An analysis of the Kenyan and South African drone technology ecosystems

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Over the recent past, drones and unmanned aerial vehicles (UAVs) have emerged as a remarkable technology platform creating value in a diverse range of sectors and industries – from agriculture to disaster management, logistics to public health, safety to search and rescue.

As foundational technologies – energy storage, remote sensing, 5G and above data services, and more – continue to evolve, the potential for drones will continue to expand. This takes place in a time of complex global challenges from climate change, to shifting demographics and economic volatility. These technologies and ecosystems offer a means to create entirely new forms of value that would not be possible without the kind of data, autonomy, and flexibility offered by drones.

Taking full advantage of this opportunity, however, requires that the systems enabling drone platforms are coherent, and intentionally designed to achieve growth in the sector. Supported by the UK Foreign and Commonwealth Development Office's (FCDO) RISA Programme, an in-depth analysis was conducted for the South African and Kenyan drone technology ecosystems, identifying strengths and weaknesses in each, along with potential avenues that could be explored to grow these ecosystems.

Delivered by a joint team of the Research Institute for Innovation and Sustainability (RIIS) and Burooj Enterprises, this research was undertaken in partnership with numerous organisations including the Drone Council South Africa, the Saldanha Bay Innovation Campus, and over thirty drone-related organisations in both countries.

The team expresses their thanks and gratitude for the contributions made, and look forward to continued growth of this sector.

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This research programme proudly supported by, and delivered together with:

Drones are quietly revolutionising critical functions in major South Africa and Kenyan industries

Early users of drone technologies have seen significant value creation across a wide range of sectors, including obvious sectors such as precision agriculture, and disaster management, but also extending to applications within mining, conservation, infrastructure inspection, and urban planning. There has also been significant interest in drones from a consumer perspective, for example, with over 250 000 hobbyist platforms sold in South Africa over the last several years. Such drones are also used for commercial purposes such as photography and events, and while not operated at the same scale as larger drones and UAVs, still require competent operators.

This complex interplay between regulations, competency, and accessibility is yet to be fully resolved in both Kenya and South Africa. Different regulatory regimes have made it easier, and potentially more risky, in South Africa; while Kenya has a stricter regulatory environment that may constrain the growth of the sector, but could result in fewer risks. Either way, significant efforts are being made to create effective regulatory environments that can enable drone ecosystems to flourish, within the context of each country.

As drone technologies continue to evolve and bring new services and value to consumers and citizens, we expect to see a more welcoming ecosystem that develops people with the right skills to use these remarkable technology platforms to solve critical problems in unique and impactful ways.

SA benefits from a deep and wide economic base that complements drone activities; while Kenya has established excellent leading practices that set it up for success

	Building Human Capital	Supportive Markets and Infrastructure	Policies and Regulation	Networking Assets	Equitable Inclusive Participation	Pathways to Scale
South Africa	Developing	Developed	Developing	Developed	Developing	Under-developed
Kenya	Under-developed	Under-developed	Developing	Nascent	Under-developed	Under-developed

South Africa

Human Capital:
- Drone-specific training is readily available, and significant complementary education (such as in engineering disciplines) is provided through HEIs.

Supportive Markets and Infrastructure:
- There is significant demand for drone services across the entire economy

Policy and regulation:
- Well defined regulations currently allow for significant economic activity, but progressive regulations could stimulate significantly more innovation

Networking Assets:
- Various groups and networking entities exist such that the drone community is relatively well connected and well informed of activities.

Equitable Inclusive Participation:
- Equity and inclusion in the sector is driven by individuals, and not a co-ordinated or deliberate effort to drive such

Pathways to Scale:
- The demand for drone services is very high, but pathways to scale will be enabled if regulations can be amended to allow for greater innovation and competition

Kenya

Human Capital:
- In combination with some private training institutions, only two universities have dedicated drone programmes. High school-focused education is limited.

