ADB

FINANCING LOW-CARBON URBAN DEVELOPMENT IN SOUTH ASIA

A Post-2012 Context

Asian Development Bank

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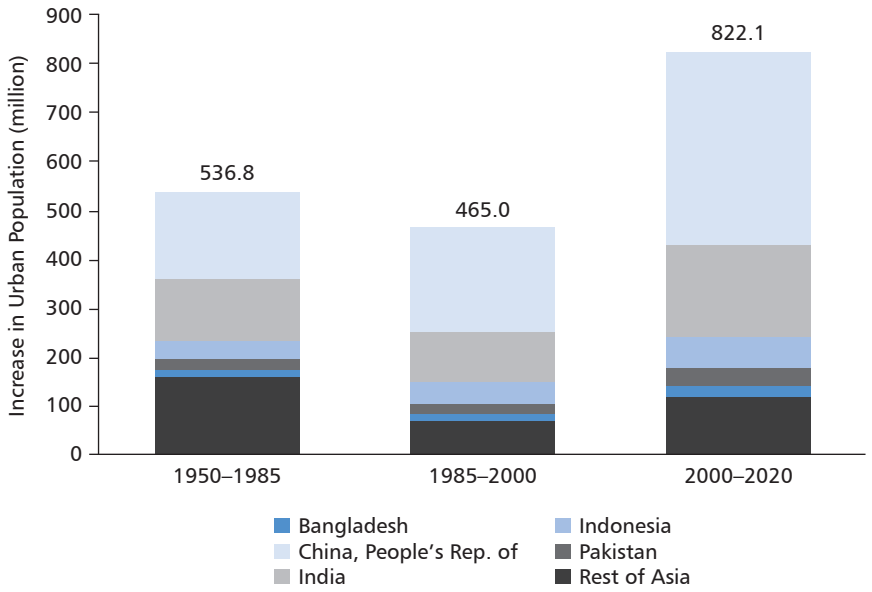
Abbreviations

ADB	–	Asian Development Bank
CDM	–	Clean Development Mechanism
CER	–	certified emission reduction
CPA	–	component project activity
DMC	–	developing member country
EU	–	European Union
FCF	–	Future Carbon Fund
GHG	–	greenhouse gas
LDC	–	least developed country
LED	–	light-emitting diode
LPG	–	liquefied petroleum gas
MOL	–	methane oxidation layer
MSW	–	municipal solid waste
PoA	–	program of activities
SWDS	–	solid waste disposal site
UNFCCC	–	United Nations Framework Convention on Climate Change

I. Introduction

The cities of South Asia are growing at an unprecedented rate. Currently, the region accounts for 5 of the world's 26 megacities (Delhi, Dhaka, Karachi, Kolkata, and Mumbai),[1] with Kolkata and Mumbai being the most dense. The urban population in India is expected to increase by 20.8 percentage points between 2010 and 2050 compared to 7.8 percentage points in Latin America and the Caribbean.[2] These trends necessitate bold efforts in project design and financing to steer this rapid urbanization onto an inclusive, green, and low-carbon urban development path.

Increase in Urban Populations in Asia (millions)



Source: ADB. 2012. *Key Indicators for Asia and the Pacific 2012.* Special Chapter on Green Urbanization in Asia. Manila.

Against this backdrop, emissions of greenhouse gases (GHGs) responsible for global climate change are increasing. Urban residents throughout the region show a growing demand for motorized transport and electricity. While GHG emissions in South Asia have historically been low, the high rate of urbanization is causing energy consumption and fossil fuel use to grow rapidly. In 2030, the total primary energy use in Bangladesh, Bhutan, the Maldives, Nepal, and Sri Lanka could be 2.4 times the 2005 figure.[3] Moreover, cities of the region are suffering from the growing problem of solid waste disposal. Total annual GHG emissions from solid waste

[1] Demographia. 2013. World Urban Areas. http://www.demographia.com/db-worldua.pdf?bcsi_scan_e41ddc73166bc1eb=0&bcsi_scan_filename=db-worldua.pdf

[2] ADB. 2012. *Key Indicators for Asia and the Pacific*. Special Chapter on Green Urbanization in Asia. Manila.

[3] ADB. 2013. *Economics of Reducing Greenhouse Gas Emissions in South Asia: Options and Costs*. Manila.

for Bangladesh, Bhutan, India, Nepal, and Sri Lanka are estimated to reach 106 million tons of carbon dioxide by 2005 and 606 million tons by 2030.

Asian Development Bank's strategy. Strategy 2020 and the Urban Operational Plan, 2012–2020 of the Asian Development Bank (ADB) support sustainable urban development throughout the Asia and Pacific region and promote inclusive and green growth to ensure cities are competitive and livable.

Post-2012 context. The first commitment period of the Kyoto Protocol ended on 31 December 2012. A significant outcome of the Doha Climate Gateway was the amendment of the Kyoto Protocol to include a second commitment period from 2013 to 2020 to reduce GHG emissions to 18% below 1990 levels on average. Four countries—Canada, Japan, New Zealand, and the Russian Federation, while remaining party to the Kyoto Protocol, did not make commitments under this second commitment period. A total of 38 countries, including Australia, Switzerland, and Ukraine, and those of the European Union (EU) continue to be part of the second commitment period; however, they account for less than 15% of global GHG emissions, calling into question the value of the extended protocol. The new context is a fragmented international carbon market with various approaches to reducing GHG emissions outside the national borders of Annex I (industrialized) countries. There is a need to help countries understand and navigate this new context, and help them earn additional revenue from the sale of carbon credits through the development of low-carbon projects.

Objective. This guidance note (i) provides an overview of the carbon financing market in the post-2012 context, (ii) guides readers on how to access carbon finance, and (iii) highlights good practices in low-carbon urban development. The paper is aimed at government officials and project developers throughout South Asia, and is structured in a question-and-answer format for quick and easy reference.

II. Carbon Finance in the Post-2012 Context

What was achieved in the latest Conference of the Parties (COP) 18 climate change conference in Doha?

In December 2012, in Doha, Qatar, the Kyoto Protocol was amended and extended for a second commitment period of 8 years from 1 January 2013 to 31 December 2020. During this period, participating countries will continue negotiations to strengthen 2020 emission reduction targets for adoption by developed countries in 2014. In addition, the COP will negotiate and finalize a new universal climate change agreement that will include a more ambitious emission reduction target beyond 2020 for all countries for adoption in 2015. The detailed timetable of commitments for adopting a new global climate change agreement is in Table 1.

Table 1: **Agreed Timetable for Adopting a New International Climate Change Agreement**

Timeline	Committed Actions
1 March 2013	Governments to submit information, views, and proposals on actions to enhance emission reduction.
Throughout 2013	Meetings and workshops to prepare new agreement and to further explore ways to reduce emissions.
December 2014	Elements of negotiation text are made available.
May 2015	Draft negotiation text is made available.
December 2015	Adoption of universal climate change agreement by the international community.
Before 2020	Entry into force of universal climate change agreement.

Source: United Nations Framework Convention on Climate Change. Report of 2012 United Nations Climate Change Conference in Doha, Qatar (COP18/ CMP8)
http://unfccc.int/key_steps/doha_climate_gateway/items/7389.php

Furthermore, advances were made toward the completion of new mechanisms to channel finance and technology to developing nations, notably the Green Climate Fund and the Climate Technology Center, and to move toward the full operation of this infrastructure. The Green Climate Fund is expected to support developing countries in limiting or reducing their GHG emissions. It is also anticipated to play a key role in channeling new, additional, adequate, and predictable financial resources to developing countries, as well as catalyzing both public and private finance at the international and national levels.

