relies on the delivery capacity of NRENs, which vary in their ability to respond to their constituencies' increasing connectivity needs and are faced with numerous country-specific challenges. Introducing a comprehensive package for the national dimension component would allow to showcase the benefits of RENs and the infrastructures and services they provide to their communities (incl. through increased capacity absorption) and to better meet end-users' connectivity needs;
- Monitoring and evaluation and impact assessment should be significantly strengthened;
- More systematic dialogue and coordination between actors supporting the African R&E sector (European as well asiInternational stakeholders) should be sought, with synergies and concerted action to ensure comprehensive support across all layers of the REN ecosystem.

3.5 The Intervention Logic

The underlying intervention logic for this action is the acknowledgment of the importance of digital transformation of the African R&E sector, as well as of the role of Research and Education Networks as key drivers of this transformation and as enablers of sustainable development via their provision of connectivity, data infrastructures,

[19] This means by supporting the provision of connectivity to NRENs from RRENs via their connection to the regional backbone, their link to global R&E networks via their interconnection to GEANT, and upgrade and maintenance of existing regional and international links, with direct financial support provided solely to RRENs. From a national perspective, this intervention allows international and regional connectivity to enter the country (connected members of RRENs) as well as regional/cross-border exchange of data.

[20] This kind of support has been piloted under the EU-funded Direcct Programme (ACP-EU Programme of Digital response to covid-19 crisis), with the Africa Digital Campus project (2,85 M EUR), led by the Institute of Research for Development (IRD) and WACREN, in partnership with the Agence Universitaire de la Francophonie (AUF), aiming to establish rapid cooperation with two West African countries, Burkina Faso and Benin, with a view to strengthening the e-learning offer (distance learning) of selected universities in these two countries. (Africa Digital Campus: deploying the offer and access to distance learning for pedagogical continuity in higher education in West Africa. – Direcct)

e-services and broader R&E ecosystem support.
Since its inception, AfricaConnect has had a very positive impact on the evolution of African Regional and National Research and Education Networks (RRENs, NRENs), providing meaningful connectivity and services to over 1700 institutions and 4.5 million end-users in universities.

The action consists in the follow-up phase of the AfricaConnect3 project, which aims to scale up EU support for the evolution and strengthening of Research and Education Networks in Africa and their provision of high-speed internet and digital tools for R&E communities (students, teachers, researchers, scientists) to advance the quality of education and increase research/scientific output towards addressing sustainable development challenges, including combating climate change.

In particular, for the two geographic clusters (West and Central, and Southern and Eastern Africa), the action will support:

- the strengthening of RRENs and NRENs to increase their ability to serve institutions/users and raising public awareness about their role (Specific Objective 1): at regional level, the action aims to strengthen the institutional and delivery capacity as well as sustainability of the RRENs in the SSA region. At national level, the Action will support the establishment of NRENs where absent and increase the capacity and sustainability of existing ones (to operationalise network infrastructure, cybersecurity, governance, develop solid business and strategic plans, including climate change/environment considerations/practices in strategic planning, skills development/training etc.). To do this, the action will adopt a flexible, demand-driven and tailor-made approach to NRENs support. The action foresees a dedicated output on fostering women leadership and engagement in the REN ecosystem (and broader Women in STEM) as well as green innovation. In addition, in view of boosting sustainability of the REN ecosystem and public sector support, significant policy advocacy, multi-stakeholder dialogue, community engagement and communication/visibility activities will be essential.

- the expansion, upgrade and maintenance of high-speed connectivity networks provided by RENs for the benefit of R&E institutions and their fast-changing digital connectivity needs: improvements in broadband connectivity for R&E communities have to be carried out across the broadband value chain: at the international level where connectivity enters the country; at cross-border and regional levels allowing the exchange of data; and nationally, incl. at institution level to ultimately reach end-users leaving no one behind. While continuing the much-needed support at regional/international level, the action seeks to introduce innovative elements of capillarity by supporting selected national/institutional connectivity needs, with the view of showcasing the benefits to end-users resulting from REN support, capitalising on what achieved at regional level and ultimately best serve end-users. The action does not aim to cover all SSA and all institutions as this would not be feasible, but to demonstrate what results can be achieved if suitable support is provided. Where applicable, a priority and thematic based approach, meaning a particular stress on connecting institutions that have a defined thematic focus (esp. climate change research, meteorology and agriculture) and the adoption of green technologies will be sought.

