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Empowering local drone ecosystems: a framework for proactive engagement with Civil Aviation Authorities

A community-driven approach to inform the drone regulatory landscape and balance international harmonization with local considerations.

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Preface

D2international, a social impact community within Deloitte Consulting LLP, conducted a one-year case study with WeRobotics and Flying Labs Namibia to understand how local drone stakeholders can effectively collaborate as an ecosystem and proactively engage their Civil Aviation Authorities (CAAs) regarding drone regulations.

D2international is a skills-based learning program that has served social impact non-profit organizations and communities across the globe for over a decade. Throughout that time, the program has expanded to support over 31 initiatives with social enterprises and nonprofits around the world to tackle the world's most pressing wicked problems. One such initiative is with WeRobotics, a global nonprofit and social impact organization that supports the localization of drone, data and AI technologies through their Flying Labs Network spanning over 40 countries.

WeRobotics provides local technology experts across Flying Labs in Africa, Latin America, the Caribbean, and Asia/Pacific, while also fostering knowledge sharing and collaboration across borders and industries. Several Flying Labs are exploring and implementing drone applications for public good, such as crop monitoring, medical supply delivery, conservation mapping, and more. However, many Flying Labs and their local drone ecosystems are experiencing regulatory hurdles as CAAs seek to balance the development of adaptable drone regulations that foster innovation without compromising safety.

There is currently no one-size-fits-all set of drone regulations; each country has distinct drivers, needs, and challenges regarding drone operations. However, it can be important for CAAs and other regulators to understand the global regulatory environment and consider international regulatory harmonization. A contextual understanding of the local, regional, and global regulatory environment is foundational for CAAs to balance local considerations with global harmonization.

Effective stakeholder engagement can be a catalyst for CAAs to establish a contextual understanding of their local, regional, and global regulatory environment. However, the onus is not just on the CAAs; proactive leadership from local stakeholders in fostering collaboration across the ecosystem can significantly amplify the effectiveness of regulatory development.

Flying Labs Namibia, based in Windhoek, is one of several Flying Labs that have been actively engaging with their CAA regarding drone regulations and operations. Given the collaborative and receptive nature of the Namibian drone ecosystem, WeRobotics and D2international teamed with Flying Labs Namibia to conduct a case study in their country.

The study produced two outcomes: 1) a 20-page report of tailored drone regulatory insights for Flying Labs Namibia and 2) a repeatable framework for the study that could be replicated and refined across Flying Labs in 40+ countries spanning Africa, Latin America, the Caribbean, and Asia/Pacific. This framework - called the **Flying Labs Drone Regulations Engagement Framework** - is designed to equip the Flying Labs to form tailored insights regarding their local drone regulations through effective engagement with their CAA, local ecosystem, regional stakeholders, and global players.

Following this framework can enable local ecosystems to foster community-driven drone regulations, understand their current regulatory landscape, identify challenges, gather insights from other countries, and develop informed solutions.

This report explores the significance of each step in the *Flying Labs Drone Regulations Engagement Framework*, emphasizing "why" each step is important for local ecosystems to consider. For more information on "how" ecosystems can do this, contact humans@werobotics.org.

Introduction

Navigating the drone landscape: balancing innovation, safety and global harmonization

From transporting medical supplies to rural areas in the Dominican Republic, to surveying highways in Nepal, to monitoring livestock in Uganda,[1] drones – also known as Remotely Piloted Aircraft Systems (RPAS) or Uncrewed Aircraft Systems (UAS) – are providing a range of applications and benefits across diverse countries and industries. Drones can streamline tasks that were once labor-intensive, time-consuming, or hazardous, such as inspecting tall transmission lines. Drones also offer the ability to capture real-time data from unique or hard to reach vantage points, improving situational awareness and decision-making capabilities for applications such as disaster risk reduction and response, climate change monitoring, agriculture, and more.

This swift evolution presents a challenge for Civil Aviation Authorities (CAAs) that strive to keep pace and ensure safety while fostering innovation for their country. The findings of this study suggest that the full potential of drones can only be harnessed with well-crafted regulations in place that strike the right balance between harnessing economic potential and addressing safety, security, privacy, and ethical concerns.

In the dynamic landscape of drone regulations, there's no one-size-fits-all solution. Every country has its unique drivers, needs, and challenges regarding drone operations. Yet, for CAAs and other regulators, a global perspective could help foster regulatory harmonization. Global regulatory harmonization may enable standardization, interoperability, and industry growth while reducing the risks and cost associated with regulatory divergence between nations.[2]

These considerations place CAAs in a delicate balancing act of tailoring regulations to local needs while fostering international collaboration and harmonization.