1 Billion Certified Emission Reduction Credits Issued

On 7 September 2012, the 1 billionth certified emission reduction under the Kyoto Protocol's Clean Development Mechanism was issued, marking an impressive milestone for the world's leading greenhouse gas offset mechanism. The Clean Development Mechanism is one of the most successful mechanisms contributing to emission reductions.

What are the implications of the second commitment period of the Kyoto Protocol for the Clean Development Mechanism (CDM)?

Countries committing to further GHG emission reduction targets under the second commitment period of the Kyoto Protocol agreed to an average reduction of 18% below 1990 levels. Four countries—Canada, Japan, New Zealand, and the Russian Federation, while remaining party to the Kyoto Protocol, did not make commitments under the second commitment period. This reduces the overall demand for certified emission reductions (CERs). The EU indicated it would not buy CERs from projects registered after 2012 unless they were from least developed countries (LDCs), which in South Asia include Bangladesh, Bhutan, and Nepal (Box 1).[4] As a result, CERs of projects registered after 2012 by non-LDC parties would need to be sold to potential buyers outside Europe, such as Australia. Table 2 shows the number of registered CDM projects and CERs in South Asia.

Table 2: **Number of Registered Clean Development Mechanism Projects and Certified Emission Reductions in South Asia**

Country	Number of Projects Registered[a]	Number of Program-of-Activity Projects Registered[a]	Number of Certified Emission Reductions Issued[b] ('000 tCO_2-equiv)
Bangladesh	4	3	7
Bhutan	2	0	0.5
India	950	5	151,968
Nepal	6	0	92
Sri Lanka	7	0	260

tCO_2-equiv = tons of carbon dioxide equivalent.

[a] United Nations Framework Convention on Climate Change project search (as of 22 November 2012).

[b] United Nations Environment Programme Risoe Centre Clean Development Mechanism Pipeline (as of 1 November 2012).

What are the opportunities for availing of the Clean Development Mechanism in future projects?

In the future, other promising market mechanisms may emerge, but until then, the CDM remains the most reliable one available. Recognizing that the number of registered CDM projects and issued CERs is concentrated in a few countries, the CDM Executive Board sought to create a more balanced distribution of CDM projects among developing countries.[5] Consequently, there are opportunities for LDCs in the post-2012 scenario, including Bangladesh, Bhutan, and Nepal to continue to benefit from CDM projects (Box 1). While the third phase of the EU Emissions Trading Scheme, 2013–2020, significantly reduces the offset credit imports from the Kyoto market, projects registered in LDCs after 2012 may sell CERs to the EU at a reasonable price. Thus, CERs generated from project activities hosted in LDCs can continue to play an important role in the post-2012 carbon market.

[4] Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009.

[5] Six developing countries (Brazil, the People's Republic of China, India, Malaysia, Mexico, and Viet Nam) account for more than 80% of the total number of registered CDM projects, while five nations (Brazil, the People's Republic of China, India, the Republic of Korea, and Mexico) hold more than 90% of all CERs.

What other options exist beyond Clean Development Mechanism in the post-2012 carbon market?

Other possible market mechanisms have been proposed by different parties, including the Joint Crediting Mechanism. These may result in a trend toward an increasingly fragmented carbon market with varying rules, approaches, market demands, and prices. Recognizing this, the Doha Climate Gateway clarified that a framework for various approaches is necessary to make mitigation actions more cost effective, recognize various approaches, increase transparency, and encourage fungibility of tradable units in global markets. Box 2 summarizes the alternatives to the CDM that are being proposed. These approaches are under negotiation, and it will take at least another year to develop the necessary structure and rules to fully operationalize them.

Box 1: Opportunities for South Asia—Bangladesh, Bhutan, and Nepal

In the post-2012 carbon market, countries such as Bangladesh, Bhutan, and Nepal will continue to benefit from European demand for Certified Emission Reductions. For many other developing nations that are not least-developed countries (LDCs), the Clean Development Mechanism market will be limited to buyers from Australia, Norway, and Switzerland. For these non-LDC countries, it will clearly be a buyer's market. It is therefore imperative for non-LDC countries to monitor the constantly changing landscape of the carbon market. Two major points to monitor are as follows:

- A new international agreement for emission reduction with specific commitments to be adopted in 2015 would increase demand for carbon credits and significantly alter the outlook for the post-2020 carbon market.
- Japan is active in proposing new market-based mechanisms for greenhouse gas emission reduction certification and crediting, and is keen on a joint crediting mechanism aimed at reducing emissions on a bilateral basis with a host country. As this and other mechanisms develop, new opportunities for project developers in non-LDC nations may arise.

Source: Asian Development Bank. 2013. Carbon Market Initiative Technical Support Facility.

Box 2: Views of Various Parties on Possible New Market Mechanisms

Party	Proposed Approach on New Market Mechanisms
AOSIS	Voluntary sectoral trading and crediting
Australia	A common framework for market mechanism, allowing parties to individually or jointly submit proposals for market mechanisms they intend to implement
Bangladesh	Supplementing market-based mechanisms
People's Republic of China	Project-based mechanism, comparable to the mechanisms established under the Kyoto Protocol
Colombia	Mechanism for Carbon Efficient Economies: a market mechanism with a sectoral and subsectoral scope
Ecuador	Net Avoided Emissions: emissions that can be emitted within the economy of each country but are avoided
European Union	Sectoral trading and crediting
Japan	Project- and sector-based approaches
Republic of Korea	NAMA crediting
New Zealand	NAMA trading mechanism
Norway	Sectoral approach and NAMA-based approach
Papua New Guinea	Market-based NAMAs
Peru	A strategic program-based approach: low-carbon asset, practices, and infrastructure
Saudi Arabia	Registry for NMMs and reduction units for NMMs under UNFCCC
Switzerland	Sectoral trading and crediting
Turkey	New market mechanisms should be flexible in access criteria, and parties should decide on the status they take to engage in the mechanism
Tuvalu	Global feed-in tariff mechanism

AOSIS = Alliance of Small Island States, NAMA = nationally appropriate mitigation actions, NMM = new market mechanism, UNFCCC = United Nations Framework Convention on Climate Change.

Source: Institute for Global Environmental Strategies. 2012. New Market Mechanisms in Charts. Version 2.

New Market Mechanisms. As defined in Durban, South Africa, a new market mechanism will operate under the guidance and authority of the Conference of the Parties to enhance the cost-effectiveness and promotion of mitigation actions, as well as to help developed countries meet part of the mitigation targets under the convention. The Clean Development Mechanism is an example of a market mechanism used to reduce greenhouse gas (GHG) emissions. A market mechanism uses the forces of demand and supply, as well as an artificially created commodity such as emission reductions, to reduce GHG emissions. The Clean Development Mechanism is one of the first market mechanisms to reduce GHG emissions. New market mechanisms refer to other possible mechanisms, such as those listed above, which would similarly engage market forces to reduce GHG emissions.

Source: Asian Development Bank. 2013. Carbon Market Initiative Technical Support Facility.

