Essex Global Environmental Opportunities Strategy: High Impact Listed Equity Investing

The Essex Global Environmental Opportunities Strategy (GEOS) intentionally invests to solve environmental challenges, focusing on climate change, by investing in impactful clean technologies. GEOS focuses on *output-oriented companies*, meaning companies that enable sustainability when their technology is deployed. Our output-oriented **listed equity** approach that explicitly aims to address environmental challenges makes GEOS unique and distinguishes us from traditional ESG approaches. Our approach demonstrates that listed equity investments can have high social impact, alongside the potential for strong financial returns. Recent ambitious government and corporate commitments to address climate change have catalyzed the growth of clean technology and creates a long-term investment opportunity within clean technology for investors going forward. The COVID-19 pandemic has also accelerated the adoption of clean technologies by demonstrating that human health is inherently linked to the environment, magnifying the importance of transitioning to a sustainable society.

This paper is about impact solutions: both describing the GEOS social impact reporting methodology while providing examples of how GEOS solves environmental challenges. We provide insights into the GEOS investment approach while expanding on how GEOS enables the achievement of the UN Sustainable Development Goals (SDGs) and helps establish a more sustainable and inclusive low-carbon society.

GEOS Investment Philosophy: Invest in clean technology solutions to environmental megatrends

As Nelson A. Rockefeller once said, "the opportunities take shape within the problems." The world is facing historic environmental challenges, with climate change headlining the most pressing environmental megatrend. Climate change is a critical threat to environmental and social health around the globe, affecting human lives through severe weather patterns, droughts, water scarcity, as well as air pollution. The global average temperature in 2019 was 1.1 degrees Celsius higher than during the pre-industrial period, and time is running out to limit global warming to 1.5 degrees Celsius.[1] Limiting temperature warming to under 1.5 degrees Celsius would drastically decrease the frequency of extreme heatwaves, reduce droughts, limit sea level rise, and lessen the loss of species and extinction compared to warming of 2 degrees Celsius or more.[2] Another megatrend that GEOS seeks to solve is water access, which is an issue deeply connected to climate change. Worldwide, four billion people experience extreme water scarcity at least one month per year, a life-threatening situation that will deteriorate as rapidly rising temperatures due to climate change exacerbate existing water scarcity issues.[3] Finally, air pollution leads to more than five million premature deaths annually, creating a tremendous burden for health systems and economic productivity.[4] The Essex Global Environmental Opportunities Strategy operates at the nexus of these environmental challenges and finance by using a thematic investment process to invest in solutions. GEOS invests in listed equity companies with disruptive clean technologies that are solving the most pressing environmental megatrends of our time, seeking to provide attractive financial returns**.** Equally as important, our investment approach

[1] World Meteorological Organization. *WMO Confirms 2019 as Second Hottest Year on Record*, 2020
[2] NASA Global Climate Change. A Degree of Concern: Why Global Temperatures Matter, 2019
[3] United Nations. *The Sustainable Development Goals Report*, 2019
[4] Environmental Defense Fund. Health Impacts of Air Pollution. https://www.edf.org/health/health-impacts-air-pollution

enables the deployment of technological solutions that will accelerate the transition to a more sustainable and equitable society and create significant social impact returns for investors.

Commitments to Solve Climate Change Catalyzing Clean Technology

Government and corporate pledges to solve climate change are catalyzing the clean technology revolution and accelerating the transition to a low-carbon society. Climate change is a systemic risk, as outlined by Ceres in their 2020 report *Addressing Climate as a Systemic Risk*, but government and corporate actions to address climate change have been uninspiring throughout the early part of the 21st century. However, recent commitments to address climate change have been far more ambitious and promising.

Government Commitments: Green COVID stimulus and the EU Green Deal

In the midst of the COVID-19 pandemic, governments in G20 countries have allocated $144.78 billion in green stimulus to the clean energy sector, seeking to create a green recovery from the pandemic while stimulating economic growth and transitioning away from fossil fuel energy.[5] The International Renewable Energy Agency (IRENA) estimates that every $1 capital expenditure invested in clean energy over the next 30 years will act as a multiplier to GDP by 5x.[6] Therefore, countries who favor green recovery plans will achieve faster economic recovery and greater growth emerging from the pandemic while improving their climate action. Green stimulus creates the opportunity to make 2019 the definitive peak for global emissions and get back on track to accomplish the Paris Agreement. In the European Union, countries have agreed on a groundbreaking climate plan, the EU Green Deal, which is projected to encompass €7 trillion in investment by 2050 in order to transition the EU to a net-zero emissions society.[7] The Green Deal will devote €550 billion to green projects within the next seven years, making the EU Green Deal the largest green recovery plan ever, with more green spending than all the recovery plans of major economies combined after the 2008 global financial crisis.[8] This deal cements the European Union's status as a global leader in the fight against climate change and will catalyze economic growth within the bloc in a sustainable manner. In total, 53% of world GDP is now covered under established or intended net-zero emissions commitments, according to the Energy and Climate Intelligence Unit, a percentage that has risen rapidly within the past year. In the U.S., where recent federal government action on climate change has been regressive, states including California and New York have taken initiative and committed to being net-zero emissions by 2045 and 2050 respectively, along with many other states and cities.

