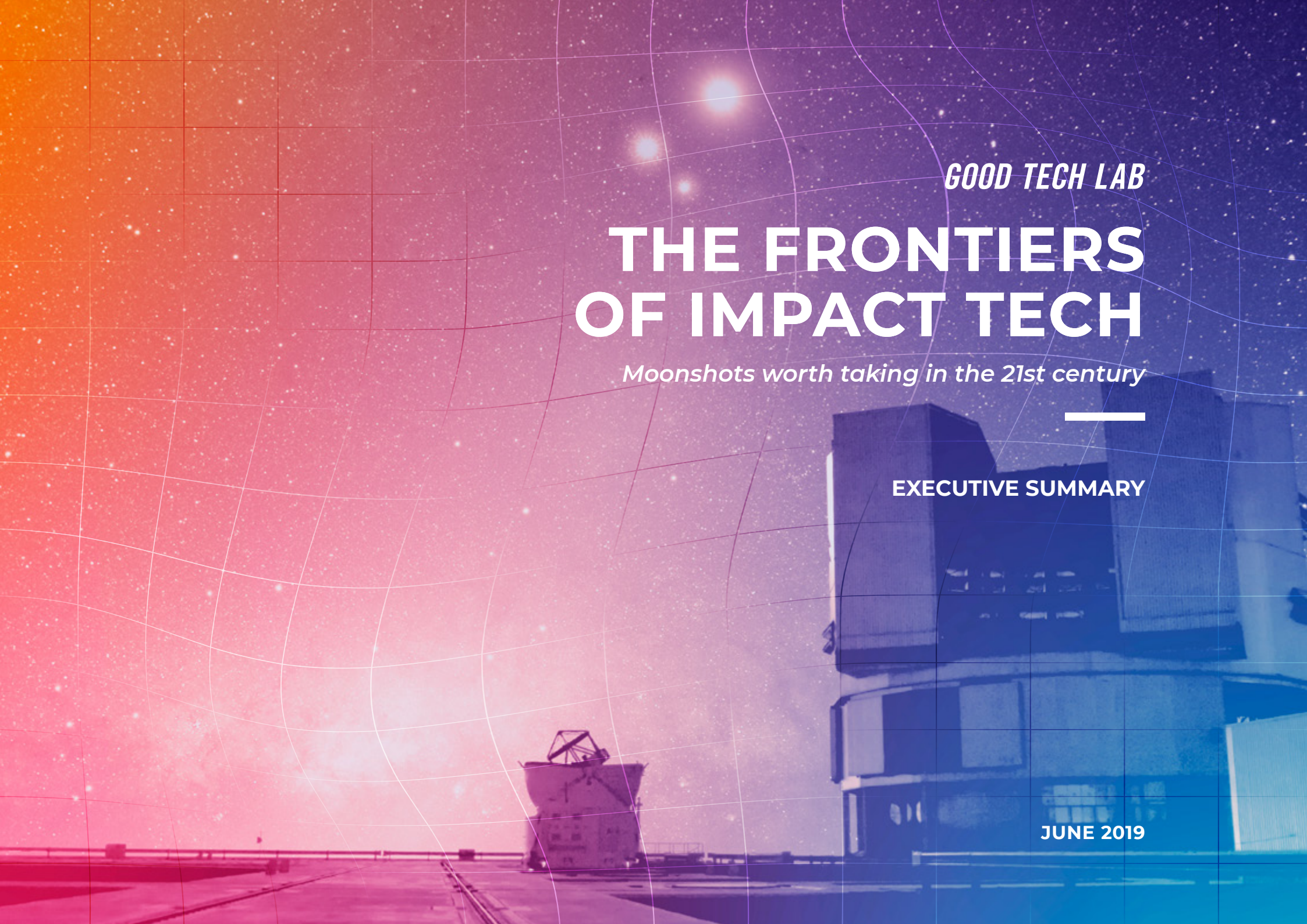

GOOD TECH LAB

THE FRONTIERS OF IMPACT TECH

Moonshots worth taking in the 21st century

EXECUTIVE SUMMARY

JUNE 2019

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Its contents are intended for entrepreneurs, investors, incubators, scientists, businesses, policymakers, and civil society organizations willing to better understand how technology, and system entrepreneurship could play a role in solving some of the world's biggest problems. We hope this report will inspire them to grow the Impact Tech movement.

Our work draws on 400+ interviews of innovators from 30+ countries on five continents and 18 months of extensive desk research.

This publication would not have been possible without the valuable input from key contributors, the review and comments from our expert panel and collaborating organizations, and the time generously granted to us by our interviewees. All of these incredible people are listed under the Contributors appendix at the end of the report.

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Good Tech Lab is a research and innovation firm focused on the moonshot of the 21st century — reversing climate change while ensuring people and nature thrive.

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RIGHTS AND PERMISSIONS

FOREWORD

Over the next decade, we need to start reversing climate change and the loss of natural capital, while achieving the Global Goals and making all humans thrive. In times of unprecedented technological acceleration, we never had so many tools at our disposal to address this challenge. We should use them wisely—managing both the impact and the risks.

This report, the first of a two-part series, is our humble contribution to this global conversation. We looked at how “Impact Tech” can help address the 17 Sustainable Development Goals, exploring its opportunities and challenges. The second volume will dive into how investors, accelerators, corporates and development organizations partner with Impact Tech entrepreneurs.

We embarked on this journey with a diverse team, with backgrounds ranging from engineering to international development, deeptech startup ecosystems and social innovation. We are grateful to be backed by visionary sponsors and supported by inspiring organizations sharing our values, who helped us with their network and expertise.

We hope our findings will inspire you as much as they inspired us. The “frontiers” featured in this report are meant to be pushed, for only then can we hope to tackle problems without borders.

This publication is the first step in a long journey. Our dream is to help foster a new model for global cooperation based on mission-driven innovation—a global Apollo program where talent and capital flow toward the moonshots of the 21st century.

The “Good Tech” in our name is a nod to the 10 Principles of Good Design enacted in the 1970s by design legend Dieter Rams. It means that technology could and should be a force of progress.

Today more than ever, we believe that science, technology and system entrepreneurship can provide leverage points to address the world's biggest problems.

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EXECUTIVE SUMMARY

Fifty years ago, humans set foot on the moon for the first time. Today, the future of our very existence depends on another *moonshot*—reversing climate change while ensuring people and nature thrive.

The window of opportunity is closing fast, but success is still within our grasp. Science, technology and system entrepreneurship could provide leverage points to help us achieve this ultimate moonshot.

