

handshake

IFC's quarterly journal on public-private partnerships

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RENEWABLE ENERGY: Wind & Solar | *Lessons from an investor*

ENERGY EFFICIENCY: Green buildings | *Approaches for every market, climate & budget*

GREEN FINANCE: Infrastructure finance | *East Asia's new investment era*

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Disclaimer

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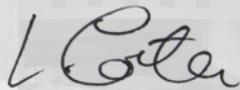
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Letter from IFC

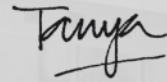
Combating climate change requires innovative, transformative thinking—and public-private partnerships, at their best, present exactly the sort of solutions needed. Well-structured PPPs bring to the table the finest qualities of the public and private sectors, extracting innovation and efficiencies while providing the right regulatory support and apportioning risks.

This issue of *Handshake* explores climate-related PPPs that address the challenges of mitigating and adapting to climate change. We offer many different snapshots of the landscape, reflecting the current diversity of views and approaches. With such a broad topic relevant to so many, there are sure to be significant differences in perspective. *Handshake* does not aim to reconcile these differences, or even mediate among them. The articles and columns here are discussions-in-progress, and we invite readers to eavesdrop on some of the more raucous debates of our time.

On this, however, we can all agree: PPPs in the climate sector are smart business for the countries they serve, the sectors they impact, and indeed for the future health of the globe.



Laurence Carter, Director



Tanya Scobie Oliveira, Editor

IFC Advisory Services in Public-Private Partnerships

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natural allies

THE GOVERNMENT AND THE PRIVATE SECTOR NEED EACH OTHER TO ADVANCE THE CLIMATE AGENDA.

By Vipul Bhagat & Ari Skromne



During the last decade we have seen a dramatic transition in the climate change debate. The question has shifted from “Are these changes real, and are we to blame?” to “How can we avert further damage?” The first question has been discussed widely among researchers and scientists. Ultimately, society responded with a clear call for world leaders to take action. The second, more recent debate is much more difficult to resolve because it involves analyzing how and at what cost we can switch our fossil fuel dependency model to one that is renewable. The questions keep coming: who pays for renewables in a time when fossil fuel remains, in general terms, the most cost-efficient way to produce power?

There are no easy answers. This is why we see countries experimenting with different models to incentivize renewable energy generation and consumption. Some of these include tax credits, minimum fixed tariff guarantees for renewable power generation, or new regulations like “green” buildings. This also explains the broad range of opinions on the role that corporations, regulators, consumers, public entities, and development organizations ought to play in this process.

This issue of *Handshake* reflects the larger debate, presenting a diversity of views, proposals, and potential solutions to solve the problem of climate change. Editors cast their net wide to represent many different perspectives, showcasing broad theories, specific financial approaches, case studies, and the individual views of lead-

ers and practitioners. Some approaches are culture-specific, as the interview with the head of Gujarat Solar makes clear; others may be widely applied, but lack support for different reasons, as we see in the article on geothermal energy.

As a society, we are still in the early stages of determining the scope of climate change, and therefore the only way to seize upon solutions is to consider many different sound, reasonable points of view. That is the objective of this issue, and it is backed by the understanding that finding solutions for climate change mitigation (measures to reduce greenhouse gas [GHG] emissions) and adaptation (measures to reduce vulnerability to climate impacts) will cost us. Therefore, innovation, cost efficiency, and regulation will continue playing a central role in the development of any new models.

READY, SET, GO

Until a few years ago, businesses heard the word “climate” and considered it code for “What is this going to cost me?” In developing countries, the perception was even worse: introducing the climate agenda was sometimes seen as an attempt to throttle economic growth. Fortunately, policymakers and the public don’t look at climate that way anymore; they know climate issues must be addressed alongside economic growth.

There has been a parallel shift in how the private sector approaches the climate agenda. As the debate has been reframed, climate-friendly building, for example, is now considered a smart business move. This evolving understanding of the climate agenda has transformed the approach to infrastructure around the globe, underscoring the importance and ongoing relevance of public-private partnerships (PPPs).

Many of today’s climate-related infrastructure projects are PPPs by definition, even if the partnership is not explicit. In fact, addressing climate issues from a business perspective is by default a PPP, because there is almost always some kind of a regulatory connection. In many of the sectors that involve mitigation of greenhouse gas emissions—for example, renewable energy or energy efficiency—regulatory drivers initiate that process. The government isn’t necessarily mandating the approach, but the private sector needs incentives to make its investment profitable. The government needs the infusion of capital, and the innovation and cost-effectiveness that comes with it.

A SYMBIOTIC RELATIONSHIP

Climate-conscious PPPs make sense for several reasons. Primarily, PPPs are an excellent vehicle to promote cost-effective projects that spur innovation. PPPs can contractually set minimum performance standards that can result in lowering GHG emissions (for example, energy standards for building or minimum loss reduction targets for electricity distribution systems). A greater number of PPPs than before are developing conditions that can capture the private sector’s capacity to innovate, and benefit the planet in the process. This issue’s waste-to-energy success story shows how cost-efficiency and mitigation can coexist.

Other possibilities include solar or wind PPP building contractual incentives, like access to a Power Purchase Agreement or to concessional financing. This would encourage the construction of a pump-storage hydropower plant that could store water during off-peak demand periods (also described in this issue). Incentives are particularly important if we expect further technological innovation, as marginal cost-efficiency gains will translate to additional marginal returns for the project developer. The intrinsic competitive bidding feature of PPPs ensures that bidders will maximize project cost efficiency, which will be reflected in the least-cost bid to the government, and ultimately to consumers.

A CLOSER LOOK

PPPs are also important for climate initiatives because these partnerships can efficiently organize, under a single project umbrella, the

numerous and complex arrangements that make a renewable energy (or any other climate-related) project work. A good example is the innovative area of Concentrated Solar Power (CSP) generation, an appealing new technology for countries with abundant sunshine and interest in reducing fossil fuel dependency.

A long-term, financially sustainable CSP project in the developing world will require a stable and adequate regulatory framework for renewable energy, conducive to long-term private investment. It will also require having a built-in power agreement with creditworthy off-takers, assurance of interconnection to a transmission line when the project is completed, and a functioning regulatory framework for power export. Availability of concessional financing and other types of multilateral support, like political risk guarantees, will most likely be necessary as well. The best way to handle all the pieces of this complex puzzle is through a PPP.

There is an additional value associated with climate-related PPPs: in countries with little experience in renewables, a PPP arrangement can become the “pilot” for future projects, and simultaneously contribute to the preparation of the applicable regulation, ensuring consistency between the legal framework and its actual implementation.

ADAPTATION

Lastly, it is critical to consider the role of PPPs in addressing adaptation to the effects of climate change. Adaptation initiatives, which would partially accept or avoid the climate risk, can be implemented by designing projects that look

forward, examining the potential impacts of a changing climate in its infrastructure. Adaptation is gaining prominence as new funds are being negotiated to assist nations that need it most—especially developing countries, which see the impact of climate literally on the ground. Many of these governments feel that adaptation is in their immediate interest because results can help improve people’s lives right away. PPPs, with possible 25-year (or longer) concessions, have the advantage of providing a structure for addressing medium- and longer-term issues. One particularly relevant article in this issue describes how a port concessionaire in Cartagena, Colombia invested in adaptation measures following a climate impact risk analysis, and this assessment applies equally to PPPs.

Continued progress in the climate arena and the maturing of climate-related regulatory frameworks will eventually change the way PPPs are constructed. This happened in the telecom industry, when the private sector matured and broke away from its dependence on government. But in these early days, governments must collectively provide the support mechanisms through funding or regulatory incentives. Today we need a public sector that is engaged and can provide an enabling environment, funds that can catalyze progress, and a private sector committed to innovation and cost efficiency. Most important, the private sector must prioritize working with governments to continue building sustainable PPPs. From the symbolic embrace of government and the private sector, the future generation of climate-conscious business emerges. 🌱

Infrastructure Climate Change

Evaluating risk options

By Vladimir Stenek & Ari Skromne

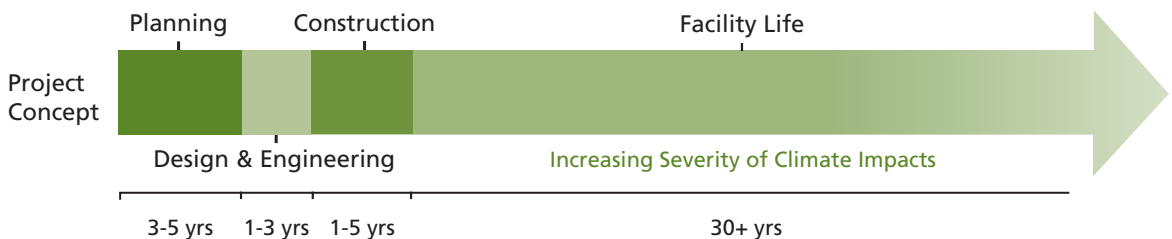
The impact of climate change on infrastructure is receiving more focused attention from project planners, sponsors, and financiers. The expectation of increase or decline in precipitation levels, increase in wind speeds, variations in temperature, and rising sea levels raises the question of whether, and by how much, new or existing infrastructure should be weatherproofed in response to actual or expected climate change.

This is particularly relevant for PPPs, for which the useful lifetime of the infrastructure asset is usually long and spans several decades between design and the end of operational life. During that period, the climate may go through considerable changes. Therefore, the assets, if their design is based only on historic records, may underperform on several levels as the years go by.

Depending on their nature as well as local conditions, projects and their components will have specific sets of climate “variables” associated with climate risk. As the variables exceed critical threshold limits, there will be materialization of direct and indirect risks and impacts.

First, the analysis

The first question for the project planner analyzing this challenge is whether there is a need to respond to actual or potential changes in climate. Examining how a discrete asset will perform in a future climate scenario, when the threshold levels will be exceeded, and the potential financial and other consequences, is important for investment and design planning. This planning process should take into account



the consequences of potential climate scenarios, which could include loss of functionality and revenue (such as lower generation capacity of a hydropower plant due to decline in precipitation levels) or greater costs (such as increased maintenance or rehabilitation costs and greater insurance premiums in the case of a port facing a rise in sea level).

Tools and data for climate risk analysis are becoming increasingly available as stakeholders recognize the need for their use. Planners now have the advantage of accessible, user-friendly information about climate variables, like the World Bank's climate portal. They also benefit from the refinement of spatial and temporal resolution of climate models and projections. Nevertheless, it is important to consider that many climate variables have a marked region-specific character and need to be scrutinized in the context of a specific location and applied to a project's (or sector's) vulnerabilities and needs.

Once the actual or expected climate risks are identified, planners must ask which adaptation option (or combination) should be considered from among the following choices:

- *Resisting the risk*, which entails designing to resist an expected climate condition (for example, stronger winds) so the infrastructure does not lose its functionality.
- *Accepting the risk*, where the design takes into account an expectation of temporary loss of functionality (for example, accepting temporary flooding).

- *Avoiding the risk*, where the planner seeks to elude the anticipated risk (for example, redefining the project site to avoid vulnerability to flooding).

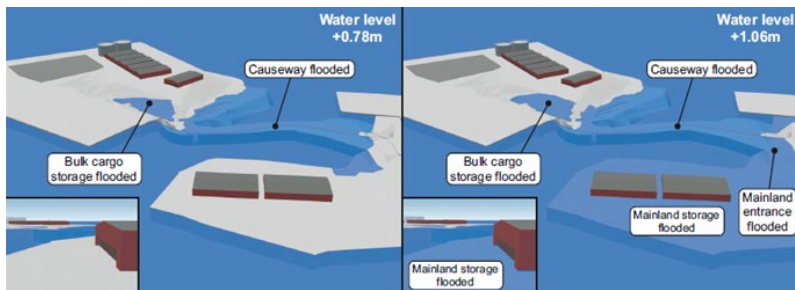
The evaluation of options comes with a review of their cost effectiveness. From a cost angle, it will be expected that resisting will usually bring increased costs, while accepting or avoiding risk may or may not. The risk of not evaluating the impact of climate risk and measuring its potential consequences is not only locking in an inadequate design but also increasing the probability of having to pay higher insurance, performance guarantee premiums, and financing costs.

A third relevant question is whether adaptation should also involve limiting the climate-related risks beyond the immediate scope of the project. The options may include reducing negative impacts arising from the interaction of climate and infrastructure, like including storage within infrastructure drainage systems to reduce the risk of causing flooding. Another option is protecting against negative impacts arising from climate change, like designing a road so that it can also serve as a refuge in case of flooding. In addition, special climateproofing infrastructure like coastal defenses can protect a very specific piece of infrastructure (a sea in a port) or be extended to benefit a larger area (such as the Thames Barrier).