Corporate Commitments: Corporations starting to implement ambitious climate plans

Corporations have taken major steps to address climate change due to pressure from shareholders, reputational risk, and the fear that climate change will affect their business activities. Microsoft has pledged to become carbon-negative by 2030, meaning they will remove more carbon emissions from the air than they emit.[9] By 2050, Microsoft plans to have removed all the carbon emissions from the environment that

[5] Energy Policy Tracker. G20, 2020. https://www.energypolicytracker.org/region/g20/
[6] Gandolfi et al. *The EU Green Deal Upside.* Goldman Sachs, 2020
[7] Gandolfi et al. *The EU Green Deal Upside.*
[8] Abnett and Green. EU makes world's biggest 'green recovery' pledge - but will it hit the mark? Reuters, 2020
[9] Brad Smith. Microsoft will be carbon negative by 2030, 2020.
https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/

they have emitted since the inception of the company in 1975. Microsoft is not only positioning their business to operate more sustainably in the future but is also resolving the negative impacts that their historical emissions have had on the environment. Apple is another company making a strong commitment to address climate change, stating that they will be carbon neutral across their supply chains and product lifecycles by 2030.[10] The carbon emissions that Apple seeks to address are extremely important because they comprise most of the company's emissions, but are difficult to reduce. By committing to address these emissions, Apple is elevating the standard for corporate climate goals and committing to do something that few companies have accomplished.

Major Investment Opportunity and Heightened Investor Awareness of Climate Change

Government and corporate actions to address climate change have catalyzed the implementation of clean technology and investor action on climate change. Climate commitments have demonstrated the systemic risks that climate change poses to the world and investors' portfolios. A low-carbon society creates tremendous financial opportunities for investors, as clean technology will continue to expand rapidly. The technology required to address climate change is commercially viable at the present and represents significant long-term investment opportunities. Investing for impact, which GEOS is a leader in, will continue to grow as climate action swiftly expands, allowing investors to become part of the solution to addressing environmental challenges, and no longer part of the problem.

GEOS Process: Investing in output-oriented companies

The Essex Global Environmental Opportunities Strategy invests for impact by focusing on *output-oriented companies*, meaning companies that enable sustainability when their technologies or services are deployed. Our focus on output distinguishes GEOS from other sustainable investment approaches that often focus on the inputs of companies, such as water consumption and operational carbon emissions. Instead of just investing in companies with strong operational sustainability, GEOS seeks to invest in impactful companies that **produce beneficial impacts to society through their products and services**. In this way, GEOS solves the most pressing global environmental challenges and creates social impact returns for investors by investing in environmental solutions. Despite our focus on output-oriented companies, GEOS is not blind to company sustainability characteristics. In fact, we find that companies that solve environmental challenges through their core business often have strong operational sustainability as well.

GEOS Themes and Description

GEOS uses a thematic investment approach based on nine themes that we believe comprise the most influential and impactful commercial technologies available today to mitigate climate change. These themes have maintained continuity since the inception of GEOS, which has now spanned more than ten years to date. The technologies within our themes provide exposure to megatrends and create long-term investment opportunities for investors. Companies must generate a minimum of 25% revenue from one or more of our themes and have at least a $100 million market cap to get into the GEOS universe of more than 600 companies. Despite these minimum thresholds, the vast majority of GEOS holdings generate far more than

[10] Apple commits to be 100 percent carbon neutral for its supply chain and products by 2030. https://www.apple.com/newsroom/2020/07/apple-commits-to-be-100-percent-carbon-neutral-for-its-supply-chain-and-products-by-2030/

25% of their revenue from our themes. GEOS holdings frequently have exposure to multiple themes due to the versatility of their technology that often has applications in various markets and industries. When this occurs, companies are placed in the theme where we see the greatest potential for their technology to have the most significant environmental impact. The nine themes are listed below, along with their descriptions.

