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## Planet Labs: Restoring The Planet Through Earth Observation

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## **Abstract**

This case study presents the new space company Planet Labs, a pioneering innovator in earth observation technologies, founded with the mission to make Earth data visible, accessible, and actionable. Working towards closing the gaps to achieve the UN Sustainable Development Goals, ending deforestation is one of the most considered challenges for Planet Labs. This case study further elaborates on company's impact for reducing deforestation, and current changes in landscape of earth observation and environmental governance.

**Keywords:** Case Study, New Space, Agile Aerospace, Earth Observation, Sustainable Development Goals, Deforestation, Planet Labs, Life on Land

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## **Introduction**

The Blue Marble, the Third Rock from the Sun, planet Earth, our home – floating against the infinite vastness of space with a paper-thin atmosphere surrounding to shield, the ones who saw its evident fragility have come back to Earth wanting to protect it more than ever (CSA 2022). Life on our planet can only depend on this shift of awareness that will lead to real action, yet we are eclipsing the wrong records even today. The intricately balanced natural ecosystem is in a crisis, witnessing the warmest recorded month of September globally and greenhouse gas emissions not only fully recovered from the drop due to COVID-19 but also exceeded (UNEP 2023). In the next decade, a mix of the loss of biodiversity, pollution, consumption of natural resources, and climate change will become the most prominent global risks (WEF 2023). Signs are clear, and warnings have been made, at halfway to the plan on rescuing people, the planet, and prosperity by 2030, known as the UN Sustainable Development Goals, allies that can truly accelerate the stalled progress could be the hope that remained. Standing as the frontrunner, an ambitious team of NASA engineers Will Marshall, Robbie Schingler, and Chris Boshuizen – made their mission to help life on Earth by capturing daily images of the planet.

## **The Crisis**

Intervening with nature, humanity triggered the chain of events from dangerously increasing global temperatures, greenhouse gasses, and sea levels which all recorded all-time highs as of 2023 (WMO 2023), to raging extreme weather events such as wildfires in Hawaii, floods in Libya, droughts worsening in the Horn of Africa, the list goes on to every corner of our world. However, if we can stop deforestation there could be a chance to make things right. Tropical forests store almost 50% of the global carbon (WRI n.d.) which means the carbon goes back to the atmosphere when they are cut down (LSE 2023). Even though we need the trees to clean the carbon dioxide more than ever, we lose 8.1 billion tons of trees every year (Benschop 2023), increased by 10% since last year (WRI s.d.), and create 4.8 billion tons more emissions

because of it (Gibbs, Harris and Seymour 2018). The main causes of deforestation are agricultural production and increased land use for pasture, mainly happening in Brazil and Indonesia, taking approximately 50% (Exhibit 1). Of the many organizations addressing this challenge, one of the most universal is the United Nations, which pledged to protect the lands with the *Sustainable Development Goal 15: Life on Land* yet, 75% of the targets under SDG 15 are off track (UN 2023) and remains to be a major challenge in all geographical regions (Exhibit 2). The struggle of insufficient comprehensive data, especially in lower-income countries, creates significant knowledge gaps, leading to ineffective policy-making and hindering the advancements toward achieving the goal. Bringing easy-to-understand, affordable, transparent real-time information to the heart of local communities is needed to accelerate the change. By providing daily images of Earth's landmass from every point to local stakeholders, Marshall and his team are now closing the data gaps with their low-cost satellites in orbit. Marshall, Schingler, and Boshuizen are proving how earth observation is an essential tool for achieving SDG 15.

### **From A Garage to The Orbit**

Marshall was deeply inspired by the UN conference themed 'Use of Space to Help Humanity' he attended. He started to fierily seek ways to use satellites for achieving what was then known as the Millennium Development Goals. Schingler and Boshuizen with the same questions in their mind, crossed paths with Marshall at the conference. As the three started to discuss in excitement, their shared passion bonded the NASA engineers. Fueled by inspiration, the trio started to work in the garage of a community house in Cupertino with a simple yet profound mission, helping life on Earth by taking images of Earth every day. Determined to go beyond orbiting satellites, Marshall, Schingler, and Boshuizen (Exhibit 3) identified three crucial areas that need to change in the space architecture: 1) decreasing the cost of the mission to go to space, 2) miniaturization of space technology, and 3) transition to cloud computing.

The three didn't believe in big, multimillion-dollar traditional satellites and they realized to make this change possible, building and launching their fleet of low-cost, small satellites that could be produced in large quantities was necessary.

With their north star ahead to make Earth observation continuous, transformative, and accessible for all, Marshall, Schingler, and Boshuizen founded the startup, Planet (formerly known as Cosmogia) in 2010. Development of their satellite and software involved countless iterations in design and testing since they were applying the rapid application development methodology to their earth observation technology. With this new approach in space science, Planet became the pioneer of what they called “agile aerospace” (Mason 2023). After 14 iterations, Planet’s first CubeSat satellite named “Dove” in the size of a shoebox and weighing approximately five kilograms, was completed (Howard 2019). In April 2013, their first demonstration satellites, “Dove 1” and “Dove 2” (Exhibit 4) were deployed into the orbit. The following summer of 2013, Planet raised its initial funding at \$13.1 million and closed its Series B funding at \$52 million in December (Foust 2015). By the beginning of 2014, Planet was able to deploy its first fleet "Flock 1" with 28 satellites, the largest earth observation constellation in the human record until that day.

### **Ally for Sustainable Development Goals**

Planet's first mission was capturing daily images of the Earth and believed in the value of Earth data for tackling humanity's problems in a transformative way. Thereby, Planet didn't find it hard to align its capabilities with the objectives of the United Nation's Sustainable Development Goals. Not only that, but Marshall also received an invitation to the UN's summit took place in 2015, to advocate the possibilities of space technologies, satellite imagery, and the important role of collaboration between organizations to meet the SDGs. He was feeling privileged to be in the very position where once he stood, attentively listening and envisioning ways to aid humanity through space technology. In his speech, Marshall made it clear that his

own company Planet will be dedicated to making their data available to initiatives that are in line with the SDGs. Marshall continued his words by emphasizing how relevant Planet's data is for 15 out of the 17 goals and how they can help monitor more than 70 of the objectives directly and indirectly (Marshall 2015). SDG 15 was the first one on his list. As Marshall was explaining how Planet's daily imaging could be used to track changes in forests to identify and prevent deforestation activities, he was already envisioning Planet's potential to do much more. Their first action was to make \$60 million worth of imagery available under the Global Partnership for Sustainable Development Data (SpaceRef Editor 2015). Next, they didn't waste time in initiating cooperation with the Global Resilience Partnership, an organization focusing on sharing innovation and knowledge for accelerating sustainability policies (GPSDD n.d.).

## **Earth Data Solutions**

Planet has two constellations of actively orbiting satellites: PlanetScope and SkySat which can capture images of the Earth in different resolutions, coverages, and frequencies. This way, they deliver geospatial data in different layers of information for diverse needs. Their products can be divided into three main categories: medium-resolution daily imagery, high-resolution tasking imagery, and tools to leverage and analyze the Earth data. PlanetScope constellation consists of Dove and SuperDove satellites which are used to provide global, daily imagery with pixel resolutions of 3 meters which costs around \$300 thousand with 3 years of useful life (Dorsey 2022). SkySat constellation, on the other hand, has satellites with a higher pixel resolution of 0.5 meters that can also capture stereo imagery and 90-second videos, making them useful for tasks that can be alerted from the images. SkySat constellation is planned to be replaced with the next generation satellites called Pelican which will cost approximately \$4 million with 5 years of useful life (Dorsey 2022). Their RapidEye satellites due to the end of their useful life have retired in 2020, however, their archive of imagery going back until 2009 makes Planet the owner of one of the largest archives for 5-meter pixel

resolution imagery (Planet Labs 2023). In total, Planet has safely deployed 542 satellites with currently more than 200 active satellites orbiting the poles every 90 minutes capturing Earth's whole landmass in approximately 4 million images every day (Planet Labs 2023). Planet is also holding the record of managing to launch the largest fleet of earth observation satellites, Flock 3p, in human history still today with 88 Dove satellites (Ryan 2017). As an early mover, Planet was able to expand its imagery capabilities which can cover 40 times of landmass more than from its closest competitors daily (Exhibit 5) with more than 10 years of historical archive. This irreplaceable historic geospatial data is one of the Planet's great "moats" which is used for timeline analysis solutions and training data for machine learning algorithms (dMY Technology Group 2021).

On top of the Earth data, Planet provides a cloud-based, machine-learning-powered analytics and monitoring platform, as well as application programming interfaces (API), allowing users to examine the images, acquire insights to analyze patterns and forecast change. The platform delivers daily measurements of land use, crop health, land surface temperature, forestry, and more by rendering complicated satellite images. Planet uses a fixed-price subscription model and usage-based contracts to sell its licensed data and analytics tools. By the nature of their business model, they generate a large recurring revenue base and lower costs to serve one more customer. This "land-and-expand" go-to-market strategy, allows Planet to generate more value from each customer over time through broadening their scope of services and products (Planet Labs 2022). Planet collaborates attentively with its customers and partner organizations to make sure of their early success and provides support for account and technical management. Over the years, Planet was able to grow its customer portfolio to more than 700 customers, 200 partners, and 34,000 users by expanding its geographical coverage and enhancing its data and software capabilities (Planet Labs n.d.). Planet operates across large commercial and governmental verticals, serving more than 10 industries including agriculture,

defense and intelligence, forestry, energy, insurance, and disaster management.

