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Assertive, appreciative and aloof:
SOUTH AFRICA, CABO VERDE AND GHANA REFLECT ON EU RESEARCH AND INNOVATION COLLABORATION

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Research and innovation (R&I) is a key ingredient of sustainable development. It is also an asset that the EU wishes to leverage to create more horizontal, mutually beneficial and multi-actor partnerships with middle-income countries (MICs). Our study presents the perspectives on R&I cooperation with the EU in Cabo Verde, Ghana and South Africa.

While the EU has a strikingly different profile in each country, all national R&I communities share an interest in collaborating with the EU. This interest springs from the EU's financial resources, the quality and quantity of research, its intercultural and multilingual networks, and its ability to make a structural contribution to national capacities, for example under the Horizon 2020 R&I programme.

R&I can offer opportunities for innovative partnerships, but partners would prefer a more honest communication on the motives and the benefits the EU expects to gain from collaboration. They would also like to see simpler procedures for participation in EU R&I programmes and, more broadly, a nimbler EU that can adapt to local agendas and the workings of dynamic enterprises. There is a clear need in all three countries for context-relevant and nationally-owned research agendas.

The EU should decide whether and how to launch an R&I collaboration and this should be an explicit, well thought-out choice rather than an accidental outcome. Otherwise, the EU risks becoming just one among many actors.

The negotiations on the EU's new R&I programme under the 2021-2027 budget and the programming of international resources present an opportunity for approaching international R&I collaboration more strategically. This will be the topic of a second dedicated paper.

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Acronyms

ACE	Africa Centers of Excellence for Development Impact
AfDB	African Development Bank
BRICS	Brazil, Russia, India, China and South Africa
CERMI	Centro de Energias Renováveis e Manutenção Industrial (Cabo Verde)
CONCHA	The construction of early modern global cities and oceanic networks in the Atlantic: An approach via OceaN's Cultural HeritAge (Cabo Verde)
CORDIS	Community Research and Development Information Service
CRIS	Council for Scientific and Industrial Research (Ghana)
CSO-RISE	Civil-Society Organisations - Research and Innovation for Sustainable Development
DEVCO	Directorate-General for International Cooperation and Development (European Commission)
DG	Directorate-General (European Commission)
DST	Department of Science and Technology (South Africa)
EC	European Commission
ECDPM	European Centre for Development Policy Management
ECOWAS	Economic Community of West African States
EU	European Union
FDI	Foreign direct investment
GAEC	Ghana Atomic Energy Commission
GDP	Gross domestic product
GHS	Ghanaian cedi
GNI	Gross national income
H2020	Horizon 2020
ICT	Information and Communication Technology
JAES	Joint Africa-EU Strategy
KNUST	Kwame Nkrumah University of Science and Technology (Ghana)
MESTI	Ministry of Environment, Science, Technology and Innovation (Ghana)
MFF	Multiannual Financial Framework
MIC	Middle-income country
MIASA	Maria Sibylla Merian Institute for Advanced Studies in Africa (Ghana)
NOSi	Núcleo Operacional da Sociedade de Informação (Cabo Verde)
ODA	Official development assistance
ORID	Office of Research Innovation and Development
PEDS	Plano de Desenvolvimento Sustentável (Sustainable Development Strategic Plan for Cabo Verde)
R&D	Research and development
R&I	Research and Innovation
SDG	Sustainable Development Goal
STEM	Science, technology, engineering and mathematics
STI	Science, technology and innovation
USD	United States dollar

Introduction: scoping research and innovation for future engagement in Africa

As negotiations on the priorities for the next EU budget for 2021-2027 and the strategic programming of funds shift up a gear, the European Union's (EU) institutions are pondering how to use research and innovation (R&I) in their relationships with third countries. This applies particularly to those where a narrative of innovative partnerships and mutual benefits is taking shape (Di Ciommo & Sayós Monràs 2018). These are primarily middle-income countries (MICs) with which the EU wishes to collaborate beyond the classical realm of development cooperation or traditional diplomacy.

There are two set of factors at work here. First, more interest-driven, national agendas are restructuring the space for international cooperation and development assistance and leading to new forms of collaboration. Science diplomacy, joint research on global challenges, technology transfer, people-to-people relationship-building and knowledge exchanges are all seen as tools for attaining both EU and shared objectives and for achieving the Sustainable Development Goals (SDGs). Europe is still a leading research power (accounting for 19% of global investments in 2013), third in the world after the United States and China (UNESCO 2015).

Second, R&I is critical to sustainable long-term economic growth, employment creation and the end of poverty in accordance with the SDGs (Gyekye, Vukor-Quarshie & Oseifuah 2012). In Africa, R&I would be instrumental in securing a demographic dividend and contributing to economic transformation. By 2050, 'integrating the African labour force into global supply chains would be beneficial both to Africa and to other regions' (Brown & Slater 2018, p. 6). In addition, countries in the South have historically advanced demands in terms of knowledge-sharing and technology transfer, and have become R&I actors themselves in an increasingly diversified international R&I environment. However, it is also a world exposed to risks of 'protectionism for science', i.e. governmental attempts to keep research findings within their borders (EL-CSID 2019).

In the political discourse, R&I tools are often presented as a collection of fresh ideas. In fact, the EU is already working with international partners on R&I through, for example, its comprehensive and multi-billion euro Horizon 2020 (H2020) programme, Erasmus+ and as part of its development cooperation portfolio.[1] Against this background, the issue is more what it would take to make more effective use of the space available for R&I collaboration with partner countries, and indeed how much space there is. This study looks at these issues from the perspective of three African MICs, i.e. Cabo Verde, Ghana and South Africa. We were interested in finding the answers to two main questions:

1. What do academics, civil society, businesses and public administrators in these countries think of international R&I cooperation with the EU?
2. What are the main takeaways that could feed into the EU's policy-making agenda, namely strategic decisions on the future EU budget and the programming of international funds?

This paper is a scoping exercise around the first question. A follow-up paper will look at the second.

Cabo Verde, Ghana and South Africa are three very different countries: the first is a small island state, the second a low-middle income country, and the third epitomises the typical African MIC. Ironically, up-to-date

[1] Although EU science and cultural diplomacy are in their infancy, a new communication entitled A New European Agenda for Culture was recently released (EC 2018b). Cultural and science diplomacy is also part of the EU's 'soft core' of external relations. See: https://ecdpm.org/dossiers/culture-international-cooperation.

data on R&I is hard to find. What data is available illustrates the differences among these countries in terms of R&I (see Table 1): investments as a share of GDP are very low in Cabo Verde and Ghana, while South Africa invests almost twice as much as the latter. Cabo Verde's low R&I capacity is reflected by the small number of published scientific articles and the small number of technicians per thousand inhabitants, although the data on researchers is more encouraging. Ghana scores quite poorly on gender equality in R&I compared with the two other countries. Naturally, the data must be seen in the context of very different population sizes (see Annex A). Any comparisons need to be taken with a pinch of salt, given the limitations in data quality and availability.

Table 1. R&I statistics for Cabo Verde, Ghana and South Africa[2]

Research and innovation indicators	Cabo Verde	Ghana	South Africa
Research and development expenditure (as % of GDP)	0.073 (2011)	0.377 (2010)	0.798 (2015)
Scientific and technical journal articles (thousands)	8.1 (2016)	982.1 (2016)	11,881.2 (2016)
Researchers (per million inhabitants)	49.2 (2011)	38.4 (2010)	473.1 (2015)
Technicians (per million inhabitants)	7.9 (2011)	29.8 (2010)	139.1 (2015)
Female R&D personnel (absolute no.)3	63	1,641	23,285
Female researchers (absolute no.)	51	465	15,794
Female share of total R&D personnel (%)	43.2	21.9	41.9
Female share of total researchers (%)	39.8	18.3	41.7

Source: Data on R&D expenditure, scientific journal articles and the number of researchers and technicians is from the World Bank database. All other data is from the African Innovation Outlook 2014 published by the NEPAD Planning and Coordinating Agency and includes data from the African Science, Technology and Innovation Indicators R&D surveys, either for 2010 or the most recent year prior to 2010.

