Addressing the Investment Challenge in a World of Climate Change

Lucas White

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It Would be More Surprising if Humans Were Not Dramatically Impacting the Environment

Source: NASA
Greenhouse Gases Have Spiked to Record Levels

Historical CO$_2$ Levels

As of 12/2016
Source: NOAA
Methane Levels Are Often Overlooked...

...despite methane being more than 20 times more potent than carbon dioxide as a greenhouse gas

Source: EPA
Carbon Dioxide Concentrations and Temperatures Are Accelerating Upwards

As of 2016

<table>
<thead>
<tr>
<th>Carbon Dioxide Concentration and Temperature</th>
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<tbody>
<tr>
<td>Temperature Anomaly (°C)</td>
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<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>-0.4</td>
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<tr>
<td>-0.2</td>
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<td>0.2</td>
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<td>0.4</td>
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Sea Levels have Risen in Tandem with Temperatures

Source: NASA

Sea Levels (1880-2016)

Global Mean Sea Level Variation (in)

Year

The Consequences of Climate Change Have been Widespread

Average Annual U.S. Coastal Flooding

Wildfire Impact in the U.S.

Extreme Precipitation Events in the U.S.*

Global Natural Disasters

Source: EPA, NOAA, National Interagency Fire Center, The WorldWatch Institute

* 48 continental states
“When Global Warming Ends, About the Year 2060, the Ice Age Will Begin”

An alternate view from Samsung Chemical Coating Co. in a full page NY Times ad on March 7, 2017

“There is No Relationship between Amount of Carbon Dioxide Emission and the Global Warming.”

“...the current global warming is caused by the synergy effect of increase of the Earth’s precession due to sea level rise.”

“During the Ice Age, which lasts for about 200 years...the creatures living in the sky, the land, and the sea will become mass extinctions. Large tsunamis and earthquakes will make dead creatures like coal and oil as in the past...At this time, the creatures that are exposed to solar radiation at the time of the ice age would become mutations and begin the birth of new species.”

“The future of mankind depends on you and President Trump.”
From an Investment Perspective, Climate Change Presents Risks and Opportunities

Quality Strategy

- Holistic integration of climate change and other ESG risks
- Exposure to Integrated Oil & Gas peaked at more than 13% in 2009
- By 2015, had sold all Integrated Oil & Gas companies due to stranded asset concerns (not divestment!)
Quality Has Lower Risk From Environmental Impact

Source: Bloomberg, GMO

Median Impact/$ Invested Relative to S&P 500

- Total Greenhouse Gas & CO2 Emissions
- Total Energy Consumption
- Total Water Used
- Total Waste Discarded

GMO Quality  S&P 500 Index  MSCI World Index
Is “Green Resources Strategy” an Oxymoron?

Maybe, but...

Our Resources Strategy:

- Excludes coal and tar sands companies
- Excludes particularly poor ESG offenders
- Has a much lower energy exposure than the benchmark
- Part of energy exposure targeted to be Alternative Energy
As Costs Continue to Drop for Wind and Solar, We Are Reaching an Inflection Point

Unsubsidized Levelized Cost of Energy over Time

$/MWh (Log Scale)

$400

$100

$50

Onshore Wind

Utility Scale Solar

As of 12/31/16
Source: Lazard
Battery Costs Continue to Drop as Well

Lithium-ion Battery Pack Prices

Source: Bloomberg New Energy Finance, 2017. Sustainable Energy In America Factbook
Renewables Are Increasingly Competitive With Conventional Generation

Solar bids have been as low as $29.10/MWh in Chile and $24.20/MWh in Abu Dhabi

Unsubsidized Levelized Cost of Energy in the U.S. by Source

As of 12/31/16
Source: Lazard, IJGGC, EIA
Now We’re Focused on Opportunities in the Climate Change Sector

The Climate Change Sector:

1. **Companies involved in climate change mitigation**
   - Alternative Energy
   - Batteries and Storage
   - Energy/Buildings/Transportation Efficiency
   - Pollution Control
   - Technology and materials (copper, lithium) used in technology aimed at the mitigation of climate change

2. **Companies involved in adaptation to climate change**
   - Water treatment, processing, and recycling
   - Agriculture
   - Energy efficient air conditioning
We Need a Massive Amount of Investment to Head Off Climate Change

- $9 trillion to decarbonize electricity between 2016 and 2050
- $6.4 trillion towards energy efficiency efforts in the building, industry, and transport sectors
- $4-5 trillion to overhaul archaic electric grids

Source: IEA
Despite Tremendous Growth, Renewables Are Still a Small Piece of the Global Energy Puzzle

Global Energy Consumption

- Fossil Fuels
- Nuclear/Hydro
- Wind/Solar

Source: BP
The Climate Change Sector Will Experience Rapid Growth

Al Gore: “...we must...ramp up our transition to a clean energy economy at a pace previously unimaginable.”

