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MULTILATERAL INVESTMENT FUND

PANAMA

FLYING LABS: HARNESSING THE POWER OF ROBOTICS FOR SOCIAL INNOVATION

(PN-T1185)

DONORS MEMORANDUM

This document was prepared by the project team comprised of: Gina Cambra (MIF/CPN) and Norah Sullivan (MIF/KE) Co-Team Leaders; Yves Lesenfants (MIF/MIF); Svante Persson (MIF/IC); Galileo Solis (CTI/CPN); and Maria Elena Uriarte (GCL/CUR)

CONTENTS

PROJECT SUMMARY

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Panama is the fastest-growing economy in Latin America and the Caribbean (LAC). However, the effect of growth on poverty reduction has been lower than the average for the region, due to the country's social gaps and institutional shortcomings. This situation signals ongoing challenges for the public provision of social services and for the consolidation of a social safety net that broadly addresses the needs of rural areas and indigenous *comarcas*, as well as growing urban centers. It also reflects an opportunity for social innovation, a novel methodology for developing a new process, product, service, or model with quantifiable social impact that is more efficient, sustainable, or fair than the existing solutions or addresses a problem in the public interest that has not responded to traditional methods. And technology plays a key role in developing, deploying, and scaling social innovation solutions.

Emerging Fourth Industrial Revolution technology breakthroughs in fields such as robotics and artificial intelligence (AI) have a transformative role to play in the development sector, aside from their well-known and growing impact in manufacturing and other industries. Drones, the most well-known robotics technology, are being used to monitor illegal logging in the Amazon, survey natural disaster sites, and deliver medicines to rural villages. Data and images collected from aerial and marine surveillance can be analyzed and processed into 3D maps, digital elevation models, and many other products that can provide evidence-based input to enhance decision-making.

However, despite their promise, the potential application of robotics technology as a social innovation solution is not widely known in LAC. Increased understanding of and demand for these technologies can also spark entrepreneurial activity and tech-driven job creation within the local innovation ecosystem. Nonetheless, a catalyst is required to accelerate the transfer of skills and technology to local organizations. This catalyst is the Panama Flying Lab to be established in this project and hosted by the Universidad Tecnológica de Panamá (UTP). Spearheaded by the non-profit organization, WeRobotics, Flying Labs are regional innovation hubs aiming to enhance and scale the impact of development efforts using appropriate robotics solutions. The Lab will build local capacity, develop solutions to address social and environmental problems using these technologies, and catalyze entrepreneurship around robotics-as-a-service.

This project is strategic for the MIF's Knowledge Economy since it will create a regional innovation hub around robotics technology, bringing together local ecosystem actors and driving the development of tech-driven solutions to social and environmental problems. Likewise, the project is directly aligned with an IDB/CTI loan with the National Department of Science, Technology, and Innovation (SENACYT) that will entail competitions for tech-driven social innovation solutions, such as those involving robotics. The Lab will help to fortify the base of solution providers that can access these funds, filling a gap in supply. The loan will also offer seed capital for innovative entrepreneurs, which could provide a path to financing for the robotics-as-a-service entrepreneurs to be supported by the Lab. Furthermore, potential opportunities to connect IDB programs in Panama related to the health, environment, and tourism sectors to the Flying Lab have already been identified.

ANNEXES

APPENDICES

AVAILABLE IN THE TECHNICAL DOCUMENTS SECTION OF MIF PROJECT INFORMATION SYSTEM

ACRONYMS AND ABBREVIATIONS

AIP	Asociación de Interés Privado
CTI	Competitiveness, Technology and Innovation Division
DNA	Diagnostic of Executing Agency Needs
FTP	Fundación Tecnológica de Panamá
IDB	Inter-American Development Bank
MIF	Multilateral Investment Fund
SENACYT	Secretaria Nacional de Ciencia, Tecnología e Innovación
UTP	Universidad Tecnológica de Panamá

PROJECT INFORMATION

PANAMA
FLYING LABS: HARNESSING THE POWER OF ROBOTICS FOR SOCIAL INNOVATION
(PN-T1185)

