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Only \$1 Trillion: Annual Investment Goal Puts Climate Solutions Within Reach

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IEA pegs cost of addressing climate change at 1.3 percent of global output of goods and services. The investment would also stoke a clean economy.

By Elizabeth Douglass

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A two-year-old number is changing the way governments, companies and investors approach the fight against climate change: \$1 trillion.

That is roughly the amount of additional investment needed worldwide each year for the next 36 years to stave off the worst effects of global warming and keep the Earth habitable, according to the [International Energy Agency](#) ^[3]. The Paris-based organization of 29 developed countries calculated the cost in 2012 and raised its estimates this year. [Ceres](#) ^[4], a Boston-based nonprofit investor group that advocates environmental sustainability, framed it as the "Clean Trillion" in an investment campaign that has become a rallying cry.

While \$1 trillion sounds like a lot, knowing the figure is good news, according to climate activists, investment experts and United Nations organizers of the next round of global climate talks. Worldwide, almost \$4 trillion a year will need to be invested over that time anyway in electric grids, power plants and energy efficiency, the IEA says. In a global economy of \$75 trillion, \$1 trillion works out to 1.3 percent of the world's annual output of goods and services, or about \$140 a person. The calculation also focuses the discussion on investment—suggesting the potential for returns and profits—rather than on costs for disaster response and losses to rising oceans.

"One of the things we're trying to show is that this is an opportunity story in response to the horror of the risks we're facing," says Sean Kidney, chief executive officer of the [Climate Bonds Initiative](#) ^[5], a London-based nonprofit promoting large-scale investment in a low-carbon world. "We're in a big hole. The key thing is for government and investors to sit down and work it out. It's got to be a grand collaboration to get out of the hole."

Putting a price tag on the energy sources, transportation systems, energy-saving steps and reductions in carbon-based greenhouse gas emissions provides a framework for discussion, according to the IEA, corporate leaders and others. It has also shifted the perspective of companies and investors. On Sept. 23, the UN is hosting a Climate Summit in New York that's meant to showcase new climate-related pledges from governments and to boost support for an international climate treaty. Next year in Paris, negotiators hope to sign a successor agreement to the expired Kyoto climate accord.

Importance of 2 Degrees

Nations participating in the treaty talks will attempt to work out a plan for keeping the average temperature of the world's atmosphere from climbing by 2 degrees Celsius (3.6 degrees Fahrenheit) since the dawn of the Industrial Age in the 18th Century. The rapid increase in burning of fossil fuels over the past 2½ centuries has poured billions of tons of carbon into the atmosphere, causing surface air temperatures to warm by 0.8 degrees on average, according to climate scientists.

Stopping the increase short of a 2-degree rise would allow the planet to dodge the most damaging effects of climate change, scientists say. The Earth's atmosphere is now on track to warm 4 degrees by the end of the century, triggering a range of mostly irreversible changes, leading to famine, water shortages, disease and wholesale migration away from coasts and expanding deserts, according to the [Intergovernmental Panel on Climate Change](#) ^[6].

Nations involved in the climate treaty negotiations agreed to the goal of holding the increase under 2 degrees, but most

countries probably will fall short of their goals for reduced emissions by 2020. Greenhouse gases have continued to rise, largely because of the continued expansion in burning of fossil fuels, which is responsible for 70 percent of climate-change emissions, according to the IEA. Warming is a function of the accumulation of carbon dioxide and other gases, so every new coal-fired power plant brings the 2-degree limit closer.

