DRONE READINESS INDEX

Samuel Nzaramba[1], Rene Kabagamba[1], Aminata Garba[1,2], Kate Chandler[3]

[1]Carnegie Mellon University Africa, Kigali, Rwanda
[2]Dept. of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA
[3]Walsh School of Foreign Service, Georgetown University, Washington D.C, USA
{snzaramba, rkabagamba}@africa.cmu.edu, aminata@ece.cmu.edu, kfc9@georgetown.edu

ABSTRACT

This paper proposes a new model for evaluating the robustness of the ecosystem for drone projects in a given country, considering nine factors ranging from the regulatory framework to economic and social impact. The objective of this study is to provide a tool in the form of an index that can be used to gauge countries readiness for drone projects. Governments, NGOs as well as commercial drone companies can use the index to gain insights into the possibilities of drones for non-military use. Notable successful projects using drones were used as a benchmark to chart out the various components of the Drone Readiness Index (DRI). We first reviewed selected projects that have attempted to use drone aircrafts for non-military activities, using secondary data. We then quantify the elements of the drone ecosystem and present derivations of the proposed drone readiness index. To show applications and examples of the proposed drone readiness index, we compute the values of the drone readiness index for selected African countries. These values are further presented in a website[1].

Keywords – Communications and control technologies, drones, drone ecosystem, readiness index

1. INTRODUCTION

Aside from their use for military purposes, drone aircrafts are increasingly being used for a range of civilian purposes including land mapping, wildlife monitoring and protection, delivery of medical supplies among others. Recreational drones are also used for private aerial photography.

African countries are taking advantage of this technology in an effort to improve the lives of their people through innovation. Drones provide an opportunity to use aerial platforms for development, which include the possibility of community based projects based on the low cost of drones, as well as opportunities to access areas with limited transportation infrastructure in rural areas of Africa.

For example, Zipline launched its drone delivery project in Rwanda in October 2016 with the support of the government [2]. Zipline drones deliver blood to 21 hospitals around the country (as of August 2017) and use GSM technology for communication during flight with the base station, as well as GPS for navigation. A number of factors were identified as being critical to the implementation of Zipline blood delivery project such as the regulatory framework, government investment in the form of utilities like power, fiber optic connectivity, and availability of skilled local capacity that could provide support to their operations. Another example is WeRobotics which established Tanzania Flying labs to spearhead innovative projects for social good in Tanzania. Also, Drone Adventures carried out a mapping project in Zanzibar using SenseFly drones, where the World Bank, the Zanzibar commission of lands and the state of Zanzibar joined forces. The project is being completed in conjunction with the State University of Zanzibar and involves training local geo-spatial technicians in the use of drones and aerial image processing. Images from the project are expected to be shared in an open source geo-spatial platform.

Common characteristics among these established projects were identified and used to chart out the elements of a drone readiness index. This is a tool which can be used by governments, NGOs and private companies to assess the preparedness of a country to adopt drones for commercial projects.

In the study of drone governance [3], the authors discuss the present regulatory framework in different parts of the world focusing on existing rules, policy dialogue, regulatory void, and enforcement. The present work goes a step further to consider other factors that make up a drone ecosystem. These include the overall environment for the technology adoption; the infrastructure and skills; the usage of the technology as can be seen from the projects in place; and finally the impact that the use of the technology has both on an economic and social standpoint.

Our work also freely borrowed ideas from the Networked Readiness Index (NRI) devised by the World Economic Forum [4]. The Networked Readiness Index (NRI) is used as tool to assess the preparedness of a country to benefit from emerging technologies and capitalize on the opportunities represented by digital transformation. The Drone Readiness Index similarly asks whether a country has the necessary drivers to initiate drone projects and whether these projects impact society both economically and socially. As with the Network Readiness Index, the components of the Drone Readiness Index were grouped into four sub-categories. While the Network Readiness Index has a broader focus and coverage in terms of number of countries reviewed and technologies considered our work has a narrower focus on drone technology. Moreover, due to non-availability of data, we first applied the proposed Drone Readiness Index to a limited number of countries.

2. METHODOLOGY

Our approach to the development of the drone readiness index involved:

1. Collecting data from drone projects to understand, assess and identify the various factors that contribute to the success of drone projects that are currently operating.
2. After reviewing various projects employing drones, the key factors used for the design and development of the Drone Readiness Index were identified.
3. The selected factors were grouped into four categories that represent the components central to the success of drone projects. These categories are explained in details in latter

sections. The Drone Readiness Index comprises of four categories (components) and nine subcategories (sub-indices) over which the countries are assessed.