Country and Geographic Location:	Panama		
Executing Agency:	Fundación Tecnológica de Panamá (FTP)		
Focus Area:	Knowledge Economy		
Coordination with Other Donors/Bank Operations:	IDB/CTI loan "Innovation Program for Social Inclusion and Productivity" (PN-L1117), particularly the components related to innovation for social inclusion and business innovation for enhanced productivity.		
Project Beneficiaries:	The project will develop at least ten social innovation solutions using robotics technologies that will seek positive social and environmental impacts. In addition, at least 30 entrepreneurs in 10 tech-driven enterprises will be supported.		
Financing:	Technical Cooperation:	US$ 715,300	50%
	Equity:	US$ 000,000	
	Loan:	US$ 000,000	
	Other (explain):	US$ 000,000	
	TOTAL MIF FUNDING:	US$ 715,300	
	Counterpart:	US$ 715,900	50%
	Co-financing (if available; include a separate line for IDB Co-financing if applicable):		00%
	TOTAL PROJECT BUDGET:	US$ 1,431,200	100%
Execution and Disbursement Period:	36 months of execution and 42 months of disbursement.		
Special Contractual Conditions:	Special conditions precedent to first disbursement will be: (i) selection of the Project Coordinator; and (ii) approval of the annual work plan.		
Environmental and Social Impact Review	This operation was screened and classified as required by the IDB's safeguard policy (OP-703) on June 16, 2017. Given the limited impacts and risks, the proposed category for the project is C.		
Unit responsible for disbursements	MIF/CPN		

I. The Problem

A. Problem Description

1.1. Panama is the fastest-growing economy in Latin America and the Caribbean (LAC), with an average annual GDP growth rate of 7.2% between 2010 and 2016.[1] However, the effect of growth on poverty reduction was lower than the average for the region, due to the country's social gaps and institutional shortcomings. There are very dynamic sectors in Panama, such as the Canal conglomerate, which benefit from special regulations to facilitate investment and require skilled labor, operating alongside other sectors, such as agriculture and manufacturing, which continue to face restrictive legal and regulatory frameworks, resulting in insufficient investment and productivity levels. This is coupled with high poverty rates, particularly in rural areas (49.7%) and indigenous *comarcas* (86.9%), and significant gaps in health, education, and other basic services, which create barriers that prevent the lower-income population from gaining a foothold in the productive areas undergoing expansion.[2]

1.2. This situation signals ongoing challenges for the public provision of social services and for the consolidation of a social safety net that broadly addresses the needs of rural areas and indigenous *comarcas*, as well as growing urban centers.[3] It also reflects an opportunity for social innovation, which is a novel methodology for developing a new process, product, service, or model with quantifiable social impact that is more efficient, sustainable, or fair than the existing solutions or addresses a problem in the public interest that has not responded to traditional methods.[4] And technology plays a key role in developing, deploying, and scaling social innovation solutions.

1.3. There is great momentum around Fourth Industrial Revolution technology breakthroughs in fields such as robotics and artificial intelligence (AI) and how they can play a transformative role in the development sector and in accelerating the Sustainable Development Goals (SDGs)[5], aside from their growing impact in manufacturing and other industries. After all, the rise of intelligent automation as a global economic force is paralleled by increasingly complex social challenges, such as climate change, rapid urbanization, environmental degradation, and entrenched poverty, all of which call for innovative and tech-driven solutions.

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[1] Average calculated using data from the National Statistics and Census Institute (INEC), 2016.

[2] For example, maternal death rates in indigenous *comarcas* such as Ngäbe-Buglé are five times greater than the national average, reflecting persistent gaps in access to health services. Sanitation services are also uneven, with a 56% rate of sanitation sewerage access in urban/peri urban areas. (IDB Country Strategy Panama 2015-2019)

[3] Ibid

[4] As defined in the IDB loan proposal "Innovation Program for Social Inclusion and Productivity" (PN-L1117).

[5] i.e., Mapping poverty with predictive Big Data analytics, modeling climate change to predict disasters, or analyzing vast amounts of healthcare data. AI for Social Good: How Artificial Intelligence Can Boost Sustainable Development. UN International Telecommunication Union (ITU), 2017.

1.4. Robotics technologies themselves are not new; what is new is the rapid shift from manually controlled robotics systems to increasingly intelligent autonomous systems powered by AI. This fast-paced technological advancement, including the proliferation of inexpensive, high-quality cameras, sensors, and wireless technologies, not only broadens the scope of the potential applications of robotics technologies, but is also making them increasingly accessible (i.e. in terms of cost and ease of use; drone flight paths, for example, can be programmed with simple apps). Unmanned Aerial Vehicles (UAVs), or drones, the most well-known and field-tested robotics technology, can be equipped with different types of cameras and sensors depending on the task. For example, drones are being used to combat deforestation by monitoring illegal logging in the Amazon, to survey natural disaster sites to provide real-time information on damage and recovery efforts, to map crop health, and to deliver essential medicines and diagnostics to rural villages. Likewise, marine robots are already being used to map distressed reef ecosystems, measure water quality, explore underwater areas at depth, and assist in fisheries management.[6] Data and images collected from aerial and marine surveillance can be analyzed and processed using different software applications into 3D maps, high-resolution mosaic images, digital elevation models, actionable reports and other products that can help to inform effective decision-making for farmers, NGOs, conservation efforts, and governments, among others.