III. Carbon Financing and Urban Development

A. Understanding Low-Carbon Urban Development

What is the value of carbon financing to urban development projects?

Carbon financing serves as a valuable revenue source for urban development projects that can (i) support the capital cost of the projects, (ii) offset operating costs, (iii) contribute to profits, (iv) provide a tool to repay loan interest, (v) partially hedge against the foreign exchange expenditure of the project, and (vi) to help meet the incremental cost of newer techniques and their training requirements.

What are the opportunities in urban development projects to reduce greenhouse gas (GHG) emissions?

Solid waste management. The decomposition of organic matter under anaerobic conditions leads to the emission of methane gas, which is a very potent GHG. Avoiding methane emissions and/or eliminating them through various technologies not only lead to better urban waste management but also significantly reduces GHG emissions. Urban waste management has the largest potential for GHG emission reductions in urban development projects.

Wastewater treatment. Urban wastewater treatment also has potential for GHG emission reductions and carbon credits. An overwhelming majority of CDM projects are in the industrial wastewater sector where wastewater is homogenous, such as manure and biomass waste.

Energy efficient street lighting. Replacing incandescent light bulbs with compact fluorescent lamps and/or light-emitting diode (LED) bulbs increases lighting efficiency by using less electricity for the same amount of brightness output. Applications for such replacements range from the household level to public lighting systems and LED stoplights.

Energy efficiency in water pumping. This involves the replacement of single-speed electric motor pumps with newer, more efficient pump technology using variable frequency drive motors. Variable frequency drive pumps also use less electricity by varying the speed at which the motor operates depending on the water flow demand. The pump speeds up and increases water flow only as demand increases. This can significantly reduce electricity consumption. Possibilities for reducing nonrevenue water, as well as better piping practices, may also be explored for CDM financing.

Public transport. Increasing urbanization results in greater public demand for transport. As demand for urban mobility increases, there is a tendency for the market to meet this demand through whatever transport means are available. Unfortunately for many developing countries, this means the use of old, inefficient auto vehicles including buses, motorbikes, tricycles, and other modified means of transport, which emit significant amounts of GHG. The opportunity lies in the development of sustainable urban public transport systems that are safe, efficient, and affordable to local users, including bus rapid transit systems, light rail, and metro rail systems. There are eight registered public transport CDM projects in the world including the Delhi and Mumbai metro systems in India.

More than 10 methodologies are available to reduce GHG emissions from transport projects. Despite this, only 4 methodologies have been utilized in fewer than 20 registered transport projects. This highlights the stringency of requirements and the inherent difficulty of gathering appropriate data for transport projects as nonpoint sources of GHG emissions. If a transport project intends to claim emission reduction credits, it should be kept in mind that detailed transport studies will need to be conducted to determine the baseline and to monitor the project for emission reductions.

The introduction of electric or hybrid vehicles for public transport in urban areas displaces the use of fossil fuels in conventional public transport vehicles such as buses, vans, tricycles, and motorcycles. Electric versions of these vehicles may replace entire fleets and have the potential for GHG emission reduction. There are six registered CDM projects in the transport sector in India, of which four are related to the production of electric vehicles and the other two represent a modal shift to low GHG emitting vehicles.

Transport projects that involve a modal shift from the use of private vehicles powered by fossil fuels to mass public transport systems may include electric mass rapid transit systems and bus rapid transit systems. The reduction in the use of fossil fuels is the source of GHG emission reductions generated from such projects.

B. Opportunities in Solid Waste Management

What is the potential for carbon financing in the solid waste management sector in South Asia?

On average, 70%–80% of solid waste generated throughout South Asia developing member countries (DMCs) is biodegradable organic mass with high moisture content (Bangladesh 78%, India 65%, Nepal 74%, Sri Lanka 65%),[6] compared to 30%–50% in Viet Nam, 44%–48% in Bangkok, and 35% in Singapore.[7] Left alone, this organic waste decomposes anaerobically, in both solid waste and wastewater systems, leading to the emission of methane gas. This not only adds to global warming associated climate change, but also leads to public and environmental health risks. A unique opportunity exists to tap carbon financing sources to support environmentally sustainable waste management practices in the region that can make the difference between viable and nonviable projects. South Asia has experience in accessing carbon finance to support solid waste management projects (Table 3).

Furthermore, waste management GHG emission reduction projects are well suited to South Asia due to the warm climate. Countries such as Bangladesh, India, and Sri Lanka provide ideal climactic conditions for the organic decomposition of waste matter that generates methane. Finally, the increasing urbanization in major cities in South Asia points to a steady rise in the volume of waste, which will need to be handled sustainably.

[6] ADB. 2012. *Toward Sustainable Organic Waste Management in South Asia*. Manila.
[7] United Nations Environment Programme. www.unep.or.jp/Ietc/Publications/spc/State_of_waste_Management/2.asp

Table 3: **Registered Clean Development Mechanism Projects in Solid Waste Management in South Asia**

Country	Registered CDM Projects in SWM
Bangladesh	2
Bhutan	0
India	14
Nepal	3
Sri Lanka	0

CDM = Clean Development Mechanism, SWM = solid waste management.

Source: United Nations Framework Convention on Climate Change. Note there are no registered wastewater CDM projects in South Asia.

What is the experience with the Clean Development Mechanism in sewage management in South Asia?

There has been less experience with the use of the CDM in sewage management systems than in solid waste management. There have been successful wastewater experiences in other parts of the world (e.g., Fiji and the Philippines), where sewage treatment projects that led to reduced GHG emissions have been registered as CDM projects. Considering the huge demand for developing sewage treatment systems in South Asia, such projects could be replicated.

It is also important to ensure high-level support for CDM programs, particularly the participation of senior government officials. Formation of a CDM cell in a relevant government agency staffed with mid- to high-level officials can ensure that opportunities and issues in the CDM process are identified early and effective measures are taken quickly.

What are the best practices for accessing carbon financing in the waste sector?

Alternative waste treatment methods offer a more sustainable course of action than the business-as-usual approach of open dumping of solid waste and discharge of untreated sewage witnessed throughout the region. Innovative approaches to waste management produce value-added resources, including organic fertilizer, renewable energy, and recycled by-products, while also reducing GHG emissions, making projects eligible for carbon financing. A city or town can selectively mix and match these technological options, depending on the local context. Appendix 1 lists and describes these options, including CDM methodologies approved by the United Nations Framework Convention on Climate Change (UNFCCC) that are relevant to the waste management sector. Box 3 highlights a success story in public-sector-led composting efforts in Dhaka, Bangladesh.

Box 3: Successful Experience in Composting, Dhaka, Bangladesh

Waste Concern is a private operator based in Dhaka, Bangladesh, and a recognized leader in the organic waste management sector throughout Asia. The company submitted a waste composting project for Clean Development Mechanism (CDM) registration to their designated national authority in March 2006, and the project was approved as a registered CDM project in July 2006. The certified emission reductions verification was done in June 2011. The first certified emission reduction, for 7,131 tons of carbon dioxide equivalent, was issued by the United Nations Framework Convention on Climate Change on 12 August 2012.

