

Financing the Energy Transition  
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Good morning. It is an honor to address you here today in Mexico City.

I was busy discovering girls in middle school when *Limits to Growth* was first published, and only came to discover it and the important work of the Club of Rome in my 40s, during my self-imposed exile from Wall Street after an eighteen-year career at JPMorgan. Some men buy a motorcycle for their mid life crisis. I holed up and read books.

The status of “global business manager and rising big shot” at the *once august* JPMorgan gave me a sense of self-confidence if not arrogance about the nature of reality, at least with respect to economics and finance. I now recognize that ignorant self-assuredness all too often among my old peers.

Reading *Limits to Growth* (and the *30 Year Update*) about ten years ago stunned me. It changed my life. It led directly to my decision to create the Capital Institute in 2010 to explore deeply the relationship between economics and finance on the one hand, and sustainability on the other. Many of my teachers are Club of Rome members, some here today.

The context of my talk is a financial system horribly broken and detached from the critical issues of the day. I am here to address specifically the challenge of financing the complex global energy transition that is necessary if we are to have a reasonable chance of avoiding more than 2 degrees of warming. Actually, I am going to talk about three interconnected challenges in increasing order of mind-numbing complexity:

1. Financing the Energy Transition (this is the easy one)!
2. Dealing with Stranded Assets and what I call “Financial Overshoot,” and finally,
3. Limits to investment.

## Financing the Energy Transition

The TRILLIONS are truly breathtaking.

The number people are gravitating to for global clean energy development, including critical energy efficiency investments, is the International Energy Agency's \$44 Trillion through 2050 (up from a \$36 Trillion estimate two years earlier).<sup>1</sup> That's a stunning *\$1.25 Trillion per year*. As a reference, \$250 Billion was invested in clean energy last year according to Bloomberg New Energy Finance.<sup>2</sup> In other words, *we need to pick it up by a factor of 5, and hold that level of new annual investment for 35 years*.

There is no historical precedent for such a shift in financial flows that I can think of other than perhaps America's diversion of real investment in order to mobilize for World War II when car factories were retooled into tank factories on command in the face of an immediate, existential threat. And our challenge today *appears* less immediate in the face of other urgent threats ranging from jobs and poverty, to the barbarism unleashed in the Arab world, and now to the Ebola crisis in West Africa. Financing the energy transition is barely on the agenda of political leaders.

Yet without government policy coercion, capital flows downhill like water to the highest perceived profit opportunities, adjusted for risk. This challenge is like moving incomprehensible amounts of capital uphill.

As a point of reference, the entire global hedge fund industry is less than \$3 trillion, a quarter century after it became a "hot new asset class" where all the smart money

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<sup>1</sup>International Energy Agency, *Energy Technology Perspectives* (May 2014), <http://www.iea.org/newsroomandevents/pressreleases/2014/may/name,51005,en.html>.

<sup>2</sup> Bloomberg Clean Energy Finance, *Clean Energy Support Falls Again to \$254 Billion in 2013* (January 2014), <http://www.bloomberg.com/news/2014-01-15/clean-energy-support-falls-again-to-254-billion-in-2013.html>.

and best investment managers wanted to go.<sup>3</sup> The entire global corporate bond market, excluding debt issued by financial firms, is only \$3 Trillion.<sup>4</sup> US Commercial and Industrial loans from banks are a mere \$1.6 Trillion in total outstandings.<sup>5</sup> In fact, the market value of all public companies worldwide is only \$60 trillion.<sup>6</sup> \$40 Trillion is a very, very large number.

And the \$40 trillion energy transition is for new *real investment* in real projects that need to be created, understood, and monitored, much of it in developing countries, all requiring a long-term time horizon, and much of it custom tailored which hinders securitization efforts. This is the definition of “uphill.”

The vast majority of this money will be for asset based project lending, some done on corporate or State balance sheets backed by their full faith and credit, some done on a project basis, historically mostly done by banks, development banks, and insurance companies. But some form of equity sponsorship is essential to attract the lending on top of it. Equity sponsorship usually means an energy development company, but it can also be an energy consumer like Google or Apple, both large renewable energy project sponsors, or a financial investor who hires out the operational needs.