1.5. More specifically, in Panama, key areas that could benefit from robotics solutions such as drone mapping, spatial data analysis using geographic information systems (GIS), and aerial cargo delivery, include environmental protection, natural resource management, disaster response and resilience, community health, and agriculture.[7] Over 40% of Panama consists of environmentally protected areas[8], which require improved strategies for monitoring and mapping to detect changes in forest cover, wildlife habitat, waterways, and other features. The Panama Canal Zone ranks among the largest environmentally protected areas in Central America, and faces routine challenges in monitoring water quality and the status of the reforestation projects it supports with local communities, as well as rapid mapping for disaster response. Recent flooding and mudslides affecting peri-urban communities in Arraijan, Tocumen, La Cabima and other areas highlight the need for accurate aerial maps of affected zones to facilitate disaster response and mitigation. Many of Panama's predominantly rural indigenous communities[9] face routine challenges in accessing health services. The Ministry of Health struggles to accurately count these populations in order to effectively plan for service delivery. Finally, greater access to precision agriculture techniques can help small farmers to boost crop productivity and respond to increased climate variability through data-driven decision making.

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[6] For example, OpenROV produces small, low-cost ($900-$1,700), open-source diving drones to make underwater exploration more accessible. A global network of researchers and "citizen scientists" are using this technology to study the ocean and raise awareness about marine protection.

[7] Based on information collected by the project team from a variety of public, private, and civil society stakeholders during the analysis mission.

[8] Plan de Acción para el Desarrollo del Turismo Verde en Áreas Protegidas en la República de Panamá 2016-2026. Ministerio de Ambiente, 2016.

[9] Panama has a population of about 3.6 million, about 12% of whom are indigenous people. IDB Country Strategy Panama 2015-2019.

1.6. However, despite their promise, the potential applications of robotics technology to help address social and environmental problems such as these are not widely known in Panama or in the rest of LAC. While there is robotics-related activity ongoing, particularly through the Universidad Tecnológica de Panama's (UTP) Department of Mechanical Engineering, which has a lab to build and fly drones, as well as through a handful of drone-related companies operating in Panama, the focus is primarily academic and commercial. Other actors such as the Panama Canal Authority (ACP), the Ministry of Environment, and the LAC Water Center for the Humid Tropics (CATHALAC) have more recently started to use drones for data collection, monitoring, and training purposes. Likewise, various local NGOs and UN agencies are interested in using drone technology to enhance their work, but lack the technical know-how to do so. Furthermore, an ongoing challenge is how to turn the vast quantity of data collected by drones into usable information.

1.7. In addition to offering new solutions to ongoing problems, increased understanding of and demand for these technologies can also signal new business opportunities, sparking entrepreneurial activity and job creation around robotics-as-a-service within the local innovation ecosystem. After all, robotics and AI are key drivers of the knowledge economy. As companies increasingly automate operations and supply chains, new jobs are created in hardware, software, repair, maintenance, logistics, big data, and other areas. Likewise, as drone manufacturers expand in the region, there is a need to build and certify local capacity to repair and service these technologies. However, the convergence of demand for tech-driven social innovation solutions with appropriate robotics technologies will not happen automatically. A catalyst is required to accelerate the transfer of professional and technical skills to local actors along with appropriate technology.

1.8. **Beneficiaries.** The project will develop at least ten social innovation solutions using robotics technologies that will seek positive social and environmental impacts. While the specific types of solutions and their corresponding beneficiary targets will be determined during project execution, preliminary scoping work has demonstrated demand in areas with high impact potential. In addition, the project will support at least 30 entrepreneurs in 10 tech-driven enterprises.

II. The Innovation Proposal

A. Project Description

2.1 The project's objective is to accelerate the application of robotics technologies to address social and environmental problems and catalyze entrepreneurship around robotics-as-a-service by creating a regional innovation hub (Panama Flying Lab). Spearheaded by the non-profit organization, WeRobotics, Flying Labs are regional innovation hubs that aim to accelerate and scale the impact of humanitarian and development efforts using appropriate robotics solutions. Flying Labs are co-created with both local partners (universities, NGOs, community organizations, governments, etc.) and technology partners (leading drone/satellite manufacturers such as DJI, Parrot, SenseFly, Flyability, and Planet; and software providers such

as ESRI and Pix4D), and are guided by the Drone Code of Conduct for Social Good[10].