For commercial uses, global and high-frequency geospatial data have been used to measure the effectiveness of sustainable agriculture applications, to identify possible food security risks, and to monitor extreme weather events which include drought, threats to biodiversity, and wildfire. On the side of nonprofit and non-governmental organizations that support humanitarian actions, Planet's data have been used for evacuation of civilians in disaster-stricken areas, damage assessment for infrastructure, measuring the impact of food supplies, as well as tracking human rights abuse cases and de-mining operations. Established partnerships with governmental bodies also demonstrate the importance of Planet's products in measuring and verifying sustainability performance which is crucial to understanding the progress of enforced policies.

## **Democratization of Space**

In 2020 Planet got one step closer to realizing its vision, democratizing space. Norway's International Climate and Forest Initiative (NICFI) set in motion a first-of-its-kind project to make high-resolution satellite images freely open and globally accessible for everyone who supports the protection of tropical forests. Planet, Kongsberg Satellite Services (KSAT), and Airbus combined their forces for The NICFI Satellite Data Program with a contract value of \$43 million (NICFI 2022). Marshall couldn't hold his excitement as he explained to BBC News, that helping people to save the forests was one of Planet's initial goals. One of the aims of this program was to empower locals to take action (Amos 2020). The project was designed to provide information on 64 countries (Exhibit 6) where the most concentration of deforestation is happening. Through a platform called the Explorer Portal and collaborating with Global Forest Watch, Planet made images with a spatial resolution of 4.77 meters from 2016 to 2020 (two intervals per year) available. Since its launch, the program gained 19,000 users from 158 countries across governments, NGOs, the private sector, and local communities with the

majority of users being non-profit organizations at 32%, followed by governments at 23% (Exhibit 7). Haka, one of the NGOs using Planet's images through this program for validating their alert system, highlighted the importance of this data for them to prioritize targeted areas for protection and their activities for enforcing regulations (O'Shea 2023). Also, the program has been supporting land use governance and monitoring, promoting transparency in managing forests, and enforcing the transformation of supply chains. The partnership has been renewed until September 2024, making it the fourth year if there won't be another extension.

Following the year of NICFI initiative, Planet took their own step by leading a consortium to combine AI technologies with land monitoring applications. The RapidAI4EO project brought industry leaders and young innovators together with the goal of developing training data for land use and land cover (LULC) application which was found scarce in this field (RapidAI4EO 2021). Importance of this project also got recognition from the European Commission as RapidAI4EO has been awarded a grant through Horizon 2020 program, the largest public research and development investment in Europe (Marchisio 2021). With Planet's Fusion Monitoring products and data from EU Copernicus satellite, over the next two years, the team accomplished to release of one of the biggest public datasets in this domain for the benefit of the earth observation community. Planet's Senior Vice President of Operations EMEA Massimiliano Vitale, believed that this dataset is going to help the progress of climate change actions and SDGs, and have an accelerating role for the EO ecosystem in Europe (RapidAI4EO 2023).

## **Partnership Ecosystem**

Planet has a valuable global ecosystem of partners which includes various solution providers, resellers that leverage Planet's data to create custom solutions, and GIS platforms that enable monitoring and analysis of the data. This network has been crucial for empowering their customers to take advantage of Planet's data and system by supporting their solution based

on the needs of the customers. The partnership forged in 2020 with Swift Geospatial, a South African firm specializing in forest management, set out how cutting-edge satellite technology can optimize forest management and significantly reduce unwanted forest destruction. By using Planet's imagery, Swift Geospatial provides weekly images comparing changes in forests to help their customers reduce needless destruction of forests and have more sustainable harvest operations (Mukuno 2020). The recently announced partnership with ERM, a global sustainable project consultancy, was also a highlight for both. Through Planet's data ERM is planning to be able to improve the evaluation of project impacts and provide tailored assessments for recently emerging EU regulations on deforestation (Newton 2023). One Tree Planted, an organization supporting forest restorations through connecting with locals in the areas, is another user for the collaborative product between Planet and Upstream Tech. Lens, Upstream's platform, collects satellite data from different EO image providers and offers it cheaper and more accessible which convinced One Tree Planted to switch from low-resolution free satellite data to Planet's imagery through Lens to monitor tree regeneration (Parks 2023). Monitoring manager of the organization, Ross Bernet underlined the most significant barrier for them is the lack of reliability and transparency for general reforestation programs therefore with Planet, they aimed to solve these issues.

Along with supporting the land conservation efforts of private companies, Planet aims to reduce the barriers to access to Earth imagery for mission-oriented non-profit organizations. With its Nonprofit Program, Planet provides high-resolution products at a discount and assistance mechanism to help expand the objectives of nonprofits (Rosa 2022). Organizacion Payipie Ichadie Totobiegosode (OPIT) is one of the organizations which Nonprofit Program allowed their goal to become a tangible reality. For their mission to combat the rapid deforestation occurring in Gran Chaco, an area that spans across Argentina, Bolivia, and Paraguay, and protect the biodiversity and the indigenous community living in the forests, OPIT

needed to detect livestock and agricultural companies in violation. Through Planet's Earth data, illegal logging activities and changes in the land have been detected the images have also been used as evidence for ongoing judicial cases including environmental crimes, property invasion, and destruction. Peter Sawatzky, a consultant at OPIT said they've decided to use Planet because it was the budget-friendly option for them which also provided flexibility for their use (Kim 2021). Amnesty International and Frankfurt Zoological Society are also organizations that rely on PlanetScope data to monitor wildlife for detecting illegal logging and land clearing for commercial purposes (Reichelt 2022; Parks, 2021). Even though most of Planet's partners are private organizations, partnerships between government bodies have also started to form. One of the firsts was the National Forest Management Institute of the Czech Republic to analyze the bark beetle epidemic that occurred in the forests of Czech in 2018 (Hortvik 2022).

## **Earth Observation Market**

During the last decade, the new space industry has been growing at an accelerated speed, becoming the central source for digital transformation (Giannopapa, Staveris-Poykalas and Metallinos 2022). One key driver of this transformation is the increasing number of private actors emerging with innovative approaches (CSTD 2020). Based on the Union of Concerned Scientists Database, 1168 EO satellites were orbiting in January 2023 and almost 50% were commercial satellites (Union of Concerned Scientists 2023). The global earth observation market was worth around \$17 billion in 2022 and the US is taking up the biggest piece with around 32% (Euroconsult n.d.). The market is expected to grow at a CAGR of 7% (Spherical Insights 2022), yet, it seems that earth observation technologies are still in the early phases of the adoption curve (Ravichandran 2022). Lack of awareness of the benefits or financing for these technologies especially in developing countries, and gaps between technology and user skills are the continuing bottlenecks (UNCTAD 2021). Although technologies such as spaceborne LIDAR which can measure vegetation and canopy height, EO data products, and

synthetic EO data are expected to reach the "plateau of productivity" at least in 10 years (Exhibit 8), solutions powered by EO are proving its importance.

## **Forestry Landscape**

The United Nations has recognized that space technologies are essential for managing natural resources (UNCTAD 2021, 7) and particularly earth observation as an enabler for the Sustainable Development Goals (Kavvada, et al. 2020). At the national and regional level, policies and developments to advance upstream such as infrastructure, and downstream such as platforms for geospatial data, are supported to achieve SDGs (ECOSOC 2020). On the global scale, the UN's Global Geospatial Information Management (GGIM) committee and Group on Earth Observations (GEO) have been working towards the availability and use of geospatial data (Sachs, et al. 2023, 89). EO4SDG initiative of GEO and Copernicus program of the European Union have been the early initiatives with the mission of advancing the effective use of EO for SDGs. While several digital efforts centered on the environment and the sustainable use of natural resources are expanding, their coordination, guidance on effective use, and calls to action directed for the SDGs are needed particularly for regions with limited access to resources (UNEA 2019, 5).

EO as the enabler, 16 out of 17 SDGs in different levels of coverage for their indicators can be directly measured or indirectly supported (EO4SDG 2023, 26). In fact, one of the most contributed goals is 15: Life on Land which is “primarily focused on sustainable forest management, slowing and reversing land and natural habitat deterioration, successfully battling desertification, and reducing biodiversity loss” (UNEP n.d.). From its set of 12 targets and 14 indicators (Exhibit 9), EO technologies can contribute to 8 targets and 5 indicators (Exhibit 10). The linkages weren't unexpected since forest mapping applications have been carried out since the first landmass monitoring satellite Landsat 1 launched in 1972 (Frédéric and Hansen 2016, 40). Nowadays forest stakeholders can access a wide range of data on forest management,

temperature and soil, tree species spread, and health (Reitz 2023), as well as products and services for applying the information from geospatial data. The value chain consists of infrastructure and data providers in the upstream segment, platforms, EO products and services, and information providers in the downstream segment (Exhibit 11).

While the forestry segment is still concentrated, the players are expected to increase with ongoing regulations and enforced policies for reducing emissions from deforestation such as the EU Deforestation-free Products Regulation (EUDR) came into force on June 2023 (European Commission n.d.). Similarly, sharing the mission of SDG 15, EU Corporate Sustainability Reporting rules, The Forest Deal agreement, and financing initiatives such as Reducing Emissions from Deforestation and Degradation (REDD+) are shifting the dynamics of capital flows for saving the planet (EUSPA 2022). In this evolving ecosystem, Planet seized the opportunities with its move to acquire Salo Sciences at the beginning of 2023.