- the provision by the RENs of data infrastructures for storage, management, analysis, exchange and re-use of research / scientific data and the delivery of digital services pivotal to the work of R&E communities: the action will further support the delivery of network, research and education services by RRENs, together with the skills development needed for service uptake. The action will support the deployment and upgrade of open data infrastructures / platforms that allow for access, storage and exchange of data, as well as the delivery of key digital services (i.e. identity federation, digital learning tools, Eduroam, videoconferencing). Prioritisation of service delivery in support of digital education/e-learning and climate change and related disciplines will be sought. Moreover, the Action will seek to support the development of climate change mitigation and adaptation solutions.

The action will seek complementarities with other EU-funded Digital4Development (D4D) programmes, especially the ones related to the provision of connectivity networks. These include the planned EU Global Gateway digital infrastructure investments, and the twin project in support of RENs in North Africa/Eastern Med and the provision of connectivity stemming from the MEDUSA submarine cable investment. Continental collaboration between RRENs in Africa will be promoted, as well as coordination with open science/science collaboration initiatives in Africa. Synergies with other initiatives from European and International partners (i.e. the World Bank) aimed at

supporting the REN ecosystem and the digital transformation of R&E sector in Africa will be ensured.

3.6 Logical Framework Matrix

This indicative logframe constitutes the basis for the monitoring, reporting and evaluation of the intervention.
On the basis of this logframe matrix, a more detailed logframe (or several) may be developed at contracting stage. In case baselines and targets are not available for the action, they should be informed for each indicator at signature of the contract(s) linked to this AD, or in the first progress report at the latest. New columns may be added to set intermediary targets (milestones) for the Output and Outcome indicators whenever it is relevant.

- At inception, the first progress report should include the complete logframe (e.g. including baselines/targets).
- Progress reports should provide an updated logframe with current values for each indicator.
- The final report should enclose the logframe with baseline and final values for each indicator.

The indicative logical framework matrix may evolve during the lifetime of the action depending on the different implementation modalities of this action.
The activities, the expected Outputs and related indicators, targets and baselines included in the logframe matrix may be updated during the implementation of the action, no amendment being required to the Financing Decision.

PROJECT MODALITY (3 levels of results / indicators / Source of Data / Assumptions – no activities)

Results	**Results chain (@): Main expected results (maximum 10)**	**Indicators (@): (at least one indicator per expected result)**	**Baselines (values and years)**	**Targets (values and years)**	**Sources of data**	**Assumptions**
Impact	Increase African Research and Education (R&E) communities' access to and use of information and communications technology and enhance international cooperation on science, technology and innovation to address global challenges.	1. Number and % of R&E institutions with access to affordable high-speed connectivity infrastructures 2. African contribution in research output of impacted countries as measured by journal publications 3.Increase in % of South-South and North-South research collaborations disaggregated by sex 4. Volume of RRENs traffic (intra-African traffic between UA and WACREN and traffic between Europe and African RENs) (average Mbit/s)	1. TBD 2. TBD 3. TBD 4. TBD	1 TBD 2. TBD 3. TBD 4. TBD	1. Project narrative reports, country reports, World Bank reports 2. Multilateral Org reports (incl. UNESCO, World Bank), country reports, SSA institutional strategic/implementation reports 3. Multilateral Org reports (incl. UNESCO), SSA institutional strategic/implementation reports 4. NOC reports	*Not applicable*