2.2 The Flying Lab model consists of four main elements: (i) building local capacity through strategic business model advice, skills training, and technology transfer; (ii) implementing projects using robotics technology to address social and environmental challenges; (iii) building the local robotics ecosystem and regional network by bringing together different stakeholders (universities, companies, incubators, governments, NGOs, etc.) to share best practices and models; and (iv) sparking entrepreneurship and job creation around these Fourth Industrial Revolution technologies.

2.3 The first Flying Lab was created in Nepal in the wake of devastating earthquakes in 2015. WeRobotics trained local partners at Kathmandu University to program and deploy drones, and process the data generated to create high-resolution maps of affected areas to assist recovery efforts. The government has since contracted the Lab to carry out similar services in other parts of the country. The Lab has also pioneered landslide vulnerability mapping for rural communities in mountainous regions using drones, which is more efficient, cost-effective, and accurate than traditional ground-based surveying or satellite imaging. In contrast to these high-altitude settings, Tanzania Flying Lab is testing the use of drones for long-distance coastline surveillance, among other tasks. In Peru, the Flying Lab played a key role in the response to severe flooding in the Northern Peru in March/April 2017 by helping to map over 7,000 hectares in three days, providing the government with critical high-resolution aerial images to help search and rescue efforts and assess damage. In collaboration with the Ministry of Health and others, the Lab has also been testing drone cargo delivery of antivenom medication in the Amazon for the first time. Initial flights from the local health hub Contamana to a village 40km away took 35 minutes versus six hours by riverboat.[11] WeRobotics is also developing a release mechanism for drones which will be used to disperse sterilized mosquitos as a way to reduce mosquito populations and disease incidence, which will be field tested with the Peru Flying Lab in 2017.

2.4 By implementing projects such as these and processing the data collected into usable products, the Labs can help to accelerate the transition from information (i.e. data collection) to insight (i.e. being able to act on data) in the robotics sector. Furthermore, this growing Flying Lab network allows for cross-fertilization of experiences across regions, as well as the creation of a critical mass of use cases to further build the evidence base for the use of drones for social good.[12] Ultimately, the aim is to build a global network of robotics capacity able to meet mounting

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[10] The code of conduct aims to inform the use of drones in humanitarian and development settings, providing guidelines on data sensitivity, community engagement, effective partnerships, and conflict sensitivity. WeRobotics' founders were among the leaders in developing these guidelines.

[11] Local doctors report an average of 45 snakebites/month and no rapid access to antivenom.

[12] Over the next three years, WeRobotics aims to consolidate a network of 6-8 regional Flying Labs that can serve as innovation hubs for surrounding countries (West and East Africa, Southern Africa, Himalayas, Southeast Asia, Asia Pacific, Central and South America).

demand for the use of these technologies.[13] In addition, a core function of Flying Labs is to provide ongoing training to local organizations (NGOs, public agencies, etc.) in the skills and knowledge necessary to use robotics safely, ethically, and effectively. In Tanzania, for example, the Lab held the first ever drone pilot training for surrounding East African countries. In general, while emphasis is placed on utilizing existing robotics technologies, particularly drones given their relative maturity, Labs are also able to research and customize technologies to address particular problems where current solutions may prove insufficient.

2.5 In Panama, the Flying Lab will be hosted by the UTP, given its recognized technical expertise in engineering, mechatronics, and robotics, as well as its business incubator, UTP Emprende, and its foundation arm, the Fundación Tecnológica de Panamá (FTP). Panama is also an ideal location for this regional innovation hub given the presence of various international organization regional headquarters (i.e. World Food Program (WFP), UNDP, PAHO, etc.) within the City of Knowledge campus, facilitating the connection between technology and the social sector. Furthermore, the vitality of Canal-driven economic activity in Panama, anchored by a productive conglomerate engaged in export logistics and transportation services, enables the creation of new businesses around robotics which facilitate the implementation of the project. In addition, there are existing drone flight regulations in place, and the UTP has already engaged with the Civil Aviation Authority. The timing is also propitious given a new IDB/CTI loan executed by the National Department of Science, Technology, and Innovation (SENACYT) (see paragraph 3.1), that will entail calls for tech-driven social innovation solutions, such as those involving robotics. The Lab will help to fortify the base of solution providers that can access these funds, filling a gap in supply.

