



The Ripples of Social Change

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ACKNOWLEDGEMENT

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INTRODUCTION

Social Good projects are typically designed and implemented to generate change around a specific problem or set of problems, often within shorter time scales. Their impact tends to be more immediate, and thus relatively straightforward to measure. However, the longer-term impact of many systems change efforts is necessarily more socially diffuse over space and time, which makes measuring this impact far more challenging. And yet, understanding this longer-term impact—what we call the ripples of social change—is just as important as assessing the impact of social good efforts over much shorter time horizons. WeRobotics and Flying Labs therefore embarked on a proof of concept project as a learning opportunity to dive deeper into these ideas. For example, how might one begin to detect evidence of possible ripple effects?

WeRobotics and the eight Flying Labs that participated in this project were especially keen to discover, follow and measure the more diffuse ripple effects that might be generated by their activities, especially those ripple effects that travel beyond the immediate ecosystems within which they were generated. These ripples are necessarily expected to be far more fluid and less tangible than the short and medium-term impact of Flying Labs activities. This more fluid impact may include factors such as boosting confidence and self-esteem amongst local experts beyond the immediate social network of Flying Labs. As such, these ripples of social change may serve as important, early indicators of possible systems change.

Flying Labs are independent and locally-led knowledge hubs in Africa, Asia, Latin America and beyond. Flying Labs are led by local experts and hosted by local organizations. Together they accelerate the collective pursuit of the Sustainable Development Goals by combining their local knowledge and lived experience with the expertise of their local partners and appropriate technologies. Flying Labs and partners work across multiple sectors, including humanitarian action, sustainable development, public health, nature conservation, climate change, agriculture, youth and education. The first Flying Labs to join the network was Nepal Flying Labs in 2015. Today, the demand-driven Flying Labs Network comprises 30+ Flying Labs, with multiple new labs joining every quarter.

The role of WeRobotics, within the Flying Labs Network, is to serve as an enabler and facilitator by accelerating demand-driven knowledge-sharing, technology transfer and opportunity-transfer with, between and to Flying Labs. WeRobotics also works with Flying Labs to shift mindsets around local expertise by creating more visibility and respect for the value-add of local expertise and leadership. In sum, we seek to shift power with proximate leaders and local organizations.

Against this backdrop, we partnered with Save the Children Sweden on a newly-funded project to detect and measure the indirect and second-order (even third-order) impact of social good efforts well beyond the initial and intended impact. Hence the references to social ripples.

Defining what we mean by “Social Ripples”, and what constitutes any given ripple, is essential albeit not straightforward. To make matters more interesting, there are no universally agreed definitions on the meaning of a social ripple. What’s more, the perception of what a ripple might mean often varies depending on the context it is being used in. For this project, we define Social Ripples as “diffuse and longer-term systems change outcomes (or byproducts) of specific and time-bound social good projects.” What makes social ripples interesting to us

in particular is that they propagate well beyond the specific social good projects and ecosystems that originally generated them. That is, social ripples represent evidence of crossover effects between one ecosystem and another. Byproducts, by definition, are the result of interactions. As such, interaction is key, which is why we believe that these crossover effects are necessary to effect systems change.

A complementary way to think about social ripples is by drawing on the language of economics, namely the notion of externalities. Social ripples could be understood as positive externalities; free, positive byproducts.

We surmise it takes time for social ripples to propagate across systems, and even more time for said ripples to be sufficient in number so as to become detectable. So it may be useful to think of this project as an “early warning” challenge. That is, to consider insights and lessons learned from the field of early warning, e.g., conflict and disaster early warning systems. In our case, however, possible early signs of social ripples are of interest to us not to prevent these early signs (or ingredients) from manifesting social ripples, but rather to detect these early signs as possible evidence of impending or current social ripples. This leads to the following questions: What specific events might trigger certain types of social ripples? Can one’s “way of being” or a mindset serve as a meaningful trigger? Might trigger-events be more “detectable” than the ripples themselves? How might an individual or organization serve as an effective amplifier to amplify these trigger-events and the social ripples themselves?

This brings up the question of intentionality in the context of social ripples. Can social good projects intentionally and unintentionally create social ripples? We expect that the number of social ripples that are the result of intentionality far outweigh those ripples that are the result of chance or accident. If intentionality is indeed essential, then we would argue that such intentionality must go well beyond the immediate change that is intended by individual social good projects. To be sure, this intentionality also must include the intention to change ecosystems and environments, especially neighboring ecosystems and environments. In other words, for social good projects to create social ripples also requires intentionally-enabling environments or systems that enable these ripples to propagate through and beyond adjacent environments and systems. As a corollary, an intentionally-enabling environment or system is one that enables the majority of social good projects to create social ripples, perhaps regardless of whether or not those social good projects were intended to do so.

The above ideas, questions and definitions were all jointly developed through a series of highly participatory co-creation sessions with WeRobotics and Flying Labs. These sessions also identified a number of effects that may serve as early evidence of possible ripples: awareness, acceptance, trust, confidence-building, and sustainability, for example. We dive into these findings further below.

PROJECT OBJECTIVES

The purpose of the Social Ripples Project was to co-create and apply an impact evaluation framework that detects and measures the indirect, secondary and tertiary ripple effects—or impact—of Flying Labs vis-à-vis their values and narratives and how these are experienced beyond the Flying Labs Network itself. New narratives and societal values, for example, become truly influential when they propagate across multiple ecosystems. Once they do, they can drive societal transitions and lead to systems change. Beyond this primary goal, we also wanted to offer a way for other organizations to measure their own social ripples.

Research Questions

Do Flying Labs influence narratives, society values and societal norms within their countries and regions? Might these influences ultimately lead to societal transitions? If so, how might we measure this? How about WeRobotics?

Research Hypothesis

Flying Labs' activities within their communities may have resulted in diffuse social ripples that have possibly traveled beyond their local communities. That being said, social ripples take time (years and decades) to propagate, i.e., longer than many Flying Labs have been in existence for. Furthermore, finding evidence of such ripples and being able to attribute their existence to Flying Labs activities is not straightforward given the diffuse nature of social ripples.

Methodology/Approach

The rest of the paper is structured as follows. First, a summary of the process of selecting participating Flying Labs, describing the selection criteria and balance in regional representation. The next paragraph discusses the approach of the co-creation sessions alongside the methodology for the stakeholder engagement. Next, we present the outcome of the identified ripples in Figure 1 and the naturally occurring ripples identified by stakeholders during the engagement in Figure 2. Finally, a section is dedicated to analysing the findings of the stakeholder engagement, coding it according to the social ripples.

Flying Labs Recruitment

To convene an expert focus group with relevant experience for the Social Ripples Project, WeRobotics launched an open call to Flying Labs interested in participating in this applied research project. This demand-driven approach is central to our work with Flying Labs. We received a total of 17 applications from Flying Labs. And after a rigorous selection process based on the following criteria; overall Flying Labs Global Impact Score, quality of application, contribution to methodology and active years in the network, WeRobotics selected 8 Flying Labs from Latin America, Africa, and the Asia Pacific. WeRobotics, Save the Children Sweden and selected Flying Labs held three co-creations sessions. WeRobotics offered Flying Labs an initial draft definition of social ripples during the first co-creation session. Based on this understanding, Flying Labs collaboratively brainstormed how social ripples might occur. They discussed the value of social ripples, how they might be tracked, what kinds of qualities these ripples might generate, and which stakeholders might most benefit from these social ripples.

Co-Creation Sessions & Application of Ripple Detector

Over the course of four months, WeRobotics and the selected Flying Labs members from Senegal, Nepal, Tanzania, Zambia, Papua New Guinea, Haiti, Panama, and South Africa worked collaboratively through several co-creation sessions. The goals of these sessions were to create the baseline for discussion, exchange insights and collaboratively design a model for mapping qualifying ripples.

Step 1: Identifying Potential Social Ripples

By the end of the first co-creation workshop, Flying Labs and WeRobotics identified social ripples that could have possibly occurred due to Flying Labs' activities within their communities.

| | |
|---------------------------------------|-------------------------------------|
| Acceptance/Adoption | Education |
| Aspiration | Innovation/Investment in innovation |
| Autonomy | Participation |
| Awareness | Partnership |
| Behavior/Mindset Change | Replication |
| Confidence Building | Sustainability |
| Credibility | Traction |
| Dialogue | Trust |
| Economic opportunity/Entrepreneurship | Understanding |

Figure 1: Social Ripples identified during co-creation session:

Figure 2 shows other ripples Flying Labs stakeholders identified during the semi-structured interviews as possible ripples their own partners might have experienced as a result of interacting with them. It is important to note that it is harder to measure ripples with third party partners/stakeholders because Flying Labs do not directly interact with these group of partners.

| | |
|---------------------------------------|--------------------|
| Inclusivity | Unity |
| Collaboration | Empathy |
| Networking | Accountability |
| Knowledge-sharing | Positive Ecosystem |
| Behavior/Mindset Change | Replication |
| Confidence Building | Sustainability |
| Credibility | Traction |
| Dialogue | Trust |
| Economic opportunity/Entrepreneurship | Understanding |

Figure 2: Other Social Ripples Identified by Flying Labs Stakeholders During Engagement

Step 2: Ripple Detector & Stakeholder Engagement Strategy

As noted earlier, Flying Labs were given free hand to collaboratively work with stakeholders to identify other social ripples. It is important to note that one of the core elements of the ripples detector model is that stakeholders were asked how their own partners were affected as a result of their interactions. These second and third-order social ripples are necessarily harder to detect as they occur outside of the Flying Labs immediate ecosystem, by definition. But identifying echoes of this propagation across ecosystems is precisely what we're looking for as these social ripples may potentially be early evidence of systems change.

