RESEARCH NOTE

Highlights of recent trends in global infrastructure: new players and revised game rules

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Renewed enthusiasm in emerging market infrastructure has attracted new sources of funding and driven infrastructure development. Governments are becoming increasingly interested in private sector involvement to raise the capital needed to meet growth objectives. New sources of funding are becoming available from public financial institutions in emerging countries. At the same time, traditional multilateral agencies are trying to re-establish their relevance and role in the midst of competition from financial institutions in the emerging markets. The availability of local currency financing in many emerging markets is at an all time high. This article highlights recent trends in global infrastructure, focusing on new sources and sponsors of funds and their objectives as they relate to foreign direct investment in developing countries and regions. It also discusses the role of new geopolitical strategic investors such as China and addresses the implications of these developments for research, government policy and company strategy. It concludes by providing an overview of the implications of these developments for project sponsors, construction and engineering firms, pension funds and micro lenders, as well as for the multilateral institutions. The article finally highlights the areas where additional research is needed to ascertain the future characteristics of international infrastructure financing.

Key words: infrastructure finance, private infrastructure funds, public-private partnerships, equator principles, multilateral development banks, emerging markets, capital markets, project finance, China

1. Introduction

Government policies around the globe and the world's capital markets are currently more enthusiastic about emerging markets infrastructure. This renewed enthusiasm has attracted new sources of funding and driven

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infrastructure development. In particular, more governments are placing greater emphasis on the development of infrastructure projects and, in recognition of the unprecedented level of capital needed to meet growth objectives, there is greater interest in private sector involvement and public-private partnerships (PPPs). Yet, from the private sector perspective, the flow of PPP deals is inconsistent and, in many markets, is constrained by politics, making it difficult to build long-term businesses around the hope that this opportunity will materialize. At the same time, some emerging market host countries (such as China, India and Qatar) are ramping up aggressively as project sponsors. In particular, Chinese investors and the Government of China are taking a growing role in infrastructure investment in Africa and other parts of the emerging world.

Growth in private infrastructure investment funds has been driven by robust capital market activity and low interest rates. However, the sheer number of new funds has led to intense competition for assets, rising prices and talk of a bubble. At the same time, new sources of funding are becoming available from public financial institutions in emerging countries, particularly the export-import banks of Brazil, the Russian Federation, India and China (the BRIC countries). Traditional multilateral agencies are undergoing a period of "soul searching" as they try to re-establish their relevance and role in the midst of competition from young new financial institutions in the emerging markets. In addition, the availability of local currency financing in many of the emerging markets is at an all time high.

These trends, which highlight the shifting nature of the global dynamic for infrastructure investment, were identified at the Third General Counsels' Roundtable on Emerging Markets' Infrastructure held in April 2007 at Stanford University.[1] The Roundtable grappled with the

[1] The Roundtable was hosted by the Collaboratory for Research on Global Projects (The Collaboratory) and sponsored by Akin Gump Strauss Hauer & Feld LLP, Baker & McKenzie LLP, and Zurich North America Construction. It was co-chaired by Professor Thomas C. Heller of the Stanford Law School and Mr. Barry Metzger, a senior partner of the law firm Baker & McKenzie. The Roundtable brought together project sponsors, institutional investors, professional advisors, regulators, financiers and the academic community to share experiences and research results. Participation in the Roundtable was by invitation only, with carefully selected representation from relevant sectors of the industry, and from multiple geographic regions, with a particular emphasis on maximizing the diversity of viewpoints at the table. Numbers were limited to a small and select few to encourage real discussion and debate. All discussion during the Roundtable was not for attribution. Graciela Testa and Sanjee Singla provided editorial and research assistance on earlier drafts of this article.

relative importance of each of these trends and how they might evolve. Based on presentations and discussions at the Roundtable, this article first highlights recent trends in global infrastructure, focusing on new sources and sponsors of funds and their objectives, particularly as they relate to foreign direct investment in developing countries and regions. It also discusses the role of new geopolitical strategic investors (namely, China and the national oil companies). The article then addresses the implications of these developments for research, government policy and company strategy.

2. The rise of new sources and sponsors of funds

There are four current trends in emerging markets infrastructure. After full privatization stalled in many emerging markets, there has been an increase in the importance of *dual firms*; these are quasi-government, quasi-private firms that have grown out of stalled reform processes and that own and operate infrastructure (Woodhouse, 2005). In several markets, *dual firms* have been able to acquire assets at low prices after international investors have lost money and pulled out.

The second trend involves the rise in the importance of *South-South investors*; that is, infrastructure investors from within developing countries who are investing in local and regional projects. This has resulted in an increase in local currency financing (Yanosek *et al.*, 2007). A third trend has to do with the rise of *BRIC country export-import banks*. This refers to public financial institutions situated in the BRIC countries that are rapidly expanding their trade and investment promotion functions (Caspary, 2007). The fourth trend is the rise of *petrodollars*: as a result of supply-demand imbalances, national oil companies and sovereign wealth funds have become key investors in energy infrastructure and ancillary infrastructure along the extraction supply chain.[2]

In addition to these trends in emerging markets, EU countries have continued to broadly utilize PPPs and many states in the United States have embarked on political debates surrounding the role of PPPs to address a need for new infrastructure that the American Society of Civil Engineers (ASCE) values at $1.6 trillion[3] over the next five years (The Urban Land Institute and Ernst & Young, LLP, 2007). Expanded opportunities for private sector finance and operations have contributed

[2] "Really big oil", *The Economist*, 10 August 10 2006.

[3] Unless otherwise noted, all values are reported in United States dollars.

to the formation of dozens of new private infrastructure funds focused on the United States and Western European markets.

This section discusses the results of studies on the growing role played by private infrastructure investment funds and local and regional firms from emerging markets as sources of funds for infrastructure investment. In addition, it presents an overview of the perspective of rating agencies regarding these new trends in global finance markets. Finally, it reviews the impact of so-called new geopolitical strategic investors; namely, Chinese infrastructure investments and national oil companies.

2.1 Private infrastructure funds

The 1990s witnessed significant growth in private investment in both developed and emerging country infrastructure,[4] accompanied by the rise of several pioneering private infrastructure funds. Some of these firms include Emerging Markets Partnership, the Hastings Fund, Barclays Private Equity and Macquarie. Today, Macquarie has almost $22 billion under management, which demonstrates the growth potential of infrastructure funds.

Preliminary results of a recent survey (Orr, 2007) of the managing directors of the newer funds show that there are more than 72 new funds worth $122 billion with a primary focus on United States and European brownfield infrastructure, and that the average fund has a target size of about $1.7 billion. For funds focused on the United States and Western Europe, the average number of investments planned ranges between 8 and 15, while the average deal size is about $150 to $300 million in equity contribution.[5] The investment period is anticipated to be 3 to 14 years, while leverage rates hover between 60 and 80%. Most funds are willing to make minority investments, and team size ranges from 6 to 19 people (except for the largest funds).