So we need:

- Several Trillion of initiating equity investment combined with operational sponsorship

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<sup>3</sup> “Hedge Funds Slip in September But Stock Funds Fall More,” *Reuters*, <http://www.reuters.com/article/2014/10/08/us-hedgefunds-returns-idUSKCN0HX11Y20141008>.

<sup>4</sup> International Monetary Fund, *A New Look at the Role of Sovereign Credit Default Swaps* (April 2013), <http://www.managedfunds.org/industry-resources/industry-research/a-new-look-at-the-role-of-sovereign-credit-default-swaps>.

<sup>5</sup> Rasmus, Jack. “From Financial Crisis to Global Recession, Part 2,” <http://www.kykloproductions.com/posts/index.php?p=63>.

<sup>6</sup> Bain & Company, <http://www.bain.com/industry-expertise/social-and-public-sector/public-sector-government.aspx>.

- Several tens of trillions of debt – loans and bonds - much of it project related
- Project structuring skills developed in thousands of bankers and investors who will catalyze projects into being, with local, regional, and global expertise,
- All happening to both meet the needs of an energy system transition in developed economies, AND, the rapidly growing new energy demand in the developing economies, some quite unstable
- And all while curtailing conventional fossil fuel investments, which amounted to \$674 billion in 2013 (3X the clean energy total)<sup>7</sup>

Conventional wisdom is that governments are broke (thanks in large part to the Wall Street induced recession and the hole it has dug in nation state fiscal budgets) so this money must come from the private sector, estimated to hold \$240 Trillion of financial assets.<sup>8</sup> I generally agree with that sentiment; private capital must play a key role. *However, it is my belief, as a capital markets practitioner, that in order for something on this scale to have a chance of happening, strong and coordinated public sector leadership and involvement is a pre-requisite.*

There are indeed hopeful signs of private sector movement on its own. \$250 Billion is not nothing after all, and the concept of “impact investment” – aligning investment with social and environmental purpose - is gaining traction among high net worth families and progressive foundations in particular. Green bonds are taking off, but we must remember that most of these bonds are really full faith and credit obligations of corporations like Unilever for example.

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<sup>7</sup> Carbon Tracker, *Unburnable Carbon 2013: Wasted Capital and Stranded Assets* (2013), <http://www.carbontracker.org/site/wastedcapital>.

<sup>8</sup> ANZ Research, <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MjIOTI1fENoaWxkSUQ9LTF8VHlwZT0z&t=1>.

But it's *the scale* here, and the urgent time-table, that simply demands proactive catalytic action from the public sector.

Governments can influence the flow of investment in five critical ways. Each complements all the others, so we must do all of them together to achieve maximum impact.

**First and most important**, by fixing the pricing signals in the product markets themselves. This means, above all, putting a strong and rising price on carbon, using some combination of caps – quotas by another name (a bad word we had better get used to) and taxes, while removing subsidies and dealing with the political and social complexities of doing so. Complementary tax incentives and risk mitigation approaches aimed at catalyzing investment of course will help. Everyone in this room knows all this. *My point is that without dealing with this most difficult political challenge, we are unlikely to mobilize the tens of trillions of necessary investment either.*

**The second roll for government leadership is on the demand side.**

Governments are huge users of energy. The US government is the largest energy user in the world. Nothing helps investment flow faster than a long term purchase order from a credit worthy customer like a national government that can be “taken to the bank.” This demand has the added benefit of driving down prices through economies of scale, stimulating further demand. Clever policy induced demand like Germany’s feed-in tariff system works as well.

**The third roll for government leadership is with R&D investment.** In the US, we spend 10 X more on medical research than on low carbon energy research. This ratio must change, with special tax incentives for philanthropic augmentation.<sup>9</sup>

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<sup>9</sup> “Five Questions for Jeffrey Sachs on Decarbonizing the Economy,” *e360 digest*, [http://e360.yale.edu/digest/five\\_questions\\_for\\_jeffrey\\_sachs\\_on\\_decarbonizing\\_the\\_economy/4194](http://e360.yale.edu/digest/five_questions_for_jeffrey_sachs_on_decarbonizing_the_economy/4194).

