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**PRIVATE INVESTMENTS IN GREEN TECH USEFUL METRIC IN TRACKING  
PROGRESS FOR INCLUSIVE GROWTH**

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## ABSTRACT

The Green Transition Scoreboard® (GTS) highlights the fact that private investments are necessary to complement government funds for transitioning to low-carbon economies as pledged by 195 countries and their INDCs at COP21 and the UN’s SDGs in 2015. The first Green Transition Scoreboard was released during the Copenhagen Climate Summit in Copenhagen in 2009, with a total of US \$1.2 trillion. The green transition is well underway, as documented by the myriad of trend points documented in this paper. Our figures are updated twice a year and the GTS model proposes that if the annual increase tracked so far of at least US\$1 trillion in these private investments, that these funds will continue the rapid scaling of renewable energy (wind, solar, geothermal, hydro and efficiency) and their lower costs will out-compete fossilized energy and nuclear power. This process is shifting the global economy into the next evolutionary stage I have termed the Solar Age. Our definition of green technologies is very strict: no nuclear, no clean coal, and only biofuels grown from algae on saltwater. Our current GTS explores “Ending Externalities: Full-Spectrum Accounting Facilitates Transition Management” (Henderson, 2016).

**Keywords:** *economic transition, global trends, private investment, capital expenditures, renewable energy*

## 1. INTRODUCTION

The GGKP has tracked the watershed agreements of 2015 between the 195 member countries of the United Nations, which are now accelerating the global transition from the fossil-fueled Industrial Era to the Solar Age. The Green Transition Scoreboard® (GTS), launched in 2009, has documented this global transition as the next stage of human socio-technical evolution. Examples of these transitions are now underway from local to global scale, as described in the GTS. Some pioneer macro-projects such as the Club of Rome’s DESERTEC Industrial Initiative (Dii) launched in 2009 encountered roadblocks, including the financial crisis of 2008. Others, such as the energy efficient “Industrial Ecology” model pioneered by the City of Kalundborg in are now working models of macro-efficiency. Even deeper transition management is that of Janine Benyus and her Biomimicry Institute and B 3.8 consulting firm helping companies redesign their products and processes since the 1990s (Scanlon, 2016).

**Table 1.** GTS Sector Breakdown

### 2016 Sector Totals

Sector	Amount US\$
Renewable Energy	\$ 3,167,439,374,995
Energy Efficiency	\$ 1,698,230,838,007
Life Systems	\$ 1,030,740,404,335
Green Construction	\$ 745,227,254,757
Corporate Green R&D	\$ 488,883,488,787
<b>Grand Total</b>	<b>\$ 7,130,521,360,881</b>

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## **2. GLOBAL TRANSITION MANAGEMENT**

The new term “transition management” sums up the decision-making challenges to both public and private sectors as they are confronted with demands from their publics and the increasingly powerful third sector: civic, non-profit organizations, public opinion and social media worldwide. Indeed, in *Can the World Be Wrong?* founder of survey research firm Globescan Doug Miller (2016) calls public opinion “the new global superpower”. Incumbent industries and finance are being forced to reevaluate their business models and assets after Carbon Tracker’s reports on the extent of their reserves that are now un-burnable, including their latest reports on “Shale and the Price Roller Coaster” (2016) and “No Rhyme or Reason” (2016), a critique of corporate forecasting errors. Popular uprisings worldwide challenge elites and their policies subsidizing 19<sup>th</sup> and 20<sup>th</sup> century fossilized sectors, corporations and the enabling financial system. Politicians responded in 2015 by ratifying the broadly grassroots agenda codified in the 17 Sustainable Development Goals (SDGs) building on the earlier Millennium Development Goals.

As far back as 2000, OPEC was exploring the transition from fossil fuels to renewable solar-based energy (Lukman, 2000). Fast forward to the game-changing failure of the Doha meeting and announcement by Saudi Arabia’s Deputy Crown Prince Mohammed bin Salman that oil giant Aramco will transform itself by 2018 from an oil producer to a \$2 trillion diversified sovereign wealth fund investing in non-oil industrial development and renewable energy (Micklethwait, 2016). Even oil major BP forecasts a decline in oil as a share of the world’s primary energy mix from its high of almost 50% down to 30% by 2035, replaced primarily by renewables, hydro and gas (“BP Energy Outlook”, 2016).