Outcome 1	1. The delivery capacity, financial and institutional sustainability African Research and Education Networks to support R&E communities is strengthened.	1.1 Number and % of NRENs reaching a minimum of Development Phase (according to NREN Maturity Matrix) 1.2 Number and % of NRENs reaching the Mature Phase (according to the NREN Maturity Matrix) 1.3 Number and % of NRENs registered in SSA region	1.1 TBD 1.2 TBD 1.3 TBD	1.1 TBD 1.2 TBD 1.3 TBD	1.1 NREN Maturity assessment reports 1.2 NREN Maturity assessment reports 1.3 Project narrative reports, country reports, continental and regional institutional reports	
Outcome 2	2. R&E communities' access to affordable, high-speed connectivity infrastructures and connection to the global R&E community is increased	2.1 Number and % of countries connected to the regional backbone 2.2 Number and % of institutions connected to selected NRENs disaggregated by type (higher education/TVET/research) 2.3 % of average reduction in RREN cost of broadband connectivity to NRENs	2.1 TBD 2.2 TBD 2.3 TBD	2.1 TBD 2.2 TBD 2.3 TBD	2.1 RREN Membership Agreements 2.2 RREN Membership Agreements 2.3 RREN Market Survey	
Outcome 3	3. The delivery of over-the-network services and data infrastructures by REN to R&E communities in SSA is strengthened.	3.1 Number and % of operational e-services and data infrastructures provided by the RRENs disaggregated by type (essential network services, other end-user services provided) 3.2 Level of uptake of e-services and data infrastructures disaggregated by country and when applicable institution or end users disaggregated by sex	3.1 TBD 3.2 TBD	3.1 TBD 3.2 TBD	3.1 Project narrative reports, RREN Cloud Data 3.2 Proect narrative reports, RREN Cloud Data	
Output 1	1.1 Institutional governance	1.1.1 Level of RRENs cash	1.1.1 TBD	1.1.1 TBD	1.1.1 Audited Accounts	RREN has

related to Outcome 1	and operational capacity of RRENs are improved.	cover (adequate for RREN to operate sustainably) 1.1.2 Level of RREN member satisfaction index disaggregated by sex 1.1.3 Number and % of risks identified in system reviews mitigated by RRENs	1.1.2 TBD 1.1.3 TBD	1.1.2 TBD 1.1.3 TBD	1.1.2 Annual Member Satisfaction Survey 1.1.3 System Review and Management Action plan	access to the necessary resources to to improve their institutional and delivery capacity. RREN is adequately staffed.
Output 2 related to Outcome 1	1.2 Institutional governance and operational capacity of existing NRENs is improved and new NRENs where possible are established.	1.2.1 Number and % of new NRENs established 1.2.2 Number of NREN staff trained disaggregated by type (technical, non technical) and sex 1.2.3 Number of capacity building programmes developed/set up for NRENs disaggregated by type 1.2.4 Number of intra-Africa and Europe-Africa RENs exchanges disaggregated by national/regional stakeholders disaggregated by sex 1.2.5 Number and % of established NREN CSIRT teams 1.2.6 Number of NRENs supported in building/ strengthening their business model	1.2.1 TBD 1.2.2 TBD 1.2.3 TBD 1.2.4 TBD 1.2.5 TBD 1.2.6 TBD	1.2.1 TBD 1.2.2 TBD 1.2.3 TBD 1.2.4 TBD 1.2.5 TBD 1.2.6 TBD	1.2.1 Project narrative reports, country reports, Membership Agreement 1.2.2 Project narrative reports, Capacity Building Register 1.2.3 Project narrative reports, Capacity Building Register 1.2.4 Project narrative reports, Capacity Building Register 1.2.5 Project narrative reports, country reports 1.2.6 Project narrative reports, Capacity Building Register	Supportive policy, funding and regulatory environment for NREN development. NRENs have access to the necessary resources to participate in the in- country training programs
Output 3 related to Outcome 1	1.3 Awareness of the added-value of NRENs and RRENs is through policy development, multi-level engagement and advocacy is raised.	1.3.1 Number of engagements with policy makers in Africa disaggregated by country and type of institution (incl. regional, continental, international)	1.3.1 TBD 1.3.2 TBD 13.3 TBD 1.3.4 TBD 1.3.5 TBD 1.3.6 TBD	1.3.1 TBD 1.3.2 TBD 1.3.3 TBD 1.3.4 TBD 1.3.5 TBD 1.3.6 TBD	1.3.1 RRENs Engagement Register, country reports 1.3.2 RRENs Engagement Register 1.3.3 RRENs	Stakeholders agree on the benefits of NRENs and RRENs. Sufficient