The objective of this research should not be to pick winners, but rather, to create new breakthroughs and unforeseen options. And, to catalyze follow-on private investment to commercialize innovations, a proven pattern in other areas of government funded technical research.

**The fourth area we need government leadership** is in addressing the structural deficiencies in the financial system related directly to the \$40 Trillion challenge. I will simplify this into two issues in their order of importance:

1. The loss of project finance skill sets and project lending balance sheets available in the banking system;
2. The speculative and short term focus of modern finance where even the credit rating agencies define their mission in a 3 to 5 year timeframe.

Project finance had largely gone out of fashion on Wall Street even before the financial crisis, although the growth of “infrastructure finance” by which is meant airports and highways represents a promising exception to that trend.

Now, one of the unintended consequences of regulatory reform for banks in response to the financial crisis, is to make the \$40 Trillion challenge harder due to higher capital requirements for long dated lending. So naturally, banks are even less keen to do it, and individuals with project finance skills are harder to find.

Some fiddling with capital charges to mitigate this unintended consequence is possible. Regardless, there will still remain a pressing need for large-scale public sector involvement with green infrastructure banks dedicated to catalyzing the clean energy transition, either directly or in creative joint ventures with the private sector.

With \$44 trillion needing to be invested, ideally \$6 trillion in the next five years, the aggregate scale of green infrastructure bank balance sheets needs to be at least \$2 Trillion to begin with in my opinion, implying \$200 Billion of equity capital investment is needed to capitalize these green infrastructure banks to make it happen. The World Bank has \$40 Billion of equity capital by comparison.<sup>10</sup>

So I am imagining perhaps ten mega-scale and highly focused regional green infrastructure banks, all commercially viable, each on average with \$20 Billion of equity capital, sourced regionally and from the world's wealthy countries.

Each bank would have a mandate to both initiate innovative transactions, a role played typically by investment bankers but in this case requiring renewable energy and energy efficiency project finance skill sets, and, to underwrite, syndicate, and hold loans on their own balance sheets. Once these new actors catalyze large scale deal flow, the existing private sector bank and rating agency machinery would follow with the necessary underwriting, rating, and syndication of the related long-term bonds to be placed with institutional investors that would complement and ultimately take out the bank debt once the projects mature. Innovation will follow. Think of this as an entirely new sector in finance that will dwarf the current global corporate bond markets inside a decade.

There are many questions about how to do this, how it would overlap, or not, with plans for new development banks like China announced last year for Asia. Critically, it would create demand for thousands of bankers skilled in renewable energy infrastructure and energy efficiency financial deal structuring, putting fresh meaning back in the lives of bankers. It's an amazing opportunity. But the private sector needs a catalyst, and a bold plan for public infrastructure banks is the practical option.

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<sup>10</sup> Wikipedia, [http://en.wikipedia.org/wiki/Distressed\\_securities\\_fund](http://en.wikipedia.org/wiki/Distressed_securities_fund).



Let me just say a brief word here on the other structural deficiency demanding government attention: the short-termism problem in finance, which is fundamental.

Much work is underway in this area, from prosecuting insider trading, to efforts to implement a global financial transactions tax, to making corporate disclosure of social and environmental risks mandatory.

Nevertheless, I believe we need to accept that capital markets are by their nature tools well suited to short-term speculators. Rather than hope we will ever change that tiger's stripes, we need to reconnect real investors – the pension funds and sovereign wealth funds in particular, who have a stewardship mandate - with real enterprises and projects *in direct relationship* with each other. This will make possible the resurrection of the responsibilities that go with genuine ownership, and will allow true alignment of interests.

This is a big topic of its own, and not something in policy makers direct control. Our work on the Evergreen Direct Investment method provides a practical and effective approach to this important issue, and I'd direct you to the EDI white paper on our website for more information on this vital topic.

