

## INNOVATIVE FINANCIAL MECHANISMS FOR SUSTAINABLE SECTOR FINANCING

Theodore Panayotou

### EXECUTIVE SUMMARY

A growing financing gap and the building up of unmet demands for improved quality of service and expanded coverage, forced governments and public utilities to seek private capital both at home and abroad, through both debt and equity participation by the private sector. At the same time, technological progress and institutional innovations made possible a wide spectrum of private sector participation, ranging from management contracts through concessions to full-fledged privatisation of energy, water and sanitation utilities and state-owned public transport companies.

Also, during this time, the financial markets have evolved in conducive directions by developing new and innovative financing instruments that made possible the tapping of new sources of financing, such as insurance and pension funds and a variety of other institutional investors. The emergence of new forms of credit guarantees, the availability of instruments to finance private and municipal projects without sovereign guarantees, and the proliferation of new modalities for private-public sector partnerships opened up opportunities for resource mobilization and risk sharing which were not available to most developing countries a decade ago.

While these innovative financing mechanisms have accessed new, previously inaccessible sources of funds for sector investments and, in combination with more realistic pricing of services, have enhanced the financial sustainability of sectors such as power, water, sanitation, and transport, they have not necessarily enhanced environmental sustainability. Furthermore, despite the obvious similarities in the innovative financing instruments in these four sectors, there are also significant differences, arising from both different sectoral features and historical reasons.

This paper explores innovative instruments for sector financing, focusing particularly on energy, transport, water, sanitation, and forestry. It identifies the similarities and differences between different sectors, analyzes their implications for sustainable development and potential for replicability in other sectors.

While the range of sources and methods of financing of power sector development has increased by a multiple, with the emergence of innovative mechanisms, the bottom line remains the same for all private investments: long-term user charges must be high enough to cover capital and operating costs. A combination of deregulation of electricity prices and introduction of competition through independent power producers (IPPs) ensures that capital and operating costs are minimized and prices are raised to cover them fully. This combination ensures both access to innovative financing mechanisms to resolve cash flow problems and the overall financial sustainability of the energy sector.

However, the new financing mechanisms for the power sector are not without problems with regard to environmental sustainability. Deregulation and privatisation means the government surrenders control over the fuel mix. The financial incentives to investors favouring conventional thermal power, and low energy prices for consumers (as a result of competition) favouring increased energy consumption, may increase the environmental impacts of energy use at a time when there is a heightened concern about the health effects and climate change risks of fossil fuel combustion. To prevent this from happening and to ensure environmental sustainability along with financial sustainability, environmental costs must be fully internalized into energy prices, and the financing and bidding processes in the privatisation exercise must be designed to encourage private bidders to take into account the environmental benefits of natural gas and renewable energy.

Water and sanitation investments exhibit similar financing problems as many other local infrastructure projects, which have been addressed either through increased access of state companies and municipal governments to the local and foreign capital markets, or through concessions and privatisation. Regardless of how the overall financing is arranged, three micro-financing issues are also confronted. First, while low-income water users are usually willing to pay the water tariffs, they may face capital constraints in paying the connection charges. Second, full-cost pricing may be considered “unaffordable” for low-income users and the government may wish to supply water to them below cost. Third, while

most users are willing to pay the full cost of water supply, they are not willing to pay the full cost of sanitation and sewage treatment. Unless these three issues are resolved, the sustainable financing of the water sector cannot be ensured. The connection financing problem is usually solved by amortizing the connection cost into monthly payments and including it into the monthly water bills. The “affordability” issue for low-income groups is often dealt through block-pricing and cross-subsidization of the poor by the wealthier users. The documented unwillingness of water users to pay for off-site sanitation and sewage treatment has created financing problems for sewer-related investments, which have been resolved by unifying the water and sewer tariff, that is by bundling an unprofitable service with a profitable one, it is possible to ensure sustainable financing of both.

In the transport sector, despite the usual arguments against earmarking, several countries established “road funds” for earmarking taxes and fees for road maintenance. This arrangement has several benefits: (a) it improves tax collection as road users are more willing to pay taxes when they know they are used to improve roads; (b) it ensures a steady flow of funding and a sustainable financing source; and (c) it results in a more efficient use of funds as road users sit along with government officials on the boards of these funds. Increasingly, road maintenance is outsourced from private sector companies introducing an element of competition in road maintenance that helps to contain costs.

Until recently, there was a lack of global institutions and mechanisms to capture global values and to fund global public goods in general and global environmental services in particular. In recent years, certain innovative instruments have emerged that are of particular relevance to the conservation of natural forests. First, the rapid growth of international ecotourism (faster than conventional tourism) has enabled countries to capture some of the global use value of tropical forest conservation. Second, debt-for-nature swaps have enabled some countries to capture part of the global non-use value (option/bequest/existence values) and to generate substantial financial flows for forest conservation. In this case, secondary foreign debt is cancelled or converted into local currency in exchange for a commitment to conserve a certain forest area or use the local currency generated for conservation purposes. Third, bio-prospecting contracts have enabled developing countries (such as Madagascar and Costa Rica) to capture part of the global use value of the biodiversity by licensing investors to extract genetic information from their forests in exchange for investments in conservation, participation in biotechnology ventures and/or profit sharing arrangements for any products developed based on this information. Fourth, joint implementation and now the Clean Development Mechanism (agreed as part of the Kyoto Protocol) provide vehicles for forest-conserving/reforesting countries to capture the global climate value of their investments, by selling carbon-saving or carbon-sequestration services as offsets to countries that assumed carbon-reduction commitments under the Kyoto Protocol. The Clean Development Mechanism offers the opportunity for private investors to invest in tropical forest conservation (and reforestation) and recoup their investments in the form of marketable carbon offsets.

All five sectors reviewed require large amounts of up-front capital investment but generate returns slowly over a long period of time (power, transport, and water supply) or returns that are much delayed (forestry). This feature creates both a cost recovery problem and a cash flow problem. All five sectors involve major externalities, that is, benefits and/or costs that are not internal to the decision maker/investor. This creates both an incentive problem, and a cost recovery problem which translates into financing difficulties. Finally, all five sectors have been traditionally “monopolized” by the public sector on account of their natural monopoly features, and their dimensions of public good. In all five sectors, there is an increasing realization of the need, and the opportunity, for private sector participation in both financing and management.

These similarities notwithstanding, there are significant differences among these sectors as well. First, power, water, and transport are essentially private goods, whose production and consumption generates certain waste by-products or spillovers (such as air and water pollution, and congestion). The predominantly private nature of power, water, and transport services means that individual willingness to pay is potentially high enough to recover costs. Exclusion of those who do not pay is possible and free-riding is less of a problem; therefore there are good prospects for private sector provision and private financing. In contrast, sanitation (including sewage collection and treatment) and sustainable forestry are predominantly public goods with some private good aspects (for example, on-site sanitation and non-timber forest products). The implication is that willingness to pay is low, inclusion of non-payers difficult (and non-advisable), and “free-riding” more the rule than the exception. This means cost recovery is potentially difficult, incentives for private sector provision limited and, in the absence of a steady flow of revenues, mobilizing financial resources requires public subsidies and/or government guarantees. Based

on our five-sector review, we may conclude that sectoral financing, especially in sectors previously dominated by the public sector, has benefited from recent innovations in financing and provision of public goods but much more remains to be done to assume to translate financial sustainability into environmental sustainability.

## I. INTRODUCTION

Traditionally governments have been the primary source of financial resources for investments in sectors such as energy, public transport, water, sanitation and forestry. The first four of these sectors were considered natural monopolies—the service was provided by a state enterprise, usually at a subsidized price and the state contributed and/or mobilized the financial resources for investment in maintenance and supply expansion. A second reason why state control and public provision was thought to be the appropriate model was the public good feature of clean water and sanitation in terms of public health, as well as the environmental externalities of energy and water resource development and use. A similar rationale was employed in asserting state ownership over tropical forests and in providing for their management and conservation.