- ***Agricultural Productivity and Clean Fuels-*** Precision agriculture and genomics technology to improve resource efficiency within agriculture, enhance crop yields, and increase agriculture's resilience to climate change. Examples of technologies within this theme include wireless total-farm software solutions, field computers, and autonomous guidance and steering solutions, allowing farmers to use fewer inputs and increase crop productivity.
- ***Renewable Energy-*** Design and installation of renewable energy systems, including solar systems for households and businesses as well as battery energy storage systems. Renewable energy harvests wind or solar energy and is a zero-emissions form of energy that displaces highly polluting fossil fuel energy. Renewable energy systems like rooftop solar systems improve homeowner energy resilience to more frequent extreme weather events.
- ***Clean Water-*** Water scarcity and pollution plagues billions of people around the world. GEOS seeks to enable efficient utilization of water resources, with technologies such as smart metering, leak detection, and treatment to provide potable water to people who lack access to it. Technologies within this theme include water filtration, wastewater treatment, energy recovery, and desalination technology.
- ***Environmental Finance-*** Financing for energy-efficiency and renewable energy projects. GEOS holdings provide no financing to fossil fuel projects and help facilitate widespread deployment of renewable energy projects to decarbonize global energy systems. This theme also seeks to provide financing to retrofit buildings and houses to become more energy efficient.
- ***Power Merchants and Generation-*** Develop utility scale renewable energy projects, such as offshore wind farms, to provide large-scale power generation and bountiful zero-emissions energy to households and industries. Energy generated can be used in heating and cooling, electricity production, or renewable hydrogen projects to decarbonize industrial processes.
- ***Power Technology-*** Renewable energy components and electricity systems management to facilitate efficient conversion and delivery of renewable energy. Examples of technologies include semiconductors to facilitate conversion of solar energy into electricity and advanced metering infrastructure to intelligently manage energy demand. Holdings within this theme increase efficiencies within renewable energy production and help utilities and customers better manage energy demand and consumption.
- ***Clean Tech and Efficiency-*** Industrial Internet of Things (IoT) and energy efficient technologies that enhance productivity and reduce energy use, thus avoiding carbon emissions. Energy efficient technologies within the theme make industries more sustainable by improving resource efficiency. Technologies include insulation systems for buildings, which emit 6% of global greenhouse gas emissions, waterless printers that reduce energy usage by 50% compared to analog printers, LED lighting, and factory machine vision and sensors to enhance industrial productivity.
- ***Efficient Transport-*** Electric vehicle, smart mobility, and autonomous driving technologies to eliminate transport sector carbon emissions and improve driver and pedestrian safety. Examples include silicon carbide semiconductors to improve battery range and efficiency within electric

vehicles, advanced sensors and software designs, and smart mobility infrastructure to optimize roadway travel and increase safety.

- ***Low Carbon Commerce-*** Environmental testing and consulting and renewable consumer products to improve environmental footprints for industries such as pharmaceuticals, chemicals and food products. Environmental testing and consulting services improve safety and resource efficiency across many industries by testing product designs and ensuring supply chain safety. Renewable consumer products include protein-engineered drugs and sustainable plant-based substances for use in cosmetics and food products.

GEOS: More Deliberate than Traditional ESG Strategies

GEOS allows investors to directly address environmental challenges by **intentionally investing in solutions** to climate change and associated environmental problems. This is a more impactful strategy than that employed by the majority of ESG managers because GEOS *enables* a sustainable society, whereas ESG strategies just consider Environmental, Social, and Governance criteria during the investment process. Traditional ESG approaches seek to mitigate ESG risks, such as a lack of corporate diversity or damaging environmental actions, believing that long-term financial performance will be better for companies with strong operational sustainability. ESG investing is still broadly focused on exclusionary screening, such as avoiding investments in fossil fuels, due to the fear of fossil fuel reserves becoming stranded assets and of reputational risks. GEOS portfolio managers still consider ESG factors when making investment decisions, but GEOS goes further than most ESG approaches by explicitly investing in clean technology that is solving environmental challenges.

To further understand the distinction between the GEOS approach in comparison to mainstream ESG investing, consider this example based on our *Power Technology* theme. GEOS invests in a company that develops LED chip and component technology to improve energy efficiency in lighting, **reducing energy consumption by 85-90%** and avoiding carbon emissions, while producing the same amount of light.[11] Traditional ESG approaches may rate companies utilizing LED technology in their corporate headquarters as contributing positively to the "Environmental" portion of ESG, along with other relevant factors. Corporations adopt clean technologies like LED lighting to reduce their operational carbon emissions, save money on energy, and improve their reputations in terms of addressing climate change. Both GEOS and the traditional ESG investment approach are helping to address climate change by reducing carbon emissions through the LED technology, but GEOS is *enabling* the climate action by investing directly in the company developing the technology. Our approach also helps investors gain exposure to a commercially viable clean technology with long-term investment prospects due to the importance of LED lighting in fighting climate change.

UN Sustainable Development Goals: Facilitating a sustainable, resilient, and inclusive society

The UN Sustainable Development Goals (SDGs) are a set of 17 goals adopted by United Nations member states in 2015 to solve the current global environmental, social, and economic challenges. The objective of the SDGs is to create a more sustainable, resilient, and inclusive society by 2030. The SDGs replaced and build on the Millennium Development Goals, which were established in 2000 to ensure that global

[11] GEOS holding in Power Technology theme as of 9/30/20

development does not leave any country behind and economies adopt more sustainable practices. The 17 goals are illustrated below, in Figure 1.