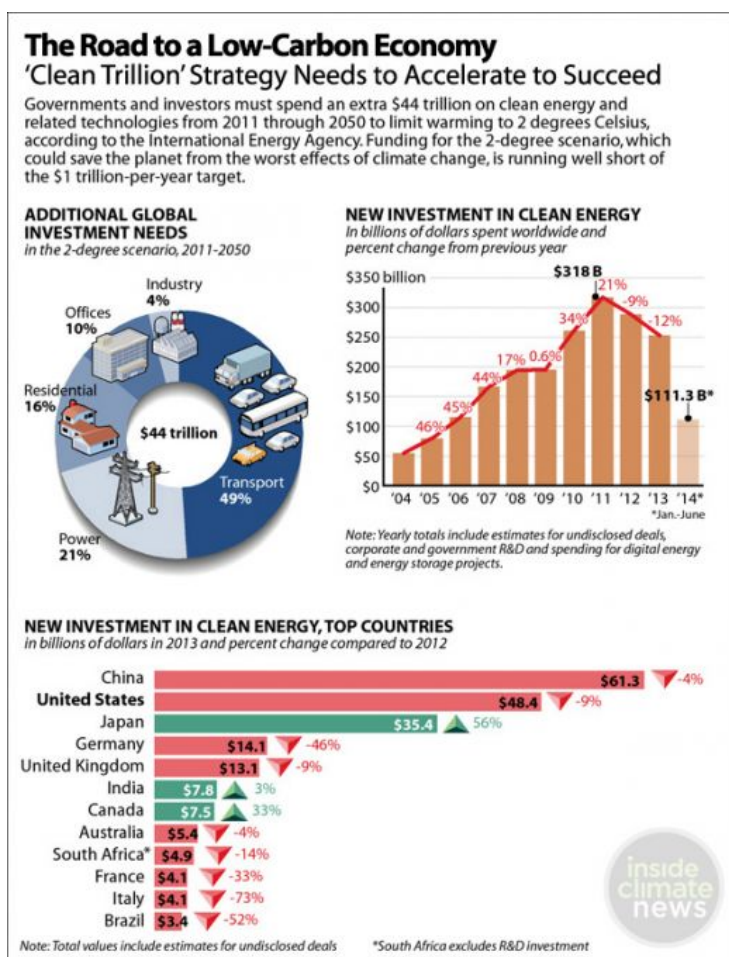
Prodded by investors and growing evidence of climate change, businesses including General Motors Co., Toyota Motor Corp., Nike Inc., General Mills Inc., Apple Inc. and Google Inc. have taken stock of how climate change will affect them. A growing number are shifting to renewable energy, preparing for sharply higher fossil fuel costs and developing more energy-efficient products. Now business leaders are urging global leaders to act.

Leading up to the UN Climate Summit next week in New York, business groups and investors who manage trillions of dollars published reports and held meetings to call for action. Last week, investment groups publicized the creation of We Mean Business [7], an umbrella organization of investors urging world leaders to agree on a plan for fighting climate change.

"There's a very compelling signal to governments that business is moving forward," said Christiana Figueres, executive secretary of the UN Framework Convention on Climate Change, the group leading the climate treaty talks. "The future will happen by default or design. It is in everyone's interest for that future to be based on policy on the part of governments and on design on the part of business sector. That is the ultimate collaboration that we're looking for."

While reframing the issue as an investment opportunity has altered the approach to slowing climate change, reaching a global agreement won't be easy. For years, climate talks have focused largely on the economic and environmental consequences of not acting. The goal has been to get polluting countries to agree to limits on burning of fossil fuels. With coal and oil the lifeblood of economic growth, that's been a tough sell.

Moreover, even if investment rises by more than \$1 trillion a year, there's no certainty it will be enough. The climate, economies, technology and governments are complex systems that are in constant flux. This year, the IEA had to rework its estimates to reflect a larger-than-expected drop in the costs of generating solar energy, a delay in carbon-capturing technology and a hit to nuclear power projections after the Fukushima disaster in Japan.



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What \$1 Trillion Will Buy

To make its estimate for clean energy investment, the IEA examined the costs and development of more than 500 related technologies, plumbed its 40-year database of global energy production and consumption statistics and combined them with emissions data and climate science.

In its report this year, the IEA said the world would need to invest an additional \$44 trillion by 2050 in clean energy and related technologies to comply with the 2-degree pledge. The "clean trillion" formulation was based on the IEA's 2012 estimate of \$36 trillion, but for simplicity and to account to other estimates that are higher and lower, the rounded \$1 trillion has stuck.

Just to accommodate today's trends and projections for growth in energy demand, the world would have to fund \$140 trillion in new and upgraded electric grids, power plants and energy efficiency, according to the IEA. The estimated \$44 trillion of additional investments in clean energy increase that total by 35 percent.