Proper planning is key

IFC's most recent Climate Risk Case Study, *Climate Risk and Business: Ports*, shows how climate risk can be evaluated for proper planning and investment. The report first assessed the risks and opportunities that seaports' operations in general may be exposed to due to changing climate variables (such as berthing, navigation, transport inside and outside of the ports, insurance, and social and environmental issues).

Next, changes in key climatic variables – as they relate to the identified risks and the port's location– were analyzed in the context of forecasted climate scenarios. Such an analysis provided a thorough understanding of impacts that allowed for a financial cost and benefit analysis of adaptation options. This analysis can include visualization examples like the following ones that show the highest spring tides in 2050 and 2100 for this project:



Spring tide levels provide information needed to calculate the costs of business interruption due to flooding inside the port, and financial analyses of investments that would climateproof it, thus preventing the flood in the first place. In this particular project, the cost and benefit analysis showed that such investments would be justified from the financial point of view.

The key initial decision is to take climate risk into consideration. In the case of ports, a recent survey of world's seaports (Becker et al. 2011) shows that most of the planned infrastructure is built taking into account only historic records, potentially exposing the new assets to severe and frequent impacts. This is not the case in Muelles del Bosque, as the climate risk analysis was instrumental in the concessionaire's decision to invest \$10 million in areas subject to flooding.

The exact change in frequency or intensity of events such as the storm tide for another port will be specific to the location and project

characteristics, requiring analyses of vulnerabilities and adaptation options in that context. Although each location is unique in its needs, they all deserve careful consideration based on the most up-to-date research and tools available. 🌿

RENEWABLES

A closer look By Jamie Fergusson

Renewable energy technologies such as hydro, wind, biomass, geothermal and solar power offer the potential of increased energy security, limited local and global environmental impact, and reduced exposure to fuel price volatility. Many of them are also experiencing rapid cost reductions as the technologies improve and the industries grow to scale. However, except in areas of particularly good natural resource or in countries that are otherwise dependent on expensive imported diesel, renewable energy is yet to be cost competitive with traditional sources of power such as coal and gas. Increasing the contribution of renewable energy within a country's energy mix often faces other challenges such as perceived higher risk by investors, unsuitable contractual or regulatory frameworks, and existing infrastructure and subsidies that weight decisions in favor of traditional thermal power. In response, many countries are implementing specific regulatory support systems to encourage renewable energies. Multiple different approaches exist,

including fixed long-term elevated “feed-in” tariffs, auctions for specific amounts of new renewable energy capacity, and requirements for utilities to source specific percentages (or “portfolio standards”) from renewable sources. Each approach has its supporters but none has proven a panacea: all have their strengths and weaknesses and often their success comes down to the details of implementation. Feed-in tariffs were once the darling of many as Europe's schemes encouraged rapid scaling of wind and solar power. The shine has come off these schemes more recently with painful retroactive reductions of tariffs threatened in Spain and the Czech Republic. As regulators and markets learn from mistakes, many hybrid approaches are being designed that optimize benefits of different approaches. IFC has financed renewable energy projects under a variety of regulatory support systems and the table below provides a comparative analysis of the four broad categories of regulatory support based on IFC's experience.

The principal support mechanisms, which can also be used in combination, are outlined below.

TAX INCENTIVES

Accelerated tax depreciation, transferable tax credits (which can be used to raise capital), and other tax-based investment incentives

STRENGTH can accelerate pay down of capital cost | regulatory reliance is not long-term | public “subsidy” is delivered upfront so regulatory reliance and public liability are not long-term

WEAKNESS burden is directly on government finances with reduced tax income | can lead to stop/start markets if support is only approved on an annual basis (such as in the U.S.) or with economic cycles affecting the availability of profits to shelter from taxes | operating incentives can lead to less well-run generation assets | may disadvantage some RE technologies



PORTFOLIO STANDARDS

A government required % of all power generated to be sourced from RE, often twinned with a credit or tradable certificate system by which suppliers demonstrate compliance

STRENGTH can drive competition among RE technologies, delivering the government target at the lowest cost | can achieve an exact volume target if measured against metered output | cost efficient (depends on floor price of certificate)

WEAKNESS low TLC* | price volatility | disadvantages some RE techs so likely to only support the single lowest cost technology for that country | complexity | bureaucracy in administering and managing the RE credit scheme | setting right % can be a challenge in understanding the cost implications on the sector (this can be mitigated by setting a suitable safety valve or penalty price above which the credits cannot go)



FEED IN TARIFF (“FiT”)

A FiT gives a guaranteed fixed price or premium per kWh to the generator for all projects of a technology (renewable energy) type for a fixed period of time

STRENGTH TLC | “pull” incentive on the market | separate FiTs can allow multiple technologies to be supported and deliver diversification

WEAKNESS getting the price right is hard, as equipment and financing prices are dynamic. A FiT that is too low will result in no investment and a FiT that is too high will give away excess returns and add to public costs | A FiT alone is not enough to spur the market – also need access to grid, bankable PPAs, etc | FiTs create long-term liability– suitable caps on the amounts of RE supported are needed, so sustainability depends on who is paying– are the tariffs passed through to consumers or subsidized by government funds– and how much is committed to?



AUCTIONS

Government or utility run competitive tendering of fixed amounts of capacity for specified renewable energy technologies

STRENGTH combination of market efficiency with the auction and the TLC of a guaranteed price | greatest regulatory control on expansion of RE in the system | separate auctions can allow multiple technologies to be supported and deliver diversification

WEAKNESS high transaction costs and long lead times associated with running the auctions | risk of non-delivery if auction entry requirements and bid scrutiny are inadequate | setting suitable bid deposit/guarantees is essential to successful outcomes | harder to achieve success in context of volatility in capital costs and/or costs of capital, particularly related to currency markets (bids may become quickly unviable)

**TLC=Transparency, Longevity, Certainty*



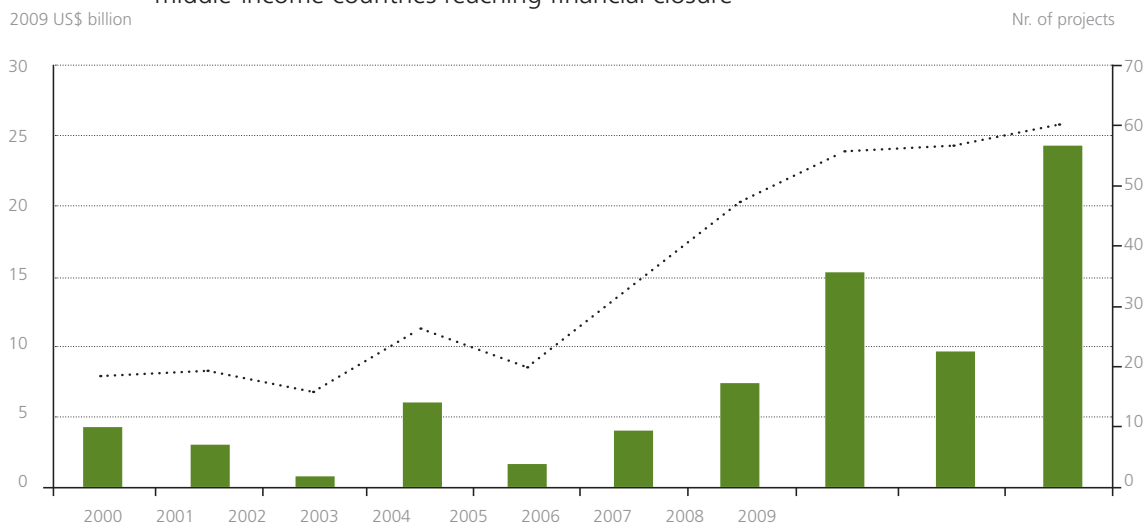
Renewable energy trends: Low- & middle-income countries

By *Edouard Perard*

Private sector investment in medium and large scale renewable energy projects in low- and middle-income countries has increased strongly during the past five years. Investment commitments to new renewable energy projects with private sector participation during 2005-2009 totaled \$60 billion, approximately four times the level of investments during the previous five years. In terms of number of projects, 253

renewable energy projects with private sector participation reached financial closure during 2005-2009, 2.5 times more than in 2000-2004. In 2009 (the last year of available data), private activity in renewable energy reached a record high of 60 new projects for a total investment greater than \$24 billion. In comparison, during that year traditional energy generation totaled 52 projects representing \$30 billion.

Renewable energy projects with private sector participation in low- and middle-income countries reaching financial closure

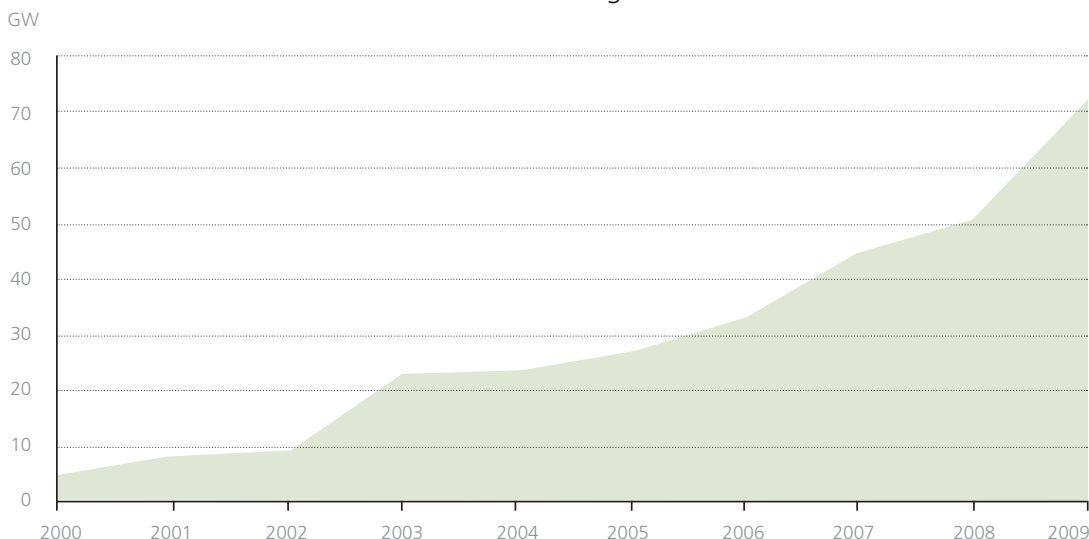


In general, the total installed capacity of medium and large scale renewable energy projects with private sector participation is becoming quite sizeable. More than 72GW of renewable energy were installed through projects with private sector investment over the last decade; most were installed during the last five years (49GW) and 21GW during 2009 alone. With progress in technology driving down the relative cost of renewable energy, and with the increase of energy prices during the last years, renewable energy has become more competitive and represents now a substantive share of energy generation projects.

During 2005-2009, renewable energy represented about 25 percent of medium and large scale energy generation projects' total capacity in low- and middle-income countries.

Not all renewable energy technologies have developed at the same pace. Hydropower remains the most commonly used technology, numbering 129 projects and \$45 billion in investment in 2005-2009. Wind power is increasing, with 85 projects and \$11 billion in 2005-2009. In the third place in terms of energy mix, biomass accounted for 31 projects and \$1.7 billion in 2005-2009. Medium and large scale private renewable energy projects based on other technologies, such as solar, are currently less developed in low- and middle-income countries. The choice of the energy technology is directly linked to the associated generation cost and the natural conditions, hydropower and wind being less costly and more exploitable. Solar power generation remains in general more expensive, and is usually less developed through private medium and large scale projects.

Cumulative capacity of renewable energy projects with private sector participation in low-and middle-income countries reaching financial closure



Brazil, India, and China are the most active countries in terms of private investment in medium and large scale renewable energy projects. The size of these economies, their important energy needs, natural conditions, and fiscal and financial incentives explain why these three countries are ahead in the development of private renewable energy projects. From 2005-2009, the three countries implemented 57 percent of all private renewable energy projects in low- and middle-income countries, representing 68 percent of total investment commitments and 69 percent of renewable energy capacity installed.

In Brazil, where \$26 billion was invested in 73 projects of a total capacity of 14GW, most projects were large hydropower plants (41), followed by biomass (21) and wind (11). In India, where \$9.8 billion was invested in 27 projects of a total capacity of 12GW, most projects were also hydropower plants (21), followed by wind (five) and biomass (one). In China, \$5.5 billion was invested in 46 projects of a total capacity of 7GW. Wind power was the predominant technology used (31 projects), followed by hydropower (10) and biomass (5).