[4] In the developed countries, this followed the 2001 Private Finance Initiative (PFI) in the United Kingdom. In the emerging markets, there was significant growth between 1990 and 1997 across a wide variety of industries (including telecommunications, energy, transportation, and water and sewage), which was estimated to approach $140 billion.

[5] In contrast, funds in India and the Middle East are smaller, and so is the average size of deals (between $5 and $10 million). However, the anticipated number of investments is much larger (20 to 25).

The survey results show that the limited partners investing in the new infrastructure funds consist primarily of institutional investors including pension funds and insurance companies. Some are heralding infrastructure as a new asset class. For others, the emphasis is on rate of return and diversification within their fixed income and alternative asset portfolios.

The survey results also show that those queried are concerned about crowding (too many funds) and the high prices that result from it, the scarcity of desirable assets and shortage of greenfield developers, as well as downward pressure on yields. However, these are likely to be short-term concerns because long-run demand for infrastructure development is very high. A more serious worry is that the expected rates of return for these funds are largely dependent on financial structuring and the persistence of historically low interest rates. An additional fear is the nature of infrastructure investment, which, unlike traded financial products, is politically, technically and legally complex and very hands-on. Funds planning to invest in emerging markets have an additional concern; namely, high political risks, and the lack of rule of law as well as fiscal responsibility and control in some countries. However, the deciding factor for this type of investor will probably rest on the quality of the project. This includes features such as project valuation, the stability of the environment and, in some cases, social and political issues that may be intrinsic to the project.

Survey respondents made note of the growing trend towards PPPs in the United States, but also highlighted the sombre mood in the market following recent incidents in Texas with the proposed moratorium on further PPP transactions.[6] It remains unclear whether or not the PPP model is going to gain a foothold in the U.S. as intense public policy debate unfolds in Texas, California, Oregon, Pennsylvania and

[6] At the time of the survey, the fate of PPPs in Texas was very much in doubt. Several toll roads throughout the state were being planned and discussed as PPPs. Included in these planned toll roads was the Trans Texas Corridor a proposed massive freeway running north-south through the eastern portion of the state. These (in some cases controversial) projects hardened opposition to PPPs in Texas and led to the Texas Legislature's passing of a bill imposing a moratorium on PPPs in Texas. This bill (HB 1982) would have potentially shut down construction on many existing projects. After a period of uncertainty, Texas Governor Rick Perry vetoed the bill. In May of 2007, after the Roundtable was held, the Texas Legislature passed a compromise bill (SB 792) which enacts a two year moratorium on public-private road projects in Texas; however, this compromise legislation has many exceptions for projects already in the planning stages and undergoing construction. This bill was immediately signed into law by Texas Governor Rick Perry.

other states. And yet, many infrastructure funds are counting on the materialization of the U.S. PPP market as a source of deal flow to put their capital to work.

Other researchers have also taken notice of the rise of the new infrastructure funds. A commercial report by Probitas Partners (2007) provides commentary on the ins-and-outs of infrastructure investing and reviews the universe of infrastructure funds in the market. A presentation by Corinne Namblard (2007) at Galaxy Fund provides a European perspective on this evolving market, with detailed segmentation of the new funds by target strategy and sector. Torrance (2007a), under the guidance of Gordon Clark at Oxford, argues that the urban infrastructure landscape is undergoing financialization, whereby formerly illiquid assets are becoming securitized and tradable on stock exchanges; infrastructure networks are being unbundled locally into smaller-scale more easily-tradable chunks; and simultaneously infrastructure networks are being interlinked internationally via specialist global infrastructure funds that are looking further and wider for solid infrastructure investments. In a second paper, Torrance (2007b) analyzes the governance of relationships between institutional investors and specialist global infrastructure fund managers. Torrance concludes that self-governance demonstrated by institutional investors and specialist global infrastructure fund managers – defined as their ability to recognize and anticipate conflicts of interest – improves their long-run ability to build trust with public sector agencies.

2.2 Local and regional sponsors from emerging markets

Project sponsors shape speculative project concepts into functioning assets that generate financial returns. A World Bank analysis (Ettinger *et al.*, 2005; Schur *et al.*, 2006) of the involvement of local and regional sponsors from emerging markets in infrastructure projects noted that the exodus of international investors from Asia and Latin America following the 1997–1998 economic crises may have benefited local and regional investors. These investors were able to fill the void left by foreign investors, buying distressed projects and acting as catalysts in the development of local capital markets, and new projects. Indeed, the data show that the relative share of emerging country investors has been quite significant (although very unevenly distributed) since the late 1990s. Between 1998 and 2004, local and regional sponsors accounted for about 42% of investment volumes, favouring the telecom and transport industries. In addition, the data suggest that overseas investment by

emerging country investors is about one-third of overall investment volumes (that is, 13 out of the 42% mentioned). This sub-group tends to favour ventures in regions neighbouring their own, enjoying a cultural advantage over foreign competitors.[7]

Across industries, in the period 1998–2004, local and regional sponsors accounted for a large portion of private investment in transportation (56%) and telecoms (46%), but much less in energy (27%) and water (19%). Across types of projects, they were responsible for almost half of all investment in concessions (54%) and greenfield projects (44%), but significantly less for management contracts, lease contracts or divestitures (30%). In terms of location, investments accounted for by emerging market sponsors were not divided evenly across regions. South Asia, East Asia and the Pacific regions stand out with larger than 50% shares, while other regions lag behind.

A second phase of the World Bank study, which is still under way, involves a representative sampling of these sponsors.[8] A preliminary examination of the data suggests that the number of projects per sponsor has gone up sharply over the time interval covered. A further analysis showed that the importance of fairness and competition have become more widely recognized, since 54% of the projects undertaken had been awarded through a bidding process. One of the more revealing preliminary conclusions was the identification of the main investment criteria driving local sponsors. These criteria include sustained economic growth in a local, well-known environment; familiarity with the cultural, ethnic, social and economic environment; and an understanding of government contracts. Overall, it was clear that political risk was considered to be more critical to the success of a given project than business or even financial and market risks.

Other scholars have also noted the rise of local and regional sponsors. Phillipe Marin, a water specialist at the World Bank, finds that during the period 1990–1997, five operators – i.e. Suez, Veolia, Thames, Agbar and Saur – dominated 53% of water projects awarded globally (Marin and Izaguirre, 2006). But in the period 2002–2005,

[7] While local sponsors are gaining momentum, they represent only a small increase in overall investment volume.

[8] Forty-two per cent of survey respondents are listed. Most such sponsors have a preference for small to medium undertakings, and their average debt-to-equity ratio stands at around 50 to 75%. They are also eager to expand their operations: 65% say they plan to invest further in existing projects and 47% claim to be willing to bid for other projects in adjacent regions.

their share dropped to 23% with many new entrants from developing countries. In 2005, national or regional firms from Argentina, Brazil, China, Colombia, Malaysia, and the Russia Federation were the primary sponsors of water concessions – and three of the top five were from developing countries. With broader coverage than just infrastructure, Antoine van Agtmael (2007) argues compellingly that the world's centre of gravity is already tipping decisively in favour of emerging economies and reviews the emerging market companies to watch in the next decade, such as Argentina's Tenaris, South Africa's Sasol, Brazilian plane maker Embraer, and the exporters, Hon Hai and Yue Yuen of Taiwan Province of China.