## **Expansion Through Acquisitions**

Over the years, Planet successfully followed acquisitions to their growth strategy that accelerated their innovation capabilities and enhanced their product offerings. In 2015, they closed their first strategic acquisition of BlackBridge group which allowed them to operate RapidEye satellites and now, making Planet the owner of one of the largest commercial imagery archives. In 2017, Planet acquired Terra Bella from Google with the SkySat satellite constellation in return Google received an ownership share in Planet as part of the transaction, as well as a multi-year arrangement to purchase SkySat image data. Boundless Spatial, a geospatial data software solutions firm was the third acquisition in 2019 to assist strengthen Planet's data subscription solutions. In 2021, Vander Sat, an emerging player from the Netherlands provided earth data and analytics that focus on water management and crop health (Skybrokers n.d.). The last two moves came in 2023 with Salo Sciences in January, a climate technology solutions company (Businesswire 2023), and in March, Sinergise Labs, a Slovenian

start-up that makes cloud-based Earth observation APIs (Werner 2023). Acquisition of Salo Sciences was seen as a critical step towards advancing Planet's land and forest monitoring technologies, carbon mapping applications, efforts on decoupling deforestation from the production of commodities, and improving measurement, reporting, and verification (MPV) for Reduced Emission from Deforestation and Forest Degradation (REDD+) (Schingler and O'Shea 2023). When announcing the acquisition, Marshall was already hinting at the new direction of technology development they were envisioning. He continued his statement with "The combined technologies of Salo and Planet are foundational for enabling accurate estimations of forest carbon which will help to understand conserving lands and biodiversity on a large scale" (Businesswire 2023).

### **New Product Launch: Forest Carbon Diligence**

Combining the fresh know-how of Salo Sciences and Planet's PlanetScope data, Marshall and his team dived into the possibilities of what they could create. After months of modeling and validating Forest Carbon Diligence was ready to go live. With this new product, they were hoping to solve the long-lasting challenges of assessing information about forest carbon stocks. In November 2023, they launched a product that can estimate the above-ground forest carbon along with tree canopy height cover (Exhibit 12) of any forest on the planet (Businesswire 2023). Produced by machine learning models that use historical satellite imagery archives at 30-meter resolution starting from 2013 and global Airbourne LiDAR reference data, Forest Carbon Diligence was able to accurately calculate the carbon levels (Exhibit 13). This model offers critical insight into deforestation since the economic cost can be quantified through the loss of carbon (D'Angelo 2019). The price set to be \$0.1 per hectare which included all three data layers of canopy height, canopy cover, and aboveground live carbon (Planet Labs n.d.).

Planet believed that this product is going to help companies, policymakers, and carbon

project developers to transparently quantify the real impact of deforestation, understand the sustainability of supply chains, improve compliance with regulations such as EUDR, and reduce risks in quality by estimating more accurate outcomes for carbon projects. “This is particularly crucial since new laws require businesses and nations all around the world to balance their carbon. To begin addressing this problem, objective metrics must be obtained. In that sense, Planet is certain to help the acceleration of sustainability transformations of global economies” says Marshall (Businesswire 2023). Since the launch, Planet already gained an important partner, BeZero Carbon which is a global ratings agency for the voluntary carbon market (VCM). This partnership is seen as the most comprehensive collaboration in the field of carbon rating (BeZero Carbon 2023). BeZero powered by Planet datasets, plans to measure the level of carbon credit that can be accounted for their customers’ projects. “Our state-of-the-art geospatial analysis and methodology will benefit greatly with Planet's Forest Carbon information for helping people make more educated investment decisions for carbon credits.” The director at BeZero Carbon, Phil Platts states about the partnership (Businesswire 2023). For the next year, they are planning to launch the next version of the product Forest Carbon Monitoring which can offer quarterly updates of up-to-date images at 3 meter resolution. With the 3-meter monitoring data, Planet aims to detect changes at the individual tree level to help measure forest degradation at unprecedented accuracy. This next version of the product is planned to be sold at \$0.25 per hectare (Planet Labs n.d.). Looking at the recent shifts in the market and their product offering, the team is confident that Forest Carbon Diligence is going to be successful.

## **Challenges on The Horizon**

Planet positioned its data and analytics services with the dominant trends in the global economy: digital and sustainability transformation, and they believe in \$100 billion market potential in 2027 as a result of these changes (Moor Insights & Strategy 2021, 12). But made

their primary purpose to create a positive impact on our planet and to establish sustainable approaches to environmental and humanitarian challenges. Planet committed to this mission when it decided to go public as a public benefit corporation (PBC) through a merger with dMY Technology Group IV in 2021 (Planet Labs 2021). Becoming a PBC was an important milestone for Marshall which meant engraving their mission of "*accelerating humanity towards a sustainable, secure, and prosperous future by helping for environmental and social change*" into Planet's DNA as part of their fiduciary obligation to investors (Planet Labs 2023). With this deal, Planet was able to further invest in expansion strategies for new industries, new software development, and data products powered by machine learning (Planet Labs 2021). At the same time, becoming a public benefit company put Planet at risk of hurting the company's financial performance because they now have the fiduciary duty to consider not only maximizing stockholders' value but also their public benefit purpose and other stakeholders impacted by Planet's decisions. Until that point, Planet had a consistent record of operating losses and following the merger, this trend continued with net losses persisting and even escalating. At the fiscal year ended in January 2023, \$162 million of net loss was reported which was 18% higher than the last fiscal year (Exhibit 13).

At the most recent investor day Planet hosted on October 2023, the CFO Ashley Fieglein Johnson stated, "The fiscal year 2024 has been challenging in many respects from elongated sales cycles, heightened solar activity resulting in accelerated depreciation of our satellites, and a headwind of growth related to loss of larger commercial accounts." (Planet Labs 2023) While revenue has grown in recent years, Planet is not certain that can generate enough revenue or achieve profitability in the future (Planet Labs 2023). As a result, Planet had to lay off 117 of their employees recently. "When we went public eighteen months ago, we entered a new style of operation. To increase our market opportunity, it involved filling up the gaps in team structures that were previously understaffed and taking on a variety of new initiatives," said

Marshall when he announced the news (Planet Labs 2023). Planet scaled their operations too quickly and is still growing at a rapid speed, but in other ways, they have slowed down because of the expense and complexity of the additional projects.

From the introduction of their latest product and the completion of the first demonstration satellite of their next-generation Pelican fleet (Businesswire 2023), Planet anticipates a further escalation in their costs. Faced with recent layoffs, ongoing financial challenges, and continued expansion efforts, the questions arise: Can Planet sustain its operations and navigate through these turbulent times? Will the launch of the new product lead to success and help to reduce deforestation, or will it fall short and potentially worsen Planet's financial challenges? All in all, as we approach the 2030 Agenda deadline, can Planet's efforts make a meaningful difference in our planet's rescue? Have we gone past the point where we can't go back?

# Teaching Note: Planet Labs Case Study

## Case Synopsis

This pedagogical case study was developed under the field lab “The Business of Space” at Nova School of Business and Economics. The case explores a US-based geospatial data company Planet Labs’ journey from founding as a startup in the new space industry to the company's growth and expansion strategies over the years, and the impactful activities of the company toward the United Nations' Sustainable Development Goals specifically focusing on their contributions for SDG 15: Life on Land. Passionate founders of 'Planet' embarked on the mission to “help life on Earth” which led them to become one of the pioneering earth observation satellite companies in the industry, providing continuous daily geospatial images and analytical solutions to more than 34,000 users. Planet created several solutions for forest monitoring and analysis operations of governments, non-profits, private companies, and publicly available datasets supporting the cause to end deforestation. The case further dives into the current shifts happening in the ecosystem of forestry and highlights the drivers of sustainability transformation in land use. Sensing these changes and believing in the urgency to catalyze actions toward sustainable forest management, Planet launched a new product named Forest Carbon Diligence. Although the team is confident with the value this product is creating for customers and the environment, Planet is facing market adoption and financial risks that can challenge the company's long-term viability.

## Research Method

This case is based on a real publicly traded company called “Planet Labs PBC” based in California, United States, and all names and job titles represented in the case exist. All data and information mentioned in the case were obtained from publicly available resources which include published company reports, news articles, videos, webpage contents, scientific research papers, and databases.

## Teaching Objectives

The initial purposes of this case study are 1) to introduce the students to an innovative new space startup's different business operation and its transformation to a growing company with social benefit purposes, 2) to advance students' knowledge on global environmental and social challenges and UN Sustainable Development Goals. Moreover, the case aims for students to interpret the interconnectivity of business strategies and impact creation by applying theoretical and practical frameworks to analyze sustainable business solutions. Furthermore, the idealistic goal is to inspire the students to gain a responsive approach to societal and environmental challenges and incorporate the dimension of impact for their encountered future business projects. The case study is designed with the following pedagogical objectives:

- A. Understanding how companies can create business strategies through achieving social and environmental impact and applying models to explain the causal links.
- B. Investigating the global challenge of deforestation and the current solution landscape to identify the impact gaps for business opportunities.
- C. Evaluating the business strategy and long-term viability of a public benefit corporation.

