



## 2021 Annual Impact Report



Pangaea Ventures is a leader in hard tech venture capital and impact investing.

# We invest in entrepreneurs to make an impact on the world

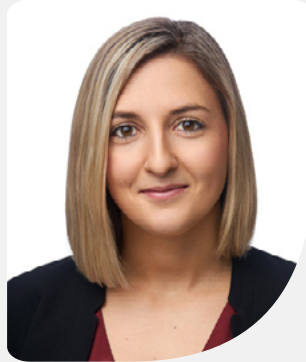
“There is an immediate and urgent need to deploy hard technology solutions that address some of the world’s biggest problems. Our climate is changing which can jeopardize food security and human health & well-being. Pangaea’s portfolio continues to work tirelessly to help mitigate these problems and we have bold ambitions for our collective impact by 2030.”

## Chris Erickson

Founder & General Partner



Chris Erickson



Janelle Goulard



Andrew Haughian



Sarah Applebaum



Purnesh Seegopaul



Matt Cohen



Tracy Hedberg

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# Message From Pangaea Ventures

Our world is under increasing strain from the intertwined issues of climate change, food security, and access to affordable and efficient healthcare. The impacts of climate change are going to be most acutely felt by marginalized populations and poorer countries. For example, 90% of Somalia is impacted by drought, a situation faced throughout much of East Africa, where the number of people facing severe food insecurity has grown to 346 million in 2021, up by 60M from the year prior. Closer to home, in British Columbia, over 600 people died during a severe heat wave in summer 2021, and the town of Lytton burned to the ground. Months later, record rainfall washed away bridges, dykes, freeways and homes causing an estimated \$13B in damages.

Many of these challenges will only be exacerbated by Russia's invasion of Ukraine which has created an acute humanitarian disaster - displacing millions of people and also impacting global food supplies as both Ukraine and Russia are amongst the world's largest food and fertilizer exporters. As these issues come to a boil, simmering on the back burner is the struggle to deliver efficient and affordable healthcare in the context of both aging demographics and vulnerable and marginalized populations.

Often, we are asked why we invest in companies working to solve these diverse challenges. These challenges have a deep impact on human wellbeing, and they are not going to be solved with software and business model innovations alone. Hard tech solutions based in chemistry, advanced materials, biology, and physics are needed if we really want to move the needle.

Investing with an impact lens can result in outsized financial returns and 2021 was a very successful year for Pangaea's portfolio. Redlen Technologies, whose semiconductor platform enables a paradigm shift for the CT imaging industry improving the diagnostic power of CT imaging, was acquired by Canon. ESS Inc. began trading on the New York Stock Exchange and is uniquely positioned in the market to enable increased renewable penetration with its long duration energy storage technology. CarbonCure is helping over 500 customers reduce the carbon footprint of concrete that is produced. Companies such as Hazel Technologies, TruTag and Tidal Vision recently closed growth financing rounds and are rapidly scaling. These are all great examples of hard tech start-ups driving impact.

With increasing commercial success, we saw Pangaea's portfolio impact continue to accelerate. We also observed that our highest impact investments continue to be the most successful at growing revenue, raising capital, and generating investor returns. Impact investing is sometimes viewed as philanthropy or as yielding concessionary returns (lower financial returns in lieu of high impact). However, when breakthrough hard tech meets the world's biggest challenges there are no concessions to be made!

We see this success continuing in 2022, in part due to the increased capital formation within our sector in 2021. Notable was the closing of many \$1B+ growth funds looking to deploy large amounts of capital in our sector. These funds have embraced hard tech and their entry point is often a few years after our "early growth" sweet spot. This capital availability is important and not unexpected. As Larry Fink remarked in his 2022 letter to CEOs, "The next 1,000 unicorns won't be search engines or social media companies, they'll be sustainable, scalable innovators - startups that help the world decarbonize and make the energy transition affordable for all consumers." We couldn't agree more!

We hope you enjoy the report and are looking forward to an even more impactful 2022.

# About Pangaea Ventures:

Pangaea Ventures is a world-leading hard tech investor. We invest in companies leveraging advancements in materials science, chemistry, and biology to address some of the world's largest global challenges. We measure impact in order to maximize returns. Through quantifying impact as part of our due diligence and assessment process, we understand both the magnitude of the problem and the scalability of the solution.