The main source of data for the sub-index scores is secondary data from the World Bank [5], World Economic Forum [4],[6], International Telecommunication Union [7] and The Swiss Foundation for Mine Action (FSD) through the Global Drone Regulation Database [8]. When data gaps were encountered for some countries, alternative online data sources were carefully selected, these included online material such as websites, blogs, news articles and national sources such as national civil aviation authorities and ministries websites.

3. STRUCTURE OF THE DRONE READINESS INDEX

The Drone Readiness Index (DRI) comprises of four components as illustrated in Figure 1. Each component is further divided into nine sub-indices. The computation for the overall score of a country on these specific components is done by successive aggregation of the values assigned to the sub-indices.

3.1. Environment

The success of a country in having drone projects setup depends in part on the quality of the operating environment. The Environment component assesses the country's drone regulatory framework, research and development aimed at drone technology and investments made by the private or public sector that directly or indirectly contributes to drone projects and activities.

3.1.1. Regulations

The regulation sub-index assesses the presence or absence of regulations on drones, considering the exceptions made to allow certain drone projects to be carried out in the country. To quantify the regulation sub-index, a score was assigned to each country to represent the presence and quality of drone regulations in the country. The Global Drone regulations database [8] was used as the main source of data however, other online sources like ministry and civil aviation websites and news articles were used for updated information.

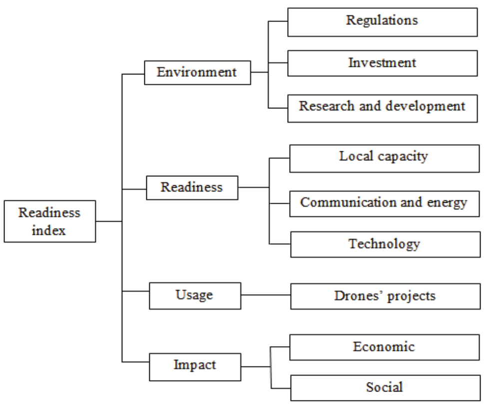

Fig. 1. Components and sub-indices for the Drone Readiness Index

3.1.2. Investment

This sub-index measures the level of investment made by the public or private sector that directly or indirectly contributes to drone projects. Investment made by government and/or private companies in the form of infrastructure or in monetary terms is considered here.

3.1.3. Research and development

This is a measure of the conducted research and development in the drone sector. We look at research being conducted that may contribute to the next generation of drones. In the African context, this is mostly accomplished through trans-national partnerships that countries enter into with overseas drone manufacturing companies.

3.2. Readiness

The *Readiness* component measures the extent to which a country has in place the infrastructure and other factors to support drone projects.

3.2.1. Local capacity

The local capacity sub-index measures the capacity of the population to work with drone technology. To compute local capacity we used data about the number of drone technical training schools and the gross enrolment rate in tertiary education. A country with a high percentage level of university graduates offers a large pool of individuals to pick from to specialize in drones operation, maintenance and repair. We also consider the availability of drone technical training schools which equip students with specific skills on operating, maintaining and repairing drones.

3.2.2. Communication and energy

The communication and energy sub-index captures the country's main infrastructures that matter to the setup, maintenance and overall operation of drone projects. This includes GSM towers for communication between drones and base stations as well as availability of power supply for the operation of the drone base stations. The indicators mobile network coverage rate and Quality of electricity supply from the Global Competitiveness Report were used in the computation of the score for this sub-index.

3.2.3. Technology

This sub-index assesses availability of the latest technologies in the country. To measure this sub-index, we used availability of latest technologies and government procurement of advanced technology products indicators from the Global Competitiveness Report.

3.3. Usage

The *Usage* component strives to capture the number of drone projects currently operating in the country and their maturity. This component has only one Sub-index: *Drone Project* explained below.

3.3.1. Drone projects

This sub-index maps the number of drone projects operating in a country, as an indicator of how easily other projects can enter the country. The projects assessed had a greater impact to the readiness index if they had entered into a maturity phase. This maturity phase depends on the time the project has been operational. Recreational use of drones was not considered owing to data availability constraints.