2.6 This project is strategic for the MIF's Knowledge Economy, particularly the Ecosystem area since it will create an innovation hub around robotics technology in Panama, bringing different local ecosystem actors (universities, incubators, businesses, public sector) together and paving the way for the development of tech-driven solutions to social and environmental problems. This project also builds on, and will coordinate with, a MIF intervention in implementation in the Dominican Republic (DR-M1049) that is focused on the health sector to test drone delivery of essential medical supplies and services to rural areas.

2.7 **Innovation.** Beyond the robotics technologies themselves, the goal of expanding access to these quickly evolving technologies and empowering local actors to apply them to address social problems is groundbreaking. WeRobotics is the only organization working to accelerate the impact of social good globally through the sustainable transfer of robotics solutions through a dedicated network of Flying Labs. The Labs will create valuable solutions and data products in underserved areas, augment learning and innovation, test cutting-edge technologies in tough conditions, and catalyze local tech entrepreneurs for the knowledge economy.

[13] WeRobotics has already begun to channel requests for project implementation and consulting to the Labs which can then provide services directly. In June 2017, the Peru Lab became the main in-country partner hosting the WFP's humanitarian drone coordination workshop and simulation.

2.8 **Component I: Flying Lab Capacity Building. (MIF US$90,000; Counterpart US$178,500).** The objective of this component is to build the capacity of the local team to manage and implement Flying Lab activities, as well as the capacity of local organizations more broadly. WeRobotics will first provide hands-on professional and technical skills training to the Lab team, including emphasis on data analysis and processing. A training workshop will be held with a broader range of local organizations focusing on the principles of drone-based data collection, best practices from multi-sector efforts in the social sector, regulatory, code of conduct and policy considerations, as well as core elements of successful drone project development. Two groups from this training session will be selected as the first pilot projects to be implemented by the Lab, with core support from WeRobotics on training and co-creation of the two drone project proposals.

2.9 These initial pilot projects serve the dual purpose of providing real-world practice for the Lab team as well as quickly demonstrating the role these technologies can play in addressing social and environmental challenges through use cases. Additional workshops will be organized by WeRobotics focusing specifically on data processing, analysis, and information products in order to accelerate projects' analytic elements and create solid products that demonstrate projects' results. This phase also includes the transfer of appropriate robotics technologies, both hardware and software, to create a core set of platforms for use by the Lab.

2.10 Overall, WeRobotics will provide a tapering level of technical support, transitioning from upfront hands-on training and project design and implementation support for both the Lab team and local organizations to mostly remote support by year three of the project. The goal is for the Lab team to increasingly assume responsibility for ongoing training with local and regional actors (NGOs, public agencies, etc.) in the skills and knowledge necessary to use robotics safely, ethically, and effectively.

2.11 In addition, in order to organize Lab workflow, an initial business model will be developed including a (i) strategy for incorporating robotics-as-a-service into Lab activities (i.e. considering potential revenue streams to foster sustainability); and a (ii) methodology for selecting and prioritizing problems to be addressed using robotics technology, taking into account experiences from within Panama as well as from WeRobotics' global experience with Flying Labs. This model will be continually updated and improved based on learning throughout project execution.

2.12 The expected outcomes include: (i) 15 organizations trained; (ii) two innovative solutions developed that have social and/or environmental benefits; and (iii) one Flying Lab business model developed.

2.13 **Component II: Implementing Social Innovation Projects using Robotics Technology. (MIF US$229,300; Counterpart US$275,100).** The objective of this component is to select, design, implement, and measure the results of a group of projects to address social and environmental challenges identified with local organizations through at least two calls for proposals to be widely disseminated with the academic, civil society and private sectors. While the methodology and criteria for the selection and prioritization of these projects will be determined during the initial Lab set up, and refined based on learning from the two initial pilot projects, preliminary scoping work has demonstrated demand for potential projects related to disaster risk response and management, environmental monitoring,

access to health services in indigenous communities, and agriculture. The design of each project will include objectives, technical specifications, work plans, community engagement needs, expected results, among other details. Evaluation and impact measures will be customized based on the type of projects being implemented. In addition to the projects to be selected through the calls, the Lab is expected to implement smaller projects on an ongoing basis. The development of the selection methodology will also be coordinated with the IDB/CTI innovation program for social inclusion and productivity (PN-L1117) being executed by SENACYT, which includes a social innovation subcomponent that will organize competitions to identify problems with excluded communities and to select tech-driven solutions to address these problems (see paragraph 3.1).

2.14 The expected outcomes include: (i) at least 30 proposals received; and (ii) six innovative solutions developed that have social and/or environmental benefits.