		1.3.3 Number of participants attending RRENs regional conferences disaggregated by sector (incl. public, private, academia) and sex 1.3.4 Number of sessions on R&E community activities tackling climate change adaptation and mitigation at RREN regional conferences 1.3.5 Number of media engagements and publications promoting the added-value of NRENs and RRENs in Africa 1.3.6 Number of publications on REN community initiatives addressing climate change adaptation and mitigation.			Conference Register 1.3.4 RREN regional conference programmes 1.3.5 Original articles on the publication websites 1.3.6 Original articles on the publication websites	resources are available to develop policy documents. Decision-makers are open to learning about NRENs and RRENs. Sufficient resources are available to organize engagement sessions. Stakeholders are willing to provide feedback. Sufficient resources are available to conduct surveys, feedback forms, or focus group discussions.
Output 4 related to Outcome 1	1.4 Women leadership within REN ecosystem and contribution to green innovation is increased.	1.4.1 Number and % of women targeted by RRENs gender focused activities 1.4.2 Number of NRENs with gender-sensitive policies and practices in place 1.4.3 Number of engagements created with other Women in STEM initiatives	1.4.1 TBD 1.4.2 TBD 1.4.3 TBD 1.4.4 TBD	1.4.1 TBD 1.4.2 TBD 1.4.3 TBD 1.4.4 TBD	1.4.1 Capacity building Register 1.4.2 RREN survey 1.4.3 Capacity building Register 1.4.4 RREN conference register and website	NRENs are willing to participate in activities focused on women's empowerment and gender equality.

		1.4.4 Number of digital climate change adaptation and mitigation solutions developed in innovation contests				Women in NRENs have the necessary skills and qualifications to participate. There are no significant cultural or societal barriers that prevent women from participating in NREN activities and decision-making processes.
Output 1 related to Outcome 2	2.1 International and regional connectivity networks for the benefit of R&E institutions are developed and maintained with resilience increased, adhering to green procurement criteria.	2.1.1 Capacity of RREN Network Backbone 2.1.2 Number and % of NRENs connected to RREN networks 2.1.3 Capacity taken by NRENs from the RRENs (average Mbps/Gbps)	2.1.1 TBD 2.1.2 TBD 2.1.3 TBD	2.1.1 TBD 2.1.2 TBD 2.1.3 TBD	2.1.1 Contracts with Service Providers 2.1.2 NREN Membership agreements 2.1.3 Member service request orders	Sufficient funding to support the development and maintenance of international and regional connectivity networks. There is a willingness among research and education institutions to participate in international and regional connectivity networks.

Output 2 related to Outcome 2	2.2 National connectivity networks in targeted countries adopting where possible the use of green technologies are expanded for the benefit of R&E institutions.	2.2.1 Number and % of use of e-services and data infrastructures in use 2.2.2 Number and % of upgraded campus networks/local institutions supported for impacted countries 2.2.3 Backbone capacity of the national network	2.2.1 TBD 2.2.2 TBD 2.2.3 TBD	2.2.1 TBD 2.2.2 TBD 2.2.3 TBD	2.2.1 Project narrative reports 2.2.2 Project narrative reports 2.1.3 Contracts with Service Providers	Availability of necessary resources and equipment No major technical or logistical challenges No major political or social unrest impedes the establishment and maintenance of connectivity networks NRENs are able to work effectively with local authorities and stakeholders to establish and maintain connectivity networks.
Output 1 related to Outcome 3	Data infrastructures and tools for the benefit of R&E communities are developed.	3.1.1 Number of users registered & datasets published by R&E communities disaggregated by sex 3.1.2 Number of researchers and staff trained on research data management best practices disaggregated by gender 3.1.3 Number of new			3.1.1 Project narrative reports 3.1.2 Project narrative reports 3.1.3 Project narrative reports, RREN Cloud Data 3.1.4 Project narrative reports, RREN Cloud	Adequate technical expertise will be available to develop and deploy the data infrastructures