The experience with the traditional model of public provision and financing has been disappointing in terms of quality of service, coverage and costs. Furthermore, the traditional sources of financing dried up as public utilities piled up larger and larger deficits due to poor cost recovery, governments faced increasingly tight fiscal constraints and official development assistance (ODA) failed to keep up with expanding needs. A growing financing gap and the build-up of unmet demands for improved quality of service and expanded coverage forced governments and public utilities to seek private capital both at home and abroad, through both debt and equity participation by the private sector. At the same time, technological progress and institutional innovations made possible a wide spectrum of private sector participation, ranging from management contracts through concessions to full-fledged privatisation of energy, water and sanitation utilities and state-owned public transport companies.

At the same time, the financial markets evolved in conducive directions by developing new and innovative financing instruments that made possible the tapping of new sources of financing, such as insurance and pension funds and a variety of other institutional investors. The emergence of new forms of credit guarantees, the availability of instruments to finance private and municipal projects without sovereign guarantees, the proliferation of new modalities for private-public sector partnerships, such as build-own-operate(BOO), build-operate-transfer(BOT), build-own-lease-transfer(BOLT), and build-own-operate-transfer(BOOT), and joint ownership, opened up opportunities for resource mobilization and risk-sharing which were not available to most developing countries a decade ago. At the same time, institutional changes in developing countries such as decentralization of government and devolution of taxing power to local governments and municipalities created the opportunity for sub-national entities to access the global capital market without the need for sovereign guarantees from the central government (for example, through the issuing of municipal bonds or the floating of shares of municipal utilities on domestic and international stock markets).

While these innovative financing mechanisms have accessed new, previously inaccessible sources of funds for sector investments and, in combination with more realistic pricing of services, have enhanced the financial sustainability of sectors such as power, water, sanitation, transport, and forestry, they have not necessarily enhanced environmental sustainability. Furthermore, despite the obvious similarities in the innovative financing instruments in these five sectors, there are also significant differences. The differences become more pronounced when we consider the fifth case: the financing of the forest sector, which is an equally important part of sustainable development. Because of pervasive externalities, many of a global nature, forest-sector financing presents particular challenges but can also potentially benefit from international environmental conventions and new market developments.

The purpose of this paper is to explore innovative instruments for sector financing, focusing particularly on energy, transport, water, sanitation, and forestry, to identify their similarities, and differences and to analyze their implications for sustainable development and their replicability in other sectors.

## II. ENERGY SECTOR FINANCING

The capital requirements of the energy sector are daunting. In the mid-1990s, annual investments in energy supply worldwide reached \$400 billion in 1990 dollars. By 2020, the capital requirements of the sector are expected to reach \$750 billion per annum with about 50 per cent going for power development (WEC, 1995). It would be virtually impossible to generate the needed capital from conventional sources and methods of financing, especially in developing countries. Indeed, the sources and methods of financing energy sector development have changed dramatically during the 1990s, and the trend is expected to continue and accelerate.

The conventional sources of financing energy projects have been: (a) the utility's retained earnings from revenues; (b) supplementary government contributions; and for developing countries, (c) multilateral and bilateral agencies in the form of ODA. To a limited extent, some funds were also mobilized from local and international commercial banks. All external borrowing was mobilized by governments under government guarantee and the funds, being in foreign currency, were used to pay for imported capital equipment and technology. In contrast, domestically generated funds were in local currency and were used to pay for the local costs of energy development.

While the sources of funding still include domestic and foreign banks and multilateral and bilateral agencies, there are now many more actors (for example, insurance and pension funds) in the domestic and international capital markets. With the introduction of new facilities, the direct participation in funds, and the development of bond markets, the role of domestic commercial banks has been reduced considerably. In contrast, the role of international commercial banks in energy sector financing remains strong, despite the emergence of the international bond market as another major source of energy sector financing. Another major development is the introduction of new facilities by multilateral and bilateral agencies that finance private projects without sovereign guarantees from host governments.

In the meantime, the relative roles of the utility's retained earnings and the government's supplementary contributions (capital subsidies) have diminished as a result of regulated (low) utility tariffs and tight fiscal constraints. Consumer subsidies have not only led to low retained earnings but also to poor credit ratings and difficulties in raising capital from commercial sources. At the same time, ODA, far from being able to fill the gap, has diminished steadily from over 70 billion in the mid 1980s to under 60 billion in the late 1990s. During the 1980s, multilateral banks and bilateral agencies invested \$8 billion per year in the power sector of developing countries; in the 1990s their contribution was lower absolutely (even in nominal terms) and relatively insignificant by comparison both to the need and the role of other sources, especially foreign direct investment.

Two fundamental questions may be raised here: Will these financing changes continue into the future, or are they temporary responses to capital and fiscal constraints? Are there, or will there be, similar changes in the financing of other sectors, such as transportation, water and sanitation? To answer these questions, we must examine the causes behind these dramatic changes: the restructuring of the energy sector and the evolution of financial markets.

Concerns about economies of scale and protection of consumers from "natural monopolies" in the 1950s and 1960s and concerns about the security of energy supply in the 1970s resulted in governments around the world either assuming ownership of energy utilities or introducing stringent regulations, including control of energy price increases. With energy prices kept low, utilities could no longer mobilize sufficient funds to finance supply expansion, and inevitably the government assumed responsibility for providing a major share of the needed expansion capital or mobilizing it with government guarantees. By the late 1980s, the combination of cash-strapped energy utilities, fiscally constrained governments, and a lacking supply capacity expansion behind rapidly growing demand (stimulated by falling real energy prices and rising incomes) convinced governments that the old system was no longer tenable or sustainable. In response, governments around the world began privatizing state energy utilities or letting them take responsibility for their own financing and economic viability while utilities which were already private but highly regulated were, at least partially, deregulated. These changes have three consequences for financing energy sector investments: (a) the government is no longer responsible for providing or mobilizing funds for capital investments; (b) the energy utilities are free to seek financing in domestic and foreign capital markets, but to do so they must convince investors that the financial risks are acceptable and expected returns are comparable to those from other investments; and (c) energy prices – gradually freed to reflect the full cost of supply – become the ultimate source of financing of investments in supply expansion.

As a result of these changes, power companies have shifted their sources of financing from public to private sources and from bank loans to the bond market. Competition in power supply was introduced through the emergence of IPPs which are non-utilities, such as industrial firms that construct new power plants to provide electricity to their own establishments and sell the additional output to the grid or directly to customers, with the power companies providing the transmission and distribution services.

The new and innovative methods of financing draw funds from a much wider range of sources than conventional financing. In terms of debt finance, most of the capital comes from institutional investors such as insurance and pension funds and the domestic and foreign bond market. In terms of equity, most of the financing comes from floating shares of public utilities on domestic and international stock markets and from resources mobilized by IPPs and independent co-generators. Another feature that attends the move to private sector power is the increasing reliance on foreign resources, which may increase risk exposure if energy prices are not raised to cover the full supply cost. This has been the case with many countries in Latin America. In contrast, in Japan and other East Asian countries, high energy prices ensure that both capital and operating costs are covered, a key feature of sustainable financing. China is the single largest actor in the demand for energy sector financing pursued through the establishment of power development funds (in partnership with private investors and multilateral banks), issuance of corporate bonds, floating of public power plant assets in international stock markets, and foreign investment in BOT power projects. While the range of sources and methods of financing of power sector development has increased by a multiple with the emergence of innovative mechanisms, the bottom line remains the same for all private investments: long-term user charges must be high enough to cover capital and operating costs. A combination of deregulation of electricity prices and introduction of competition through IPPs ensures that capital and operating costs are minimized and prices are raised to cover them fully. This combination ensures both access to innovative financing mechanisms to resolve cash flow problems and the overall financial sustainability of the energy sector.

However, the new financing mechanisms for the power sector are not without problems with regard to environmental sustainability. Deregulation and privatisation means the government surrenders control over the fuel mix: the new financial incentives favour thermal power over hydro and nuclear, and within thermal, conventional coal over imported gas and clean coal technologies. This has to do with the capital intensity and long construction time of nuclear, hydro and importing facilities for natural gas versus the modest up-front investments of conventional coal and oil fired plants.