Flying Labs Philippines using drones to deliver COVID-19 vaccines to the remote villages of Tawi-Tawi

A case study in Namibia: local stakeholder engagement and leadership for drone regulations

The findings of this study suggest that CAAs should look within and beyond their nation's borders when developing drone regulations. A contextual understanding of the local, regional, and global regulatory environment is foundational for CAAs to balance local considerations with global harmonization.

Effective stakeholder engagement serves as a critical catalyst for CAAs to understand local drone regulatory needs, challenges, and opportunities.

By actively involving relevant stakeholders from the outset, CAAs can not only ensure regulations address the diverse needs of these groups but also provide education on expectations and feasibility.[3]

However, the onus is not just on the CAAs; proactive leadership and engagement from local stakeholders can foster collaboration across the ecosystem and significantly amplify the effectiveness of regulatory development.

To understand how local stakeholders can come together as an ecosystem and proactively engage their CAA, Deloitte Consulting LLP collaborated with WeRobotics and Flying Labs Namibia to conduct a case study in Namibia.

Deloitte brings nearly a decade of experience in drone strategy consulting, helping clients navigate and evaluate the complex regulatory, technology, and financial impacts of drone programs. WeRobotics is a global nonprofit and social impact organization, supporting the localization of drone, data and AI technologies through their Flying Labs Network spanning 40+ countries. Flying Labs Namibia is a drone expertise hub and ecosystem builder that provides local capacity building and drone services across agricultural, health, humanitarian aid, education, and development sectors in Namibia. Together, the team brings drone expertise across the public and private sectors and critical perspectives spanning the local and global drone landscapes.

Flying Labs Namibia and Flying Labs Kenya conducting drone pilot training

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🔍 Research Questions

The team conducted a comprehensive case study in Namibia to address three key research questions:

1. How can local drone ecosystems initiate effective engagement with their CAAs to better understand and navigate local regulatory considerations?

2. How can collaboration within the local drone ecosystem be fostered to promote a collective understanding of regulatory nuances at the local level?

3. How can ecosystems identify and leverage leading drone regulatory practices from the regional and global landscape for informed engagement with their CAAs?

⚙️ Research Methods

The team used several research and engagement methods to gather local and international insights, including:

- a series of co-creation workshops **with 35+ Namibian drone stakeholders**

- **interviews with regional stakeholders**, including large-scale drone operators, international development agencies, and training providers

- **surveys and interviews of Flying Labs across 15 other countries** spanning Africa, Asia, and Latin America

- a **literature review** of current drone regulations across **20+ countries**

🗂️ Case Study Outcomes

The outcomes of the Namibia case study were two-fold:

1. Tailored insights for Flying Labs Namibia to share with the Namibia Civil Aviation Authority regarding their local, regional, and international regulatory environment.

2. A repeatable framework for the study to be built upon and replicated across Flying Labs in 40+ countries spanning Africa, Latin America, and Asia/Pacific. This framework, along with several resources and tools, form the ***Flying Labs Drone Regulations Engagement Toolkit*** (Figure 1).
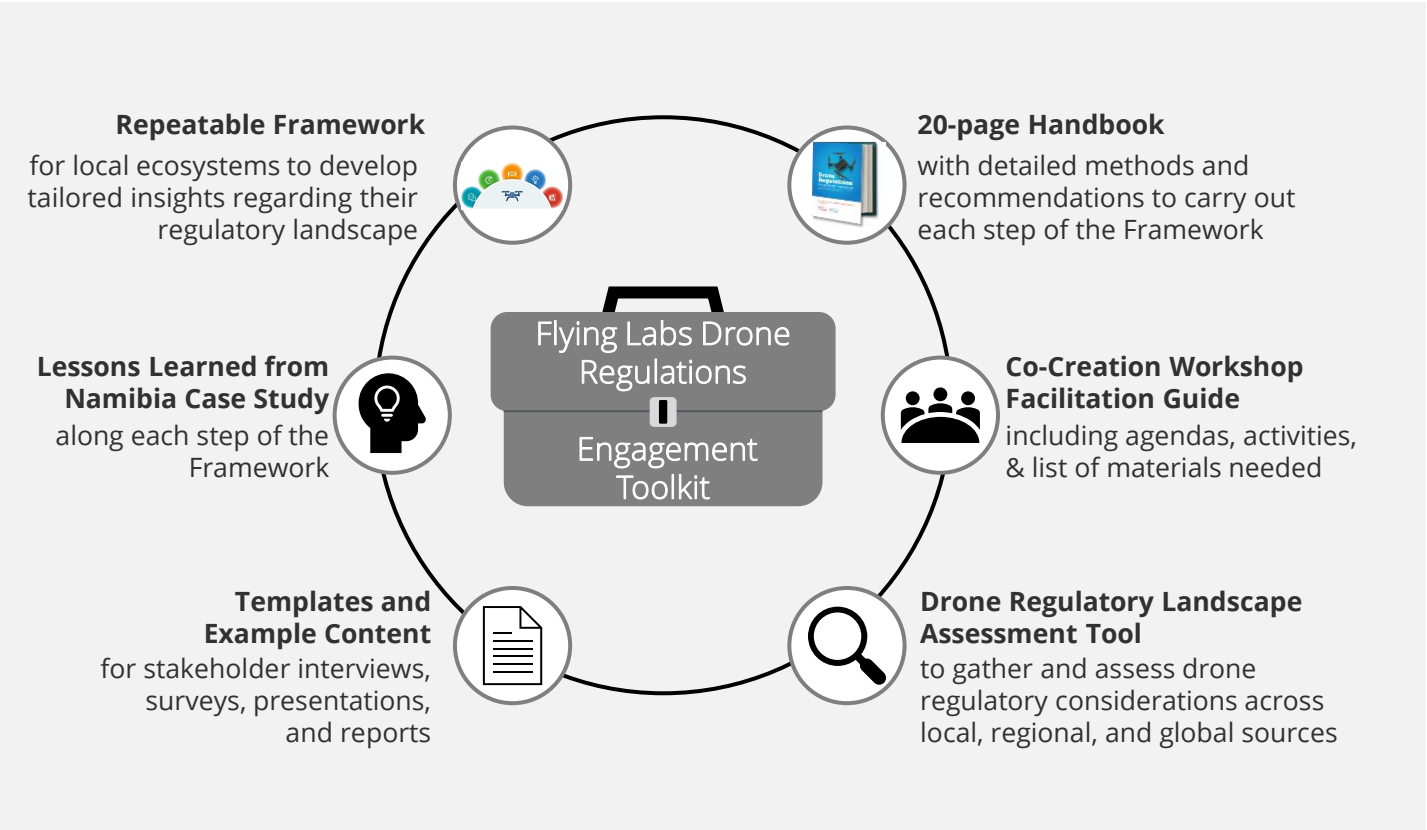