While definitions vary, the IEA's clean-energy investment list includes:

- Renewable electricity-generation technologies such as wind, solar, and hydropower;
- Power infrastructure technology to eliminate wasted electricity and accommodate a mix of power sources;
- Systems that capture and store harmful carbon emissions;
- Technologies to make buildings, devices and machines more efficient;
- Improved industrial processes to reduce fuel consumption;
- Transportation advances such as hybrid/electric or fuel-cell vehicles.

Overhauling transportation will take the most money, accounting for 49 percent of the total, the IEA estimates. Power generation is second at 21 percent, with housing, offices and industrial installations accounting for the rest.

David Elzinga, author of the IEA report, warned that the \$44 trillion cost estimate includes assumptions on the use of several new technologies that are still being developed, such as carbon capture and storage. These need to be funded, nurtured and redesigned over time, and if successful, they will have to be widely deployed to reduce costs.

"The less progress we make in the early stages, the more expensive it's going to get over the long term because you can't necessarily rush the learning," Elzinga said. "You have to put the time in. You have to install the gigawatts or the megawatts in order to bring those costs down."

The world can still meet the 2-degree goal, he said, but the slower the progress, the greater the chances that existing and new fossil fuel facilities will have to be shut down before the end of their useful lives.

"We see that approximately 800 gigawatts of generation capacity is going to need to be retired before the end of its technical life, so that's another example of how these costs go up," Elzinga said. "Technology gets deployed, and then if we really need to meet our climate goals, we actually have to shut this stuff down. That's a waste of money."

Now, corporations, governments and groups ranging from the World Bank to pension managers are becoming more focused on the economic benefits of tackling climate change.

The IEA estimates, for example, that between now and 2050, the world could have a net savings of \$115 trillion that would otherwise be spent on fossil fuels. The health benefits of limiting pollution also translate into substantial savings.

In addition, there is some evidence that the link between higher energy use and greater prosperity isn't absolute. [Germany](#)^[9] and some other economies have shown that economic growth and lower power use can co-exist.

Investment Lags

So far, however, clean energy investment is lagging. Worldwide investment in clean energy peaked in 2011 at \$318 billion, less than a third of the \$1 trillion target. In 2013, clean energy funding fell to \$254 billion, according to Bloomberg New Energy Finance. The Bloomberg LP unit bases its calculations on a smaller "clean energy" universe than the IEA, omitting such things as energy efficiency measures, but it has consistent data stretching back to 2004.

There have been other reversals, too. Oil giants BP Plc and Chevron Corp., at one time among the largest investors in clean energy projects, have either dismantled or sold off their renewable energy units. And in some places—Australia and Ohio among them—politicians have dropped policies aimed at curbing fossil fuel use.

What's more, fossil fuel projects are still being built using outdated, more-polluting technology. According to the IEA, 60 percent of global coal technology deployed worldwide in the last 10 years fell into that category.

In January, Ceres launched an investment campaign framing the IEA's low-carbon funding target as the "Clean Trillion." In a report accompanying the launch, Ceres—whose name was also the name of the Roman goddess for agriculture and fertility—laid out concrete ways to fund the transition and made the case that the task of reworking the global energy system was both feasible and potentially profitable.

"A trillion is actually not a big number anymore in global economies," said Mark Fulton, a co-author of the Ceres Clean Trillion report. "It's a challenge, but it's easily doable."

Global Bond Market

The global bond market, expected to be a critical source of clean energy money, is about \$100 trillion strong—significantly larger than the market for stocks. And there is plenty of money sitting on the sidelines and transferable out of fossil-fuel investments. Pension funds, insurance companies, corporations and others have large amounts of cash on their balance sheets, and they're looking for investments that would boost returns in an era of record-low interest rates.

"There is no problem with money," said Kidney of the Climate Bond Initiative, which has been following the emergence of green and climate-action bonds. "The world is awash in capital that's looking for a good home."

Borrowed money in the form of bonds is especially useful for the climate challenge because ramping up renewable energy and other infrastructure requires large infusions of funds up front, and the payback accumulates over time as either revenue or savings.