Based on feedback generated throughout the project, however, it is clear that this non-standard approach was far from intuitive for all involved. Flying Labs (and WeRobotics) were not just asking their own partners to comment on the impact that they had on them. Why? Because doing so might potentially limit the research and results to first-order, immediate impacts only, whereas the kinds of social ripples that may be particularly relevant (and much harder to detect!) for systems change are those that travel well beyond their original ecosystems. As such, Flying Labs and WeRobotics faced the additional challenge of asking their partners to consider (and speculate) whether their interactions with Flying Labs and/or WeRobotics might have in turn impacted their own partners in ways relevant to systems change.

Like the mind-bending movie Inception featuring Leonardo DiCaprio, this kind of recursive thinking is not intuitive. That said, some Flying Labs did venture beyond first-order impacts by using the Ripple Detector to investigate second and third level ripples that may have occurred among partners of organizations that interacted with Flying Labs on joint projects.

Together with the eight Flying Labs, we developed an engagement strategy to support Flying Labs to engage with a broad and diverse range of stakeholders. First, we established the social ripple effect phenomena through the co-creation sessions and then performed open and axial coding analyses on data collected using semi-structured open-ended discussions. The Semi-structured interview relied on several questions developed by each Flying Labs to act as a guide for the stakeholders involved.



This style of data collection allowed and encouraged Flying Labs to ask follow-up questions to identify social ripples. The number of interview questions varied depending on the stakeholder and nature of engagement. However, a total of fifty eight (58) semi-structured interviews were conducted by participating Flying Labs, from first and second stakeholder engagements. Each stakeholder engagement lasted between 20-25 minutes and took place either over the phone due to covid restrictions for some organizations or face to face. Although stakeholders received the questions well ahead to enable them to reflect on the questions and provide answers, Flying Labs also provided Stakeholders with adequate information about social ripples and the intended purpose of the research. For convenience, Flying Labs could either apply the

surveys in their local language or English and then a professional translator was hired by Flying Labs to interpret

the answers into English. Beyond Flying Labs’ engagement, WeRobotics also reached out to one of its partners to gain insights on social ripples that might have occurred due to their engagement with WeRobotics; the results from this are analyzed in the findings section.

First Order Ripple Detector Questions

As it was an open-ended semi-structured interview, participants were allowed to expand on their experience using a narrative storytelling approach; the discussion was then transcribed and subsequently coded. To collect information on first order impacts, which may or may not be evidence of social ripples, the questions in Figure 3 were asked first. These were followed by more central questions on how their own partners might have been impacted as a result of what the immediate stakeholder gained by interacting with the Flying Labs. This second version of the ripple detector (Figure 4) sought to reveal the second and third order impacts.

| Question | Answer |
|---|---|
| Did your engagement with our Flying Labs make you more / add to / increase (Insert ripples here)? | Answer = Yes or No |
| > If yes: how did it make you more / add to / increase Insert Ripple(s) here? | Answer = Narrative (interview style feedback) |
| > If yes: Were there specific elements to our engagement that made this happen? | Answer = Narrative (interview style feedback) |
| > If no: in your view, why do you think this did not happen? | Answer = Narrative (interview style feedback) |
| > In any case (yes or no): did your engagement with our FL increase, add and/or influence any other elements that were of value to you? | Answer = Narrative (interview style feedback) |
| And did your partners become more / gain / increase insert ripple (s) here as a result of engaging with you? | Answer = Yes or No |
| > If yes: can you tell me more about how this happened? | Answer = Narrative (interview style feedback) |

Figure 3: First Order of Ripple Detector questionnaire developed in co-creation sessions.

| Question | Answer |
|---|--------------------------------------|
| Did your partners get impacted as a result of engaging with you? (Please specify the impact or values created) | Answer = Yes or No |
| Can you tell me more about how and in what way your partners got impacted? (Please give specific examples for each impact mentioned in the previous question) | Narrative (interview style feedback) |

Figure 4: Second Version Ripples Detector Questions for Flying Labs Partners.



The stakeholders engaged by Flying Labs included the following groups:

- Student
- Youth
- Community member
- Community leader
- Higher Learning Institution
- Marginalized Group
- Government Stakeholder
- Non-governmental organizations

The methodology used for this exercise is as follows:

1. The first version of ripple detector questions developed by Flying Labs and WeRobotics
2. Development of survey questions by individual Flying Labs according to their activities
3. Vetting of questions by WeRobotics, providing feedback where and when necessary
4. Validation and review of first stakeholder engagement findings to identify evidence of possible social ripples.
5. Debrief call with all 8 Flying Labs for additional discussion, feedback and reapplication of adjusted survey questions based on the first review
6. Submission of second stakeholder engagement
7. Consolidation and analysis of findings by WeRobotics

At different stages throughout the project, WeRobotics also assisted Flying Labs by offering multiple one-on-one consultations with Flying Labs to answer their questions and/or provide tailored guidelines for stakeholder engagement. Flying Labs also worked with each other to provide additional assistance.

Note that WeRobotics also applied the Ripple Detector by engaging one of its long-time partners on medical drone delivery. The results of this application proved useful to multiple Flying Labs given that looking for evidence of social ripples is in many ways counterintuitive and certainly not common practice. This fact was made evident to WeRobotics when applying the detector with its own selected long-term partner. Said partner kept identifying the impact that WeRobotics had on them rather than the indirect impact that WeRobotics may have had on their own partners. This may also explain why many of the stakeholders that Flying Labs engaged on this project tended to default to the immediate impact that Flying Labs have had on their own organizations through the joint projects they've had. We found it insightful that this approach was anything but intuitive for all involved.

ANALYSIS OF STAKEHOLDER ENGAGEMENT

Having outlined the processes and approach undertaken to identify ripples and the steps taken by the eight Flying Labs to apply the model within their countries with past stakeholders, it is helpful to review the outcome of their engagements. The coding transcript is divided into eight social ripples identified during the semi-structured interviews. A chart (Figure 3) has also been used to present the findings. The analysis will be carried out in reference to the data gathered from the semi-structured interviews.



In the following section of this report, we expand on the findings from six different social ripples identified during the Ripples Project and discuss how these ripples contribute to systems change. The analysis of these ripples are in two parts. Guided by the first and second version detector models presented in Figure 3 and 4, we analyze the findings submitted by Flying Labs to discover possible ripples that occurred with Flying Labs stakeholders, and then we dive further into discussing how their interactions with Flying Labs have impacted their own stakeholders. All findings are coded using the following social ripples: Credibility, Awareness, Mindset/Behavior Change, Sustainability, Diversity & Inclusion, and Partnerships.

Credibility

While credibility broadly applies to everyone in a professional setting, it becomes even more critical for Flying Labs given their use of emerging technologies like drones and robotics to solve social problems in the Global South. Previously, drones were primarily viewed as tools for military surveillance and were not-so-popular in the social good space. However, this discourse is changing as drones are increasingly being used in medical delivery, smart farming, disaster management, and more. As their popularity grows in the social good space, several questions remain unanswered; “can we trust it?” Do they offer lasting solutions?” Unconsciously, Flying Labs are answering these questions through their work and activities.

It was no surprise that Flying Labs’ stakeholders frequently responded that “their interactions with Flying Labs increased their credibility and made their own partners to view drones as in fact trustworthy tools that can be used in solving social challenges.” This first-order impact is possible because Flying Labs members are guided by work ethics that respects fundamental human rights and are committed to building an effective and sustainable future that challenges the status quo.

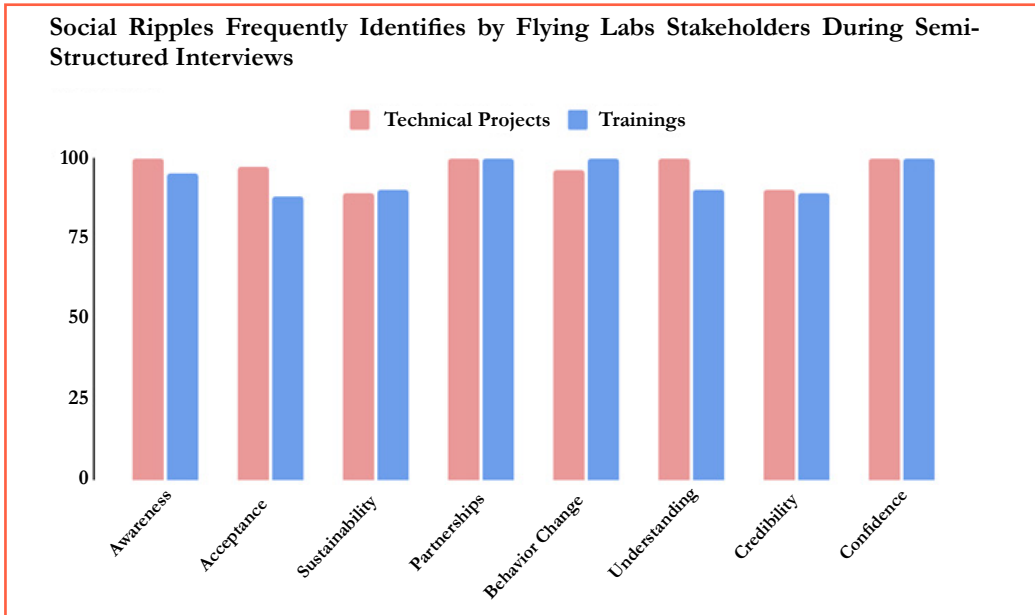


Figure 5: The most frequently identified social ripples by stakeholders

One of Nepal Flying Labs’ stakeholders affirms that their government stakeholders saw them as a more credible organization due to interacting with the team of Nepal Flying Labs. They shared this: “Besides business opportunities, Nepal Flying Labs’ engagement with us helped create a positive ecosystem around drones in Nepal. Every company related to the drone sector, like us, benefited from this. As we are a GIS-based service, providing the company with proper drone regulations created a positive atmosphere around drone usage in the country.” They also note that “Government officials responsible for Drone permissions in the country led to discussions towards opportunities for software companies to work in the digitization-related consulting works. They contacted us to review the presentation from their client for the drone registration software. For this partner, their government stakeholders viewed them as a credible organization and an authority in providing advisory solutions for drone-related regulations.