3.4. Impact

The *Impact* sub-index gauges the broad economic and social impacts accruing from drone projects. The observed impact is assessed for countries that currently have or have had a drone project in the past. We decided to assess impact of drones in countries that currently have or have had drone projects before. An alternative approach would be to assess the *potential benefit* of drone projects in a country, which would result in a different index.

3.4.1. Economic impact

The economic impact sub-index measures potential cost-saving benefits, the effects drone projects have on job creation in the country, investment and transfer of capacity.

3.4.2 Social impact

The *Social impact* sub-index measures the effect the drone projects have had on the lives of the people in the country; this could be in the form of improved access to healthcare and service delivery.

4. DESIGN OF THE PROPOSED DRONE READINESS INDEX

In this section, we provide a detailed description of the computation of the *Drone Readiness Index*.

4.1 Analysis and Evaluation of the Sub-indices

Figure 1 summarizes the overall components and sub-indices used to calculate the drone readiness index. Except for the indicator scores retrieved from elsewhere and the score assigned for the number of projects, each indicator was assigned a value of 0, 0.5 or 1 depending on whether this specific aspect is not observable, partially perceptible or extensively noticeable. A larger scale was used for number of projects. Table 1 gives the details of the different sub-indices indicators, the rationale behind the scores assigned for each indicator and the data source. The Regulation and Impact sub-indices are evaluated using qualitative data while the rest of the scores were obtained using quantitative data.

4.1.1. The Drone Readiness Index (DRI)

The *drone readiness index* was computed using the additive utility function model. Equation (1) gives the expression of the readiness index using a utility function:

$$DRI = k_1 \times U_{Reg} + k_2 \times U_{Inv} + k_3 \times U_{R\&D} + k_4 \times U_{cap} + k_5 \times U_{Com\&En} + k_6 \times U_{Tech} + k_7 \times U_{Proj} + k_8 \times U_{Eco} + k_9 \times U_{Soc} \quad (1)$$

where the utility functions are defined below:

- U_{Reg}: score assigned for drone regulations
- U_{Inv}: score given for investment in the drone sector
- $U_{R\&D}$: score assigned for the research and development being conducted in the sector
- U_{cap}: score allocated for the local capacity building done on drones as well as for the presence of repair and maintenance facilities
- $U_{Com\&En}$: score given for the communication and energy infrastructure in place
- U_{Tech}: score for the type of drone technology in place
- U_{Proj}: score assigned on the drone projects in place
- U_{Eco}: score assigned for the economic impact
- U_{Soc}: score assigned for the social impact

Each country was assigned scores on the above attributes following the score description in Table 1.

Swing weighting [9] was used for setting the value of the various k constants in (1) representing the attribute weights. The weight assessment process can be summarized in the following steps documented with the results in Table 2:

1. Taking the various sub-indices as attributes, the best and worst values of each attribute were determined to the lowest and highest score in Table 1, zero and one respectively.
2. Eleven fictional alternatives were devised following the ten attributes in (1). Ten alternative cases where each one of the 10 attributes were in turn set to the best score keeping all the other attributes low, as well as a worst-case alternative where all attributes were considered to be at their lowest score.
3. Ranks were then assigned to each case. The worst-case received the highest rank to indicate that this was the least desirable case and the lowest rank was assigned to the most desirable case. The best alternative was chosen to be that of the case where a country would have ready infrastructures in terms of communication and electricity followed by the case of a country with only favorable regulations in place.
4. Rates were assigned to each alternative case following the rank that was assigned. The rating of the worst-case alternative was zero while the best alternative received a value of 100. All the alternatives were rated following how likely or unlikely they would contribute to the overall readiness of a country.
5. The rating of each alternative case was then normalized by the division of each rating with the sum of all the ratings to obtain the weight associated with each attribute.