The Moonshot of the 21st Century

We are living in the Anthropocene, an era in which human activities are no longer compatible with the planetary boundaries. Our carbon budget will be exhausted by 2030 (IPCC), leading us to catastrophic climate change beyond 1.5C. Meanwhile, a million species—one in eight—face near-term extinction (IPBES). **Global warming and the collapse of biodiversity are two faces of the same coin: an existential threat** to the life-support systems on which we depend for food, clean water, and a stable climate. Only a quantum leap can reverse that trend.

For climate change to remain below 2C—ideally 1.5C—global CO2 emissions should peak by 2020 at the latest, then halve every decade to reach carbon neutrality by 2050. Scientists called this trajectory the Global Carbon Law. It is a nod to Moore's Law, which drove the digital revolution forward during 50 years by stating that computing power would double every two years.

Following an exponential roadmap for carbon drawdown and ecosystem restoration requires rapid and far-reaching changes. We need a shift toward a New Carbon Economy, a prosperous economy which captures more greenhouse gases than it emits. We also need to bring the Circular Economy to its maximum potential, and "*design waste out of the system.*"

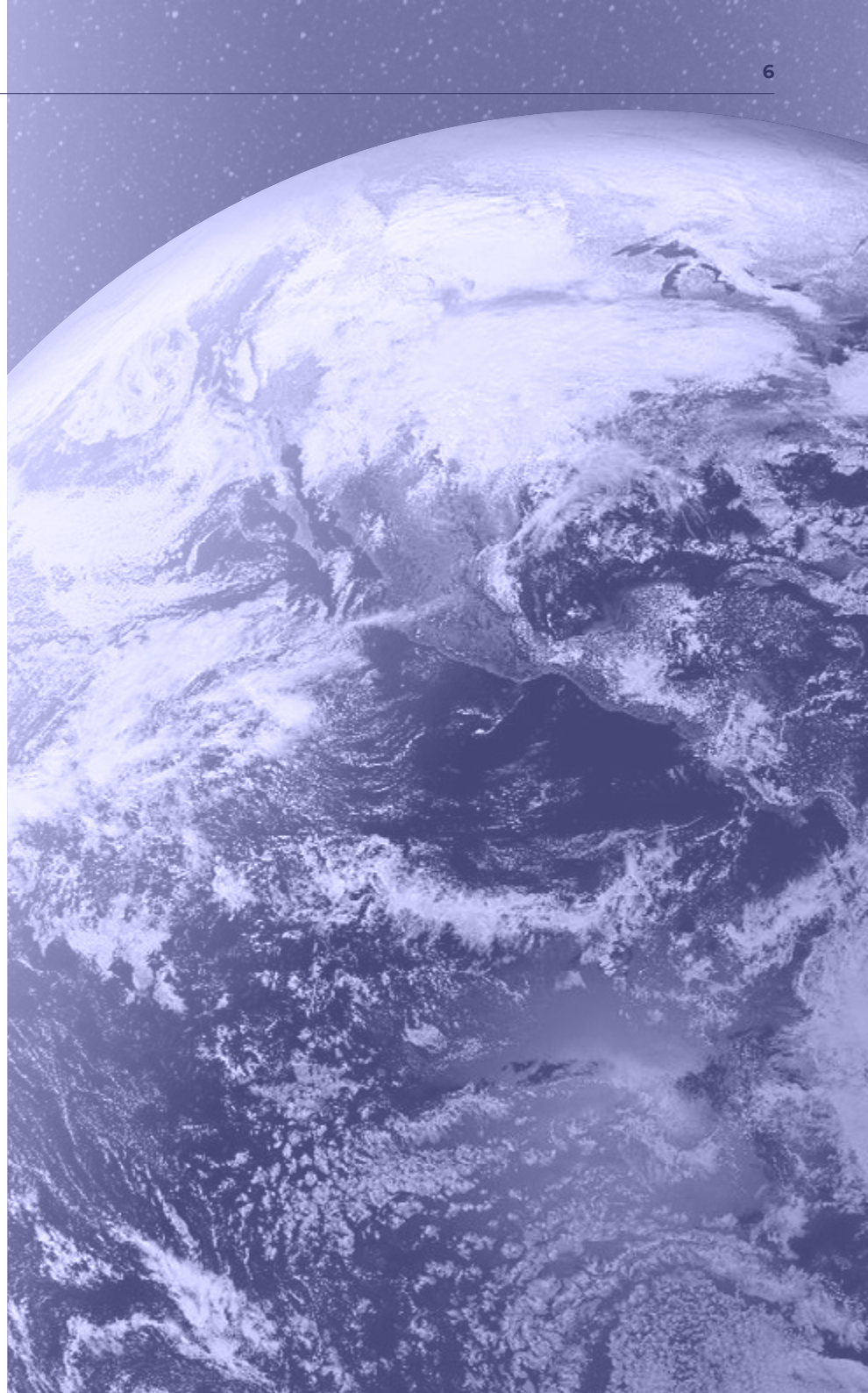
This radical shift will only succeed if it leaves no one behind. That means everyone should have access to decent housing and basic services, good food, quality education, and healthcare. It also implies an inclusive economy which reduces inequalities, alleviates poverty, and make cities more liveable. Those are among the **17 Sustainable Development Goals** (SDGs) set by the UN for 2030—also known as the Global Goals. Combined with the planetary boundaries, they provide a holistic framework to "*meet the needs of all within the means of the planet,*" as the economist Kate Raworth puts it.

Fifty years after we first landed on the moon, the ultimate moonshot of the 21st century is to reverse climate change and the collapse of biodiversity, while making all humans thrive.

This global effort would be environmentally restorative and socially just—but also economically attractive. Removing 1000 gigatons of CO2 from the atmosphere could create a $45 Trillion net financial gain according to Project Drawdown, while SDG solutions represent a $12 Trillion annual market and 380 million new jobs by 2030, according to the landmark report *Better Business, Better World*.

Business as usual is no longer an option, but those economic incentives could steer market forces and innovation in the right direction. Today "*doing the right thing*" goes much beyond corporate social responsibility—it is about creating future-proof companies.

Moreover, science and technology could provide leverage points to address planetary emergencies. The tools at our disposal have never been more powerful: the digital revolution has matured and deeply transformed most industries, while a *Fourth Industrial Revolution* is already underway. The latter is enabled by deep technologies like AI, synthetic biology, new materials, robotics, 3D printing, the internet of things, blockchains, clean tech and satellites.