Supportive Markets and Infrastructure:
- Kenya faces complex infrastructure challenges that affect the value-contribution of drones such as a stable power supply, general internet availability, and limited hardware manufacturing capabilities

Policy and Regulation:
- A controlled regulatory environment limits risk, but also opportunity

Networking Assets:
- No formally established networks or communities of practice were identified

Equitable Inclusive Participation:
- This is not currently a major focus for the sector, which is still nascent

Pathways to Scale:
- Scaling will be best achieved once other contributing elements have been improved (such as human capital, networking assets, and supportive markets)

Legend Nascent · Under-developed · Developing · Developed · Fully-Developed

While there are many sectors that show demand potential, this research showed large unrealized opportunities in the agriculture, and media sectors, in both countries

Sector	Application	Current applications in SA	Current applications in Kenya	Growth area in SA	Growth Area in Kenya
Agriculture	• Predict and analyse crop growth • Provide aerial views • Pest detection and control • Warning and remedy of crop failure • Perform labour intensive tasks (i.e. seeding, planting, and spraying)	X	X	X	X
Health services	• Medication/prescription delivery • Blood and organ delivery • Laboratory sample collection and delivery	X	X		X
Insurance	• Damage and infrastructure • Drone insurance • Fraud detection/prevention • Inspection of claims • Natural disaster monitoring and modelling • Vehicle damage	X			X
Media	• Broadcasting sports • Cinematography • Videography	X	X	X	X
Wildlife preservation and anti-poaching	• Monitor and track animals • Anti-poaching operations • Collect samples • Research ecosystems	X	X		
Fire fighting	• Damage and infrastructure • Find trapped persons • Detection of fire sources • Assessment of risk to fire fighters	X			X

There is also an opportunity for Kenyan private sector to learn from the experiences and business models developed in South Africa, which has pioneered in certain areas

Sector	Application	Current applications in SA	Current applications in Kenya	Growth area in SA	Growth Area in Kenya
Construction	• Soil analysis • Surveying and mapping • Inspections • Monitor building progress • Construction site inspection • Photography and virtual walkthroughs • Structure inspection and photography	X			X
Real estate	• Mapping • Property tours • Photography and videography • Infrared analysis • Sink-hole detection	X			X
Mining	• Surveying and mapping • Safety inspections • Security • Mining operations • Exploration • Inventory management	X		X	
Energy	• Infrastructure and compliance Inspection • Leakages and spread detection • Energy exploration • Buildings and transmission efficiency mapping	X			
Safety and security	• Aerial videos and photos • Surveillance • Inspection • Find missing or stolen property • Communications relay	X			

Equally, Kenya has been able to address specific issues that may be of interest to South African firms and service providers, who may learn from Kenyan experiences

Sector	Application	Current applications in SA	Current applications in Kenya	Growth area in SA	Growth Area in Kenya
Search and rescue	• Inspect and explore disaster areas • Predict and assess natural disasters and affected areas	X	X		
Telecommunications	• Monitoring infrastructure • Providing temporary signal coverage in geographically challenging areas	X			X
Education and research	• Aerial data collection for research • Collect samples				X
Delivery and logistics	• Last mile delivery services for medical supplies, e-commerce purchases and essential cargo		X		X
GIS Mapping	• Large scale mapping • Real time assessment and monitoring of services	X	X		X

The South African drone ecosystem has all the components needed to be globally competitive, provided that it can unlock it’s broad-based capacity for innovation

Throughout our engagements in this sector, it was clear that SA has all the necessary capabilities and skills to be globally leading. Universities and colleges provide technical training in engineering disciplines needed for drone technologies , while numerous private education institutions provide licenses for drone operations; both human and financial capital is available to grow businesses, and the market demand for these services exists across multiple sectors.

SA has seen successful companies emerge across the entire drone value chain – from manufacturing (with both government entities such as Denel, and private entities such as Alti UAS) to operations and applications (such as Aerobotics and Delta Scan).

A few specific interventions may help catalyse further growth in the sector. Firstly, ensuring that people are appropriately skilled and exposed to drone technologies as early as possible can help to drive interest. School programmes and outreach activities can be of high impact here.