Table 1. Utility scores for each of the sub-indices of the Drone Readiness Index

Sub-index	Indicator	Indicator scores	Sub-index (Utility) score
Regulations	Regulatory framework, regulations draft and policies on drones [8]*	0 – No regulations published and no draft pending for approval 0.5 – No approved regulations, but there are some preliminary steps taken towards having regulations (e.g.: a draft of regulations which is pending for approval) 1 – Comprehensive drone regulations in place	Same score as the indicator score
Investment	The number of investment instances in the drone sector	0 – No instance of investment in the drone sector 0.5 – One instance of investment in the drone sector by a private company or by the government (monetary or infrastructure) targeted directly to drones 1 – At least two instances of investment in the drone sector	Same score as the indicator score
R&D	Number of research and development work instances in sector by drone companies and other institutions*	0 – No instance of research work done in regards to drones 0.5 – One instance of research work conducted on drones either by a private company conducting research in the country or outside the country 1 – At least two instances of research work done on drones	Same score as the indicator score
Local capacity	Gross enrolment ratio, tertiary, both sexes (%) [5]	Percentage value out of 1	Average of the indicator scores
	Number of drone training schools and certifying institutions*	0 – No drone training schools in the country 0.5 – One drone training school 1 – Two or more drone training schools in the country	
Communication and energy	Mobile-cellular telephone subscriptions /100 pop. [7]	Percentage value out of 1 (converted to 1 for a percentage greater than 100)	Average of the indicator scores
	Quality of electricity supply [6]	Normalized value of the score	
Technology	Availability of latest technologies [6]	Normalized value of the score	Average of the indicator scores
	Government procurement of advanced technology products [6]	Normalized value of the score	
Drone projects	Number of commercial drone projects*	0 – No commercial drone projects in the country 0.5 – one commercial drone project operational in the country 1 – at least two drone projects operational in the country	Average of the indicator scores
	Maturity of the commercial projects*	0 – No commercial drone projects in the country 0.2 – At least one commercial project operational for less than 3 months 0.4 – At least one commercial project with operations between 3 to 6 months 0.6 – At least one commercial project with operations between 6 to 12 months 0.8 –At least one commercial project with operations between 12 to 24 months 1 – At least one commercial project with operations running for more than 2 years	Average of the indicator scores
Economic impact	Observed economic impact of drones through job creation, investment*	0 – No observed economic impact, most likely because there has never been any drone commercial projects before 0.5 – Short-term impact 1 – Observed economic impact through direct and indirect job creation, process optimization, etc.	Same score as the indicator score

Social impact	Observed social impact of drones through job creation, investment*	0 – No observed social impact, most likely because there has never been any drone commercial projects before 0.5 – Short-term impact 1 – Observed social impact through improvement of people welfare (health), preservation of the environment, etc.	Same score as the indicator score

* From various online sources like news articles and blogs

If the utility (sub-indices) were assumed to have equal weight, the DRI becomes:

$$DRI = \left(U_{Reg} + U_{Inv} + U_{R\&D} + U_{cap} + U_{Com\&En} + U_{Tech} + U_{Proj} + U_{Eco} + U_{Soc}\right)/9 \quad (2)$$