The Rise of Impact Tech

We call Impact Tech the intentional use of science and technology to benefit people and the planet. Around the world, that emerging sector is growing, under the influence of several factors: i) a talent convergence between the tech and impact worlds, ii) a feeling of emergency in regards to global challenges, iii) economic incentives, iv) the growing influence of new generations as consumers, workers, and investors, and v) the possibilities offered by emerging technologies.

Impact Tech entrepreneurs could put us on course toward the ultimate moonshot. The various transformative solutions they provide include bio-based materials, animal-free meat, AI for faster diagnosis, satellite imagery to protect human rights, zero-emissions transportation, mobile payments for financial inclusion, and many more.

Impact Tech takes many shapes—some strategies may seem contradictory, but are in fact complementary.

Tech-push vs demand-pull. Impact Tech innovations result either: i) from a technological advance which allows new applications with a positive impact for society, or ii) from the intentional response to social and environmental issues using available technology. In both cases, success depends on a deep understanding of the problem.

Root causes vs symptoms. While a long-term cure requires to address the root causes of an issue, one should not dismiss the need to reduce harm on the short term. For instance, cleanup technologies and the circular economy are both needed to tackle ocean plastic pollution.

Impact depth vs impact scale. Impact Tech innovators constantly juggle between impact depth (the degree of change) and scale (how many people experience it). Corporate sustainability efforts often occur at scale but lack depth, while the opposite is common for social enterprises. Achieving both depth and scale is hard, but possible.

Innovation vs replication. Technological breakthroughs and new business models can be instrumental in addressing wicked problems. However, innovation should not get all the credit—the high-quality replication of the best ideas also deserves some. Project Drawdown attempts to balance both methods, by featuring 80 existing solutions to the climate crisis, while also listing 20 potential game-changers.

Startup vs systemic initiative. Startups excel at solving well-defined problems with a scalable tech solution, such as better water purification. Systemic collaborations, on the other hand, create momentum across multiple stakeholders to achieve collective impact on wicked problems like climate change and inequality. The system entrepreneurs driving those efforts can be companies, non-profits, or international organizations.

Low-tech vs deep-tech. While low-tech refers to simple tools that are frugal in resources, deep-tech pushes technology frontiers like AI and synthetic biology. Impact Tech opportunities exist across the spectrum, from solar concentrators to mobile payments, to biofabrication. The key is to choose wisely which tech is the most appropriate in a given context.

Platforms vs applications. Impact Tech mostly stems from the direct use of technology to address specific social and environmental issues. However, those applications rest on platform technologies, from the Internet to AI and CRISPR. The development of those platforms will likely influence our capacity to address the ultimate moonshot.

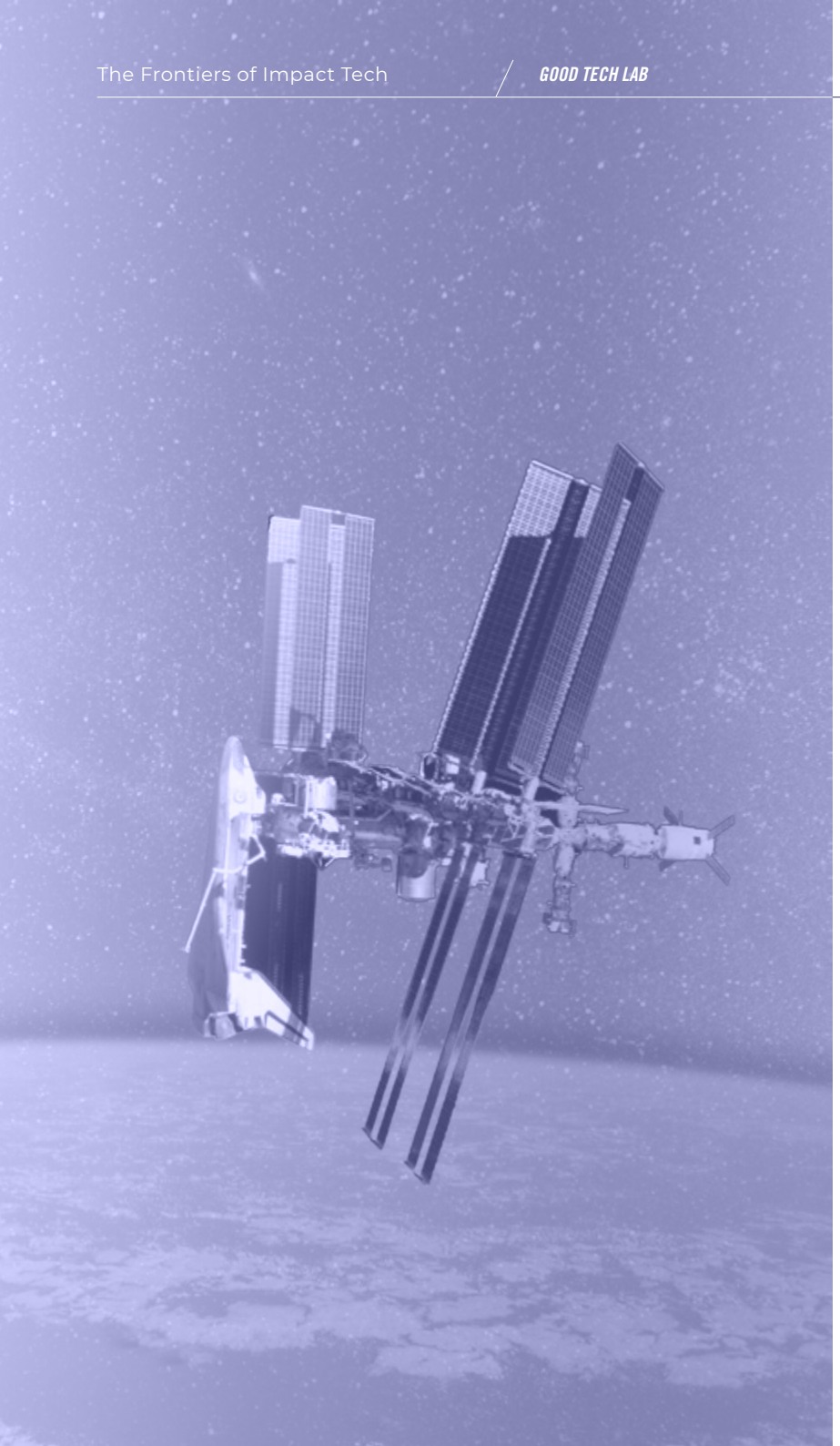
Impact-first vs finance-first. There may be times when Impact Tech innovators need to prioritize between their mission and financial returns. Strategies to balance both include business models where profit is tied to impact, the definition of impact and financial "floors," and mission lock-in in the company charter.