By 2030, our portfolio companies will contribute:

 55M tons of **CO<sub>2</sub> reduction**

 153B m<sup>3</sup> **fresh water saved**

 50M tons more **food made**

 18M **lives impacted**

Established in 2000, our team has spent decades standing shoulder-to-shoulder with our entrepreneurs, rolling up our sleeves to help them solve problems. We invest with impact.

## WE BELIEVE

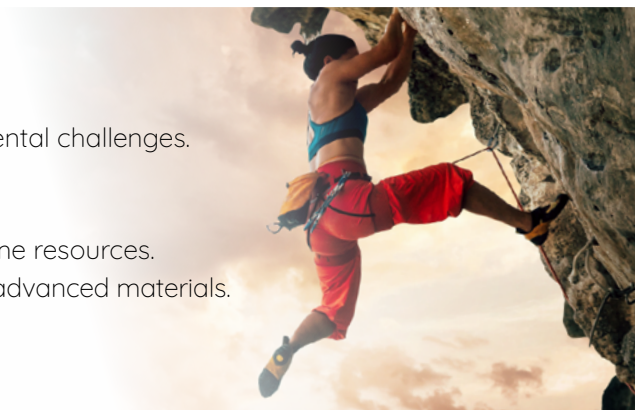
Advanced materials have the ability to solve the world's most fundamental challenges.

## WE INVEST IN

Entrepreneurs who figure out how to go farther and faster with the same resources.

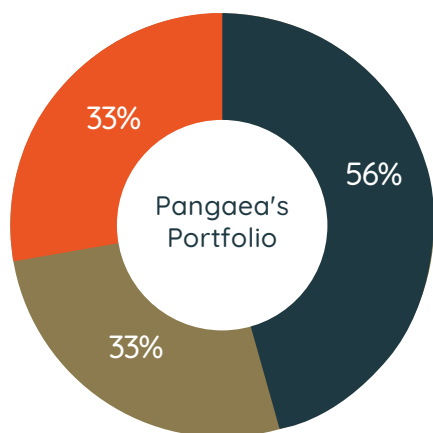
Entrepreneurs who solve the world's most fundamental problems with advanced materials.

Entrepreneurs who are making a meaningful impact.



# Our Investment Themes:

- Climate Change
- Food & Water Security
- Healthcare



Total does not sum to 100 as Pangaea portfolio companies often contribute towards more than one theme.

## CLIMATE CHANGE

Our climate is changing and interventions are required to reduce greenhouse gas emissions and increase our resiliency. We are investing in decarbonization, energy transition, circular economy, green chemistry, resource & industrial efficiency, and more.

## FOOD AND WATER SECURITY

As the world's population continues to grow, we will need to produce 70% more food to meet our needs. We are investing in sustainable agriculture, water treatment, supply chains, alternative & plant based proteins, and more.

## POOR HEALTH OUTCOMES

Improving health outcomes and reducing the cost of healthcare will have a significant impact. Approximately 25% of total healthcare spending in the US is wasteful. We are investing in medical devices, point of care diagnostic tools, biomaterials, personalized health, and more.



# Massive Impact Opportunities Drive Capital Flows

2021 was a record year for investing in climate and sustainability focused start-ups. According to Techcrunch, over \$40 billion was invested in more than 600 climate related companies, double the capital deployed in 2020 and 2021 delivered 28 new climate tech unicorns. Over the last two years, growth stage companies have benefited from public market interest in transformational sustainable and climate oriented companies. We have seen capital flow into billion-dollar growth stage funds sponsored by mainstream asset managers such as BlackRock, Goldman Sachs, TPG and Wellington. With this later stage capital in place, early stage investors have the confidence that capital will not be the limit to growth as it was in the past. Nevertheless, with public market valuations softening, increased regulatory scrutiny for Special Purpose Acquisition Companies (SPACs) and geopolitical tension casting attention towards more acute issues such as a growing humanitarian crisis, global energy prices and security, will capital flows retreat in 2022?

Our belief is that 2022 will be a year where investors take a moment to recalibrate and rationalize the market opportunity. We believe the days of growth-stage-sized funding rounds (and their associated valuations) for pre-revenue companies are behind us. We will see fewer unicorns created in 2022 as valuations start to normalize. But, what we won't see is the evaporation of capital that occurred in the late 2000's during cleantech 1.0. Today, there are funds with significant dry powder and the investor interest in high impact investments is undeterred. We have seen that once a new technology has proven its technical and economic feasibility and has strong product market fit, the opportunity is so large that exponential scaling can be achieved. Ultimately that's the driver for a continuation of the large growth rounds and go-public events we saw in 2021.