2.3 Growth of project finance from the capital markets

The notion that "new financiers" dominate infrastructure project finance[9] is misleading. Actually, 70 to 80% of all project finance deals are still funded by commercial banks, although rated deals funded through capital markets are increasingly being used as a substitute. The difference is that the rating agencies conduct due diligence and debt is priced according to the rating assigned to the transaction, which is said to measure levels of risk.

The first rating for a public project finance transaction was for a co-gen power plant in Michigan and did not take place until 1991. The first cross-border, non-United States transaction rating did not occur until 1994. So, the history is relatively short, and project finance from the capital markets, as a financing tool or methodology is still in its infancy when compared to corporate finance (in general) or public finance in the United States. The industry remains in a state of flux, evolving as different players enter the market bringing with them the methods used,

[9] Project finance is a financing technique used for creating, upgrading or renovating single assets (or small, homogeneous and coherent portfolios) of assets. For that purpose, debt is issued and the debt repayment is serviced by the cash flows generated by the assets. Typically, incoming cash flows are kept in a trusted account, and no dividend is paid unless the debt investors are repaid on time. Perhaps most importantly, only very limited recourse is granted to the project sponsors. The project finance approach can be used to finance any investment that provides a service generating a revenue stream that can be used to repay the lenders. This approach has grown tremendously since the 1960s and 1970s when it was applied primarily to mining and natural resource transactions. In the 1980s it was used extensively for power transactions in the United States. In the 1990s, under the United Kingdom's Private Finance Initiative, it was applied to a wide range of sectors including power, airports, toll roads, and health care, and more recently, justice centers and government buildings.

for example, in municipal and public sector finance, corporate finance, and structured finance.

There are several key trends in the evolution of project finance from the capital markets. In terms of regional activity for rated project finance transactions, approximately half of rated transactions between 1994 and 2006 took place in the United States, although the use of this type of instrument is growing in Europe, Latin America and the Middle East. Most project ratings tend to fall in the lowest investment grade category (Baa3) with a persistent spike at the highest (AAA) level. These transactions involve a monoline insurance guarantee.[10] Ratings methodologies for target sectors are gradually evolving. Initially, rated deals were mostly for power projects, but today toll roads are also being financed via the international capital markets.

Growth in the rated project finance market can be explained by a combination of key factors, some of which are focused on the capital markets. For example, interest rates since 2002 have been significantly lower on average than the preceding fifteen years. Not too many years ago, when toll roads were first rated in Chile, interest rates ranged between 8 and 10%. However, a transaction in Chile was recently rated under 4%. In addition, liquidity in most markets has been quite high, increasing financings via the capital markets. The yield and profitability of project finance is currently higher than municipal and corporate finance. The interest in project finance is also fuelled by the perception that infrastructure and project finance focus on essential long-term valued assets that provide stable cash flows. The globalization of the industry is also a factor in its growth because it brings more players into certain markets, such as the monoline insurance companies. The willingness of AAA-rated monoline insurance companies to insure these transactions encourages investors.

[10] The underlying or natural rating where most infrastructure projects tend to cluster is Baa3, at the divide between investment grade and non-investment grade. The reason is that, typically, this is where project sponsors *want* the transaction to reside because it balances their ability to offer lenders confidence that the loan will be fully repaid on time and their ability to save money by avoiding unnecessary enhancements. Increasing the enhancements to the transaction yield a higher rating on the loan but add additional cost to the sponsor. If the sponsor spends more on enhancements, the net cost of these enhancements outweighs the benefit of the higher-rated loan, and the sponsor's profits decline. For example, a monoline insurance guarantee from a bond insurer such as MBIA or Ambac may bump a projects natural rating up to AAA, but the cost of the bond insurance must be paid by the sponsors.

Identifying risks is critical to the development of this market.[11] However, the only way that risks can be identified is if there is greater transparency; that is, if there are more frequent flows of information on the financial and operating performance of the assets. The benefit of financing projects through the capital markets as opposed to commercial banks is that the rating process tends to force sponsors to provide information that is consistent and comparable. Over time, as project financing through the capital markets matures, it should lead to increased transparency for the entire project finance industry, and lead to increased investment.

2.4 New geopolitical strategic investors: China[12]

Chinese trade and foreign investment are growing strongly. Trade has doubled, while foreign investment has grown by a factor of eight (IMF, 2006). Trade flows between China and Africa have shown particularly strong growth, much of it driven by the development of petroleum and mineral resources (Broadman, 2006).[13] A large part of the infrastructure being developed in Africa involves extractive infrastructure such as mines and drilling sites, as well as roads to get these export commodities to ports (Stellenbosch University Centre for Chinese Studies, 2006; Goldstein *et al.*, 2006).

In parallel with deepening business linkages, a number of authors comment on the substantial growth of official economic assistance

[11] When structuring a financing package, rating agencies place particular emphasis on construction risk, political risks and transparency of sponsor risks. *Construction risk* includes a number of considerations that relate to whether or not the construction will be completed on time and on budget. Included in this calculation are technical complexities related to the nature and novelty of the project as well as the expertise and creditworthiness of the contractor. *Political risk* can take many forms, including, for example, interference in setting tariffs, non-delivery of the right of way, abusive changes to concession terms and conditions, and early termination. Political risk has been especially pernicious for project financing in China and other emerging markets that lack strong rule of law. *Transparency of sponsor risks* (the ongoing and high quality disclosure of operating and financial performance and material events) is critical to maintaining investor confidence, which suffers when there is no transparency and the quality of the information provided is poor, as was the case in several Chinese toll roads rated in the mid-1990s.

[12] This section is based on research by Collaboratory research assistants Henry Chan and Vishnu Sridharan.

[13] Some observers note that China is placing so much emphasis on investment in Africa because it is late to the table in other regions and efforts at direct investment in some countries have been rebuffed.

provided by China to African governments.[14] The number of Chinese state-owned and private enterprises in Africa has been estimated at 900 spread across 49 countries (Alden and Rothman, 2006).

A study by The Collaboratory shows that Chinese infrastructure investment is largely concentrated in Angola, Nigeria and Sudan and that it involves a wide range of projects, including water and sanitation, transportation, and energy and mineral-related projects. The study also shows that Chinese contractors are now present in just about every single African country. Almost half (49%) of their work stems from international bidding for World Bank and African Development Bank projects, while 40% results from bidding for projects financed by China's Export-Import Bank. In contrast to European contractors, the Chinese are opening branch offices and moving in to stay. On average, 50% of the labour employed is Chinese and involves mostly management and technical staff. The other half of the workforce, which is largely unskilled, is local. The Chinese have created a very aggressive pricing structure that causes domestic as well as foreign contractors to exit the market.