Impact Tech could unlock the future of global development.

Development actors are embracing Impact Tech. Development institutions and international organizations have recently increased their focus on technology and innovation. Many have launched dedicated programs, such as the British, French, German, and US cooperation agencies, the World Bank, and various UN agencies. Meanwhile, tech firms and philanthropists have entered the space—from the Gates Foundation to Airbnb to the many startups profiled in our report.

For entrepreneurs in the Global South, Impact Tech offers an opportunity to leapfrog old solutions and move straight to advanced ones. Some can replicate proven leapfrogs like mobile banking for financial inclusion. Others innovate with the drone delivery of medical supplies, or blockchain records to secure land rights for the poor. Moreover, such endeavors could also unlock the tremendous economic rewards mentioned above, and **"leapfrog old capitalism"** by channeling entrepreneurial energy toward social good.

These new development stories should give us hope, but beware of pitfalls. Among them, the fetishization of innovation in the form of "development gadgets," and the over-reliance on digital leapfrogs at the expense of long-term investments—in infrastructure, academia, and capacity building. The Global Goals will not be achieved thanks to silver bullets and will require collective intelligence.



Impact Tech opportunities across the Global Goals

The Global Goals provide a great lens to analyze how Impact Tech can address some of the hardest global issues. Our research profiles over 180 Impact Tech trends and their contribution to the 17 SDGs. Hundreds of examples illustrate them—including tech startups and social enterprises, but also initiatives from corporates, non-profits, and the public sector. The trends are associated with a specific SDG target for easier readability, although many are relevant to several goals.

The overview below summarizes the main themes behind those Impact Tech opportunities.

- **Mobile connectivity for financial inclusion**, including payments, credit, local currencies, and affordable health insurance
- **Digital records that empower the world's poor**, allowing them to prove their identity, secure their land rights, and share their address even when it is not officially registered
- **Disaster risk reduction technologies** using machine learning, drone mapping, and 3D printed homes

- **AgTech for sustainable farming**, including precision agriculture, agroecological data platforms, small farm robotics, and substitutes to synthetic fertilizers and pesticides
- **Digital technologies for smallholder farmers** that improve their productivity and livelihood: soil and plant health analysis, weather forecasts, farming knowledge networks, and access to markets, credit, and insurance
- **Postharvest technologies** to increase food preservation and reduce the waste occurring between harvest and distribution
- **New protein sources** to sustainably feed 10 billion humans, such as meat-like products (plant-based or cell-based) that appeal to omnivores, and insect protein feed for aquaculture
- **Food science and genomics** to develop food ingredients and crops with higher nutritional value

- **Digital health** to improve preventive care, aftercare, quality-of-life support, and to reduce infant mortality with pregnancy and childcare advice
- **New diagnostic devices and AI tools** for early detection of infectious diseases like malaria, or chronic diseases like cancer, in a fast, affordable, and non-invasive way
- **Genome editing applied to medicine**, such as improved gene therapies, genomic vaccines, and gene drives
- **Big data analytics and machine learning** for epidemiology, medical research, and precision medicine
- **Emerging technology platforms** such as regenerative medicine, microbiome therapies, and nanomedicine

- **Digital classrooms solutions** that empower teachers and students—in the developing world and beyond—with devices, multimedia lessons and personalized learning
- **Lifelong learning platforms**, such as mobile lessons, MOOCs, gamified apps, remote yet immersive programs, and mentor marketplaces
- **Alternative schools and bootcamps** for coding
- **New learning mediums** such as VR, video games, and hands-on experimentation kits

- **Apps and devices** to help women navigate cities safely, and to report sexual offenders more effectively
- **Digital services and technology products** for female and reproductive health
- **Initiatives to empower women at work** by preparing women for future tech jobs and supporting HR professionals to improve workplace equity and reduce the gender pay gap

- **Pumps, collectors, and generators** that harvest freshwater from aquifers and atmospheric moisture
- **Water purification technologies** for point-of-use filtration, desalination, circular wastewater treatment with resource recovery, and decentralized wastewater systems
- **Waterless toilet solutions** that allow safe sanitation in urbanizing areas that lack sewage systems, which also reuse the energy and nutrients in human waste
- **Water efficient technologies, systems and processes** in agriculture, industry and the residential sector
- **Water supply management** using remote sensing, satellite imagery, and water-tracing technologies

- **Energy access solutions** that sustainably improve the livelihoods of the world's poor in rural areas, such as pay-as-you-go solar, microgrids, and improved cookstoves
- **Advanced renewable energy:** more efficient photovoltaic cells, better turbines for wind and marine energies, enhanced geothermal systems, and ongoing developments in sustainable fuels (e.g. hydrogen, bioenergy, sunlight-to-fuel)
- **Breakthroughs in energy storage** for electric vehicles and grid balancing, including battery technology, ultracapacitors, power-to-gas, thermal storage, and mechanical storage
- **Smart grid and grid edge technologies** to increase energy efficiency and leverage decentralized energy resources
- **Energy fintech platforms** to fund renewable infrastructure and unlock peer-to-peer energy trading

- **Digital tools for inclusive employment**, including targeted job boards and bias-free recruitment software
- **Digital services to improve employability**, such as worker upskilling platforms and AI advisors for job seekers
- **Technologies for better working conditions**, including cobots, exoskeletons, and wearable devices that enhance safety and wellbeing in physical labor, as well as digitized social protection for freelancers
- **Data-driven prevention of human trafficking**

- **Innovative logistics for sustainable development**, including clean container ships, cargo airships, and drone deliveries of medical supplies
- **Internet access technologies** to bring the second half of humanity online in remote areas, such as airborne backhaul infrastructure and innovations for last-mile access
- **Advanced technologies for sustainable industry:** additive manufacturing, biofabrication, AI for new materials discovery, short-loop recycling, circular and flexible factories
- **Data-based SME financing** for developing markets

- **Assistive technologies** to improve the lives of people with disabilities, from real-time captions and audio description to new wheelchair designs, and affordable custom-fit prosthetics
- **Digital solutions for displaced populations**, supporting them with access to information, education, work, healthcare, social inclusion, as well as affordable remittances
- **Tools and initiatives to spread the "digital dividends"** more widely, such as digital literacy programs and ownership structures aimed to decentralize capital gains in the digital economy