Flying Labs Namibia conducting a co-creation workshop with Namibian drone stakeholders

The *Flying Labs Drone Regulations Engagement Toolkit*: a framework and resources for local ecosystems to engage with their CAAs

The *Flying Labs Drone Regulations Engagement Toolkit* is a proprietary collection of resources and tools for the Flying Labs Network to implement and build upon across their 40+ countries of operations. The toolkit is designed to equip Flying Labs to form tailored insights regarding their local drone regulations through effective engagement with their CAA, local ecosystem, regional stakeholders, and global players. The toolkit includes the components shown in Figure 1:

Figure 1: Contents of the *Flying Labs Drone Regulations Toolkit*

Repeatable Framework
for local ecosystems to develop tailored insights regarding their regulatory landscape

20-page Handbook
with detailed methods and recommendations to carry out each step of the Framework

Lessons Learned from Namibia Case Study
along each step of the Framework

Co-Creation Workshop Facilitation Guide
including agendas, activities, & list of materials needed

Templates and Example Content
for stakeholder interviews, surveys, presentations, and reports

Drone Regulatory Landscape Assessment Tool
to gather and assess drone regulatory considerations across local, regional, and global sources

Flying Labs Drone Regulations
Engagement Toolkit

Each component of the toolkit maps to the steps outlined in the *Flying Labs Drone Regulations Engagement Framework,* detailed in Figure 2.

The *Flying Labs Drone Regulations Engagement Framework* outlines a locally-led approach for ecosystems to engage with local regulators and collaborate with stakeholders across borders, fostering a nuanced understanding of the local, regional, and global regulatory landscape.

The framework aims to equip local ecosystems with insights on local regulatory considerations as well as leading practices across the international landscape. This approach prioritizes safety, innovation, and harmonization, balancing local responsiveness and global regulatory coherence.