These figures certainly underestimate the real scope of private sector participation in renewable energy in low- and middle-income countries, as many renewable energy projects are small scale and remain difficult to track. As the relative cost of renewable energy keeps declining, it is expected that private sector participation in renewable energy projects will continue developing strongly: wind, hydropower and small hydro projects in the short term, and solar in the medium term with the decrease of associated costs and the development of incentive programs. Brazil, India, and China are expected to remain the first destination for renewable energy projects in low-and middle-income countries for quite some time. 🌿

All calculations are based on data from the PPI Database (World Bank and PPI-AF). <http://ppi.worldbank.org/> Data from the PPI Database on energy projects with private participation include primarily medium and large scale projects as reported by the media and other public sources. Small-scale projects are usually not included because of lack of public information.



“Renewable” is the battle cry of environmentalists and climate change activists. Yet, across the spectrum of renewables, some resources seem more “green” than others.

By Katharine Baragona



What's the deal with **GEO THERMAL?**

FIELD OF

WHAT'S HOLDING BACK INVESTMENTS FOR THIS CONVENTIONAL SOURCE OF RELIABLE AND STABLE ENERGY? SOME EXPERTS SAY IT'S THE UPFRONT DRILLING COSTS AND RESOURCE BASE RISK; SOME POINT TO COMPETITION WITH SIMILAR RESOURCE TYPES; SOME BLAME LACK OF PROJECT FINANCING. OTHER CULPRITS:

COST: Geothermal plants have no fuel costs but upfront costs are high. Verifying a site can take a long time, making financing difficult. Expenses are front-loaded in research, development and drilling and costs can vary widely depending on location, temperature, and drilling depth, among other things. Typically, drilling costs increase exponentially with depth. The most economically viable projects are those that exploit high temperatures at shallow depths.

RESOURCE BASE RISK: The last major geothermal exploration effort was about 30 years ago, during the 1970 energy price spikes, with no significant geothermal exploration since. Much resource base knowledge is grounded on older data, gathered with older instrumentation. Industry and governments need to address resource risk if geothermal is to gain a larger fan base. What happened to that portion of Google.org and the U.S. Department of Energy's investment in AltaRock's EGS project going toward geothermal resource mapping? Did the research baby get thrown out with the injection waters?

Perceived risks also affect investment. Recently, PPIAF supported a study evaluating resource risks associated with developing geothermal power in Indonesia. Investors claim to need specialized mitigation interventions to overcome the excessive

Controversy swirls around what really promotes economic growth, development, and sustainability. Focusing on benefits can boost investment, attracting financiers with a feel-good factor along with profits. Yet, across the spectrum of renewables, some resources seem more "green" than others. Everyone knows something about solar and sees it as a plus.

GEOTHERMAL 101

Geothermal energy is a renewable resource derived from the Earth's heat. By mass, 99.9 percent of the Earth is hotter than 100° C. The Earth's available heat is estimated at equivalent to 42 million megawatts of power and doesn't deplete like an oil or natural gas deposit, ensuring an inexhaustible supply of energy.

As a power source, geothermal is unsurpassed. Plants are capable of running 24/7, providing steady base load power with high capacity factors. It's clean and sustainable with virtually zero carbon. Facilities have a small surface footprint; there are no vast installations of unsightly, noisy wind turbines or immense arrays of mirrors or solar cells.

Most geothermal power is conventional, exploiting naturally occurring pockets of steam or hot water close to the Earth's surface. Heat from

The same goes for wind, which produces clean energy from majestic white turbines. But ask people about conventional geothermal energy versus engineered geothermal systems (EGS), and enthusiasm for renewables gives way to blank stares. Geothermal projects struggle for attention and vie for finance with little or limited success.

water is used to boil fluid and drive a steam turbine connected to a generator. Conventional geothermal power plants are located in rift zones or volcanically active parts of the world such as Iceland, along the Pacific's "Ring of Fire," Indonesia, Philippines, and on America's west coast.

A newcomer is engineered geothermal systems. This approach, based on related principles, is designed to work in non-volcanic areas by drilling thousands of feet underground. Wells are bored and pathways created inside hot rocks, into which cold water is injected. The water heats up as it circulates and is then brought back to the surface, where heat is extracted to generate electricity.

In 2008 it appeared geothermal energy had finally hit the big time. Google.org, the philanthropic arm of Google, and private equity heavyweights Kleiner Perkins Caufield & Byers

DREAMS

geothermal resource risks found in Indonesia. The study concluded Indonesia's geothermal resource risks, given its vast potential and attractive prospects, are likely to be similar to or less than other countries.

COMPETITIVE OPPORTUNITY: Government sponsored incentive programs help level the playing field. A typical American geothermal plant, using conventional technology, produces electricity at around \$0.10/kWh. Producing electricity from coal or gas also costs around \$0.10/kWh. Add financial incentives such as production tax credits, and geothermal power becomes competitive with many other technologies.

Chile offers grants to geothermal companies capable of exploring Chile's largely untapped geothermal potential, a lesson others can learn from. Similarly, Australia launched a Geothermal Drilling Program to help develop its geothermal industry. California's Geothermal Program awards annual grants and loans to develop new geothermal technologies for low-temperature use and generation while protecting the environment.

LACK OF FINANCING: There are numerous projects being financed. These multiple structures are in various stages of development, in all regions and sectors. The difficulty is not lack of financing, but rather a lack of well-structured, well-prepared bankable projects where enough time and money has been invested to establish technical, economic, and financial viability. Governments must build the investment case with preparatory fieldwork before investors will come. Only then will geothermal be the next "field of dreams."

and Khosla Ventures announced investments in EGS. Funding was also supposed to go toward geothermal resource mapping, information tools, and a geothermal energy policy agenda. What happened?


EARTHQUAKES

EGS technology has a propensity to cause noticeable earth rumblings. It's a sign the technology is working, propping open or enlarging existing cracks and fractures, where injected, high-pressure water causes small tremors. Although man-made earthquakes are not unique to EGS—they occur with oil-and-gas drilling, and damming and mining operations – the shaking unsettles peoples' nerves. Opponents of EGS seize upon that fear, highlighting unknown geological risks, potential damage, and high costs. Proponents tell us opponents are hysterical, tremors are manageable, and EGS will greatly reduce the cost and availability of geothermal power.

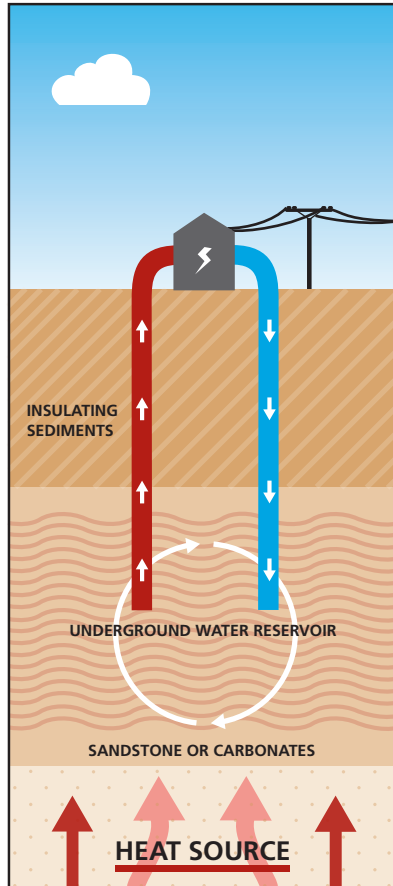
Either way, the sci-fi nature of the geological risk is enough to keep most investors' wallets closed for now. More work needs to be done to understand the true geological risks. Those risks then need to be rationally balanced against the drawbacks of other energy technologies, such as fossil fuels. The real question, in the end, is what people are willing to tolerate in return for a secure energy supply.

CONVENTIONAL GEOTHERMAL

Which brings us back to conventional geothermal: the resource not far below our feet with the power to boil unlimited water and generate clean, renewable energy with proven safe technology. Conventional geothermal energy supplies more than 10,000MW to 24 countries worldwide, meeting the electricity needs of 60 million people. The United States boasts the largest geothermal market, with about 3,000MW of installed capacity. The Philippines, the world's second biggest producer, generates 23 percent of its electricity from geothermal energy. Geothermal energy has also helped Indonesia, Philippines, Guatemala, Costa Rica, and Mexico. Iceland derives 17 percent of electricity and 87 percent of its heating needs from geothermal energy.

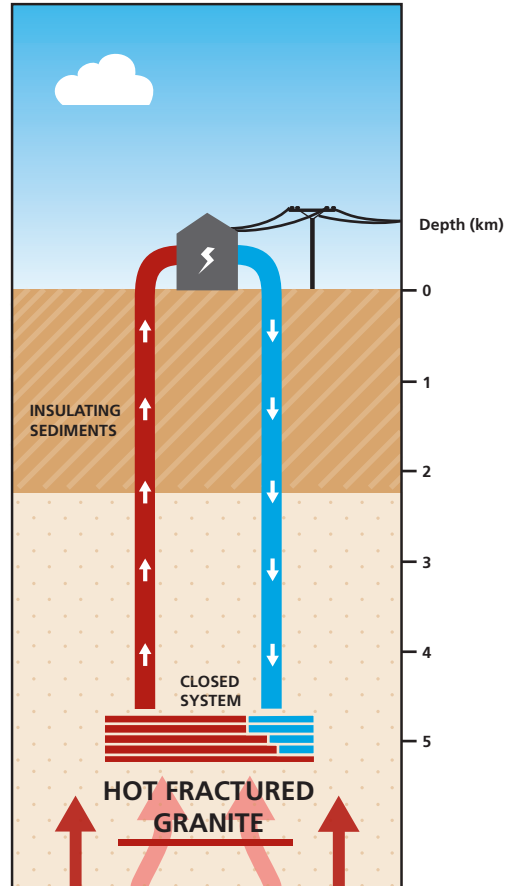
As these figures demonstrate, an operational geothermal power plant is quite reliable, offering continuously available base-load power with historic reliabilities in excess of 90 percent. Compare this to wind-generated power, with 25 to 40 percent reliability (the wind doesn't always blow when needed), or solar-generated power, with 22-35 percent reliability (the sun sets each night). Despite its lower profile, geothermal power has staying power. In this particular popularity contest, it may yet be voted "Most Likely to Succeed." 

HOT SEDIMENTARY AQUIFER



GEOHERMAL

ENHANCED GEOHERMAL SYSTEM



HOT ROCK

India's solar roofs

How Gujarat will set up 500MW of distributed solar systems by 2014.

Mr. D.J. Pandian spoke to Handshake about an IFC project that involves installation of 5MW distributed rooftop solar PV systems in Gandhinagar, the capital of Gujarat, by a third-party developer on a PPP model. The developer would be selling the energy to the local distribution grid at a preferential tariff to be determined during the bid process. The pilot project will demonstrate the techno-commercial viability of the plan, which would help firm up policy and legal frameworks for PPPs for the larger distributed rooftop solar program in the state.





Mr. D.J. Pandian is a senior official in the Indian Administrative Services, and his experience spans 30 years. Prior to being the Principal Secretary in the Energy and Petrochemical Department for the government of Gujarat, Mr. Pandian worked with the Gujarat State Petroleum Corporation Ltd. He was also on deputation with the World Bank in Washington, D.C., and served as Director, External Commercial Borrowing, for India's Ministry of Finance from 1995 to 1997.

How did your interest in climate change evolve?

I was posted to [India's] Department of Energy two years ago; before that, I did a stint in a corporation mostly dealing with distribution of gas to cities and towns. We wanted people in the area to stop cutting down trees in the woods. I set up a pipeline network to the kitchens of area villages, which made people very happy because they had fuel available with no smoke and no pollution. Even the children were happy because they now spend more time with their mothers, since women no longer need to collect firewood. As the project was successful, the chief minister asked me to do this for the whole of Gujarat. So although it started as a charity, it became a corporate responsibility and now reaches almost 700,000 people.

Was pollution a serious problem in Gujarat?

Oh yes. Gujarat is highly industrialized, so we needed a long-term policy to reduce its carbon footprint. There are a lot of small and medium industries, like the ceramics industry, which use coal. With natural gas, we reduced the pollution level tremendously. The chief minister himself asked me to reduce the pollution next to his house. He lived next to a coal-based thermal power station, and he said, "Ash is falling on my house, how will you stop it?"

How did your idea of using rooftops to generate solar energy take off so fast?

It had political support at the highest levels, which helped our plan proceed quickly. We also had support from the Clinton Climate Foundation. They told us how they can help so that over time the cost of solar power can come down. That motivated us. We signed power purchase agreements for 100MW, but the process took a lot of time. Since this government is so forward-looking, we looked to them to fix the tariff, which they did. Now, anyone who has the capacity of financing our technology can come forward and submit an application to the government of Gujarat to set up solar powered generating units.