- **Sustainable transportation systems** that emerge at the convergence between electrification, autonomy, ride-hailing, new vehicles, mobility-as-a-service and public transit
- **Air pollution control and mitigation technologies**, such as sensor networks that allow hyperlocal monitoring, as well as large-scale air purifiers
- **Various solutions that improve urban metabolism** through organic resources looping, local food production, energy and water efficiency, advanced recycling, and other circular economy mechanisms
- **Digital tools for urban planning**, like citizen participation, urban data management, and advanced simulations
- **Infrastructure and basic services for fast-growing urban areas**, as well as their informal settlements

- **Digital solutions to reduce food waste** at the retail, catering and consumer levels: optimized procurement, dynamic pricing, and redistribution platforms for unsold food
- **Product reuse, repair, and upgrade** relying on digital technologies, circular business models and modular designs
- **Sustainable materials and chemicals**, either using feedstock derived from biological sources, captured greenhouse gases, or recycled waste, as well as advanced materials with superior longevity and robustness
- **Responsible retail technologies** like online farmers markets, product sustainability ratings, and blockchain records to certify ethical supply chains
- **Fintech for sustainable consumption**, such as digital ethical banks, retail impact investing platforms, digitized local currencies, and civic crowdfunding

Emissions reduction (see also SDG2, 7, 9, 11, 12)

- **Decarbonized energy:** substituting fossil fuels with clean energy, adding storage and flexibility into the grid, and reducing the emissions from existing fossil fuel plants
- **Decarbonized agriculture:** reducing food waste and the share of animal food products, and adopting regenerative farming methods
- **Decarbonized industry:** scaling the circular economy, replacing fossil-based feedstock with sustainable alternatives, increasing production efficiency, and safely phasing out HFC refrigerants
- **Decarbonized transportation:** scaling electric vehicles, low-emission fuels, and mobility-as-a-service, increasing logistics efficiency, and reducing air travel emissions
- **Decarbonized buildings:** scaling energy efficiency, improving the competitiveness of low-carbon construction materials, and reducing demand for new buildings

Negative emissions (carbon removal)

- **Carbon removal *via* engineered solutions** like enhanced weathering, direct air capture, carbon capture and use (e.g. construction materials, fuels, chemicals, plastics, protein, carbon fiber, and nanomaterials)
- **Carbon removal *via* natural and hybrid solutions** like carbon farming, biochar, and the restoration of carbon-dense natural ecosystems—other potential solutions, such as phytoplankton stimulation and bioenergy with carbon capture and storage, still need to demonstrate system sustainability

Cross-cutting strategies

- **Digital enablers of mitigation**, including data-driven climate strategies and blockchain-based carbon credit systems
- **Climate adaptation technologies**, especially for the resilience in agriculture, urban areas, and low-lying islands

- **Marine cleanup technologies** to remove plastic pollution from oceans, lakes, and streams
- **Ocean plastic prevention** through marine biodegradable materials, digitized recycling, and other circular models
- **Marine biodiversity protection**, using satellites and AI to monitor fisheries, or aquatic drones and robots to detect threats to marine life (e.g. invasive species, pollution, ocean acidification)
- **Coastal ecosystem restoration**, including genetic engineering to strengthen coral reefs, and drones to restore mangroves
- **Sustainable seafood solutions** like traceability blockchains, improved aquaculture systems, plant-based and cell-based fish

- **Terrestrial ecosystems and wildlife monitoring** using satellite imagery, drones, remote sensing, machine learning, DNA analysis devices, and citizen science apps
- **Computational conservation science**, including soil modeling and analysis, geospatial data platforms, and biodiversity genomics databases
- **Reforestation and desert greening technologies**, ranging from low-tech innovations in agroecology to drones and algorithms used for industrial-scale reforestation
- **Fintech for ecosystem restoration** like impact investing platforms, crypto-tokens, and more

- **Data and algorithms for peace and justice:** crime forecasts, early warning systems to protect civilians during conflicts, or tools to investigate human rights violations and identify victims faster
- **Remote demining technologies**, including drones
- **Digital government solutions** to increase the quality of public service, and to reduce corruption in procurement
- **Civic Tech platforms** to ensure transparent and accountable institutions, and increase citizen participation
- **Automated fact-checking** against fake news

- **Fintech solutions** to mobilize additional SDG funding in developing countries
- **Online collaboration platforms** for technology research and capacity building on sustainable development
- **Multi-stakeholder partnerships** to harness technology in the achievement of the SDGs
- **Data collaborations**, including open data programs, data philanthropy, and multi-stakeholder data partnerships to provide high-quality information on social and environmental issues.

Technological Risks and Challenges

Although this report adopts a cautiously optimistic tone overall, technology introduces its own set of risks and challenges which should not be overlooked.

At least eight critical risks should be mitigated for technology to deliver positive outcomes.

Psychological hijacking. Mobile screens, social media, and the attention economy have damaged our mental health and social fabric, while the effects of new media like VR are still poorly understood.

- ***Mitigation strategies:*** *ethical design, "digital wellness" habits, regulation*

Privacy and surveillance. Six years after the revelations of Edward Snowden, China is now exporting its mass surveillance technology to other countries, while targeted advertising has established surveillance capitalism as the new normal.

- ***Mitigation strategies:*** *privacy by design, standards and regulation (GDPR and beyond), privacy tools*

Algorithmic discrimination. When trained on biased datasets, AI algorithms can lead to systematic and unfair discrimination. Left unchecked, the large-scale implementation of those biases can fuel injustice in law enforcement, education, healthcare, financial services, democracy, and at the workplace.

- ***Mitigation strategies:*** *increase diversity in tech, ethical design, standards and regulation (beyond GDPR)*

Media manipulation. Against all the odds, social media now appears among the main threats to democracy. Recommendation algorithms increase political polarization, amplify fake news, and allow micro-targeted propaganda based on psychological profiling. Fake news has also led to the lynching of innocents and propelled the anti-vaccine movement to new heights. In the future, AI video manipulation could make things even worse.

- ***Mitigation strategies:*** *fact-checking tools, regulation, digital literacy, and education programs*

Economic and labor disruption. The fear that machines will replace human labor too fast for us to adapt is widespread. However, predictions vary widely on how many jobs are concerned. Essential questions include: i) what will be the quality of new human jobs? ii) how can we drive more investment in AI that enhances human work instead of automation? iii) who will own the robots, and how do we contain the power of tech giants?