Global financial players began responding, beginning to acknowledge their over-investments in fossil fuels and fossilized sectors: legacy central power-generation electric utilities, coal mining, industrial food production and other fossil-reliant industries, now being forced to disclose their carbon-footprints. Cheap debt fueled the US boom in shale now with \$77 billion in junk bonds as cheap oil turned into today’s bust (Loder, 2016). In 2015, 26 shale drillers went bankrupt with more to follow in 2016 and expected to rise to 73 in 2017 (“DUC and Cover”, 2016). Fracking-related earthquakes in Oklahoma caused by injection of wastewater led to new regulations on its 4,000 disposal wells (Philips, 2016). Led by Ceres, the UN Inquiry: Design of a Sustainable Financial System, UN Principles of Responsible Investment (UNPRI), SASB, GRI and others shifting to successful fossil-free portfolios, mainstream finance is beginning to catch up, as described herein (Ceres, 2016). ShareAction’s 2016, report “Transforming Our World Through Investment” surveyed 52 institutional investors worldwide with £4 trillion AUM on their response to the UN’s SDGs with 95% of respondents planning to engage with investee companies; 84% will allocate capital to investments supporting regulatory reforms Money Morning’s Nick O’Connor called the transition “The Age of the Sun Guzzler” (2016) correctly linking oil’s decline to the electric vehicle revolution. Investopedia reported that the jump in oil stocks in response to oil’s price rebound was “Another Case of Too Fast Too Soon” – as GTS confirms (Saintvilus, 2016).

Bill Gates and other investors announced a multi-billion dollar fund for clean energy technologies – the Breakthrough Energy Coalition (Nussbaum, Talev, & Morales, 2015). Yet, more research is less a priority than applying existing technologies, ramping them up to scale and continuing lowering their prices. Many institutional investors and banks attended the Ceres Conference at the UN, January 2016, and joined in pledges to shift to green development, and our GTS goal of \$1 trillion annually was adopted by many. A report was released, “Mapping the Gap: the Road from Paris”, which provides a roadmap (Bloomberg New Energy Finance, 2016). Further pledges by 117 global companies set emissions reduction targets; 52 companies pledged to work toward use of 100% renewable energy. Another 156 companies pledged “Positive Action” on climate while 400 cities pledged similar action (Strassner, 2015). A recent survey by GreenBiz (2016) indicated that 75% of global businesses with \$10 billion or more in sales do not think a price on carbon would affect them significantly while 39% think it would help them. The UN Principles for Responsible Investment signatory pension funds have grown to \$56 trillion under management. UNPRI Managing Director Fiona Reynolds (2016) makes the business case for ethical investing as practical not political. The 2015 report of the UN Inquiry: Design of a Sustainable Financial System includes Ethical Markets’ report “Perspectives on Reforming Electronic Markets and Trading” (Henderson, 2016). Beyond

traditional money-denominated GDP-measured economic growth, models initiated in the European Union, and the new inclusive sustainable development models are based on new metrics measuring 6 forms of capital: finance, built, intellectual, social, human and natural capital.

These new auditing standards (SASB, IIRC, CDSB, GRI) all use multi-disciplinary research and incorporating statistics measuring progress in health, education, human rights, gender equality, poverty reduction, environmental protection and regeneration. New certification for accountants based on Global Management Accounting Principles® of the Chartered Institute of Management Accountants (CIMA) and the American Institute of CPAs (AICPA) embrace these new values, focusing their journal beyond cost accounting to Financial Management on integrative thinking and metrics for intangible assets: intellectual property, brands and reputation (CIMA & AICPA, 2016). The Global Initiative for Sustainability Ratings (GISR) provides a broad overview of this expanding field (GISR, 2016). In our 2014 GTS report “Green Bonds Growing Green Infrastructure”, we cover the expansion of this important public sector and the global issuance of green bonds led by China. At the G20 meeting in Chengdu, China, July 23-4, 2016, the final Communiqué incorporates the move to “Green Finance” (G20 Communiqué, 2016).

The new global focus on transition management leaves behind obsolete, myopic, economic textbooks and such misleading terms as “externalities”. This terminology is now revealed as an accounting strategy used by companies to ignore those social and environmental costs imposed on others: taxpayers, the public, future generations, and the environment. A recent study commissioned by the UN found that if these costs had been internalized and properly accounted on company balance sheets, they amounted to \$7.3 trillion worldwide and reduced or eliminated stated cumulative corporate profits to shareholders (Makower, 2016). Companies that support the Paris climate agreement now demand that other companies relying on business models based on “externalizing” costs disclose their carbon emissions. Former US Chair of the SEC Mary Schapiro is leading this disclosure initiative for the Financial Stability Task Force on Climate-Related Financial Disclosures. The 2° Investing Initiative, CDP and other research and NGO groups will be monitoring these disclosures and the pledges on INDC promises by those 189 countries at COP21. The IMF estimates the annual cost to governments and consumers of “externalities”, subsidies and social impacts at \$5.3 trillion annually (IMF Research, 2015).