The financial incentives to investors favouring conventional thermal power, and low energy prices for consumers (as a result of competition) favouring increased energy consumption, may increase the environmental impacts of energy use at a time when there is a heightened concern about the health effects and climate change risks of fossil fuel combustion. To prevent this from happening and to ensure environmental sustainability along with financial sustainability, environmental costs must be fully internalized into energy prices and the financing and bidding process must be designed to encourage private bidders to take into account the environmental benefits of natural gas and of renewable energy.

Another factor that affects sustainable energy technologies is scale. Many of the most promising technologies for advancing sustainable development (for example, solar, wind-power, biogas, geothermal and energy efficiency improvements) require investments in small-scale energy production systems and technology upgrading, which are not well served by existing capital markets that provide large quantities of capital on the scale required for conventional power sector development. Furthermore, consumers tend to choose less energy-efficient technologies because they involve lower initial investment compared to more efficient –but initially more costly– sustainable energy technologies. This problem may be solved through innovative financing mechanisms that convert the capital cost into operating costs which are aligned with the stream of benefits accruing to the user. Micro-financing is another innovative instrument whereby households and small businesses are given access to loans for small investments under flexible lending and repayment conditions (for example, India, Bangladesh, Indonesia). Yet another innovative instrument is the aggregation of small investments into an umbrella energy service company (ESCO), which finances end-use efficiency improvements in exchange for a share of the resulting energy savings (Reddy and others, 1997).

### III. WATER SECTOR FINANCING

The capital requirements for water supply and sanitation in developing countries have reached \$35 billion (in 1990 dollars) per annum and they are expected to double by the year 2025. Financial

resources of this order of magnitude are far beyond the capacity of cash-strapped public water utilities or the fiscally-constrained governments to provide. A combination of technical, financial, institutional and environmental problems of public water utilities has resulted in unreliable service, unsatisfied consumers, poor cost recovery, financially insolvent systems, unnecessary environmental damage and unacceptable health hazards. An assessment of public water supply and sanitation by Idelovitch and Ringskog (1995) identified the following problems (which are shared to varying degrees by other public services such as power, telephone and transport):

- (a) Low-quality service and inadequate coverage (50-75 per cent for water, 30-50 per cent for sanitation); inability to cope with expanding population; the intermittent, low pressure water supply is mirrored in the power sector by frequent brown-outs and a variable electric current;
- (b) Inefficient operational practices and poor maintenance resulting in large water losses, unaccounted-for water, and power losses as high as 40-50 per cent, compared to 10-20 per cent for well-managed systems;
- (c) Excessive and wasteful use: For example, water consumption may reach 500-600 litres per capita which is twice the norm in metered and well-managed water supply systems; this is largely the result of water pricing, non-marginal cost pricing, and lack of metering. In the energy sector, underpricing leads to energy intensities (energy use per unit of GDP) that are two to three times the norm for full-cost priced energy;
- (d) Poor cost recovery and financial problems arising from underpricing, limited consumption, metering, irregular meter reading and billing not based on actual consumption. Water and electricity tariffs typically do not reflect the incremental costs of future supplies, which results in inadequate funds for expansion. Poor maintenance resulting from poor cost recovery results in a vicious circle of falling revenues and deteriorating service;
- (e) High labour costs and low labour productivity because of excess staff, generous benefits and lost skills. For example, public water companies often employ 5-10 employees per 1,000 water connections compared with only two to three employees per 1,000 connections for efficient water companies;
- (f) Poor management and inability to attract management talent and qualified technical staff due to non-competitive wages, political appointments, high turnover, lack of a disciplined labour force and lack of incentives to attract qualified managerial and technical staff;
- (g) Large and growing state subsidies that benefit mainly the middle class and the wealthy who are large consumers of water and power, while the poor are either not connected or too small users to benefit as much from untargeted subsidies;
- (h) Lack of clear regulatory responsibility and conflict of interest between the regulator and operator functions of the public utility. Underperformance or under-compliance is often dealt with by lowering standards rather than by improving operations;
- (i) Public service monopolies are usually among the largest sources of environmental problems, for reasons that range from soft budget constraints and inefficiency to low tariffs and bureaucratic shielding. Water tariffs rarely include environmental costs. For example, water rates do not cover the cost of collecting and treating waste water. Moreover, sewage deposited in septic tanks that contaminate shallow aquifers is often a major source of urban water supply.

The poor performance and mismanagement characterizing publicly-owned and operated water utilities gave the impetus for considering private sector participation. A second and equally important catalyst has been the increasing needs of urban water supply and sanitation, and the inability of the public sector to mobilize the needed resources. Declining ODA, unsustainable levels of budget deficits and external debts, and the need to maintain fiscal discipline to control inflation and spur economic growth have convinced governments to seek private sector resources.

#### A. Private Sector Participation

The promise of the private sector lies in (a) improved management and higher efficiency and (b) increased access to private capital for maintenance and expansion. The two are related since greater

efficiency results in cost savings and greater availability of funds for investment; improved management results in easier access to private capital; and investment of private capital constitutes an added incentive for operational efficiency.

While the potential benefits from private sector participation are clear, the obstacles are often formidable. Infrastructure investments tend to be capital intensive and lumpy, and have long gestation and even longer payback periods. In water and sanitation, the ratio of investment in fixed assets to annual tariff revenues is 10 to 1. This means that private financing is contingent upon the existence of long-term capital markets and guarantees and rewards offered for high perceived risks. These private sector risks are many and varied: demand for the services provided may turn out to be lower than expected; tariffs may be too low and not permitted to adjust to reflect costs; the condition of infrastructure may turn out to be worse, delays of construction longer, and costs higher than anticipated. Other risks include the financial risk of currency devaluation, legal risks in dispute resolution, and the political risk of asset appropriation. As a result of one or more of these risks, the private contractor may be unable to recover costs and earn a reasonable profit. Indeed, how these risks are quantified and mitigated turns out to be the key to private sector participation in infrastructure projects. The principle is that whoever controls a particular risk best should assume it and be compensated for it.

The public sector that invites private sector participation in areas that have been traditionally reserved for the state also faces risks: procured services may be substandard or costs may turn out to be higher than those charged by the public utility. There are also political risks, arising from public opposition, especially by labour unions. Water supply, sanitation, and power (as well as other utilities) are natural monopolies; it is uneconomic to duplicate the water and sewage pipes or the power lines in city streets, and, therefore, competition is difficult to achieve. Moreover, regulation is necessary to protect against monopolistic practices. Regulation is also necessary to control externalities related to public health and the environment; as the social benefits exceed private benefits, investments must be promoted above what is privately profitable.

## B. Options for Private Sector Participation

There is a wide spectrum of options for private sector participation in infrastructure and public service provisions that vary in the respective roles of the public and private sectors as they concern ownership, management financing, risk sharing, duration, and contractual management with the users (see Annex I). These options may be classified into two groups: (a) those that retain public ownership of the assets while contracting out management, operation, and even investment, and (b) those that involve at least partial or temporary private ownership of assets. The first group includes service contracts, management contracts, lease arrangements, and concessions. The second group includes: BOOT (Build-Own-Operate-Transfer, and its variations, BOT and BOO) reverse BOOT (whereby the public entity builds the infrastructure and progressively transfers it to the private sector); joint ownership or mixed companies; and outright sale or divestiture.

All options promote to differing degrees commercial viability, operational efficiency, increased competition, improved cost recovery, and performance-based compensation (in most cases). The wide range of options allows flexibility and the potential to move from less risky arrangements without private sector investment, to riskier arrangements involving a progressively larger share of private investment as credibility and confidence among the parties grow. As BOOT contracts involve gradual transition to the public authority or to the private contractor, they constitute a useful transitional mechanism for countries without prior private sector involvement. Joint ownership or mixed companies is a risk-sharing arrangement that helps attract private sector involvement. For an innovative and fairly successful private sector concession in water supply and sanitation, with important lessons for other countries, see Box 1.

## C. Sub-national Government Borrowing for Infrastructure Development Projects

A number of new financing instruments have been developed in recent years for urban infrastructure projects, particularly water and sewage systems and based on the security provided by intergovernmental transfers, taxing authority, and user fees. An interesting instrument for securing bank loans, known as the “tax revenue intercept” emerged in Latin America. For example, provinces in Argentina used their share of tax revenues from federal income and value-added taxes, collected by the

federal government and distributed to them through the National Bank as security for loans from private and state-owned banks. Lenders, whether local or international, have a first lien on the tax revenues of the province: if the borrowing province (or municipality with provincial guarantees) defaults on their debt service payment, the creditor can activate the “intercept” mechanism by requesting the national bank to pay the debt service directly to the creditors account at the bank, out of the province’s tax revenues.