[2] Research and development (R&D) includes both capital and current expenditure in the business, government, higher education and private non-profit sectors. R&D covers basic research, applied research and experimental development. The item 'scientific journal articles' refers to the number of articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences. The World Bank defines researchers as 'professionals who conduct research and improve or develop concepts, theories, models techniques instrumentation, software of operational methods' and technicians as 'people who perform scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers'. R&D covers basic research, applied research, and experimental development. For more information, see https://data.worldbank.org/topic/science-and-technology.

[3] Ghana has more recent data on gender (MESTI, 2017) but the figures are not comparable with data for the two other countries.

The three countries also have different relationships with the EU on R&I and more broadly.

We collected a range of domestic views on the national R&I environment and on the drivers, benefits and shortcomings of the EU approach to R&I collaboration. We also scoped the demand for such collaboration and its added value in comparison with that offered by other international players. We conducted field trips of about one week in each country during which we interviewed a total of 63 people: 15 in South Africa (three women and 12 men); 22 in Ghana (16 women and six men) and 26 in Cabo Verde (eight women and 18 men). We interviewed university administrators, researchers, think-tank experts, national policy-makers, business people and development partners. We also attended a seminar on the topic held in in Praia, Cabo Verde, jointly organised by the ECDPM and the West Africa Institute. We complemented fieldwork with desk research on EU external action, international cooperation on R&I and MICs.

We found that R&I collaboration with the EU is regarded as a valuable means of supporting national R&I environments and sustainable development. However, the EU brand risks losing visibility, and in some cases ground**,** to players such as the BRICS countries and the US, even in countries such as Cabo Verde and South Africa that are strongly committed to EU collaboration. Moreover, the EU's idea of equal and mutually beneficial collaboration in R&I seems quite far removed from reality in the case of African MICs, although for different reasons in each context. In all three countries, our interviewees expected R&I to serve primarily domestic needs. In some cases, they would like to see more research projects led by African researchers. They also ask for the EU to be more explicit about the underlying interests driving its strategy and objectives.

This study concludes with a number of general points on the EU's 2021-2027 Multiannual Financial Framework (MFF) and the programming of these resources, both under external financing and Horizon Europe, the future research framework programme.[4] These will be further explored in the second publication. We do not pretend to tell the full story on Cape Verde, Ghana and South Africa – or to present an 'African voice' on R&I. Rather, we hope that the two papers will result in a more balanced understanding of non-European perspectives on R&I collaboration that will inspire better policies in the EU.

1. Cabo Verde: negotiating insularity through R&I

Cabo Verde has a strong vision on the use of human capital, technology and its geostrategic position for sustainable development and has made impressive progress in developing its R&I environment. There are still many hurdles to overcome before this vision becomes a reality. For some people, a prosperous and technologically advanced country still looks like a distant dream. All in all, though, the challenge for Cabo Verde seems to be one of sustainability rather than a lack of drive or opportunities. The EU has a high profile in Cabo Verde and is a recognised partner. The R&I space could be better exploited to support a successful and like-minded neighbour leveraging EU knowledge, resources and networks.

Internationalisation is a core strategy

Cabo Verde is a collection of ten islands, nine of which are populated. While most Europeans are familiar with Cabo Verde as a tourist destination (tourism accounts for 42% of its international resources; see Annex A), the country is also well-known among international development *aficionados* as a successful, policy-led case of graduation to low middle-income status. While graduation is not *per se* a sign of development, Cabo Verde has something to show for it. Uninhabited until the 15th century and regarded as

[4] For more details on the ECDPM's work on EU negotiations on the next MFF, see: https://ecdpm.org/dossiers/multiannual-financial-framework-mff/

a non-viable country at the time of its independence from Portugal in 1975, it is hailed today as an example of a stable and peaceful democracy, with a committed administration and a multicultural population and having achieved social progress. Cabo Verde managed to bring about a substantial decline in extreme poverty, from 18.5% in 2000 to 7.2% in 2015 (Annex 5). Cabo Verdeans are proud of these achievements. They agree that this is what they have to offer to the world and believe that their success should trigger more appreciation, especially in the current political climate and in a region, i.e. West Africa, that is short on the above characteristics on many accounts.

Cabo Verdeans consider insularity as both a privilege to be exploited and a condition that needs to be counteracted by internationalisation. In the realm of R&I, internationalisation anticipated a fully functioning educational system: since the islands did not have a university to speak of until 2001, when the private Piaget University opened its doors.[5] At the time Cabo Verdean elites studied abroad and many continue to do so today. Even after 2001, internationalisation strategies have helped to resist what could be called 'knowledge insularity'. Studying abroad meant that Cabo Verdean students had access to cutting-edge knowledge and prestigious studies, were able to keep up with the pace of innovation and compensate for the limited formative offer in their own country. As a non-aligned country, Cabo Verde developed strong links with Europe, Latin America, the former Soviet Union and China. However, because of cultural affinities and a shared language, Portugal and Brazil (and to some extent other Lusophone countries) have been the allies of choice.

Throughout its history, Cabo Verde has valued internationalisation and has always been on the lookout for new opportunities. For example, by the year 2017, the public University of Cabo Verde (founded in 2006) had participated in 139 international projects and events and had hosted 98. There has also been some two-way traffic: as Cabo Verdeans have gone abroad, so foreigners have come to contribute to academic research and teaching. Our research identified a clear understanding of the benefits of international networks and collaboration in terms of:

- raising the visibility of Cabo Verde and its universities;
- widening a limited educational offer;
- fostering international collaboration as a way of speeding up knowledge transfer;
- using multiculturality and international mobility as answers to young people's expectations of international experiences;
- training teachers and strengthening human resources;
- improving research infrastructures.

An evolving research environment

Cabo Verde has made a great deal of progress in tertiary education and research. A new Directorate for Tertiary Education, Science and Technology as part of the Ministry of Education launched the National Research Agenda in December 2018.[6] The first call of the new Fund for Research for Development was also launched last year, for €20,000. The Regulatory Agency for Tertiary Education and the Statute of Researcher, which better defines the profession, were also inaugurated.

[5] The first university established in Cabo Verde was the Piaget University in 2001, followed in 2006 by the public University of Cabo Verde. Historically, most research has been conducted by agencies founded in the 1980s and with limited funding and human resources.

[6] It has six thematic pillars: environment and health; seas and oceans; regional economy; social sciences, education and culture; archipelagic economy; and technology.

Today, despite the fact that Cabo Verde has nine universities, research capacity remains low. While its educational offer has expanded to a total of 69 postgraduate, master's degree and vocational training options, the University of Cabo Verde has only four PhD programmes. Non-academic research institutions face logistical, financial and staffing constraints. The brain drain is a structural threat to the research capacity of a small economy such as Cabo Verde.

With all its pros, internationalisation means that the production of knowledge relevant to Cabo Verde's domestic problems occurs either abroad or not all. Cabo Verdean public administrators and businesses believe there is a need to adapt externally-led research to national social, economic and natural environments and intensify relevant knowledge production in Cabo Verde. They feel that research agendas should evolve from reactive (i.e. problem-solving) to proactive (i.e. anticipating problems and suggesting solutions). Research on marine environments is one example of dynamism: the *Campus do Mar* (Campus of the Sea) in Mindelo is planning to offer academic and technical courses and to perform applied research. Cabo Verde is a founding member of the Atlantic International Research Centre, a new research network on the Atlantic.