The Angola Mode

To facilitate its investments abroad, China created the Export-Import Bank (Moss and Rose, 2006). In addition, in 2001 it created Sinosure, an entity that provides export credit insurance. Since then, Chinese activity in Africa has grown rapidly. Many Chinese investments in Africa follow the Angola Mode, an approach to investment under which African nations barter natural resource exports for investment in infrastructure by Chinese firms.

The Angola Mode involves securing a senior level cooperation agreement between the Governments of China and the host country. It then requires locating a Chinese contractor willing to take on an infrastructure project and a Chinese resource company willing to make repayments in exchange for oil or mineral rights. China's Export-Import Bank plays the role of coordinator between the parties and moves payments from the resource company to the contractor.[15] The innovation in this approach is twofold. First, China is bundling ODA-type aid with

[14] See for example Glosny (2006) and Kurlantzick (2006).

[15] Because the contracts are barter, the types of financing structures being used by the Chinese banks are not yet well known or understood. The World Bank is conducting research into the terms of these contracts.

commercial trade finance in a single transaction. Second, the money from the export-import bank never passes through the host country government; that is, it goes directly to the Chinese contractor. This provides a safeguard against corruption and political instability in the host country and allows China to work in very difficult places (such as Angola and the Democratic Republic of the Congo and Sudan) without concerns of expropriation or freezing of bank accounts.

While this mechanism is new, there is some similarity between the Chinese focus on development assistance to resource-rich countries and United States foreign aid to and oil imports from sub-Saharan countries. A parallel can also be drawn to Japanese war reparations to its South-East Asian neighbours in the form of Japanese-built ships. Thus, China's relationship with the African nations, while structured in a slightly new manner, is not a new phenomenon, but rather fits into historical barter arrangements.

Risks and rewards

China has long had geopolitical reasons (including concerns over United States policy, efforts to sway the balance of power at the United Nations Security Council, and a desire to isolate Taiwan Province of China) for garnering favour with African nations through infrastructure investment (Eisenman *et al.*, 2007). Today, in addition to these geopolitical concerns, Africa has become a viable market for Chinese exports.[16] The rapid increase in trade between China and Africa has also taken on a strong economic significance because it plays an important role in creating new jobs.

The risks to China as a nation and to Chinese companies in Africa include security risks to people and property, risk of sudden political shifts that endanger project timetables or completion, and risk of abrupt nationalization of assets. These risks are not unique; they are faced by any nation investing in weak and fragile states. However, a risk for China as a member of the international community is that of political sanctions resulting from lack of attention or sensitivity to environmental, health, safety and human rights issues surrounding infrastructure projects being developed by Chinese contractors and companies. There is evidence of a growing awareness in China about these matters and the need to carefully monitor projects. It behoves China to pay attention to issues of corporate social responsibility and to consider the needs of the local

[16] Asian exports to Africa have grown by more than 18% in the past five years.

community. (However, care should also be taken so that developers do not compete or take over local government roles and responsibilities.)

The infrastructure being built by Chinese contractors is likely to have a direct positive impact on the people of Africa. Infrastructure development creates a virtuous cycle whereby improved infrastructure (say, better roads) facilitates trade, which in turn, has a direct positive impact on overall economic growth and leads to more infrastructure development. Additional direct benefits include expanded health facilities, reliable and widespread access to electricity, as well as proper roads, port development and improved water and sanitation facilities. The boom in infrastructure may help resolve the transportation barriers that have hampered African development in the past and fuel more rapid and cost-effective development within the region.

The Angola Mode seems to side-step one of the most common problems for the people of developing nations; namely, the risk that money and assets will fall into the hands of just a few people and/or a corrupt regime. However, this approach cannot eliminate the risk of civil uprising, war or terrorism. Another key risk is that natural resources will be rapidly or irresponsibly exploited leaving some of the nations worse off. Finally, if Chinese firms continue to rely on Chinese managers and skilled workers instead of developing local talent, the African nations may not be able to reap the full benefits of increased foreign investment (that is, the creation of local businesses and new jobs and the transfer of skills). However, on this last point, it should be noted that the cost of Chinese labour is climbing sharply, which, when coupled with the increasing sophistication of mobile workers, is beginning to erode the underlying cost advantage of Chinese contractors. A shortage of skilled workers would stand in the way of China's efforts to double its trade with Africa by 2010. Chan-Fishel and Lawson (2007) find that the relative developmental benefits of Chinese investment-for-resources swaps across a sample of Angola, Nigeria, Uganda, and Zimbabwe cannot be generalized and depend on the quality of the investment package offered, the level of governance in the host country, and the attitudes of the developer towards environmental and social safeguards and job creation.

In addition to becoming an engine for economic development for some sub-Saharan nations, increased trade between China and Africa has contributed to China's involvement as a key stakeholder in important global issues such as climate change. However, for traditional OECD donors it implies a reduction in their ability to exert influence

over Africa. China's state-centric approach to overseas investment gives its companies a strong competitive advantage over companies from other nations. Scholars at think tanks, policy institutes, and development institutions around the globe are starting to seriously examine the global implications of China's foray into Africa (e.g. Tjønneland *et al.*, 2006; Gill *et al.*, 2007).

2.5 New geopolitical strategic investors: national oil companies [17]

As with other infrastructure investments, there is a tremendous need for investment in new energy exploration, production and distribution infrastructure to meet forecast global demand. Estimates of investment needs over the next 30 years reach $2.2 trillion. National oil companies, which barely existed fifty years ago, have an important role to play in the development of energy and transportation infrastructure. Today, they control 70 to 80% of the world's proven oil and gas reserves, and in an environment of high oil prices, national oil companies find themselves flush with capital reserves.

The development of new fields is a highly capital intensive process, and because of their very different structures, objectives and costs of capital, national oil companies are, in many instances, out-competing independent international companies. For example, in Africa today, most of the bids for new oil fields are being won by national oil companies, particularly Chinese and Indian ones. A current study by Professor Thomas Heller details the behaviour, structure and strategic differentiation of national oil companies. The study, which organizes national oil companies by their type of organization and how they invest their money, found that they fall into three categories: bank, operator and commercial company structure. An example of a national company operating under a bank structure is the National Nigerian Petroleum Company, which does not carry out operations but simply collects money. Saudi Aramco is an example of a national company with an operator structure. This type of company operates exploration, production and refining facilities worldwide. Brazil's Petrobras, which is operated under a commercial company structure, has undertaken a process of international expansion and sells its expertise to other oil companies. The preliminary findings of the study are that the potential to drive commercial behaviour exists where there is a high level of

[17] This section is based on research by Prof. Thomas Heller, Stanford Law School.

regulatory capacity. Where regulatory capacity is low, the national oil company tends to be structured under a banking model.