The government of Gujarat assured us that they will buy net power at the rate fixed by the state's regulatory commission, and very few people disagree with these numbers. They're reasonable numbers. So that led to the creation of our first public-private partnership.

How does the system work?

We set up the generating unit. Anyone who agrees to supply power at the rate of \$.32 is ready to go. The ease of the process has created a lot of enthusiasm. I can assign 965MW of solar power. By December 2011, 300MW may be commissioned. This will be the highest in south Asia. The project's potential attracts private investment which will ultimately help cut back the carbon footprint.

Once you realized you could use the rooftops of government building for solar power, how did you flesh out the idea?

I approached IFC for that. They enabled us to bring the best practices to the project, as well as the best technology partner. The proposal from IFC attracted tremendous response. Because we went with the best practices, within six months to a year we saw that rooftops across the city were full of solar panels. That's our dream. Now

bothered by pollution, he only wants affordable energy, and your energy is very costly." Others told us that pollution is a problem created by Westerners and foreigners. "Pollution is created by them, now they want us to pay," we heard over and over again. We listened very patiently and said to them, "If not today, then tomorrow we will have to face this situation." We also showed them the concrete effects of climate change. In Gujarat, the monsoons start at the end of June. Climate change here is very perceptible, because we used to get only five inches of rain, and now we get 10 inches. Also, each year

Climate change here is very perceptible, because we used to get only five inches of rain, and now we get 10 inches. Also, each year the sea comes closer and closer to the coast. We are sinking.

we are passionate to see this project spread further in the big cities. The carbon footprint can be completely reduced, and we can see climate change effects cut back.

Climate change can be very controversial. Did you have to address this during the project?

In the beginning, people thought our plan was too costly, and asked, "Why are you bothering the common man? The common man is not

the sea comes closer and closer to the coast. We are sinking. Climate change is visible and we are experiencing it. When you explain it to people with actual examples, then they understand.

So you communicated directly with the residents themselves.

Yes. We are the most industrialized state in India, and also the most sickly. Our women and children are getting unknown diseases because of the pollution created by the chemical industry. There

is a correlation between the industries here and the residents' life cycle. When it comes to that, then who are the stakeholders? The people who are going to buy this power.

And how did you convince government officials?

I explained that if they don't spend the money today, they will spend it later, on disaster relief and healthcare costs. That was the best way I could convince the government finance department. And once we proved the project is viable, the political will was there. When private investors come and look, they see that here is the place for developed land at an affordable cost, and they can set up their solar situation in Gujarat.

Where do you see Gujarat Solar in five to seven years?

We need to set up at least 10,000MW solar, since our objective is to have at least 30 percent of the electricity available through renewables. We have a population of 60 million, which equates to almost 12 million households. We need 30 percent coverage out of that number. To do that we have to work out a strategy to pin down the cost of generation in a phased environment – perhaps through the Clean Technology Fund. It is a win-win situation, but somebody has to start the cycle. Someone has to kick off the ball. 🌱

Renewable energy has gained recognition in international climate change negotiations as well as from private sector investors. However, there are still barriers to investment, such as cost, experience and expertise. Translation? Countries should be focused on implementing an appropriate low carbon energy mix rather than immediately banking on the latest technology.

Clara Alvarez, a Senior Infrastructure Finance Specialist at the World Bank, consults with governments on issues in solar and wind power. Handshake asked Clara what lessons she would share with a newly-appointed minister on how to best achieve climate-friendly milestones.

WIND & SOLAR

Lessons from an investor

1 INVEST FOR THE **RIGHT REASONS**

There are sensible reasons for choosing renewables, and they're not all related to climate change.

First, your country should actually need the additional capacity, or be able to export it to a neighboring country. In many cases, managing demand (for example, by offering power at reduced rates during off-peak hours) is good enough and doesn't require massive investment. Second, the market should be big enough and stable enough for renewables to come online smoothly. The capital investment is high, so you need the scale to justify it. Third, the infrastructure needed to connect renewable energy to the existing system should be in place or reasonably easy to set up. Finally, you have to be able to pay for it, including maintenance and transmission.

If the business reasons are right, then renewables can bring real advantages. Reduced air emissions are a big plus. But grid stability, greater employment, and energy independence are also important benefits. As renewable energy technology matures, many utilities and large energy companies will use them to hedge against increasing and fluctuating prices in fossil fuels.

2 PURSUE ONLY IF BACKED BY

As well as the practical reasons for choosing the above renewable solutions, it is also true that everyone likes the idea of clean, renewable energy. Governments often come under a lot of pressure—both at home and abroad—to jump on the wind and solar bandwagon. But trends aren't always good business.

Take the case of Colombia, which mainly uses hydropower. It also has large reserves of natural gas. Is there a good business case for shifting away from these and investing in wind or solar? Perhaps not. Solar and wind are more expensive than hydro or gas, and require a large upfront investment.

BUILD IT **RIGHT**

3

Building and managing renewable energy systems is complicated and it's easy to underestimate the effort needed. Governments need to make sure they get the players on board with the right experience through a transparent bidding process.

Price should not be the main driver in picking partners. The bidding criteria should focus on the technical experience first. Look for companies with a solid track record for construction, management, and quality.

Examine closely how you want to approach the issue of the financial supports and subsidies that are always required for renewables. Should you do it at the initial/capital investment level or at the output level? If this is your first large-scale project which you want to use as the foundation for a comprehensive program, you will be better served applying subsidies at the capital investment level. In this way, you demonstrate to the markets that you are fully committed to the program, and also create a solid base for it.

Consider an external advisor to work on the transaction process. In parallel with the transaction itself, there may be other important considerations, such as legislative issues, public awareness efforts, education, and training.

SOUND BUSINESS OBJECTIVES

Before committing to solar or wind power, officials need to ask:

- Will it bring real business benefits to my country?
- Can we afford the cost of the technology?
- Who will pay for it?
- Is this the best use of public funds?
- Are there better alternatives for clean energy—for example, increasing energy efficiency or developing small-scale energy sources?

4 DON'T FORGET TRANSMISSION & MAINTENANCE

With so much focus on the power-generating asset, it's easy to forget about transmission and maintenance. Sometimes the asset is in a remote location, far from where the energy is needed.

Pay close attention to the equipment supply contract. Suppliers should have a good track record for honoring performance obligations if you want your new asset to be reliable.

ENGAGE THE **PRIVATE SECTOR**

The chances for success are much better if you involve the private sector, since these companies are looking for business results, not political ones. Public-private partnerships make sense in this space because they push risk (and therefore cost) to private providers. They have strong incentives to be efficient, thorough, and cost-effective. This reduces the financial and managerial burden on governments, and ultimately delivers power to consumers at a lower cost. Sometimes, governments may need to buy down the first in a series of interventions to set a market benchmark, but if the program is well-designed and strongly implemented, the benefits will be worth it.

Climate change & renewable-energy legal and regulatory resources

By *Victoria Delmon*

The Public-Private Partnership in Infrastructure Resource Center (PPPIRC)'s new Climate Change/Renewable Energy Page (CC/REP) taps a wealth of legal materials on clean energy project development in two significant energy markets: Brazil and the United States.

For example, as the Brazilian Electricity Regulatory Agency (ANEEL) gears up for a July 2011 auction for renewable energy generation resources, the CC/REP provides the original texts and annotated summaries of the generic ANEEL Power Purchase Agreements (PPAs) used as part of the 2010 auction for small hydro, wind, and biomass generation resources. The 2010 auction resulted in PPAs with 89 projects representing 2.9GW of potential installed capacity.


Wondering about the PPA provisions that seek to ensure that these projects will be developed and brought online in three years? On the CC/REP you can download and print a PDF file of the PPAs in Portuguese or browse the annotated summary in English.

If you're looking for ways that utility procurement efforts can push investments in renewable energy generation projects—one that can meet renewable energy needs as well as protect the interests of ratepayers—the CC/REP has your answer. There you can access a Request for

Proposals for Renewable Energy Resources and associated PPAs issued by PacifiCorp, a large investor-owned utility in the western United States. You can also access a sample PPA for wind power facilities issued by the United States Department of Energy.

The new version of the CC/REP also provides access to valuable information on clean energy public-private partnerships in other parts of the world. Are you searching for the relevant legal documents regarding project development and financing for a large-scale desalination plant? On the CC/REP you can access documents for a reverse osmosis desalination project in Melbourne, Australia, using clean solar energy and other clean energy features.

Sharing Good Practices

The Climate Change/Renewable Energy Page is an open source tool designed as a go-to reference and resource on clean energy PPP projects. It is populated with materials that address the challenges and opportunities in developing and deploying clean energy PPP projects around the world. Materials on carbon capture and sequestration will be added soon. 

The Climate Change/Renewable Energy Page is supported by funds from the Public-Private Infrastructure Advisory Facility (PPIAF), the Norwegian Trust Fund for Private Sector and Infrastructure (NTF-PSI), and IFC.

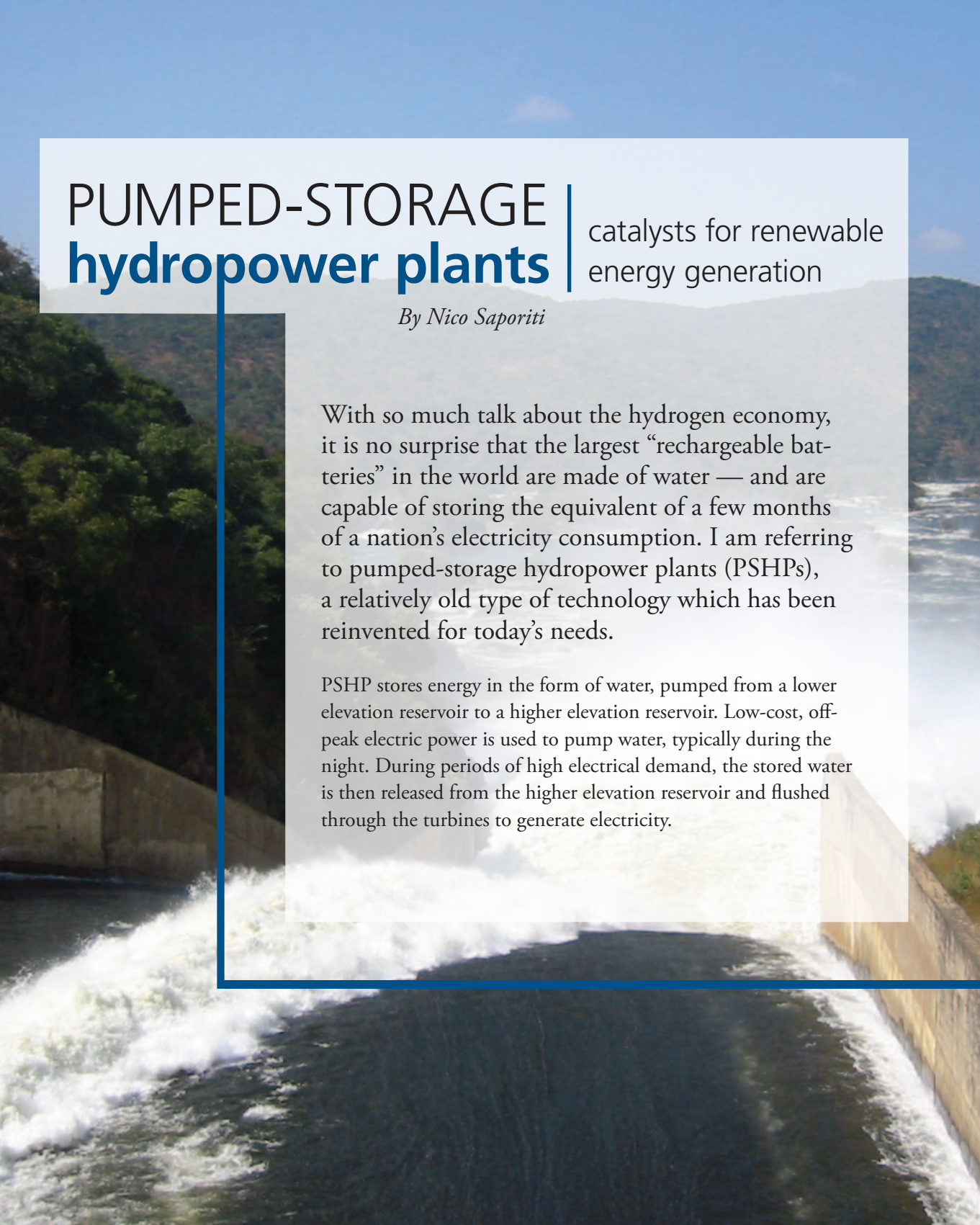
PUMPED-STORAGE hydropower plants

catalysts for renewable
energy generation

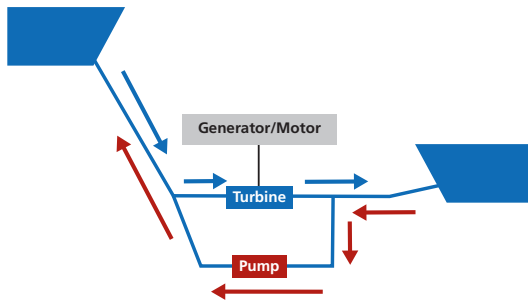
By Nico Saporiti

With so much talk about the hydrogen economy, it is no surprise that the largest “rechargeable batteries” in the world are made of water — and are capable of storing the equivalent of a few months of a nation’s electricity consumption. I am referring to pumped-storage hydropower plants (PSHPs), a relatively old type of technology which has been reinvented for today’s needs.