Figure 1: Sustainable Development Goals

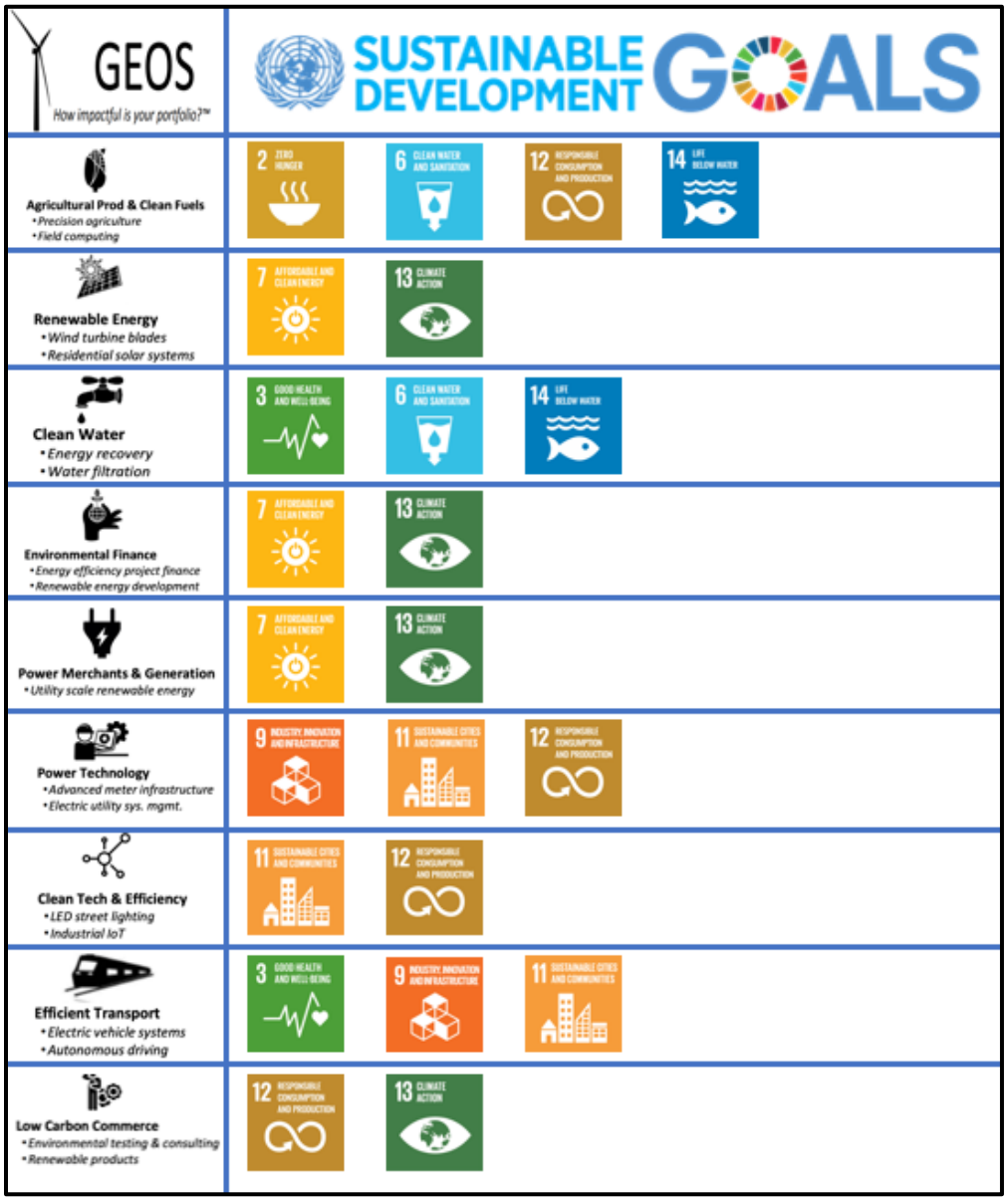
The SDGs are interconnected by nature and demonstrate the important link between environmental and human health. Common issues such as air pollution or natural resource efficiency are found in multiple goals. Each of the 17 SDGs comprise targets and indicators to help track progress in attaining the goals and provide more in-depth analysis of what each goal aims to achieve. One example is Target 7.2: increasing renewable energy in the global energy mix for Goal 7- *Affordable and Clean Energy*. In order to ensure access to reliable, affordable, and modern energy for all, which Goal 7 seeks to achieve, renewable energy generation must drastically increase and displace fossil fuel energy. Renewable energy is healthier for humans and the planet because it is a zero-emission energy and, unlike fossil fuel-based energy, does not require any harmful extraction processes.

GEOS Solves for the Sustainable Development Goals

In recent years, the SDGs have become a common framework and language among investors for demonstrating positive impact through investments. The SDGs provide investors the opportunity to show how their investments are furthering sustainable and inclusive development, with special attention paid to developing countries. As part of our proprietary impact reporting process, GEOS reports alignment to the SDGs by discussing the individual goals that each GEOS theme solves for. The SDG framework provides a comprehensive representation of GEOS solutions and demonstrates how GEOS enables a more sustainable global society. Simultaneously, we are able to draw attention to the funding gap to achieve the goals. Accomplishing the SDGs requires $6-7 trillion in annual investment, yet there is an annual

investment gap of at least $2.5 trillion to accomplish the goals.[12] GEOS can help close this gap by attracting more capital to companies making positive contributions to the SDGs, while also educating investors on the SDGs. **GEOS solves for nine of the seventeen SDGs**, as demonstrated in Figure 2 which displays our nine themes and the corresponding SDG solutions.