## While Impact Drives Change, ESG Keeps Us in the Lane

Often, we hear the terms "Impact Investing" and "Environmental Social Governance (ESG) Investing" used interchangeably. Impact Investing drives additional positive change above and beyond the status quo. For Pangaea Ventures that means investing in companies that are material, measurable, intentional, and sustainable. For an impact company, making money and solving a significant problem are one and the same; the larger the problem the company solves, the greater the financial reward.

In contrast, ESG investing relies on metrics and rankings of a company against various ESG standards. This is typically done in the context of risk mitigation as opposed to proactively seeking to drive a truly positive outcome. ESG investing has grown in prominence with large asset managers and public market investors because companies that score high on ESG rankings typically have lower risk profiles and are less exposed to potentially value-destructive macro trends and policies (for example carbon pricing for a coal-based power generator). ESG principles such as consultation with indigenous stakeholders or having a gender balanced management team are synonymous with good management.

Pangaea invests in early growth companies typically with teams ranging from 20-40 people. In many cases there is little corporate structure. Nimbleness trumps the reporting requirements and procedures often associated with ESG frameworks, but the need for structure increases as the company grows. The early growth phase is a transitory time and part of our role is to help guide this transition. ESG frameworks provide simple and standardized metrics for evaluating and ranking inputs and outputs which we can leverage these metrics to help build good corporate citizens and better companies for all stakeholders.

However, strong ESG performance does not guarantee that impact at any scale will be achieved. Driving positive impact requires penetrating the market with a differentiated product, service, or business model. Breakthrough hard tech innovation is required to achieve the transformational impact on critical issues such as carbon dioxide emissions, food and water security and improvements to human health. Quantifying impact is not easy. It's more nuanced than completing a survey or ticking off a box. This limitation is widely recognized and we're proud to be partnered with organizations like Impact Capital Managers and Impact Frontiers as we collectively work to deliver a level of standardization that has been the key success factor for the widespread adoption of ESG.

# Shifts in Climate Exposes Vulnerability of Health Equity

Often, people struggle to make the connection between health outcomes and climate change. Climate and weather-related disasters have increased fivefold over the last 50 years. This makes the climate change connection to a host of health issues more directly than expected. For example, climate-related events such as wildfires, extreme heat, air pollution, and prolonged drought have an impact on many human health factors including: respiratory complications, birth defects, fertility issues, infectious disease, mental health, gastrointestinal conditions, and cardiovascular disease.

When disaster strikes, the vulnerable and marginalized populations are often disproportionately affected. This creates a multiplier effect: communities where access to healthcare is historically most constrained are often hit the hardest by environmental impacts. The goal of equitable healthcare falls even further from reach, especially in the United States. Each additional burden we place on the already fragile system such as food insecurity, damaged infrastructure, supply chain disruptions, interrupted services and increased rates of disease and comorbidities have a significant financial impact. According to the National Resources Defense Council, air pollution and climate change generate more than \$800 billion in health costs in the United States each year. Fundamentals like access to basic needs and health providers that are equipped to adequately deliver care in a timely manner become more challenging to secure as climate pressures increase.

Pangaea's health portfolio focuses on lowering cost, improving patient outcomes and increasing access. We can no longer think of climate change in isolation from the societal impacts it creates and the burden on the healthcare system. The last 18 months have demonstrated that the system cannot withstand a significant increase in pressure. The urgency to commercialize technologies that reduce carbon emissions while at the same time improving lives has never been more critical.

Adding to the complex relationship between climate change and healthcare, the global health care industry is the fifth largest greenhouse gas emitter on the planet and is responsible for 4.5% of worldwide emissions. As a significant driver of greenhouse gas emissions, hospital systems, care providers, pharmaceutical companies and manufacturers will need to join the other industries in setting emission reduction targets and adopting new technologies to reduce their impact.



# NewLeaf Life Cycle Analysis Drives New Products

symbiotics

We sat down with Aaron Kelley, VP Product Strategy and David Flack, VP Business Development of NewLeaf Symbiotics, to learn more about how the company is leveraging the power of impact assessments as a key driver in their business.