The concept of tax revenue intercept has been employed in Mexico to secure financing of concessional wastewater treatment plants through a credit line established at the state development bank, BANOBRAS. The concessionaire can draw on this credit line in case the municipality fails to pay for the treated water. Indeed, during the financial crisis, Mexico used this mechanism to secure payments for wastewater treated by the concessionaires.

In Colombia, another version of the intercept concept works through the Findeter program (Financiere de Desarrollo Territorial, S.A). The revenues from water tariffs or wastewater treatment charges are escrowed at the creditor bank, which in turn endorses this lien to Findeter, a “second tier” lender that provides, through first tier banks, loans with long maturities to municipalities investing in infrastructure projects, such as water supply and sanitation. If the municipality defaults on its payment, Findeter has a double recourse: the bank is liable to Findeter even if the municipality defaults; but if the bank defaults too, Findeter can still collect directly from the municipality since it has the first lien on revenues.

Table 2. Bond Offerings by Emerging Markets (1993-1995)

<i>Country</i>	<i>No. of issues</i>	<i>Amount in \$ billion</i>
Mexico	103	20.0
Argentina	106	15.2
Thailand	78	7.1
Indonesia	39	4.5
China	23	4.0
Brazil	155	13.8
Philippines	28	3.2

*Source:* Darche (1997)

Government, states, provinces and municipalities have increasingly direct access to international markets for water/sewer system development and other infrastructure projects. Table 2 provides examples of bond offerings that were issued by public and private entities in emerging markets in 1993-1995. However, most of these issues were by sovereign borrowers, state enterprises and private companies. Only better known Argentine and Chinese provinces and Brazilian states have directly floated bonds in international markets. A few large cities have also been able to issue foreign currency denominated bonds in Eurobond markets: in 1994 Prague issued \$250 million in five-year fixed rate notes with a “BBB” investment grade rating; in 1996, Rio de Janeiro issued a \$125 million in three-year fixed-rate notes with a “B” non-investment grade rating. Both issues were well received by international investors and other cities followed suit. Rapidly evolving sources of local infrastructure finance in domestic credit markets are general obligation bonds, secured by the tax collection powers of local governments, and revenue bonds, secured by user fees. But the full development of these financing mechanisms would require: (1) predictable fiscal relations between local and central governments; (2) autonomous public utilities with secure recurrent income through reliable services to customers and rational pricing policies; (3) transparent city budgets, credible accounting systems, and independent audits; and (4) well specified creditors rights and seniority of claims over municipal assets. Furthermore, credit rating and bond insurance would further stimulate the development of municipal bond markets for urban infrastructure development in developing countries. A credit rating by a recognized rating agency would provide to

potential investors information on the local government's ability to service debt from its tax and other revenues and its credit track record. Bond insurance, while not a substitute for the creditworthiness of municipal bonds, would help increase their marketability, or reduce their cost.

#### D. From Municipal Development Funds to Infrastructure Banks

Water supply, sewage treatment systems and similar local infrastructure investments require debt financing from both domestic and international markets. In response, some developing country governments established "municipal development funds" to channel municipal credit. Such funds are, in effect, substitutes for government grants or vehicles for borrowing at home and abroad with sovereign guarantees from the central government, and lending to municipalities through local banks. As such, they do not constitute new and innovative sources and mechanisms for financing infrastructure, but simply different vehicles for the same funding.

According to El Daher (1997, 4), a "challenge would be to move this concept further along commercial principles and assess the feasibility of establishing 'infrastructure banks' that could issue 'market-based' long-term debt (neither guaranteed nor subsidized by the government) for viable, revenue-generating infrastructure investments." Such infrastructure banks, analogous to the US "State Revolving Funds" with a built-in diversification portfolio, would be able to provide more security and credit quality, offer bond insurance and be open to smaller borrowers (El Daher, 1997).

#### E. Financing Instruments Specific to Water and Sanitation

Water and sanitation investments exhibit similar financing problems as many other local infrastructure projects, which have been addressed either through increased access of state companies and municipal governments to the local and foreign capital markets, or through concessions and privatisation. Regardless of how the overall financing is arranged, three micro-financing issues are also confronted. First, while low-income water users are usually willing to pay the water tariffs, they may face capital constraints in paying the connection charges. Second, full-cost pricing may be considered "unaffordable" for low-income users and the government may wish to supply water to them below cost. Third, while most users are willing to pay the full cost of water supply, they are not willing to pay the full cost of sanitation and sewage treatment. Unless these three issues are resolved, the sustainable financing of the water sector cannot be ensured.

The connection financing problem is usually solved by amortizing into monthly payments and including it into the monthly water bills. For example, in Bolivia concerns that lump-sum connection fees might discourage households from connecting to public water supply prompted the regulators to allow the concessionaire, Aguas de Illimani (AdI), some flexibility in pricing its services. While the "conversion contract sets maximum tariffs and connection fees for water and sewer service, it does not prevent the company from lowering prices or offering financing schemes to increase demand for in-house water and sewer concessions" (Komives, 1998). Aguas de Illimani gave households the option of paying a reduced connection fee in exchange for supplying labour for the connection. Eighty per cent of the households receiving connections avail themselves of this option. At the same time, AdI offered low-income water users a 3-5 year financing plan to pay their connection fees, and for people in remote areas it offered a subsidized interest rate (8 per cent, compared to the normal 12 per cent). The innovation here that ensures that sustainable financing can be attained despite long financing periods and subsidized interest is that these are not mandated by the concession contract but encouraged by the pricing flexibility that the contract allows.

Issues of social security or affordability of water services are often dealt with through block pricing and cross-subsidization. For example, in the Bolivian case above, two cross-subsidies are provided for in the conversion contract: (a) industrial, commercial and government users subsidize domestic connection, and (b) a lower tariff applies to low volume users and a higher tariff applies to high volume users. Most households use less than 30 cubic meters per month and pay a tariff well below the marginal cost of supply. This tariff structure may actually have perverse financial incentives inducing the concessionaire to service first industrial and commercial users and to leave poor residential areas for later. On the other hand, the need for political support for privatisation and the desire to maintain access to other lucrative opportunities may counter these perverse incentives.

The water users' documented unwillingness to pay for off-site sanitation and sewage treatment has created financing problems for sewer-related investments which have been resolved by unifying the water and sewer tariff, that is, by bundling an unprofitable service with a profitable one, it is possible to ensure sustainable financing of both. However, where all households pay for sewer services but not all households are connected to the sewer network, the unified water and sewer tariff creates a perverse incentive for the concessionaire to expand the sewer service since expansion imposes additional cost but brings in no additional revenues (Komives, 1998).

Yet another instrument that is used in the water sector (and occasionally in the electricity sector) in order to ensure the financial sustainability of the provider is exclusivity of service or prohibition on free entry. The rationale for such a prohibition that limits competition and is out of line with recommended policy toward other sectors has to do with three concerns: (a) difficulty in attracting private capital, (b) inefficient duplication of facilities; and (c) possible adverse impacts on safety and environmental quality. A study by Ehrhart and Burdon (1999) argues that exclusivity is only justified for countries with low administrative capacity and high risk, where mechanisms to hedge risk are difficult to obtain, as an instrument for encouraging private sector participation. The only other case where exclusivity may be justified is where safety and environmental concerns are of great importance or there is a risk of over-pumping of aquifers and/or pollution of aquatic environments; in such cases policy makers may use exclusivity to prevent competitive pressures from leading companies to cut corners in terms of safety or environmental protection.