The confusing concepts and terminology of “externalities” are still ubiquitous in economic analyses, textbooks, company accounting, government policies and public debates. Even the OECD’s Policy Challenges for the Next 50 Years contains only one reference to greenhouse gas emissions, and its entire analysis is based on GDP-measured economic growth models (Braconier, Westmore, & Nicoletti, 2014). While the vast majority of so-called “externalities” are negative and impact human health, safety and the environment, corporate-friendly economists point to “positive externalities”, i.e., jobs, company training programs, benefits and charitable contributions. The time has clearly come to clarify these claims by finally closing the books on this confusing historic term: externalities. The American Sustainable Business Council (ASBC) is focusing on how US Congress members, their corporate supporters and conservative think tanks rely on these obsolete assumptions, terms and analyses (ASBC, 2016). Ending externalities is vital to clarifying humanity’s choices for our common future.

### **3. FULL-SPECTRUM ACCOUNTING TRACKING GLOBAL TRANSITION GOALS**

Going forward we can focus instead on the goals and outcomes we want: the SDGs and the COP21 outcome. Both are accelerating the global transition now underway and the opportunities they present for a more equitable cleaner, greener future for all. This transition requires organizations and all government agencies and national accounts to adopt genuine full spectrum accounting. Some accounting firms claim to perform full-spectrum accounting – but within the traditional accounting profession frameworks. The GreenBiz & Trucost “State of Green Business” (2016) states that this year provides the best time for companies to position their business models to capitalize on sustainable growth opportunities. The Circular Economy 100 created by the Ellen MacArthur Foundation reached similar conclusions in its research, partnering with the World Economic Forum and McKinsey & Company (Ellen MacArthur Foundation, 2015). The *Financial Times* reported in January 2016 that ETFs tracking social responsible investing (SRI)

indices outperformed their benchmarks over the past 5 years (Faursschou, 2016).

The pioneering report “Clocks and Lenses” by IISD and UNEP documents the extent that externalities in the form of subsidies to powerful favored interests had distorted full-cost accounting by fossil fueled industrial economies across the globe (Clements-Hunt, 2012). The historic drop in oil prices presents opportunities to cut these wasteful subsidies – without any visible effects on consumers, and major progress has been made in Indonesia and other countries. The drive to put prices on carbon or enact pollution taxes illuminates the absurdity of simultaneously both subsidizing and taxing carbon! Once prices reflect these social and environmental costs formerly “externalized”, the public can see that renewables win. Fossil fuel divestments in 2015 grew to 2,476 institutions and individuals representing \$2.6 trillion in assets. Globally as of 2014, more than \$21 trillion in assets were invested under ESG principles, up from \$13 trillion in 2013. However, global greenhouse gas emissions increased by 5% from both US and global firms (Makower, 2016). While coal companies continue to go bankrupt, there are many oil companies still over-valuing their huge proven reserves on their balance sheets. While write-downs of these unburnable oil reserves are necessary, they can be reclassified as feedstocks for future use in plastics rather than burned. This transition strategy is also advocated in *The New Grand Strategy: Restoring America's Prosperity, Security, And Sustainability In The 21st Century* (Mykleby, Doherty & Makower, 2016).

#### **4. DEVELOPING COUNTRIES “LEAPFROG”**

Even in this still tilted playing field, solar and wind are now competitive with nuclear and coal for electricity generation. As subsidies to fossilized sectors are cut further and genuine full spectrum accounting illuminates real costs, the green transition will continue accelerating, particularly in developing countries. In my many visits to China in the 1980s and 1990s, I emphasized how developing countries could bypass the costly wasteful infrastructure and technologies of the earlier Industrial Era and leapfrog directly to the Solar Age. This “leapfrog” strategy is now the mantra in many developing and emerging economies in Asia, Latin America and Africa, summarized in “The Developing World Can Leapfrog Dirty Coal and Go Straight to Clean Energy” (Jacobson, 2016). Professor Daniel Kammen, director of the Renewable and Appropriate Energy Laboratory (RAEL) at UC Berkeley, applies these “leapfrog” strategies in African and other developing economies, described in “The Energy To Change the World” (Kammen, 2015). Such strategies in India are best exemplified by Development Alternatives, operating in thousands of Indian villages since 1983 and facilitating sustainable livelihoods for 12.4 million people (“Outcomes from 1983 to 2014”, 2015). Ending energy poverty is one of the worldwide goals of the SDGs, as examined by *The Economist* (“Power to the Powerless”, 2016).