A market for green bonds is already beginning to take root, with companies, governments and others selling debt instruments to fund rail projects, solar power plants, energy efficiency projects and even consumer purchases of electric cars.

Since 2008, the World Bank has issued more than \$6.4 billion in green bonds in 17 currencies. The International Finance Corp. has issued \$3.6 billion in green bonds. Intergovernmental economic development organizations have joined the trend, and so have governments and major corporations.

GDF Suez, a French utility, sold \$3.4 billion in bonds to fund renewable projects. It was the largest green bond issued to date—and it attracted triple the amount of investment needed.

Overall, \$503 billion was invested in 1,900 outstanding climate-themed bonds at the end of July, according to the Climate Bond Initiative. More than 70 percent of it funded rail and other transportation projects. A large percentage of those bonds included some form of government backing, thanks largely to the inclusion of state-backed railway projects in China and elsewhere. More green investment opportunities are needed, though, according to asset managers and investment authorities.

'Clean-Energy Investment Gap'

"Quite simply, there's a huge clean-energy investment gap," said Jack Ehnes, chief executive officer of the [California State Teachers' Retirement System](#) ^[10], the second-largest U.S. pension fund, with assets of \$146 billion.

Ehnes and hundreds of other leading investors attended the UN's Investor Summit on Climate Risk last January on ways to increase climate-related financing.

"Meeting the \$1 trillion-a-year goal will be a challenge, but it is where we need to be in order to protect and grow our portfolios and to ensure the long-term sustainability of our planet," Ehnes said.

Ceres President Mindy Lubber said pension funds aren't alone in seeking investing opportunities.

"Many in the business community ... are eager for climate action," Lubber said. "Businesses have seen firsthand the devastating impact of climate change, and they realize it is not good for the planet or for our economy."

Lubber and others said there are several roadblocks slowing down clean energy investment. The main one is uncertainty over the strength of government commitments to help move energy systems from fossil fuels to clean energy. If the UN doesn't broker a climate treaty, will federal and regional governments act aggressively? Will they enact policies to accelerate the transitions—and will they renege on those policies?

"Many corporations are wising up and responding to both the risks and the opportunities that climate change present," said Nigel Topping, executive director of CDP, a nonprofit that focuses on company disclosures on climate change. "What's missing is a strong policy response around the world to climate change, and a lack of such a policy is adding dangerous uncertainty to the marketplace." That kind of uncertainty, he said, "holds business back from bold investment."

Investors are also waiting for a strong flow of green projects that offer good returns, but that aren't too risky. Funding won't go to green bonds in large sums unless they are financially on a par with, or better than, other investment options, investor groups say.

Governments can assist on that front, too, by providing loan guarantees and shouldering some of the costs. Last month, for example, the [U.K. government provided guarantees](#) ^[11] for \$78.7 million in bonds for a Scottish biomass power project.

Such guarantees are one way governments can reduce risk and help raise investor interest in climate or green bonds. Governments can also help along the energy transformation by changing regulations, instituting mandates, providing tax breaks and incentives, and funding critical research and development, advocates say.

Policy-makers also can raise the cost of using fossil fuels by removing subsidies, creating disincentives and instituting strict emission controls.

One of the most discussed policy options is putting a price on carbon emissions. One way to do that is by imposing a steadily rising tax on fossil fuel use. Another is to enact a cap-and-trade system that would set progressively lower emission limits and allow trading of emission credits in a market. Power plants and others would have to buy credits at increasing prices to continue to operate. Carbon markets are widespread in Europe and elsewhere, including in California and the Northeast.

What it comes down to, according to the UN's Figueres, is that it's going to take major commitments from government leaders and investors to help the world stay clear of the worst effects of climate change.

"This is absolutely critical, because we are running out of time," she said. "We can no longer afford the luxury of being gradual or incremental. We really do need very, very stark changes right away."

An earlier version of this story misstated that the \$1 trillion per year clean energy investment was equivalent to \$10,400 per person.

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[5] <http://www.climatebonds.net/>

[6] <http://www.ipcc.ch/>

[7] <http://www.wemeanbusinesscoalition.org/>

[8] <http://insideclimatenews.org/sites/default/files/images/CleanTrillionCharts600px.preview.jpg>

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