**Pangaea:** *Before we get started can you tell us a little more about what NewLeaf Symbiotics does?*

**David:** NewLeaf Symbiotics leverages a type of microbe called methylootrophs that can be used on a wide variety of agricultural crops to improve yields, increase resiliency against drought and pests and improve nutrient utilization. This allows farmers to produce more food to feed the world at lower costs. NewLeaf Symbiotics has developed a large library of these microbes and provides growers with crop-specific microbes that are applied in various stages of the growing cycle.

**Shortly after we produced our first impact report, you became motivated to further understand the potential impact of your technology. What were some of the key findings?**

**Aaron:** Indeed, we engaged a third-party consultant to conduct an impact and life cycle assessment of our technology. Our initial work on estimating the impact potential in broadacre crops such as soy and corn was largely in line with the work that Pangaea had done. However, we saw greater potential impact with reducing required nitrogen inputs by farmers. Because of this effort, we found that the impact potential of our technology vastly exceeded our expectations and have intensified our resources in these areas.

**Improved nitrogen efficiency is very timely given recent concerns about fertilizer shortages. Is this an increasing area of customer interest?**

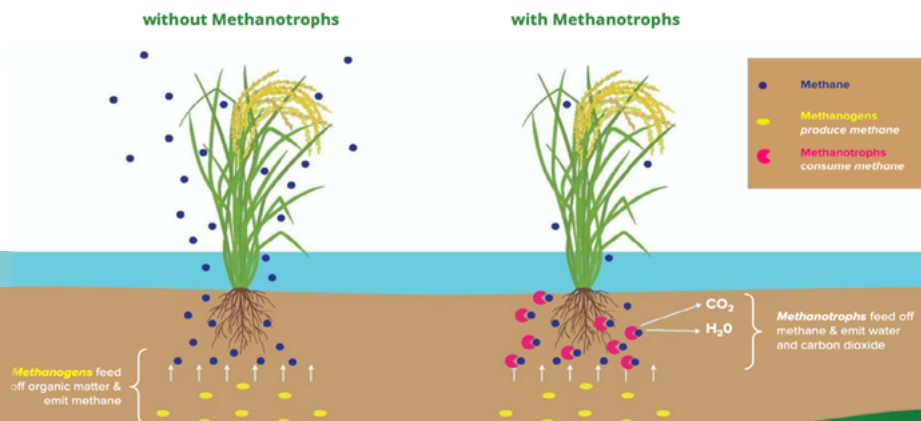
**David:** Yes, although with nitrogen production currently representing about 2% of GHG emissions and a major input cost for farmers, there has been excitement about this for a while. We're already working closely with Sabic, a Pangaea Ventures limited partner, to bring this to market.

**Were there any other key findings from your impact analysis work?**

**David:** Yes, we learned that a major GHG emission contributor is methane production from rice. Methane is a 25X more potent contributor to global warming than carbon dioxide and rice production is one of the major man-made sources of emissions. Research has shown that methanotrophs have the potential to reduce these emissions by up to 60%. With our deep experience commercializing a similar organism we're ideally positioned to bring a microbial methane reduction technology to market.

**Very exciting. What are the next steps for the methane mitigation technology?**

**Aaron:** We are a month or so away from obtaining southern hemisphere field trial data and are putting together similar programs in the United States. Because we have already produced a product for rice that has demonstrated an improvement in yield, in the range of 8%, we are ahead of the game in bringing this complimentary product to the market. We'll be working collaboratively with the industry, including seed providers, and those discussions are already underway.





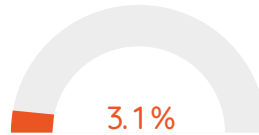


# Our Progress On CO<sub>2</sub> Emissions:



## PORTFOLIO GOAL

**55M tons** of CO<sub>2</sub> reduced by 2030



## PROGRESS TO DATE

**1.7M tons** of CO<sub>2</sub> reduced

It is universally recognized that we need to take action to reduce global CO<sub>2</sub> emissions significantly over the next decade in order to slow the rate of climate change. Pangaea Ventures is actively investing in companies and technologies whose activities can reduce emissions, capture CO<sub>2</sub> and permanently sequester carbon.