Figure 2: GEOS Thematic Alignment to the SDGs



[12] Gornitzka and Wilson. *Charting the course for SDG financing in the decade of delivery*. World Economic Forum, 2020. https://www.weforum.org/agenda/2020/01/unlocking-sdg-financing-decade-delivery/

- GEOS thematic alignment to the SDGs is mapped based on how technology and holdings within the theme help accomplish the objective of each individual SDG goal
- Each GEOS theme solves for multiple SDGs due to interconnections within GEOS themes and the SDGs
- Example: GEOS *Power Merchants and Generation* Alignment
    - Theme Description: Utility scale renewable energy generation projects, such as offshore wind farms produce clean energy for households and industries. Large scale renewable energy generation mitigates climate change by displacing fossil fuel energy and avoiding harmful emissions. This theme solves for two SDGs: Goal 7- Affordable and Clean Energy and Goal 13- Climate Action.
    - **Goal 7 - Affordable and Clean Energy:** "Ensure access to affordable, reliable, sustainable and modern energy for all"[13]
        - Utility scale renewable energy generation substantially increases the amount of renewable energy in the global mix and expands access to modern and clean energy services for people lacking access. 789 million people still lack access to any electricity, while billions of others only have access to dirty, polluting forms of energy.[14] The development of offshore wind farms makes clean energy more affordable and abundant, providing energy that is healthier for humans and the environment.
    - **Goal 13 - Climate Action:** "Take urgent action to combat climate change and its impacts"
        - Utility scale renewable energy generation produces zero-emission energy, displacing polluting fossil fuel energy that creates harmful greenhouse gas emissions. Offshore wind farms produce clean energy that, unlike fossil fuel energy, does not emit harmful greenhouse gases and pollute the environment. Society must immediately shift to clean forms of energy to minimize the effects of climate change. GEOS investment within the *Power Merchants and Generation* theme helps accelerate the transition to sustainable forms of energy.

Multiple GEOS themes solve for numerous SDGs due to the interconnected nature of both the Sustainable Development Goals themselves, as well as our own themes. One example of the interconnections between the SDGs within our themes relates to climate change. Goal 13 – Climate Action discusses taking urgent action to address climate change and its impacts, and we list four GEOS themes as solving for this goal. However, Goal 13 is not the only goal that seeks to address aspects of climate change. Goal 7- Affordable and Clean Energy seeks to accelerate the adoption of zero-emission renewable energy sources. Goal 9- Industry, Innovation, and Infrastructure seeks to make industries, such as the transport sector, more sustainable and less polluting by eliminating emissions. Goal 2- Zero Hunger seeks to implement sustainable agricultural practices to increase resilience to climate change. Therefore, though we list four themes as solving for Goal 13, all of the GEOS themes are helping to address aspects of climate change, whether by mitigating emissions or strengthening global capacity to withstand climate change.

[13] SDG definitions from United Nations. https://sdgs.un.org/goals
[14] United Nations. Goal 7. https://sdgs.un.org/goals/goal7

GEOS Impact Management and Reporting Process

Quantitative Metrics: Proving impact and preventing 'greenwashing'

GEOS applies an entirely proprietary impact reporting process, utilizing both qualitative and quantitative data to determine the extent of impact for GEOS holdings and prospective holdings. GEOS quantitative metrics are listed below, in Figure 3, grouped by our nine themes. GEOS metrics help convey social impacts by including a measurable assessment of our companies and themes. An example of two metrics we use within our Renewable Energy theme are *carbon avoided* and *renewable energy generated*. We are striving to aggregate, for our renewable energy holdings, how much total renewable energy is generated. We can then estimate how much carbon is avoided from a baseline using fossil-fuel energy generation. Carbon avoided in this scenario is often calculated by our holdings determining the carbon intensity of the electricity grid in areas where their technology is deployed and determining how much fossil fuel energy generation is displaced. The estimate of avoided carbon emissions helps us determine the breadth of that company's renewable energy solution and the impact they have in addressing climate change. The main metrics we utilize across our entire portfolio are carbon avoided and water saved and provided, due to the megatrends of climate change and water. We are diligently working to calculate aggregate metrics across our entire portfolio but are paying special attention to ensure these metrics represent reliable estimates.

Figure 3: GEOS Themes and Quantitative Metrics

GEOS Theme	Quantitative Metrics			
Agricultural Productivity and Clean Fuels	Water saved	Carbon avoided/energy saved	Yield improvement	Inputs saved
Renewable Energy	Carbon avoided	Renewable energy generated	Households powered	Pollution deaths prevented
Clean Water	Water saved	Potable water provided	Water treated	Carbon avoided/energy saved
Environmental Finance	Carbon avoided	Water saved	Renewable energy added	Benefit to society
Power Merchants and Generation	Carbon avoided	Renewable energy generated	Households powered	Expected future capacity
Power Tech	Carbon avoided	Water saved	Energy storage capacity	
Clean Tech and Efficiency	Carbon avoided	Water saved	Productivity increase	
Efficient Transport	Carbon avoided	Safety improvements	Pollution prevented	
Low Carbon Commerce	Carbon avoided	Deforestation avoided	Biodiversity saved	Value added to society

Quantitative metrics are also useful in detecting 'greenwashing.' Greenwashing refers to a company that claims it is providing beneficial social impacts or solving environmental challenges, but in reality, is falsely alleging or overstating positive impact to improve brand reputation and attract investors. As the field of impact investing grows, metrics will become more important to distinguish greenwashing companies and investment approaches from true sustainability leaders.