The case follows a multidisciplinary structure, referring to three different frameworks to interpret each of the objectives. Objective A is suggested to be analyzed through the “Theory of Change”, a methodology for “backward mapping” (EPRM n.d.) the project steps starting from the desired outcome and linking back to the early stages of progress (Weiss 1995). Objective B is suggested to be analyzed by the “Impact Gaps Canvas”, a practical tool for understanding the ecosystem of challenge and assessing the possible gaps for solutions (Papi-Thornton n.d.). Objective C is suggested to be analyzed by four principles of business strategy evaluation (Rumelt 1980). The case offers the adaptability to construct the level of scope and analysis for the objectives, and applicability to different areas of focus for business and management courses. Objectives of the case study can be elaborated separately or together

depending on the objectives of the instructed course. Suggested educational fields for this case study in relation to the theoretical and practical frameworks include Sustainable International Business, Technology Strategy, Applied Social Entrepreneurship, Design Thinking for Social Innovation, Fundamentals on Environment and Sustainability, and Sustainability Evaluation of Policies, Plans, and Projects.

## **Suggested Readings**

The following list provides the suggested readings for the case study:

Rumelt, Richard. 1980. "The Evaluation of Business Strategy." In *Business Policy and Strategic Management 3rd Edition*, 1. McGraw Hill Publishing.

Weiss, Carol Hirschon. 1995. "Nothing as Practical as Good Theory: Exploring Theory-Based Evaluation for Comprehensive Community Initiatives for Children and Families." In *New Approaches to Evaluating Community Initiatives. Concepts, Methods, and Contexts. Roundtable on Comprehensive Community Initiatives for Children and Families*. Aspen Institute.

## **Assignment Questions**

The suggested assignment questions offer the analysis of the case in an integrated scheme by encouraging the students to find the connecting information in the case with the suggested theoretical and practical frameworks. Also, the questions challenge the students to generate new ideas/recommendations/assumptions regarding each discussed scenario. The suggested assignment questions follow:

1. As the impact manager at the company, analyze Planet's "Theory of Change" for the Sustainable Development Goal 15: Life on Land.
2. Being in the product team of "Forest Carbon Diligence", investigate the opportunities to create impact by evaluating the market using the "Impact Gaps Canvas" before the product launch. Are there any opportunities/obstacles that need to be considered?
3. Evaluate Planet's current business strategy and facing risks. Is Planet consistent, in consonance, holding its advantage, and feasible in the long term?

## Case Analysis

### Question 1: Theory of Change

The Theory of Change (ToC) methodology has been discussed widely in academia for evaluating interventions under terms including *program theory*, *action theory*, *outcome pathway*, and *logic model* (Mayne 2015). Weiss familiarized the concept of evaluating social programs and initiatives by mapping the causal steps to achieve the true impact of the program (1995, 73). This method of determining the primary activity of the initiative and the desired long-term outcome allows to design of the involved processes and to development of an action plan to reach its desired results (Source, 16). Even though ToC methodology doesn't limit how to apply the method under a distinct structure, it is suggested to determine the following components of a program in order: desired goal (impact), outcomes, outputs, activities, inputs, assumptions, and risks (EPRM n.d., 2-3) For the detailed descriptions of the components of Theory of Change, see Figure 1. Regarding this assignment question, the students are not limited to the design and format of how to construct their own ToC map, but it is expected to provide the components of ToC and are encouraged to develop original structures for their map. To visualize how to construct a ToC map, students can review the example in Figure 2.

Desired goal (Impact): End deforestation and land degradation in tropical forests to mitigate climate change by the 2030 Sustainability Agenda.

Outcomes: To achieve the desired end goal several actions, must be considered for hindering and supporting actors. Long-term outcomes include regeneration efforts for previously deforested areas being integrated into supply chains, main commodity production supply chains being transformed to sustainable practices, illegal logging activities being monitored and prevented before deforestation occurs, and policies and regulations for deforestation activities being effectively applied. Medium-term outcomes include companies adjusting internal policies according to supply chain actors' actions and committing to choosing

sustainably sourced products, commodity goods producers harmonizing to conduct sustainable production activities and adopt best practices, and local authorities enforcing effective forest management. Lastly, short-term changes include relevant technologies and processes being made available to assess deforestation, collaborations between technology providers, policymakers, supply chain actors, and local groups being recognized, and sensitiveness towards deforestation being acknowledged by supply chain actors and administrators.

Outputs: From the determined changes to realize the end goal, Planet develops the following outputs: Developing an innovation strategy to support processes in forestry management, building an integrated ecosystem to increase the engagement of stakeholders, and fostering mechanisms for advancing the sustainable transformation of supply chain actors.

Activities: To achieve these results, Planet sets the activities including development of new technologies to improve forest management and measurement of deforestation effects, promote partnership-based customer relationships to enhance mutual capabilities, support government initiatives and non-profit organizations to help current mitigation activities, coordination with local groups to extract local insights, publish successful use cases to demonstrate solution applications, support initiatives that enhance the achievements of SDGs, host events for increasing the awareness on current societal and environmental challenges, facilitate customer and partnership support system to advance integrations.

Inputs: The inputs include budget and workforce allocation for research and development of technologies and communication operations, technology infrastructure, and partnership integration personnel.

Assumptions: The assumptions made under this theory of change include the current perception of supply chain actors hindering environmental challenges and rather than focusing on profit maximization, advancing technological capabilities on forest management will be improving the deforestation efforts.

Risks: The potential risks that need to be considered are insufficient support from local authorities and government agencies, slower adoption of new technological advancements among forestry stakeholders, and developed technologies that may not be capable of offering expected solutions but rather burden current management systems.

## Question 2: The Impact Gaps Canvas

The Impact Gaps Canvas (IGC) has started to increasingly be accepted in programs and research such as social entrepreneurship accelerator programs and ideation competitions (Systems-led Leadership n.d.). Creator Papi-Thornton explains it as a useful tool for anybody seeking to understand the scope of an issue and determine the potential ways how to solve that challenge. The structure of the IGC is defined in three parts: challenge mapping, solution mapping, and impact gaps. To interpret a problem, IGC suggests understanding the dynamics of the challenge landscape at first then following with mapping the current available solutions. The conclusion is made by identifying the gaps in between to evaluate the obstacles, key opportunities, and possible action points. For further details of the tool, students are encouraged to review Figure 3.

Challenge Mapping: Deforestation remains a critical global challenge that accelerates the greenhouse effects on the atmosphere and creates a domino effect on climate change including global temperature, gas emission, and sea level rises. Over the next ten years, if deforestation continues to increase at the same level, it is projected to become a prominent global risk. The devastating results can be understood since from 2021 to 2022, 10% of tropical forests have been lost and the progress on SDG 15 shows that in all geographical regions, it remains a major challenge with stagnating progress. 75% of the targets are not met and 5 out of 12 targets (15.1 to 15.5) are directly associated with deforestation referred from Exhibit 9. Current measures taken by governments are inefficient in reducing deforestation and primary causes with almost 80% of deforestation occurring from agricultural and industrial tree

plantation operations. Almost half of the global tropical deforestation is happening in Brazil and Indonesia, followed by Latin America and Africa taking around 20% and 17% respectively referred from Exhibit 1.

Solution Mapping: Due to the landmass scale of forests, understanding the health and conditions regarding forests was challenging before satellite technologies were limited. First forest mapping projects started to form in the US around the 70s with the launch of earth observation satellites however, satellite data was in service for mostly governmental organizations in the old space times. With the commercialization of space, forest managers more gained access to satellite imagery and currently, various applications are offered in the market such as forest monitoring, deforestation detection, and initiatives such as NICFI program which allows free access to global forest imagery. The capacity of current technologies can provide daily geospatial images of Earth such as Planet's platform, yet access to high-resolution data and awareness for these technologies is yet to be lacking, and measuring the effects of deforestation is still a challenge. Although the solutions offered in the market seem to be centered around a couple of providers including Planet, acceleration in the market growth is expected with REDD+ financing mechanism and governments imposing sustainability regulations such as the Deforestation Act and obligatory sustainability reporting for companies. These initiatives seem to be increasing in Europe therefore the acceptance of deforestation solutions may be latened in other regions.

Impact Gaps: For the product team, it is recommended to consider the several gaps identified gaps between the challenge and solution landscape. The regions where there are fewer regulatory initiatives compared to Europe, particularly Latin America require further focus on law enforcement and international cooperation. Incentives such as REDD+ and regulations in Europe are expected to drive the need for reliable sustainability reporting systems in the private sector. Since agricultural and industrial plantations continue to be the primary cause of

deforestation, stimulating the sustainable transformation of agricultural practices and supply chains, also measuring the economic effects of deforestation will become critical. While earth observation technologies have been advancing, the gap in widespread accessibility to these resources especially in developing countries continues to be visible.

### Question 3: Rumelt's Strategy Evaluation Principles

Principles of evaluating a business strategy published by Rumelt in 1980, continue to be widely recognized and accountable even though as he explains, "generating business strategies have dramatically changed since then" (McKinsey & Company 2007). He suggests that to guide an enterprise, evaluating the business's strategy is a crucial step, and proposes four criteria to analyze the long-term continuity of businesses which are consistency in goals and policies, adaptability to the environment, possession of a competitive advantage, and feasibility of operations (Rumelt 1980).

Consistency: Planet presents to be consistent with its public benefit mission, business operations, product and service offerings, and perceived support from the management. Planet has been following a low-cost, superior product and services strategy throughout their portfolio which allows them to manage customer expectations and follow a subscription-based monetization and land-to-expand sales strategy. Planet, as a nature, is obligatory to "accelerate sustainable transformation" of society and all stakeholders involved. The company is accountable within its internal policies, initiatives, and collaborations to support this mission.