#### **5. COP21 COUNTRY PLEDGES (INDCs)**

The UN Inquiry’s report “Green Finance for Developing Countries” reviews all these pledges worldwide (Forstater, Halle & Zadek, 2016). Progress is evident in Brazil where over 70% of electricity is hydro-powered, while local biofuels from sugarcane wastes power farms and flex-fuel cars. Brazil is now one of the world’s fastest growing solar markets and has added 7 GW of installed wind capacity since 2009. Recent droughts threatened hydro-electricity and led to this focus on Brazil’s huge solar and wind resources, as well as 1-2 GW of utility scale solar with net-metering to credit local small solar generation. The Brazilian Development Bank (BNDES) has been a leader in supplying low-cost financing for renewable energy (Figueiredo & Pascal, 2016). Financial markets still based on obsolete models continue mispricing energy and risk, since they are wedded to fossilized sectors and oil prices. For such reasons, as well as the corruption scandals over Petrobras, Brazil is oversold since its natural resources and human capital are still unpriced. In fact, Brazil’s scandals are intertwined with global corruption and US banks that inflated Petrobras’ debt burden. New York judge Jed Rakoff consolidated all lawsuits against Petrobras and its bankers Citigroup Global Markets, JP Morgan Securities and Morgan Stanley into one class action (Prins, 2016).

New tools beyond conventional economics will now compare the INDC pledges countries made at COP21 in Paris. The ECIU Comparator Tool is produced by the non-profit Energy and Climate Intelligence Unit (ECIU) and uses information from the World Bank, the World Resources Institute and will be regularly updated (Hower, 2015). Another tool developed by our partner Paris-based HELIO International is the HELIO Index for Investors (HIFI), which complements our GTS (HELIO International, 2015). HIFI helps investors in renewable energy assess which countries have conditions most conducive to develop such projects to shift to low-carbon economies and prioritize the general welfare of their citizens and environmental quality. Energy efficiency continues to provide the best returns in the USA, and the American Council for an Energy-Efficient Economy (ACEEE) sees the market at \$100 billion (Stickles, 2015). Clean Edge now ranks global companies that are leading in low-carbon, clean energy, tracking six different indicators to create these rankings (Clean Edge, 2016).

## **6. FINTECH**

Silicon Valley startups, the ‘unicorns’ with sky-high valuations prior to IPO are all part of the disruption of many sectors of 20<sup>th</sup> century industrial societies and finance called fintech. The good news for sustainability is that such financial platforms can enhance efficiency and transparency and democratize financial transactions. These are companies we included in GTS which are revolutionizing payments, banking, lending, microfinance, community development and crowdfunding of new models of renewable energy and efficiency. Incumbent legacy financial firms, who are now desperately trying to catch up, partner with, or acquire these startups, initially overlooked all of these new models. Ethical Markets will be tracking all these more democratic, transparent and sustainable companies, including those reforming stock markets, such as the revolutionary electronic platform Investors’ Exchange (IEX) which invented the electronic speed bump slowing down high-frequency trading (HFT).

This brings us to some of the bad news about fintech, documented in *Throwing Rocks at the Google Bus* by Doug Rushkoff (2016) and other books. These problems include the jobs lost to these disruptive companies which economists surveyed by the World Economic Forum released at Davos indicate that in four years such companies could destroy more than 7.1 million jobs. While 2 million new jobs can be created, the net loss would still be 5 million (Hayes, 2016). Google, General Motors and other auto firms petitioned the US Congress for \$3.9 billion of taxpayer subsidies to accelerate adoption of driverless vehicles, while Professor of Mechanical Engineering Mary Cummings (2014) revealed all of the downplayed problems, risks and hype by the auto industry. Thus, GTS will continue sorting out the good and bad news of fintech.