Figure 2: the *Flying Labs Drone Regulation Engagement Framework*
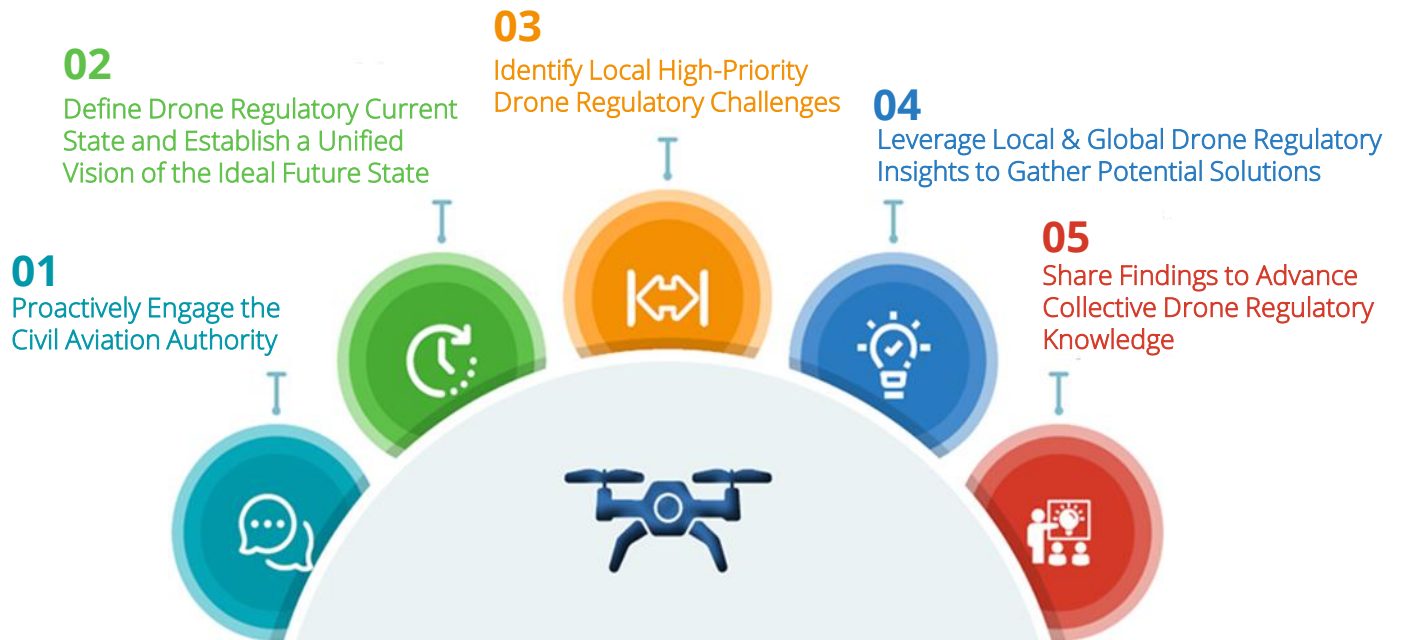
This report explores the significance of each step in the *Flying Labs Drone Regulations Engagement Framework*, emphasizing "why" each step is important for local stakeholders to consider, rather than "how" stakeholders can conduct each step. For more information on the "how" and the details included in the *Flying Labs Drone Regulations Engagement Toolkit*, contact humans@werobotics.org

01. Proactively Engage the Civil Aviation Authority

CAAs are responsible for developing and enforcing regulations and standards to ensure the safety, efficiency and equitability of civil flight operations, including drone operations. While many CAAs recognize the importance of involving stakeholders and the community in the regulatory process, the specific practices and mechanisms employed can differ based on the country's regulatory framework, cultural norms, and the maturity of the aviation industry.

Many CAAs have established procedures for incorporating community engagement into their processes for developing regulations. Community engagement methods may include public consultations, advisory committees, or industry forums to gather input and feedback from stakeholders such as industry representatives, operators, and the general public. In some countries, community engagement includes and is extended into the process of creating regulations by giving the public opportunities to comment and contribute. The public may even be able to initiate or directly suggest regulatory action in some cases.

However, not all CAAs have formalized community engagement practices incorporated into their regulatory development processes. In some cases, engagement might be more ad-hoc or limited, depending on the regulatory priorities and processes. Additionally, even where processes for community engagement or other forms of contribution are available, stakeholders may not always feel comfortable speaking openly in these engagement forums about issues they face with policies and regulations.

The Flying Labs Drone Regulations Engagement Framework shows a path that local stakeholders can take to proactively initiate engagement with their CAA rather than waiting to engage reactively to CAA requests. Proactively approaching the CAA empowers stakeholders to share their insights such as industry expertise, operational realities, concerns, needs, and barriers based on their experience.

By engaging the CAA before and throughout each step of the *Flying Labs Drone Regulations Engagement Framework*, stakeholders can build rapport, foster mutual understanding, and yield contextually-informed and impactful regulatory insights.

Flying Labs Panama using drones for crop mapping
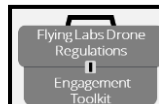
 The *Flying Labs Drone Regulations Engagement Toolkit* includes detailed methods and engagement letter templates for local stakeholders to approach and/or establish an engagement with their CAA.