2.15 **Component III: Ecosystem and Regional Network Building. (MIF US$105,000; Counterpart US$150,500).** The objective of this component is to consolidate the Flying Lab as a regional magnet for robotics solutions by raising awareness about robotics for social good in Panama and surrounding countries[14], providing ongoing training for local and regional organizations, building partnerships and professional communities of practice, and advocating for a flexible public policy environment which permits robotics projects to thrive and be sustained. This will also include a focus on education by organizing internships for UTP students to gain practical experience in the implementation of robotics solutions together with Lab "clients" (i.e. NGOs, companies, public agencies, etc.) as part of ongoing Lab project activities. The first year of project implementation will focus more on building the ecosystem and convening different stakeholders within Panama through meetings, webinars, and an event to be organized in year one to showcase Lab activities and stimulate the budding robotics sector. As activities are consolidated in Panama, the Lab will expand to more of a regional focus in years two and three, engaging in exchanges, training, and other knowledge sharing activities with different actors. A second convening event with a regional focus will be organized in year three.

2.16 Given the pioneering nature of these projects and the need to build the evidence base around applications of robotics technologies, emphasis will be placed on measuring, systematizing, and communicating results of the projects being implemented by the Lab both within local and regional ecosystems, as well as with the global network, in order to generate additional demand for Lab services and stimulate more activity in this innovative space. To this end, a learning and communication strategy, focused on routine webinar presentations, development of high-quality video and photographic materials, social media and regular blog writing as well as cultivation of media coverage, will be developed together with WeRobotics, which will also play a key role in disseminating the Panama experience with the broader Flying Lab global network.

2.17 The expected outcomes include: (i) at least 50 institutions have access to knowledge transfer outputs and/or activities; (ii) at least 15 instances of collaboration with key actors in the innovation ecosystem at the national and/or

[14] Initial regional focus will be on Central America and the Dominican Republic.

reginal level; and (iii) at least 100 students build capacity through Lab activities (internships, training, ongoing project implementation, etc.).

2.18 **Component IV: Catalyzing Entrepreneurship around Robotics-as-a-Service. (MIF US$48,000; Counterpart US$83,000).** The objective of this component is to catalyze entrepreneurship opportunities within the local ecosystem, link the innovations being developed at the Lab with local industries and strategic partners through sector "challenges" and other targeted activities, and stimulate new businesses capable of providing robotics services throughout the social good sectors, private markets and public agencies. To this end, business plan competitions will be organized and selected teams will receive entrepreneurial and business skills training in collaboration with the UTP Emprende incubator. WeRobotics will lead a business development workshop as part of this training process. Depending on the level of maturity of the different entrepreneurial ventures, the Lab will facilitate links to additional support services as needed, such as those provides by the City of Knowledge Innovation Center, as well as to potential sources of seed financing[15]. A network of private sector mentors will be developed to provide strategic coaching and advice to entrepreneurs, in collaboration with the Chamber of IT Companies (CAPATEC).

2.19 The expected outcomes include: (i) at least a 50% increase in the number of applications received by the second business plan competition; (ii) at least 30 entrepreneurs receive business skills training; and (iii) 15 mentors recruited for the private sector mentor network.

B. Project Results, Measurement, Monitoring and Evaluation

2.20 The expected outcomes by project-end are: (i) 15 organizations adopt new practices or technologies (CRF 230100); (ii) 10 enterprises developed around robotics-as-a-service (CRF 230300); (iii) at least five links made between entrepreneurs and/or solutions being developed by the Lab and strategic partners (CRF 230200); (iv) the Flying Lab has reached partial operational and financial sustainability; and (v) 90% increase in the number of requests for support received by the Lab (vs. year 1). At the final outcome level: at least 30 jobs created around robotics-as-a-service (CRF 330301).

2.21 For project monitoring and evaluation, the Flying Lab will use the existing information system developed by WeRobotics for the global network, which tracks a series of indicators (number of drone flights, amount of data collected, organizations trained, projects implemented, etc.) allowing for comparisons across regions. The design of each social innovation project will include a customized evaluation and impact measurement plan. The project will include a midterm evaluation to assess its operation and areas for improvement, including an assessment of the initial business model developed.

[15] As part of its business innovation efforts, the IDB/CTI loan (PN-L1117) executed by SENACYT will provide up to $25k in seed financing for tech-driven entrepreneurs, such as those supported by the Flying Lab.