National oil companies have evolved significantly since the 1960s and 1970s when the nationalization of oil and gas operations was the norm as the consequence of a natural outgrowth of statism, the rise of OPEC and the principal-agent problem. However, by 1995, as readily available reserves were depleted and commodity prices declined, national oil companies could no longer support large investment needs with dwindling returns. This led to a move toward commercialization and privatization to stay competitive and find new sources of capital. Today, sustained high prices have once again bolstered the national oil companies, and there is readily available funding for even greater activity.

In addition to their lower cost of capital, national oil companies are not under the same scrutiny as international companies and they do not need to make their operations as transparent. Also, in many cases, they do not exploit reserves with the same level of efficiency as the international oil companies; this has serious implications for global energy supply. The national oil companies may need to learn to manage assets as efficiently as the international oil companies. Reliable energy supply may well depend on a larger%age of the national oil companies behaving in a truly commercial manner or forming alliances with commercial energy companies. However, despite plentiful reserves, many countries ban private investment in national oil companies.

Enlightened state oil companies recognize that by partnering with international oil companies they may shift some risk while taking full advantage of the expertise and resources that are available within many international oil companies (the experience of Qatar is worth exploring in this regard). This partnering can lead to tremendous profits for national oil companies as well as more efficient production of hydrocarbons. International oil companies are learning to make money as middlemen by taking on a share of the upside risk. The issue of punitive tax regimes must be addressed in order to encourage these relationships. By taking advantage of partnership arrangements with international oil companies, national oil companies have been able to increase their institutional knowledge and capabilities. This increase combined with the recent increases in oil prices over recent years argues in favour of shorter term arrangements from a national oil company perspective. As such, while it is likely that there will be new partnerships forged in the future, the relationships may be shorter in duration and more limited in scope. As

the international oil companies are displaced, capital investment in new oil and gas infrastructure is expected to shift towards the national oil companies.

National oil companies also play a role in the development of alternative fuels and the infrastructure to support them. For example, Petrobras is playing an active role in the development of biofuels. However, it seems that the national companies that are able to achieve results in this area are those that, like Petrobras, behave as commercial entities. In the end, however, the development of alternative fuels is a policy issue. Larger national companies may have a role to play in influencing national policy in this area.

National oil companies are also able to take on projects that cannot be touched by international oil companies because of their sensitive nature. An example is the experience of Talisman in the Sudan (Kobrin, 2004).

In the near term, there is significant tension between developers of hydrocarbon deposits (whether such developers are national oil companies or international oil companies) and issues such as the environment, social responsibility and transparency. This is another area where national oil companies have an advantage, but also an area where they are vulnerable to criticism and now facing increasing pressure from NGOs and civil society (Wainberg and Foss, 2007). But perceptions can vary. The consensus view among the national oil companies in the Middle East – Abu Dhabi, Algeria, the Islamic Republic of Iran, Kuwait and Saudi Arabia – is that they provide strong societal benefits, such as skilled jobs for locals, and that it is the international oil companies who fail to deliver positive societal spillovers (Marcel, 2006).

3. The Equator Principles: new game rules

The Equator Principles address the problem of the environmental and social impacts which large infrastructure and resource projects could have on local communities. They apply especially to projects in emerging countries that lack (or fail to enforce) strong environmental and social regulatory structures to minimize impacts. Experience has shown that when these impacts are not properly managed, the host community suffers, projects eventually fail, and banks face major financial and reputational risks. The Equator Principles are a framework for financial institutions to manage environmental and social issues in project finance. The principles are based on the environmental and social

policies and guidelines of the International Finance Corporation (IFC). They are purely voluntary and each financial institution establishes its own implementation procedures.

Over the past two decades, commercial banks that participate in project finance transactions have incurred financial loss, damage to their reputations and shareholder activism as a result of organized campaigns by nongovernmental organizations (NGOs). Partly as a result of such pressure, banks have realized that they need to demonstrate leadership in sound environmental management and social responsibility.

In October 2002, ABN AMRO asked the IFC to convene a meeting to address these problems. As a result of the discussions, four banks (ABN AMRO, Barclays, Citigroup and WestLB) formed a working group to seek neutral, international and universally-accepted standards of social and environmental responsibility. Following extensive consultations with clients and NGOs, ten banks adopted the first version of the Equator Principles in June 2003. Today, the Equator Principles extend globally. There are 60 signatory institution (as of March 2008) including banks, export credit agencies, development agencies and insurance companies. This represents over 80% of the global project finance market and more banks are joining on a monthly basis. Increased emphasis is currently being placed on engaging developing country banks in Argentina, Brazil and South Africa. No major project is likely to be financed today without the application of the Equator Principles.

The Principles apply to project finance and advisory work on project finance in all industries for all projects with a total capital cost of $10 million or more. The environmental risk categorization and industry standards apply globally. The performance standards apply to low- and middle-income countries. The Equator Principles have been revised – and will continue to be revised – to reflect changes in IFC policies and the implementation experience of the banks.

The Equator framework also includes a set of process steps to ensure appropriate application within the context of the project. These steps are the social and environmental assessment; development of an action plan; disclosure and community engagement; environmental covenants; and ongoing project monitoring.

The initial implementation of the Equator framework is not without challenges that must be overcome. Institutions that adopt the Equator Principles must first gain in-depth knowledge of the IFC policies and guidelines on which the Equator Principles are based. In

addition, incorporating sustainability covenants into lending agreements might require some special consideration, despite the fact that many banks have codes of conduct covering environmental awareness. Many financial institutions work closely with their home-country international development banks on many transactions (for example, Japanese institutions cooperate with the Japan Bank for International Cooperation), which are likely to have their own guidelines for social and environmental due diligence. Thus, it could initially seem onerous to have to comply with both standards. There is also some degree of competition with other Equator Principle financial institutions in assessing each project, and setting standards for development of an assessment report and other documentation. Finally, financial institutions tend to have little prior experience in engaging with NGOs and need to establish a point of contact with them. Although they do present challenges, these issues are often successfully dealt with.

The benefits of the Equator Principles are multi-dimensional. In addition to improving environmental and social outcomes, they provide a global standard for project finance and save borrowers time and money by identifying and managing risks up-front. As a result, "loan-shopping" based on environmental and social criteria is reduced and banks are better able to reach a consensus in large loan syndications. There have also been some unexpected benefits of the application of the Equator Principles, including unprecedented cooperation among financial institutions and NGOs to promote best practices and the broader understanding and integration of transparency and sustainability into corporate business models. At many banks, the Equator Principles have led to an array of follow-on sustainability initiatives and, in some cases, even to the creation of a sustainability department.