A 15-year concession agreement was signed with Dhaka City Corporation in 2007. The delay in signing the public–private partnership contract was due to lack of government guidelines on such partnerships for the waste sector. Guidelines were subsequently issued in 2010. The project started operation in the fourth quarter of 2008. This is the first concession agreement in solid waste recycling in Bangladesh. Under this project, Waste Concern can collect up to 700 tons/day (tpd) of organic waste (not mixed, only vegetable waste) incrementally starting from 100 tpd. Land for composting is arranged by Waste Concern, along with the collection of organic waste. No waste collection fee or tipping charge is provided to Waste Concern by the municipality. If Waste Concern fails to the collect waste, there is a penalty of 250 taka (Tk)/ton ($3.50/ton). All the vegetable markets are under the jurisdiction of Waste Concern for the collection of waste. However, for the first plant with a capacity of 100 tpd, Dhaka City Corporation has allowed Waste Concern to collect waste from six vegetable markets of Dhaka, while daily monitoring of the amount of waste collected is undertaken by the municipality. This project is a joint venture between Waste Concern from Bangladesh, World Wide Recycling, the Entrepreneurial Development Bank of the Netherlands (FMO), and High Tide Investments of the Netherlands. The project uses aerobic composting in a shed with forced aeration.

The compost produced by Waste Concern has been approved and certified by the government. It took 18 months for Waste Concern to obtain the registration and approval from the government. Advanced Chemical Industries (ACI), the largest fertilizer marketing company in Bangladesh, purchases all the compost from the factory gate at a price of Tk6,000/ton ($85/ton) for a 40-kilogram (kg) bag, and Tk10,750/ton ($150/ton) for a 5 kg bag. ACI then distributes the compost through its own network to villages as far as 500 kilometers from the plant. The production cost per ton of compost, including the waste collection cost, is Tk4,500/ton ($63/ton). Apart from sale of compost, the project is expected to earn 25%–30% in extra revenue from the sale of carbon credits.

There is no marketing problem for Waste Concern. ACI is the sole distributor of the compost. The process used for composting is forced aeration using the box method. The entire composting operation is done with overhead cover and a leachate collection system. The first plant has a 100 tpd capacity and is located in Bulta, near Dhaka. Waste Concern is planning for the construction of its second plant, with a capacity of 250 tpd, close to the first plant. The project is financed by FMO, High Tide Investments of the Netherlands, and Dutch Bangla Bank of Bangladesh.

The following lessons are drawn from the successful experience of this project:

- **Identify suitable projects.** Carbon revenue can be an important supplemental revenue source for making the project profitable. Even if the revenue from carbon credits is not significant compared with other revenue sources, it may make the project profitable and sustainable. The compost produced from urban waste can be sold as a commodity, while the project's carbon finance lowers financial risk, making the project profitable and attracting both investors and buyers.

continued on next page

Box 3 *continued*

- **Establish public–private partnership to reduce project risks**. Forming a public–private partnership could reduce project risks such as policy and regulation risk, and financial risk. The composting project was implemented by signing a public–private partnership contract that binds the public and private sector together.

Source: Asian Development Bank. 2011. *Toward Sustainable Municipal Organic Waste Management*. Manila.

IV. Planning for Carbon Finance in Urban Development

What are the key considerations for carbon financing?

Developing a project with carbon financing requires time and careful preparation. In the typical CDM cycle, project registration takes approximately a year (Appendix 2). Moreover, the amount of GHG diverted from urban development projects depends on the size of the population and the technologies selected. For example, most waste management projects in secondary towns have smaller emission reductions and are therefore unable to afford the substantial transaction costs associated with the CDM. Therefore, to maximize the benefits of carbon credits in the post-2012 carbon market, it is important to continually find ways to reduce transaction costs and maximize the volume of available credits.

Indicative transaction costs for CDM projects are in Box 4.

The following strategies can be applied to minimize the costs incurred:

(i) **Bundling projects.** This can be done for smaller projects, as stand-alone CDM projects or under a program of activities (PoA) (see point iv).

(ii) **Bundling verification (monitoring) activities.** This strategy will be useful when a single registered project has modest credits. In such cases, verification costs can be reduced by doing multiple verifications at one time.

(iii) **Adopting a programmatic approach.** When a number of similar projects is available, a common program, or PoA, can be launched. This will use common elements and standardize many procedures. An example of a PoA in Rajasthan, India, is in Box 5.

(iv) **Joining an existing program of activities.** A project boundary will need to be defined under the program. In many cases, the project boundary may be the entire country if a nationwide program is to be implemented. In some cases, it may be an entire region encompassing several countries. Should a project activity fall within the boundary of a previously registered PoA, it is possible to explore collaboration with the coordinating and managing entity and the CDM by joining the PoA.

(v) **Establishing standardized baselines for common projects.** The UNFCCC established guidelines to help designated national authorities determine baselines for the most likely sectors and areas. This will reduce transaction costs considerably.

What are the critical factors for obtaining carbon finance?

Monitoring and verification. Projects validated for international emissions trading schemes have a stringent monitoring and verification protocol to ensure that data parameters are accurately recorded for CDM purposes. The protocol specifies parameters such as the instruments to be used and their frequency calibration, measurement, and recording. Such practices need to be followed closely by the project proponent. Environmental integrity is

Box 4: Indicative Transaction Costs for Clean Development Mechanism Projects

Greenhouse gas mitigation incurs transaction costs before there is flow of saleable carbon credits. The magnitude of these costs will vary with the type of mechanism chosen to earn carbon credits. The major costs associated with Clean Development Mechanism projects are as follows (amounts are approximate and may be checked at the time of transaction):

One-time registration cost		
A. Consultant for document preparation		$20,000
B. Host country approval		$1,000
C. Validator		$30,000
D. Registration fees	Depends on project	$0–$350,000
Annual costs		
E. Annual verification by designated operational entity		$15,000
F. Monitoring report fees (consultant)		$7,000

Special cases
Program of activities

Validation fees for the program of activities	$50,000–$100,000

In the case of programs of activities, each component project activity (CPA) will involve CPA inclusion fees, to be paid to the designated operational entity. These are over and above the one-time registration fees. The CPA inclusion cost can be about $10,000.

Each CPA also incurs annual verification fees.

Renewal of crediting period
Additional fees must be paid to the validator when renewal of the crediting period is done every 7 years. These fees may be about $5,000.

In some CDM projects, the country may take a share of the certified emission reduction credits as fees for the revenue generated from the sale of certified emission reductions. This cost will also have to be considered.

An understanding of the costs and benefits of carbon credits will help in determining the viability of the exercise.

Coverage of transaction costs
Transaction costs can be met through negotiated deals with the carbon credit buyers. Some of the ways of meeting these costs are

- agreeing on upfront payment by the buyer;
- providing carbon credit prices in the emission reduction purchase agreement;
- agreeing all transactions are done by the buyer.

Source: Asian Development Bank. 2013. Carbon Market Initiative Technical Support Facility.

Box 5: Rajasthan Urban Solid Waste Composting Program of Activities, India

Project description. The Rajasthan waste management program implemented by the Local Self Government Department (LSGD) of the Government of Rajasthan intends to address one component of solid waste management through the treatment of organic matter using an aerobic composting process. To maximize the benefits from the Clean Development Mechanism (CDM), the project has been developed as a program of activities (PoA). Small and medium-sized towns of Rajasthan are encouraged to join this program to avail of the CDM benefits and comply with the implementation of Municipal Solid Waste (MSW) Rules, 2000.