Innovation and human capital are key

The lack of professional opportunities has meant that many Cabo Verdeans have opted for greener pastures abroad, sometimes quite literally considering the almost lunar landscape on some of the mother islands. With few natural resources, high youth unemployment (12.4% of people who have completed higher education remain unemployed) and a diaspora double the size of its small (546,000) population, job creation, human capital development and innovation are at the centre of Cabo Verde's national development strategy, the Sustainable Development Strategic Plan (PEDS).

The first objective of the PEDS is '*to make Cabo Verde an economy of circulation in the middle of the Atlantic*', offering air and marine connectivity services, attracting international business opportunities, leveraging the diaspora, diversifying tourism, and developing information and communication technology (ICT) (Ministério das Finanças, Direção Nacional do Planeamento Governo de Cabo Verde 2018). The idea of an infinitely connected Cabo Verde permeates the vision of the country as the hub of three continents, i.e. Africa, Europe and the Americas, and as a laboratory for experimenting with technologies and ideas in a stable, lively, progressive, multicultural and internationally integrated environment.

The PEDS envisages Cabo Verde as an innovation hub and smart digital platform: the Digital Strategy's vision is for Cabo Verde *'to become an engine of transformation towards building a digital society in Africa'* (Handem, A. 2018; Fernandes Antonio J. 2019). The idea is not only to improve ICT for the Cabo Verdean population but, more fundamentally, to transform Cabo Verde into a researcher, investor producer and distributor of digital economy products and services. The idea is for Cabo Verde to create decent jobs and provide international ITC services, for example to West African and Lusophone countries, and set itself up as a centre of reference for ICT investments. Although the private sector needs to lead, the PEDS envisions strong support from the public sector, for example on regulatory matters and capacity development.

Cabo Verde is doing its homework in this area: a technical park is under way on Santiago Island, with support from the African Development Bank (AfDB). ICT education has become compulsory in secondary schools and Cabo Verde is reaching out to the international community to attract partnerships and investments (Government of Cabo Verde 2018). The African Innovation Summit also has its origins in Cabo Verde (Financial Afrik 2018). The Núcleo Operacional da Sociedade de Informação (NOSi) is the

crown jewel of ICT innovation in Cabo Verde. Established in 1998, it works on ICT in-country and provides data storage and e-governance services to some ECOWAS (Economic Community of West African States) member states, as well as certain Lusophone African countries outside of ECOWAS.

There is widespread acknowledgement that Cabo Verde needs to solve its transport, energy and human resources issues in order to take the next step in this direction. Efforts on renewables are ongoing: the 2017-2040 Masterplan for Sustainable Energy envisions taking renewable energy generation to 50% of national consumption by 2030. Renewable energy offers advantages for Cabo Verde in terms of lower costs of electricity and water, reduced dependence on imported fossil fuels and technology transfer opportunities. The Centro de Energias Renováveis e Manutenção Industrial (CERMI), a training centre for renewables and industry, is pitching itself as a regional reference point. Similarly, ICT training is expanding, although R&I capacities would need to be sensibly scaled up and tertiary education reforms are regarded as being important.

Technology has greatly improved the lives of the population, spread as it is across nine islands with tricky transportation and issues of scale, with the aid of e-government, telemedicine, distant learning and e-jobs.[7] Supporters of the vision of Cabo Verde as an innovation hub and smart digital platform believe that more technology will deepen these benefits. Others reject it as being a plan that is 'only good for Praia', the national capital, and question the benefits it would bring to the most disadvantaged Cabo Verdeans. An additional concern is that Cabo Verde is betting on too many horses, i.e. tourism, the blue economy, ICT, renewables, transportation, etc., and that its ambitions are unrealistic. Development partners recognise that Cabo Verde's administration is reliable, honest and serious, but they fear that its scant human and financial resources could be spread too thinly.

The EU: an appreciated partner with an underexploited potential

We found that the EU is regarded as a recognisable and appreciated partner in Cabo Verde. In the words of one interviewee, it is 'an anchor for our small steps'. It has indirectly supported tertiary education and research through general budget support.[8] Horizon 2020 is a well-known programme and Cabo Verde research organisations participate in nine projects (CORDIS Datalab Horizon 2020 Organizations nd). While this is only a small number, it is in fact remarkable that a country with an admittedly limited research capacity and young institutions has been able to access such a complex programme. Access has been thanks to personal or institutional connections, primarily with Portugal but also with Spain, Germany, France and the Benelux countries.

Participation in the Horizon 2020 (H2020) programme is deeply appreciated. Beyond financial resources, the 'structuring' character of involvement is a plus: projects develop long-lasting capacities and research infrastructures, as in the case of the University of Cabo Verde. They are also an opportunity to carry forward indigenous projects with a strong link to national priorities. For example, the CONCHA project that investigates the history of Atlantic navigation since the 15th century also helps to strengthen submarine research capacities, build a better and more sustainable tourism offer and deepen knowledge of the country's unique cultural heritage (CORDIS Factsheet).

[7] Telemedicine is also supported by EU countries such as Slovenia (ITF Enhancing Human Security, 2018).

[8] General budget support is an aid modality through which international partners directly support a country's national budget through the ministry of finance. While sector budget support is specific to a sector (such as health or education), general budget support is not tied. The country's government decides how to use the resources, although this is often a matter of negotiation with the donor.

However, there is scope for growth in the EU's R&I profile. Evidence suggests that the EU profile is linked more closely to a general in-country presence rather than specifically to R&I. Participation in Horizon 2020 is hampered by a number of factors such as complex procedures, the need to have a European partner to access the programme, low research capacity and a scarcity of human resources in Cabo Verde. The EU delegation has been trying to offer tailored courses in H2020 and there is a demand for simplified H2020 procedures. Some interviewees suggested that a dedicated financial envelope would facilitate partnership. While this could ease national budgetary negotiations on educational funding, this demand needs to be balanced against the benefits of the general budget support that Cabo Verde receives from the EU today.

Although keen on a stronger relationship with the EU, Cabo Verdean stakeholders did not seem aware of 'associated status' in H2020. This allows third countries to participate in the programme on a footing similar to EU member states.[9] Under the proposed Horizon Europe, the new R&I framework programme for the 2021-2027 period, association opportunities might be extended, although prospective associates would still have to meet certain requirements. A discussion about this could form part of a wider dialogue on a more political and economic collaboration between Cabo Verde and the EU.

The EU-Cabo Verde Special Partnership includes a pillar on a knowledge-based society to encourage 'economic, social and cultural development through education, research and information and communication technologies'. From our interviews, we gathered that this pillas seems to have been underexplored. On a more positive note, the EU and Cabo Verde signed the Mindelo Agreement on marine and oceanic research in 2018, during a visit by Carlos Moedas, the EU Commissioner for Research and Innovation, and as part of an Atlantic partnership among countries in the North and the South (EC 2018d). Although R&I is not part of the Cabo Verde National Indicative Programme which sets out priorities for the European Development Fund, the EU delegation has worked hard to raise the visibility of H2020. One of the ideas we heard, both from the delegation and Cape Verdean interviewees, is to provide training in EU framework programmes in order to boost participation.

Innovation: a more mixed picture

Where innovation is concerned, the picture is more mixed as compared with research. The EU institutions have supported the masterplan and CERMI on renewables, jointly with other member states such as Luxembourg. Beyond that, and especially on ICT, some of our interviewees claimed that the EU was hard to get on board even where there was a clear mutual advantage. In diplomatic circles, this disappointment often translates into requests for additional funding, but not at the expense of other partnerships and resources.