Tanzania Flying Labs partner also notes that:

“In general, whenever we have a success on a certain effort toward ending malaria in Zanzibar, our supportive partners also use it as evidence to show their success while working with us, so on one hand I can say yes they have increased their credibility because of working with us, especially on this new innovation which added value in fighting malaria, but I can’t fully measure it or rank this innovation on what extent has it increased their credibility to their funders/partners.”

Awareness

As seen in the above chart, Flying Labs partners frequently selected awareness as a first-order social ripple that occurred during the course of their engagement. Awareness may influence systemic change because it enables broader stakeholders from public institutions and private organizations to realize that new ideas and solutions possibly exist that can tackle social problems. We find it particularly important not to confound solutions with technologies. Solutions can relate to new methodologies and innovative processes. To put it briefly, it is difficult to transform a system or effect change unless people are aware of the more profound solution. In some cases, the root issue of systemic change may be a lack of awareness. This is more important from a localization context because most Flying Labs activities often involve community members. In doing so, they raise awareness about existing challenges and proffer solutions tailored to the needs of the local communities.



For example, for Nepal Flying Labs, a participant in the Unmanned Aerial System (UAS) Coordination in Humanitarian Action Project, says, “when the government found out about my organization and heard the things we were doing, they were quite amazed. They had not heard about such an organization before and the work it does. They were so glad to know that such great works happen all over the world and in Nepal too. They were also happy to see the work and how it will impact much in the country too by uplifting the socio-technical sector.” This serves as evidence of first-order impact.

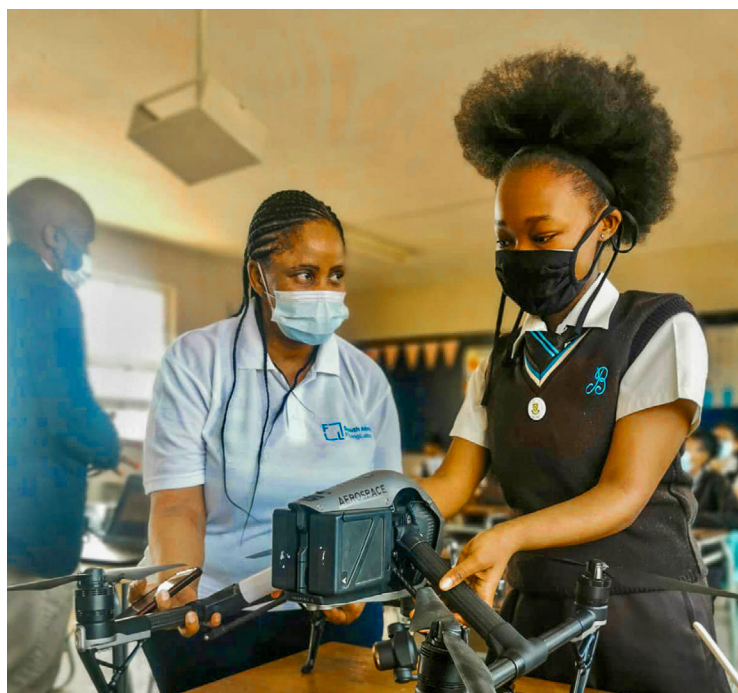
In contrast, WeRobotics applied the ripples detector to a long-time project partner, Pfizer, to gain insights into possible second and third-order social ripples that might have occurred with Pfizer’s partners as a result of Pfizer working with WeRobotics. Pfizer shared, “Quite possibly, there’s a good chance that some of our partners now see Pfizer as a more innovative organization, and that this has driven more sales reps to knock on our doors. There’s also a good chance that by demonstrating our innovativeness (thanks to our collaboration with WeRobotics), this may have motivated other companies to become more innovative. I don’t have any specific evidence of this, but I would expect this to be the case.”



Tanzania Flying Labs' partner Zanzibar Malaria Elimination Programs has worked with the Flying Labs team on a malaria prevention program. Like WeRobotics and Pfizer, this Flying Labs partner notes the changes that have occurred with their own partners as a result of their interaction with Tanzania Flying Labs "Community and other partners see how we use drones in identifying water bodies. For example, our project partner defined some areas from different locations which are smaller, to begin with the trial phase. When we presented the results to the Ministry of Health, explaining how drones can be effective in eliminating malaria, they became more aware of what to expect. They appreciated what we have done, and we have discussed the need to expand the use of drones to more areas to reach our objective of making Zanzibar malaria-free. So in general, when ever we discuss with our different partners issues regarding drone, it is no longer a new phenomenon."

Mindset/Behavior Change

In the context of mindset change, one of the ripples frequently identified by Flying Labs stakeholders indicates that as a result of either working with Flying Labs on a project or attending Flying Labs training sessions, people realized that drones and robotics are valuable tools for solving social problems, particularly from a local context point of view.



This was the case for individuals who attended the Drone Coordination in Humanitarian Action workshop organized by Nepal Flying Labs. The workshop had participants from the public and private sector learning how to rapidly deploy drones in humanitarian situations. They integrated the knowledge gained from this workshop into their work and as a result their partners were equally impacted. One of the participants notes that the second-order ripple that occurred as a result of their interaction with Flying Labs as: "we have been involved with drone-related stakeholders in the country in one common table which further helped us organize drone regulation workshops and consultations with different stakeholders on the UAS model regulations that were incorporated in Nepal." In addition, the same partner also notes

another second order social ripple that occurred with their government stakeholder due to their interaction with Nepal Flying Labs, "government health offices, and municipalities) saw the positive use of technology that would enhance local ownership, sustainability, local partnership and multi-sectoral collaborations."

Sustainability

Global challenges we face today are complex and interconnected and require the adoption of new solutions and ideas to solve these problems. Their ability to be sustainable may determine how quickly they are scaled and integrated into broader systems to shift the narrative. It was interesting to see that sustainability was a recurring theme identified by Flying Labs partners during the engagement and, more so, for Flying Labs themselves. Integrating sustainable ideas, particularly the ones that contribute to solving social problems has become an increasingly important strategy for organizations, albeit hard to measure for third-party partners in the context of this project. This implies that the results are limited to the views of the interviewer and possibly does not express the actual experiences/views of their partners.

However, in the context of sustainability, Flying Labs partners observed that their own partners became more aware of the need to continuously innovate and introduce new solutions to their work in order to remain



sustainable and relevant. An example can be seen in this interaction where Tanzania Flying Labs asked: “Can you tell me more about how and in what way this made your partners more sustainable in what they are doing?” the partner responded thus: “I don’t have a direct way to measure this, because I don’t know if they have started drone operations, though in our presentation we have observed their willingness of doing so.”

The findings gathered from the interaction between Nepal Flying Labs and their partner indicates several second-order ripple effects occurred with their own partners who are mainly government stakeholders. It was interesting to see that government officials after being exposed to drone technology are keenly

interested in ensuring the sustainability of the drone ecosystem in Nepal by creating favorable laws and improved drone permission processes to promote the establishment of more social innovation startups in Nepal.

Diversity and Inclusion-Participation

While inclusion as a social ripple was not identified during the co-creation sessions that were facilitated by WeRobotics, Zambia Flying Labs identified this first order ripple during their engagement with students who participated in their Drone Business Challenge. Comments ranged from specifics around Flying Labs’ activity having a good number of female participants to the broader issue of involving differently-abled children in activities. Diversity and inclusion are core values embedded within WeRobotics and Flying Labs activities. As noted by the community members: “We were touched by the story aspects included as part of the training, especially the inclusiveness of females and differently abled children as part of the event”. “This involvement made us realize how important we are, even though we are differently-abled.”



A significant issue requiring systems change within the science, technology, engineering, and mathematics (STEM) fields is the representation and inclusion of women. The Flying Labs network and WeRobotics are committed to encouraging and providing more opportunities for women and girls to engage in STEM education and professions. The discovery of this first order impact indicates that Flying Labs activities are making a difference in STEM gender inclusivity. There is potential that examining more of the Flying Labs’ gender-focused projects and trainings will reveal additional examples of this ripple effect within participating communities.

Partnerships

Another Flying Labs-created impact which repeatedly appeared through the collected data was new partnerships. Partnerships and collaboration exist at the center of the Flying Labs model, so it is not surprising that these values also appear in the ripples that result from various projects conducted by Flying Labs. Collaboration is a key component to enabling systems change as an organization, particularly those which bring together different sectors to achieve a common goal.

In multiple circumstances, Flying Labs partners have credited their work with the Flying Labs to facilitating new partnerships. To share an example of a second order ripple, one of Senegal Flying Labs' partners, an NGO called UrbaSEN, shared that as a result of geographic information systems (GIS) training sessions held by Senegal Flying Labs, they “have signed technical partnership agreements that are part of the efforts made to promote



the development of local authorities in Senegal, from which they do not have GIS offices.” As such, the training sessions not only directly benefited Endeavour Mining, but secondarily enabled systems change through the use of GIS at the government level.

Additionally, the Mangrove Restoration project conducted by Panama Flying Labs with their partner Fundación Naturaleza led to new opportunities and government-level change, also in the form of second order ripples. Fundación Naturaleza shared, “we are ready to sign a new agreement with the Ministry of the Environment. In addition, we have signed agreements with the National Land Authority, the Institute of Agricultural Innovation and a letter of understanding with the Mayor’s Office of Panama. Our alliance with Flying Labs is key in supporting

our project with geographic information capture with drones.” Furthermore, “The state signed agreements in which it commits to restore nearly 50,000 hectares of mangroves by 2030 and to support foundations like ours.”