Involved organizations. The LSGD of Rajasthan is the coordinating and managing entity of the program, responsible for including each component project activity in the PoA using the program inclusion criteria.

The Asian Development Bank (ADB) provided a loan package for the Rajasthan Urban Sector Development Investment Program. This program includes composting as a major component of the investment package. ADB's Carbon Market Program is assisting the project in CDM project development. The Technical Support Facility of the Carbon Market Program has helped the project proponent develop the CDM potential of the project activity from inception.

Methodology. The project is pursuing avoidance of methane emissions through controlled biological treatment of biomass. The baseline scenario is the situation in which unsegregated mixed MSW is dumped in open dumpsites and left to decay. The decomposition of organic matter in the anaerobic conditions of the dumpsite generates methane, which is released into the atmosphere. In the CDM project activity, waste is segregated and all organic material is composted and processed under aerobic conditions. The avoidance of methane generation through this process is the emissions reduced in the project activity.

Findings and lessons learned. Developing an emission reduction project as a PoA is an effective way of reducing transaction costs on a per project basis. A CDM PoA has the advantage of being able to add projects to the program at any time during its 28-year crediting period. Each new project activity added to the program will need to comply with the project inclusion criteria as outlined in the PoA design document. Once added and validated by the third party designated operational entity, the added project does not need to be approved separately by the CDM Executive Board. This saves time and money.

The success of the project hinges on a clear directive from the leaders of the program and decisive government initiative with the issuance of their own solid waste management policy—Government of Rajasthan Solid Waste Management Policy Guidelines for Effective Implementation of MSW Rules 2000 in Urban Local Bodies of Rajasthan State. In this case, the Government of Rajasthan has a clear intention of complying with MSW Rule 2000. Despite the complexity of the project, which involves collection, segregation, transport, treatment, and disposal, the program, with support from ADB financing, made the implementation of composting possible at the level of small and medium-sized urban local bodies.

CDM validation project of the project activity by the designated operational entity has been completed successfully, and now the project is at an advanced stage of registration with the United Nations Framework Convention on Climate Change. Major lessons learned during development of this project under the CDM are as follows:

- For small-scale MSW composting project activities, the revenue from the sale of compost is very low. Because of this it is difficult for a project to sustain its operations over a long period of time. Carbon financing is very important because this additional revenue can help meet a portion of the operation and maintenance cost. Hence, carbon finance is essential

continued on next page

Box 5 *continued*

sustainability of the project activity. Programmatic (PoA) CDM is the best approach for small-scale MSW composting projects contributing to GHG emission reduction in view of its lower costs and effort compared to normal CDM project development.

Source: Asian Development Bank. 2013. Carbon Market Initiative Technical Support Facility.

of paramount concern to the CDM Executive Board; therefore only emission reductions that are measured and verified under strict conditions are acceptable. Project developers often make the mistake of underestimating the detail and cost of a proper monitoring procedure that meets the standards of the UNFCCC. Many CERs are not issued due to poor monitoring procedures, uncalibrated instruments, and lack of attention to detail.

A monitoring plan can be prepared by project proponents to ensure the CDM methodologies are being implemented in a systematic, transparent, and accurate manner and that data is easily verifiable and intelligible. A monitoring plan includes standard operating procedures developed by the project proponent that clearly define the roles and responsibilities of project staff involved in data measurement and collection (e.g., sampling of waste, process parameter monitoring, meter reading, and meter calibration); quality control (i.e., internal data review mechanisms and internal audit); data storage and protection; and training protocols. A team of technically trained staff should be assembled to execute the monitoring plan. The implementation of an effective monitoring system should include a preverification check before each crediting period and before the verification activity.

Data collection. In the context of the CDM, there are many variables that affect emission reduction and subsequently the issuance of CERs. The availability of national values for parameters, such as grid emission factors and biomass demand and supply, significantly reduce transaction costs. Having national data available at the beginning of a project reduces the amount of project-specific data gathering necessary to substantiate the calculation assumptions for the emission reductions.

For example, in wastewater projects, data requirements include chemical oxygen demand, and wastewater volume and treatment efficiency. For solid waste projects, the composition of garbage, trash particle size, organic content, landfill age, temperature, humidity, leachate pH, and toxin content all play a critical role in the design of an appropriate and sustainable disposal measure. These variables also come into play in estimating the volume of methane that will be generated in a landfill or methane that would be avoided in a compost processing facility. In developing solid waste management projects, country data on waste characteristics are a key component to the success of a waste management program. The availability of such data will not only assist in developing an appropriate waste management design, but will also facilitate the development of a CDM project activity from project design to monitoring and data verification.

Commercial terms. Buyers of carbon credits have an exhaustive agreement that has a number of commercial terms. The seller is advised to review the emission reduction purchase agreement carefully and take advice from a legal or technical expert before signing. Exit clauses and penalties must be studied carefully. It should be ensured that the buyer is bound to a committed price within a given time frame. The jurisdiction of the contract may also be confined to the host country to reduce transaction costs.

Why is a programmatic approach encouraged in urban development?

The glossary of CDM terms defines a PoA as:

> a voluntary coordinated action by a private or public entity which coordinates and implements any policy/measure or stated goal (i.e., incentive schemes and voluntary programmes), which leads to anthropogenic GHG emission reductions or net anthropogenic greenhouse gas removals by sinks that are additional to any that would occur in the absence of the PoA, via an unlimited number of CPAs. (Source: UNFCCC. 2012. Glossary: CDM Terms [Version 07.0]. http://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf)

A national program, spearheaded by a national entity, can develop a CDM PoA intended to support sustainable urban development activities. A programmatic approach is suitable when a country has a large number of small projects with similar technologies and baseline characteristics. On their own, these projects may not reach the emission reduction threshold necessary to support the transaction costs of a CDM project.

A PoA approach reduces transaction costs by allowing independent project proponents to join the program run by a coordinating and managing entity. A component project activity (CPA) can be added to the PoA by the coordinating and managing entity at any point during the time frame of the PoA. The entity informs the CDM Executive Board of the addition of a CPA or CPAs through a designated operational entity using a predefined format. Inclusion in the program is filtered by inclusion criteria established at the beginning of the program. A designated operational entity, as a third party, will validate the inclusion of an activity in the program. While the entire PoA needs to be registered and approved under the CDM Executive Board, each CPA does not need board approval.

A sample project, or initial CPA, is needed to develop the methodology for the PoA so that the program can be registered by the CDM Executive Board. The rules approved by the CDM Executive Board stipulate that a PoA can have a maximum crediting period of 28 years. The program is managed by a coordinating and managing entity such as a national agency (e.g., the Ministry), while individual CPAs are implemented by individual entities such as local governments or private firms.

The PoA can make the distribution of CDM projects among developing countries more equitable by allowing micro-scale projects to have a chance of obtaining carbon credits. Projects promoting compact fluorescent lamps, efficient cooking stoves, and electric tricycles, for example, now have an opportunity to overcome the transaction costs barrier and qualify for carbon credits. The possibility of developing PoAs that include multiple methodologies and technologies can also be explored.

V. ADB Support for Carbon Financing and Urban Development

How can ADB support developing member countries (DMCs) in accessing carbon finance?

ADB's Carbon Market Program helps DMCs access carbon finance for climate change mitigation programs in a broad range of sectors.