Some other interviewees put more emphasis on the fact that the EU could be a more profitable ally in showcasing Cabo Verde as a destination for sustainable investments and as a reliable partner for European businesses. Support for regulation was also valued, although the main objective should not necessarily be regulatory alignment with the EU. The Africa-EU Alliance could offer some opportunities, although there were concerns that the Alliance did not offer the right framing, mindset and instruments. Horizon 2020 and, more broadly, EU procedures were regarded as not being fit for the scale and working methods of innovative, small to medium-sized businesses with a more private-sector-oriented mindset.

[9] Albania, Armenia, Bosnia & Herzegovina, the Faroe Islands, Georgia, Iceland, Israel, Moldova, Montenegro, Norway, Serbia, Switzerland, North Macedonia, Tunisia, Turkey and Ukraine (EC 2019b). See also Regulation (EU) No 1291/2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020), article 7.

In short, the European brand seems much in demand in a country that wants to move quickly on innovation. Europe still retains a fascination for Cabo Verdeans, some of whom feel culturally close to the continent. However, as one interviewee put it, '*I am agnostic about partnerships [...] and Europe is losing ground in Africa, fast!*' Another interviewee said that '*we are too small to be picky*', implying that they would keep relations warm with the EU as a trusted and historic partner, while also turning to more proactive and flexible players such as China and the US.[10]

2. Ghana: a rich R&I environment struggling for recognition

Perceived as a political and economic stronghold among less stable West African neighbours, Ghana has profiled itself internationally as a thriving middle-income country that is aiming for beyond-aid cooperation. Ghana has a rich R&I community that can help find nationally-led solutions to remaining development issues such as economic transformation, as well as emerging issues such as inequality. Ghana's population includes a large number of young people whose aspirations and future visions also need to be considered so as to ensure that the country remains as stable and peaceful as it is today. While extreme poverty has been reduced, 10.9% of Ghanaians still lived in extreme poverty in 2015. Over 80% of Ghanaians work in the informal sector and 5.9% of people who have passed through higher education remain unemployed (see Annex A).

President Nana Addo Dankwa Akufo-Addo seems to be giving a fresh impulse to science, technology and innovation (STI). This is music to the ears of a community driven largely by external funding and of innovators who appear to be thriving in spite of, and not thanks to, public-sector action. But, with elections looming in 2020, concerns linger among those working in the field about the political will to place STI, and R&I more broadly, at the core of national development. The EU's R&I profile in Ghana is minimal, a situation that may be attributed to the vast number of international partnerships in the country, together the low level of interest and the EU's capacity to engage on the topic.

A promising future for R&I?

Ghana's STI surge dates back to its independence in 1957. President Kwame Nkrumah's government took great interest in science and technology and established a number of research institutions that are still relevant to Ghana today.[11] In recognition of his efforts, the African Union's Scientific Excellence Award for key scientific contributions to African development is named after him. After the end of his rule, STI was put on the back burner of Ghana's development efforts as political attention and investments faded (Amankwah-Amoah, J. 2016).

More recently, STI seems to be back on the national agenda as part of a wider attempt to transform Ghana's economy under what is known as a 'Ghana Beyond Aid approach'. In January 2019, President Nana Akufo-Addo presented an update on the progress made under the 2017-2020 Ghanaian STI policy and the Coordinated Programme of Economic and Social Development Policies (2017-2021) (MESTI 2017; Republic of Ghana 2017; Citi Newsroom 2019).[12] The President also announced the establishment of a

[10] The Special Economic Zone on the island of Sao Vicente is sponsored by China (Macauhub, 2018).

[11] The Ghana Academy of Arts and Sciences, the Council for Scientific and Industrial Research (CRIS), the Ghana Atomic Energy Commission (GAEC) and the Kwame Nkrumah University of Science and Technology (KUST).

[12] The objectives of the 2017-2020 STI policy are to provide a framework for interinstitutional efforts; to create an enabling environment for STI; to ensure that STI supports competitiveness on trade and exports; and to promote a societal science and technology culture.

Presidential Advisory Council to provide oversight and advice on STI envisioned by this policy. He reiterated his pledge to raise STI national funding to at least 1% of Ghana's gross domestic product (GDP) 'in the short to medium term' and to increase it to 2.5% 'in the long term'.[13] The president also announced the formation of an Inter-Ministerial Coordinating Council to coordinate sectoral activities and a new Ghana Innovation and Research Commercialisation Centre. Other pillars of the STI approach include the integration of STEM (science, technology, engineering and mathematics) at all levels of education, stronger STI legislation and a clear focus on the development of strategic technology areas.

Our interviewees mentioned the future establishment of an R&I fund that would encompass sciences and humanities and involve both the Ministry of Environment, Science, Technology and Innovation (MESTI) and the Ministry of Education. This would represent an improvement in the current architecture, which is fairly fragmented. The hope is that it would bring more transparency to R&I funding, more ability to direct resources to national priorities and also earmark funding for research.

Beyond policy changes, we found that there was a fertile environment for R&I in Ghana. Ghana has a large pool of researchers both in academic institutions and in non-academic research centres. A 2015 survey counted a total of 5,579 researchers and 2,807 STI teaching staff. Under MESTI, which is responsible for national STI policies, and the Ministry of Education, which is responsible for tertiary education, there is an ecosystem of bodies working on academic training and research, science and atomic energy, agriculture, health, technical education and STEM, just to mention a few relevant fields. Among the beneficiaries of this system are CRIS and GAEC, the Noguchi Medical Research Institute, the University of Ghana, the Kwame Nkrumah University of Science and Technology. National bodies have also been pushing for stronger linkages between research and marketable innovations, as in the case of the University of Ghana's Office of Research Innovation and Development (ORID).

Another notable characteristic of Ghana's R&I landscape is its strong international character. Not only are Ghanaian researchers well connected internationally, Ghana's institutions also receive researchers and students from abroad. For example, many Nigerian students are studying in Ghana as the educational institutions in Ghana operate on a much more stable basis than those in Nigeria. During our fieldwork, we visited the newly established MIASA Institute, a collaborative research initiative that aims to reduce global knowledge asymmetries and boost collaboration between European and African researchers and beyond. MIASA is the first institute for advanced studies in sub-Saharan Africa outside of South Africa and is a joint venture involving the German Federal Ministry of Education and Research and the University of Ghana.

International R&I collaboration seems to be a structural feature of Ghana's environment. The successful experience of the Africa Higher Education Centres of Excellence is due to be expanded in Ghana as part of a new project.[14] Multinational organisations have started to explore new territory in Ghana, Google's recent establishment of an Artificial Intelligence research centre being a good example of this. The role of diaspora returnees has been pivotal in the expansion of private innovation institutions and start-ups, such as the private Ashesi University, which was awarded the renowned World Innovation Summit in Education Prize in 2017; and the ISpace Foundation start-up that is taking part in Horizon 2020 as part of its goal of supporting female entrepreneurship and leveraging ICT for social impact.

[13] The commitment to increase research and development spending to 1% of GDP was already made by African countries, including by Ghana, in 2006.

[14] The ACE (Africa Centers of Excellence for Development Impact) Project aims to scale up postgraduate education and applied research fundamental to economic growth in Central and West Africa. Funding of USD 300 million will be provided by the World Bank and Agence Française de Développement. Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Djibouti, Gambia, Ghana, Guinea, Niger, Nigeria, Senegal, and Togo are all involved in the project (ACE nd).