In all other cases, free entry must be encouraged. Especially where monopoly water utilities provide low quality service at high cost and investment funds are lacking, free entry would provide alternative solutions, as the cases of Pakistan's Orangi Pilot Project and Paraguay's *aquateros* demonstrate. After years of inaction by the municipal utility in 1980, a charitable group developed a low-cost approach to pipe-sanitation in the Orangi settlement in Karachi. With low costs and high expected benefits in terms of health improvements and property value appreciation, households and neighbourhoods mobilized the funds among themselves and financed the construction of pour-flush latrines and sewage lines covering half the settlement by 1993. In Paraguay, 300-400 water vendors (*aquateros*) have been supplying quality piped water to areas not served by public supply, with the added financing incentive of allowing payment of connection fees by instalment (Ehrhart and Burton, 1999). In Bolivia, Aguas de Illimani – despite its contractual exclusivity of water service provision – has permitted water delivery by truck to some areas and even initiated a similar service for households without access to public supply, and with the regulator's permission delayed the metering or removal of communal standposts.

#### IV. TRANSPORT INFRASTRUCTURE FINANCING

The annual capital requirements for transport infrastructure developments are expected to more than double over the next 25 years, from \$23 billion (in 1990 dollars) today to over \$50 billion in the year 2025. Not only is existing transport infrastructure inadequate, but it is poorly maintained and public transport services are generally of low quality and financially unsustainable without state subsidies. In an effort to improve maintenance, quality of service and financial sustainability, a number of innovative financing mechanisms have been used in recent years. We will illustrate these new approaches with two examples: (a) Africa's road maintenance initiative; and (b) Rio de Janeiro's urban transport sector reform.

##### A. The Sub-Saharan Africa Transport Program

According to the World Bank (1998), almost one-third of Africa's \$150 billion road system has been lost to disrepair, while half the region's paved roads and 70 per cent of the unpaved roads are in fair to poor condition. Lack of funding has not been the cause of poor maintenance; institutional and policy weakness have. State-owned public road maintenance companies used their large and under-used capital stock to ensure employment rather than road maintenance *per se*.

In 1987, a group of African transport ministers launched the Sub-Saharan Africa Transport Program, with major emphasis on road maintenance. The root causes of the poor maintenance were identified to be institutional rather than technical or financial. Existing institutional arrangements were too weak to manage and finance road maintenance, despite the availability of financial resources (Heggie 1994). Africa's road maintenance initiative had two components: (a) it brought together policy-makers

and transport users to better understand the problem; and (b) the institutional weaknesses arising from maintenance being part of the general civil service were addressed by establishing institutional and financial autonomy for road agencies. Institutional autonomy was needed in order to have a more flexible employment policy and a more focused mandate on road maintenance. Financial autonomy was needed to ensure reliable financing. Despite the public-good aspect of roads and the inability of maintenance companies to recover costs through user charges, financial autonomy would enable the structuring of vehicle and fuel taxes to “closely approximate ‘prices’ for road construction and maintenance.” (World Bank, 1998, 114).

Despite the usual arguments against earmarking, several countries established “road funds” for earmarking taxes and fees for road maintenance. According to the World Bank, this arrangement has several benefits: (a) it improves tax collection as road users are more willing to pay taxes when they know they are used to improve roads; (b) it ensures a steady flow of funding and a sustainable financing source; and (c) it results in a more efficient use of funds as road users sit along with government officials on the boards of these funds. Increasingly, road maintenance is outsourced from private sector companies introducing an element of competition in road maintenance that helps to contain costs.

### B. The Rio de Janeiro Urban Transport Sector Reform

Despite huge subsidies on the order of \$350 million per year (or 10 per cent of state revenues), Rio de Janeiro’s public transport system carried only 8 per cent of the 13 million person trips made daily in the metropolitan region. The lack of integration between the metro and the rail network discouraged more rail trips and encouraged the use of more buses and cars, resulting in heavy congestion and waste of commuters’ time. Commuters from low-income areas spent on average 2.5-4 hours on crowded buses and a fourth of their personal income on transit fares (Rahelos, undated). Finally, congestion and poor maintenance was contributing to air quality problems and frequent road accidents.

To address these issues and to improve the supply of urban transport services, the Rio de Janeiro State Government, under the leadership of the State Secretary of Planning, introduced a reform program aiming, among other objectives, to (a) improve financial management, (b) recover cost through tariffs, (c) target subsidies for the poor, and (d) increase private sector participation in both investments and operations. The reformers’ expectation was to eventually eliminate subsidies to all public transport except for rail. But, in the meanwhile, a new financing mechanism – a surcharge on the vehicle ownership tax – would provide the needed revenues for the operating subsidy and the capital for expansion.

By 1998, Rio de Janeiro’s urban transport system was fully privatised. Concessions for the metro, rail (Flumitrens) and the ferry service (COPVERG) were awarded through competitive bidding, and other smaller state enterprises related to transport were sold or liquidated. The Rio de Janeiro urban transport reform holds some important lessons for sustainable sector financing. First, even systems that suffer from large losses and require huge state subsidies, due to inefficient management, can attract private sector interest and yield a positive and substantial concession fee in a public bidding. Contrary to the results of consultant studies and the experience of Buenos Aires, the State of Rio de Janeiro was able to privatize its urban transport system without operating subsidies.

The privatisation of Rio de Janeiro’s urban transport system is considered a successful example of new and innovative financing mechanisms of sustainable development. Financially burdensome and environmentally damaging subsidies of \$360 million (or \$400 per resident actually using the service) given to public transport companies were eliminated. Private capital, both domestic and foreign, for rehabilitating trains and the overall transport infrastructure was injected into the sector. There are already signs that the service is improving and the demand for the service has increased at least for the Metro and ferry transport. Improvements in the train service are underway. Congestion and pollution problems are expected to ease as the improved public transport services, combined with increased taxation of private vehicle ownership and use, induce more commuters to shift from private driving and buses to an improved, integrated and expanded public transport system.

## V. FOREST SECTOR FINANCING

Forest sector financing needs arise with regard to (a) national forest conservation (b) reforestation and afforestation (c) sustainable timber management and (d) sustainable forest management. (We mostly

employ the terminology used by Pearce, Putz and Varclay, 1999). In all these areas there are interesting financing issues for two main reasons. First, there is a temporal separation between investments and returns, which creates serious cash flow problems as well as uncertainty. Second, not all benefits are captured by the investor. Many benefits are in the form of positive externalities or public goods, local or global, that accrue to distant beneficiaries that were not part of the investment decision and do not share in the costs. Financing investments with a long lag (decades) between investment and returns, and/or only partial capture of the benefits (due to non-exclusivity) creates a serious financing challenge for private investors, financial institutions and developing country governments. Of course, such financing problems do not arise with conventional logging of mature forests because, indeed, unless one is concerned with sustainable timber management, neither of the two problems identified above arises. To the contrary, conventional logging liquidates large quantities of natural capital that has accumulated over the past decades without any investment by the concessionaire and ignores any external cost imposed on others.

Sustainable timber management (STM) and natural forest conservation (NFC) are the two polar extremes of forestry sector financing. While STM faces only the temporal separation between investment costs and returns, NFC faces only the externality problem, the spatial and “institutional” separation between investment costs and returns. Both problems involve valuation, internalisation and capture. Distant returns can be captured through longer-term concessions that encompass the next harvesting cycle. This does not guarantee sustainable timber management, since the present value of future returns may fall short of investment costs (which include both forgone current harvest revenues in cases of selective logging and management costs). However, long-term concessions ensure that the returns for future harvests are considered, valued and, if worthwhile, can be captured by the concessionaire/investor. If the present value of future harvests does not justify current investment costs, STM collapses to conventional “extractive” logging. Various studies (most notably Sedjo 1994) have shown that sustainable timber management at any reasonable discount rate is at best a “marginal” investment. For example, clear cutting and abandonment of a tropical forest concession in Indonesia, that is no investment in any form of management except protection from encroachment, was found to yield a net present value from future harvests of about \$3 per ha in 1988 prices; any investment in forest management other than protection would yield negative returns. STM could be more profitable if either discount rates are lower or timber prices are expected to rise over time, and/or timber volumes grow faster.