Carbon Market Program. One of ADB's flagship initiatives in support of climate mitigation projects, the Carbon Market Program, assists project developers in identifying potential projects and guides project managers through the CDM project cycle. The Carbon Market Program has three elements: (i) the Asia Pacific Carbon Fund, (ii) the Future Carbon Fund (FCF), and (iii) the Technical Support Facility. The Asia Pacific Carbon Fund purchased CERs up to 2012, when the first commitment period of the Kyoto Protocol ended, while the FCF purchases CERs beyond 2012 up to 2020. More details of these initiatives can be found at www.adb.org/themes/climate-change/programs-and-initiatives

Future Carbon Fund. The FCF is a trust fund established and managed by ADB on behalf of fund participants. The fund is a component of ADB's ongoing Carbon Market Program. It became operational in January 2009. The FCF seeks to (i) support and encourage energy efficiency and renewable energy projects, and other projects with long-term GHG abatement benefits beyond 2012 undertaken in DMCs; (ii) assist participants that have mandatory or voluntary GHG reduction targets and policies beyond 2012 by providing ongoing access to CERs and verifiable emissions reductions; and (iii) enhance the affordability and attractiveness of low-carbon technologies compared to conventional options by reducing the initial capital barriers of GHG mitigation projects.

ADB Technical Support Facility. This provides technical support to project sponsors within the ADB portfolio to develop CDM-eligible projects. Further, the Technical Support Facility team helps project sponsors navigate the post-2012 terrain for projects eligible for carbon credits. Other tools available from international organizations are listed in Appendix 3.

Other funds related to climate change, but not necessarily to carbon markets managed or implemented by ADB, such as the Climate Change Fund and the Climate Investment Fund, can be accessed through the following link: www.adb.org/themes/climate-change/financing

How can ADB support DMCs in low-carbon urban development?

ADB urban development specialists work closely with DMCs to develop projects that are both sustainable and meet the demands of the clients. Key investment areas include water supply, sanitation, urban transport, drainage and flood control, solid waste management, other municipal infrastructure, and capacity strengthening. During project development, ADB explores opportunities to introduce various financing instruments and scale-up good practices in low-carbon urban development.

VI. Conclusion

International climate change negotiations are continuing with the aim of limiting global GHG emissions to a level that would avoid a 2°C increase in temperature. Part of this effort involves finding a cost-effective mitigation tool for the future, and determining how carbon markets can support these efforts. In view of this evolving market, the challenge is to continue to support sustainable urban development projects with carbon financing in an increasingly fragmented post-2012 market scenario. Key considerations for continued access to carbon financing in the post-2012 context are as follows:

(i) Least developed countries (LDCs), including Bangladesh, Bhutan, and Nepal, can continue to use the CDM and explore emerging market mechanisms. A programmatic (PoA) CDM approach is recommended to reduce transaction costs. In addition, LDCs can explore future opportunities in other bilateral mechanisms and new market mechanisms that are under development.

(ii) Non-LDCs can explore future opportunities in bilateral and internal markets, as well as new market mechanisms that are under development.

APPENDIX 1

Urban Development Approaches for Low-Carbon Development

Sustainable urban development projects have high potential to reduce greenhouse gas (GHG) emissions, and hence provide opportunities to tap the carbon market. Technological options that can be considered under the Clean Development Mechanism are listed in Table A1. Solid waste projects are explained in more detail in the paragraphs that follow, as these are the most commonly utilized approaches.

Table A1: **Approved Clean Development Mechanism Methodologies**

No.	Methodology	CDM Method Number
	Solid Waste Management	
Small-Scale Methodologies		
1.	Avoidance of methane emissions through composting—Version 11.0	AMS-III.F
2.	Landfill methane recovery—Version 8.0	AMS-III.G
3.	Thermal energy production with or without electricity—Version 19.0	AMS-I.C
4.	Grid-connected renewable electricity generation—Version 17.0	AMS-I.D
5.	Methane recovery in wastewater treatment—Version 16.0	AMS-III.H
6.	Recovery and recycling of materials from E-waste—Version 1.0	AMS-III.BA
7.	Avoidance of methane emissions through excavating and composting of partially decayed municipal solid waste—Version 1.0	AMS-III.AF
8.	Methane recovery through controlled anaerobic digestion—Version 1.0	AMS-III.AO
9.	Methane oxidation layer for solid waste disposal sites—Version 1.0	AMS-III.AX
10.	Introduction of low-emission vehicles/technologies to commercial vehicle fleets—Version 3.0	AMS-III.S
11.	Introduction of bio-CNG in transportation applications—Version 1.0	AMS-III.AQ
12.	Recovery and recycling of materials from solid wastes—Version 3.0	AMS-III.AJ
Large-Scale Methodologies		
13.	Flaring or use of landfill gas—Version 13.0.0	ACM0001
14.	Treatment of wastewater—Version 5.0.0	ACM0014
15.	Mitigation of greenhouse gas emissions with treatment of wastewater in aerobic wastewater treatment plants—Version 1.0	AM0080
16.	Avoidance of landfill gas emissions by in-situ aeration of landfills—Version 1.0.1	AM0083
17.	Avoidance of landfill gas emissions by passive aeration of landfills—Version 1.0.1	AM0093

continued on next page

Table A1 *continued*

No.	Methodology	CDM Method Number
	Transport	
	Small-Scale Methodologies	
18.	Emission reductions by electric and hybrid vehicles—Version 13.0	AMS III.C
19.	Introduction of low-emission vehicles to commercial vehicle fleets—Version 4.0	AMS III.S
20.	Cable cars for mass rapid transit system—Version 1.0	AMS III.U
21.	Transportation energy efficiency activities using retrofit technologies—Version 1.0	AMS III.AA
22.	Transport energy efficiency activities using post-fit idling stop device— Version 2.0	AMS III. AP
23.	Introduction of Bio-CNG in transportation applications—Version 1.0	AMS III. AQ
24.	Transportation energy efficiency activities installing digital tachograph systems to commercial freight transport fleets—Version 2.0	AMS III.AT
25.	Introduction of LNG buses to existing and new bus routes—Version 1.0	AMS III.Y
26.	Emission reductions through improved efficiency of vehicle fleets—Version 1.0	AMS III.BC
	Large-Scale Methodologies	
27.	Mass rapid transit projects	ACM0016
28.	Bus Rapid Transit Projects	AM0031
29.	Modal shift in transportation of cargo from road transportation to water or rail transportation	AM0090
30.	High-speed passenger rail systems	AM0101
31.	Modal shift in transportation of liquid fuels	AM0110
	Urban Energy Efficiency	
	Small-Scale Methodologies	
32.	Demand-side energy efficiency activities for specific technologies—Version 14.0	AMS II.C
33.	Energy efficiency and fuel switching measures for buildings—Version 10.0	AMS II.E
34.	Demand-side activities for efficient lighting technologies—Version 4.0	AMS II.J
35.	Demand-side activities for efficient outdoor and street lighting technologies—Version 1.0	AMS II.L
36.	Demand-side energy efficiency activities for installation of low-flow hot water savings device—Version 1.0	AMS II.M
37.	Demand-side energy efficiency activities for installation of energy efficient lighting and/or controls in buildings—Version 1.0	AMS II.N
38.	Dissemination of energy efficient household appliances—Version 1.0	AMS II.O
39.	Energy efficiency and renewable energy measures in new residential buildings—Version 1.0	AMS III.AE

continued on next page

Table A1 *continued*

No.	Methodology	CDM Method Number
40.	Substituting fossil fuel based lighting with LED/CFL lighting systems— Version 4.0	AMS III.AR
41.	Electrification of rural communities by grid extension—Version 1.0	AMS III.AW
Large-Scale Methodologies		
42.	Distribution of efficient light bulbs to households	AM0046
43.	Installation of zero energy water purifier for safe drinking water application	AM0086
44.	Energy efficiency technologies and fuel switching in new buildings	AM0091
45.	Energy efficiency in data centers through dynamic power management	AM0105

CDM = Clean Development Mechanism, CFL = compact fluorescent lamp, CNG = compressed natural gas, LED = light-emitting diode, LNG = liquefied natural gas, No. = number.