		services enabled by the upgraded RREN Cloud infrastructures	3.1.1 TBD 3.1.2 TBD 3.1.3 TBD	3.1.1 TBD 3.1.2 TBD 3.1.3 TBD	Data 3.1.5 Project narrative reports, RREN Cloud Data	and tools R&E communities will be willing and able to adopt and effectively use the newly developed data infrastructures and tools
Output 2 related to Outcome 3	Over the network e-services and applications for cross-cutting or sector specific use cases and digital applications in particular addressing climate mitigation and adaptation are developed.	3.2.1 Number and % of NRENs and institutions using over the network services provided by RRENs (eduID.africa, eduroam, regional T&I platforms) 3.2.2 Number of successful video-on-demand course completions 3.2.3 Number and % of digital learning materials downloads 3.2.4 Number of capacity building trainings delivered for service uptake 3.2.5 Number of digital applications addressing climate mitigation and adaptation developed	3.2.1 TBD 3.2.2 TBD 3.2.3 TBD 3.2.4 TBD 3.2.5 TBD	3.2.1 TBD 3.2.2 TBD 3.2.3 TBD 3.2.4 TBD 3.2.5 TBD	3.2.1 EduID.africa website/analytics 3.2.2 Project narrative reports 3.2.3 Project narrative reports 3.2.4 Project narrative reports 3.2.5 Final reports from application developers; project website	Sufficient technical expertise is available to develop and test the e-services and applications R&E community members have access to the necessary hardware and internet connection to use the e-services and applications
Output 3 related to Outcome 3	User communities of NRENs services and collaborative practices within targeted education and research institutions in SSA are developed.	3.3.1 Number of NRENs active users of the different services and contents	3.3.1 TBD	3.3.1 TBD	3.3.1 Project narrative reports	

4 IMPLEMENTATION ARRANGEMENTS

4.1 Financing Agreement

In order to implement this action, it is not envisaged to conclude a financing agreement with partner countries.

4.2 Indicative Implementation Period

The indicative operational implementation period of this action, during which the activities described in section 3 will be carried out and the corresponding contracts and agreements implemented, is 72 months from the date of adoption by the Commission of this Financing Decision.

Extensions of the implementation period may be agreed by the Commission's responsible authorising officer by amending this Financing Decision and the relevant contracts and agreements.

4.3 Implementation of the Budget Support Component

N/A

4.4 Implementation Modalities

The Commission will ensure that the EU appropriate rules and procedures for providing financing to third parties are respected, including review procedures, where appropriate, and compliance of the action with EU restrictive measures[21].

4.4.1 Direct Management (Grants)

(a) Purpose of the grant(s)

The grant will contribute to achieving part of the three Specific Objectives of the action (Specific Objective 1 "Enhance the delivery capacity and the financial and institutional sustainability of African Regional and National Research and Education Networks (RENs); Specific Objective 2 "Ensure African R&E communities' access to affordable, reliable, high-speed connectivity infrastructure and connection to the global R&E community" and Specific Objective 3 "Strengthen the delivery of over-the-network services by RRENs and NRENs to R&E communities in Sub-Saharan Africa, with particular focus on supporting e-learning and climate change science and related disciplines") in each of the regional component.

(b) Type of targeted applicants

Regional Research and Education Networks.

4.4.2 Indirect Management with an entrusted entity

A part of this action may be implemented in indirect management with an entity which will be selected by the Commission's services using the following criteria: i) technical capacities and proven experience in providing support within the area targeted; ii) available expertise in SSA R&E sector and the functioning of the REN ecosystem; iii) widespread presence at country level in Africa; iv) capacity to mobilise additional funds (especially from a EU Member State) to co-finance the action, and to co-ordinate effectively these partnerships.

The implementation entails targeted activities in support of NRENs and national institutions (hence covering the national/institutional level of intervention) contributing to Specific Objective 1 "Enhance the delivery capacity and the financial and institutional sustainability of African Regional and National Research and Education Networks (RENs); Specific Objective 2 "Ensure African R&E communities' access to affordable, reliable, high-speed connectivity infrastructure and connection to the global R&E community" and Specific Objective 3 "Strengthen the

[21] www.sanctionsmap.eu. Please note that the sanctions map is an IT tool for identifying the sanctions regimes. The source of the sanctions stems from legal acts published in the Official Journal (OJ). In case of discrepancy between the published legal acts and the updates on the website it is the OJ version that prevails.

delivery of over-the-network services by RRENs and NRENs to R&E communities in Sub-Saharan Africa, with particular focus on supporting e-learning and climate change science and related disciplines".

4.4.3 Changes from direct to indirect management mode due to exceptional circumstances

If the preferred modalities described in 4.4.1 cannot be implemented due to circumstances outside of the Commission's control, the alternative implementation modality is indirect management with an entrusted entity which will be selected by the Commission's services using the following criteria: i. technical capacities and proven experience in providing support within the area targeted; ii. available expertise in SSA R&E sector and the functioning of the REN ecosystem; iii. widespread presence at country level in Africa; iv. capacity to mobilise additional funds (especially from a EU Member State) to co-finance the action, and to co-ordinate effectively these partnerships. The implementation entails part of the three specific objectives of the action in each of the regional component.