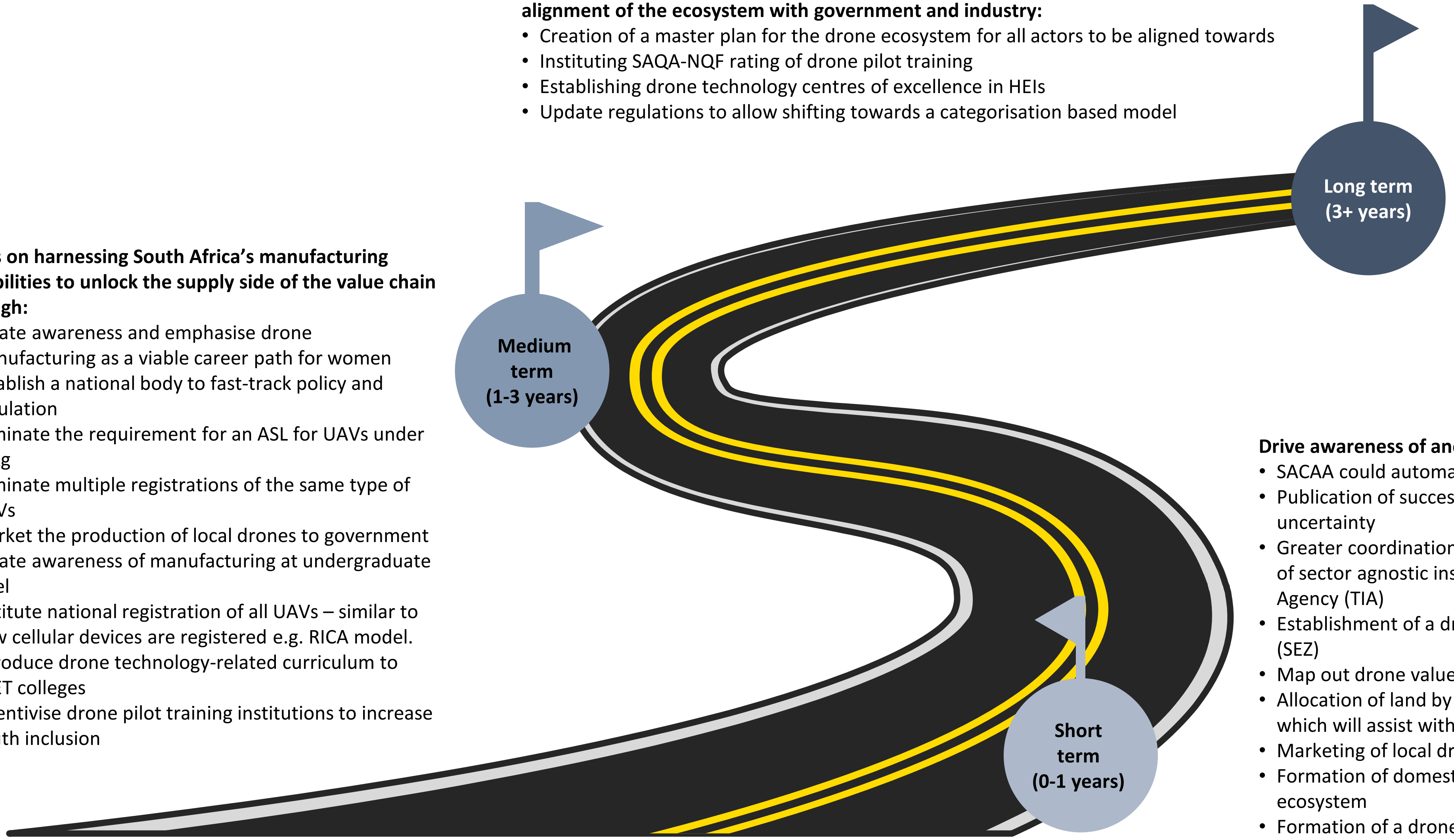
Secondly, the establishment of a regulatory sandbox in which drone innovation can be safely pursued can unlock significant investment into R&D about drone technologies – ultimately leading to greater competitiveness.

Lastly, given the relative nascency of the industry, transformation can be achieved through investment into previously disadvantaged entrepreneurs

The drone and UAV community in SA identified a series of possible interventions focused on investing into new human capital, and reducing bureaucracy

Work towards crafting and developing a leading coordinating body to champion alignment of the ecosystem with government and industry:

- Creation of a master plan for the drone ecosystem for all actors to be aligned towards
- Instituting SAQA-NQF rating of drone pilot training
- Establishing drone technology centres of excellence in HEIs
- Update regulations to allow shifting towards a categorisation based model



Focus on harnessing South Africa's manufacturing capabilities to unlock the supply side of the value chain through:

- Create awareness and emphasise drone manufacturing as a viable career path for women
- Establish a national body to fast-track policy and regulation
- Eliminate the requirement for an ASL for UAVs under 25kg
- Eliminate multiple registrations of the same type of UAVs
- Market the production of local drones to government
- Create awareness of manufacturing at undergraduate level
- Institute national registration of all UAVs – similar to how cellular devices are registered e.g. RICA model.
- Introduce drone technology-related curriculum to TVET colleges
- Incentivise drone pilot training institutions to increase youth inclusion

Drive awareness of and support for accelerating the drone industry:

- SACAA could automate ROC applications via an online process
- Publication of successful examples of ROC applications to reduce uncertainty
- Greater coordination across stakeholder groups under the leadership of sector agnostic institutions such as the Technology Innovation Agency (TIA)
- Establishment of a drone corridor within a Special Economic Zone (SEZ)
- Map out drone value chain opportunities and applications
- Allocation of land by research institutions for regulatory sandboxes which will assist with improving the experimental flight process
- Marketing of local drones to the domestic recreation market.
- Formation of domestic and international partnerships to scale the ecosystem
- Formation of a drone manufacturing industry body

The Kenyan drone technology ecosystem is nascent, but well positioned for rapid growth if a few catalysts are properly leveraged

Drones in Kenya remain relatively limited in use, due largely to existing regulations preventing their widespread adoption, despite what appears to be material interest in this technology from various customer groups. In particular, the opportunities provided by drones in the agriculture sector – combined with the importance of this sector for the Kenyan economy – suggest that a careful re-consideration of regulations related to drones (bearing in mind the various complexities in the Kenyan context) may result in a rapid growth of the sector, together with employment creation and greater economic performance (particularly in agriculture, such as improved yields).

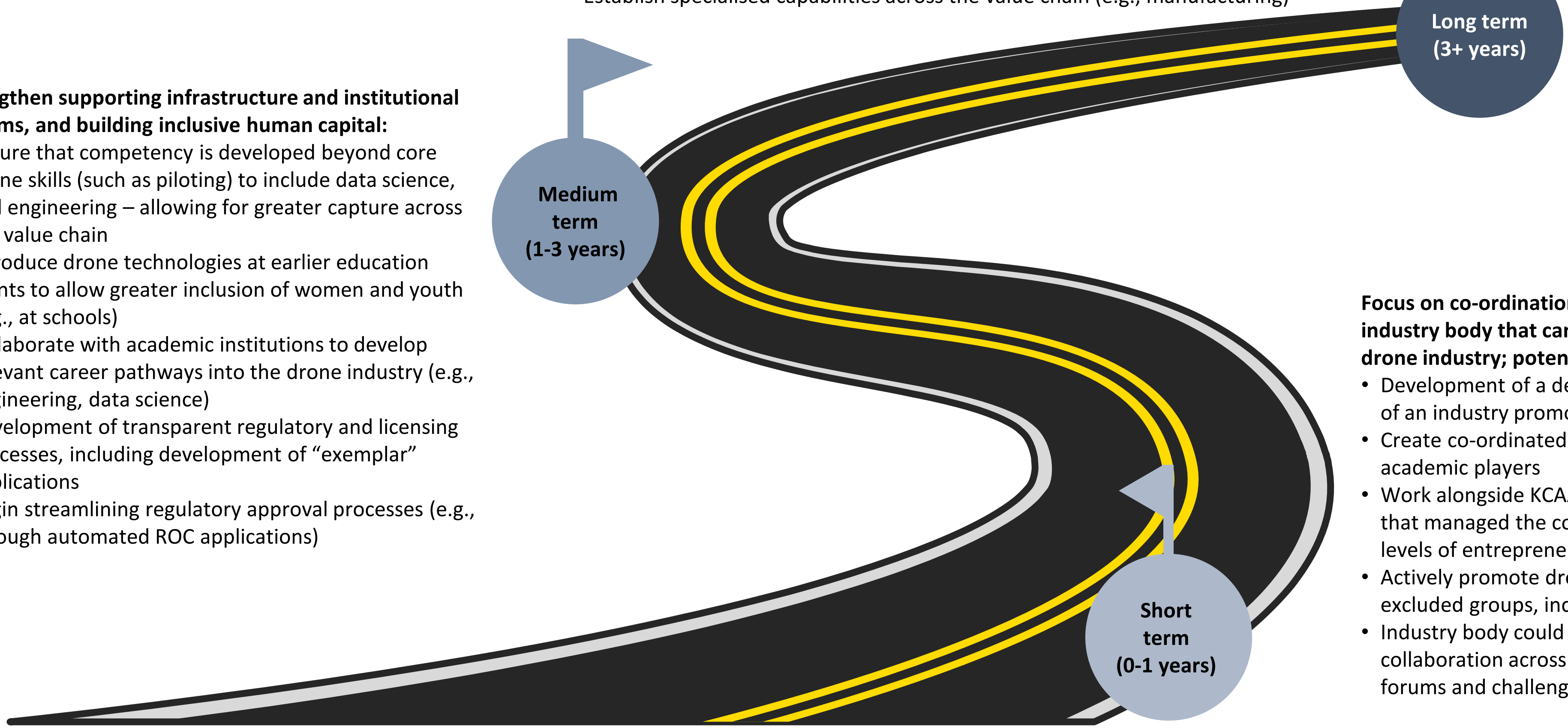
However, despite the enthusiasm of current drone operators (of which there a few), the creation of a dedicated industry representative body that can lobby on behalf the sector, could positively influence the development, and appetite for development, of the regulatory environment.