PSHP stores energy in the form of water, pumped from a lower elevation reservoir to a higher elevation reservoir. Low-cost, off-peak electric power is used to pump water, typically during the night. During periods of high electrical demand, the stored water is then released from the higher elevation reservoir and flushed through the turbines to generate electricity.



Two types of PSHP plants exist: one with separate pump and turbine units, and one with a single reversible unit which can pump or turbine water by changing its direction of rotation. The first type offers higher generation efficiencies, faster reaction times, and lower maintenance costs at higher capital costs.

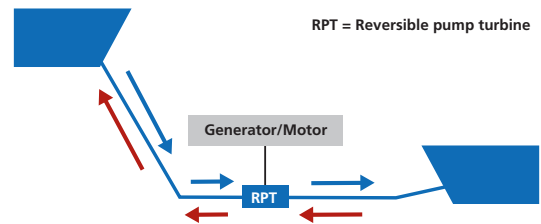


MATCHING VARIABLE DEMAND WITH CONSTANT SUPPLY

While the first use of pumped-storage dates back more than a century (the first plants were developed in the 1890s in Italy and Switzerland), the first big wave of development is commonly associated with the emergence of nuclear power

generation in the 1970s and 1980s. Nuclear power plants can only produce energy at a constant rate and cannot follow the variable electricity demand pattern during the different hours of the day. This is also a problem for coal-fired plants.

Stable electricity transmission grids require that production must be equal to consumption at all times. Therefore, electricity generation plants



must be capable of providing a fast response to load changes. With their very fast ramp-up rates, conventional hydropower plants have typically been able to provide this type of response. However, even in relatively mountainous and wet countries, hydropower plants suffer from seasonal hydrological variability, and there is a

limited potential for development of new plants. The conversion of existing conventional plants to PSHPs offers the possibility to increase the installed capacity of hydropower plants and to mitigate the impact of highly seasonal hydrological availability. The conversion of the existing plants also prompts limited environmental and social problems, because it makes use of existing large dams and reservoirs, and requires the building of small compensation reservoirs.

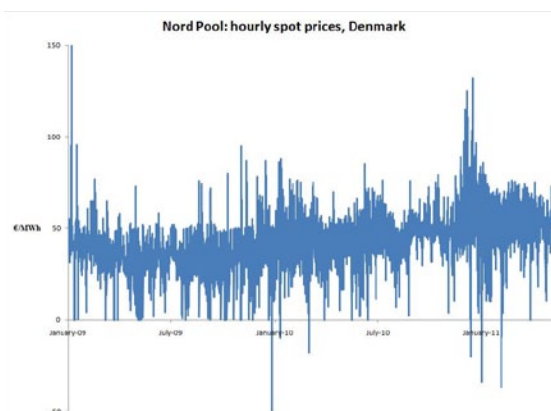
INTEGRATING VARIABLE RENEWABLE ENERGY SUPPLY

The second large development is associated with the relatively new use of pumped-storage plants to level the fluctuating output of intermittent power sources, such as solar and wind plants. It is expected that by 2020, one-fifth of all energy production in Europe will come from renewable energy sources, with an installed capacity of 150,000MW for wind power based on the development of large offshore wind farms.

Problems arise because it is difficult to predict production from wind. In addition, production from solar panels can fall to next to zero in a matter of seconds with a passing cloud. New technologies are allowing PSHPs to switch from turbine to pump mode in a matter of minutes, providing the flexibility required to balance the grid. PSHPs are the catalyst that make possible the relative increase of solar and wind sources in the total generation mix. This happens by providing a response to sudden load changes, and the ability to generate over long periods of

lack of wind or sun.

However, the efficiency of PSHPs is only 70 to 85 percent because energy is lost in the pumping process, through water evaporation and infiltration in the upper reservoir, through hydraulic losses, and through the turbine and generator. PSHPs are thus net consumers of off-peak energy.



Additionally, because of the increased reliance on nuclear, wind and solar sources, and in the absence of sufficient capacity for flexibly storing and generating energy at a short notice, in certain markets electricity prices have occasionally been close to zero and even negative (Denmark, Ontario). This indicates that there is more generation than load available to absorb it, and that for some period of time, generators had to pay consumers of energy to use energy.

THE BUSINESS CASE FOR PSHPs

The technical value of PSHPs is undisputed: they offer the largest capacity energy storage system currently available, they match electricity demand and production from nuclear and thermal sources, they shift the excess production of renewable energy sources to provide the peaks, and they firm renewable energy generation to compensate for non-predicted power variation.

They also suppress peaks from intermittent renewable energy production sources and smooth demand peaks, providing frequency control (primary regulation), capacity reserve (secondary regulation and minute reserve), reactive power production, and Black start capability. They provide ancillary system services that are essential for the stability and functioning of an electricity transmission grid.


The value of PSHPs can be monetized by arbitraging among large price differences. Since the plants consume at low prices and produce (sell) at high prices, they profit from the electricity price differential between peak and non-peak times, which should be sufficiently high to compensate for the above-mentioned energy losses and for the operating and capital costs. Such price differentials, however, can only be observed in certain circumstances:

- Unbundled electricity markets in which energy generation is open to competition, and a large number of energy users can buy from different suppliers of electricity at non-regulated power prices, and

- Where there are well-functioning institutional and organizational arrangements for the efficient and transparent pricing of electricity.

An unbundled market is also required to monetize the ancillary services provided by the PSHPs. In a competitive power market, the responsibility of upholding the balance and frequency in the power system rests with the transmission system operator, which should create a market for balancing power and pay a competitive price for these services.

Across the world, electricity markets vary in terms of their degree of market opening and how advanced the markets are. Traditionally they have in most cases been vertically integrated monopolies. In Europe, public ownership of a national utility has been common, although this has not been the only solution. This type of structure still dominates in many parts of the world, although a rapid change is taking place. For example, day-head markets have been introduced in parts of India and in Southern Africa.

Any long-term strategy to meet the growing global electricity demand with renewable energy sources will require an increased reliance on PSHPs. Wind and solar's attractiveness and competitiveness can be expanded if developed jointly with a PHSP. Private sector investment can be leveraged to finance, develop, and operate these plants under the condition that national and regional electricity markets are sufficiently developed to allow private sector investors to monetize the full value provided by these plants. 

Rachel Kyte's *commitment to environmental sustainability stems from her earliest memories of playing on the salt marshes of her native England. Her activism grew as a college student involved in pan-European environmental initiatives around the same time that the cloud of Chernobyl crept across the continent. With a dawning understanding of the threats to the environment, she steered her career toward exploring and implementing sustainable solutions. She spoke to Handshake about how the rhetoric of climate change gets in the way of answers, IFC's climate agenda, and how PPPs can make a difference.*

A Champion *for* Sustainability

Rachel Kyte is IFC's Vice President for Business Advisory Services; she manages environmental, social and corporate governance risk for the corporation. She was responsible for introducing new sustainability performance standards and disclosure policies at IFC, showing how environmental and social performance can improve financial results in emerging markets. These standards then became the Equator Principles, a global benchmark.





Your interest in environmental issues is well-documented. When did you realize you wanted to pursue environmental policy professionally?

I went to high school on the east coast of England in the 1980s, and when you hit your teenage years, you start to become aware of the world. At that time there was a curtain down the middle of Europe. One of the main concerns among young people was the issue of mutually-assured destruction, and it seemed it was going to happen right in our backyard. Literally. We had cruise missiles at the U.S. Air Force base behind us, and as we sat at the salt marshes and the planes flew so low that we could see the pilots inside the cockpit. This is around the same time we became aware of acid rain. Later came Chernobyl, when I was in college, and we watched that poisonous cloud move across Europe. In Wales, where my family is originally from, the sheep farmers were paid not to sell their sheep, because of fears of how the cloud hovering over them affected them. Because I spent so much time outside, and because these issues came along while I was developing a political consciousness, the way I saw world politics and the environment changing around me became part of my identity.

How did this influence your own activism?

For my generation, the environment was central to ideas about the Europe we wanted to build. It inspired us. I became active in pan-European discussions, and in 1989 I hosted the first ever pan-European youth conference on the environment, which was held in Norway. The Soviet youth movements were there, along with the emerging democratic movement of the eastern bloc.



Photo © Lee Bailey



Climate change is not an environment issue. It's a business issue, it's a financial issue, it's a risk issue, it's a future-of-humanity issue, and it is the future of development.

As secretary general of the Council of European Youth. I was institutionally responsible for youth cooperation, and the cooperation we sought came out of talking about the environment. The climate change piece has always been there for me, because I was always working on sustainable development, and climate change poses the greatest challenge to sustainable development. What's been interesting for me more recently is to more deeply understand, "What do we do about this?"

What gets in the way of answering that question?

The problem with the climate change rhetoric is that it seems such a big problem that we can't do anything about it. In order to arrest temperature rises around the world, to stop the temperature from rising more than 2 degrees, which is what we have to do by 2050, we have to be at a concentration of CO₂ equivalent in the atmosphere of 350 parts per million. 450 ppm would be good. Current estimates show us at 650 ppm. We are not going to slow down climate change enough, or arrest the temperature increase. We have to work on answers to how people around the world deal with this problem.

Does it mean different things in different places?

Absolutely. In the developed world, it means we need to seek high carbon efficiencies in the economy. Over the last 150 years, we have become 10 times more efficient in our use of labor than we were at the beginning of the industrial revolution. Change is possible. This is the scale of carbon efficiency we need today. The developed world should be of one mind on the use of carbon. People say it's impossible to change habits, but for the developing

world the challenge is meeting the needs of the people by going greener. Everybody can start somewhere. The important thing is to start, take that first step.

What is IFC's role in this?

IFC is there to help the private sector in middle income countries become efficient across all sectors of the economy, and to help the banking sector, shocked by 2008, into understanding it has a role in society: to bank sustainable growth. We aim to help the banking system understand the risks of exposure to a commodity which is going to be a difficult thing to manage in your portfolio, i.e. carbon.

For low-income countries, IFC's role is to help create scalable green innovations that will help poor people move sustainably out of poverty. This can include off-grid, mini grid, renewable energy solutions, and new water technology. We need to help the poorest countries follow a different path. All of this requires large amounts of private investment.

What will it take to see this happen?

The financial calculation is that \$100 billion a year is needed for the mitigation agenda, to decrease the parts per million in the atmosphere. In some respects, \$100 billion a year is chump change compared with security targets. But everyone is cutting back on their ODA, so it's difficult. However if you can find \$10 billion, and leverage that with \$90 billion in private

investment, it's eminently doable. The poorest countries are going to need aid to build the capacity to plan in a way that's going to be climate resilient.

Leveraging the 10 into 100 is where IFC has more experience than any other institution of blending public and private, either through PPPs or mobilization and syndication or finding other partners who have different risk appetites and can blend approaches. One issue is that the public funds are accountable to public decision making. So the governments putting 10 billion in need to know the money is being used in a good way. It's a difficult proposition to sell, that that money is going to be subordinated to the private investors' contribution. Donors ask, "Why can't the private sector do this alone?"

What is the origin of this mistrust?

Many people, including government leaders, crave hard evidence of results. They understand they need to leverage the private sector. That aid should be spent on encouraging private investment is not the easiest message to communicate.