- ***Mitigation strategies:*** *investment in labor-enhancing AI and lifelong learning, new social protections, regulation*

Increasing inequalities. Technological acceleration could widen the wealth gap at all levels—between companies, between countries, and between workers of different skill levels. In the future, technology could even translate economic inequality into biological inequality.

- ***Mitigation strategies:*** *new social protections, addressing the root causes of inequality, regulation*

Unsustainable electronics. Clean and digital technologies are neither clean nor immaterial. Upstream, components are produced at a terrible human and environmental cost and rely on a stressed supply of critical metals. Downstream, the amount of e-waste is exploding due to planned obsolescence and low recyclability.

- ***Mitigation strategies:*** *circular product designs and business models, sustainable materials, ethical sourcing tools, clean mining and advanced recycling technologies, regulation*

Security and safety. AI is quickly expanding the scale and scope of cyber threats. Those include digital risks (cyber attacks), political risks (election hacking) and physical risks (using drones, self-driving vehicles, and attacking critical infrastructure). Moreover, synthetic biology, solar geoengineering, and nanotechnology are introducing entirely new hazards.

- ***Mitigation strategies:*** *security-enhancing development processes, interdisciplinary research on risks, regulation*

Four root causes underpin technological and sector-specific risks. They stem from deep economic, social and cultural norms.

A lack of diversity in tech and science. Left unchecked, the chronic underrepresentation of women and minorities in technology and science is leading to abuse, injustice, and harmful products.

- ***Responses:*** *Education and mentoring for underrepresented talents, bias-free hiring tools, diversity-focused funds, advocacy groups, research on inclusive design*

A prevalent ideology of solutionism. The idea that the "right" technology could fix any problem is commonplace in the startup community. This reductionist view of the world is the opposite of systems thinking and stems from insufficient knowledge—or consideration—of problems.

- ***Responses:*** *Education on systems thinking, diverse teams, integration of additional responses (business model innovation, policy, behavior change, etc)*

Economic incentives that hinder positive outcomes. A large part of government funding for tech remains associated with military research, including in AI, robotics and gene editing. Moreover, venture capital is increasingly under scrutiny. The hypergrowth VC depends on has several flaws: i) it does not suit most companies, and turn startups into speculative assets, ii) it can incentivize futile innovation, and iii) it often comes with hidden societal costs. Overall, commonly available funding in tech and science have several blind spots—companies driven by impact, by science, and which are not fit for "growth at all cost."

- ***Responses:*** *Impact investing, new fund structures, strategic venture philanthropy, policy incentives.*

Unfit technology governance. How can we steer technological progress in a way that maximizes societal benefits and minimizes adverse effects? Today tech governance lies de facto within industry and academia. However, self-regulation is hardly enough, as Facebook scandals and CRISPR babies have taught us. National and regional policy can help, but many issues require international cooperation—from killer robots to climate change and the new space race. Global institutions need a serious upgrade to regulate technology in a way that i) is compatible with the pace of change, ii) can handle conflicting interests and cultural differences, iii) fosters a better dialogue between science and society.

- ***Responses:*** *better global frameworks for technology governance, and platforms for science-society dialogue at all levels*

Impact Management

Impact Tech could make a dent in solving some of the world's biggest problems. However, that possibility depends on our capacity to maximize positive outcomes while mitigating adverse effects. Achieving this will require to equip innovators with the right compass—impact management.

What does "impact" mean?

The Impact Management Project (IMP) is a forum for building global consensus on how to talk about, measure and manage impact. Gathering 2,000 organizations, they reached consensus that ***"Impact is a change in an important positive or negative outcome for people or the planet"*** and that it can be deconstructed into five dimensions:

- **What:** what outcomes the enterprise is contributing to and how important the outcomes are to stakeholders
- **Who:** which stakeholders are experiencing the outcome and how underserved they were prior to the enterprise's effect
- **How Much:** how many stakeholders experienced the outcome, what degree of change they experienced, and how long they experienced the outcome for
- **Contribution:** whether [efforts] resulted in outcomes that were likely better than what would have occurred otherwise
- **Risk:** the likelihood that impact will be different than expected

Impact management can be challenging, especially in the context of technology and science. Many Impact Tech innovators are either unaware of, confused about, or reluctant to use those methods.

- **They are often complicated and time-consuming to use** for entrepreneurs who operate on limited resources.
- **Most of them were intended for well-defined activities in established industries.** Meanwhile, innovators explore uncharted territories, using breakthrough technologies and disruptive business models—sometimes with multiple pivots.

A common misconception is to see impact management as a static set of processes. Instead, it should be an iterative process—starting with simple tools, then increasing the level of sophistication as the organization grows and matures.

The full report provides an overview of methods, tools, indicators and resources for the three pillars of impact management—planning, measurement, and reporting. We also suggest a simplified approach for Impact Tech ventures. That experimentation can be the first step toward the development of agile impact management processes adapted to the context of science and technology.

Impact planning is about understanding the problem, defining the solution hypothesis, and preventing adverse effects.

Positive Impact Planning aims to i) understand the problem from a systemic perspective, and ii) define the solution hypothesis and its components (technology, business model, partnerships, etc.)

- ***Resources:*** *issue-specific (e.g. SDGs, IPCC) and sector-specific knowledge, research on other tech solutions, and the Theory of Change*

Negative Impact Planning aims to iii) estimate the societal cost of the solution to reduce it, and iv) anticipate potential adverse outcomes (risks) and how to mitigate them.

- ***Resources:*** *design and development guidelines (e.g. EthicalOS), material libraries, software tools and datasets (see SDG Compass)*

Impact measurement consists in defining relevant impact indicators and tracking their evolution.

Measuring impact enables an organization to evaluate its progress toward positive outcomes, and the existence of adverse effects. It requires to i) collect the right data, ii) analyze it and transpose it into useful formats and timely fashion, and iii) create an organizational capacity to apply the knowledge gathered to update strategy and processes.

Key Performance Indicators (KPIs) should be SMART: specific, measurable, achievable, relevant, and time-bound. A rule of thumb is to start with simple ones and refine them over time. Impact Tech innovators should, however, keep a holistic view to avoid burden shifting—the improvement of a few KPIs at the expense of more important ones. Approaches like Agile Measurement and Acumen's Lean Data aim to lower barriers of collecting the right data.