Pushing through barriers in search of opportunities for R&I

Such a wealth of assets seems to have grown quite organically rather than by explicit design and current public engagement on R&I is perceived to be limited. Despite the change of pace in the Ghanaian administration, we met profound scepticism about the government's capacity to push forward a national STI agenda and its political willingness to follow through on commitments, a sentiment shared by researchers and policy managers alike. STI, and R&I more broadly, is rightly perceived as a long-term game whose results do not fit in with the electoral calendar. As one interviewee said, '*politicians build things that people can see if they want to win elections*' and R&I does not do that.

One specific challenge is to clarify the links between STI and the Ghana Beyond Aid agenda. The agenda has merit in emphasising private-sector development, industrialisation and the need to attract foreign investors. It is also viewed as a political sound bite that presents a new mindset '*to get away from the panhandling mentality*', as one of our interviewees said. Otherwise, we encountered a lot of scepticism surrounding the Ghana Beyond Aid agenda. On the one hand, some development partners found it a challenge to identify the contours of the strategy and what it entails. On the other hand, some Ghanaians feared that the agenda went too far in disentangling the social and environmental aspects of development in a country that has deep and urgent needs on both counts. A related concern was that the government may not have adequately pondered the consequences of such a line on donors' behaviour.

This scepticism means that some see there is a risk of a missed opportunity, not only for R&I, but also for its potential to provide solutions to development issues in Ghana. As one interviewee said, *'there's an urgency because Ghana is on a tight timeline and the youth will be growing in frustration if they are not stimulated. So the debate is much larger than science and the social processes that drive what [researchers] are doing are key'*. In this sense, a focus on STI alone at the expense of the humanities was also regarded as being short-sighted.

Almost all our interviewees mentioned the lack of a strong national financing system as a huge challenge for linking R&I with national priorities. Most R&I funding in Ghana comes from abroad: according to a 2013-2015 survey, out of a total of approximately GHS 1 billion for R&I, GHS 757 million came from foreign donor agencies (representing 74% of the total). The Ghanaian government provided GHS 216 million (21%), and the rest came from the research institutions, charitable donations and, albeit to a minimal degree, the private sector. As the survey report concluded, '*he who pays the piper calls the tune and so the government needs to enhance R&D funding to have a greater control of the research agenda*' (MESTI 2016). This is a sentiment shared by the vast majority of our interviewees: while foreign support is appreciated and helps to keep institutions running, Ghanaian researchers struggle to link their research with national priorities as research framing, procedures and timing are set elsewhere.

One consequence is that it is difficult to gain access to information relevant to policy-making. Development partners and Ghanaian policy-makers said that they found it hard to find data on a vast array of issues. In many cases, there is no continuity of knowledge production. The irony is that some of this information may be available in grey literature (i.e. produced outside traditional academic channels), *ad-hoc* surveys or as part of wider research projects carried out elsewhere. A strong, long-term national commitment to nationally-owned R&I is considered as being crucial in order to fill this gap.

A number of research professionals also claimed that alternative or complementary research framing on top of those proposed to them would also enrich global knowledge. This applied, for example, to the fields of medicine, migration, agriculture or climate change. Asked when such framing should occur, they said that it should be done at the proposal stage or as part of bottom-up calls that gave researchers more

freedom to shape their work. Calls that required co-authoring by researchers from different countries and institutions were also considered a good practice. In relation to innovation, researchers valued the facilitation of international exchanges, opportunities to network with potential funders and long-term engagement with funders. While the Ghanaian government was perceived to be focusing on attracting large-scale investments from abroad, small-scale resources could go a long way to support local innovative start-ups, innovators said, so the threshold for international investments should be lowered.[15]

EU presence on R&I is limited: a missed opportunity or other interests?

R&I is not a focus for collaboration between the EU and Ghana and our interviews confirmed that the EU's R&I profile is minimal. The EU supports research activities as part of broader projects, for example in agriculture and climate-change resilience. A call was recently issued under the CSO-RISE programme (Civil-Society Organisations - Research and Innovation for Sustainable Development), which attracted more than 52 applications. Four of these were selected. The research component of the project focused on social protection.

Ghana is a low to mid-range performer under Horizon 2020, with 11 projects (Cabo Verde has nine and South Africa, an exceptional performer, has 124) (CORDIS Datalab Horizon 2020 Organizations nd). The EU's limited engagement stems from the fact that R&I is not part of Ghana's National Indicative Programme (EC 2014), which was developed in accordance with national priorities and focuses on public-sector management and accountability, productive investment in agriculture, employment and social protection. The EU+ Working Together in Ghana, the joint programming document of EU member-states plus Switzerland, makes limited mention of R&I (White & Illán, 2017). Our interviewees confirmed that the government had not included R&I in the discussions with the EU and that this had not left any scope for R&I initiatives, even when Ghana's administration expressed a degree of interest.

Such a low profile may also be attributed to the many international partnerships formed by Ghanaian organisations spanning a wide range of countries and institutions. The US, the UK, Denmark, Norway, Sweden, Canada, Japan, Germany and others were mentioned during our interviews. Multilateral organisations and charitable bodies also fund R&I. With such an array of partners, it was difficult to identify an EU profile, even in initiatives where the EU is the only funder, such as the African Union Research Grants under the Joint Africa-EU Strategy's (JAES) STI pillar (EU Directorate-General for External Policies 2017).

Where the EU is a recognisable partner, our interviewees were positive. Some interviewees noted the financial benefits of engaging in H2020 as a key motivator. The H2020 programme is considered a competitive programme which allows participants to work with European and African researchers and innovators alike. The programme is also appreciated for the high quality of the participants and the fact that it is results-oriented, a feature that allows any underperforming partners to be called to account. Interviewees mentioned the administrative burden as a barrier to participation in H2020. H2020 has a contact point in Ghana, which received training and information on the programme. However, the contact point suffers from a lack of capacity to promote the programme and scope opportunities for the national community. Participation depends on personal networks and, at the University of Ghana, on calls posted on the ORID database.

In line with the overarching messages of the Ghana Beyond Aid agenda and the Africa-Europe Alliance, the future focus of EU-Ghana collaboration would appear to be on private-sector development and job

[15] It currently stands at USD 200,000.

creation.[16] These are both urgent in a country set to double its population by 2050 and whose President mentioned the '*seemingly intractable problem of the Ghanaian economy's industrialisation deficit*' as a top priority (Government of Ghana nd). Such an agenda opens up opportunities to work selectively on R&I in areas where there are stronger linkages between innovation, technical education and economic growth. The EU's role in a wider, more nationally owned R&I agenda seems more limited and primarily linked to how the EU budget support aid modality will be used in the future. Although the establishment of a national fund for R&I offers opportunities, it will be up to the Ghanaian government to decide what to do with it.[17]

3. South Africa: reconciling Africanisation, internationalisation and a strong position in the South

South Africa's leading role in R&I is widely recognised for its contribution to pushing stronger R&I investments in Africa and for its status as a gateway for Europe to access African networks and knowledge. The country's R&I landscape reflects the complex relationship between South Africa and Europe, in relation to which South Africa has been cautious about taking on a leadership role in Africa and at the same time profiling itself as the EU's key partner for pushing forward similar values on the continent and beyond (Masters, 2014). South Africa purports to wed the continued internationalisation of its R&I agenda to a domestic political context in which there is a strong demand to africanise the knowledge domain. As a result, the country maintains a close and special relationship with the EU while leveraging opportunities for African countries and seeking South-South collaboration.