Consonance: Planet holds a competitive position in the earth observation market through building high innovation capacity and following strategic acquisitions to advance its moats. Although Planet is confident to have a leading position compared to competitors, the financial well-being of the company needs to be analyzed. The company's revenues haven't reached the growth as forecasted, followed by expected increases in costs. Consecutive net losses with the current state of market adoption signal a threat for the company. Planet is advised

to evaluate business operations or investment decisions that offer insufficient value to mitigate the risk. Although in the short-term the company can continue with operations, in the long-term Planet may become incapable of sustaining its capacity and be exposed to attacks from competition.

Advantage: Planet has a competitive advantage over its competitors by holding an early mover advantage with its superior imaging capacity and historical imagery archives. Since images can't be produced by any other system, it is believed that Planet will continue to hold this advantage. Planet's current operating satellite fleet also puts the company in a good position since obtaining the same levels of infrastructure requires high investment capabilities hence the barriers to developing the same capabilities as Planet is high.

Feasibility: Planet possesses a valuable innovation culture and a strong management team which supports the company's feasibility in the long-term. However, the financial instability is posing a risk for holding a strategic position over time. The recent occurrence of employee layoff signals another risk for maintaining their business operations. If the company continues to lose skillful employees, Planet may face the risk of downsizing operations.

## **Teaching Plan**

The following teaching plan suggests covering the case study in a single lecture of 120 minutes. Subject to the course structure, number of enrolled students, teaching methods, selected focus area for objectives, or the level of theoretical knowledge, the following structure of the teaching plan is customizable. It is advised for the instructors to share the case study, suggested readings, and supplementary materials with the students before the lecture to increase engagement in the session.

### **1. Introduction (20 minutes)**

The session starts with a quick review of the Sustainability Development Goals and discussions on students' familiarity with the SDGs. The discussion then be followed by methods of creating

impact and bridged with the introduction of frameworks and theories which will be used to answer the assignment questions. Lastly, follow with the introduction of the case and start an interactive discussion about general information about Planet Labs' and its sustainability mission.

## **2. Group Formation and Assignment Explanation (10 minutes)**

Students are formed into sets of groups of 3 to 5 depending on the number of students. After the groups are formed, explain the assignment questions, and give time for the students to decide on one of the questions they want to select to analyze as a group. After the selections are completed, explain the time frame for the group work. With their group, students are expected to analyze the chosen assignment question collaboratively and develop a 5-minute-long presentation for their answer.

## **3. Case Study Session (45 minutes)**

In this part, students will work with their group members to prepare for the presentation. The instructor is advised to check on each group's progress and answer if any questions arise.

## **4. Group Presentations (35 minutes)**

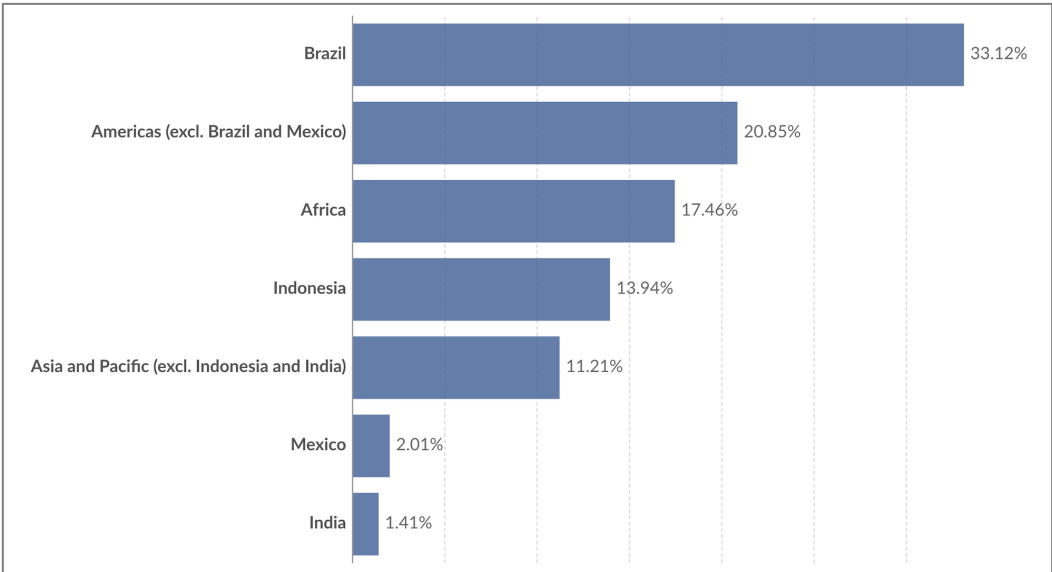
In this part, each group will present their answers followed by a Q&A time for the students and the instructor to ask questions about the group's interpretation of the assignment. Depending on the number of groups formed, the time frame is advised to be adjusted. With the presentation and Q&A, for each group, approximately 7 minutes should be considered.

## **5. Conclusion (10 minutes)**

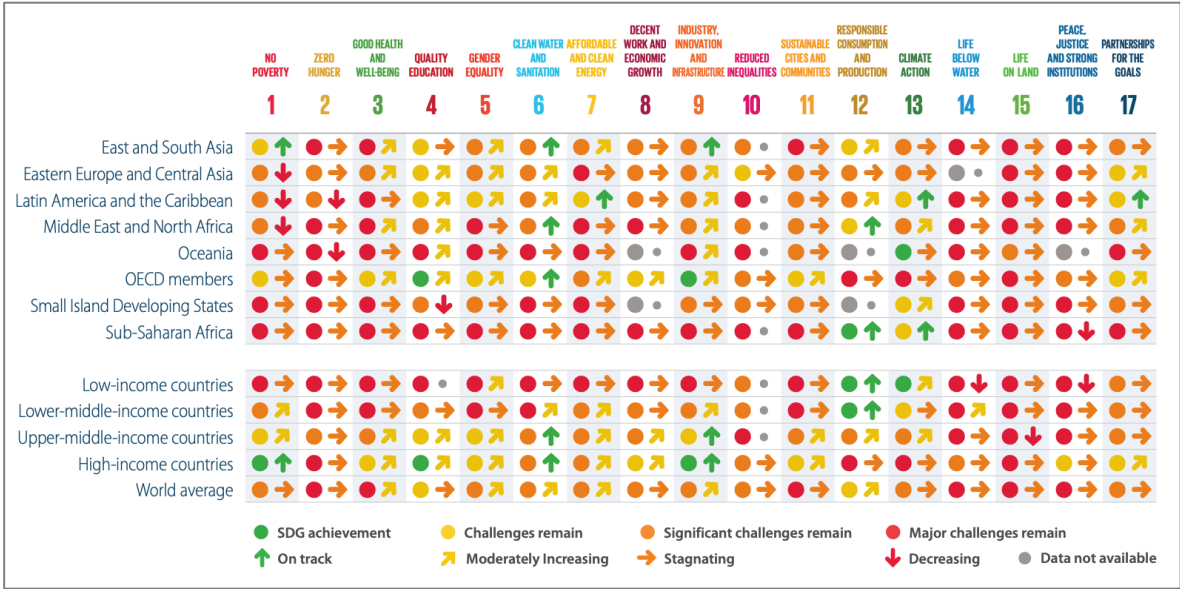
The instructor summarizes the key takeaways from each of the applied theoretical frameworks and the case of Planet Labs. To reinforce the learnings from this case study, similar case studies suitable for linking SDGs, ToC, IGP, or strategy evaluation can be shared with the students. Depending on the course structure, the instructor can provide a written bonus assignment for students to further elaborate on the concepts underlined in this case study.

# Case Study Appendix

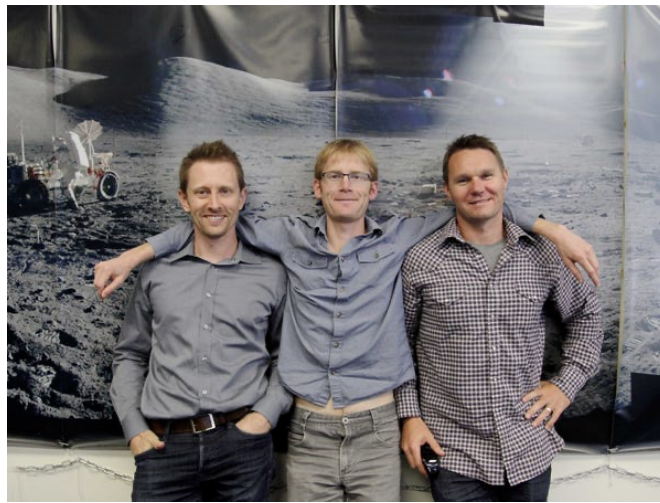
**Exhibit 1:** Share of tropical deforestation from commodity production between 2010-2014 (Richie 2021)