With the Climate Investment Funds, which are managed by the World Bank Group, we're already taking some of this public climate finance and leveraging the private money. We're working with Mexico in wind, working in geothermal and solar in Turkey. But a lot of what's needed is infrastructure that is less reliant upon a fossil fuel economy. Infrastructure risks include long lead times, the need to create public-private partnerships, and electoral politics which don't mesh with the project timeline. To green an infrastruc-

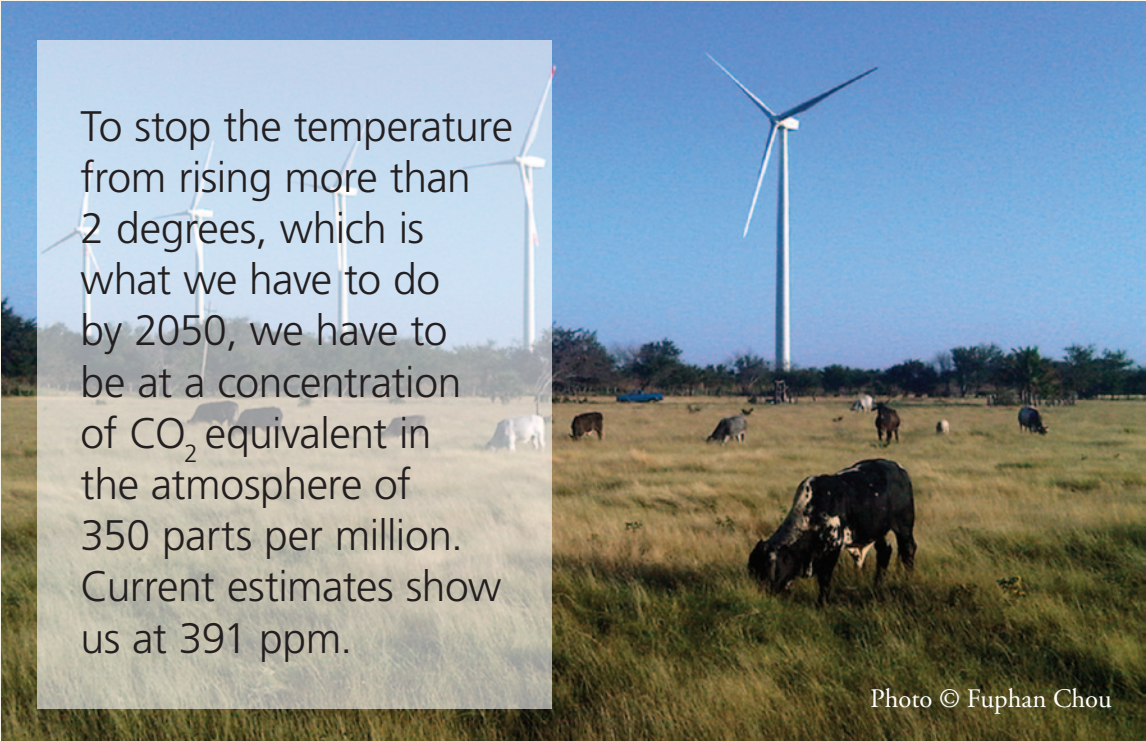
ture pipeline in the developing world adds an extra level of difficulty. Building that pipeline of investable, green, cleaner infrastructure projects is going to be one of the key challenges for IFC in the next 10 years.

Is that at the heart of the creation of IFC's new Climate Business Group?

Development is taking place in the context of climate change; it isn't a question of climate change or development. Therefore, it's everybody in IFC's business. If you're investing in a port, the port needs to be factoring in climate analysis

so it knows what the changing water patterns are going to be, where the dredging needs to be, what happens when the sea level rises, and what that does to your wharves. The same is true for an agriculture investment, because we need to examine what is the resilience of the crop in the face of temperature or precipitation change. This is about the whole of IFC looking at what it does through the context of climate change. That requires data, evidence, tools, and analysis, which this group will produce for the whole corporation so that everyone can factor this into their service and their strategy.

Climate change is not an environment issue. It's a business issue, it's a financial issue, it's a risk



To stop the temperature from rising more than 2 degrees, which is what we have to do by 2050, we have to be at a concentration of CO₂ equivalent in the atmosphere of 350 parts per million. Current estimates show us at 391 ppm.

Photo © Fuphan Chou

issue, it's a future-of-humanity issue, and it is the future of development.

What is the role of PPPs in climate change?

The private sector can help many countries think through their investable infrastructure proposition within the next 30 years. Most of the countries we work with aren't aware of what technology can offer them. We can fuse the public-private discussion, creating bankable partnerships.

There are theoretical arguments to be made, but you always come back to real-world examples in your talks about climate change. Is this because it's such a controversial issue?

IFC is a mirror image of the world in terms of nationality, religion, and spiritual disposition. So within IFC we have the same debates they have at the UN. But climate change isn't a polemical debate, it's happening now. I was recently in Colombia, which is experiencing floods that have washed out a large part of the infrastructure in the country. Colombia's social inclusion agenda may have been set back years. The country is now focused on how to become more resilient. If you understand what climate change is doing to the path of development, you will want to be a part of altering the trajectory. At the end of the day, that's what our clients need. 🌿



The business of climate

Climate-consciousness is becoming good business: a way to demonstrate corporate responsibility, stay relevant, and plan for profitability. Just as the information revolution transformed the way the world works, the climate agenda may now potentially shift the status quo. Recognizing this, IFC has positioned climate as a strategic priority, proactively engaging the private sector via the new Climate Business Group. Its naming was deliberate. Climate Business, as opposed to the more ubiquitous “climate change,” turns the climate agenda into a value proposition—and this demonstrates to private sector clients the real business benefits of investing green.

Much-needed innovation comes from involving the private sector, according to Mohsen Khalil, the head of IFC’s Climate Business group. “Innovation is central to our climate agenda because it’s the only way we can make a difference,” he said. “So we focus on three categories of innovation: technology innova-

tion, business process innovation, and—to me the most important—financial innovation.”

With a focus on innovation, the centrality of PPPs becomes clear. PPPs that prioritize climate change transfer innovation from the private sector to the public. At the same time, public sector involvement through the PPP allows the private sector to engage in areas that, without public support, would present a far more challenging business proposition.

“For our countries and governments, it’s about inclusive and sustainable economic and social development, and for our corporate and business clients it’s about sustainable and long-term competitiveness,” Khalil said. “Ultimately, pursuing the climate agenda is a common good as well as an individual good.”

Public Lighting PPPs

Energy efficiency improves lives

By Tanya Scobie Oliviera

Picture a crowded urban avenue at night. Movie theaters release swarms of pedestrians, who gather for coffee and dessert at street cafes. Those returning home late from work buy fruit at the corner market. Mothers desperate to get their babies to sleep push carriages around and around the neighborhood.

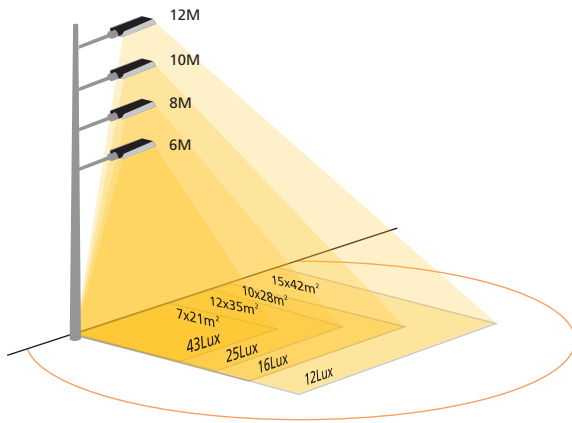
Now picture that same block at night without street lights. Dark, abandoned, and menacing, few venture out. Modern public lighting systems improve nighttime visibility, result in decreased criminal activity, and improve the sense of security among citizens. This increased visibility also ushers in increases in productivity, due to a rise in legitimate activity after dusk, and a longer workday that allows people to travel safely at later times.

Politicians benefit, too. Public lighting by nature is a highly visible indicator of progress, and can therefore be a very effective tool for municipal governments to show commitment to their constituents. Even better for the

politician, it is in many cases self-financing. Technological upgrades reduce energy usage (and therefore cost), and those savings can cover the cost of the installation and maintenance of the new equipment. This depends on the starting price of energy: in markets where energy is highly subsidized, the same benefits may not apply.

For this reason, PPPs are a critical piece of the decision-making process. Through a public lighting PPP, government can purchase a service from a private operator—light—as opposed to an asset—the luminaire itself. The government will receive a lighting service of pre-agreed quality standard at all times during the contractual period.

The contract with the private operator simplifies the process and allocates appropriate risk to the operator. It bundles together the decision of the most appropriate technology, the purchase and installation of the efficient lamps and bracket, and the routine and unscheduled



Public lighting service can be measured through the intensity of the light and its coverage on the ground beneath the lamp.


maintenance of the lamps and guarantee of the quality of that service.

This last benefit is especially valuable because the contract requires preventative maintenance, thus avoiding the typical reactive maintenance habits of governments, which can be costly in the long run. Preventative maintenance requires keeping the lamps clean and ensuring they aren't encumbered by foliage—a simple yet highly effective way to guarantee that the infrastructure will be functional for its full expected life. Effectively managing maintenance of a public lighting system also requires up-to-date systems, like a full GIS for identifying and managing assets, and well-designed processes, like public call centers, to ensure efficiency. The contract checks off these boxes as well – all so a few hungry theatergoers can ask the waitress for the check as they wrap up their night on the town. 🍃

Energy-Efficient Street Lighting in Quezon City

Energy efficient street lighting is expected to be operational in Quezon City in the Philippines in the first quarter of 2012. The street lighting project is a result of a series of workshops in which city officials agreed on a Coordinating and Managing Entity to launch and manage the project. In addition to the cost savings, better street lighting will improve the area's safety and the security of city drivers and pedestrians.

Many street lamps available today are more energy-efficient than their predecessors. Quezon City plans to replace existing 184-Watt High Pressure Sodium luminaries with new energy-efficient lamps such as 80-Watt light-emitting diodes. As a result, the city will save around 20,000MWh per year. This translates to cost savings of \$4.5 million.



Buildings and their operations consume tremendous resources and emit many varieties of pollution. To reduce carbon emissions, it's critical to address the long-term environmental sustainability of the construction industry, and the manner in which buildings are occupied.

GREEN BUILDINGS

Approaches for every market, climate & budget

By Prashant Kapoor

More than half of all resources consumed globally are used in construction and almost half of all energy generated across the world is used to cool, light, and ventilate our buildings. Green buildings—those which reduce environmental impact—answer the need for sustainable solutions in the coming century. This approach is adaptable to every market, climate, and budget; even the smallest changes can yield quantifiable results. But builders don't need to reach for reclaimed timber or grab at green roofs. Changing a set of light bulbs or adding smart meters can put buildings on a path toward compliance – and profit.

FIXES THAT PAY FOR THEMSELVES

Savings from going green can repay costs in the first decade of operation. Buildings offer the single largest global opportunity to make deep emission cuts at low, no, and even negative cost. Green building also reduces energy costs in heating, lighting, and cooling. Energy savings for green buildings average 30 percent over conventional buildings, and green buildings also use less water and offer lower maintenance costs.

Growing tenant demand due to these lower operating costs, higher worker productivity, and reputational issues will eventually force the real estate sector to require, rather than request, efficient building techniques. The emerging markets represent the greatest opportunity for reductions, underscoring the need for an international effort to rapidly enhance sustainable building practices in such countries and to capitalize on emission reduction potential.

In the EU, stricter government regulation is likely to drive the de facto standard for new and renovated buildings in the next decade. The transformation of the building sector will soon follow. In fact, building codes and regulations have already tightened. In Europe, national governments and the EU have mandated higher efficiency standards for new construction and renovations within the EU Energy Performance of Buildings Directive of 2002. The follow-up directive of 2010 is likely to make “near-zero” energy buildings mandatory by 2021. The emerging markets will follow close behind.

MARKET-SPECIFIC STANDARDS

A bike rack might make sense in San Francisco or Oslo, but in Cairo riding one's bike to work indicates a death wish. So green building standards vary depending on the climate, culture, economy, and other demands of the market. Climate-specific solutions might include fixes for tropical climates, where temperatures vary only within a small range; arid climates, with hot summers and cool winters; temperate climates, where the need for winter home heating is greater than the need for summer cooling; and cold climates, which require insulation over the entire building, including the foundation.

Under a PPP contract, the government can require that private operators meet certain green building standards. But because needs change based on location, these standards may depend on the country sponsoring the building.

Indeed, the number of certification systems around the world has surged. But most of the green building certification systems have inher-

VIDEO: ENERGY EFFICIENCY IN HUNGARY

This short film is based on an external evaluation of IFC's Commercializing Energy Efficiency Program in Hungary. It focuses particularly on block house renovation efforts.



Photo © GY Gabor

ent problems. Some cover wide requirements for green buildings and therefore lack focus on key issues like climate change and resource efficiency. Others do not suggest efficient technology options and related cost savings. At times, these standards rely on complex simulation models to predict energy use. Finally, the assessment process is lengthy and expensive, especially for clients in developing countries.