As of 2/2017
Source: BP
Electric Vehicle Sales Have Been Growing Dramatically

...and are projected to grow rapidly over the next few decades

Global Electric Vehicle Sales

CAGR: 65%

As of 2016
Source: International Energy Agency (IEA)
Electric vehicle sales include both battery electric cars and plug-in hybrid electric cars
Electric Vehicles Represent a Tiny Fraction of Global Vehicle Sales

Global Passenger Vehicle Sales

Source: International Energy Agency (IEA), International Organization of Motor Vehicle Manufacturers (OICA)
Electric vehicle sales include both battery electric cars and plug-in hybrid electric cars
Many Are Concerned About the Impacts of the Trump Administration on Climate Change Mitigation Efforts

But will President Trump endanger an industry with job growth 8 times that of the broad U.S. job market?

The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive.

Source: USDA, Twitter
Global Policies Will Support the Move to Sustainable Energy

The Paris Accord, Global Covenant of Mayors, and other initiatives target greenhouse gas emission reductions

**Greenhouse Gas Emission Reduction Targets**

- **Targeted Percentage GHG Reduction**
  - California 2050
  - New York State 2050
  - London 2040

**India’s Renewable Energy* Capacity**

- **Capacity (Gigawatts)**
  - 2016
  - 2022 Target

**Chinese Electric Vehicle Fleet**

- **Number of Electric Vehicles on the Road**
  - 2016
  - 2020 Target

**Incremental Energy Efficiency Standards**

- **Annual Savings Targets**
  - California
  - Maine
  - Massachusetts
  - Rhode Island

Source: Compact of Mayors, Global Covenant of Mayors, Government of India’s Ministry of Power Central Electricity Authority, EVVolumes.com, ACEEE

*Refers to wind and solar
Have You Had to Sacrifice Returns to Invest in Companies That Do Good for the World?

No…after over a decade, the Climate Change sector kept up with the broad market

As of 4/30/16
Source: Bloomberg
Companies Positioned for Dramatic Secular Growth Are Trading in Line With the Broad Market...

As of 12/31/16
Source: MSCI, IBES, GMO

Price/Forward Earnings

MSCI Global Environment Index: 17.0
MSCI ACWI: 16.6
The Existence of Secular Growth Doesn’t Mean Investing Is Easy...

Despite impressive growth in solar, solar companies have been terrible investments

Source: BP, GMO
Vertically-Integrated Solar is comprised of First Solar, SunPower, Canadian Solar, and Jinkosolar
However, a Value Orientation to a Secular Growth Sector Can Produce Outstanding Opportunities

Source: BP, GMO

Footnote: Wind turbine manufacturers are Vestas, Gamesa, and Nordex. P/E ratios are based on normalized earnings.
Value Has Worked Well in the Environmental Sector Recently...

Performance of Cheapest Quartile P/E Stocks within the MSCI Global Environment Index Relative to the MSCI Global Environment Index

As of 12/31/16
Source: MSCI, GMO
It’s Reasonable To Think That This Could Be a Particularly Inefficient Sector

Value has worked well

Analyst coverage is low

- The average MSCI ACWI stock had 50%+ more coverage than the average HSBC Climate Change Index stock as of March 2016

The companies are relatively small

- The largest solar company is around $3b in investable market cap
- The largest wind company is around $15b in investable market cap

This is a relatively new, poorly understood sector

- Requires a combination of being able to see the big picture and analyze companies

This sector is unlikely to be picked over by value managers

- This is a volatile, high growth sector

As of 12/31/16
Source: HSBC, MSCI
Conclusions

- Climate change is a critically important investment issue that poses risks...and presents opportunities
- Economics will drive the transition to a clean energy world
- There will be tremendous investment opportunities in the climate change sector...but we believe a disciplined, value-oriented approach will be critical in navigating this high growth sector