4.5. Scope of geographical eligibility for procurement and grants

The geographical eligibility in terms of place of establishment for participating in procurement and grant award procedures and in terms of origin of supplies purchased as established in the basic act and set out in the relevant contractual documents shall apply subject to the following provisions.

The Commission's authorising officer responsible may extend the geographical eligibility on the basis of urgency or of unavailability of services in the markets of the countries or territories concerned, or in other duly substantiated cases where application of the eligibility rules would make the carrying out of this action impossible or exceedingly difficult (Article 28(10) NDICI-Global Europe Regulation).

For this multi-country action, natural persons who are nationals of, and legal persons who are effectively established in the following countries and territories covered by this action, are also eligible: all countries in Sub-Saharan Africa.

4.6. Indicative Budget

Indicative Budget components	**EU contribution (amount in EUR)**
Implementation modalities – cf. section 4.4	
West and Central Africa component composed of	15 000 000
Direct Management (Grants) – cf section 4.4.1	11 000 000
Indirect management with entrusted entity cf. section 4.4.2	4 000 000
Eastern and Southern Africa component composed of	25 000 000
Direct Management (Grants) – cf section 4.4.1	25 000 000
Grants – total envelope under section 4.4.1	36 000 000
Evaluation – cf. section 5.2 **Audit** – cf. section 5.3	may be covered by another Decision
Contingencies	N.A.
Totals	**40 000 000**

4.7 Organisational Set-up and Responsibilities

A Strategic Steering Committee will be set up to provide strategic guidance and orientations for the action. It will

be composed of representatives of the European Commission and the implementing partners. The committee shall, among other tasks, supervise the consistency of the activities against EU and Africa continental and regional implementation strategies. Representatives from African continental and regional institutions (e.g. Africa Union, RECs) shall also be invited on an ad-hoc basis for this purpose.

In order to ensure the continued good collaboration between RENs at Africa continental level and to promote sharing of good practices, regional REN representatives from North Africa/Eastern Med will also be invited to the Steering Committee.

Other stakeholders (e.g. EU member states development agencies, World Bank, NRENs, representatives) may be invited to attend the Steering Committee meeting on an ad hoc basis to help improve the synergy with the overall education/research ecosystems and with other ongoing initiatives.

The daily management of the action will be closely followed by the European Commission. Regular meetings will be organised with the Implementing Partners in order to ensure a smooth and responsive management of the project.

As part of its prerogative of budget implementation and to safeguard the financial interests of the Union, the Commission may participate in the above governance structures set up for governing the implementation of the action and may sign or enter into joint declarations or statements, for the purpose of enhancing the visibility of the EU and its contribution to this action and ensuring effective coordination.

5 PERFORMANCE MEASUREMENT

5.1 Monitoring and Reporting

The day-to-day technical and financial monitoring of the implementation of this action will be a continuous process, and part of the implementing partner's responsibilities. To this aim, the implementing partner shall establish a permanent internal, technical and financial monitoring system for the action and elaborate regular progress reports (not less than annual) and final reports. Every report shall provide an accurate account of implementation of the action, difficulties encountered, changes introduced, as well as the degree of achievement of its results (Outputs and direct Outcomes) as measured by corresponding indicators, using as reference the logframe matrix (for project modality) and the partner's strategy, policy or reform action plan list (for budget support).

The Commission may undertake additional project monitoring visits both through its own staff and through independent consultants recruited directly by the Commission for independent monitoring reviews (or recruited by the responsible agent contracted by the Commission for implementing such reviews).

Roles and responsibilities for data collection, analysis and monitoring: where appropriate, the Implementing Partners will be responsible for monitoring and reporting on indicators of the logframe matrix, including the collection of baselines and data collection in the inception phase of the action. Indicator values will be measured at regional or country level, depending on the nature of the activities.
Indicators shall be disaggregated at least by sex and, where applicable, by urban/rural location. All monitoring and reporting shall assess how the action is taking into account the human-rights based approach and gender equality.