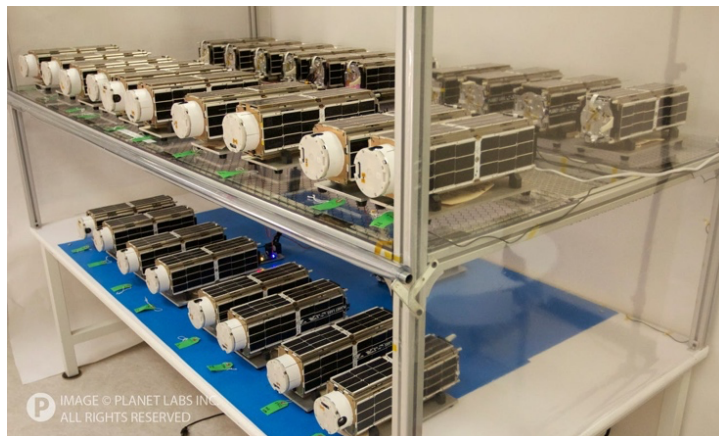
**Exhibit 2:** 2023 SDG Dashboard by Region and Income Group (Sachs, et al. 2023, 89)



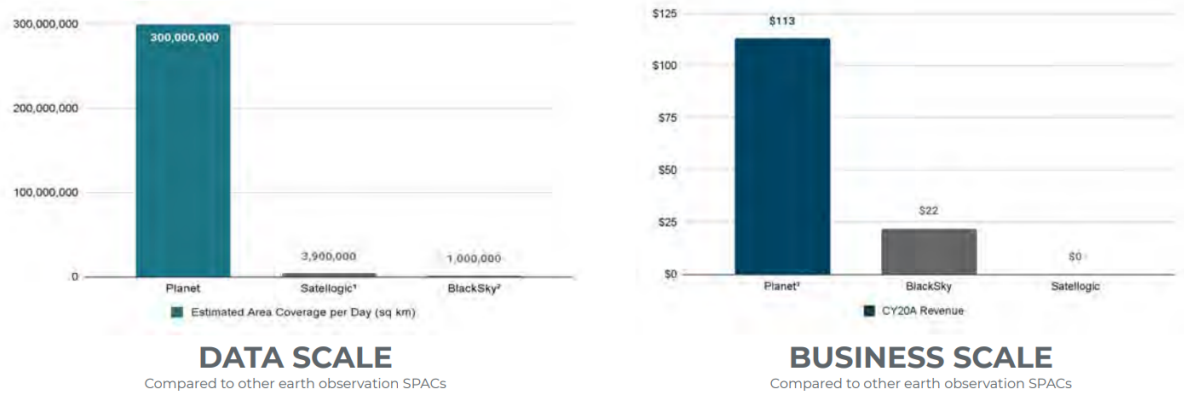
**Exhibit 3:** Will Marshall, Robbie Schingler, and Chris Boshuizen (Bort 2013)



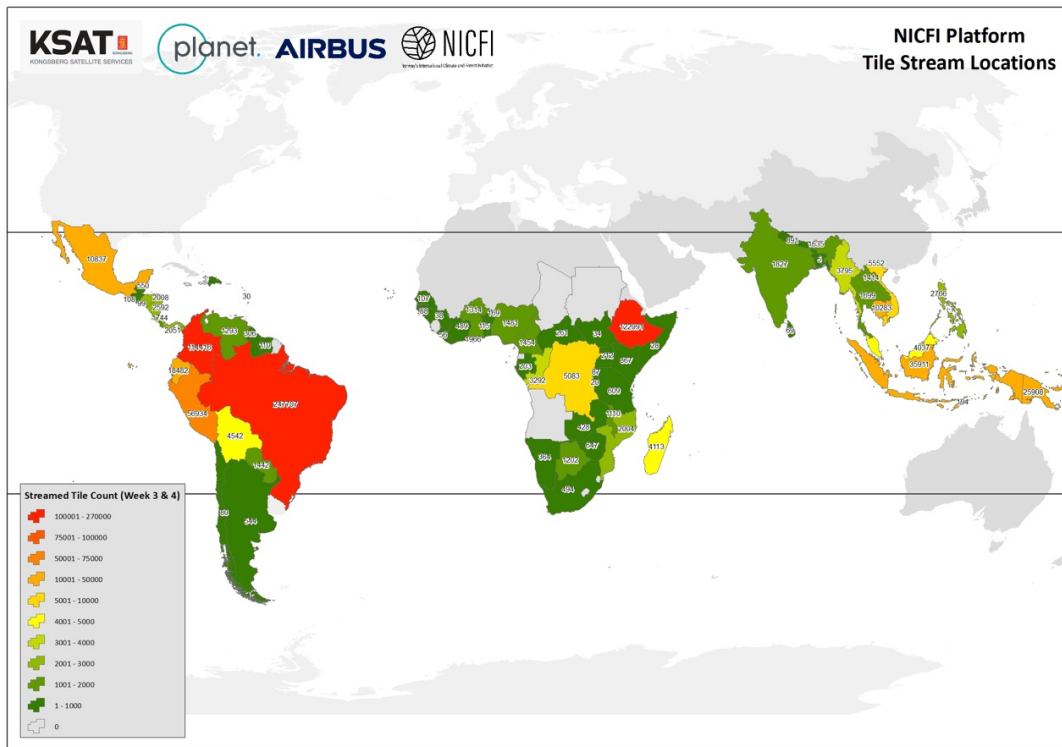
**Exhibit 4:** Dove 1 and Dove 2 Satellites (Bort 2013)



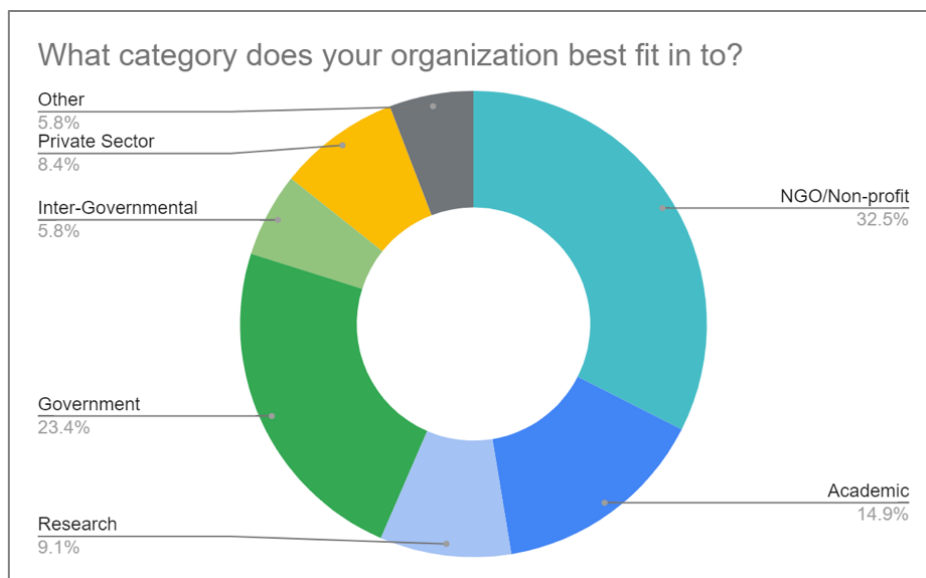
**Exhibit 5:** Comparison between Planet Labs PBD and Competitors (Planet Labs 2021)



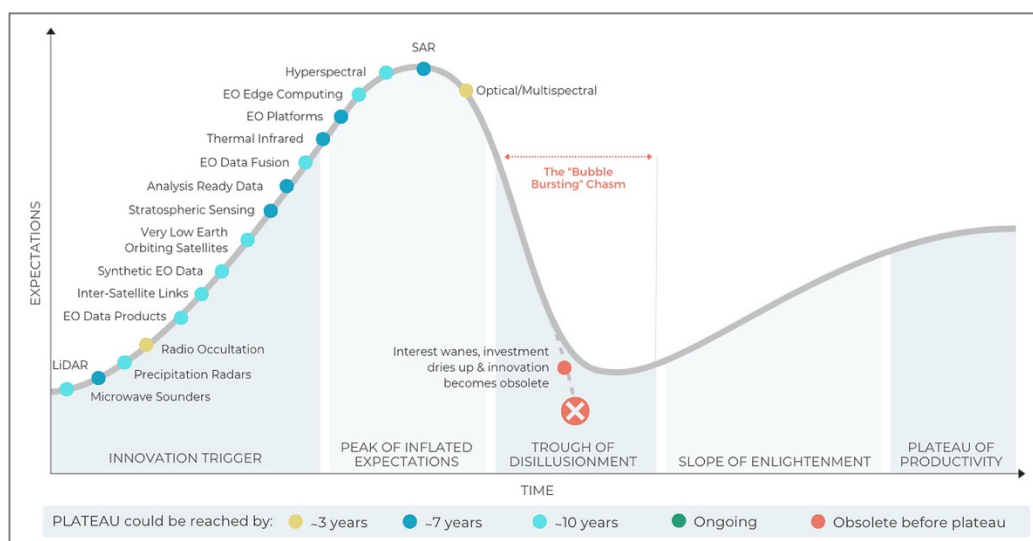
**Exhibit 6: NICFI Platform Tile Stream Locations (O’Shea 2021)**