Feedback from Flying Labs

Overall, the stakeholder engagement approach was a great learning experience for Flying Labs and WeRobotics. It provided us with an opportunity to re-interact, reflect and evaluate the possible social ripples that might have occurred due to their activities. Some Flying Labs shared insights from their experience working on the Ripples Project:

“We are now very aware of our own responsibility (and power) as a ‘Ripple Generator’. This was noted by South Africa Flying Labs. This insight provides a sense of agency around social ripples and systems change. We have the agency and responsibility to “pay it forward” as the saying goes. That is, we can choose to respond to a person’s kindness to ourselves by being kind to someone else. We can choose to help a social ripple propagate outside our own ecosystem. To borrow from Mahatma Gandhi, “Be the ripple that you want to see in the world.”

“We realize now that we are always surrounded by ripples.” This insight was shared by Panama Flying Labs, giving the sense of movement and fluidity between ecosystems. As such, those ecosystems that best propagate social ripples outwards to other systems are those with very porous, fluid boundaries; those with blurred and fuzzy boundaries.

“It was a new experience to have a worldview of our past projects in the initial part of the project and map the knock-on effects of our projects. We were able to brainstorm a few ‘known’ ripples (both primary and secondary ripples) at the time of our co-creation session. As we interacted with our stakeholders, along with these ‘known’ ripples that they acknowledged, we were introduced to some of the ‘unknown’ or ‘unanticipated’ ripples that we hadn’t thought of which was an interesting learning for us. This activity helped us realize our actions and it’s consequences or the ripples it creates in the system we live in which has an influence on other related parts beyond our planning or estimation. The whole experience has shown us that local problems are very complex and one action is not enough to tackle all these complexities. In essence every problem is affected by so many factors that it can’t be solved with a single solution. On the contrary, if one solution does solve the problem, it’s not just one problem that it’s solving but a range of problems because of the causal ecosystem. A system thinking approach towards mapping these casualties of our projects showed us a range of opportunities and impacts that we can aim for in our future projects.” Nepal Flying Labs.

For Zambia Flying Labs, the ripples provided them with lessons that they are already integrating into their own projects. Kelvin notes: “One thing that I learned from this project which I’m already implementing in other projects is flexibility. I’ve come to realize that with some projects, having an open-minded and general approach will help you discover certain elements that look simple but actually are valuable. The open-minded approach also helped our stakeholders to speak freely about the experience and we were able to learn more from them. Through this study, we realized that the ripples phenomenon affects us all. We were able to develop a new concept note for one of our stakeholders who liked the approach of the ripples project and is interested in working with us to establish a STEM center of excellence. Having an idea of what the ripples are, and what the triggers are can help us better plan our projects and attract the right stakeholders.”

Project Limitations

Top-down systems are powerful, dominant, and endemic. They have for centuries propagated a narrative based on colonial ideologies whereby “White is Right” and “West Knows Best”. Breaking through these powerful narratives is essential for systems change. This is no easy task and will take years. Have individual Flying Labs been operational long enough to promote the new narrative and values embodied by The Power of Local? The Covid pandemic, which is now stretching into year 3, has slowed down Flying Labs’ efforts to achieve a broader impact. In terms of causal loops, demonstrating that specific organizations have caused specific ripples that have propagated across multiple systems is extremely difficult to do, requiring more complicated methodologies, more time, and significant resources. As such, we sought instead to demonstrate contribution rather than attribution.

This research project primarily relied on data collected from semi-structured interviews with several stakeholders who have been involved with Flying Labs in the past. In relying on qualitative data as the primary source, differences in skills, knowledge, and experience among Flying Labs’ capacity to conduct the interviews may differ. We believe this should be taken into consideration. Among the stakeholders interviewed, their knowledge, understanding and experience regarding social ripples varies; furthermore, their engagement with Flying Labs in terms of activities may affect the outcome of the collected data. As mentioned earlier, this project was conducted by Flying Labs in

eight countries across three continents that speak English and have their local languages. Therefore, it is essential to consider the language barrier a possible limitation when translating collected data from the local language to English. Most Flying Labs intuitively focused on identifying first-order ripples with their stakeholders rather than expanding on the questions to gain further insights of second-order ripples from third-party stakeholders. The available literature on “social ripples” is also particularly limited, which means this project had little to draw on when developing the concept, further both in terms of theory and practice.

Conclusion

As global challenges become more multifaceted, it is reasonable to demand a shift in mindset, norms, and other social values, some of which are not often considered possible outcomes of individual social good projects. As seen in the above analysis (see Figures 1 and 2), the different types of social ripples identified are not particularly new to us. That being said, thanks to the “Ripple Detector” co-created with Flying Labs, their mode of occurrence, triggers and generators can now be sought out, particularly in social good projects and the extended impacts these projects/activities have on third-party partners.

A recurring theme in carrying out this research was the need for Flying Labs and stakeholders to frequently adapt to new theories and phenomena and relate these ideas to their local context. It further proved that beyond the primary and secondary objectives of the social ripples projects, Flying Labs also benefited directly from the activities of this project through the co-creation sessions and stakeholder engagement.

RECOMMENDATIONS

This project's research objectives were to define social ripples and then co-create an impact evaluation framework with Flying Labs that detects and measures indirect and secondary ripples. We developed several sub-questions and research hypotheses to respond to the primary research objective. The following recommendations that we present below are based on the research objectives, insights from Flying Labs and findings from the stakeholder engagements.

Recommendations 1: For the Flying Labs Network

WeRobotics and eight Flying Labs carried out the pilot study of this project to establish the ripple effects of Flying Labs projects and activities in their communities. We recommend implementing the detector with other Flying Labs in the Network, and definitely over a more extended period of time to ensure that the full detector can be used. In addition, Flying Labs should integrate the findings from this research into their existing projects or activities. Most Flying Labs who participated in this project have already noted that the knowledge gained from this project is shaping their thinking and strategic partnerships. Using a multi-stakeholder approach without limiting the surveys to executives and decision-makers proved to be an effective strategy. It enabled us to collect data from a mixed audience. Therefore, more collaborations within Flying Labs and local stakeholders may ultimately uncover more evidence of social ripples. Flying Labs can also intuitively narrow down to specific areas they are interested in shaping systems change. For example, focusing on social good projects that raise awareness may provide them with better insights on how systems function and can help accelerate change, leverage points, and opportunities for other social ripples to occur.

Recommendation 2: For WeRobotics

In the past five years, WeRobotics has served as the primary enabler of the Flying Labs Network. Leveraging the social ripples and insights identified through this research can strengthen the existing learning culture WeRobotics promotes within its organization and the more extensive Network. As Flying Labs are at the



frontline of understanding social problems within their communities, in the long-term, strengthening their capacities through technical skills, funded projects, and thematic sessions will further equip them with the expertise they seek to broaden their scope of reach. If more Flying Labs adapt and apply the Ripple Detector to their own work, it will be important for WeRobotics to ensure that the detector is used and applied in full. That is, that the detector is used to investigate evidence of second and third order ripples, not just evidence of first order impact. WeRobotics should also expand its use of the Ripple Detector vis-a-vis its own long term partners in order to seek additional evidence of possible ripples.

Recommendation 3: For Donor Organizations/Agencies

For the most part, changing systems depends on the strategic approach donor organizations take regarding what projects are funded, who benefits from said projects and who gets to be a part of the problem-solving process. Undoubtedly, funding more locally-led projects that trigger social ripples geared towards accelerating the Sustainable Development Goals would ultimately have a broader impact on systemic change. However, the risk for international organizations is that without adequate knowledge of systems change and its complexities, they could be funding/supporting projects and activities that do not contribute to (or counter) shifting mindsets or effecting change. Organizations can address this problem by working collaboratively with local efforts like the Flying Labs and similar organizations to develop solutions that challenge the status quo.

A recurring theme in the analysis of the stakeholder engagement data is the importance of organizations continuously learning, adapting, and reflecting on their global efforts in solving social problems. Therefore achieving significant success towards social change and the Sustainable Development Goals in the face of global challenges involves integrating an inclusive approach that leverages the identified ripples to bridge the technological innovation gap between the Global North and the Global South. The private sector plays a pivotal role in accelerating change and facilitating change within a society. By involving the private sector in activities, organizations can unlock more social ripples that positively impact systems change. Organizations can facilitate systemic change by strategically focusing on projects that address economic inequality, STEM-education learning gaps between boys and girls, global health challenges and other underlying socio-cultural challenges.

Literature Review Summaries

Our first step in the Ripples Project was to review the literature on monitoring and evaluation (M&E) and systems change to identify any existing methods or frameworks that we might be able to draw on to measure the ripple effects generated by Flying Labs. Accordingly, we conducted two separate literature reviews on M&E frameworks and approaches to creating systems change. It is important to note that, while there is significant literature available on M&E and systems change generally, limited resources are focusing specifically on technology for social good projects or for measuring secondary and tertiary impacts. As such, the primary purposes of the literature reviews conducted for this project were to provide a general background on common frameworks used within the M&E/Systems Change fields and determine whether any of said frameworks may be manipulated to suit the objectives of the Ripples Project. Both full literature reviews can be found in Appendix A and B.

Monitoring and Evaluation Literature Review Summary

Following an analysis of approximately 50 M&E references, we identified four promising frameworks for in-depth review and selected the STEEP model as a potential option for the Ripples project.

The STEEP Model

The Social, Technological, Economic, Environmental, and Political (STEER) model described by Everard, Reed, & Kenter (2016) is of particular interest for our project. The model offers a promising way to measure the ripple effects of social change. It seeks to measure the ripple effects of different systemic “levers” on societal transitions. Social levers are defined as external mechanisms that influence societal values and thus drive societal norms. In the context of the Ripples Project, we might consider individual Flying Labs as the prospective systemic levers themselves, levers that influence societal values and thus drive societal norms, possibly as far as leading to societal transitions. This goes to the heart of our Ripples Project.

It’s important to note that the STEER model was originally conceived as a way to measure the impact of external societal factors on an organization rather than the other way around. Regardless, this doesn’t change the fact that a model is an effective tool for measuring the impact of indirect factors in many situations. To be sure, we would seek to reverse the directionality of the framework to measure the impact of Flying Labs on external societal factors.