**The fifth possibility for government intervention lies with Central Banks.** It is reasonable to question what role the world's central banks could play in channeling credit toward this unprecedented financing need. After all, global central banks just expanded their collective balance sheets by \$10 Trillion to support the global financial system using unconventional "quantitative easing" which essentially means printing money to buy bonds, keeping interest rates artificially low and supporting the balance sheets of banks in the process.

Could there be a central bank driven "qualitative easing" aimed at the targeted purchase of new green infrastructure loans and bonds (or any other qualitative targets for that matter)?

I am an advisor to the UNEP's Sustainable Finance Inquiry, which is seeking answers to this very same \$40 trillion question. This topic is on the table for the Inquiry, and interesting discussions are ongoing. It turns out that the central bank of Bangladesh is an active and innovative practitioner of "qualitative easing" for social objectives with great success, and even uses that phrase. The same is apparently true for the Bank of Japan.

Even Lord Adair Turner, former Chairman of the UK's Financial Services Authority, has been open to the idea, seeing the logic of exploring what's effectively a subsidy to capital given the front loaded capital intensity of the energy transition. But as expected, such thinking would be politically charged and goes against the deeply engrained belief system of conventional central banking orthodoxy. It warrants careful consideration and may be suited in certain political contexts while not in others.

Let me conclude this section by reiterating the main point: Public sector leadership and resources are essential if we are to mobilize the \$40 trillion, even though the vast majority of the money will need to come from the private sector. The scale of the financing challenge is unprecedented, calling for unprecedented public leadership.

There is no Santa Claus. There is no invisible hand.

### **The Second Challenge: Stranded Assets and Financial Overshoot**

Financing the \$40 trillion will not happen in a vacuum. There is critical context to consider. The first context issue to understand is what I call "Financial Overshoot," with so-called stranded assets being the most obvious example.

Financial overshoot is a corollary to ecological overshoot. If we are exceeding the safe operating space of the planet while assuming business as usual can go on, it

follows that financial asset values that assume business as usual will continue (which I submit is what markets assume) are similarly in “overshoot” since the long-term economic growth rate is the foundation assumption for financial asset valuation. Just watch what happens to stock markets when assumptions for growth are ratcheted downward as happened last week.

Nowhere is this more clear than with the way the markets value carbon in the ground. When UK based Carbon Tracker issued their first report in 2011, based on the earlier carbon budget research done by the Potsdam Institute, they suggested that short of a major technological breakthrough on carbon capture and sequestration (not on the horizon as far as I know), if we are to have a decent chance of not exceeding the 2 degree warming threshold, we could only burn some 20% of the proved fossil fuel reserves already discovered and held on company balance sheets (and implicit in stock prices).<sup>11</sup>

In a piece I wrote at the time titled “Our \$20T Big Choice,” I estimated that the current value of the reserves we would need to leave unburned was a stunning \$20 Trillion. Our choice was either to absorb a \$20 T cumulative asset write down into the real economy in the decades ahead, or destroy the planet.<sup>12</sup> The direct losses associated with the sub-prime crisis that triggered the global Great Recession were a mere \$3.7 Trillion by comparison.

And, a point that few have yet to really discuss, 75% of those fossil fuel reserves are owned by nation states, not financial investors like pension funds. Nations like Mexico and Venezuela, Canada, Russia, and the United States. And of course much of

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<sup>11</sup> “Greenhouse-Gas Emission Targets for Limiting Global Warming to 2 °C,” *Nature: International Weekly Journal of Science*, <http://www.nature.com/nature/journal/v458/n7242/full/nature08017.html>.

<sup>12</sup> Fullerton, John, “Financial Overshoot,” *The Future of Finance* (blog), Capital Institute, July 23, 2012, <http://www.capitalinstitute.org/blog/financial-overshoot>.

the Arab world, whose economies and fragile social cohesion are highly dependent upon the continued exploitation of fossil fuel reserves.