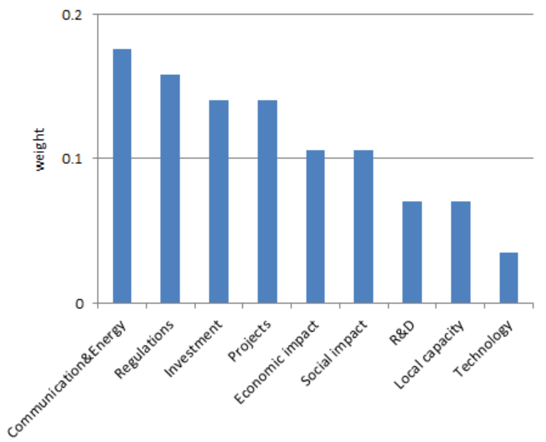

Fig. 2. Weights of the various attributes of the DRI

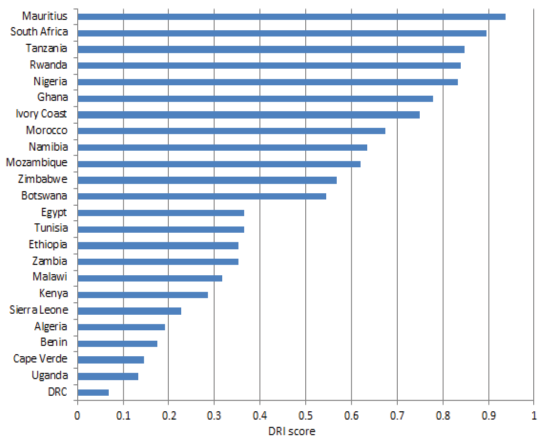

Fig. 3. Proposed Drone Readiness index per country

Table 2. Summary of the swing weighting approach for weight assignment

Attribute swing from worst to best	Consequence to compare	Rank	Rate	Weight
Benchmark (Worst Alternative)	all scores low	10	0	0/510 = 0
Regulations	All scores low except regulations	2	90	90/510 = 0.16
Investment	All scores low except Investments	3	80	80/510 = 0.14
Research and development	All scores low except R&D	8	40	40/510 = 0.07
Local capacity and facilities	All scores low except local capacity building and drone facilities	7	40	40/510 = 0.07
Communication and energy	All scores low except communication and energy	1	100	100/510 = 0.18
Technology	All scores low except technology in use	9	20	20/510 = 0.04
Drones projects	All scores low except drones projects	4	80	80/510 = 0.14
Economic impact	All scores low expect economic impact	5	60	60/510 = 0.11
Social impact	All scores low except social impact	6	60	60/510 = 0.11

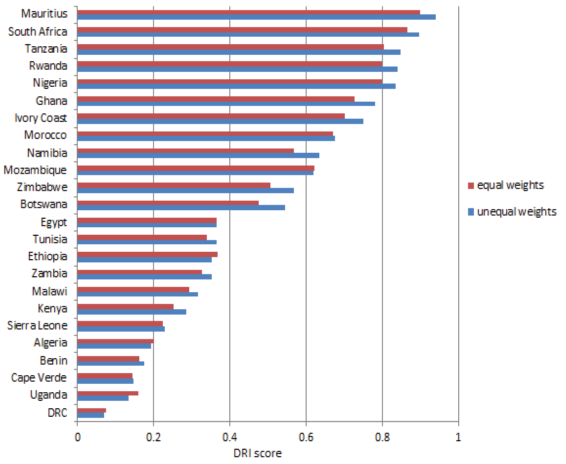

Fig. 4. Comparison of Drone Readiness index with equal and unequal weights per country

5. APPLICATION OF THE DRONE READINESS INDEX TO SELECTED COUNTRIES

In this section, we apply the proposed Drone Readiness Index given by equation (1) to selected countries and analyze the performance of these selected countries. Although, the proposed index is intended to be applied to all countries, due to limitations in data, we apply the proposed model to a selected number of African countries. This choice was also motivated by the greater proliferation of drone projects on the African continent mainly because African countries have emerged these past years as a test bed for new technologies that take too long to start elsewhere [10]. The computed indices for these various countries are also available on the drone readiness webpage [1].

As observed in Figure 3, using the proposed Drone Readiness Index given by equation (1), Mauritius tops the chart among the countries for which the Drone Readiness Index is computed. This is attributed to the fact that Mauritius has provided an environment that seems conducive for drone projects and companies to develop. This includes comprehensive drone regulations, infrastructure and development of skilled capacity resulting in a number of drone companies setting up and operating in the country offering services from aerial photography to mapping to agriculture solutions.

Table 3. Sub-indices scores per country

Country	Regulation	Investment	R&D	Local Capacity	Communication & Energy	Technology	Drone Projects	Economic Impact	Social Impact	Readiness Index
Algeria	0	0	0	0.67	0.75	0.38	0	0	0	0.19
Benin	0	0.5	0	0.08	0.49	0.39	0	0	0	0.17
Botswana	1	0.5	0	0.14	0.69	0.50	0.45	1	0	0.55
Cape Verde	0	0	0	0.12	0.69	0.49	0	0	0	0.15
DRC	0	0	0	0.03	0.32	0.32	0	0	0	0.07
Egypt	0	0.5	1	0.04	0.70	0.43	0.1	0.5	0.5	0.37
Ethiopia	0	0	0	0.16	0.42	0.43	0.3	1	1	0.35
Ghana	1	1	1	0.33	0.60	0.46	0.65	1	1	0.78
Ivory Coast	1	1	1	0.29	0.72	0.5	0.8	0.5	0.5	0.75
Kenya	1	0.5	0	0.02	0.65	0.60	0	0	0	0.28
Malawi	1	1	1	0.00	0.28	0.35	0	0	0	0.32
Mauritius	1	1	1	0.69	0.87	0.53	1	1	1	0.94
Morocco	0	1	1	0.12	0.86	0.50	0.55	1	1	0.68
Mozambique	0	1	1	0.03	0.52	0.40	0.65	1	1	0.62
Namibia	1	0.5	1	0.05	0.88	0.53	0.65	0.5	0.5	0.64
Nigeria	1	1	1	0.30	0.44	0.43	1	1	1	0.83
Rwanda	1	1	1	0.04	0.62	0.63	0.9	1	1	0.84
Sierra Leone	0	0	0	0.01	0.55	0.34	0.1	0.5	0.5	0.23
South Africa	1	1	1	0.60	0.67	0.53	1	1	1	0.90
Tanzania	1	1	1	0.27	0.54	0.43	1	1	1	0.85
Tunisia	0	1	1	0.17	0.84	0.44	0.1	0	0	0.36
Uganda	0	0	1	0.02	0.45	0.47	0	0	0	0.13
Zambia	1	0.5	1	0.01	0.50	0.48	0.45	0	0	0.35
Zimbabwe	1	0.5	1	0.03	0.53	0.34	0.65	0.5	0.5	0.57