02. Define Drone Regulatory Current State & Ideal Future State

A crucial early step for ecosystems to gather drone regulatory context and insights is to define their current state and their ideal future state regarding drone regulations in their country.
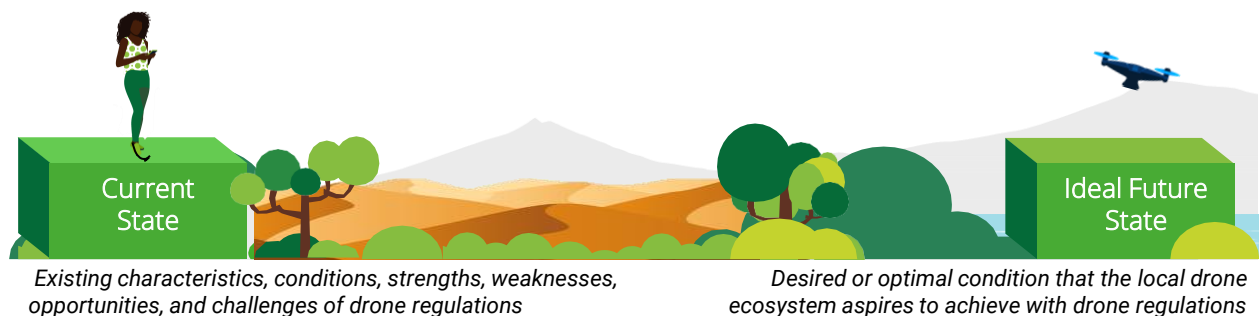
Defining the current state and ideal future state allows the ecosystem to answer two key questions:

1. **Where are we now?**
2. **Ideally, where do we want to be in the future?**

The local ecosystem's "current state" of drone regulations reflects their knowledge and perspectives on the existing characteristics, conditions, strengths, weaknesses, opportunities, and challenges of the regulations.

The current state provides the local drone ecosystem with a baseline and clear picture of where drone regulations currently stand in their country. It serves as a foundation for making informed decisions, setting goals, and planning for the future.

The local ecosystem's "ideal future state" refers to their desired or optimal condition that they aspire to achieve with drone regulations. In general, the ideal future state envisions a time where drone regulations clearly articulate guidance and limitations and allow safe and equitable access to the airspace. A clear and shared understanding and commitment to a common vision among stakeholders – including the CAA, other regulatory bodies, industry players, and the community – fosters collaboration and alignment of efforts. This unity promotes shared goals, reducing potential conflicts and enhancing the likelihood of successful outcomes.

By collectively aspiring towards an ideal future state, the local drone ecosystem can collaborate to address challenges, capitalize on opportunities, and foster a regulatory environment that not only meets current needs but also anticipates and adapts to the evolving landscape of drone technology and operations.

Figure 3: Definitions of "Current State" and "Ideal Future State"

Current State

Ideal Future State

Existing characteristics, conditions, strengths, weaknesses, opportunities, and challenges of drone regulations

Desired or optimal condition that the local drone ecosystem aspires to achieve with drone regulations

The *Flying Labs Drone Regulations Engagement Toolkit* includes detailed methods and tools for local ecosystems to identify their current state of drone regulations and align on a clear, unified vision for their ideal future state.

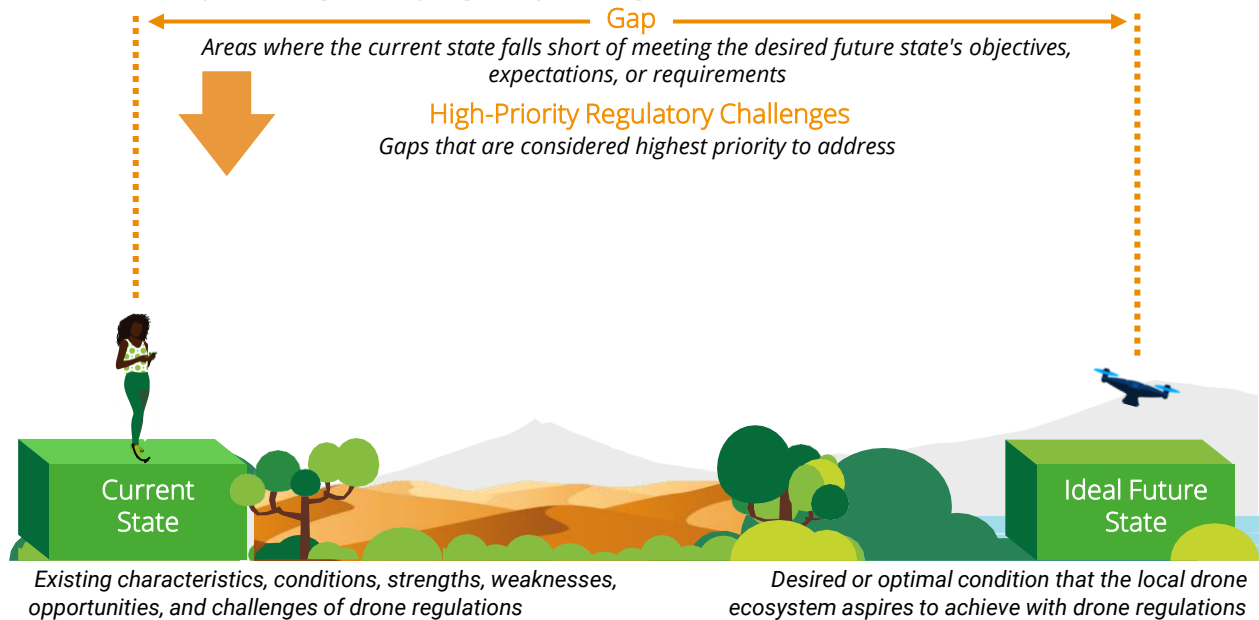# 03. Identify Local High-Priority Drone Regulatory Challenges

Local drone stakeholders, intimately familiar with the specific challenges and dynamics of their region, offer meaningful perspectives on regulatory gaps. Gaps are areas where current regulations fall short or hinder progress towards achieving the ideal future state. By identifying gaps, local stakeholders can highlight drone regulatory areas that require attention, improvement, or strategic intervention.