Storytelling & Systems Change Literature Review Summary

Systems Change

Over the last decade, the term “systems change” has become increasingly popular within the social and developmental sectors. A systems change approach looks at problems as an interconnected network rather than individual occurrences. It aims to address underlying systemic issues to create more adaptable and sustainable

systems. A report by Ashoka and other co-creation partners defines systems change as “approaches [which] address root causes rather than symptoms by altering, shifting, and transforming behavioural structures, customs, mindsets, power dynamics, and rules, with the intent of solving societal problems – with lasting effects on a local, national, and global level.”

Storytelling for Systems Change

According to an article by Saltmarshe (2018) in the Stanford Social Innovation Review, “Stories make, prop up, and bring down systems. Stories shape how we understand the world, our place in it, and our ability to change it.” Stories are one of the oldest forms of sharing knowledge, situating ourselves within a chaotic world, and making sense of the phenomenon that is human existence. Furthermore, stories allow us to visualize, understand, and act upon the interconnectedness of complex social systems. Storytelling can occur in many different forms: written text, film, art, song, and more. Regardless of the form, telling stories creates meaning, inspires empathy, and brings people together in a way that typical systemic processes cannot. For these reasons, Saltmarshe (2018) describes storytelling as foundational to changing mindsets, objectives, and values within a system.

Following the completion of both literature reviews, the WeRobotics team decided to report the results from the Ripples Project through a systems change lens. It was determined that the frameworks discovered during the M&E literature review were too technical and did not suit the qualitative/narrative methodology well. Throughout the analysis section of this report, the findings from Flying Labs’ stakeholder engagements will be discussed in terms of their impact on systems level change.

APPENDIX B

Full Literature Reviews

Riding the Ripples of Social Change: Insights from the Literature on Monitoring & Evaluation

“An impact evaluation provides information about the impacts produced by an intervention - positive and negative, intended and unintended, direct and indirect.”¹ A priority of impact evaluations is to establish a causal attribution for the observed changes, i.e., what caused said changes to occur? To this end, what indirect, secondary, and tertiary impacts might Flying Labs be having in their own countries and regions? This question will be answered through a series of co-creation sessions with select Flying Labs. In the meantime, this study seeks to answer the following question: What M&E methods might we be able to draw on and/or combine to measure indirect, secondary and tertiary impacts of social good projects more broadly?

Once we’ve identified what Flying Labs induced changes or ripples to look for, and how to measure those changes, we will partner with a select number of Flying Labs who will apply the measurement framework within their own countries and regions. This will enable us to collectively test the effectiveness of the evaluation framework and to identify initial ripple effects generated by Flying Labs.

OECD Report

The OECD report titled “Outline of Principles of Impact Evaluation” provides a short but informative overview of key considerations and methods when it comes to creating and implementing an M&E system. Particularly helpful is the list of key elements for designing an impact evaluation, which includes: determining whether the evaluation is necessary and appropriate, choosing the main evaluation questions, using a comparison group, triangulating evaluation findings, and ensuring that the evaluation is context-specific. Additionally, the report mentions that evaluation methods must be theory-based. As stated, the program theory “documents the causal (or results) chain from inputs to outcomes.” By analyzing each link in the chain individually, an argument may be built to establish if the theory exists in practice. This ties into their recommendation of triangulating results, which means finding “several pieces of evidence [that] point in the same direction.” In terms of methodology, the report suggests that most good evaluations are conducted with a mixed methods approach, incorporating the collection of both qualitative and quantitative data. Qualitative data should be used to design the method of collecting quantitative data as well as to inform its interpretation.

Another report by OECD outlines “10 steps to designing, building and sustaining a results-based monitoring and evaluation system.” In the first step, OECD recommends conducting a readiness assessment as a form of preparatory work to assess not only what the country of focus needs, but also what their current capabilities are when it comes to M&E. A readiness assessment includes three parts: determining the incentives and demands for designing a results-based M&E system, gauging roles, responsibilities, and existing structures for impact evaluation, and establishing the capacity-building requirements for a new M&E system. The OECD document also describes the readiness assessment process in significant detail.

¹ https://www.betterevaluation.org/en/themes/impact_evaluation

Step two discusses the importance of choosing outcomes before choosing indicators and describes the process of determining outcomes for an M&E system. Outcomes are typically not as long-term as goals, with a time-frame of approximately 5-10 years. After outcomes are determined, they can be narrowed down further into targets, which tend to have a shorter time-frame. Step 2 also provides a 5-part process for setting outcomes: Identify specific stakeholder representatives, identify major concerns of stakeholder groups, translate problems into statements of possible outcome improvements, disaggregate to capture key desired outcomes, and develop a plan to assess how a government or organization will achieve these outcomes.

Once outcomes have been agreed upon, key indicators must also be identified in step three of the M&E system. Outcome indicators are qualitative or quantitative variables that can be measured to assess performance of an organization, changes as a result of the intervention, or progress toward outcomes and goals. Indicators must be used at every level of the M&E system (i.e., inputs, activities, outputs, outcomes, and goals), and measured on a regular basis.

In the fourth step, baseline values for each indicator are established as a means of comparison throughout the intervention. Once baseline data has been collected, step five outlines how to set results targets - what progress towards an outcome can be achieved within a specific period of time. Together, the outcomes, indicators, baselines, and targets makeup what is called “the performance framework”.

Next, step six explains how to use the performance framework to monitor results and step seven overviews the role of evaluations and the different types of evaluations that may be used in the M&E system. The final three steps detail the process of reporting findings from the evaluation, using these findings to improve performance, and sustaining the M&E system within the organization.

Introduction to Impact Evaluation by Patrick Rogers and BetterEvaluation

“Introduction to Impact Evaluation,” by Patrick Rogers and BetterEvaluation provides a detailed breakdown of impact evaluation processes, explaining how impact evaluation differs from and complements other types of evaluation, why impact evaluation should be done, when and by whom. In addition, it raises important questions such as; what constitutes credible and appropriate impact evaluation? How should impact evaluations be managed? What are appropriate measures and data sources? How can qualitative and quantitative data be effectively combined in impact evaluation?

It goes on to discuss the different methods and research designs as applicable to projects. For example, the randomized controlled trials or participatory methods is one approach. Others have argued for situational appropriateness. This means choosing methods that suit the purpose of the evaluation, the types of evaluation questions being asked, the availability of resources, and the nature of the intervention, in particular whether it is standardized or adaptive, and whether interventions work pretty much the same everywhere and for everyone or are greatly affected by context.

On developing evaluation questions that will provide desired outcome/result, some questions to consider in this process have been divided into four aspects and they include: overall impact, nature of impacts and their distribution, influence of other factors on the impacts, how it works and match of intended impacts to needs. Under each section, there are several questions evaluators can ask to provide information.

Under clarifying values for impact evaluation, the author suggests the first step is to underpin evaluation because it is always important to understand what success looks like in terms of achieving desirable impacts and avoiding negative impacts; for example, will the success of a road development project be judged in terms of increased access to markets, or improved access to maternity hospitals? Achieving desirable distribution of benefits; for example, should the success of a project/program be judged in terms of the average educational outcome, improvements for the most disadvantaged, or bringing a vulnerable or disadvantaged group (like young girls, etc) up to the same level as their more advantaged counterparts?

From the author's point of view some methods that help people articulate values during an impact evaluation includes: appreciative inquiry which entails involving stakeholders, having discussions about a time when their programs were extremely effective, then identify the values it exemplified during those times using community surveys; individuals in the community either nominate or rate the issues that they see as most important to address; most significant change which is a structured process for generating and selecting stories of change that identify what different individuals and groups see as the most important outcomes or impacts.

For developing a theory or model, It is often helpful to base an impact evaluation on a theory or model of how the intervention is understood to produce its intended impacts. This might be called a program theory, a theory of change (ToC), a result chain or a logic model. It is best to develop the theory of change as part of planning an intervention, and then review it and revise it as necessary while planning an impact evaluation.

The article further provides credible sources for measuring indicators in particular sectors. Relevant to our context is the Sustainable Development indicators guidelines developed by the United Nations Commission on Sustainable Development, it contains 130 indicators of social, economic, environmental and institutional aspects of sustainable development.

Explaining to what extent observed results have been produced by the intervention, one of the important features of an impact evaluation is that it does not just gather evidence that impacts have occurred, but tries to understand the intervention's role in producing them. It is rarely the case that an intervention is the sole cause of changes. Usually, an intervention works in combination with other programs, a favorable context or other factors. Often a group collaborates to produce a joint impact, such as when international NGOs partner with local governments and communities.

It can also be helpful to investigate causal attribution or plausible contribution of projects in terms of three components. The starting point is the factual; to compare the actual results to those expected if the theory of change were true. When, where and for whom did the impacts occur? Are these results consistent with the theory that the intervention caused or contributed to the results? The second component is the counterfactual; an estimate of what would have happened in the absence of the intervention. The third component is to investigate and rule out alternative explanations. In some cases, it will be possible to include all three components in an impact evaluation. In complex situations, it might not be possible to estimate a counterfactual, and causal analysis will need to depend on the other components.

The Rainbow Framework by BetterEvaluation

The BetterEvaluation Rainbow Framework can help evaluators navigate the choices available at each stage of an evaluation. The framework organizes clusters of tasks associated with each stage of the evaluation process, although the stages and tasks are not necessarily sequential, each task is as valuable as the other.

The first task is to Manage an evaluation or evaluation system: This includes who will conduct the evaluation and who will make decisions about it. We will also need to select and engage some Flying Labs members to participate in the evaluation process. In the second stage of managing the evaluation, we will create a decision making process which can include: what type of structure, ways of exploring issues and how to make decisions.

The second task is to define what is to be evaluated, in this case (ripple effects of Flying Labs in their communities), this will involve developing an initial description of the initiative or program being evaluated, developing a program theory or logic model to describe how the program is intended to create change, and identifying potential unintended results. For example, a logic model may consist of a simple pipeline or results chain, a more sophisticated logical framework, more structured and free-flowing outcomes hierarchies, or realist matrices, though complex evaluations are much more likely to rely on the more sophisticated models. Prominent questions include whether an evaluation is looking at the effects on policy, the effects on populations, or both; whether multiple levels of activity are being evaluated; and who the stakeholders are.