Qualitative Data, GEOS I-Assessment, and the SDGs: Conveying and tracking impact

Qualitative data is also useful for reporting and assessing social impact, so we devised a *GEOS I-Assessment* for each holding that encompasses thematic and Sustainable Development Goal (SDG) alignment. The *I-Assessment* helps us track a company's SDG alignment, quantitative metrics, and whether or not they have published a sustainability or impact report. The SDGs provide a common framework to report social impacts by demonstrating how an investment, company, or technology is helping to create a more sustainable society. Initially, we only tracked our themes and companies to the main SDG goals, seeking to determine the SDG solutions from both companies and themes. SDG mapping helped us notice a convergence of technologies across our Efficient Transport, Clean Tech and Efficiency, and Power Technology themes. Technologies within these themes are starting to expand to other markets due to the growth of "smart city" technology that provides resource-efficient and connected solutions to urbanization. We have since extended this SDG mapping project to include SDG targets, delving deeper into company and thematic impacts for the specific SDG targets. This will help us develop a greater understanding of how our technologies and companies enable the 17 main Sustainable Development Goals.

Active Engagement Strategy: Helping companies articulate their environmental solutions

GEOS portfolio managers practice an active engagement strategy with companies in order to better understand the environmental and social solutions offered by companies and their technologies. However, GEOS engagement also helps companies to improve the way they present their solutions. Solving for climate change and other environmental megatrends is ingrained in the DNA of GEOS holdings, but GEOS engagement helps companies to better articulate their environmental and social impact benefits to improve their message to the marketplace. We encourage companies to report relevant quantitative metrics, such as those illustrated earlier in Figure 3, to report on contributions to the SDGs, and to publish case studies that demonstrate the environmental and social benefits of their solutions in a real-world setting.

Numerous companies have credited GEOS engagement for encouraging them to calculate and publish what we have termed "output metrics": quantitative metrics demonstrating how the company is solving for environmental challenges. For example, one company in our *Power Technology* theme recently published that their smart meter install base **avoids 8 million metric tons of carbon** emissions annually and credited GEOS engagement for catalyzing them to track and publish this data**.**[15] Smart meters reduce carbon emissions by making energy consumption more transparent to utilities and consumers, improving energy efficiency, and helping customers reduce their energy consumption. As a listed equity strategy, our direct outreach is another way GEOS is able to have meaningful engagement with companies expanding listed-equity impact investing beyond proxy voting.

Illustrating GEOS Social Impact

With GEOS solving for nine different SDGs and comprising nine different themes, there are numerous examples of GEOS solving environmental and social challenges. Three important areas where GEOS investment enables sustainability which we would like to highlight are through our *Efficient Transport, Clean Water,* and *Agricultural Productivity and Clean Fuels* themes.

[15] GEOS holding in Power Technology theme as of 9/30/20

Efficient Transport: ***Electric vehicle technology enables fewer emissions from the road transport sector***

SDGs Solved For:

- **Goal 3 - Good Health and Well-Being: "**Ensure healthy lives and promote well-being for all at all ages"
- **Goal 9 - Industry, Innovation, and Infrastructure: "**Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation"
- **Goal 11 Sustainable Cities and Communities**: "Make cities and human settlements inclusive, safe, resilient, and sustainable"

The transportation sector is responsible for 14% of global greenhouse gas emissions, with road transportation accounting for 72% of those emissions, making it a significant contributor to climate change and harmful air pollution.[16] Taking action to address these emissions is crucial since transportation emissions are projected to grow at a faster rate than any other sector due to the increasing number of global vehicles.[17] Not to mention, historic reliance on dirty fossil fuels to power transportation has led to numerous environmental disasters, including recent oil spills in Siberia, on May 29th, and Mauritius, on July 25th. In Mauritius, the oil spill has led to dolphins, whales, sea turtles, and other marine life washing up dead on the shores, a devastating blow to ocean ecosystems that are already strained by human activity.[18] The GEOS Efficient Transport theme seeks to address these major issues by investing in companies involved with lithium batteries, advanced sensors, and semiconductors, in order to accelerate the adoption of environmentally-friendly electric vehicles. Lithium batteries combined with advanced sensors improve the range of electric vehicles and increase efficiency, alleviating concerns of "range anxiety" which has been a key complaint among consumers regarding electric vehicles. Semiconductors are increasingly made from silicon carbide materials which can sustain a voltage 10 times higher than silicon, improving efficiency, while silicon carbide has high thermal conductivity which eliminates cooling system complexity.[19]