South Africa emerged second among the considered countries. Similarly, South Africa has regulations in place as well as public and private investments in drone technologies. In addition, there are several training schools to provide certification for drone pilots. South Africa has also a number of projects using drones in wildlife to combat poaching and in entertainment for video and photography.

Tanzania and Rwanda are next in the ranking. In the case of Tanzania, the mapping project and the flying lab for training drone operators contributed to the high score. Tanzania has also received considered investment from private companies and NGOs in the drone sector, for example from the World Bank and the Red Cross [11].

Like Mauritius, South Africa and Tanzania, Rwanda have comprehensive drone regulations in place coupled with a growing number of drone projects most notably Agrilift focusing on crop monitoring with drones, the Zipline project and CHARIS that assembles drones for rental for commercial or private purposes. These projects promote and attract investment in the drone sector in the country.

Figure 4 compares computation of the proposed Drone Readiness Index using unequal weights as described in Table 2 and the same index when the weights are assumed equal. As observed in Figure 4, the Drone Readiness Index slightly varies under these different assumptions. Moreover, most countries seem to have a higher index with the non-equal weight. This is particularly observed for countries where there are active drone projects. This observation can be explained by the fact that the attributes with higher weights such as communications, regulations, investments and projects are usually achieved by countries where there are active drone projects.

6. DISCUSSION

Notwithstanding the novelty of the paper, the computation of the *Drone Readiness Index* has the following limitations which could affect the values of the computed Drone Readiness Index.

- We selected some sub-indices and indicators based on qualitative data. In addition, quantifying these sub-indices was sometime dependent on qualitative data. This can increase the sensitivity of the Drone Readiness Index. If different and/or additional sub-indices and/or indicators were selected, different values of the Drone Readiness Index could be expected.
- The results of the computation are as good as the data collected. If comprehensive data was available, the accuracy of the Drone readiness index would be higher. In this study, we have experienced difficulty collecting some data and therefore there are some data gaps, that we expect to bridge in our future work. For example, in the absence of the desired Mobile geographic coverage indicator data for the communication and energy sub-index, Mobile-cellular telephone subscriptions /100 pop was used. This emphasizes the need to optimize the selection of the indicators used in the study to ensure accuracy of the results.
- The number of countries, for which the drone readiness index was computed, was limited. This was partly due to difficulties in data collection. In the next phase, more data is expected to be collected from countries on different continents, e.g., using crowdsourcing. Hence we expect to extend the application of the *Drone Readiness Index*, and rank almost all countries.
- In our work, we used scores of 0, 0.5 and 1 for many of the sub-indices. However, the level of granularity can also be increased by using a wider scale to provide greater accuracy for the Drone Readiness Index. For example, if the same indicators were quantified using a gradation of 0.1 instead of 0.5 used in this paper, more differentiation would be expected for different countries.

7. CONCLUSION

We proposed a novel drone readiness index that can be used to evaluate the robustness of the ecosystem for drone projects in a given country. The proposed readiness index is built using factors such as the regulatory structure, the economic and social impact, the investment in the sector, research and development. Using the derived formula, we computed the drone readiness index for selected countries. These values are further presented in a website [1].

Our future work will focus on refining the proposed drone readiness index for greater accuracy. This will be done through a sensitivity analysis for the different sub-indices, collecting more data using crowdsourcing, using a finer granularity when evaluating the sub-indices and applying the drone readiness index to more countries in different continents.