Enabling access to drone-based data platforms could be a key focus for the local agriculture sector, which can see major efficiency gains through this technology. Thus, awareness and outreach programmes to bring more potential market demand online will help create a more sustainable local ecosystem.

A co-ordinated industry organisation, that promotes, communicates, and lobbies for a vibrant industry is a key first step in creating buy-in and shifting perspectives in Kenya

Support pathways to scale and continued regulatory adaptation to industry needs:
- Work to optimise import factors for drone platforms (e.g., review tax implications), while growing the local drone manufacturing capacity
- Re-evaluate license categorisation to enable youth learners to develop relevant skills (or develop within regulatory sandbox)
- Work with financiers to improve understanding of drone systems to enable greater access to finance (including asset-based, venture capital, private equity, and more)
- Establish specialised capabilities across the value chain (e.g., manufacturing)

Strengthen supporting infrastructure and institutional systems, and building inclusive human capital:
- Ensure that competency is developed beyond core drone skills (such as piloting) to include data science, and engineering – allowing for greater capture across the value chain
- Introduce drone technologies at earlier education points to allow greater inclusion of women and youth (e.g., at schools)
- Collaborate with academic institutions to develop relevant career pathways into the drone industry (e.g., engineering, data science)
- Development of transparent regulatory and licensing processes, including development of “exemplar” applications
- Begin streamlining regulatory approval processes (e.g., through automated ROC applications)



Focus on co-ordination and networking assets such as as neutral industry body that can lobby on behalf of, and promote, the Kenyan drone industry; potential activities include:
- Development of a detailed value chain analysis for the industry as part of an industry promotion drive
- Create co-ordinated information sharing across public, private and academic players
- Work alongside KCAA to establish progressive regulatory environment that managed the concerns of all parties but still enables greater levels of entrepreneurship
- Actively promote drone skills and education amongst previously excluded groups, including women and youth
- Industry body could begin to incentivise and encourage local collaboration across the industry streams in the ecosystem through forums and challenge grants.

The different pathways and challenges ahead of South Africa and Kenya will lead to different modalities of adoption of drones – but it is clear that these systems will play an increasingly important role in each society.

Entrepreneurs, companies, and citizens are already seeing widespread value from use of drones in these two countries. The genie cannot be placed back in the bottle – nor should it. The question is rather around how best to create the incentives, protections, and systems that will enable the greatest value to be created by drone operators.

The establishment or strengthening of industry representative bodies should be viewed as a powerful catalyst by all players – including government. Far from being confrontational, industry bodies are able to provide deep insight into the evolution of the sector, drive innovation, and create significant inclusive and equitable employment provided that they operate within the right institutional structures.

Creating the right perspective around education and training – the foundations of which exist in both countries – can help to open the eyes of learners (young and old, male and female) to the opportunities presented by this exciting technology.

These choices are not make-or-break for the industry; entrepreneurs and enthusiasts will always find a way – but careful and deliberate planning can accelerate and catalyse growth faster, more equitably, and with greater impact for all.