There has been relatively little research on the role, diffusion and effects of the Equator Principles. The first definitive report on the Equator Principles noted that "The Equator Principles will be no more than a laudable aspiration unless the Equator Banks practice what they preach by refusing to finance projects that cause demonstrable and significant environmental or social harm" (Watchman, 2005). A follow-on report by the same author, written after the Equator Principles underwent a major set of revisions, presents a much more optimistic view: "The Equator Principles are not greenwash. They have revolutionized project finance and have been a force for good throughout the financial world" (Watchman, 2006). A study conducted at the London School of Economics identifies regional patterns in adoption of the Equator Principles, and argues that banks are more likely to adopt if they are

located in jurisdictions where they face high-levels of NGO and advocacy group opposition and strong regulatory systems and if they routinely participate in large, highly-visible, cross-border project finance deals (Wright and Rwabizambuga, 2006).

4. Implications and new strategies

This section provides an overview of the implications of the new trends in global infrastructure markets from the point of view of project sponsors, construction and engineering companies, pension funds, micro lenders and multilateral organizations. The viewpoints expressed are those of Roundtable participants who were asked to comment on the second day of the programme.

4.1 The project sponsor perspective

The key lessons for project sponsors deal with relationships with local government entities. It is important that project sponsors be well aware and realistic about the political situation and dynamics in the host country. Similarly, it is vital to understand the cultural, institutional and regulatory environment, and how the government and the legal system actually work. Project sponsors should be particularly careful to work within the host country legal system. In order to avoid corruption, it is important to move slowly within the host national environment, allowing plenty of time to obtain local knowledge, vet local partners, and learn about local cognitive-cultural, normative and regulative institutions (Orr and Scott, 2008).

While infrastructure projects can provide great benefits to host countries, some project sponsors feel that it is difficult to engage in activities that yield social benefits without reducing the return to the private equity investors.

Host countries must take steps to encourage foreign investments in infrastructure. Qatar has done a good job of promoting foreign investments. In the 1990s, the country's leadership began opening up opportunities for production-sharing agreements; building the trust of buyers such as Japan and the Republic of Korea, whose main concern is security of supply; and providing support infrastructure such as liquefied natural gas ports. Qatar also provided credible financial incentives to investors. This was a significant turnaround from the situation in the 1980s when the country was almost bankrupt. Qatar understood that the government is not always the best developer or operator and that

its role is to find the right partners. Today, Qatar's per capita GDP is $50,000 per year and the country has an excellent education system. One of the lessons of this experience for the international oil companies is that those companies that supported Qatar in their time of need have been rewarded by the country's success.

4.2 The construction and engineering firm perspective

Several trends currently affect infrastructure construction and engineering firms. Government emphasis is shifting from public to private sector infrastructure. This move has been reinforced by increased liquidity in the private sector. Private equity financing of projects (such as revamping the London underground) are a definite trend. However, regime changes and lack of policy and leadership consistency make project development very difficult. International construction is a business that deals with a tremendous amount of political, public and environmental risk in every country, including Europe and the United States. Thus, the key lessons for project sponsors regarding dealings with local governments also apply to contractors.

The problem in the United States is unique because it relates to the difficulty of dealing with the various state legislatures and legal systems. Political and regulatory fragmentation is emerging as a serious problem in the United States market. Indeed, the PPP market in the United States has been likened to dealing with 50 independent developing countries. Federal government efforts to provide a uniform approach to project structure and administration could contribute to creating a standard platform for the development of structures governing PPPs. Design-build PPP projects in the United States that involve turning over the asset to the state after the project is completed work well as long as there are no serious start-up delays. Most states are not comfortable with selling assets to the private sector and giving up control. Successful PPPs require that public and political support at the local, regional and national level be obtained well in advance of the initiation of the work. Environmental clearance should also be obtained well in advance to avoid problems and delays. It is important to apply the lessons learned in one project to other projects.

An important consideration for private contractors is to maintain financial market discipline in the selection of projects and ensure that marginal projects not go forward in times of booming economic activity. Indeed, unsuccessful, economically unviable or publicly-challenged projects can have a significant negative impact on the ability of

economically sound projects to gain approval and financing. In addition, construction and engineering firms are concerned that too much private infrastructure fund investments are going into brownfield projects and too much emphasis is being placed on existing assets. Instead, infrastructure funds should stress greenfield development, a segment that is falling on the shoulders of contractors. While investment funds are interested in closing a deal in a few months, it can take three to five years to set up a complex greenfield project to be closed and financed with public and political support. It is important to establish a presence in a market and understand wage rates, equipment challenges and other such issues before starting to build. A chain of unsuccessful projects or very early exit by private funds due to impatience will not be good for the industry as a whole.

In the specific case of China, international contractors see Chinese contractors as both potential partners and competitors. While the Chinese contractors' share of international work is currently dwarfed by that of larger international contractors, the dynamic is rapidly changing. Chinese contractors, which are specializing in transport and basic civil infrastructure, are poised to become formidable competitors.

Compared to Chinese contractors, international construction companies have had a challenging time working in Africa. One of the difficulties that international companies face in dealing with African governments revolves around obtaining payment and fair treatment when costs grow outside the control of the firm. Another area in which China has an advantage involves its role as a major cost-effective supplier of goods and services. Big projects now require global sourcing and China is an important part of the supply chain (steel procurement is a key example). One of the biggest opportunities for Western contractors involves collaborating with Chinese suppliers. Productive collaboration to bring projects to fruition and a focus on how risks are managed and/or spread in a project are the wave of the future.

Sustainable development and social responsibility are a much clearer business dynamic for international contractors because their home governments demand compliance. The Chinese firms, in order to grow, will need to have a business model that converges with other international players. Safety is a huge baseline expectation that the Chinese firms have to demonstrate as part of their business model. Examples of industries where this is critical include nuclear power plant projects.

4.3 The pension fund perspective

Pension fund money is increasingly being attracted into public infrastructure through private infrastructure funds and direct investments by public pension funds, such as Ontario Teachers. Two key characteristics of pension funds could have an influence on the broader project finance market. Public pension funds are not only mindful about rates of return, but they are also extremely sensitive to constituents' interests as many have publicly elected boards. Some funds also have so-called permissible countries or permissible investment lists that take environmental, social and human rights issues into account when considering investments. One implication of this sensitivity to shareholder approval is that there could be a growing interest within the pension fund community in projects that are built on principles of sustainability such as the Equator Principles. Another characteristic of public pension funds is that they are quick to step forward and make their views known if they perceive misguided corporate management. As pension funds get more involved in infrastructure financing, this kind of shareholder expression may become more common and may result in more consistency and transparency in reporting.

4.4 The perspective of micro lenders

It is well to keep in mind that infrastructure projects are not always multimillion dollar investments. The infrastructure needs of many poor communities do not require an electrical grid or large dam or irrigation project but low-cost treadle pumps and drip irrigation sets. Small-scale projects, which can have a significant developmental impact, can be financed through micro loans of $100 to $200. Interestingly, the rate of defaults on micro loans is less than that on AAA credits. The loans, which have a repayment rate of 98.9%, are made at market rates and the borrowers are principally women. The model is ideal because its implementation bypasses the state governmental structure, going directly to the people in need. The idea is not new: it was the concept under which the World Bank was originally set up. The key now is to find a match between appropriate financing systems and appropriate small-scale water treatment, irrigation, electricity generation and communications technologies. This is an area where the multilateral organizations and foundations, such as the Gates Foundation, could provide some meaningful support.