III. Alignment with IDB Group, Scalability, and Risks

A. Alignment with IDB Group

3.1. One of the key reasons Panama was selected for this MIF project was due to direct and timely alignment with a new $30 million IDB/CTI loan (PN-L1117) with the National Department of Science, Technology, and Innovation (SENACYT), which aims to improve Panama's social inclusion and productivity by promoting investment in innovation and research. Specifically, the project is being developed in close connection with two components of the loan. First, the innovation for social inclusion component, which includes organizing competitions with excluded groups to identify problems (related to education, health, access to services, etc.), followed by annual competitions to identify and finance tech-driven solutions (up to $50,000), which may include robotics solutions offered by the Flying Lab. And second, the business innovation component, which seeks to support innovative tech-driven entrepreneurs with seed capital (up to $25,000), providing a potential path to financing for the robotics-as-a-service entrepreneurs to be supported by the Lab.

3.2. Furthermore, potential opportunities to connect IDB programs in Panama related to the health, environment, and tourism sectors to the Flying Lab have already been identified. For example, a loan currently in preparation for approval in 2017, "Support for the Rehabilitation of Panama's Cultural and Natural Heritage" (PN-L1146) will include activities related to developing environmental monitoring strategies for protected areas using innovative technologies, which could be supported by the Flying Lab. In addition, there is an opportunity to complement activities underway in the "Integrated Health Service Networks Strengthening Program" (PN-L1115) by using drones to map indigenous communities to get more accurate population counts, helping to enhance service delivery planning.

3.3. The project is also aligned with the Panama country strategy 2015-2019, specifically the strategic objective to strengthen the population's educational profile, establishing the need for an innovation system that promotes social inclusion and productivity, as well as objectives for enhancing competitiveness.

B. Scalability

3.4. While the initial project scope focuses on Panama, the goal of the Flying Lab is to serve as a regional magnet for robotics research, robotics companies, and social good applications. Solutions developed and implemented in communities in Panama could be applicable to other settings in LAC and will be disseminated accordingly. This project will essentially be creating a new market around robotics for social innovation by building local capacity, catalyzing the ecosystem, and demonstrating the power of these technologies through use cases, thereby generating future market demand for these skills and services in the social sector and beyond. Likewise, an important factor for Lab sustainability and scale will be the creation of a new legal entity (*Asociación de Interés Privado* - AIP) by the UTP, which essentially allows public institutions to more easily engage with the public and private sectors both locally and internationally. The idea is to house the Lab in

this AIP, which is currently in the process of being created, once the MIF project concludes, thereby facilitating implementation of the Flying Lab business model.

3.5. There is also significant potential for scaling the use of these technologies at the IDB Group institutional level. For example, all IDBG programs entail some level of monitoring and data collection that could potentially be enhanced or made more efficient through the use of drone technology. The IDBG and its network of partners could become among the "clients" of the Flying Lab, helping to sustain operations and scale its reach. To this end, the project will engage with IDBG officers to identify opportunities for collaboration in IDBG programs, starting in Panama.

C. Project and Institutional Risks

3.6. Since the use of robotics technologies for social innovation is very new, and drones are viewed by many as tech "toys", there is a risk that there may not be a critical mass of organizations or entrepreneurs with the interest and/or technical capacity to pursue activities or business opportunities in this space. This risk will be mitigated through the training and ecosystem building activities to be carried out to raise awareness about the potential practical applications of these technologies. Another risk is related to timing. If the Flying Lab does not quickly demonstrate the potential application of these technologies in real-life scenarios to galvanize demand, the project may lose momentum. This risk will be mitigated by carrying out and widely disseminating the results of the initial pilot projects as part of the foundational capacity building activities, as well as through targeted efforts to systematize and disseminate the results of all social innovation projects to be implemented throughout the project. The lack of local technical workforce capacity in robotics technologies and data analytics to be able to provide services for a burgeoning robotics sector is another project risk. Housing the Lab at the UTP and connecting mechanical engineering and other students to Lab activities to gain hands-on experience will help to build the pipeline of skilled workers in this area.

IV. Instrument and Budget Proposal

4.1. The instrument to be used is non-reimbursable technical cooperation funding. The project has a total cost of US$1,431,200, of which US$715,300 (50%) will be provided by the MIF, and US$715,900 (50%) by the counterpart.