## **7. ACTION PLAN FOR DECARBONIZATION**

The G-20, presided over by China for 2016 continues to set an ambitious calendar through October with multiple meetings on Green Finance, Climate Finance, Energy Sustainability and the International Financial Architecture reforms (“G20 – China 2016”, 2016). China’s solar and wind capacity soared in 2015 by 74% and 34% over 2014, while coal use dropped by 3.7% and imports down by 30% (Coghlan, 2016). Clearly, 2016 will see acceleration of all the reforms needed if CO<sub>2</sub> is to stay within the official “carbon budget” to keep global warming within the 2 °C limit. However, the official “carbon budget” used at COP21 is questioned by scientists who think it is overstated. Some say this “carbon budget” is only half as big as thought, while others believe that due to unacknowledged long feedback loops, that the world is already facing a “carbon deficit” (Radford, 2016). The “De-carbonize Green Paper” (2016), released by responsible-investor.com and a group of financial firms, provides a roadmap for institutional investors. Beyond capping CO<sub>2</sub> emissions, efforts to curb soot and particulates, particularly in cities, pay big benefits in avoided healthcare costs. Also, ultra-small particles known as aerosols are receiving more attention (Ramanathan, Seddon, & Victor, 2016). Measures of green technology shifts still rely too heavily on carbon footprints.

There are many possible ways to limit global warming to 1.5 °C. Many proposals to sequester carbon from coal-fired power plants, which we reported in GTS, are too expensive and cut energy efficiency by up to

40% (Biello, 2016). The best way to sequester carbon is in properly managed land use and forestry practices. Now efforts to capture CO<sub>2</sub> directly from the air are proposed in various projects to accelerate vegetable growth in greenhouses, produce cement and jewelry and to inject into exhausted oil and shale deposits (Budds, 2015). Most of these schemes, including chemically absorbing CO<sub>2</sub> from the air are costly (Pearce, 2016). New interest is emerging in 35 year-old schemes to collect solar energy from satellites and beam electricity to Earth (Marks, 2016). Previous assessments make these projects doubtful. Other projects include the pilot plant at the University of Newcastle, Sydney, to bind CO<sub>2</sub> into concrete (Schiffman, 2016). Shifting some agriculture from fresh-water plants (glycophytes) which make up most of human food supplies to salt-loving plants (halophytes) including algae-based fuel from seawater, would use four currently wasted resources: 10,000 varieties of these halophytes for food, fiber and fuel; some 40% of desert and scrubland; 97% of the planet's water which is salty; and abundant free photons from our Sun (Henderson, Nash, & Sanquiche, 2014).

## **8. GLOBAL FINANCE AT BAY**

The power of global financial networking and their interconnectedness was a cause of the 2008 financial crisis and the danger to Main Street of banks becoming too big to fail and their costly bailouts in the USA and Europe by taxpayers. The US Treasury announced on April 13, 2016, that five US banks, JP Morgan Chase, Wells Fargo, Bank of America, Bank of New York Mellon and State Street had failed their “living will” plans and now have until October 2016 to revise them (Hamilton, 2016). The UN Inquiry: Design of a Sustainable Financial System is one of the few direct challenges to conventional financial models and the enormous costs their “externalities” impose on societies, including exacerbating inequality and capturing regulators and political power in many countries. Computers and algorithms dominate stock markets and are trading at blinding speeds, which cause flash crashes and daily volatility. Thus, security can be achieved by retaining old-fashioned mechanical systems (Sax, 2016). Meanwhile, humans are more efficient, as attributed to NASA in a 1965 report: “Man is the lowest-cost, 150 pound, non-linear, all-purpose computer system which can be mass-produced by unskilled labor” (Brynjolfsson & McAfee, 2016).

In spite of the progress in reforming accounting, business and finance obsolete economic models are still taught in many business schools. The dysfunctional language of “externalities” still blinds politicians, citizens, taxpayers and consumers about the true costs they pay. Many unsustainable industrial activities, products and services based on polluting technologies and energy sources are still not accounted for in company balance sheets or national accounts. Media reporting of business and finance perpetuates the myths of externalities. For example, we are still told that coal is cheaper than clean energy sources and that industrial agriculture produces cheaper food than organic farms. Media editors rarely question macro-indicators like GDP – assuming that GDP-growth is an unalloyed good and the measure of national progress. Conventional thinking pervades societies, and new paradigms have required decades to change obsolete theories and practices.

## **9. CONCLUSION**

After the historic agreements by 195 countries on the UNs 17 SDGs and the COP21 climate agreements of 2015, the model of GDP-measured economic growth is giving way to the new integrated model of sustainable, inclusive human development. As the textbooks and courses are updated, the irresponsible accounting allowed under the externalities rubric is becoming obsolete, and full-spectrum accounting and integrated thinking and reporting are becoming the new norm. Tracking and projecting all these changes is the purpose of our GTS, in order to clarify choices for humanity's path to our common future on planet Earth.

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