4.5 The perspective of multilateral institutions

As we have seen, there has been a shift in the field of players active in emerging markets infrastructure finance and delivery. As a result, the roles of the multilateral lending institutions are evolving and adapting to the changing industry structure. They are developing new products and different ways of supporting projects.

The pressures facing the multilaterals are varied. The growth of the local capital markets means that debt is being issued predominantly in local currency. Thus, as currency risk ceases to be a concern, multilateral support for currency inconvertibility is no longer necessary. Furthermore, there is now a great deal of pluralism in the approaches to development, including the activities of entities like the Gates and Soros Foundations. This creates added pressure for the traditional multilaterals institutions because it provides new competition, developmental philosophies and benchmarks of performance.

China and India, which are major clients of the Asian Development Bank (ADB) and the World Bank, have become significant internal critics and forces for change within these institutions. While these institutions still have an important role to play, doing business with them has become costly and difficult. Thus, China and India are looking for changes in the degree of conditionality in bank lending. They also want to play an expanded role, particularly in the ADB where Japan and the United States dominate.

New directions at the ADB and the World Bank

A recent report (the Eminent Persons Report) validates many of the discussions taking place at the ADB, highlighting the fact that its original role as a development bank channelling excess capital of developed countries into developing countries is no longer the role it should play. The report contends that the Asian Development Bank should narrow its focus to infrastructure and financial sector development, energy and the environment, regional integration, technology development and information and knowledge management.

Specifically, in terms of infrastructure, the report suggests that the ADB should broaden its scope to also include information and communications technology, and not focus solely on power, water and roads. In addition, it recommends that the institution place greater emphasis on its work in the areas of legal and regulatory reforms to promote PPPs. Instead of its traditional role as a lender to infrastructure projects, the report states that the Asian Development Bank should focus

more on the creation of bankable projects and on providing venture capital. The report's emphasis on regional integration also has implications for infrastructure as it highlights the critical role of projects such as cross-national roads, ports and other infrastructure to facilitate trade. The ADB should also increase its focus on financial industry development by, as much as possible, financing projects in local currency, which would help to establish local capital markets

The report also suggests that the ADB find ways to channel Asia's $3.1 trillion in foreign exchange reserves into regional investments instead of foreign treasury bonds as is currently the case. Internal discussions surrounding this issue involve the creation of a new institution that is not controlled by Japan and the United States. Another notion is to create a subsidiary of the Asian Development Bank (similar to the IFC) to invest these reserves. The report, however, favours the creation of designated funds within the ADB to meet this aim. Another suggestion is that the ADB make more and better use of credit enhancement facilities. The idea is to use ADB cofinancing to leverage more money into deals. This means a move away from trying to finance the biggest piece of the pie internally and limiting ADB exposure to projects. The latter could be done through a B loan program, similar to that of the IFC, or by providing more political risk guarantee covers or other credit enhancement. Finally, the report states that the Asian Development Bank should play a greater role in developing and expanding markets for trading carbon emissions, as well as increase its activities in financing energy efficiency and clean energy projects. (The ADB has already set up a number of technical assistance funds for this purpose and created its own carbon fund.)

The World Bank is also reacting to a changing environment and placing added emphasis on infrastructure lending, which has increased in the past few years. However, because many middle-income countries have access to financial markets, the World Bank's share of infrastructure lending has decreased compared to commercial sources. Consequently, lending to those countries is focusing more on public sector reform and social sectors. Yet, where the World Bank remains engaged in lending to infrastructure it emphasizes public sector infrastructure reform and greater efficiency. The World Bank is also stressing the development of appropriate frameworks for PPPs. Finally, it is focusing on very specific instruments in addition to lending, including credit enhancement for private sector projects. The goal is to use these instruments more, and with more leverage, in order to promote private participation in infrastructure.

The future role of the multilateral development banks

There are several areas where the multilateral institutions have an advantage over private lending institutions, including social and environmental management, political risk management, project development, serving as lifelines in times of crisis, venture financing for micro infrastructure, creating transparent legal and regulatory environments, designing collective institutions and debt relief.

- *Social and Environmental Management.* The multilaterals have a deep expertise in the management of environmental and social risks and they maintain an "honest broker" position that allows them to be objective in their initial assessments of those risks as well as in their monitoring.

- *Public-Private Interface Management.* The multilaterals have a role to play as a buffer between the public and private sectors. Their involvement in a transaction can help to keep host governments from abusing their powers (what the private sector refers to as "political risk") and can help keep global investment banks, contractors and infrastructure operators from picking plums[18] (what the public sector refers to as "greed and profiteering"). There are a lot of projects in Asia that have excessive levels of political risk, which would not go forward without a B loan or a political risk guarantee from a multilateral. And conversely, there are many governments that are unable to fully utilize the capabilities of the private sector.

- *Project Development.* Their vast knowledge of the projects that could be developed in their member countries and the needs of those countries allows multilaterals to play a key role in short-listing and prioritizing winning projects and providing development support.

- *Lifelines in Times of Crisis.* Assistance from the multilateral lending institutions has been vital during times of economic crisis when other sources of financing become unavailable. They will continue to play a fundamental role in this area in the future.

[18] In other work at The Collaboratory we have described a "theory of the plums"; this is the idea that private buyers of infrastructure concessions often have greater knowledge about the true value of the concessions than do government sellers and that private buyers are therefore in a position to pick "plums." This draws on Akerloff's "theory of the lemons", which says that buyers (say, of used cars) get stuck with "lemons" because sellers exploit information asymmetries and superior knowledge. Although the direction is different, the mechanism is the same.

- *Venture Financing of Micro infrastructure.* The World Bank and other international financial institutions have the potential to make early venture investments in micro infrastructure projects and help to scale up these solutions.

- *Creating Transparent Legal and Regulatory Environments.* A very clear role for the multilaterals is in helping countries create enabling environments, implement reforms and create more transparent legal systems that promote private sector development.

- *Designing Collective Institutions.* Another important role of the multilaterals is to design collective multinational institutions that function effectively and efficiently. For example, the deployment of carbon trading systems has been hampered by the self-interests of individual states, and multilaterals with a more global view may have a role to play.

- *Debt Relief.* The multilateral institutions and the World Bank in particular, have an important role to play in resolving difficulties that are likely to arise over debt relief. Until now, issues of debt relief have been addressed by traditional donors in the context of the Paris Club. However, as new lenders enter the market (primarily China, Brazil, India, Kuwait, the Republic of Korea, the Russian Federation and Saudi Arabia) there is a need for a more global approach to debt relief. This is particularly important because Paris Club donors are going to be unwilling to restructure debts owed to them if debts owed to these new lenders are being repaid in full.