- ***Resources:*** *IMP impact data categories, the SDG indicators, and indicator catalogs like IRIS (see also SDG Compass)*

Monitoring and measuring frameworks can be broadly categorized into four main categories, which are complementary:

- **Social Return on Investment (SROI)** attributes a monetary value to the social benefit of a project to evaluate its efficiency
- **Scorecards and dashboards** aim to track the progress of pre-selected indicators to monitor an organization's performance, such as the B Assessment for B Corps
- **Contribution assessment** like randomized control trials (RCT) and other statistical methods use counterfactuals to evaluate what would have happened independently of the intervention
- **Environmental assessments** include the Life Cycle Assessment (LCA) of a product's footprint from materials sourcing to end-of-life, and various specialized methods like the Greenhouse Gas Protocol (GHGP), the Natural Capital Protocol (NCP) and Material Flow Analysis (MFA)

Impact reporting refers to the communication of impact to all relevant stakeholders.

Effective reporting requires valid data, transparent and appropriate evaluation methods, and results that are easy to understand for the target audience. With growing expectation from customers, investors, government and civil society, impact reports are quickly becoming strategic in the private sector.

- ***Resources:*** *certifications like B Corp, Solar Impulse and the Trustable Technology Mark, and reporting standards like GRI and CDP*

A look into the future of Impact Management

The impact management landscape is continuously evolving. Global standard-setters are coming together to increase their compatibility, assessment tools are adapting to the SDGs, while tech startups are offering new solutions to streamline impact measurement.

Meanwhile, Impact Tech innovators, impact advisors, and scientists should partner to develop complementary tools and methods that could reach mainstream adoption in technology.

Those efforts should aim to:

- **Allow different levels of sophistication,** in assessment and the choice of indicators, according to the maturity stage
- **Use data and scientific knowledge** to facilitate the comparison between different innovations aimed to address a societal problem
- **Take multiple types of impact risks into account,** including those related to specific technology domains

The Way Forward

The last IPCC and IPBES reports on global warming and the sixth mass extinction are alarming. At the same time, inequality remains at unacceptable levels in most parts of the world and will likely worsen with AI and climate change. **These planetary emergencies could lead to the collapse of civilization as we know it**, unless we operate rapid and far-reaching changes in every aspect of our economic system.

The speed and scale of the transformation we need—at the pace of the Carbon Law—has no historical precedent. The closest comparison would be wartime mobilizations, during which entire economies are directed against an existential threat. Investments made during such times have played a substantial role in the emergence of Silicon Valley and led to the Apollo Program, which put the first humans on the moon.

Fifty years passed since Apollo 11. Today, the world needs a new moonshot—reversing climate change while ensuring people and nature thrive. This time, no superpower can achieve that effort alone. On Spaceship Earth, we are all crew.

Science, technology, and system entrepreneurship could be our wildcards. Impact Tech is rising everywhere, providing leverage points to address almost every SDG target. However, to achieve the ultimate moonshot we need a plan—a “Global Apollo Program” for the 21st century.

To say that the 2020s will be decisive would be an understatement: by 2030 we need to achieve both the SDGs and the first halving of the Carbon Law. **The 12 priorities listed below could help us maximize the potential of Impact Tech in the next decade.**

Impact Tech leadership

1. **Think in systems—and data.** Wicked problems resist any reductionist solution. Addressing them requires to understand system dependencies, differentiate effects from root causes, prioritize the best leverage points on which to intervene, and anticipate unintended consequences:
   - **Learn about systems thinking** (or hone those skills)
   - **Dive into key frameworks,** including the SDGs, the planetary boundaries, carbon cycles, and the circular economy
   - **Rely on science and data** to craft strategies

2. **Raise ambitions.** A growing cohort of startups and corporates claim to be purpose-driven. Not only should their number increase fast, but their ambitions should also match what planetary emergencies require—10X improvements. As Extinction Rebellion activists frame it:
   - **Tell the truth:** acknowledge the extent of the environmental and social emergencies into the company's mission
   - **Act now:** set aggressive short-term and long-term targets in every aspect of strategy

3. **Embrace impact management.** Impact Tech innovators and investors should embrace agile methods for impact planning and measurement, and include them within existing processes—research, design, engineering, operations. They should also contribute to the development of new frameworks adapted to science and technology.

4. **Leverage diverse teams.** The diversity of a team's demographics and skill sets can help prevent the biases and blind spots that routinely occur during innovation. Moreover, interdisciplinarity, diverse viewpoints, and collective intelligence can lead to breakthrough solutions.

5. **Form partnerships to drive system change.** Businesses should join or create coalitions with sector peers and other stakeholders, to unlock bigger Impact Tech opportunities, and help solve wicked problems:
   - **Map and join relevant networks,** clusters, and consortiums
   - **Leverage outcome-driven open innovation** to foster effective startup-corporate cooperation.
   - **Support (or become) system entrepreneurs** that act as "central gears" to align the interests of various stakeholders

Impact Tech ecosystems

6. **Expand the talent pool.** Attracting the best talent is often the biggest bottleneck in Impact Tech—even more than raising capital, many have told us. To expand the talent pool, we need to:
   - **Upgrade university programs,** by integrating global sustainability, the SDGs, systems thinking, and collaborative problem-solving into the curricula of all science, engineering, business, and design colleges. Combine theory with project-driven practice.
   - **Develop innovative Impact Tech programs** for initial and vocational training, that combine engineering and systems thinking
   - **Promote Impact Tech** success stories and role models
   - **Attract experienced mentors** from technology, business, and sustainability to support Impact Tech entrepreneurs

7. **Increase funding capacity.** Impact Tech funding needs to reach much higher proportions. Although strategic government funding is critical (see item 10), private investment should get up to speed and rely on various capital instruments that meet different kinds of financing needs:
   - **More impact investing capital** with sufficient access to technology expertise and dealflow
   - **More tech VC flowing into impact sectors,** with access to impact management knowledge
   - **Patient capital:** investment funds with flexible, long-term time horizons (e.g. 12-15 years rather than 7-8 years in VC)
   - **New fund structures:** revenue-based investment, small infrastructure funds, blended capital, impact bonds
   - **Strategic philanthropy to bridge funding gaps:** in early-stage impact and science-based ventures (too risky for commercial investors) as well as non-profit Impact Tech
   - **Cross-cutting efforts to increase diversity** among founders who receive investment

8. **Strengthen venture support.** Increase the availability of incubators, accelerators, company builders, and other entrepreneurial support organizations (ESO) focusing on Impact Tech:
   - **Build capacity within existing ESOs** on global sustainability, the SDGs, impact management and systems thinking
   - **Channel public and philanthropic funding** toward ESOs that are on a mission to help achieve the ultimate moonshot
   - **Develop ESOs responding to underserved needs,** such as late-stage support, science venturing, open-access testbeds, systemic initiatives with multiple stakeholders, and founders from underrepresented backgrounds