Given that several gaps could exist between the current state and ideal future state, local ecosystems may have to evaluate which

gaps are high-priority drone regulatory challenges to maintain a realistic research scope. The ecosystem's perspective is critical in answering the following questions:

- **Which gaps are most commonly identified by local drone stakeholders?**
- **Which gaps are time-sensitive; what needs to be solved as soon as possible to enable future change?**
- **Which gaps would be "quick wins" that would require minimal effort to address, while leading to big impact?**

Figure 4: Definitions of "Gaps" and "High-Priority Regulatory Challenges"

Gap

Areas where the current state falls short of meeting the desired future state's objectives, expectations, or requirements

High-Priority Regulatory Challenges

Gaps that are considered highest priority to address

Current State

Ideal Future State

Existing characteristics, conditions, strengths, weaknesses, opportunities, and challenges of drone regulations

Desired or optimal condition that the local drone ecosystem aspires to achieve with drone regulations

The *Flying Labs Drone Regulations Engagement Toolkit* includes detailed methods and tools for local ecosystems to deduce and prioritize drone regulatory gaps and pinpoint high-priority drone regulatory challenges they wish to overcome.
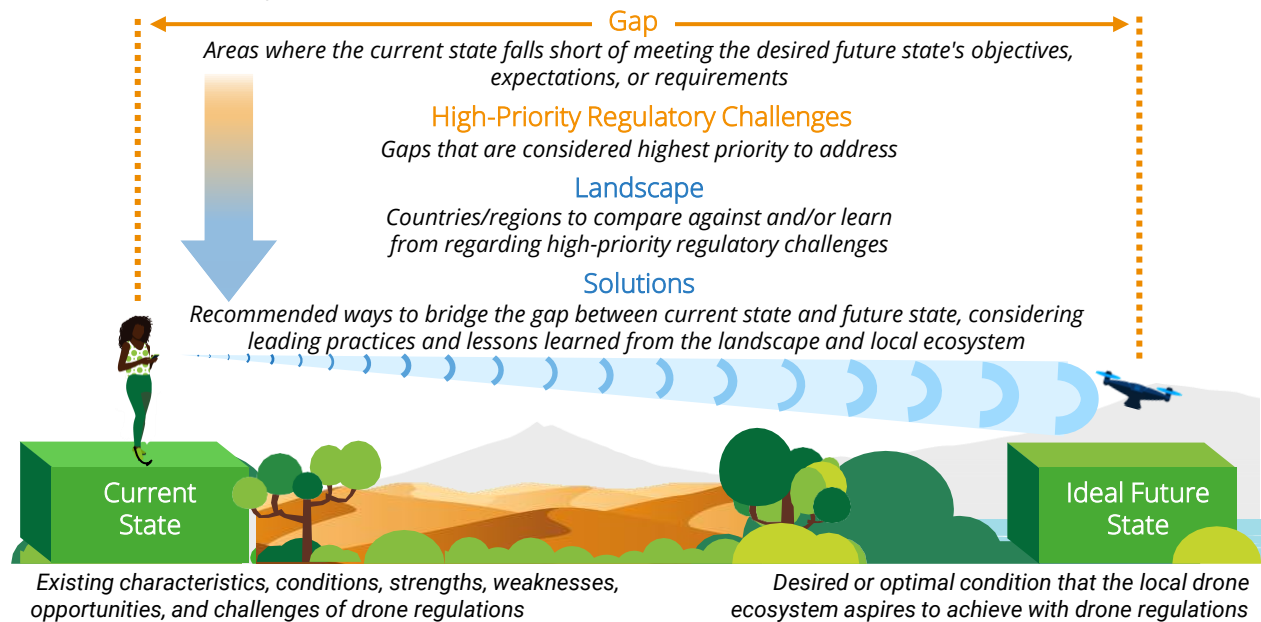
04. Leverage Local & Global Regulatory Insights for Potential Solutions

Local stakeholders possess valuable insights regarding drone regulations that stem from their firsthand experiences and subject matter expertise. They know what can and cannot work in their country, they know their cultural norms, and they have lived shared experiences. However, many of the drone regulatory challenges that local ecosystems face may be common issues that other countries are also addressing.