Most projections of timber price growth do not exceed 1 per cent per annum (for example, Brook 1996; Sohngen and others, 1997; Panayotou and Ashton 1992). Estimates of annual timber growth range from 1 to 3 cubic meters per ha or 1-3 per cent growth rate. If we take 2 per cent as the average volume growth rate for STM (see Rice 1998) and 1 per cent as the annual price increase, STM would only be justified at real discount rates well below 5 per cent. Yet researchers such as Poulos and Whittington (19\*\*) found long term discount rates in developing countries to hover above 10 per cent and to reach as high as 30 per cent per annum. Under these circumstances, STM would not be profitable and hence financially not viable, unless somehow (for example, through reduced import logging, and higher seeding densities) volume growth rates are raised significantly and/or discount rates are dramatically reduced. Pearce and others (1999, 6) speculate that “STM could easily result in volume increments of commercial species that are 2-4 times higher than after CL (conventional logging).”

Recognizing the “poor economies” of STM, governments have sought to impose it by dictating selective logging (for example, Indonesia) or requiring the posting of a performance bond by the concessionaires to ensure regeneration and future harvest (for example, Philippines). The results have not been encouraging; indeed, they led to perverse outcomes such as high grading, illegal logging and relogging, and intentional forest fires. We may conclude that unless we go beyond timber to the other products and services of tropical forests, and replace STM by sustainable forest management (SFM), sustainability will remain elusive and more the exception than the rule. Correspondingly, financing for STM will continue to be scarce or subsidized; but public subsidies make no economic sense unless non-timber services or the externality and public good values of forests are taken into account. We do this by considering first the extreme case of natural forest conservation (NFC), the setting aside of natural forests as protected areas, such as national parks, wildlife sanctuaries and wildlands.

Natural forest conservation involves costs in terms of demarcation and protection from encroachment, which could be enormous for mature forests; there is also the opportunity cost of the land, which in poor developing countries is by far the most important economic asset and source of livelihood. In contrast to its substantial costs, NFC generates no direct returns or cash flows to recoup its investment costs. At face value, NFC investments are not financially viable and are unlikely to attract any private

capital, domestic or foreign. They can only be financed by the state from tax revenues or, if borrowing is involved, sovereign guarantee and security against tax revenues would be necessary. But are such investments of scarce public funds by developing countries justified? From an economic perspective, it makes no difference whether such investments are actual outlays for the establishment and protection of conservation areas or simply forgone revenues from non-harvesting and non-conversion to other uses; from a financial perspective, of course, it makes a difference, since only actual outlays need to be financed; forgone revenues do not, unless the land is privately owned.

Whether the expense of public funds or the creation of national debt for forest conservation investments is justified depends on the magnitude of the benefits generated and to whom they accrue. The benefits of natural forest conservation consists of (a) watershed protection services (water, soil, downstream impacts); (b) micro-climatic benefits; (c) increased resilience to natural disasters and pest outbreaks (d) recreation and tourism; (e) wildlife and biodiversity protection; (f) carbon sequestration and (g) regional and global climate benefits. None of these benefits are private; only the first three are national; the fourth ranges from local to global and the last three are regional or global. Since all costs for setting up conservation areas are incurred by the country that owns the forests and sets up these areas, while a great deal of the benefits accrue to non-national and the global community, and exclusion is not possible, we would expect that natural forest conservation areas would be underfinanced and underprovided, even if the host country fully appreciates the local environmental benefits and can mobilize the resources to invest in them.

Biodiversity conservation and carbon saving or sequestration are global public goods that should be financed by global public revenues. Contributions by international environmental NGOs, some bilateral and multilateral development assistance and the Global Environmental Facility, have in recent years served as partial sources of financing of the provision of these public goods, but they have been grossly inadequate relative to the global demands for conservation of tropical forests and biodiversity. (It is not clear whether such demands are effective demands, that is they are backed by sufficient willingness to pay to finance the cost of provision).

The world until recently lacked global institutions (global value-capture instruments and financing mechanisms to fund global public goods in general and global environmental services in particular). In recent years, certain innovative instruments have emerged that are of particular relevance to the conservation of natural forests. First, the rapid growth of international ecotourism (faster than conventional tourism) has enabled countries to capture some of the global use value of tropical forest conservation. Second, debt-for-nature swaps have enable some countries (most notably Costa Rica) to capture part of the global non-use value (option/bequest/existence values) and to generate substantial financial flows for forest conservation. In this case, secondary foreign debt is cancelled or converted into local currency in exchange for a commitment to conserve a certain forest area or use the local currency generated for conservation purposes. Third, bioprospecting contracts have enabled developing countries (such as Madagascar and Costa Rica) to capture part of the global use value of the biodiversity by licensing investors to extract genetic information from their forests in exchange for investments in conservation, participation in biotechnology ventures and/or profit sharing arrangements for any products developed based on this information. Fourth, joint implementation and now the Clean Development Mechanism (agreed upon as part of the Kyoto Protocol) provide vehicles for forest conserving/reforesting countries to capture the global climate value of their investments by selling carbon-saving or carbon-sequestration services as offsets to countries that assumed carbon-reduction commitments under the Kyoto Protocol. The Clean Development Mechanism offers the opportunity for private investors to invest in tropical forest conservation (and reforestation) and recoup their investments in the form of marketable carbon offsets.

Thus, an entirely new market has been created and new economic instruments and financing mechanisms have emerged to finance, value and capture global benefits from forest conservation. If a sufficient part of the revenues from carbon offsets, bio-prospecting contracts, debt-for-nature swaps and ecotourism find their way to those that pay the cost of forest conservation, conservation would have been achieved. This is critically important, as is the maximization of the captured value. For example, countries around the world fail to properly price entrance to national parks and the collected revenues often are not dedicated to park management but flow to the treasury. Surveys in Central America and Southwest Asia (see TDRI, 1996; DeShazo, 1999) have obtained estimates of willingness to pay by foreign visitors to national parks that are 3-5 times (for the existing level of service) and 5-20 times (for improved level of service) the entrance fees currently charged, while the parks remain underfinanced and underprotected.

Furthermore, respondents, including non-visitors to national parks, expressed considerable willingness to pay into a trust fund to ensure the protection and continued existence of conservation areas; yet to date there are very few such mechanisms in place for capturing such non-use values and reinvesting them in nature conservation.

We can now consider the two intermediate cases: sustainable forest management (SFM) and reforestation. SFM requires both a longer time horizon (tenure) to internalize future benefits and a broader geographical, institutional and product/service scope to internalize off-site and off-country benefits. This requires simultaneous solutions to two problems. First, what is the optimal combination of timber and non-timber products and local and global environmental services (watershed protection, biodiversity conservation, carbon sequestration) that would maximize the net present value of the forest, recognizing of course both competition and complementarities (synergies or joint products) between different forest products and services. Second, which instruments/mechanisms can best capture the external (to the management unit) values, whether local or global, and transfer them in part or in full to the management unit (local stakeholder) to ensure sustainable forestry is economically and socially, as well as biologically/environmentally sustainable. While there is no presumption here that multiple use forestry will be superior to dominant use forestry at the stand level, there are many modifications to conventional logging and to sustainable timber management that can increase the net present value of the forest and its sustainability, moving us closer to sustainable forest management. The various instruments we discussed under natural forest conservation can be employed to capture many of the external benefits of practicing sustainable forest management; such a stream of benefits can be used to secure loans or to issue revenue bonds to finance sustainable forest management.

For example, carbon offsets, bioprospecting contracts or debt for nature swaps can be used to induce and finance a shift from conventional logging, which is highly destructive, to reduced impact logging. Any investment costs involved and any forgone profits can be financed through the sale of carbon offsets, local currency from a debt swap, receipts from bioprospecting fees or revenues from watershed protection charges (such as those in effect in Brazil, Indonesia and Costa Rica, among others). Two specific examples will suffice to illustrate the point. In the mid-1990s, New England Power financed a shift from conventional logging to reduced impact logging in Sabah, Malaysia (by agreement with the local logging company), in exchange for "credits" for the carbon saved (about 36 tons per ha at \$3-\$5 per ton). More recently, Costa Rica has provided \$50 per ha per year incentive to landowners willing to keep their land under (natural) forest. The government financed this incentive by selling the environmental services of the forests through a watershed protection charge on benefiting municipalities, and carbon offset sales directly to countries such as Norway at \$10 per ton, or through certified tradable offsets (CTOs) placed at the Chicago Board of Trade. A fuel tax also contributed part of the cash flow for financing these incentives, which are designed to decline over time, as land owners begin to extract products from the forest on a sustainable basis. This approach provides one "simultaneous solution" to both problems of sustainable forest finance: the intertemporal separation of investment costs and return; and the external-to-the-investor nature of many of the benefits occurring from reforestation or establishment of new forests. However, maximum and full capture of the value of sustainable forestry in all its dimensions and manifestations will have to await the further development and "thickening" of the emerging markets for environmental services as well as the resolution of the institutional and property rights uncertainty that surrounds tropical forests.