The real estate industry needs a universal definition of what constitutes a green building, as well as consistent data sources and metrics on green buildings. These deficits make an assessment of the profitability of green building investments difficult and therefore hold back stronger investor interest.

Under a PPP contract, if the government requires that private operators meet certain green

building standards, it may be wise to advise them to pay more attention to the key criteria with these systems to insure that they get genuine green buildings rather than “greenwash.” Simple energy efficiency measures and practices can save more than one-third of any typical building’s consumption.

So why aren’t we already doing this? The common culprits are:

- Misalignment of incentives between the providers of buildings and occupiers of buildings.
- Difficulty accessing financing for energy efficient upgrades due to low awareness of energy efficiency in the banking sectors and very few ESCOs with financial products.
- Disincentives from government policies, such as minimal energy codes and artificially

WHAT MEASURES MAKE IMMEDIATE SENSE? WHERE?

Sensitivity analysis of energy efficiency options for Jakarta shows that energy savings of more than 30-50% can be achieved from simple measures.


HIGH IMPACT MEASURES	OFFICE	RETAIL	HOTEL	HOSPITAL	APT.	SCHOOL
Photoelectric controls <i>To maximize daylight</i>	4%	3%	NA	8%	NA	3%
Solar shading <i>Horizontal & vertical devices</i>	10%	5%	10%	9%	5%	2%
Glass performance <i>Solar & thermal properties</i>	7%	3%	9%	8%	7%	4%
Efficient chillers <i>Higher chiller COP</i>	11%	8%	6%	7%	9%	12%
Variable speed drives <i>Variable drives on pumps</i>	2%	1%	2%	1%	0%	0%
Glazing percentage <i>Window-to-wall ratio on façade</i>	8%	4%	9%	7%	2%	0%
Low-energy lights <i>Limiting power density</i>	7%	8%	7%	16%	6%	5%
Thermostat mgmt. <i>Limiting minimum temp.</i>	2%	3%	3%	7%	6%	11%
Heat recovery <i>Adding unit to fresh air inlet</i>	2%	5%	3%	8%	0%	0%

* Note: the above values must not be aggregated as they reflect only the potential of making each individual measure. The total energy savings potential will be smaller than the sum of individual measure.

low energy pricing, negatively impacting energy-efficiency investment.

- Weak leadership from the government and professional institutions, miscommunicating the economic benefits of sustainable design and construction.
- Difficulty in capitalizing additional cost of green building investments. For example, home buyers aren't necessarily willing to pay more for green buildings.
- Lack of clear benchmarks for energy use, technology choices and demonstration projects.
- Lack in supply chain of energy-efficient technologies and low-carbon building materials.

Each country must also consider where green buildings make the most sense. Buildings that are in use around the clock, like schools, can see immediate results, as can owner-occupied buildings like hospitals, hotels, and schools. Brand-sensitive clients, like supermarkets and housing developers, also benefit soon after implementation.

In parts of the world with high energy tariffs, like the Caribbean, West Africa, and the Philippines, green buildings are a no-brainer because they pay their own way. Similarly, in countries where CO₂ from electricity generation is high – South Africa, Indonesia, India, China, and states in the Middle East and North Africa region – it's easy to track fast results. Overall, countries with the highest energy costs are likely to have the biggest demand for energy efficiency in buildings. 

PUBLIC-PRIVATE PARTNERSHIPS TURN BUILDINGS GREEN

Mexico hospitals

IFC's contract to build two new hospitals in Mexico State is structured to be environmentally responsible. Silver LEED certification requirements will be met for the construction and operation of both hospitals. This will result in energy savings of at least 20 percent, compared to a traditional hospital in Mexico. These buildings and hospital operations are the first elements of a "green" social infrastructure in Mexico, creating a model for future development. The hospitals are expected to contribute to emissions reductions by about 10 tons of CO₂ equivalent per year.

Malé Airport

Malé International Airport required immediate physical infrastructure improvements to sustain tourism. The tourism sector is a major contributor to the country's economic sustenance and improvements planned at the airport were critical to its continued growth – but growth could not come at the cost of the local ecosystem, which was already in jeopardy. With IFC's help, the airport and new terminal will be eco-friendly, with an anticipated LEED Silver accreditation. This is a major milestone in a country that is among the most vulnerable to the effects of climate change.



9

STEPS TO SUSTAINABILITY

For a ready-made path to compliance, follow this guide:

- 1. Review the site constraints and opportunities.** It's important to understand building energy codes and conduct spatial site analysis and climatic analysis.
- 2. Design a building core and façade to reduce energy demand,** utilizing thermal mass as a tool to form part of a building energy strategy.
- 3. Create a low energy heating and cooling strategy,** utilizing variable speed drives for fans and pumps. Consider alternative cooling systems such as earth tubes, seawater cooling, ground source heat pumps, desiccant and evaporative cooling.
- 4. Design efficient heating and hot water,** and consider cost-effective alternatives like passive heat recovery from the air conditioning chiller, solar thermal systems, and grey water heat recovery systems.
- 5. Select efficient lighting and appliances,** and maximize natural lighting where associated solar heat gain is modest.
- 6. Consider a renewable & low carbon energy supply.** Renewable energy technologies including solar panels, photovoltaic, wind turbines, and biomass heaters offer an alternative to fossil fuels.
- 7. Re-conceive water use,** especially recycling grey water for flushing toilets.
- 8. Monitor materials and waste.** It is especially important to monitor and report hazardous and non-hazardous waste from site activities, and recover demolition materials that are recyclable.
- 9. Ensure biodiversity and efficient land use.** Use only local flora and fauna, and confirm that the selected site is defined as land of inherently low ecological value.



Waste has a key role to play in reducing greenhouse gas emissions. Public-private partnerships can help speed up the adoption and implementation of the most transformative waste programs.

By Amar Qureshi

A WASTE TO ENERGY *success story*

When organic matter decomposes without oxygen, the powerful greenhouse gas methane is produced. If methane can be captured and burned to produce energy, a potential negative can be turned into a positive. Or, if waste is incinerated, it can produce electricity from the heat generated.

An appreciation of the science has in many countries resulted in a quiet revolution in the public's relationship with its own waste, an shift from a "throw-away" culture to one that sees waste as a resource to be utilized either through recycling or recovering it to produce energy.

WASTE NOT, WANT NOT

One shining example is England's PPP program for waste, which during the last few years has had a dramatic effect on the development of the waste infrastructure. This accelerated development has been achieved by the Department for the Environment, Farming and Rural Affairs (DEFRA), through its Waste Infrastructure Delivery Program (WIDP), a partnership among DEFRA, Infrastructure UK, and Local Partnerships. DEFRA, through WIDP, is providing funding support to a program of residual waste treatment projects across the country. It also acts as an expert resource to the projects in the pipeline, aiming to make the public sector a stronger, more effective client.

The application of PPPs to waste infrastructure has not been without controversy. A common concern relates to technology obsolescence, given the pace of technology development in this area. There is a presumption that technology will continually progress, making it difficult to commit to an investment decision based on technology. Furthermore, perceived concerns relating to health and concerns around the management of


odor, noise, and traffic means that the development of waste infrastructure stirs strong opposition from the public and special interest groups. This makes planning or land use permission potentially challenging.

The waste PPP program in England was launched in a context of a PPP program that embraced a broad spectrum of infrastructure covering schools, hospitals, transport, and streetlighting. It has therefore taken time for all parties, both public and private, to become accustomed to the different issues and risks that waste projects present, including volatility of income streams from electricity and capacity at the facility provided to other parties.

Despite the continuing debate relating to the application of PPPs to waste, the issue of risk is key to the argument that the use of PPPs is appropriate and conducive to positive public sector outcomes in the waste sector. PPPs are fundamentally about risk transfer. The nature of residual waste treatment projects, given their use of process technology, means that they are inherently more risky than other PPP projects.

THE SOUTH TYNE AND WEAR WASTE PARTNERSHIP

One particularly successful project within the WIDP program is the South Tyne and Wear waste PFI project, which closed in April 2011. The South Tyne and Wear project comprises a partnership of three U.K. Local Authorities (Gateshead, South Tyneside and Sunderland), covering 284,000 households across the South Tyne and Wear area. The objective of the three Councils and the project is to reduce the partnerships' reliance on landfill via the procurement of a residual waste facility, and to provide the public with a greener waste management service. The project will reduce the amount of biodegradable municipal waste sent to landfill from 169,000 tons in 2009-10 to around 12,000 tons by 2020.

The waste solution comprises the development of an Energy-From-Waste (EFW) plant located in Teeside on a site adjacent to an existing EFW plant. The proposed facility will be enabled to produce Combined Heat and Power (CHP). The facility will offer a total capacity of 256,000 tons. The partnership will require initially around 190,000 tons, with the excess capacity available to treat additional third-party waste. The facility will open its doors in April 2014. 

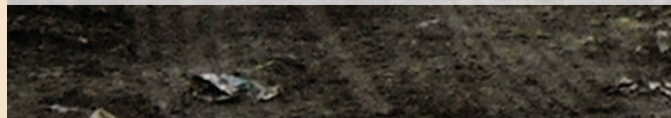
SLIDESHOW: MALDIVES RUBBISH ISLAND TURNS PARADISE INTO DUMP

guardian.co.uk



Waste PPPs are gaining traction in developing countries, and the recent implementation of a waste PPP in the Maldives illustrates how far a country can come in its relationship with rubbish. Since the 2008 election, the country has been in the midst of a rapid social, political, and economic transformation. Officials and administrators aim to combat the developmental challenges of climate change, poverty reduction, private sector development, and economic restructuring, so urban infrastructure tops the priority list.

The country is particularly vulnerable to climate change and rising sea levels. The threat of climate change to the nation's existence was highlighted by the United Nations' Intergovernmental Panel on Climate Change (IPCC) report, released in



Cleaning up Thilafushi

Making the Maldives carbon neutral

By Divya Singh

2007, which forecasted a rise in sea levels by the end of the century. Because 80 percent of the Maldives' 1200 islands are about 1 to 1.5 meters above sea level, the report suggested that the country may become uninhabitable within 100 years. In response, the president has set an ambitious target of turning Maldives into a carbon-neutral country by 2020.


To this end, the government decided to tackle the growing solid waste management issues in the country via private-sector participation. IFC, as lead transaction advisor, assisted the government in developing an integrated waste management strategy and implementation plan (including primary and secondary collection, transportation, storage and recycling, treatment and scientific disposal of waste) for the country's prime waste generation geography. This includes the capital island of Malé and the surrounding islands and resorts, which generate nearly 60 to 70 percent of the waste in Maldives.

IFC also recently concluded the bid process for the selection of a private concessionaire to undertake the integrated waste management project.

The winning bidder has proposed to set up a 2.7MW waste-to-energy plant at the project island of Thilafushi. This plant will have the potential to replace 100 percent of the diesel-

based power generation on the island and save nearly 12,000 tons of CO₂ annually. The concessionaire cannot dispose more than five percent of organic rejects, which are the primary cause of leachate generation at the landfill (causing contamination of the surrounding environment). It is also prohibited from disposing more than 15 percent of the overall rejects into the landfill.

The concessionaire would also discontinue the current environmentally unfriendly system of open burning of waste at Thilafushi and use a treatment plant so that emissions are controlled and air quality is maintained. It would also be required to prepare an EIA report and an Environment and Social Management Plan in compliance with Maldivian Environmental Standards, International Best Practice, and Equator Principle Standards.

When the project is completed, IFC will have helped the Maldives promote private sector investment in the solid waste management sector by mobilizing capital worth \$50 million; improved the solid waste management infrastructure and services in the catchment area for around 120,000 people; supported its goal to become carbon-neutral by 2020; and helped it comply with good global practices on scientific treatment and disposal of solid waste. What was once known only as trash may yet become treasure. 

Do the right thing: Incentives for the private sector

By Jeff Delmon

In the last issue of *Handshake*, this column outlined how to incentivize line ministries and other contracting agencies to implement PPPs when appropriate. In line with the current focus on climate change, I'd like to introduce another contentious subject: how to incentivize the private sector to "do the right thing."

There has long been a debate about private involvement in infrastructure services, and whether it is well suited to help achieve social policy goals. Is the private sector just a greedy, commercial machine focused on profits for management and shareholders, or does this robot have a heart? Is the nature of the private sector fundamentally inconsistent with social policy objectives?

Critics are often angry that private operators think first about the bottom line, rather than the interests of the poor and unconnected. This is unfair to some extent, as private companies are often committed to charitable efforts (whether truly altruistic or for marketing opportunities). But generally, the private sector will do what you pay it to do.