By looking beyond their borders to the broader landscape, local ecosystems can tap into standards, lessons learned, and leading practices from countries tackling similar regulatory challenges. This not only enriches the effectiveness of local solutions but also contributes to a collaborative and harmonized global approach to drone regulations.

Figure 5: Definitions of "Landscape" and "Solutions"

Gap
Areas where the current state falls short of meeting the desired future state's objectives, expectations, or requirements

High-Priority Regulatory Challenges
Gaps that are considered highest priority to address

Landscape
Countries/regions to compare against and/or learn from regarding high-priority regulatory challenges

Solutions
Recommended ways to bridge the gap between current state and future state, considering leading practices and lessons learned from the landscape and local ecosystem

Current State

Ideal Future State

Existing characteristics, conditions, strengths, weaknesses, opportunities, and challenges of drone regulations

Desired or optimal condition that the local drone ecosystem aspires to achieve with drone regulations

The *Flying Labs Drone Regulations Engagement Toolkit* includes methods and tools for local ecosystems to engage regional players, conduct a landscape analysis, and gather leading practices and lessons learned to inform their solutions. The "glocalization" practices of the Flying Labs Network facilitate knowledge flow from local regions to the global stage and back, fostering global collaboration.
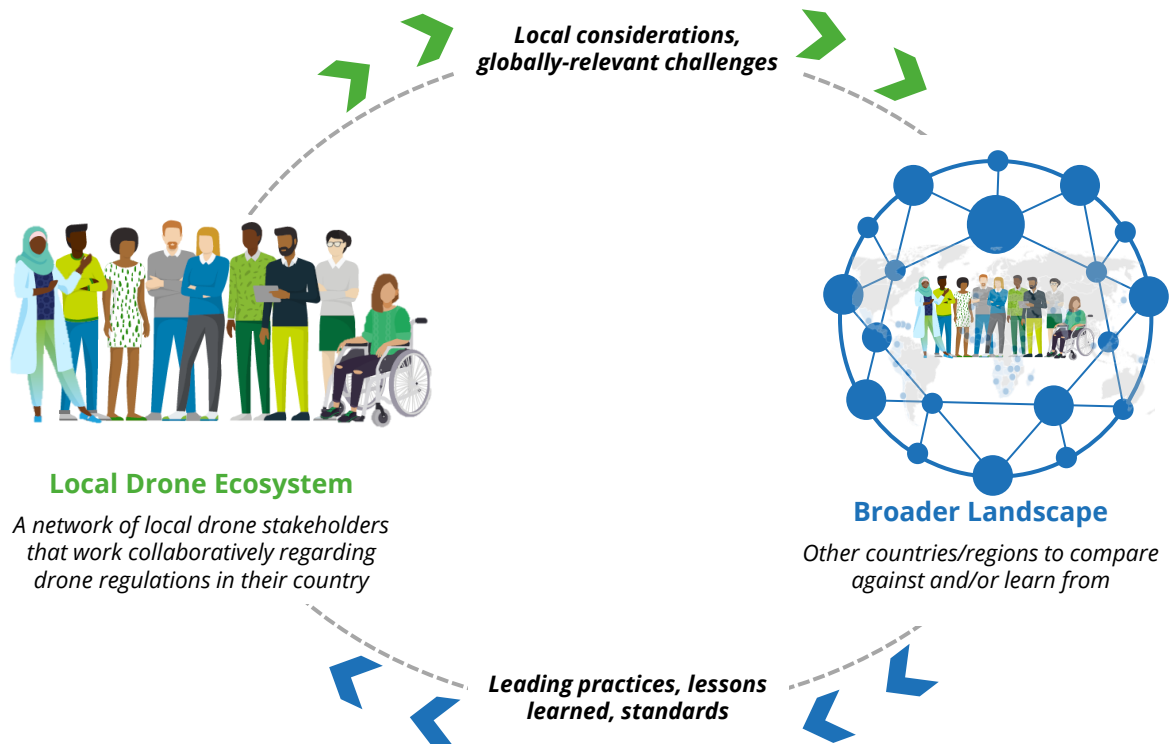
05. Share Findings to Advance Collective Drone Regulatory Knowledge

Local drone ecosystems that follow each step of the *Flying Labs Drone Regulations Engagement Framework* can glean a nuanced understanding of the local, regional, and international regulatory landscape.

By sharing these insights with their CAAs, local ecosystems actively contribute to shaping regulations that cater to local needs and challenges. Moreover, local ecosystems can play a pivotal role in fostering knowledge exchange and regulatory harmonization by sharing their insights beyond their borders.