Privileging 'glocal' R&I in a context of africanising and decolonising knowledge

Within both the South African government and universities, there is a sharper focus on the merits of 'glocal' research and innovation and on preparing for the 4th industrial revolution in a context of continued calls for africanising and decolonising knowledge (production) in South Africa.[18]

In the wake of the process of democratisation in 1994, South Africa has focused on job creation, poverty elimination and the reduction of inequality. Despite this, 18.9% of the population still lived in extreme poverty in 2015 and inequality remains deep, with the poorer segment of the population (i.e. the bottom quintile) receiving only 2.4% of South Africa's income. Over 14% of those who have passed through higher education were unemployed in 2018. The influence of STI on these aspects has been recognised since the first national Reconstruction and Development Programme and subsequently acknowledged in key documents up until the current policy on STI (i.e. the ten-year Innovation Plan for South Africa 2008-2018, ESASTAP 2020, nd).

National R&I policies have a dual objective, i.e. '*to enhance South Africa's capacity for generating knowledge to produce world-class research outputs*', according to the South Africa Yearbook Science and Technology 2017/2018, and also to contribute to socio-economic development at home (GCIS 2018). In

[16] In October 2018, the EU Ambassador to Ghana, Diana Acconcia, said: '[...] You are a strong promoter of Ghana Beyond Aid – and I couldn't agree more with you. The EU is changing the focus of its relations with Africa from a "donor receiver" relationship to a partnership based on common interests and values. President Juncker has called it an Alliance for Sustainable Investment and Jobs.' (European Union Delegation to Ghana 2018)

[17] The new funding is to be directed towards job creation by promoting domestic and foreign private investment, supporting economic transformation by businesses, boosting employment opportunities, bolstering public financial governance, encouraging domestic revenue mobilisation and counteracting corruption (EC 2019a).

[18] The term '4th industrial revolution' generally refers to the rapid evolution of robotics, artificial intelligence, 3-D printing (or additive manufacturing technology) and the internet of things

other words, there is a need for a combination in which '*African solutions for African problems*' bring added value to South Africa and globally. Our interviewees repeatedly mentioned a couple of specific themes.
First, the need for home-grown and home-led research and innovation. According to a number of interviewees, South African R&I should focus on the production and re-discovery of indigenous knowledge. African knowledge (of medicines, for example[19]) has been continuously sidelined in the West and even in South Africa: '*for a long time, people thought Africa had not much more to offer than the singing and dancing'*, one interviewee asserted.

A growing number of Africans want to be recognised for the ways of transmitting their knowledge (including orally), the content, research methodologies and the parameters on which research quality and institutions are assessed. As one interviewee put it, '*local epistemology based on African narratives and Africa's needs*'. They feel that this should form an incentive to develop home-grown and fully African-owned methodologies for R&I.[20] Some interviewees also argued that South African universities, which have often contributed to research consortia led by European, should drive their own research agendas.

The call for home-relevant research and innovation is also strong. The motto would be: 'Locally relevant, globally applicable'. Our interviewees stressed that research should focus on solving problems at home. Solutions could then be exported to other countries and regions of the world.[21] The rationale would be for South African research to be home-relevant, market-specific, future-oriented and 'transferable' to places facing similar problems.

Examples abound. Research on how mines contaminate water in South Africa may also be of use in other countries with a big mining industry, as the work of the University of Witwatersrand suggests.[22] Technology that addresses both social and logistic needs in South Africa, such as the Cape Town Ishack Project for equipping shacks with up-to-date technology, can be used in regions of the world facing similar problems, such as in poor communities in Brazil.

Calls for home-relevant R&I have grown stronger since the *#FeesMustFall* movement, which started in 2015 as a nationwide student protest across South Africa. More than a set of demonstrations advocating the suspension of fees for higher education, the movement '*radically questioned the socio-political dispensation resulting from the 1994 social compact between big business, the ruling elite and the liberation movement*' and put forward the issues of black consciousness and coloniality (Booysen et al. 2016). As evidenced by its twin movement, #rhodesmustfall,[23] #feesmustfall was directly related to demands to decolonise education and extend knowledge production in South Africa.
Our interviewees expressed the hope that the Africanisation of education and the internationalisation of research and education could serve agendas beneficial to South Africa's concerns about knowledge production and the same practices that govern the latter. At the same time, South Africa relies partly on the

[19] The Hoodia plant, for instance, was used by the Khoisan nomads to suppress hunger (allowing them to travel for days in the desert and to stay hydrated). A drug developed on the basis of this plant was introduced to the US market as an appetite suppressant, which gave rise to several legal disputes on patent law and traditional knowledge. For further information, see 'Case study: Hoodia Plant', prepared by the World Intellectual Property Organization in January 2008. See also 'Struggle over Hoodia patent continues', Business Day, Johannesburg, 12 July 2006, p. 6.

[20] How to define African parameters for ranking African universities will, for instance, figure on the agenda of the upcoming Times Higher Education Africa Universities Forum (Times Higher Education nd).

[21] Wits University Press considers itself 'strategically placed at the crossroads of African and global knowledge production and dissemination'(Wits University Press nd).

[22] The Industrial and Mining Water Research Unit from the University of Witwatersrand seeks to "Respond[ing] to the threats posed to exportable our environment by mine drainage" and to deliver "tailor-made research solutions for specific water issues." (University of Witwatersrand nd)

[23] This movement pushed for the removal of a statute of British imperialist Cecil Rhodes at Cape Town University, an aspiration subsequently picked up at Oxford University in the UK (Chaudhuri 2016).

outside world for external expertise. This means there is hope that '*decolonisation won't divorce us from the world research agenda*', as one interviewee put it. The political context may form an extra incentive for strengthening ties on R&I, especially with partners from the South, while maintaining those with Europe.

Preparing for the 4th industrial revolution

Our interviewees, both in the South African government and at universities, repeatedly mentioned the 4th industrial revolution. This has become the motto at the University of the Witwatersrand and the University of Johannesburg, where the Vice-Chancellor is nicknamed the 'Archbishop of AI'. There is concern, however, that technology will create a less labour-intensive job market, potentially leading to job losses and new forms of technical employment (Benioff 2016).

The 4th industrial revolution was central to a recent address by President Ramaphosa, in which he announced 'policies, strategies and plans that will position South Africa as a global competitive player within the digital revolution space', and appointed a dedicated Presidential Commission (South African Government 2019). Our interviewees recognised the government's acknowledgement of R&I and the understanding that, for development to get going, 'we need to be doing tech transfer and cutting-edge technology'.

Nevertheless, a degree of scepticism remains about these grand announcements. As one interviewee put it, *'we haven't even passed the third and we are [already] talking about the fourth revolution'*. South Africa's development landscape appears to lack confidence-building measures for facilitating such a step and there are doubts about whether leapfrogging is either desirable or feasible. The whole country is in debt to the tune of 400 billion Rands, and its infrastructure is less well-endowed than one might expect, with major problems surrounding railway connections and energy, for example (BBC 2019).

Unemployment is still rampant and the mismatch between the large number of theoretically skilled university graduates and the need for technically skilled young people on the job market remains wide. As one interviewee said, '*currently in Africa, there are too many universities producing many unemployable people, while colleges and practical schools should provide capacity-building for jobs that will later need these skills*'. This is also considered a challenge elsewhere on the continent: 'where job demand in the formal sector does exist, necessary skills and training do not, due either to the poor access and quality of education or to the specialisation of degrees in subject areas' (Brown & Slater 2018 p. iii).

South Africa and the EU: a strong and historic partnership in R&I

In spite of the 'fluctuating dynamics' of the SA-EU Strategic Partnership, during their 2018 meeting in Brussels, President Tusk and President Ramaphosa showed more interest in collaboration on R&I (Masters & Hierro, 2016). The EU-South African partnership in R&I started with the 1997 Science and Technology Cooperation Agreement. Since then, R&I has remained an integral aspect of collaboration, leading to a number of agreements including the Scientific Cooperation Agreement on Space Research in 2012, the Implementing Arrangement allowing South African researchers to visit the European Research Council, the South Africa Association Agreement with the EUREKA network (2015) and the Declaration of Intent on Marine research (2016) (DG Research and Innovation 2017).