Leaving 80% of these reserves unburned is the geopolitical challenge of all time, at the very least. But stranded assets is gaining currency: just last week, Bank of England Governor Mark Carney acknowledged the reality at a World Bank meeting. We must consider that we were alerted to this and ignored it when the Potsdam Institute published their original research nearly a decade ago. Sound familiar? And worse, stranded assets are just the most obvious example of “financial overshoot.” But that’s a story for another day.

### **The Third Challenge: Limits to Investment**

Finally, and since this is the Club of Rome after all, I would like to address another critical context issue: the possibility of “Limits to Investment.” I have a short paper on this subject for those interested to dig further, published by Tellus Institute, but this is an area I would welcome the Club of Rome to take up with the formal rigor it deserves.<sup>13</sup>

I submit to you that if there are indeed limits to growth, it follows then that there are also limits to investment. Contemplating such a constraint at the macro systemic level is something no economic system has ever had to consider. But I see no way to avoid it, if indeed there are limits to growth.

Simply stated,  $GNP = C + I + G + \text{net } X$ . Since some 70% of GNP is comprised of consumption in the developed economies - somewhat less in developing economies - we naturally focus on consumption and the material throughput it generates when thinking about limits to growth. But we must also consider the quality and quantity

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<sup>13</sup> Fullerton, John, *Limits to Investment*, Great Transition Initiative, Tellus Institute, <http://greattransition.org/publication/limits-to-investment>.

of government expenditures (some of which are consumption and some of which are investment), and critically, *we must also consider aggregate system wide investment flows and their quality*, especially given their defining role in the economic system they fuel.

It is important to distinguish between real investment and financial speculation in capital markets. Too much of our focus within the “sustainable finance” community is simply focused on increasing transparency in speculative capital markets though our efforts to promote integrated reporting that measure environmental and social factors. The unspoken assumption of this work is that once the information is made transparent, the markets will work their magic and all will be well in the kingdom. This is dangerous and naive thinking, evidence that we are still trapped in our ideological market fundamentalism beliefs. ,

The critical large investment flow decisions today are made as capital budgeting decisions of the largest global corporations, admittedly with their financial speculator investors in mind, and the capital investment decisions of large nation states, equally corrupted by the short-termism of politicians. It is the quality and quantity of these aggregate capital investment flows that matter. And since all real investment flows drive material throughput in the real economy, and there are aggregate limits to material throughput in order to not trigger ecological collapse, *large real investment decisions are a matter of critical public interest.*

The implications boggle the mind, particularly for a former banker, schooled in a free market belief system. Nevertheless, I see no choice but to invite more public engagement in the tricky prioritization choices ahead of the large capital allocation decisions of the global economy. How to do that remains a question.

I will leave you with one final conundrum on limits to investment that keeps me awake at night. If the logic of limits to investment is sound, then it follows that there must be a *right relationship* to use Peter Brown’s term between the stock of

aggregate natural capital and the stock of aggregate financial and built capital, given the technological choices of any given macro economy. Yet our economic system is designed to perpetually grow the aggregate stock of financial capital, (that's what finance is all about) generating economic growth as a byproduct, which is intended to create jobs.

*After centuries of economic "success," what if the aggregate stock of financial capital, regardless of its grotesque distribution inequities which dramatically complicate matters further, is simply too large for the scale of the planet? And if so, how will we recycle that financial capital back into natural (and social) capital? I see three options: voluntarily, coerced by public policy, or via financial asset price deflation, aka financial collapse. Looked at over the long timeframes that are appropriate, I can see signs that all three possibilities are already under way.*

It would appear that in addition to a once in the history of civilization challenge of mobilizing \$40 trillion in real investment, we need to manage at the same time a global economic transition that includes a \$20 trillion write down of stranded assets, deal with other consequences of financial overshoot which have feedback loops into the real economy, and, we need to understand all this in the context of an as yet explored relationship between the aggregate scale of financial and material capital and the scale of the earth's natural capital stock which we barely understand in itself.

As I said at the beginning, dealing with the \$40 Trillion is the easy part. I'm confident we know what to do there. Let's begin with that.

Thank you.