The third task in the evaluation process is to frame what is to be evaluated. Framing an evaluation is an important aspect needed to design said evaluation. Framing involves selecting the primary intended users, deciding on the purposes of the evaluation, specifying key evaluation questions, and determining what “success” would look like; for example, what standards or criteria will be used to make judgments about the program? Complex interventions are likely to have multiple contributors and users of results, and the author notes that the different purposes of these users can conflict. Users also may have additional evaluation questions that need to be tackled, which means they might have different understandings of success.

The fourth task is to describe what happened. This involves the use of samples, measures, or indicators; the collection and management of data; the combination of qualitative and quantitative data; the analysis of data; and the visualization and communication of data.

The fifth task is to understand the causes of outcomes and impacts. What caused particular impacts, and did an intervention contribute to said outcomes? Do the results support causal attributions? How do the results compare with the counterfactual analysis? What alternative explanations are possible? The author further notes that simply collecting information about what happened cannot answer questions about causes and effects, whereas an evaluation must deal with causation in some way.

The sixth task is to synthesize data from one or more evaluations. Synthesizing looks at a single evaluation or at multiple evaluations, and it can generalize findings from, for example, a small population to a larger population. Synthesis can be difficult in cases where some positive and some negative impacts have been achieved, which requires weighing up the strengths and weaknesses of the interventions.

And finally the last task in an evaluation process according to the rainbow framework is to report and support use of findings. “We are in the business of evaluation because we want those evaluations to make a difference. “We

do not want them just to be published as a report and for the users of those reports to ignore them or to misuse them.”² Therefore, this task requires identifying reporting requirements for different stakeholders; developing reporting media, whether written reports, social media campaigns, or some other output; ensuring accessibility for those who can use the results; developing recommendations where necessary; and helping users of evaluations to apply the findings in their respective programs.

The Ripple Effect

An article by Everard, Reed, & Kenter (2016) titled “The Ripple Effect: Institutionalising Pro-environmental Values to Shift Societal Norms and Behaviours,” applies the Social, Technological, Economic, Environmental, and Political (STEEP) framework as a means to measure the ripple effects of different systemic “levers” on societal transitions. Social levers are defined as external mechanisms that influence societal values, and thus drive societal norms. Of note, the authors also propose that societal values and concerns only become influential when they exist across multiple sectors. While this paper focuses specifically on how pro-environmental values shift norms and behaviours, the STEEP model is an effective tool for measuring the impact of external and indirect factors in many situations.

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RIDING THE RIPPLES OF SOCIAL CHANGE: SYSTEMS CHANGE LITERATURE REVIEW

Introduction

The global international development ecosystem comprises a broad provider of donor agencies, driven by one goal: end social challenges plaguing countries. Yet, despite the influx of donors within this space, imperfections still exist in major aid-driven programs partly due to a lack of a thorough understanding of systemic change within the local, national and international context. Consequently, systems change and development aid have become crucial parts of discussions on today's most serious global problems, and in this context, relating to the use of technological innovations like drones to solve problems in health, agriculture, education, climate action, etc. With governments worldwide faced with several complex issues to navigate simultaneously, there is a lot of pressure to accelerate the achievement of sustainable development goals and recover from the global effects of the pandemic. However, delivering these goals outlined in the UN's Sustainable Development Goals (SDGs) requires changes to present societal systems. This is because the pandemic has primarily impacted the progress towards a sustainable society and some underlying problems are systemic. In recent years, academic research and organizational policies toward development have shaped approaches to international aid processes. As a result, the conversation about foreign aid has moved from the traditional method of fostering economic growth in the Global South to understanding systems change and the ripple effects of social projects within communities. The emerging shift in emphasis has positive and negative consequences for many social projects, including donors' shifting focus and devoting a higher percentage of funds to social programs such as health, education, technology, and strengthening human capital and skills acquisition to achieve lasting and meaningful impacts. Against this backdrop, we are conducting systems change research to gain deeper insights into the ripple effects of Flying Labs projects within their communities. We begin by explaining what systems change entails and then narrow our discussions to why it is essential in achieving lasting positive impacts in donor-funded programs.

What is Systems Change?

With the 21st century, came a rise in complex social challenges across the globe, often rooted in a web of underlying political, economic, and environmental issues. As a result, previous approaches became insufficient to tackle these dynamic problems and there became a need for new, innovative methods of achieving transformative change. Over the last decade, the term “systems change” has become increasingly popular within the social and developmental sectors. **A systems change approach looks at problems as an interconnected network rather than individual occurrences, and aims to address underlying systemic issues as a means of creating more adaptable and sustainable systems.** A report by Ashoka and other co-creation partners defines systems change as “approaches [which] address root causes rather than symptoms by **altering, shifting, and transforming behavioral structures, customs, mindsets, power dynamics, and rules, with the intent of solving societal problems** – with lasting effects on a local, national, and global level.”³ As such, systems change requires not only a new methodology to approaching problems, but also the implementation of new ways of thinking, new leadership styles, and interdisciplinary teamwork.

3 “Embracing Complexity: towards a Shared Understanding of Funding Systems Change” (Virginia: Ashoka, 2020).

To this end, we must first reconceptualize the ways we view the process of change. Systems thinking acknowledges the fact that **change is, by nature, non-linear.** There is not one clear path to achieving lasting social transformation. Rather than searching for linear, one-dimensional solutions to a problem, systems thinking involves analyzing the system as a whole and identifying **“leverage points.”** As described by Donella Meadows, leverage points are “places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can produce big changes in everything.”⁴ A classic example is “growth,” which has been identified as a major systemic leverage point with the power to positively shift the interconnected issues of global poverty, hunger, depletion of resources, unemployment, and more. While global leaders tend to view economic growth as the solution to everything, the systems change community describes this action as leaders “pushing with all their might in the wrong direction.” In actuality, poverty, hunger, resource depletion, etc. are costs of economic and population growth. A systems approach to these problems views slowing, ceasing, or even reversing growth as the key to moving systemic change in the right direction. This example illustrates another key aspect of leverage points - their counterintuitive nature. As described by Forrester (1971), **leveraging change within a complex system often requires choosing actions that oppose common sense.**⁵ This has created a resistance to systems change in many situations and sheds light on the necessity of shifting mindsets.

Why Systems Change?

Since 1970, the aid industry has increasingly become an area of particular interest to donor countries, mainly because it is still the economic lifeblood to many countries. And in the context of Africa, understanding the role of foreign aid in systemic change became necessary as a result of the influx of donors from India, Brazil, China, etc. For example, China’s Belt and Road Initiative (BRI) supports infrastructure development projects in some African countries, breaking the West’s exclusive domain with new approaches to foreign aid and signalling the need for a systemic change to support developing countries attain economic independence, using a sustainable and inclusive approach. According to Alden, one of the main drivers of colonial systems change was as a result of new donors like China recognizing investment prospects created by the economic ruptures caused by the World bank’s structural adjustment programmes (SAP) of the 1980s and 1990s, with specific reference to the privatization of state-owned assets.⁶ Alden describes one clear example of the evolution of systemic change largely due to development aid ineffectiveness of the Millennium Development Goals (MDG), where targets agreed upon in 2000 to reduce under-development in areas like health and income by coordinating activities of donor and recipient countries. The Millennium development goals “failed to deliver on its targets because it focused more on poverty alleviation programs”⁷, leaving little room for understanding the root causes of poverty within the context of a particular country.

Systems change is necessary for organizations and donors to address social problems in a sustainable manner, going beyond temporary fixes, but rather, partnering with local organizations and governments to achieve structural changes. For example, many problems faced by countries can be described as systemic because they exist under complex situations of power dynamics, leadership and cultural practices. Systemic change also provides an opportunity to address social problems, even if the underlying system remains the same. An example can be drawn from the potential success of improved healthcare. McKinsey Global Institute estimates that global disease could be reduced by over 40 percent by using existing healthcare interventions, 230 million premature deaths can be prevented by 2040.

4 Donella Meadows, “Leverage Points: Places to Intervene in a System,” The Academy for Systems Change, April 5, 2012, <https://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/>.

5 Jay W. Forrester, “Counterintuitive Behavior of Social Systems,” *Technological Forecasting and Social Change* 3 (1971): pp. 1-22, [https://doi.org/10.1016/s0040-1625\(71\)80001-x](https://doi.org/10.1016/s0040-1625(71)80001-x).

6 Chris Alden, Daniel Large, and Alvaro Mendez, “The Western Way of Development: A Critical Review,” *Governing China in the 21st Century*, 2019, pp. 19-38, https://doi.org/10.1007/978-981-13-7232-2_2.

7 Brian Atwood, “Creating a Global Partnership for Effective Development Cooperation,” accessed December 7, 2021, www.cgdev.org/content/publications/detail/1426543.

A report by the Organization Economic Co-operation and Development (OECD) observatory on public sector innovation explains that **“time is an essential resource in systems change: people need to live through and experience the change rather than be told about it by a third party. Therefore, the timing of change is thus crucial.”** In addition, **“meaningful measurement and feedback mechanisms are the cornerstones of successful systems change.”**⁸ In policy making and program formation there is often a gap between design and implementation, especially when addressing complex social problems.

To put it succinctly, if organizations and donors do not attempt to understand the root causes of social problems, they alleviate the outcomes of broken systems or provide inadvertent cover for failure. While Systems change is not the only way of addressing social issues, it offers an informed way of evaluating projects and provides guidelines for achieving change. This means that using a systemic approach to complex problems is helpful to map the system’s dynamic underpinning it, how the relationship between system components affects its functioning, and what type of interventions can lead to better results. System reasoning helps organizations understand how systems are constructed and how they function.