Under H2020, South Africa has been a partner in 124 projects (CORDIS Datalab Horizon 2020 Organizations nd). South Africa came second only to the United States in 2014 and 2015 in terms of the number of grant agreements signed (DG Research and Innovation 2016). The ongoing collaboration

between the EU and South Africa's Department of Science and Technology (DST) remains thriving. The DST set up a network of H2020 National Contact Points to disseminate relevant calls, promote participation and support South African participants (ESASTAP 2020, nd). Similarly, the EU-South Africa ESASTAP 2020 was established to deepen STI partnerships between the two parties. The South Africa-EU Dialogue Facility promotes sector-specific dialogues on science, technology and education (South Africa-EU Dialogue Facility 2013).

Interviewees' perceptions of Europe's role on R&I revolved around three issues. First, there was criticism on practical grounds due to burdensome procedures, a lack of coordination and insufficient dialogue. Interviewees also called for less bureaucracy. The capacity to lead a project and perform the related administration is often lacking on the South African side, and some interviewees claimed that South African procedures were also cumbersome. Some interviewees encouraged the EU to disburse more direct funds and increase budget support to the South African government. According to one interviewee, indirect funding or working through consortia means that the EU is now '*most aloof and far from things happening on the ground*'.

A second challenge relates to the purported lack of coordination and integration between the different Directorate-Generals at the European Commission, making it harder for South Africans to know who to approach at the EU when discussing R&I, i.e. DG Trade, DG Research, DG DEVCO or others. Occasional conflicts of interest between the DGs on R&I are an additional challenge. As a result, we encountered a call for more and substantive dialogue in the framework of the EU-SA Partnership Dialogue Facility. The first step would be to formulate a common definition of what a 'dialogue' actually means, and then to agree on what the definition entails in practical terms. Dialogue is felt to be insufficient because there is a perception among South Africans that the facility results in what some describe as a one-way conversation, in which South African expertise (say, on how to handle and take a census of migration flows) is not always valued and considered a source of inspiration for tackling real-life problems.

A third set of criticisms are ideological in nature: '*South Africa, like other African countries, is allergic to interference from any [other] part of the world*', one interviewee claimed. Europe is still seen as a reliable and historic partner on R&I, though. Against this background, interviewees expected the EU to be more explicit about its interests in pursuing R&I collaboration and about recognising South African intellectual ownership and leadership. There were questions about the EU's broader objective of driving innovation and who will benefit from it, Europe's role in steering innovation with a social impact in South Africa, and the market access benefits deriving from R&I collaboration. As another interviewee put it, '*it is frustrating that Europe hides its agenda behind a narrative of political politeness. We prefer to work with people with interests because then we know why, and they are more motivated*'.

Under H2020, only member states and associated members' agencies and organisations can take the lead in research consortia. Some interviewees asserted that South African universities should also be able to take the lead (i.e. supply the primary investigators) and to steer the research agenda, in spite of the administrative burden associated with leading research projects. At the very least, they felt that more recognition should be given to intellectual work in the form of academic credit.

Others argued that it was easy to blame the absence of recognition or ownership on the EU: unless the 'going glocal' motto is put into practice and South African research becomes directly relevant to the EU, the EU would have little interest in promoting and paying for 'home-grown, home-led and home-relevant' research. The EU's R&I strategy is also interest-driven and research consortia with South African

universities allow European counterparts to access South African knowledge in the same way that South Africans are allowed to access European knowledge.

The EU: increasingly one among many?

In the South African context, the EU risks becoming one of many players in a world in which 'the prospects [...] for establishing a central role for both science diplomacy [...] as the "soft core" of its external relations have become more difficult' (EL-CSID, 2019). There seems to be space in South Africa for the EU and other actors to work towards stronger complementarity or a 'division of labour' in R&I. However, this would require a change in attitude as this type of approach has not succeeded in other areas such as development cooperation and seems to be difficult to pursue even within Europe itself.

R&I collaboration between the BRICS countries (i.e. Brazil, Russia, India, China and South Africa), especially in the sciences, has increased thanks to prioritisation by the South African National Research Foundation and the current Brazilian presidency of BRICS. Several declarations and memoranda have been signed to increase cooperation between BRICS universities and funding is available for '*excellent research on priority areas which can best be addressed by a multinational approach*' among BRICS countries (BRICS STI Framework Programme-Joint Call Secretariat nd; BRICS Network University 2015; BRICS representatives 2015).

However, there are also differences. In the case of South Africa, China has argued that hard, proper development such as in relation to the infrastructure comes first and that R&I should be linked to this type of development. In the Chinese view, Europe could position itself to lead on 'soft' R&I investments. However, current thinking in the EU seems to be going in quite a different direction in terms of framing partnerships with Africa, in part in response to the Chinese presence on the continent.

Another interesting development is South Africa's own role in R&I in Africa. Behind the scenes, South Africa provides support to research networks such as the African Research Universities Alliance, headquartered in Accra (Ghana), and the Association of African Business Schools.

4. R&I collaboration between EU institutions and African countries: some comparisons

A journey across three countries exposes even the most seasoned travellers to many different encounters. While it is tempting to lump all these encounters together under a common 'Africa' label, we feel that such a label would not do justice to the variety we experienced (Kapuscinski, 2001). At the same time, some experiences are reminiscent of others, and some words strike more of a chord than others. So we would like to conclude with a reflection on what the three countries have in common and what sets them apart when it comes to R&I and collaboration with the EU.

The EU has a strikingly different profile in the three countries. The EU and H2020 are highly visible in Cabo Verde, despite the small number of projects. This appears to be linked less to an apparent dearth of partnerships, as Cabo Verde has historically built many, and more to the historical and cultural connection that the islands retain with Europe, including with European universities and to the small, tight-knit national community. Cabo Verde sits in stark contrast with Ghana, where the EU is barely identifiable as an R&I actor and to a certain extent even with South Africa, where the EU is increasingly seen as one (albeit historic and reliable) partner among many.

South Africa's R&I collaboration with the EU is unique in other aspects: South Africa has a specific Dialogue Facility and a network of H2020 national contact points (EC 2015). It is also a top performer among third countries under Horizon 2020. South Africa's R&I policy framework is well regarded, and some interviewees in Ghana even cited it as a source of inspiration.

In all three countries we found interest in collaborating more with the EU on R&I, although often as part of partnership diversification strategies. Especially in South Africa, there was recognition of the fact that 'more is on offer' from other global actors, including the BRICS. While the financial motivation for EU framework programmes remains strong, the EU's appeal also lies in the strength and variety of its network, the quality of EU research, the multiplicity of languages and cultures that frame R&I, and the structural contribution that projects make to national research capacities. The EU's position in the world, for example on shared values and interests, also plays a role. In South Africa, we did not detect any contradiction between these motivations and the africanisation and decolonisation of knowledge. The emphasis was on 'glocal' R&I (locally relevant, globally useful), which also entails shared concerns and cooperation. Conversely, interviewees in all countries were frustrated by the cumbersome bureaucracy of Horizon 2020, while recognising the need for appropriate checks and balances (Jones, Tadesse & Apiko 2019).

The issue of research framing and the production of context-relevant knowledge was mentioned in all settings. Both Ghanaians and South Africans emphasised the urgent need for African researchers to play a bigger role in shaping their respective research agendas, whether in order to gear research towards national problems or to respond to wider calls for africanisation and the decolonisation of knowledge. Interviewees in both countries placed the responsibility for such goals first and foremost on their national authorities and peers. Interestingly, there was some recognition, and even appreciation, of the fact that the EU has its own goals. People expected the EU to be more transparent about these. Cabo Verdeans also mentioned the need to produce knowledge relevant to their context and bring that knowledge back home, but their assessment of their participation in H2020 was also very positive in that regard.