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APPENDIX

Table A.1. Scores environment sub-indices per country

Country	Regulation	Investment	R&D	Overall score
Rwanda	1	1	1	1.00
Tanzania	1	1	1	1.00
South Africa	1	1	1	1.00
Nigeria	1	1	1	1.00
Ivory Coast	1	1	1	1.00
Mauritius	1	1	1	1.00
Ghana	1	1	0.5	0.83
Malawi	0.5	1	0.5	0.67
Namibia	1	0.5	0.5	0.67

Zimbabwe	1	0.5	0.5	0.67
Morocco	0	1	1	0.67
Mozambique	0	1	1	0.67
Zambia	0.5	0.5	0.5	0.50
Tunisia	0	1	0.5	0.50
Botswana	1	0.5	0	0.50
Egypt	0	0.5	0.5	0.33
Kenya	0.5	0.5	0	0.33
Benin	0	0.5	0	0.17
Uganda	0	0	0.5	0.17
Algeria	0	0	0	0.00
DRC	0	0	0	0.00
Ethiopia	0	0	0	0.00
Sierra Leone	0	0	0	0.00
Cape Verde	0	0	0	0.00

Table A.2. Scores readiness sub-indices per country

Country	**Local Capacity**	**Communication and energy**	**Technology**	**Overall score**
Mauritius	0.69	0.87	0.53	0.70
Algeria	0.67	0.75	0.38	0.60
South Africa	0.60	0.67	0.53	0.60
Ivory Coast	0.29	0.72	0.51	0.51
Morocco	0.12	0.86	0.50	0.49
Tunisia	0.17	0.84	0.44	0.49
Namibia	0.05	0.88	0.53	0.48
Ghana	0.33	0.60	0.46	0.46
Botswana	0.14	0.69	0.50	0.44
Cape Verde	0.12	0.69	0.49	0.43
Rwanda	0.04	0.62	0.63	0.43
Kenya	0.02	0.65	0.60	0.42
Tanzania	0.27	0.54	0.43	0.41
Nigeria	0.30	0.44	0.43	0.39
Egypt	0.04	0.70	0.43	0.39
Ethiopia	0.16	0.42	0.43	0.34
Zambia	0.01	0.50	0.48	0.33
Benin	0.08	0.49	0.39	0.32
Mozambique	0.03	0.52	0.40	0.32
Uganda	0.02	0.45	0.47	0.31
Zimbabwe	0.03	0.53	0.34	0.30
Sierra Leone	0.01	0.55	0.34	0.30
DRC	0.03	0.32	0.32	0.22
Malawi	0.00	0.28	0.35	0.21

Table A.3. Scores usage sub-indices per country

Country	**Number of projects**	**Projects maturity**	**Overall score**
Mauritius	1	1	1
Nigeria	1	1	1
South Africa	1	1	1
Tanzania	1	1	1
Rwanda	0.8	1	0.9
Ivory Coast	0.6	1	0.8
Ghana	0.8	0.5	0.65
Mozambique	0.8	0.5	0.65
Namibia	0.8	0.5	0.65
Zimbabwe	0.8	0.5	0.65
Morocco	0.6	0.5	0.55
Botswana	0.4	0.5	0.45
Zambia	0.4	0.5	0.45
Ethiopia	0.6	0	0.3
Egypt	0.2	0	0.1
Sierra Leone	0.2	0	0.1
Tunisia	0.2	0	0.1
Algeria	0	0	0
Benin	0	0	0
Cape Verde	0	0	0
DRC	0	0	0
Kenya	0	0	0
Malawi	0	0	0
Uganda	0	0	0

Table A.4. Scores Impact sub-indices per country

Country	**Economic impact**	**Social Impact**	**Overall score**
Mauritius	1	1	0.67
South Africa	1	1	0.67
Tanzania	1	1	0.67
Nigeria	1	1	0.67
Rwanda	1	1	0.67
Ghana	1	1	0.67
Mozambique	1	1	0.67
Morocco	1	1	0.67
Ethiopia	1	1	0.67
Ivory Coast	0.5	0.5	0.33
Namibia	0.5	0.5	0.33
Zimbabwe	0.5	0.5	0.33
Botswana	1	0	0.33
Egypt	0.5	0.5	0.33
Sierra Leone	0.5	0.5	0.33
Zambia	0	0	0.00
Tunisia	0	0	0.00
Algeria	0	0	0.00
Cape Verde	0	0	0.00
Kenya	0	0	0.00
Benin	0	0	0.00