Climate change is a good example. Altruistic and marketing opportunities aside, a private operator of infrastructure (in particular in an arrangement

as highly structured as PPP) is likely to implement climate-friendly technology or changes to business practices only if such actions are profitable. Thus, where financial rewards are aligned, governments can exploit the private sector to

Where financial rewards are aligned, governments can exploit the private sector to achieve social policy

achieve social policy. This is some of the logic behind output-based aid – where grants or subsidies are paid out only as and when key benefits are achieved, as with reductions in emissions.

This is only the beginning of the challenge. The bestowal of this beneficence can be expensive for the one doing it, but valuable for the economy or society at large. This justifies the use of public money. There remain other complications associated with the dynamic of an additional incentive and the technology often used.

Utilities are generally built with public money, connecting the rich and influential first. As the utility becomes a going business concern, it must recover its costs, or at least account for them. Therefore new connections need to be paid for. New connections cost money, and unless free or cheap public money is available, consumers must pay for those connections in advance. Tariffs can be increased to pay for this, but higher tariffs may not be affordable, or politically feasible. Connection fee increases are often needed to cover costs, so new consumers have to pay. Low tariffs may therefore turn out to be anti-poor, since they benefit the connected, who are typically well-off. This is because the connected pay the low tariff, which keeps the utility underfunded and unable to subsidize or even finance connections for the unconnected.

In the end, the poor are left with access only through water vendors, car batteries, fuel stoves, or some other private, high-cost source of services. This is the context in many developing countries, where utilities and public service providers strapped by low tariffs rely on government subsidies. These are often unlinked to performance and create a culture of dependency and perverse incentives. Within this context, including an additional subsidy to encourage green behavior may just add to the inefficiency. Setting sensible, environmentally and socially responsible tariff levels for utilities takes courage and effort from politicians. Unfortunately, however, modern democracy and short attention spans often do not reward courage or effort. Will the government benefit more from additional energy to reform the sector, or, by creating an additional incentive, reduce climate impact?

Technology for climate change is evolving. In particular, renewable energy sources still pose some logistical challenges. Solar, wind, and often biomass are peak load generation technologies, depending on wind, sun, and harvest cycles, though storage technologies are improving. Lower- and many middle-income countries are chronically low on generating capacity. So should precious funds be expended on less-needed peak load capacity rather than more essential base load capacity? Wind is expensive, but solar (for large scale thermal generation) is still very expensive. So is it the best technology for use in developing countries where the marginal challenge of passing such costs on to the consumer is even more difficult? Hydro and geothermal are less expensive technologies, but they are generally located far from demand centers and therefore require larger investments in transmission facilities (with the associated environmental challenges) and grid balance challenges.

This quandary highlights the critical need for project preparation assistance. We're not referring only to money. We also promote sending skilled experts to help developing countries prepare relevant and appropriate climate change solutions. Ideally these will not just attract investors, but also meet the needs of the government in question. A quick look around the sector reveals a large number of market-based and concessional funding sources, but precious few sources of project preparation funding and even fewer sources of expertise. This is a massive gap, and probably one of the key reasons for frustrated green fund managers and donors sitting on piles of cash looking for good projects. If money could talk, this stack of bills would tell us how very lonely it is. 🍃



Infrastructure finance: East Asia's new investment era


By Aldo Baietti

Relying purely on financial instruments to shape the green finance agenda exposes a limited set of options. More important, it misses policy and institutional interventions that governments must take on their own to promote a more attractive investment climate for green technologies. To remedy this, the World Bank is developing the framework to review the financing challenges of green investments in the region, and to look for solutions that will close the gap. The resulting study, which includes a compilation of leading initiatives, should be concluded by the summer of 2011. The following article is adapted from draft conclusions.

During the last few years we have all witnessed an intensified focus on climate change, the need to reduce greenhouse gases (GHG), and the drive to cultivate more sustainable business and lifestyle practices. This has catalyzed initiatives to create greener economies by emphasizing that sustainable environments should command

a more prominent role on how green investments (a term used here interchangeably with low GHG, clean or low carbon investments) are evaluated, designed, financed, and implemented.

The concept of green growth involves the process of promoting economic growth while reducing emissions, minimizing waste and the inefficient



use of natural resources, and maintaining biodiversity. It involves the use of appropriate climate-friendly technologies and financing instruments that generate sustainable economic development. Green growth describes mitigation measures for tackling the long-term costs of global warming, along with mitigating local costs of environmental degradation.

Recent studies by the World Bank and International Energy Agency have projected the global consequences on greenhouse gases if energy usage continues on a business-as-usual path between now and 2030 in major East Asia Pacific (EAP) developing countries. The solution is delivered through a combination of energy efficiency policies, investments in renewable energy, and support to other new climate-friendly technologies that collectively could bend the GHG emissions curve by 2030. However, as much as \$80 billion a year of additional financing is required to fund these greening investments.

World Bank analysis shows that most EAP developing economies (notably China, Indonesia, Thailand, Vietnam, Philippines and the Pacific island nations) are extremely vulnerable to unpredictable changes in the water cycle induced by climate change. Water variability affects food security, human health, and the ecosystem's general well-being. A few cycles of excess and scarcity can negate very quickly the gains in pov-

erty reduction achieved in these countries over many decades.

The size of financing required to protect communities and ecosystems against flash floods, sea level rise, more frequent typhoons and droughts will likely be as large as the earlier estimates cited for reducing GHGs. One could conclude that these massive annual financing requirements are beyond the capacity of the public sector and traditional overseas development assistance. Full participation of private loans, equity, and other instruments are essential. The dilemma is how public and donor support can fully leverage private finance.

DEFINING THE INVESTMENT CHALLENGE

The majority of green investments are not sufficiently attractive to solicit interest from the mainstream financial community on purely commercial terms. As such, green finance needs to consider not only instruments and financial arrangements. There are policies and other factors that would ultimately balance out the cost of clean investments to make them more attractive against the full spectrum of investment options available. Financing issues relating to climate adaptation investment will not be the focus of this initiative as these would require a different set of financing solutions and approaches to risk mitigation and risk sharing.



EXAMINING THE CHALLENGES

Green investments for mitigation present three financing challenges for investors:

ONE

Technologically proven green investments that are not yet competitive compared to their higher GHG-emitting comparators. There is a distinct life cycle cost difference usually due to higher upfront costs. As such, a financial viability gap needs to be overcome in order to shore up or rebalance the disadvantage to incentivize real investments in clean technologies. Many renewable energy projects fit in this category, as well as some energy efficiency investments that may require higher rates of returns because of long payback periods.

TWO


Investments that may yield a positive return but the discounted payback period is longer than loan tenures, thus stifling the decision to finance — particularly in the absence of refinancing facilities in many of the East Asian and Pacific countries. In such cases, the investment may require substantially large, upfront capital costs in order to realize benefits in the future. Given the nature of these cash flows, the higher the hurdle rate, the longer it may take to achieve a “go” decision.



Photo © Ham Sun

THREE

Investments in unproven technologies or processes require different financing approaches for research and development initiatives in order to prove the technology for commercialization. Before any operational financing considerations are taken, risks of unproven technologies need to be fully mitigated through different prescriptions, such as incubation, demonstration, and other public and corporate R&D interventions.

Securing such large commitments to tackle the finance problems of low carbon investments will inevitably require active participation from private financial markets. Innovative methods must be developed and brought to bear to best utilize public policies and public finance, effectively leveraging private and market-based instruments. All measures are needed in order to bridge the financial viability gap of most green investments: public and private finance as well as international donor support and concessional finance. 

LOW-CARBON INVESTMENT

How to move forward

By Henry Derwent

The international climate change negotiations still have a blind spot when it comes to private finance. The sums required to achieve a transformation of the global economy are absolutely enormous – many trillions of dollars in the energy sector alone, as the International Energy Agency keeps reminding us. The current focus is on scraping together the \$30 billion “fast start” sum promised in Copenhagen. The \$100 billion promised by 2020 is spoken of vaguely as being contributed largely from private sources, but no serious work has yet been done on the means and the channels. The Kyoto Mechanisms are getting easier to use, but their small scale and bad reputation puts major investors off carbon.

Ban KiMoon’s Advisory Group on Financing reported before Cancun with a useful survey of possibilities but no clear proposals. Project Catalyst has provided figures and structures, but we still await action by governments and institutions. The United Nations Environment

Programme Finance Initiative and other bodies involving investing institutions produce good reports and support renewables, but cannot conceal the fact that with no means of creating a return on carbon, investment will be limited to situations where renewables are cheaper than conventional fossil fuel alternatives (or are mandated by regulation, which is still politically unattractive). The World Bank’s funds face the same problem, and its Partnership for Market Readiness, though important, begs the question of why developing countries would absorb the costs of cutting emissions just because they are delegated through cap and trade schemes to their industries.

To make progress on low carbon investment that is not conventionally competitive, we must remember two lessons from the last 30 years of private financing. The first, the idea of using a regulatory cap on emissions to give commercial value to units of emissions reduction, is excel-


lent. The hard politics of deciding the level of a cap, the transaction costs and other problems of the clean development mechanism, and the accident-prone recent history of the European Union Emission Trading Scheme, should not obscure the fact that this idea has been successful. It creates a powerful economic driver where none existed before.

The second lesson is that public-private partnerships are necessary when public money is tight and private investors need to be tempted into investing in public goods. This means risks and returns have to be planned and distributed appropriately, and financial structures have to be created that make every public dollar achieve the maximum leverage. Public sector contributions, conventional revenue from the investment, the prospects of carbon revenue, and guarantees or other de-risking devices all have to be blended into a product that will attract investors, and can in time be commoditized. If an important part of the investment value comes from the continued fulfillment of promises by the public sector, whether financial contributions or a fixed regulatory environment, guarantees and insurance will be essential. This is especially true in the developing countries where so much forthcoming investment has to be made low-carbon.

In those countries, there will be a very large role for the multilateral development banks (MDBs), export banks, and other international financial institutions. From the perspective of the developed countries that contribute to the MDBs,

this is the tried and tested route to the syndication of risk. The MDBs have a suite of existing guarantee and other products that can be used or developed. They also provide a structure within which developing country projects can be tested and assessed for consistency with low carbon agendas.

The need for private investment and for a structure that will minimize risks and keep investors interested must be recognized at the United Nations Framework Convention on Climate Change and elsewhere. There is no point in developing the concept of nationally appropriate mitigation actions purely on the basis of what governments alone will invest in: it will not be enough to make a difference. The future of measurement, reporting and verification, in a world more fragmented than the Kyoto architects intended, must be pursued in a way that recognizes the needs of private investors, and it must be consistent with the crucial role that MDBs will play in supporting low carbon investment. For low carbon investment to take place at sufficient scale, we are not just faced with the need to create new sources of economic value: we will need the biggest-ever program of international public-private partnerships, structured to blend all sources of value into compelling investment cases.

The task is huge, and progress so far has been limited. But by recognizing it and defining it in terms that make economic sense, we can start getting to work now. 

FAST FACTS

The atmospheric concentration of carbon dioxide (CO₂) has increased by more than 30% since pre-industrial times, trapping more heat in the lower atmosphere.

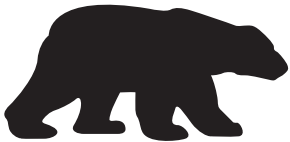


Up to 300 years ago: **275 ppm***

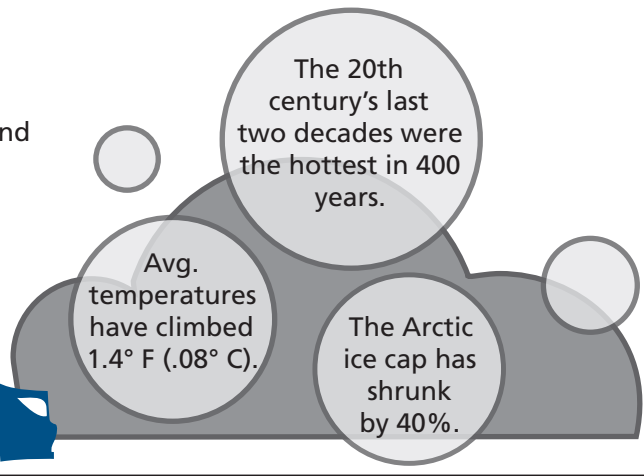
Today: **391 ppm***

The world must stay below 350 ppm to avoid catastrophic climate change.

**parts per million CO₂*



More than 1 million species face extinction from disappearing habitats, changing ecosystems, and acidifying oceans.



Sources: 350.org, National Geographic, and WHO.

“ The insistence on complete certainty about the full details of global warming—the most serious threat we have ever faced—is actually an effort to avoid facing the awful, uncomfortable truth: that we must act boldly, decisively, comprehensively, and quickly, even before we know every last detail about the crisis.”

—Al Gore,
Earth in the Balance

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