The 2022 IPCC report states that global greenhouse gas emissions must peak by 2025 and be reduced sharply over the coming decade if warming is to be capped at 1.5°C. There will not be one magic solution that solves this problem, but a symphony of complimentary hardtech innovations that can permanently capture and sequester atmospheric carbon, reduce point source emissions and reduce the carbon intensity of essential industries like agriculture.

## Highlighted Portfolio Companies:



CarbonCure enables the concrete industry to improve operations while reducing its carbon footprint.



ESS Inc. designs, builds and deploys environmentally sustainable, low-cost, iron flow batteries for long-duration commercial and utility-scale energy storage applications requiring from 4 to 12 hours of flexible energy capacity.



NewLeaf Symbiotics is an agriculture technology company that discovers, develops, produces and commercializes a new class of microbial inoculants. These microbial inoculant products enhance nutrient uptake to improve crop health and increase yield.



Prime Roots uses koji (a fungi) to produce a healthy, delicious, and sustainable protein that replicates the taste and texture of meat. Substituting 1kg of Prime Roots bacon for 1kg of pork bacon prevents the emissions of 9kg of CO<sub>2</sub>.

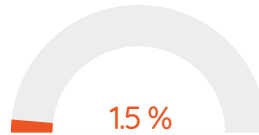


# Our Progress On Food Production:



## PORTFOLIO GOAL

**50M tons** of food produced by 2030



## PROGRESS TO DATE

**730,000 tons** of food produced

With a growing population and increasing per capita protein consumption, we need to realize a 70% increase in food production by 2050 to feed an expected population of 10 billion. Coupled with regulatory changes around pesticides and fertilizer use along with increasing pesticide resistant insects, the world requires innovative crop and animal health solutions.

Pangaea Ventures is an active investor in food & agriculture, focusing not only on how we grow our food more efficiently and sustainably, but investing in how food is transported from farmers fields to grocery store shelves and alternative protein products.

## Highlighted Portfolio Companies:



Over 30% of produce harvested is never consumed. Hazel improves the quality and shelf life of produce during storage and transportation.



Vestaron is leading a peptide-based revolution in crop protection. Their peptides overcome existing resistance issues while offering a desired safety profile for workers, beneficials and the environment.



Calysta is the world-leader in creating novel protein ingredients that can future proof food – with high-quality fish, livestock and pet nutritional products to improve global food sustainability and security



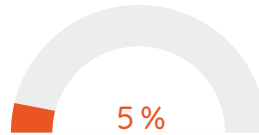
Tidal Vision is the only commercial-scale producer of chitosan in the USA because traditional processes produce large chemical waste streams. Chitosan is a natural biomolecule elicitor which improves plant health and hardiness, reduces the need for synthetic pesticides, and reduces transpiration without lowering crop output.

# Our Progress On Fresh Water:



## PORTFOLIO GOAL

**153B m<sup>3</sup>** of fresh water saved by 2030



## PROGRESS TO DATE

**7.5B m<sup>3</sup>** of fresh water saved

Access to clean and fresh water is essential for health and well-being. Water is considered a multi-impact investment by the UNPRI due to its interconnection with climate change, the agri-food value chain, industrial productivity, healthcare, renewable energy, ecosystem services, and biodiversity. Therefore, it's no surprise that water touches almost every one of Pangaea Ventures' investments!

With changing weather patterns, unprecedented drought, and concerns around persistent pollutants - hard tech innovations are urgently required to clean, preserve, and protect this essential non-renewable resource.

## Highlighted Portfolio Companies:



Tidal Vision is the only commercial-scale producer of chitosan in the USA because traditional processes produce large chemical waste streams. Incorporating chitosan into water treatment systems reduces operating costs, increases throughput, and enables sludge upcycling.



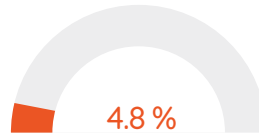
Prime Roots uses koji (a fungi) to produce a healthy, delicious, and sustainable protein that replicates the taste and texture of meat. Prime Roots uses 92% less water to produce 1 kg of koji protein compared with animal meat.



## Our Progress On Lives Impacted:



**PORTFOLIO GOAL**  
18M lives impacted by 2030



**PROGRESS TO DATE**  
865,000 lives impacted

Annually, 30% of the \$4.1 trillion that is spent on US health care is wasteful. Wasteful care means patients are unnecessarily harmed at the point of care or receive unnecessary or low-value care that makes no difference to their health outcomes. Our metric of lives impacted means patient health outcomes are being improved through driving factors like increasing access, affordability and quality.