Source: United Nations Framework Convention on Climate Change Clean Development Mechanism: http://cdm.unfccc.int

A. Small-Scale Methodologies

Avoidance of methane emissions through composting (AMS-III.F). This methodology comprises measures to avoid the emission of methane to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site (SWDS), in an animal waste management system, or in a wastewater treatment system. Controlled biological treatment of biomass or other organic matter is introduced through aerobic treatment by composting and proper soil application of the compost. This methodology includes construction and expansion of treatment facilities, as well as activities that increase capacity utilization at an existing facility. It is also applicable for co-composting wastewater and solid biomass waste, where wastewater would otherwise have been treated in an anaerobic wastewater treatment system without biogas recovery.

Landfill methane recovery (AMS-III.G). This methodology comprises measures to capture and combust methane from landfills (i.e., SWDSs) used for the disposal of residues from human activities, including municipal, industrial, and other solid wastes containing biodegradable organic matter. This methodology is not applicable if the management of the SWDS is deliberately changed in order to increase methane generation, compared to the situation before the implementation of the project activity (e.g., other than to meet a technical or regulatory requirement). Such changes may include, for example, the addition of liquids to a SWDS, pretreating waste to seed it with bacteria for the purpose of increasing the rate of anaerobic degradation of the SWDS, or changing the shape of the SWDS to increase methane production.

Thermal energy production with or without electricity (AMS-I.C). This methodology comprises renewable energy technologies that supply users with thermal energy to displace fossil fuel. These units include technologies such as solar thermal water heaters and dryers, solar cookers, deriving energy from renewable biomass, and other technologies that provide thermal energy that displaces fossil fuel. Energy production using biomass-based cogeneration systems is eligible. Electricity or heat is supplied to a captive use and/or to other facilities. Electricity can also be supplied to the grid. If solid biomass is used, it has to be demonstrated that solely renewable biomass is used. If charcoal or biomass fuel is used, all project or leakage emissions (e.g., release of methane) from fuel production have to be considered.

Grid-connected renewable electricity generation (AMS-I.D). This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal and wave, wind, geothermal, and renewable biomass units that supply electricity to (i) a national or a regional grid, or (ii) an identified consumer facility via the national or regional grid through a contractual arrangement such as wheeling [the transportation of electric power over transmission lines]. Typical projects include construction and operation of a power plant that uses renewable energy sources and supplies electricity to the grid (greenfield power plant), or retrofit, replacement, or capacity addition of an existing power plant that uses renewable energy sources and supplies electricity to the grid.

Methane recovery in wastewater treatment (AMS-III.H). This methodology comprises recovery of biogas resulting from anaerobic decay of organic matter in wastewater through the introduction of an anaerobic treatment system for wastewater and/or sludge treatment. Anaerobic lagoons should be deeper than 2 meters; without aeration; with ambient temperature above 15°C, at least during part of the year, on a monthly average basis. The minimum interval between two consecutive sludge removal events shall be 30 days. The recovered biogas may also be utilized for the following applications instead of combustion or flaring: (i) thermal or mechanical electrical energy generation directly; (ii) thermal or mechanical electrical energy generation after bottling of upgraded biogas; (iii) thermal or mechanical electrical energy generation after upgrading and distribution; (iv) hydrogen production; or (v) use as fuel in transportation applications after upgrading.

Recovery and recycling of materials from E-waste (AMS-III.BA). This methodology comprises collection and recycling activities of E-waste performed in dedicated facilities with the aim of recovering materials such as ferrous metals, nonferrous metals, and plastics. E-waste contains rare and precious metals that require specific technologies to extract and refine them. These materials are recovered and processed into secondary materials, thus displacing the production of virgin materials, thereby resulting in energy savings and GHG emission reduction.

Avoidance of methane emissions through excavating and composting of partially decayed municipal solid waste (AMS-III.AF). This methodology comprises avoidance of methane emissions from MSW that is already deposited in a closed SWDS without methane recovery. Due to the project, non-inert material will be composted through pre-aeration, excavation, and separation of the MSW in the closed SWDS, so that methane emissions will be avoided. In the project activity, methane emissions will be avoided by applying the following sequential measures or steps: (i) aerobic pretreatment by aerating the existing SWDS to achieve a safe operation environment for the subsequent excavation; (ii) excavating the MSW from the SWDS and separating it into inert and non-inert materials, with the excavation phase commencing immediately after the pre-aeration phase, i.e., without significant time lag; and (iii) composting the non-inert material, and proper soil application of the compost. This methodology is applicable if the aerobic pretreatment is realized either through high-pressure air injection enriched with oxygen (20%–40% volume) or low-pressure aeration using ambient air. The existing regulations do not require the capture and flaring of landfill gas of closed SWDS. The composting process is carried out in enclosed chambers or roofed sites; outdoor composting is not applicable.

Methane recovery through controlled anaerobic digestion (AMS-III.AO). This methodology comprises measures to avoid the emissions of methane to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in an SWDS, an animal waste management system, or a wastewater treatment system. The project activity is the controlled biological treatment of biomass or other organic matters through anaerobic digestion in closed reactors equipped with biogas recovery and a combustion

or flaring system. Project activities treating animal manure as single source substrate shall apply AMS-III.D; similarly, projects only treating wastewater and/or sludge generated in the wastewater treatment works shall apply AMS-III.H. The project activity does not recover or combust landfill gas from the disposal site (unlike AMS-III.G), and does not undertake controlled combustion of the waste that is not treated biologically in a first step (unlike AMS-III.E).

Methane oxidation layer for solid waste disposal sites (AMS-III.AX). This methodology is applicable to project activities involving the construction of a methane oxidation layer (MOL) on top of a municipal SWDS to avoid the release of methane through biological oxidation in the MOL. It is applicable where landfill gas collection and treatment is not possible due to low concentration of landfill gas or other reasons. It is not applicable for SWDS with an active gas extraction system, that are still receiving wastes for disposal, or where a MOL is required by legal regulation.

Introduction of low-emission vehicles and/or technologies to commercial vehicle fleets (AMS-III.S). This methodology comprises introduction and operation of new less-GHG-emitting vehicles (e.g., compressed natural gas [CNG], liquefied petroleum gas [LPG], electric, or hybrid) for commercial passengers and freight transport, operating on routes with comparable conditions. Retrofitting of existing vehicles (e.g., switching from high GHG intensive to low GHG intensive fossil fuel) is also included in the methodology. Types of low-emission vehicles to be introduced include CNG vehicles, electric vehicles, LPG vehicles, and hybrid vehicles with electrical and internal combustion motive systems. Types of vehicles covered by the methodology include buses, jeepneys, commuter vans and tricycles for public transport, and trucks for freight transport, waste collection, or other services with regular routes.