Some observers note that the future of these institutions largely depends upon whether they are prepared to accommodate the desire of the emerging superpowers (China, Brazil and India) to play a larger decision-making role within the institutions. If there is no accommodation, these large borrowers will go elsewhere and create alternative institutions that they believe are more responsive to their individual and collective needs. Whether or not this is doable, however, is a matter of debate. Other observers point to the long gestation period for a new global multilateral entity. Thus, it might be much more likely that the existing multinational entities will transform themselves and continue to evolve.

5. Conclusion and future research directions

Renewed enthusiasm in emerging market infrastructure has attracted new sources of funding and driven infrastructure investment

and development growth. Governments are placing emphasis on the development of infrastructure projects and because of the significant capital needed to meet growth objectives there is greater interest in private sector involvement and PPPs. New sources of funding are becoming available from public financial institutions in emerging countries. Traditional multilateral agencies are trying to re-establish their relevance and role in the midst of competition from new financial institutions in the emerging markets. The availability of local currency financing in many of the emerging markets is at an all time high.

The key lessons of these developments for project sponsors are those related to the relationship with local government entities. It is important that project sponsors be well aware and realistic about the political situation and dynamics in the host country. An important consideration for private contractors is to maintain commercial discipline in the selection of projects and ensure that marginal projects not go forward in times of booming economic activity. Pension fund money is increasingly being attracted into public infrastructure through private infrastructure funds and direct investments by public pension funds. As a result of the shift in the field of players, multilateral lending institutions are developing new products and different ways of supporting projects.

In addition to understanding current developments in the rapidly changing international environment for project finance and infrastructure investment, it is important to get a better feel for future developments in the sector. The discussions at the Roundtable meeting highlighted many remaining questions and point to matters of concern that require further study.

The first question concerns the characteristics of the market for international infrastructure in the future. As the markets continue their transition, it is important to ascertain which new players can be expected to dominate. Will it continue to be project sponsors from the West backed by their multilateral and bilateral institutions? Several on-going developments (including the strengthening of local and regional sponsors in many emerging markets, the spread of local capital markets, and the rapid growth of export-import banks in emerging countries) may imply more diverse participation and the need to create new or different financing models.

Another issue that requires careful attention is the path that the traditional multilateral institutions may take following the current period of "soul-searching". As many of these institutions reinvent themselves, it is important to figure out what the impact of their shifts in strategies

and structures (which might be quite dramatic) will be on infrastructure project finance. Will the discussions currently underway lead to the establishment of new institutions?

The potential effects on social and environmental standards of the rise of ultra-competitive "South-South" players in many emerging countries should also be carefully scrutinized. Have the Equator Principles become a market standard for old and new entrants alike or could social and environmental standards suffer as a result of the entry of these new players? Are there further steps that can be taken to strengthen the Equator Principles and forestall negative social and environmental impacts?

Private infrastructure financing is a difficult sector and many project sponsors failed in the 1990s. It is important to focus on what the future might bring for the new private infrastructure funds. What factors can ensure that they will be successful? Will the market bifurcate with a segment focusing on greenfield projects?

Finally, careful analysis of the implications of China's foray into Africa should be undertaken in order to forecast whether it will continue and, if so, how it might change. It is also important to ascertain what will happen when an African country defaults on its sovereign loans and the new players and the traditional OECD donors need to come to an agreement on debt relief. Indeed, it might be useful to consider potential solutions to such a problem.

To address some of these issues, The Collaboratory currently has five major studies underway and is contemplating several other areas of research (see appendix).

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APPENDIX

New Research Directions at The Collaboratory

The Collaboratory currently has five major studies underway. It is undertaking research on NGOs and governance to predict emergent political conflict in large infrastructure investment projects. The study

will focus on explaining the opposition of international NGOs and local interest groups in a sample of 30 international water and pipeline projects. Water projects tend to involve local issues and conflicts, while pipelines tend to bring to the surface national and international conflicts involving transnational bodies. The Collaboratory is also in the midst of a study to help conceptualize the overall development plan for a new economic free trade zone in the Middle East. This research uses 4D CAD and GIS technology to visualize the coming together of all of the buildings and infrastructure in the zone over a multi-year period. A third report involves investment and trade relationships between China and Africa and will culminate in the publication of a book. A joint project with KPMG involves undertaking case studies of several United States PPP transactions to chronicle the history of infrastructure finance and development in the United States; and to help California design a new PPP coordination agency for infrastructure renewal. Finally, a fifth analysis underway involves how firms in the global infrastructure sector integrate and capture best practice as they work globally.

For the future, The Collaboratory is exploring the possibility of holding a series of roundtable meetings in China, India and the Middle East, involving business executives and government officials who have a deep understanding of infrastructure markets within their regions. The Roundtable on Emerging Markets' Infrastructure suggested the following areas of interest for future study:

- The environmental impacts and consequences of rapid urbanization in China;
- The impact of China's growth on the international capital markets, especially emerging markets, and the new financing structures and models for financing that are emerging;
- The PPP market, comparing the PPP models used in Australia, Canada, Chile, Spain and the United Kingdom and their applicability to the development of PPP programs in states in the United States;
- A quantification of the interest of national oil companies in investing in energy and non-energy infrastructure and the implications for contractors, law firms and other businesses that could participate in this market;
- A look over the horizon at the types of infrastructure that are likely to be developed over the next 10 to 15 years based on technological, demographic and other trends;

- Micro infrastructure possibilities and options for combining such models with existing microfinance models to better reach the world's poor;
- Creation of a developed country PPP project database similar to the PPI database categorized by sector, market, value, year of initiation, etc.;
- An evaluation of trends in private infrastructure projects in the United States focusing on the late start of PPP structures in this country and the expectations of foreign developers;
- A roundtable discussion addressing the infrastructure development challenge facing India; and
- An ex-post examination of the lessons of the Asian financial crisis focusing on the steps that could be taken to mitigate the impact of future such episodes.

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- Charles (Jack) Lester, CJ Lester & Assoc. (recently retired Assured Guaranty officer)
- Raymond E. Levitt, Stanford Dept. of Civil and Environmental Engineering
- Jianzhong Lu, CCCC First Highway Engineering Co. Ltd. (Beijing)
- Bob Medearis, Solaicx
- Barry Metzger, Baker & McKenzie LLP
- Corinne Namblard, Galaxy Fund (Paris)
- Larry O'Bryon, Bechtel Group
- Osamu Odawara, Mizuho Corporate Bank, Ltd. (Tokyo)
- Ryan J. Orr, Stanford University, Collaboratory
- W. Richard (Dick) Scott, Stanford Dept. of Sociology

- Vishnu Sridharan, Stanford School of Law
- Marsha Vande Berg, Pacific Pension Institute
- Stephan Von Klaudy, The World Bank
- Gerald West, Georgetown University (recently retired MIGA official)
- Amy Javernick Will, Stanford, Collaboratory