The EU operates in different R&I settings that ultimately shape its contribution and the way in which it is perceived. R&I is strongly emphasised in Cabo Verde because of the importance of human capital and innovation for the national economy, despite the lack of research capacity in the country. Comparatively speaking, R&I is less relevant in South Africa, despite the prominence given to the 4th industrial revolution, and especially in Ghana, where R&I actors seem to be in search of their place in the national development landscape. Research funding is a universal concern that, unsurprisingly, also reverberated throughout our fieldwork. The pressing issue of youth unemployment was another leitmotif in our interviews, as were the linkages between R&I and STI and all stages of education, the match between curricula and market needs, economic growth, and hard infrastructure. Interviewees in all three countries mentioned the departure of skilled professionals and intellectuals in search of opportunities abroad, although they also underlined the role of internationalisation and of returnees in catalysing R&I initiatives.

Domestic politics provides the backdrop for R&I discussions and shapes demands directed at international partners such as the EU. The forthcoming general elections in Ghana in 2020 were mentioned as a threat to a steady commitment to R&I, even for a relatively STI-friendly government. For South Africa and Cabo Verde, where elections are due to be held in 2019 and 2021 respectively, commitment to R&I appears to be based on a long-term strategy that transcends electoral timelines. In these two countries, it has been easier for the EU to find a good lead for R&I, as in the case of South Africa, or to invest in strengthening its profile as an R&I partner, as in Cabo Verde. There would not appear to be any such opportunities in Ghana at the moment or, if they do exist, they are not convincing enough.

Furthermore, the position of these countries in the world also shape how R&I features in national agendas and how the EU is perceived. In Ghana, we were left with the impression that a relatively pessimistic assessment of the R&I landscape, a dependence on external resources and uncertainty about the relevance of R&I to national development, relegate most international players to the role of payers. In Cabo Verde, the EU's contribution to R&I takes place in a much more reassuring context of a consistent narrative and concrete steps in an ambitious national agenda, strong personal connections in a relatively small population, and a cultural affinity with Europe. South Africa's role as a global player and its substantial research capacity mean that it plays on many different tables (Europe, Africa and the BRICS countries) and is better able to strategically diversify its partnerships.

5. Future EU collaboration with African countries in R&I: initial thoughts and opportunities

The EU is a valued partner in all the contexts we explored. The fact that the EU pursues a number of different objectives means that it has to make choices in terms of where and why to engage in R&I.[24] It may well be that R&I is not an area of strategic collaboration in certain contexts, but this should be an explicit choice rather than an accidental outcome. Our research suggests that a more bottom-up approach is needed in order to make collaboration relevant to the EU's external action and development policy. Some of our African interviewees would like to see a clearer R&I approach that spells out the EU's strategic choices and motives, as well as franker communication with partner countries and other R&I players. At the same time, if R&I collaboration is to fulfil its aim of fostering sustainable development and thriving societies, it needs to establish a clearer link with the development problems, innovation opportunities and research interests of specific locations.

It seems to us that that the EU has a positive reputation and a good track record on which to build future collaboration in R&I. However, if the idea is to use R&I as a space for soft diplomacy, people-to-people relationship-building and even as a locus of horizontal and mutually beneficial partnerships, there is still quite some work to do. This regards policy decisions on a grander scale, such as a long-term strategy on R&I international collaboration, how to communicate and implement the EU's approach to R&I, the shape of a future relationship with Cabo Verde, and how to positively interact with BRICS assertiveness, as much as the nitty-gritty of R&I itself, such as how research projects are framed, what types of calls to issue and H2020 bureaucratic hurdles.).

In the midst of all this sit the debates occupying EU minds beyond intestinal dramas such as Brexit and how to deal with the illiberal democracies in its midst: the shape and size of the 2021-2027 MFF for international collaboration and for Horizon Europe, and the ensuing programming process. The proposed Horizon Europe programme aims to strengthen international cooperation, extend association agreements to countries with excellent STI capacities and enhance synergies with external policies (EC, 2018a; EC, 2018c). The MFF negotiations are a mid-term game, but preparations and even decisions on how to put these statements into practice will come will much before the conclusion of the MFF negotiations.[25]

[24] We did not investigate the EU's motives for undertaking R&I at this stage. Broadly speaking, however, they are a combination of soft diplomacy objectives, joint research into global challenges and the preservation of the existing international liberal order, support for the EU's international development activities and external action policies, the possibility of attracting talent, economic and industrial competitiveness, the strategic positioning of EU businesses in emerging markets, fostering people-to-people exchanges and multicultural exchanges.

[25] For more information on the ECDPM's work on the MFF, see: https://ecdpm.org/dossiers/multiannual-financial-framework-mff/

Before the summer of 2019, EU delegations and headquarters must compile background documents and hold informal discussions with country partners in preparation for future programming. This process is intended to identify EU in-country objectives, country partners' development needs and interests, and areas where these all overlap, including R&I (Sherriff & Cascone 2019; Herrero et al. 2018). These will need to secure political validation from the new European Commission and the High Representative for European External Action.

The aim of both the European Commission and the European External Action Service is to make programming an opportunity for strategic thinking and to move relations towards more political, societal and economic partnerships. The intention is to combine the development cooperation logic with other drivers of EU external action, including mutual benefits. Whether and how the R&I community in African countries will be involved in consultations will set the tone for how future international collaboration in this field. Similarly, how different DGs will contribute and how much scope will be available to the EU delegations to shape this process will also matter.

So what is the EU's strategy, if any, in pursuing R&I collaboration in Africa and beyond? Building on the observations made in this paper, the second paper of the series will address this question from a European perspective.

Annex A

Development statistics for Cabo Verde, Ghana and South Africa

Development indicators	Cabo Verde	Ghana	South Africa
Extreme poverty (% of population)	7.2%	10.9%	18.%
Income distribution (% of lowest quintile)	5%	5.4%	2.4%
Population	546,000	28.8 million	56.7 million
ODA (% of GNI)	7.1%	3.1%	0.4%
Top 3 international resource flows (% of international flows)	Tourism (43%) Remittances (24%) ODA (15%)	FDI (33%) Remittances (20%) Long-term debt: commercial sources (18%)	Tourism (31%) Long-term debt: commercial sources (42%) FDI (8%)
Young people (% of population)	31%	39%	30%
Unemployment rate	10.4 %	2.4%	27.4%
Unemployment rate among people with higher education (% of labour force with higher education)	12.4%	5.9%	14.6%

Source: The data on young people was obtained from the World Population Database of the Population Reference Bureau. Unemployment and total population data is from the World Bank database. All other data is from the Development Initiatives Development Data Hub. ODA is official development assistance; GNI is gross national income; FDI is foreign direct investment. Extreme poverty relates to people living under 2011 Purchasing Power Parity of USD 1.90 per day in 2015. Income distribution shows the percentage of income in the bottom quintile of the population for 2016 or the most recent year prior to then. Population data is for 2017. The figures for ODA (% of GNI) and the top three international resources flows are for 2016. 'Young people' are defined as those aged under 15 in 2018. Total unemployment is modelled according to ILO estimates for 2018. The unemployment rate among people with higher education is based on the 2017 figure for Cabo Verde and South Africa, and the 2015 figure for Ghana. The term 'higher education' refers to short-cycle tertiary education, a bachelor's degree or equivalent, a master's degree or equivalent, or a doctoral degree.

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