Electric vehicles are zero-emission vehicles, but emissions are created when non-renewable energy sources are used to charge them. Even so, electric vehicles currently are associated with **30-60% lower emissions** than combustion engine vehicles during their use when charged from the grid.[20] As renewable energy as a portion of total electricity generation increases, the decarbonization benefits from electric vehicles will be even further enhanced. When electric vehicles are charged with 100% renewable energy, such as solar energy from rooftop solar systems, the vehicle's use is associated with zero-emissions**.** As electric vehicles start to outpace demand for combustion vehicles, the likelihood of environmental disasters due to ruptured oil tankers or leaking well sites declines dramatically, protecting vital ecosystems and biodiversity. The social impact return of electric vehicles is therefore less, and eventually zero, emissions during the vehicle's use, no harmful air pollution, such as particulate matter due to burning gasoline, and reduced instances of environmental disasters. GEOS investment in electric vehicle technology helps solve for SDG Goal 3 -

[16] IPCC. *Climate Change 2014: Mitigation of Climate Change*, 2014
[17] Wang and Ge. Everything You Need to Know About the Fastest-Growing Source of Global Emissions: Transport. World Resources Institute, 2019
[18] Ariel Saramandi. Dead whales wash ashore as Mauritius faces oil spill aftermath. NBC News, 2020.
[19] Jed Dorsheimer. *The New SiC Constant: Entropic reduction in the future of transport*. Canaccord Genuity, 2019
[20] World Economic Forum. *A Vision for a Sustainable Battery Value Chain in 2030*, 2019

Good Health and Well-Being, Goal 9 - Industry, Innovation, and Infrastructure, and Goal 11 - Sustainable Cities and Communities.

Efficient Transport: ***Smart mobility technology improves roadway safety and optimizes efficiency***

SDGs Solved For:

- **Goal 3 - Good Health and Well-Being**
- **Goal 11 - Sustainable Cities and Communities**

GEOS holdings in the Efficient Transport theme are also developing smart mobility technology using advanced sensors, smart mobility infrastructure, and autonomy to improve road travel safety. Road transportation poses many risks to driver, pedestrian and cyclist safety, and often leads to deadly accidents. The adoption of autonomy and advanced sensor technology within vehicles helps protect against driver error by automatically maintaining vehicle position within lanes and enabling automatic braking features. When vehicles are fully autonomous, driver error will be eliminated, and roads will become far safer. Smart mobility infrastructure enhances safety outside the vehicle by creating smart intersections which reduce traffic congestion and pollution and improve safety. Smart infrastructure is also able to recognize cyclists and pedestrians near intersections to limit potential accidents. The benefits of smart and connected mobility further provide positive social impact returns through the Efficient Transport theme by reducing congestion, improving safety, and optimizing vehicle time on the roads. GEOS investment in these smart technologies helps solve for SDG Goal 3 - Good Health and Well-Being and Goal 11 - Sustainable Cities and Communities, where SDG 3.6 explicitly seeks to reduce traffic accidents and SDG 11.6 aims to improve air quality within cities.

Clean Water: ***Increasing potable water availability to all and reducing energy intensity of desalination***

SDGs Solved For:

- **Goal 3 - Good Health and Well-Being**
- **Goal 6 - Clean Water and Sanitation**: **"**Ensure availability and sustainable management of water and sanitation for all"
- **Goal 14 - Life Under Water**: "Conserve and sustainably use the oceans, seas, and marine resources for sustainable development"

Water is a basic human necessity, yet water procurement poses major global challenges due to widespread scarcity and pollution. *One in three people worldwide lack dependable access to clean drinking water*, a measurement that is projected to worsen as climate change intensifies and often leads to water-borne illnesses and poor health.[21] The GEOS Clean Water theme helps solve this issue by investing in desalination, wastewater treatment, energy recovery, and water filtration technologies. The Clean Water theme enables sustainability in terms of three SDGs: Goal 3 - Good Health and Well-Being, Goal 6 - Clean Water and Sanitation, and Goal 14 - Life Under Water. For example, one company in the GEOS Clean Water theme treats **121 million cubic meters** of drinking water annually through their decentralized and

[21] World Health Organization. 1 in 3 people globally do not have access to safe drinking water, 2019 https://www.who.int/news-room/detail/18-06-2019-1-in-3-people-globally-do-not-have-access-to-safe-drinking-water-unicef-who

customized water treatment solutions, providing clean drinking water in developing countries and high water-stressed areas.[22] Another GEOS holding has leading energy recovery technology that enables more than **11.5 million metric tons of annual carbon savings** during use in seawater reverse osmosis (SWRO) desalination processes, by reducing energy consumption by 60%.[23] This company's solutions produce **17 million cubic meters of potable water daily**. Energy recovery devices (ERDs) are utilized to reduce the energy intensity of desalination processes. ERDs recycle hydraulic energy using existing fluid flow from desalination plants and injecting captured energy back into SWRO processes, thereby reducing energy consumption and carbon emissions. The positive social impacts of these two examples are clean drinking water, fewer carbon emissions, and fewer water-related illnesses and deaths.