	MIF	Counterpart	Total
Project Components			
Component I: Flying Lab Capacity Building	$90,000	$178,500	$268,500
Component II: Implementing Social Innovation Projects using Robotics Technology	$229,300	$275,100	$504,400
Component III: Ecosystem and Regional Network Building	$105,000	$150,500	$255,500
Component IV: Catalyzing Entrepreneurship around Robotics-as-a-Service	$48,000	$83,000	$131,000
Project Administration (Executing Unit costs)	$195,000	$28,800	$223,800
Mid Term Evaluation	15,000	0	15,000
Ex Post Reviews/Audits	15,000	0	15,000
Contingencies	18,000	0	18,000

Grand Total	**715,300**	**715,900**	**1,431,200**
% of Financing	**50%**	**50%**	

V. Executing Agency (EA) and Implementation Structure

A. Executing Agency(s) Description

5.1. The **Fundación Tecnológica de Panamá (FTP)** will be the Executing Agency of this project and will sign the agreement with the Bank. FTP is a well-recognized private, nonprofit entity created in 1995 by the UTP to strengthen links between the university and the private sector. The Foundation is fully autonomous and has a strong track record in project and fiduciary management through the administration of consulting and research projects developed by the UTP with the academic, public, and/or private sectors. Its administrative expertise and strong connections with both the university and the private sector, make it well-placed to execute a MIF project.

5.2. Created in 1981, the **UTP** is the top public science and technology university in Panama and the national leader in engineering research. Its Mechanical Engineering Department has a robotics research laboratory and workshop for experimenting with mechatronic systems design, control and simulation, and will soon be home to a FabLab (a digital fabrication laboratory) with 3D printers, laser cutters, routers and other equipment. The UTP Emprende incubator will also play a key role in providing business training and support to entrepreneurs in collaboration with private sector actors. UTP Emprende has incubated 24 companies since 2010, and has experience with soft-landing projects, spin offs, technology transfer, promotion of intellectual property, and patentable technological innovation. UTP Emprende is one of the top generators of international patents in LAC.

5.3. **WeRobotics** is a US-based non-profit created in 2016 by merging two “robotics for good” initiatives, DroneAdventures and UAViators, that had carried out dozens of aerial robotics missions and trainings in many countries. The founding team consists of one MBA and three PhDs, bringing together decades of professional experience, expertise and contacts across the humanitarian, development, environmental, robotics, and business sectors. WeRobotics is the only organization working to accelerate the impact of social good globally through the sustainable transfer of robotics solutions through a dedicated network of Flying Labs. In June 2017, WeRobotics organized its first global convening with key actors (Labs, technology companies, NGOs, universities, and funders), further solidifying its leadership role in this space. With support from the Rockefeller Foundation, WeRobotics has established Flying Labs in Nepal, Tanzania, and Peru, adapting its model to each of these different contexts. In Panama, WeRobotics’ role will be to provide strategic advice for setting up the Lab model, transfer skills and technology through training, provide hands-on support in the selection, design and implementation of social innovation projects, and support regional and global Flying Lab network building, communication and knowledge sharing activities. WeRobotics also brings to bear its strong network of leading technology partners (DJI, Parrot, SenseFly, Flyability, Planet, ESRI, Pix4D and others) and will work to connect these companies with Lab activities.

B. Implementation Structure and Mechanism

5.4. Fundación Tecnológica de Panamá (FTP) will establish an executing unit and the necessary structure to execute project activities and manage project resources effectively and efficiently. The FTP will also be responsible for providing progress reports on project implementation. Details on the structure of the execution unit and reporting requirements are in Annex V in the project technical files.

5.5. **Governance model**. The Lab will be housed at the UTP and given their technical expertise, the UTP will provide the Lab Director who will manage Lab activities together with the MIF Project Coordinator to be hired by FTP as part of this project. The Lab Director will have a more technical role in the development of robotics solutions and the Project Coordinator will be focused on project management, building partnerships, connecting local and regional ecosystem actors, identifying and communicating around social innovation projects, and catalyzing entrepreneurship. WeRobotics will be directly contracted by FTP to provide training and strategic advisory services in order to create the Lab and build local capacity. As part of project governance, a Steering Committee will be created including UTP, WeRobotics, the IDB/MIF and key public and private ecosystem actors. The Committee will help to facilitate ecosystem building efforts and will meet periodically to review project progress and provide feedback.

VI. Compliance with Milestones and Special Fiduciary Arrangements

6.1. **Disbursement by Results, Fiduciary Arrangements.** The Executing Agency will adhere to the standard MIF disbursement by results, Bank procurement policy[16] and financial management[17] arrangements as specified in Annex V and VI.

[16] Link to the Policy: Procurement of Works and Goods Policy

[17] Link to the document Operational Guidelines for Management of Milestones and Financial Supervision for MIF and SEP Technical Cooperation Projects