Creating Systems Change

An article by Misra & Maxwell (2016) in the Stanford Social Innovation Review outlines three key aspects to “unlocking systems-level change.”⁹ These include developing a systems mindset, identifying the right tools and frameworks, and understanding human dynamics. Forming a systems mindset is like equipping oneself with a toolbox for creating and implementing solutions to systemic issues. Similarly, having a strong foundational knowledge of systems change tools, such as concept mapping, system dynamics modeling, and social network analysis, as described by Willis et al. (2011), help answer important questions that arise during the process of planning and enacting systems change.¹⁰ Finally, and arguably the most important aspect of creating systems-level change, is emphasizing and fully understanding the importance of “people.” There cannot be true systems change without involving individuals from every level of said system in planning, decision making, and implementation. This component is critical to long-term, sustainable success within a system.

Building on these aspects, New Philanthropy Capital’s (NPC) guide to systems change outlines six key principles to consider when attempting to create systemic changes.¹¹ These include: **understanding needs and assets, engaging multiple actors, mapping the systems, doing it together, distributing leadership, and fostering a learning culture.** Collectively, these principles help guide the planning and execution of changing systems. As mentioned, due to the complexity of social systems, changes that appear rational from one perspective may actually result in a chain of unintended and unforeseen consequences. This is why the first three principles are so important to consider when planning an approach to systems change. The outcomes of the planning process include identifying the key actors, leverage points, and root causes within the system, as well as setting objectives and establishing boundaries.

When it comes to enacting or “doing” systems change, the last three principles listed on the NPC report focus on creating collaborative, interdisciplinary partnerships and an environment that fosters constant learning and sharing of knowledge. As stated by Rachel Sinha in the NPC guide, “there is no failure, just learning.” A report by the Rockefeller Foundation titled “Seeing, Facilitating, and Assessing Systems Change” shares a detailed guide

8 OECD: Working with ChangeSystems approaches to public sector challenges

9 Jamaica Maxwell and Susan Misra. “Three Keys to Unlocking Systems-Level Change.” Stanford Social Innovation Review, 2016. <https://doi.org/10.48558/RZ96-N674>.

10 Cameron D Willis et al., “System Tools for System Change,” BMJ Quality & Safety 21, no. 3 (2011): pp. 250-262, <https://doi.org/10.1136/bmjqs-2011-000482>.

11 Rob Abercrombie, Ellen Harries, and Rachel Wharton, “Systems Change: a Guide to What It Is and How to Do It” (London, UK: New Philanthropy Capital (NPC), 2015).

to mapping systems.

“By mapping the systems they aim to change while developing robust theories of change, funders and program partners can better see how systems function, where promising leverage points and opportunities for intervention may exist, and where unintended consequences may arise.”¹² Along with the systems mapping process, this report describes other tools, such as the iceberg model, which provides a visual model of the levels which constitute systems. These range from observable events (located at the “tip” of the iceberg), the societal patterns that lead to these events, the system structures that create societal patterns, and finally, **the mental models (i.e., beliefs, attitudes, and values) which comprise the “base” of the iceberg/system.**

Storytelling to Enable Systems Change

According to an article by Saltmarsh (2018) in the Stanford Social Innovation Review, **“Stories make, prop up, and bring down systems.** Stories shape how we understand the world, our place in it, and our ability to change it.”¹³ Stories are one of the oldest forms of sharing knowledge, situating ourselves within a chaotic world, and making sense of the phenomenon that is human existence. Furthermore, **stories allow us to visualize, understand, and act upon the interconnectedness of complex social systems.** Storytelling can occur in many different forms, for example: written text, film, art, song, and more. Regardless of the form, telling stories creates meaning, inspires empathy, and brings people together in a way that typical systemic processes cannot. For these reasons, Saltmarsh (2018) describes **storytelling as foundational to changing mindsets, objectives, and values within a system.** Another article by the Centre for Public Impact shares that storytelling “is a part of our DNA and an integral part of our structure. We just need to apply this in a contemporary setting.”¹⁴

A report by Vitalyst Health Foundation defines a story as “the narrative shape given to a sequence of events to contextualize, highlight, and amplify the meaning.”¹⁵ In this report, the authors also share three ways in which storytelling can help inform and change decision-making. The first is through self-understanding, that is, sharing stories creates greater self-awareness and helps the storyteller understand the value of their lived experiences. Next, is the ability of storytelling to create empathy in action. By nature, stories elicit an emotional response and require a level of vulnerability and trust between the speaker and listener. When the listener is able to see the direct impact of laws, policies, or regulations on the lived experiences of others, it may challenge their current perceptions. Finally, **stories can act as a catalyst for systems change when decision makers are challenged to act upon their new understanding of the lived experiences within their community.** It is important to note, however, that storytelling should not be used to replace the role of community stakeholders in decision-making processes. Alternatively, it should always be used alongside community representation in order for other leaders to better understand lived-experiences.

12 Heather Grady et al., “Seeing, Facilitating, and Assessing Systems Change: Learnings from the Scaling Solutions toward Shifting Systems Initiative” (New York, USA: Rockefeller Philanthropy Advisors, 2020).

13 Ella Saltmarsh. “Using Story to Change Systems.” Stanford Social Innovation Review, 2018. <https://doi.org/10.48558/4FVN-0333>.

14 Lila Wolff, Rachel Fyfe, and Thea Snow, “Storytelling for Systems Change: Early Insights from Communities and Storytellers,” Centre for Public Impact, 2021.

15 Liz Warren and Stephanie Luz Cordel, “Storytelling as a Catalyst for Systems Change” (Phoenix, AZ: Vitalyst Health Foundation, 2018).

MEASURING SYSTEMS CHANGE

The previously mentioned Rockefeller report also shares a “new approach to evaluation” of systems change. This new approach stems from the inadequacies of previous evaluation methods when it comes to measuring long-term systemic change. While short-term outcomes are certainly important, this style of impact evaluation is ideally used when targeted outcomes are well-defined and achievable within a relatively short period of time. Due to the holistic, wide-ranging, and ambiguous nature of systems change programming, a more adaptive or reflexive approach to evaluation is required. Additionally, the approach to evaluation must also take into consideration that **the knowledge of local communities is vastly important in creating and understanding societal and systemic shifts. For this reason, qualitative approaches to detect changes in patterns, connections, and nuances within the system are a valuable way of assessing changes in system structure and adaptiveness resulting from collective efforts.**

To simplify, the Rockefeller Foundation provides some key priorities to focus on when measuring systems change. The first priority is engaging stakeholders. As discussed throughout this paper, involving a wide range of key informants is critical throughout the entire process of enacting systems change. This also extends to the assessment of systems change programs, where grassroots to high-level perspectives are necessary to inform the existence and impact of social change. The next priority, titled “describing the program” refers to all individuals engaged in the evaluation process having an understanding of the many moving parts within the systems change initiative. Following this is the priority of “focusing the evaluation design” in order to determine a combination of methods that address the many relevant challenges and questions being assessed. Next are “gathering credible evidence” and “justifying conclusions” based on the evidence collected and the corresponding analysis which converts “evidence” into “findings”. The final priority described by the Rockefeller Foundation is “sharing lessons and ensuring use.” Sharing insights can also be seen as a key outcome of systems change evaluation. Lessons on success, as well as missteps and failures, may be extremely valuable to organizations with similar intentions. This brings us back to one of the foundations of creating positive systems change - collaboration and sharing of knowledge.

Measuring the Ripples of the Flying Labs Network

Flying Labs are fully locally-run and independent knowledge hubs currently active in over 30 countries across the world. Flying Labs work within multiple sectors, using emerging technologies to address local challenges through locally-led practice. In the past 3 years, Flying Labs have initiated more than 120 projects and 90 training sessions across more than 30 different countries. The direct positive impact Flying Labs have had on their local communities since their inception in 2016 is clear. However, a framework with the potential to measure the systems level impact of Flying Labs activities within their countries would shed light on how far these effects travel across the ripples of social change. Said framework has yet to be created, but will likely consist of multiple tools relevant in the measuring and evaluation and systems change fields. The project led by WeRobotics and Flying Labs to co-create a framework for measuring the ripple effects of the Flying Labs Network has been called “the Ripples project.” To showcase the alignment of the Ripples project with systems change models, we will showcase our methodology using the six systems change principles defined by NPC.

Methodology: Using the NPC Principles

Understanding needs and assets & engaging multiple actors

This section addresses the first two principles shared in the NPC document. Understanding needs for any project is an important first step. With that in mind, we must first ask: Why should we measure the ripples of Flying Labs activities? In the Flying Labs context, we believe this project will provide a more in-depth understanding of the systems change progress in affected communities. One of the organizational goals of WeRobotics and the Flying Labs Network is to shift power with local experts, thus enabling locally-led practice while reducing the influence and Power Footprint of Western-based organizations. By measuring Flying Labs' potential contributions to systems change, we may trace the systems-level changes created by Flying Labs through multiple sectors and develop a clearer understanding of their sphere of influence.

Engaging multiple actors is also an important principle for creating true and sustainable systems change. For this reason, the Ripples Project will involve multiple co-creation sessions between WeRobotics and various participating Flying Labs, which will help identify needs and ultimately create a Ripples Framework that can be adequately applied to all participating Flying Labs. Co-creation sessions will also be a valuable component of our intended storytelling approach, as described earlier in this paper. Social systems are complex and often difficult to visualize. For this reason, storytelling will help identify the interconnectedness of various components within the broad systems of interest for Flying Labs.