The GEOS Clean Water theme also provides social benefits by reducing effluent pollution from untreated wastewater, which affects both human and marine ecosystem health, and by utilizing water more efficiently to alleviate environmental stress on aquifers. Reducing effluent pollution helps solve for SDG Goals 3 and 14, especially important for marine ecosystems in which nitrogen-rich nutrient pollution can cause algal blooms that create hypoxic zones. As global aquifers become more depleted due to growing water demand and climate change, the ability to treat and recycle water will become essential in providing water to scarce regions, making GEOS water holdings integral in providing long-term water solutions.

Agricultural Productivity and Clean Fuels: ***Precision agriculture and genomics technology facilitates greater farm productivity and efficiency and increases resilience to climate change***

SDGs Solved For:

- **Goal 2 - Zero Hunger: "**End hunger, achieve food security and improved nutrition, and promote sustainable agriculture"
- **Goal 6 - Clean Water and Sanitation**
- **Goal 12 - Responsible Consumption and Production: "**Ensure sustainable consumption and production patterns"
- **Goal 14 - Life Under Water**

Global agriculture is a substantial cause of environmental stress and degradation throughout the world. Agriculture is responsible for *70% of global water withdrawals* and *23% of greenhouse gas emissions*, creating issues in water-stressed regions and significantly contributing to climate change.[24] The GEOS Agricultural Productivity and Clean Fuels theme reduces environmental issues caused by agriculture, but also mitigates risks that climate change poses to agriculture, by investing in precision agriculture and genomics technology. As climate change intensifies, drought, extreme precipitation, and rising temperatures will put food production at risk. Uncertain precipitation patterns magnify the importance of planting resilient crops and maximizing resource efficiency. Precision agriculture technology allows farmers to use fewer inputs such as water, fertilizer, and pesticides, but still increase crop yields, limiting contributions of emissions from agriculture while simultaneously growing more food. One example of GEOS exposure to precision agriculture is our investment in a company that developed a laser land-leveling technology to reduce water run-off. Agricultural run-off wastes water resources and often carries chemicals,

[22] GEOS holding in Clean Water theme as of 9/30/20
[23] GEOS holding in Clean Water theme as of 9/30/20
[24] Ceres. *Climate Change and Agricultural Production: An Overview of Risks and Opportunities*, 2020

such as fertilizer and pesticides, that pollutes waterways, affecting human and marine health. Uneven land grade can also reduce crop quality and yield by creating water pooling and dry patches throughout the field. The laser technology helps farmers achieve perfectly level fields and minimize water runoff, which has enabled farmers in Pakistan to **reduce their water use by 40%** while improving the quality and productivity of their crops.[25] This same company provides their vast array of technological solutions to avoid **362,000 metric tons** of carbon emissions annually, primarily through efficient field navigation through crop rows using autonomous guidance and steering solutions.

Genomics, another agricultural technology GEOS invests in, improves agricultural productivity by selecting for desirable traits such as drought tolerant, high yield, and pest resistant crops. Unlike genetically modified crops which contain introduced foreign genes, genomics technology uses *existing* genes within a plant's genome to select for desirable plant characteristics. As climate change intensifies, agriculturally desirable traits will be crucial to feed a growing population that is expected to demand 50-70% more food by 2050.[26] One company GEOS invests in has created a form of low-lignin alfalfa that is a more efficient feed system for dairy cows, allowing fewer cows to produce more milk due to increased bioavailability and nutrients in the feed.[27] Improved livestock productivity is extremely important because if dairy and beef cattle were a nation, it would be the second highest greenhouse gas emitting nation after China, yet demand for animal products is projected to rise as global population and incomes continue to increase.[28]

Closing Thoughts: GEOS enables SDG achievement

The Essex Global Environmental Opportunities Strategy is unique by intentionally investing in clean technology solutions to climate change and other environmental megatrends. Our *output-oriented* approach distinguishes GEOS from traditional ESG approaches and enables investors to have high impact through listed equity investments that help solve the UN Sustainable Development Goals (SDGs). Interest in ESG and impact investing has expanded since the beginning of the devastating COVID-19 pandemic, due to the realization that environmental, social, and governance factors are extremely relevant for a just recovery and transition. The pandemic has illustrated the important link between human health and the environment, especially given that researchers have found an association between prolonged exposure to air pollution and COVID-19 mortality.[29] As investors continue to consider sustainability criteria throughout the investment process and inflows into ESG approaches continue to grow, ask yourself this: "Do I want to invest in companies that operate sustainably or do I want to invest in companies that enable sustainability and help solve environmental megatrends?" GEOS is an impactful investment strategy that allows investors to enable sustainability, solve environmental megatrends, and enact positive environmental and social impact.

[25] GEOS holding in Agricultural Productivity and Clean Fuels theme as of 9/30/20
[26] Lang et al. *Impact Investing in Sustainable Food and Agriculture Across Asset Classes*. Croatan Institute, 2017
[27] GEOS holding in Agricultural Productivity and Clean Fuels theme as of 9/30/20
[28] Ahmed et al. *Agriculture and Climate Change: Reducing emissions through improved farming practices.* McKinsey & Company, 2020
[29] Harvard T.H. Chan School of Public Health. Coronavirus and Air Pollution, 2020. https://www.hsph.harvard.edu/c-change/subtopics/coronavirus-and-pollution/

Disclosures:

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