The intersection between individuals' health and CO2 emissions, malnutrition and clean water means that all Pangaea's portfolio companies contribute in some way to impacting lives. Our measurement focus is on portfolio companies whose specific mission is to improve quality of human life through direct health-related impacts.

### Highlighted Portfolio Companies:



Aspect combines the power of microfluidics and 3D bioprinting to create living, human tissues that will save lives and make people healthier



TruTag digitizes drugs, consumables and other products to enhance product security and safety, and to fuel new digital health solutions.



Modulim is a pioneer in optical imaging solutions powered by spatial frequency domain imaging that help clinicians assess compromised circulation



Sun Genomics aims to change the way we choose a probiotic by making the best custom formulated probiotics. Using whole genome sequencing, the company produces custom gut probiotics tailored and formulated for each individual customer.



# Measuring Impact Return on Investment (IROI) Remains Elusive

At Pangaea Ventures we have always seen impact as an opportunity lens. If companies have a differentiated technology that can make a meaningful dent in global carbon dioxide emissions, food production, fresh water, and lives impacted, we have the starting ingredients to build a large and profitable global company.

Financial returns are easy to measure, but Impact Return on Investment (IROI) are not, mainly because there are no generally accepted [accounting] standards. On the one hand, calculating the number of patients impacted by a novel medical device or the amount of food produced with a new fermentation process can be reasonably measured. However, taking that data and translating it into a quantified impact value relies on layers of assumptions.

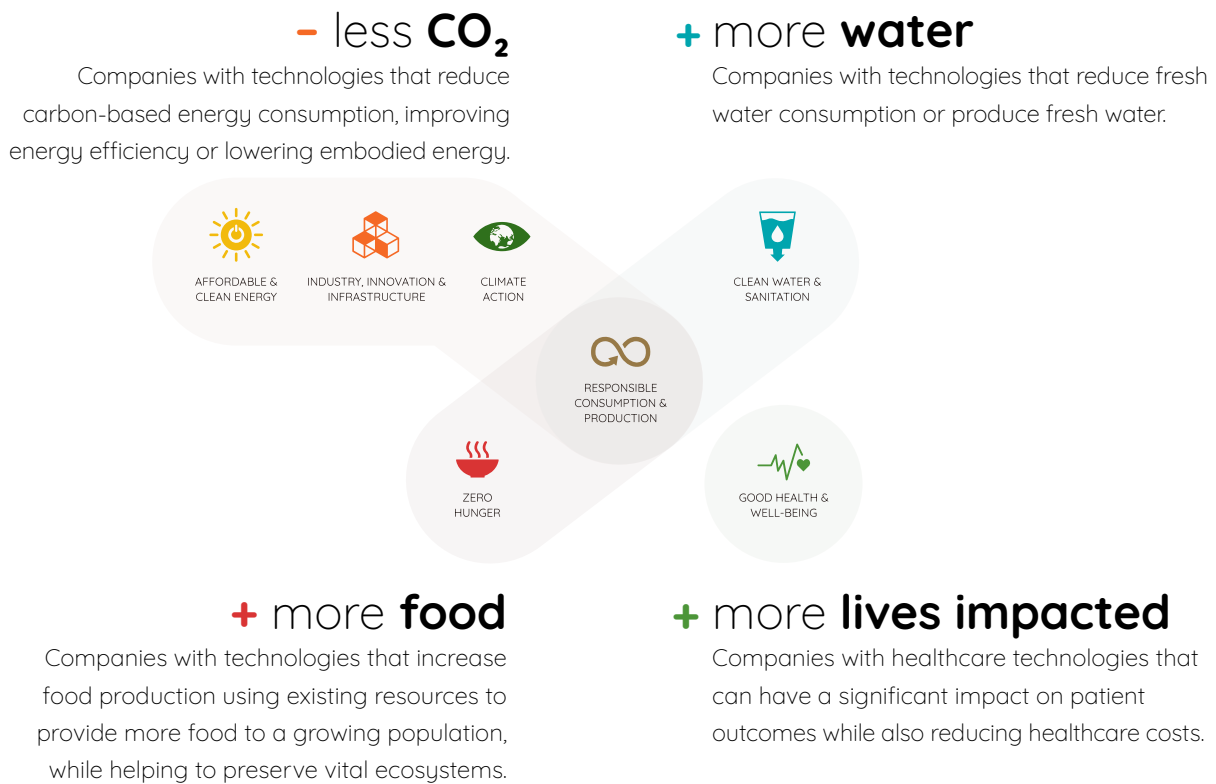
For example, a medical device that cures diabetes has a much more significant impact on each patient's expected lifespan and quality of life vs. a device that improves the quality of a patient's sleep. Our "Lives Impacted" metric does not account for the subjective magnitude of impact. For a measure such as carbon dioxide reduction, what is the dollar value of each ton that is captured or reduced? How do you value different levels of carbon emissions (Scope 1, 2, 3) and consider other factors such as permanence? The diversity of technologies, markets and scope of impact means that impact measurement frameworks are still in their infancy.