9. **Bring corporates and cities onboard.** Corporates and cities can help bring Impact Tech to scale, either as partners, customers, or (in the case of corporates) solution providers. They should:
   - **Establish training and leadership programs** for both executives and management teams, focusing on Impact Tech, the SDGs, global sustainability, and systems thinking
   - **Adopt the five priorities for Impact Tech** (see above)
   - **Leverage procurement and outcome-driven open innovation** to support Impact Tech innovators with access to customers, funding, expertise, IP, testbeds, sales and distribution channels

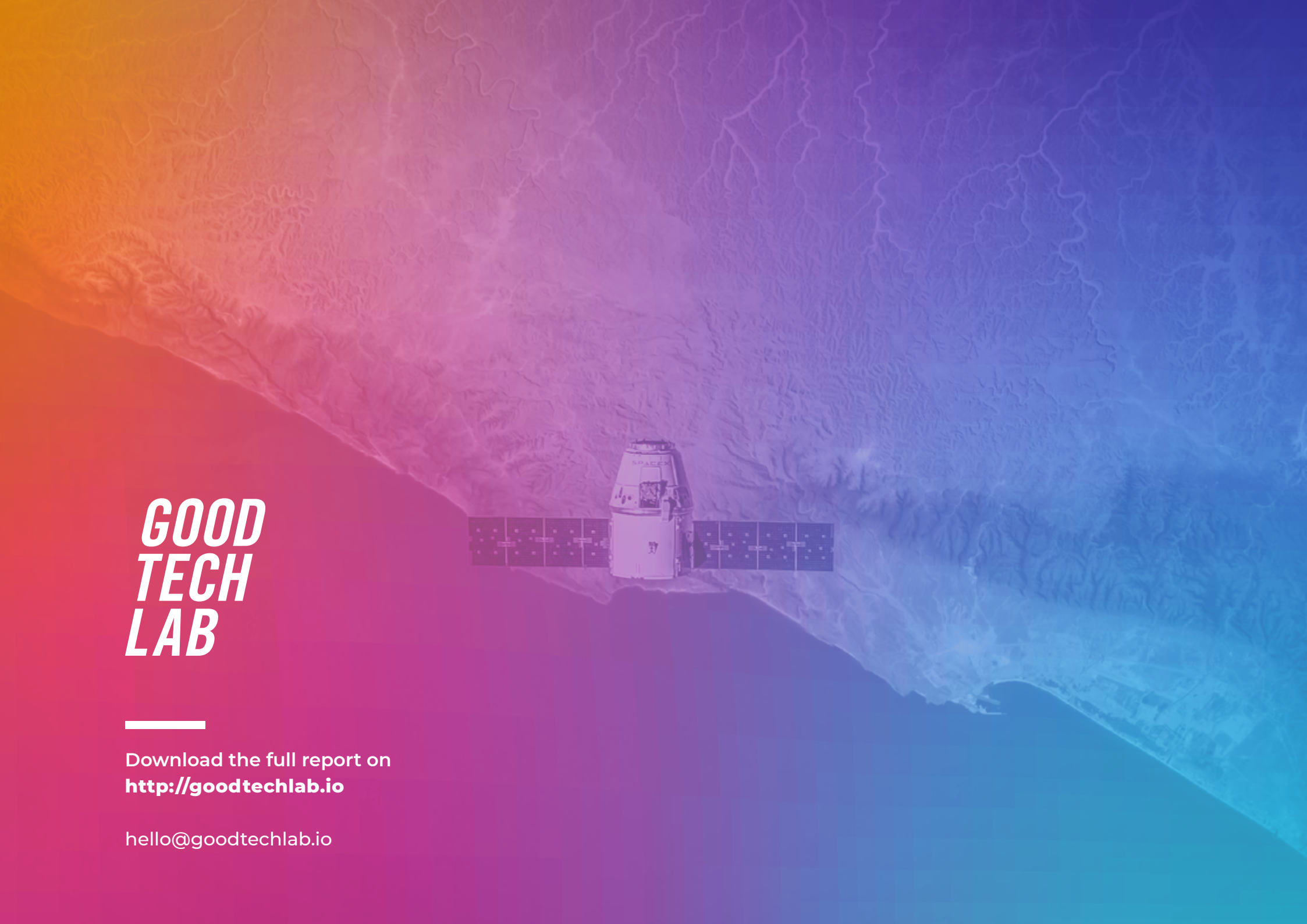
10. **Shape markets with strategic government.** National and federal states could help unlock the carbon-negative, restorative, and inclusive economy we need by shaping markets. They could:
    - **Use mission-oriented innovation policy** (Mazzucato) to steer innovation toward a "*Global Apollo Program*" which could achieve the ultimate moonshot—with the strategic use of public funding and private sector incentives
    - **Update regulation and taxation** to drive large-scale behavior change among consumers and companies (e.g. carbon pricing)
    - **Leverage procurement** to support Impact Tech innovators

11. **Establish shared roadmaps and research agendas.** Academia, governments, businesses, civil society and international organizations should work together to:
    - **Define 10-year roadmaps** to deliver the ultimate moonshot, in all sectors and at all scales (country, city, organization). Review those plans yearly as new information arises
    - **Set research agendas** which establish the R&D priorities to develop, scale and deploy the necessary technologies
    - **Develop an impact culture within research institutions,** such as impact management and incentives (e.g. HR policy, funding criteria, etc) to maximize societal value

12. **Reinvent international cooperation.** Impact Tech could be decisive in the fight against "*problems without borders*"—such as planetary emergencies, as well as emerging threats like antibiotic resistance and AI risks. Better global cooperation could help unlock that potential:
    - **Adopt platform strategies within international organizations and development actors** to support Impact Tech innovation and deployment—for instance by harnessing the collective intelligence from private, public, academic and civil society actors
    - **Upgrade global governance frameworks** to manage emerging technologies and existential risk

All stakeholders have an opportunity to step up and do their part to deliver the ultimate moonshot. Good Tech Lab will further explore those strategies in a second report on Impact Tech innovation ecosystems—focusing on investors, accelerators, corporates, academia, foundations, and development institutions.

Today more than ever, we believe that science, technology and systems entrepreneurship could be one of the keys to unlock a brighter future—one in which people and nature thrive.



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