**Exhibit 7: NICFI User Survey (O’Shea 2022)**



## Exhibit 8: Earth Observation Technology Hype Cycle (Ravichandran 2023)



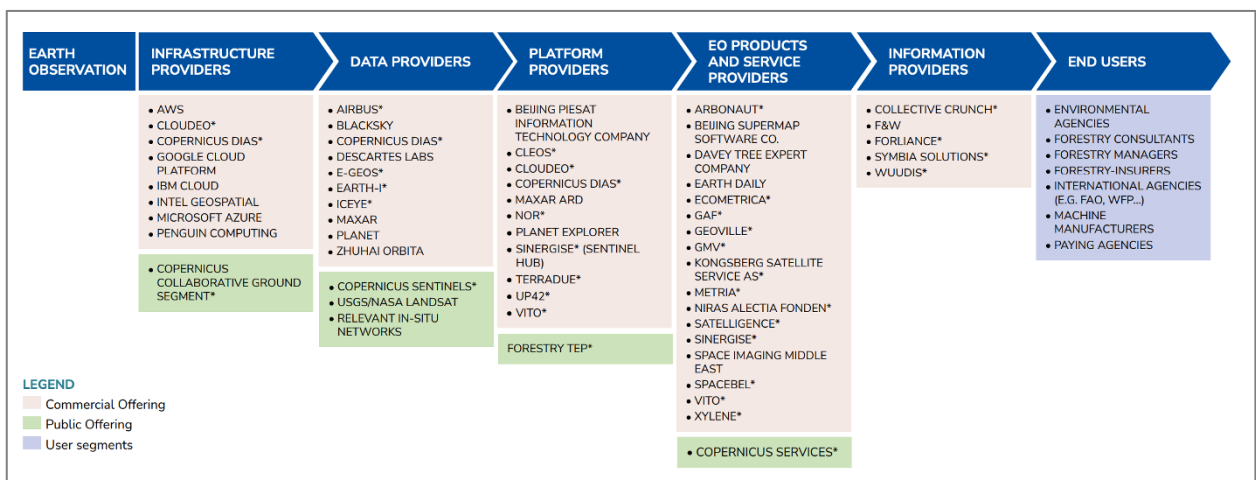
## Exhibit 9: SDG 15 Targets and Indicators (Paganini and Petiteville 2018)

Targets	Indicators
<b>15.1</b> By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains, and drylands, in line with obligations under international agreements.	<b>15.1.1</b> Forest area as a proportion of total land area.
<b>15.2</b> By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.	<b>15.1.2</b> Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type. <b>15.2.1</b> Progress towards sustainable forest management.
<b>15.3</b> By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought, and floods, and strive to achieve a land degradation-neutral world.	<b>15.3.1</b> Proportion of land that is degraded over total land area.
<b>15.4</b> By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, to enhance their capacity to provide benefits that are essential for sustainable development.	<b>15.4.1</b> Coverage by protected areas of important sites for mountain biodiversity. <b>15.4.2</b> Mountain Green Cover Index.
<b>15.5</b> Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.	<b>15.5.1</b> Red List Index.
<b>15.6</b> Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed.	<b>15.6.1</b> Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits.
<b>15.7</b> Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products.	<b>15.7.1</b> Proportion of traded wildlife that was poached or illicitly trafficked.
<b>15.8</b> By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species.	<b>15.8.1</b> Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species.
<b>15.9</b> By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.	<b>15.9.1</b> Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011-2020.
<b>15.a</b> Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems.	<b>15.a.1</b> Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems.
<b>15.b</b> Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation.	<b>15.b.1</b> Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems.
<b>15.c</b> Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities.	<b>15.c.1</b> Proportion of traded wildlife that was poached or illicitly trafficked.

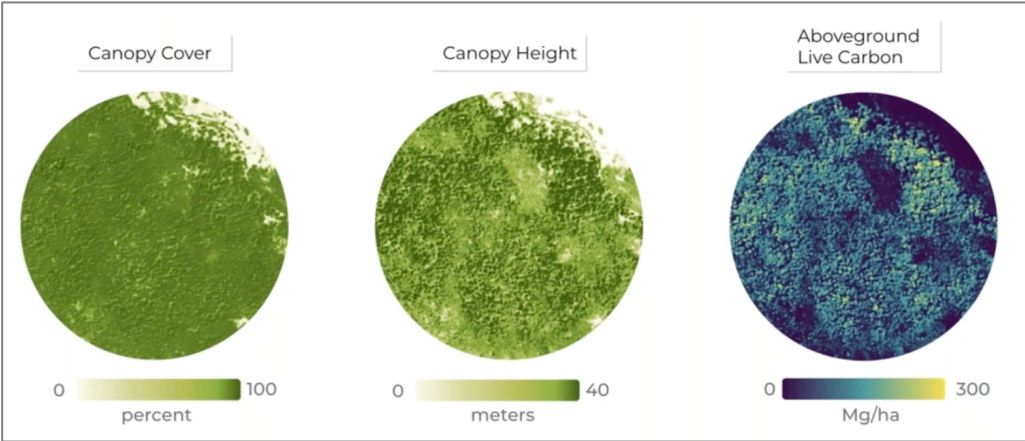
**Exhibit 10: Earth Observation in Service of the Agenda 2030 (EO4SDG 2023)**

Sustainable Development Goals															
Earth Observations in Service of the Agenda 2030															
Target								Goal	Indicator						
Contribute to progress on the Target yet not the Indicator per se									Direct measure or indirect support						
							1.4	1.5	1	1.4.2					
							2.3	2.4	2.c	2.4.1					
				3.3	3.4	3.9	3.d		3	3.9.1					
									4						
								5.a	5	5.a.1					
	6.1	6.3	6.4	6.5	6.6	6.a	6.b		6	6.3.1	6.3.2	6.4.2	6.5.1	6.6.1	
					7.2	7.3	7.a	7.b	7	7.1.1					
								8.4	8						
				9.1	9.4	9.5	9.a		9	9.1.1	9.4.1				
					10.6	10.7	10.a		10						
	11.1	11.3	11.4	11.5	11.6	11.7	11.b	11.c	11	11.1.1	11.2.1	11.3.1	11.6.2	11.7.1	
				12.2	12.4	12.8	12.a	12.b	12	12.a.1					
					13.1	13.2	13.3	13.b	13	13.1.1					
		14.1	14.2	14.3	14.4	14.6	14.7	14.a	14	14.3.1	14.4.1	14.5.1			
	15.1	15.2	15.3	15.4	15.5	15.7	15.8	15.9	15	15.1.1	15.2.1	15.3.1	15.4.1	15.4.2	
								16.8	16						
17.2	17.3	17.6	17.7	17.8	17.9	17.16	17.17	17.18	17	17.6.1	17.18.1				

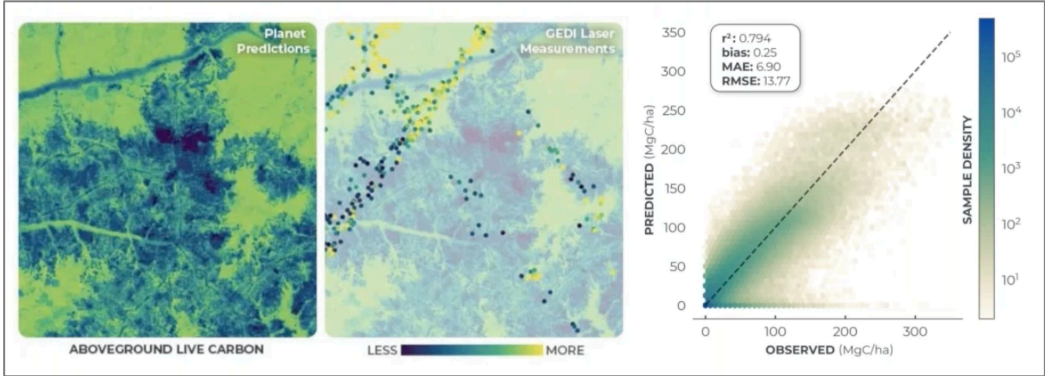
**Exhibit 11: Forestry Value Chain (EUSPA 2022)**



**Exhibit 12: Forest Carbon Diligence Data Layers (Planet Labs n.d.)**



**Exhibit 13: LiDAR Data Validation**



**Exhibit 14: Planet Labs PBC Income Statement for the fiscal year ended in January 31, 2023 (Planet Labs 2023)**

	Year Ended January 31,		\$	%
	2023	2022		
<i>(in thousands, except percentages)</i>				
Revenue	\$ 191,256	\$ 131,209	\$ 60,047	46 %
Cost of revenue	97,248	82,987	14,261	17 %
Gross profit	94,008	48,222	45,786	95 %
Operating expenses				
Research and development	110,916	66,684	44,232	66 %
Sales and marketing	78,020	52,917	25,103	47 %
General and administrative	80,747	56,672	24,075	42 %
Total operating expenses	269,683	176,273	93,410	53 %
Loss from operations	(175,675)	(128,051)	(47,624)	37 %
Debt extinguishment gain (loss)	—	(1,690)	1,690	(100)%
Interest income	7,672	21	7,651	36,433 %
Interest expense	—	(8,772)	8,772	(100)%
Change in fair value of convertible notes and warrant liabilities	6,554	5,726	828	14 %
Other income (expense), net	330	(2,248)	2,578	(115)%
Total other income (expense), net	14,556	(6,963)	21,519	(309)%
Loss before provision for income taxes	(161,119)	(135,014)	(26,105)	19 %
Provision for income taxes	847	2,110	(1,263)	(60)%
Net loss	\$ (161,966)	\$ (137,124)	\$ (24,842)	18 %

The table below reconciles our net loss (the most directly comparable U.S. GAAP measure) to Adjusted EBITDA for the periods indicated:

<i>(in thousands)</i>	Year Ended January 31,	
	2023	2022
Net loss	\$ (161,966)	\$ (137,124)
Interest expense	—	8,772
Interest income	(7,672)	(21)
Income tax provision	847	2,110
Depreciation and amortization	43,330	45,043
Debt extinguishment (gain) loss	—	1,690
Change in fair value of convertible notes and warrant liabilities	(6,554)	(5,726)
Stock-based compensation	75,544	41,956
Other (income) expense	(330)	2,248
Adjusted EBITDA	\$ (56,801)	\$ (41,052)

## Teaching Note Supplementary Materials

**Figure 1:** Elements for Theory of Change (EPRM n.d.)

Element	Guiding Question	Explanation
<b>Desired end-goal (Impact)</b>	What do we want to achieve?	Impact is usually a long-term result, and it may not be achievable even during the life cycle of the project.
<b>Outcomes</b>	What change do we want?	Outcomes can be considered as mid-term results. Outcomes often take time to emerge, they are not seen immediately after the end of the activity. These changes must be reasonably linked to your activities.
<b>Outputs</b>	What do we produce or provide?	Outputs are the short-term results which are achieved immediately after implementing an activity. Outputs tell the story of what you produced or organized. They are under your direct control.
<b>Activities</b>	What do we do?	Activities are the things we do or implement. They can be expressed by a verb (e.g. “provide”, “facilitate”, “deliver”).
<b>Inputs</b>	What do we use?	Inputs are the resources required for a project, programme, or policy, such as funding, staffing, equipment, curriculum materials, and so on.
<b>Assumptions</b>	What do we assume?	Assumptions are the necessary conditions for change, or the “underlying conditions or resources that need to exist for planned change to occur”. They should be stated in positive language. If the assumptions hold true, the expectation is that results will be achieved.
<b>Risks</b>	What factors can undermine our success?	Risks are potential events or occurrences that could adversely affect the achievement of results.

**Figure 2:** Example for ToC Mapping (Taplin and Clark 2012)

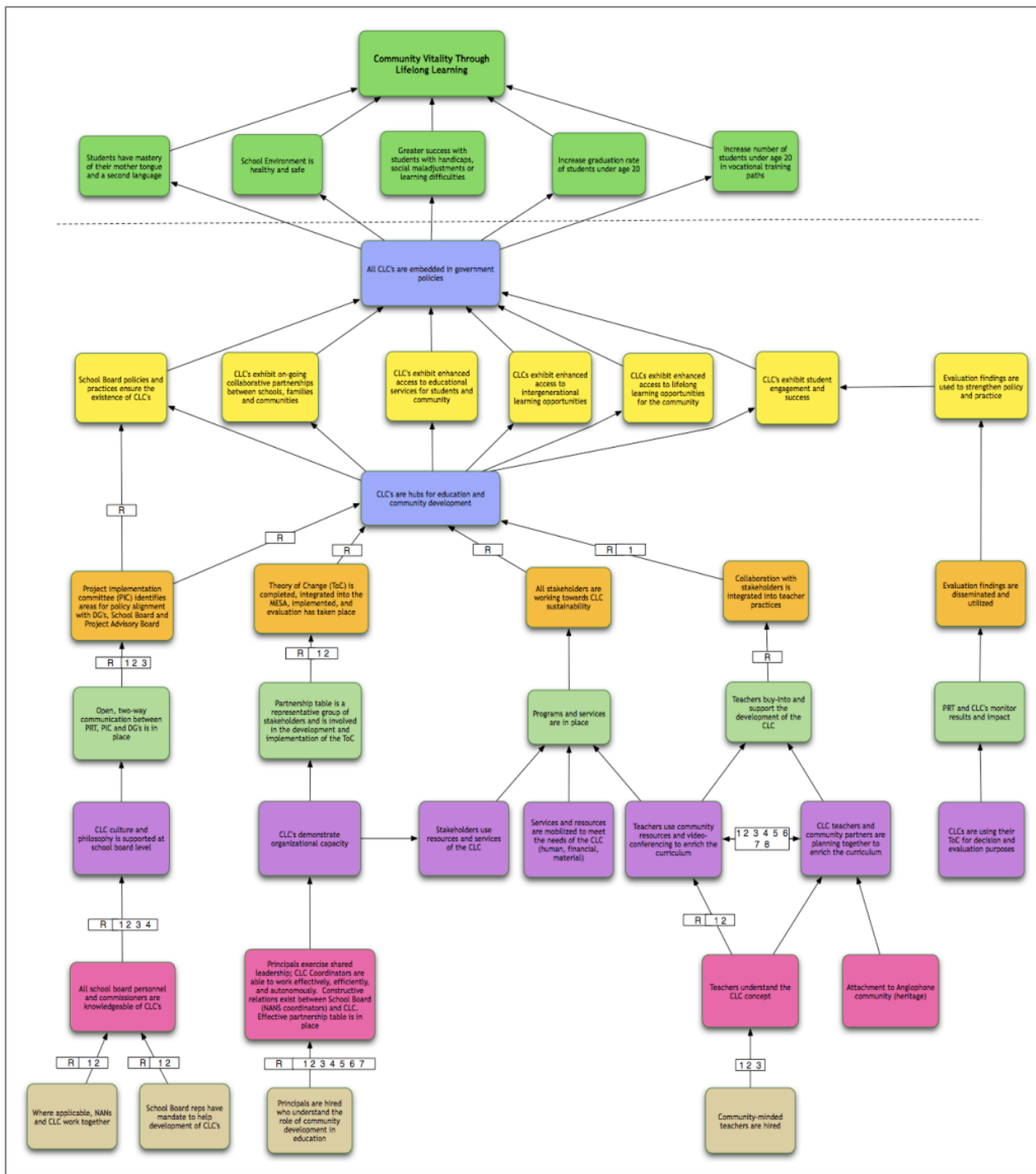
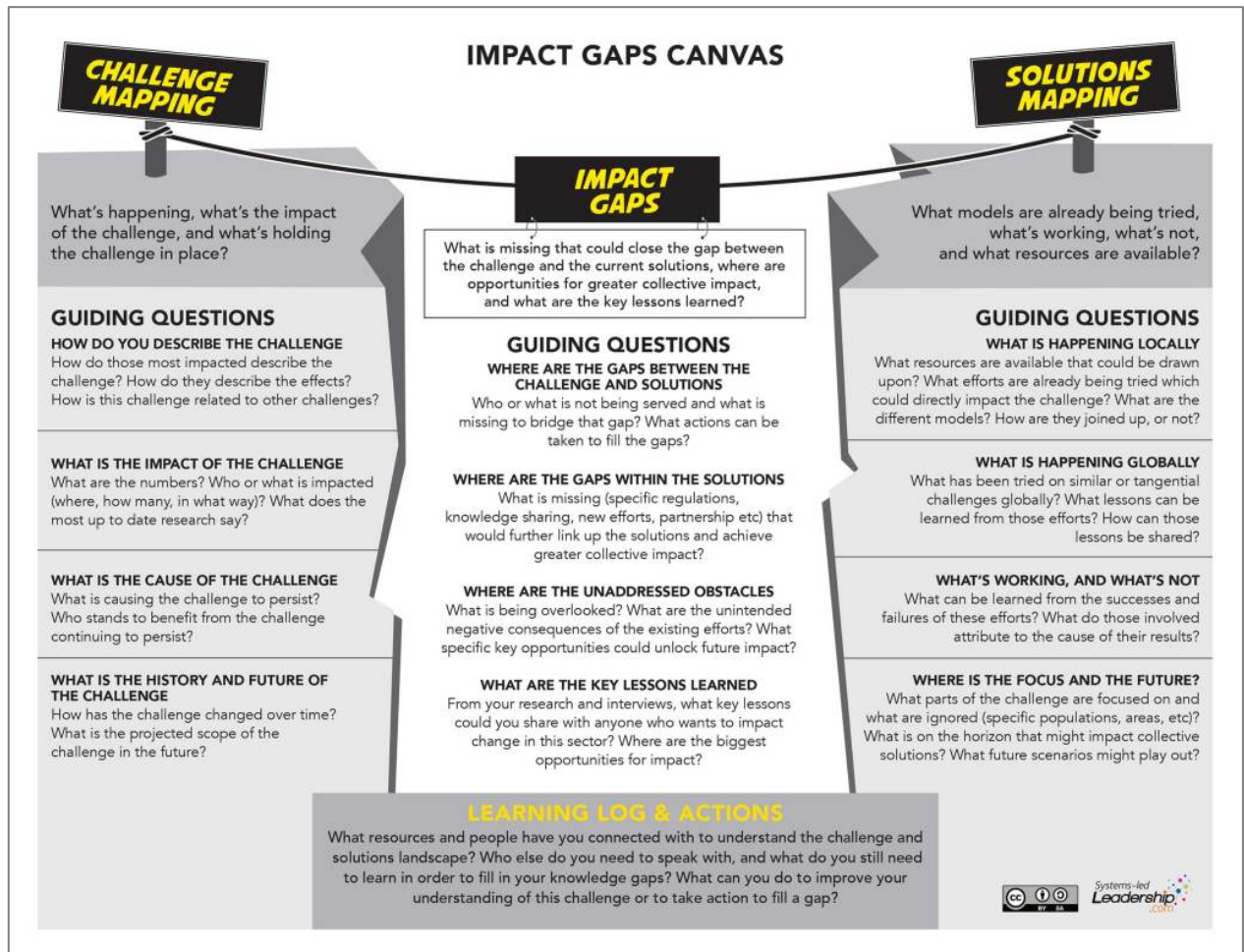


Figure 3: Impact Gaps Canvas (Papi-Thornton n.d.)



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