The beauty of financial statements is that they are not subjective. There are consistent units and standardized accounting standards. We're thrilled to report on the progress our portfolio companies have made in reducing carbon emissions, increasing food and water availability and improving people's health. But as you finish reading this report we're already working on how we will quantify the value of impact in the years to come.



# Notes on Impact methodology

Pangaea’s investment process includes a commitment to quantify and qualify the impact of the business’s activities. As detailed in our previous Impact Reports, Pangaea has developed an impact model that enables us to monitor and measure impact creation across industries. The United Nations Sustainable Development Goals were used as a framework for Pangaea to select a handful of simple and quantifiable metrics that are relevant to the wide number of technologies and markets within our investment scope.



From initial screening and through the due diligence process, Pangaea evaluates opportunity through an impact lens in order to gain insights into the magnitude of the problem being solved and the scalability of the solutions being developed. With the 2030 impact goals in mind, Pangaea’s deal analysis includes consideration of impact criteria that the technology must address in order to be approved for investment. The impact considerations are not meant to replace financial returns but to provide us with an holistic view of potential investment candidates.

## 2030 Impact Goals

### Pangaea’s Impact Strategy





# Current Portfolio Companies

Company	Pangaea's Impact Target	SDGs	Focus
 AEPONYX	CO <sub>2</sub> Reduction		Optical switching for high broadband, 5G, and data center
 Airborne	CO <sub>2</sub> Reduction		Automated composite manufacturing
 Aspect biosystems	Lives Impacted		3D bioprinting of tissue for drug screening and regenerative medicine
 CALYSTA	Food Production & Water		Protein production using methane feedstock
 CARBON CURE	CO <sub>2</sub> Reduction		Lower carbon concrete using a CO <sub>2</sub> mineralization process
 CORRELIA BIOSYSTEMS	Lives Impacted		Correlia is a spinout from UC Berkeley developing protein measurement tools that are cost-efficient, rapid, and customizable.
 ESS INC	CO <sub>2</sub> Reduction & Water		Low-cost energy storage with iron-based battery
 hazel technologies inc	CO <sub>2</sub> Reduction, Food Production & Water		Freshness preservation solution for produce and fresh proteins
 modulim	Lives Impacted		Imaging solution for diabetic foot ulcers and wound care
 NewLeaf symbiotics	Food Production & Water		Microbial crop treatment for plant health and yield enhancement
 polySpectra	CO <sub>2</sub> Reduction		PolySpectra makes functional photopolymer resins for advanced additive manufacturing
 prime roots	CO <sub>2</sub> Reduction, Food Production & Water		Plant-based meats based on Koji superfood protein
 REDLEN TECHNOLOGIES	Lives Impacted		Precision radiation detection and imaging technology
 sun genomics	Lives Impacted		Microbiome analysis for precision probiotics
 tactus	CO <sub>2</sub> Reduction		High impacted screen protection for the next generation of display
 Tidal Vision	CO <sub>2</sub> Reduction, Food Production & Water		Chitosan based formulation for agriculture, water and textiles
 TruTag TECHNOLOGIES	Lives Impacted		Nanoparticles with unique signature for product safety and authentication
 VESTARON THE POWER OF PEPTIDES	Food Production & Water		Peptide based insecticides with performance equaling synthetics



WE ARE HARD TECH INVESTORS.  
WE ARE IMPACT INVESTORS.

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