All monitoring and reporting shall assess how the action is considering the principle of gender equality, human rights-based approach, and rights of persons with disabilities including inclusion and diversity. Indicators shall be disaggregated at least by sex.

5.2 Evaluation

Having regard to the importance and nature of the action, a mid-term and final evaluation may be carried out for this action via independent consultants contracted by the European Commission. A mid-term evaluation will be carried out for problem solving and learning purposes, in particular with respect to the effectiveness of activities implemented at regional level, approaches and implementation modalities. The final evaluation will be carried out for accountability and learning purposes at various levels (including for policy revision), taking into account in particular the fact that the action targets diverse stakeholders and beneficiaries in different regions of Sub-Saharan Africa.

The Commission shall inform the implementing partner at least one month in advance of the dates envisaged for

the evaluation missions. The implementing partner shall collaborate efficiently and effectively with the evaluation experts, and inter alia provide them with all necessary information and documentation, as well as access to the project premises and activities.

The evaluation reports may be shared with the partners and other key stakeholders following the best practice of evaluation dissemination. The Implementing Partner and the Commission shall analyse the conclusions and recommendations of the evaluations and, where appropriate, apply the necessary adjustments.

The financing of the evaluation may be covered by another measure constituting a Financing Decision.

Evaluations shall assess to what extent the action is taking into account the human rights-based approach as well as how it contributes to gender equality and women's empowerment and disability inclusion. Expertise on human rights, disability and gender equality will be ensured in the evaluation teams.

5.3 Audit and Verifications

Without prejudice to the obligations applicable to contracts concluded for the implementation of this action, the Commission may, on the basis of a risk assessment, contract independent audit or verification assignments for one or several contracts or agreements. To that extend they must comply with the instructions given in the 2022 Guidance document Communications and raising EU visibility: Guidance for external action) or any successor document)

6 STRATEGIC COMMUNICATION AND PUBLIC DIPLOMACY

The 2021-2027 programming cycle will adopt a new approach to pooling, programming and deploying strategic communication and public diplomacy resources.

In line with the 2022 'Communicating and Raising EU Visibility: Guidance for External Actions', it will remain a contractual obligation for all entities implementing EU-funded external actions to inform the relevant audiences of the Union's support for their work by displaying the EU emblem and a short funding statement as appropriate on all communication materials related to the actions concerned. This obligation will continue to apply equally, regardless of whether the actions concerned are implemented by the Commission, partner countries, service providers, grant beneficiaries or entrusted or delegated entities such as UN agencies, international financial institutions and agencies of EU member states.

However, action documents for specific sector programmes are in principle no longer required to include a provision for communication and visibility actions promoting the programmes concerned. These resources will instead be consolidated in Cooperation Facilities established by support measure action documents, allowing Delegations to plan and execute multiannual strategic communication and public diplomacy actions with sufficient critical mass to be effective on a national scale.

Appendix 1 REPORTING IN OPSYS

A Primary Intervention (project/programme) is a coherent set of activities and results structured in a logical framework aiming at delivering development change or progress. Identifying the level of the primary intervention will allow for:

Articulating Actions or Contracts according to an expected chain of results and therefore allowing them to ensure efficient monitoring and reporting of performance;
Differentiating these Actions or Contracts from those that do not produce direct reportable development results, defined as support entities (i.e. audits, evaluations);
Having a complete and exhaustive mapping of all results-bearing Actions and Contracts.

Primary Interventions are identified during the design of each action by the responsible service (Delegation or Headquarters operational Unit).
The level of the Primary Intervention chosen can be modified (directly in OPSYS) and the modification does not constitute an amendment of the action document.

The intervention level for the present Action identifies as (tick one of the 4 following options);

Action level (i.e. Budget Support, blending)		
☒	Single action	Present action: all contracts in the present action
Group of actions level (i.e. top-up cases, different phases of a single programme)		
☐	Group of actions	N.A.
Contract level		
☒	Single Contract 1	Grant
☐	Single Contract 2	Procurement
☒	Single Contract 3	Contribution Agreement to entrusted entity
☐	Single Contract 4	Contribution Agreement to entrusted entity
Group of contracts level (i.e. series of programme estimates, cases in which an Action includes for example four contracts and two of them, a technical assistance contract and a contribution agreement, aim at the same objectives and complement each other)		
☐	Group of contracts 1	N.A