Mapping the Systems

While there is no agreed process on how systems are mapped for evaluations, partly due to the complex nature of mapping processes, the importance of mapping in itself can't be overlooked. The NPC guideline for systems study describes mapping “the process of describing a system in order to understand how to act on it.”¹⁶ It also adds “some systems maps are intentionally high level abstractions that identify the principal components and relationships in a system, but are intended to act as a basis for discussion rather than a description of reality.”¹⁷ For the Ripples Project, we will use a storytelling approach to visualize depictions of a system, such as its relationships and feedback loops, actors and trends within communities where Flying Labs operate. This approach aims to provide a conceptual overview of complex systems to Flying Labs and a clear understanding of the intricacies of the ripple effects that can occur within a specific context. We must provide Flying Labs with ample information about possible changes within a system vis-a-vis using innovative technological solutions. This mapping process can either use the Social, Technological, Economic, Environmental & Political (STEEP) Framework or break down the cycle to Flying Labs' area of specializations, which are in line with the Sustainable Development Goals (SDGs).

Doing it together & distributing leadership

The Flying Labs Network, by nature, fosters a highly collaborative environment. Sharing knowledge collected during a single Flying Labs project means the network benefits as a whole. As such, “doing it together” is a very important aspect of the system. The methods for this project will be no different, with collaboration set as a priority in developing and applying a systems change measurement framework. Similarly, the learnings from this project (good or bad) will also be shared across the network. Tying into collaborative work within the network,

¹⁶ Rob Abercrombie, Ellen Harries, and Rachel Wharton, “Systems Change: a Guide to What It Is and How to Do It” (London, UK: New Philanthropy Capital (NPC), 2015).

¹⁷ Ibid.

the distribution of leadership also serves the organization's purpose of shifting power. Each Flying Labs is an independent legal entity, making their own decisions and choosing their own leadership. In the context of the ripples project, Flying Labs engaged the expertise of students, interns, and beneficiaries to foster a learning culture, and strengthen their leadership skills.

Fostering a Learning Culture

Already, the Flying Labs Network exists to encourage learning and collaboration. The results and findings from this systems study research will further provide Flying Labs members, WeRobotics, and stakeholders with in-depth knowledge of the systems in which they operate, that is, what is working and what is not, considering how things change rapidly in today's world.

“Learning without adaptation has little value for systems change.” To this end, once we have gathered our findings on the ripple effects of flying labs projects, we will begin to adapt these findings into existing processes to mitigate possible negative impacts and continuously improve. Experts in the systems study field often argue that foreign aid doesn't necessarily produce clean, progressive and contained outcomes; instead, continuous development of innovation and learning is necessary to bring about systemic change.

APPENDIX C

Summary of Flying Labs Stakeholder Engagement.

(The following section has been edited for clarity & length)

| Social Ripple | Flying Labs/ Project | Partner | Project Description | Stakeholder Interviewed | How the Ripple Occurred |
|---------------|--|-----------------|---|-------------------------|---|
| Awareness | Nepal Flying Labs/ UAS Coordination in Humanitarian Action Project | WeRobotics/ WFP | To improve the rapid deployment and coordination of drones in humanitarian action | Individual | “The presentations and practical disaster simulation exercise helped me become more aware of the role of UAVs in real time disaster assistance. This has made me realize the greater importance of drones for society.” |
| | Zambia Flying Labs/ Chunga Dumpsite Mapping Project | Chunga Dumpsite | A waste management project using drones for stockpile auditing at Chunga dumpsite. For several years, attempts have been made to improve the dumpsite’s sanitation and safety to protect area residents. Now drones are being used to assist this effort. | | “The inclusiveness of the project (seeing females and students being involved in the organizing and implementation of a project).” |
| | Nepal Flying Labs | | | | “Government officials responsible for Drone permissions in the country: NFL did a series of workshops around digitising drone-related software in Nepal and it led to discussions towards opportunities for software companies to work in the digitization-related consulting works.” “I had to report back to my seniors and colleagues about the workshop and my involvement in it. I mentioned to my seniors the issues that were reflected during the presentation in the presence of all drone-related stakeholders. This resulted in organising a consultation workshop where we invited all drone-related government offices and private and non-government organisations from the contact database we acquired during the workshop. This led to a successful consultation meeting on the UAS model regulation that we were working on. This also led to the second round of deep dialogue on the drone issues of Nepal and possible pathways for change.” |
| | Tanzania Flying Labs | ZAMEP | Malaria eradication project | Partner | “Even the government gets more understanding that when drones are used properly, they are not a threat.” |

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|-------------------------|--|----------------------|---|--|--|
| Acceptance/ Adoption | Panama Flying Labs/Mangrove Restoration Project | | A technical demonstration in Panama using specially adapted drones to restore the ecosystems in two communities in the Central Provinces | | “People in the community are a little more supportive of the mangrove restoration activities and we participate in discussions about the mangrove issue in meetings that we did not participate in before.” |
| | Tanzania Flying Labs/Zanzibar Malaria Prevention Project | | Mapping & spraying as a malaria vector control mechanism | | “As we are progressing in using the technology, our partners also start introducing it within their programs to fight malaria.” |
| Credibility | Panama Flying Labs/Mangrove Restoration Project | Fundación Naturaleza | A technical demonstration in Panama using specially adapted drones to restore the ecosystems in two communities in the Central Provinces | | “The Orthomosaics, the georeferenced data that Flying Labs worked for us in Cayo Zapatilla, helped us get support for our restoration of mangroves proposals.” |
| | Zambia Flying Labs/Chunga Dumpsite Mapping Project | Chunga Dumpsite | A waste management project using drones for stockpile auditing at Chunga dumpsite. For several years, attempts have been made to improve the dumpsite’s sanitation and safety to protect area residents. Now drones are being used to assist this effort. | | “Gives confidence in potential sponsors to fund us in projects due to our technological component.” |
| | Senegal Flying Labs | IAM Senegal | | | More credibility by highlighting our certification and training. The partners are more confident when they realize that we will combine drone technology with traditional methods. They feel reassured and entrust us with more and more projects. State bodies are also increasingly interested in our institute. |
| New Partnerships | Senegal Flying Labs/Drone Training Program | UrbaSEN | N/A | | “We have signed technical partnership agreements that are part of the efforts made to promote the development of local authorities in Senegal, from which they do not have GIS offices.” |

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|--------------------------------|--|----------------------|---|-------------------|--|
| | Senegal Flying Labs/ “Use of drones for mapping in the Mining and Geology sector” Training | IST Senegal | | | “More credibility by highlighting our certification and training. The partners are more confident when they realize that we will combine drone technology with traditional methods. They feel reassured and entrust us with more and more projects. State bodies are also increasingly interested in our institute.” |
| | Panama Flying Labs/Mangrove Restoration Project | Fundación Naturaleza | A technical demonstration in Panama using specially adapted drones to restore the ecosystems in two communities in the Central Provinces | Project partner | “We are ready to sign a new agreement with the Ministry of the Environment, and we have signed agreements with the National Land Authority, the Institute of Agricultural Innovation and a letter of understanding with the Mayor’s Office of Panama. Our alliance with Flying Labs is key in supporting our project with geographic information capture with drones.” “The state signed agreements in which it commits to restore nearly 50,000 hectares of mangroves by 2030 and to support foundations like ours.” “International organizations have contacted us to create joint projects that allow us to have funds in the short, medium and long term.” |
| | Zambia Flying Labs/Drone Business Challenge Event | | Student-to-student education of drone technology and innovation. | Student | “We got the chance to meet with a lot of social organizations that we are now in the process of rolling out a joint-activity. Improved STEM collaboration with other institutions” |
| Behavior/ Mindset Change | Tanzania Flying Labs/Zanzibar Malaria Prevention Project | | Mapping & spraying as a malaria vector control mechanism | Government agency | “Now people understand the need to use drones for better outcomes, not just for leisure as often people see it.” |
| | Haiti Flying Labs | | Drone Mapping | Project partner | The perception changed, and they had confidence in their land boundaries. |
| Diversity & Inclusion | Zambia Flying Labs/Drone Business Challenge Event | | Initiative aimed to encourage students to develop creative and innovative ideas for solving modern-day problems using drones, one of the first steps towards stimulating STEM education | Community member | “How touched they were with the story aspects included as part of the training, especially the inclusiveness of females and differently abled children as part of the event made us realize how important we are, even though we are differently-abled.” “The beauty and ‘wow effect’ of seeing their fellow youth being posted on social media and involved in this event” |

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|---------------------|--|-------------------------|--|-----------------|---|
| Confidence Building | Tanzania Flying Labs/Zanzibar Malaria Prevention Project | UrbaSEN | Mapping & spraying as a malaria vector control mechanism | Project partner | “Even the government gets more understanding that when drones are used properly, they are not a threat.” “People continue to understand how we fight the spreading of Malaria, so they continue trusting what we do.” |
| | Nepal Flying Labs | IST Senegal | UAS Humanitarian Project | Participant | “While working in groups during the designing thinking workshop as well as the disaster simulation exercise, I realized the essentiality of teamwork and support in the immediate aftermath of a disaster.” |
| | Senegal | IAM Senegal | | Project partner | Our students feel more confident by adding on their drone pilot resumes and this gives them more chances during the recruitment processes. |
| Sustainability | South Africa Flying Labs/UNICEF | UNICEF | | Project partner | “This partner in the course of applying the ripple detector model, committed to co-funding the Disaster Management Conference that is planned for September 2022 (confirming continued partnership) in addition to co-fund South Africa Flying Labs’s STEM related Workshops. UNICEF has also convinced other agencies of the United Nations to come on-board the conference and to partner with SAFL to address the development challenges faced by some communities in South Africa.” |
| | Zambia Flying Labs | Standard Chartered Bank | | Project partner | “We now have two potential stakeholders looking to fund two activities and are interested in establishing the first female STEM lab in Zambia.” |
| | Papua New Guinea | Code Avengers | | Flying Labs | “PNG Flying Labs is excited to engage with Code Avengers again in 2022 from May to June to promote Computer Science to bridge the digital divide in the Pacific. We delivered two successful PacifiCode Code Campsin 2021 at Sabusa Primary School, Central Province (rural) and Port Moresby International School NCD (urban). |
| | Nepal | UAS | | | “Startup business companies incubated through this program have not only proven to create a lucrative sustainable business but also have been offering services to contribute to drones for social good efforts.” |

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