Figure 6: Knowledge exchange between local drone ecosystems and the broader landscape

Local considerations, globally-relevant challenges

Local Drone Ecosystem

A network of local drone stakeholders that work collaboratively regarding drone regulations in their country

Broader Landscape

Other countries/regions to compare against and/or learn from

Leading practices, lessons learned, standards

The *Flying Labs Drone Regulations Engagement Toolkit* includes detailed methods and tools for local ecosystems to identify, capture and share their lessons learned and key insights throughout their research. The Flying Labs Network provides a global platform for local drone ecosystems to share resources and knowledge across borders of 40 countries of operation.

Conclusion

The *Flying Labs Drone Regulations Engagement Framework* outlines a locally-led approach for ecosystems to engage with their local regulators and collaborate with stakeholders across borders, fostering a nuanced understanding of the local, regional, and global regulatory landscape. Following the framework can help equip local ecosystems to:

Foster a locally-led, community-driven approach to influencing the development of drone regulations

Provide a baseline and clear picture of where drone regulations currently stand in their country

Form a unified vision among stakeholders for a future with drone regulations that provide clear guidance, set limitations, and ensure safe and equitable airspace access

Identify high-priority drone regulatory challenges in their country

Gather insights from other countries on leading practices and lessons learned regarding high-priority regulatory challenges

Develop potential solutions informed by local, regional, and global expertise and context, promoting local considerations and global harmonization

Share findings across the ecosystem and global landscape, fostering knowledge sharing and global collaboration towards drone regulation development

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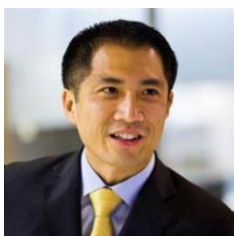
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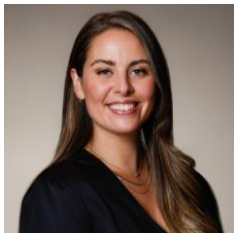
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About Our Organizations

Deloitte Drone Strategy Consulting

Deloitte U.S. Drone Services (UDS) brings the technical capabilities, relationships, and subject-matter experience to help clients navigate the disruptive and emerging world of uncrewed aircraft systems (UAS). The team provides support along the advise-implement-operate framework to assist federal and commercial clients with integration of UAS into their business models while maintaining the balance of innovation and risk mitigation. For more information, visit:
https://www2.deloitte.com/us/en/pages/public-sector/solutions/drone-services.html

Deloitte D2international

D2international (D2i) is Deloitte Government and Public Service's (GPS) flagship international social impact program. We were founded on the belief that doing good is good business. After a decade of consulting and advisory projects with non-profits and social enterprises across the world, helping them tackle a variety of wicked problems, we are just as confident in that belief. For more information, visit: https://www2.deloitte.com/us/en/pages/about-deloitte/articles/d2international.html

WeRobotics

WeRobotics is a social impact organization that amplifies the power of local expertise to multiply sustainable solutions for development, aid and climate, driven by local actors and supported by appropriate drone, data and AI technologies. WeRobotics supports and connects local experts in Africa, Latin America, the Caribbean and Asia/Pacific with a platform, skills, frameworks, technologies and opportunities to lead and contribute to local solutions for climate action, disaster, agriculture, STEM/Youth, entrepreneurship and more. This platform is the Flying Labs Network, currently active in 40+ countries. WeRobotics also provides global connections for the members of the Flying Labs Network and its ecosystem partners, to facilitate connections, collaboration, learning and knowledge sharing between local experts, global organizations and industries. By doing so, the organization is co-creating a proven and replicable model to successfully localize and shift power at a grassroots level.

Flying Labs Namibia

Flying Labs Namibia is a drones and robotics knowledge hub that focuses on solving local challenges and needs through the use of appropriate robotics and AI technologies. The facility fosters inclusive, social empowerment through the equipment of locals with the necessary skills and expertise to develop and efficiently manipulate appropriate robotics solutions towards alleviating diverse societal challenges. The organization works closely with key stakeholders in building a tech-innovation network, designed to shift power to locals, by utilizing lived experiences and appropriate technology to accelerate positive impact of agriculture, development, education, environmental, healthcare and humanitarian aid efforts. Flying Labs Namibia builds local skills, develops capacity and increases impact in the unmanned aviation sector; by providing tailored professional training on drones and robotics, imparting expertise, as well as developing opportunities through concerted projects and stimulating an ecosystem that is directly empowering to the Namibian population.

Endnotes

1. Flying Labs, "Discover the vast diversity of project and training use cases documented by Flying Labs."
    https://flyinglabs.org/use-cases/

2. Deloitte, "The future of regulation; principles for regulating emerging technologies."
    https://www2.deloitte.com/us/en/insights/industry/public-sector/future-of-regulation/regulating-emerging-technology.html

3. ICAO, "The ICAO UAS Toolkit: 2. Development of UAS Regulation."
    https://www.icao.int/safety/UA/UASToolkit/Pages/Narrative-Regulation.aspx

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