## VI. DIFFERENCES AND SIMILARITIES BETWEEN SECTORS

In this paper, we have reviewed innovative financing mechanisms for five sectors: energy, transport, water supply, sanitation, and sustainable forestry. These sectors have several features in common. First, all five are strategic sectors for sustainable development and have all been identified as such in Agenda 21. This means that in addition to their key role in economic development, they are also of strategic importance to poverty alleviation, equity concerns, environmental protection, and ecological sustainability. Second, all five sectors have been identified in Agenda 21 as having serious financing gaps that require both domestic and international resource mobilization. Third, all five sectors were, in the past, major recipients of official development assistance (ODA) from both bilateral and multilateral sources; in recent years, they suffered from declining levels of ODA, with the possible exception of the forest sector. Fourth, all five sectors require large amounts of up-front capital investment but generate returns slowly over a long period of time (power, transport, and water supply) or returns that are much delayed (forestry). This feature creates both a cost recovery problem and a cash flow problem. Fifth, all five

sectors involve major externalities, that is, benefits and/or costs that are not internal to the decision maker/investor. This creates both an incentive problem and a cost recovery problem, all of which translate into financing difficulties. Finally, all five sectors have been traditionally “monopolized” by the public sector on account of their natural monopoly features and their public good aspects. In all five sectors, there is an increasing realization of the need and opportunity for private sector participation in both financing and management.

These similarities notwithstanding, there are significant differences among these sectors as well. First, power, water, and transport are essentially private goods, whose production and consumption generates certain waste by-products or spillovers, (such as air and water pollution, and congestion). The predominantly private nature of power, water, and transport services means that individual willingness to pay is potentially high enough to recover costs. Exclusion of those who do not pay is possible and free-riding is less of a problem; therefore there are good prospects for private sector provision and private financing. In contrast, sanitation (including sewage collection and treatment) and sustainable forestry are predominantly public goods with some private good aspects (for example, on-site sanitation and non-timber forest products). The implication is that willingness to pay is low, exclusion of non-payers difficult (and non-advisable), and “free-riding” more the rule than the exception. This means cost recovery is potentially difficult; incentives for private sector provision is limited and, in the absence of a steady flow of revenues, mobilizing financial resources requires public subsidies and/or government guarantees.

A second major difference is that while energy, transport and forestry have significant global commons implications, water and sanitation have only local effects. The release of CO<sub>2</sub> emissions by fossil fuel combustion, (whether for the production of power or for transport), and deforestation add to the concentration of greenhouse gases that increase the risk of global warming. This means that the energy mix of power and transport, and land use changes in one country are of concern to other countries and the global community.

On the other hand, investments in renewable energy, more efficient public transport systems, forest conservation, and reforestation generate substantial global benefits that are enjoyed free of charge. This means that there *are* global values to energy, transport, and forestry investments and if they can somehow be captured, they can be used to finance these investments. Indeed the Global Environmental Facility and the Clean Development Mechanism can help capture and reinvest part of these global values. Water and sanitation investments do not enjoy the same global interest but ought also to be of concern since they represent an important component of the social dimensions of sustainability.

A third obvious difference between sustainable forestry, especially reforestation, and all other sectors is that investment costs and returns are separated by many years, indeed decades. This requires long-term bridge financing to resolve a very challenging cost flow problem, especially in developing countries where only short term credit is usually available. Instruments for capturing environmental values such as ecotourism, bio-prospecting, watershed protection charges, and carbon offsets, help generate a steady flow of revenues for securing long term loans, as well as mitigating cash-flow shortfalls.

A fourth difference is that foreign equity in economic assets such as power plants, water supply systems, sewage treatment plants, and transport systems is more palatable to developing countries than foreign equity in natural resources such as forests and national parks. On the other hand, forests and water supply systems lend themselves more easily to community ownership and management than mass transport systems and power plants.

Another contrast is between the “beneficiary pays” principle, applied in financing sustainable forest management and conservation through innovative instruments, and the “user pays” principle we employ in recovering costs from investments in water, power, and transport. Sanitation presents an interesting challenge for financing since neither the “user pays” nor the “beneficiary pays” principles can be applied directly. In theory, the right approach would have been the “polluter pays” principle, but because of the large number of households and small businesses involved, it is difficult to collect a pollution charge directly from each source, especially since willingness to pay for outside-the-home sanitation is virtually nonexistent. For this reason sanitation is bundled with water (since waste water is roughly proportional to water use), and sanitation charges on water use are collected as part of the water bill. An interesting analogy in the case of sustainable forest management is the bundling of carbon and biodiversity in what has come to be known as “exotic” carbon for sale at a premium in the emerging global carbon markets.

## VII. CONCLUSIONS

The last two decades have witnessed the development of many new and innovative financial mechanisms and instruments for sectoral financing, as our review of five sectors (power, water, sanitation, transport, and forestry) has demonstrated. However, financing mechanisms, no matter how innovative, are not a substitute for full-cost pricing and sound management; they indeed depend on them. Nor is the attainment of financial sustainability a sufficient condition for environmental sustainability. Indeed, increased private sector participation and the proliferation of international financial market instruments that can be accessed for sector financing might externalize some of the public good aspects of sectoral investments, unless supplemental environmental pricing or regulatory instruments are employed. On the other hand, the development of international environmental conventions is beginning to internalize some of the traditional externalities and capture hitherto unaccounted global environmental values.

## REFERENCES

- Brook Cowen, P.J. (1996). "Getting the private sector involved in water- What to do in the poorest of countries?" *Public Policy for the Private Sector*, Note No. 81, June (Washington D.C.: The World Bank).
- Crampes, C. and A. Estache (1996). "Regulating Concessions: Lessons from the Buenos Aires Concession" in *Public Policy for the Private Sector* (Washington D.C.: The World Bank).
- Darche B. (1997). "Financing mechanisms at the subnational level in emerging markets borrowings and concessions/concessions," Urban No. FM-9 (Washington D.C.: The World Bank).
- De Shazo J. R. (1999). "Characterizing the demand for Central America's tourism Assets" in T. Panayotou, ed., *Environment for Growth-Environmental Management for Sustainability and Competitiveness in Central America* (Center for International Development and Harvard Institute for International Development), forthcoming.
- Ehrhart, D. and R. Burdon (1999). *Free Entry Infrastructure*, London Economics/World Bank report (Washington D.C.: The World Bank).
- El Daher S. (1997). "Municipal Bond Markets-Prospects for developing countries," Urban No FM-8b (Washington D.C.: The World Bank).
- Heggie, I. (1994). "Commercializing Africa's Roads: Transforming the role of the Public Sector," SSATP Working Paper 10, World Bank, Africa Technical Department, Washington D.C.
- Idleovitch, E. and K. Ringskog (1995). *Private Sector Participation in Water Supply and Sanitation in Latin America* (Washington D.C.: The World Bank).
- International Atomic Energy Agency (1995). *Energy, Electricity And Nuclear Power. Estimates For The Period Up To 2010* (Austria: IAEA).
- Kaosa-ard, M., T. Panayotou and J.R. DeShazo. (1995). "Green Finance: Valuation and Financing of Khao Yai National Park in Thailand," Thailand Development Research Institute Policy Brief.
- Komives K. (1998). "Expanding water and sanitation services to low-income households, *Public Policy for the Private Sector*, Note No. 178, April. World Bank, Washington D.C.
- Panayotou T. and P. Ashton (1992). *Not by Timber Alone: Economics and Ecology for Sustaining Tropical Forests* (Island Press).
- Reddy, A. K. N., J. Goldenberg, T. B. Johansson and R. H. William (1998). *Energy for a Sustainable World* (Gloucester, U.K.: John Wiley and Sons).
- Sedjo, R. (1994). "The potential of high yield plantation forestry for meeting timber needs: recent performance and future potentials," Discussion Paper ENR95-08 (Washington D.C.: Resource for the Future).
- Sohngen B., R. Mendelson, R. Sedjo, and K. Lyon (1997). "An Analysis of Global Timber Markets" , Resource for the Future, Discussion Paper, Washington D.C.
- World Energy Council (1995). *Energy for Tomorrow's World* (U.K.: Kogan Page).

Annex I. Options for Private Sector Participation in Infrastructure and Public Service Provision

<i>Private Sector Participation Option</i>	<i>Service Contracts</i>	<i>Management Contracts</i>	<i>Lease Arrangements</i>	<i>Concessions</i>	<i>Build-Own-Operate-Transfer (BOOT)</i>	<i>Reverse BOOT</i>	<i>Joint Ownership (mixed companies)</i>	<i>Outright Sale or Divestiture</i>
Financing of investments	Public sector	Public sector	Public sector	Private sector	Private sector	Private sector	Private sector	Private sector
Financing of working capital	Public sector	Public sector	Private sector	Private sector	Private sector	Private sector	Private sector	Private sector
Contractual relation with users	Public sector	Private sector	Private sector	Private sector	Private sector	Private sector	Private and public sectors	Private sector
Duration (years)	1-2	3-5	5-10	20-30	Time needed to retire debt	Time needed to retire debt	Indefinite or fixed	Indefinite
Responsibility for setting rates	Public sector	Public sector	Contract	Contract	Contract	Contract	Public/private	Regulated private
Method of payment	Work done/unit price	Cost-plus and productivity bonus	Rates price	Rates	Rates	Rates	Rates	Rates
Method of recovering public expenditure	Rates	Rates	User overcharge	Not applicable	Not applicable	Annual fees by private firm	Rates	Sale price
Main objective of PSP	Improve efficiency	Improve efficiency	Improve efficiency	Mobilize private capital	Mobilize capital and efficiency	Improve efficiency	Mobilize capital and efficiency	Mobilize capital and efficiency
Ownership	Public sector	Public sector	Public sector	Public sector	Private then public	Public then private	Private and public	Private sector
Financing	Public sector	Public sector	Public sector	Private sector	Private sector	Public sector	Private and public	Private sector
Management	Public sector	Private sector	Private sector	Private sector	Private sector	Private sector	Private and public	Private sector
Risk	Public sector	Public sector		Private sector	Private sector	Public and private	Private and public	Private sector

Source: Partially based on Idleovich and Ringskog (1995).

## ANNEX II

## The Buenos Aires Concession for Water Supply and Sanitation

The greater Buenos Aires water supply and sanitation system, operated by a public company (*Obras Sanitarias de la Nacion*, OSN) was plagued through the years by problems common to public water utilities throughout the developing world. Coverage was only 70 per cent for water supply and 58 per cent for sanitation, while only 5 per cent of the waste water received any treatment before dumping into natural water bodies. The service was of poor quality and unreliable. Infrastructure was poorly maintained and unaccounted-for water was as high as 45 per cent of the water produced. Water meters were installed at only 20 per cent of the connections; meter reading and billing were highly irregular, and water consumption reached 400-500 litres per capita a day – twice the norm for metered and well-managed systems. The public utility was grossly overstaffed with 8,000 employees, or 8-9 employees per connection compared with 2-3 by efficiently operating systems. At the same time, population growth and urbanization were expanding the demand for additional coverage. The cost of rehabilitation of the deteriorating system and expansion to reach 100 per cent coverage was estimated at several billion dollars over the next 20-30 years, which was clearly beyond the capacity of both the utility and the state to mobilize.

In 1993, the government of Argentina privatised water and sewage services for Greater Buenos Aires as part of a massive privatisation program that began in 1990, with World Bank support, and included virtually all public services and federally-owned enterprises such as electricity, telephone, railways, airlines, roads and ports. The private sector participation option chosen for water and sanitation was a 30-year full concession that allowed the assets to remain under public ownership while the operation, maintenance, rehabilitation, expansion, and wastewater treatment were transferred to a private concessionaire. After a successful process of preparation and bidding, the concession was awarded to *Aguas Argentinas*, a consortium of foreign and local firms led by *Lyonnaise de Eaux-Dumez*, that offered a 27 per cent discount to the prevailing public water tariffs. Thus, competition was effective in reducing costs. It also mobilized \$4 billion over the life of the contract to meet the performance targets of the concession, which include 100 per cent coverage in water supply and 90 per cent coverage in sanitation by year 30, a reduction in the unaccounted-for water from 45 per cent to 25 per cent, and an increase in sewage treatment from 5 to 93 per cent. Over the first five years alone, the concessionaire will invest \$1.2 billion, or \$240 million a year – 12 times more than the historic annual investment made by the public utility in the last decade. To regulate and control the concession, and protect consumers against monopolistic practices, the government established a regulatory agency, *Ente Tripartito de Obras y Servicios Sanitarios* (ETOSS) with participation of the federal, provincial and local government with a budget of \$8 million to be financed through a user surcharge of 2.7 per cent of the water and sewage bill collected by the concessionaire. The regulatory agency also enforces water and effluent quality standards based on international norms introduced prior to bidding.

During the first three years of operation, accelerated rehabilitation of the system led to a reduction of water losses from 45 per cent to 25 per cent, and coverage increased by 10 per cent, with no increase in production. The population receiving sewage services increased by 8 per cent. Prices were reduced initially by 27 per cent, but increased by 13.5 per cent in 1994 to further accelerate rehabilitation provided in the contract clause; still, water prices are 17 per cent lower than those charge by the public utility. The staff was reduced by 47 per cent through severance payments by the government and a voluntary retirement program by the concessionaire. Labour productivity rose and new recruitment is no underway as the concessionaire is responding to increasing demand for water and sanitation services. The table below summarizes these improvements.

Impact of the Greater Buenos Aires Water Concession

<i>Indicator of Performance</i>	<i>Changes from May 1993 to December 1995</i>
Increase in production capacity (per cent)	26
Water pipes rehabilitated (kms)	550
Sewers drained (kms)	4,800
Decline in clogged drains ( per cent)	97
Meters upgraded and installed	128,500
Staff reduction ( per cent)	47
Residents with new water connections	642,000
Residents with new sewer connections	342,000

Source: *Aguas Argentinas*

While the overall experience has been clearly positive and the model is now being adopted by other Argentine provinces and other countries in Latin America, there have also been teething problems with regard to negotiations with the labour unions and regulation. Indirect labour costs remain high as the concessionaire continues to provide fringe benefits traditionally available to civil servants. The regulatory agency, staffed with former utility employees, find it difficult to give up the state's day-to-day management role and focus on its regulatory and contract enforcement role.

This successful privatisation of the supply and sewage services in Buenos Aires contains many important lessons for private sector participation in water and sanitation throughout the developing world. First, privatisation must receive the endorsement of major stakeholders, enjoy political commitment at the highest level, and be part of a comprehensive program of economic reforms. Second, political, technical, legal, commercial and financial risks must be assessed and alleviated through appropriate mechanisms. Third, all available options for private sector participation should be considered and the one best suited to the country's political and cultural conditions, and the sector's features, must be selected ; the assets need not be privatised to improve efficiency and attract capital.

Fourth, the regulatory framework and regulatory institution must be established, and the technical and financial feasibility of the concession studied prior to bidding. The regulatory entity must be strong enough to regulate an experienced international concessionaire. Fifth, while adequate preparation and time should be allowed to ensure universal bidding, eligibility should be confined to qualified bidders through a prequalification process. Sixth, sensitive staff reduction issues can be effectively dealt with through attractive retirement packages jointly financed by the government and the concessionaire. A final lesson is that the contract should be realistic and specific to minimize conflicts yet be flexible enough to allow for adjustments for unforeseen or substantially altered circumstances.

*Source:* Idleovitch and Ringskog (1995); Crampes and Estache (1996).

---