Introduction of bio compressed natural gas in transportation applications (AMS-III.AQ). This methodology comprises activities for the production of biogenic CNG (bio-CNG) from renewable biomass and its use in transportation applications. The bio-CNG is derived from various sources such as biomass from dedicated plantations, wastewater treatment, manure management, and biomass residues. The project activity involves installation and operation of a bio-CNG plant that includes (i) anaerobic digesters to produce and recover biogas; (ii) a biogas treatment system that includes processing, purification, and compression of the biogas to obtain upgraded biogas, such that methane content, its quality, and its physical and chemical properties are equivalent to the CNG; or (iii) filling stations, storage, and transportation.

Recovery and recycling of materials from solid wastes (AMS-III.AJ). High-density polyethylene, low-density polyethylene, and polyethylene terephthalate plastic materials are recycled from MSW and processed into intermediate or finished products (e.g., plastic bags). The recycling process may be accomplished manually and/or using mechanical equipment, and includes washing, drying, compacting, shredding, and pelletizing.

B. Large-Scale Methodologies

Flaring or use of landfill gas (ACM0001). This is the capture of landfill gas and its flaring and/or use to produce energy and supply consumers through a natural gas distribution network. This methodology is applicable to project activities that (i) install a new landfill gas capture system in a new or existing SWDS; (ii) make an investment in an existing landfill gas capture system to increase the recovery rate or change the use of the captured gas, provided that (a) the captured gas was vented or flared and not used prior to the implementation of

the project activity; and (b) in the case of an existing active landfill gas capture system for which the amount of gas cannot be collected separately from the project system after the implementation of the project activity, and its efficiency is not impacted on by the project system, historical data on the amount of landfill gas captured and flared is available; (iii) flare the landfill gas and/or use the captured gas in any (combination) of the following ways: (a) generating electricity; (b) generating heat in a boiler, air heater, or kiln (brick firing only) or glass-melting furnace; and/or (c) supplying the landfill gas to consumers through a natural gas distribution network; and (iv) do not reduce the amount of organic waste that would be recycled in the absence of the project activity.

Treatment of wastewater (ACM0014). This involves treatment of industrial wastewater in a new anaerobic digester, capture, and flaring or utilizing of the generated biogas for electricity or heat generation; dewatering of industrial wastewater and application to land; or treatment of industrial wastewater in the same treatment plant as in the baseline situation, but treatment of the sludge from primary and/or secondary settler either in a new anaerobic digester, or treatment of sludge under clearly aerobic conditions. The methodology is applicable to the following scenarios: (i) the wastewater is not treated, but directed to open lagoons that have clearly anaerobic conditions. In cases where solid materials are separated before directing the wastewater to the open lagoons, the solid materials have a different treatment than the wastewater; or (ii) the wastewater is treated in a wastewater treatment plant. Sludge is generated from primary and/or secondary settlers. The sludge is directed to sludge pits that have clearly anaerobic conditions.

Mitigation of greenhouse gas emissions with treatment of wastewater in aerobic wastewater treatment plants (AM0080). This methodology is applicable to project activities implementing a new aerobic wastewater treatment plant for the treatment of domestic and/or industrial wastewater, with sludge treated either in the same manner as the baseline, or in a new anaerobic digester with biogas capture. The biogas is flared and/or used to generate electricity and/or heat. The project either replaces an existing anaerobic open lagoon system, with or without conversion of the sludge treatment system, or is an alternative to a new, to-be-built anaerobic open lagoon system.

Avoidance of landfill gas emissions by in-situ aeration of landfills (AM0083). This methodology applies to project activities where landfilled waste is treated aerobically on-site by means of air venting (overdrawing) or low-pressure aeration, with the objective of avoiding anaerobic degradation processes and achieving aerobic degradation. By aeration of the landfilled waste, landfill gas emissions are avoided.

Avoidance of landfill gas emissions by passive aeration of landfills (AM0093). This methodology applies to project activities that treat landfilled waste on-site by means of passive (semi-aerobic) aeration with the objective of avoiding anaerobic degradation processes and achieving aerobic degradation. By aerating the landfilled waste, landfill gas emissions are avoided. The methodology is applicable under the following conditions: (i) treatment of landfilled waste is in closed landfills or closed landfill cells; (ii) if mandatory environmental regulations require the collection and flaring of landfill gas, the corresponding compliance rate is below 50% in the host country; (iii) closed cells of operating landfills might be eligible as long as they are physically distinct from the remaining parts of the landfill; or (iv) the distance between vertical venting wells should not be more than 40 meters.

APPENDIX 2

Clean Development Mechanism Project Implementation Cycle

Clean Development Mechanism Cycle Activity	Time Frame
Project identification and preliminary Clean Development Mechanism (CDM) assessment	1–4 weeks
Submission of Prior Consideration of the CDM form to United Nations Framework Convention on Climate Change (UNFCCC) and host country designated national authority (within 6 months of project start date)	1 day
Preliminary project data collection and preparation of project information note	2–4 weeks
Detailed project data collection and preparation of CDM project design document (PDD) as per UNFCCC requirements and guidelines	3–8 months[a]
CDM host country approval or Letter of Agreement process (with submission of PDD or project information note to the designated national authority)	3–8 months[b] (parallel activity)
Project validation by an independent, UNFCCC-accredited designated operational entity	4–18 months
CDM registration process of UNFCCC CDM Executive Board	3–6 months
Monitoring of project activity by project proponent as per CDM–PDD monitoring plan	Continuous
Project verification by designated operational entity and certified emission reduction issuance by UNFCCC CDM Executive Board.	4–8 months

[a] These timelines are indicative only for a project where no new methodology development or clarification is required.
[b] Host country approval or Letter of Agreement process subject to host country designated national authority and its parallel with CDM documentation / validation process

Source: Asian Development Bank. 2013. Carbon Market Initiative Technical Support Facility.

APPENDIX 3

Other Tools from International Organizations

United Nations Framework Convention on Climate Change Clean Development Mechanism help desk. In August 2012, the Clean Development Mechanism (CDM) Executive Board launched a CDM help desk targeted at designated national authorities in least developed countries (LDCs) and underrepresented regions to support them in developing CDM projects. In September 2012, a second CDM help desk was created to support CDM project developers, coordinating and managing entities, and designated national authorities. The initiative is aimed at LDCs with fewer than 10 registered projects, including Bangladesh, Bhutan, and Nepal. Any queries regarding the latest guidelines, procedures, and rules, including issues with CDM projects, can be answered by the help desk. Inquiries can be e-mailed to CDM-HelpDesk@unfccc.int. All questions will be acknowledged and responded to within 15 working days by the help desk team.

Clean Development Mechanism Loan Scheme. The United Nations Environment Programme Risoe Centre and the United Nations Office for Project Services jointly operate the CDM Loan Scheme on behalf of the United Nations Framework Convention on Climate Change. A zero interest loan is provided for CDM projects in LDCs (Bangladesh, Bhutan, and Nepal), as well as those non-LDCs that have fewer than 10 registered projects. The loan is intended to cover all CDM-related transaction costs, such as writing the project design document, validation, and registration. To date, the majority of loans approved have been for programs of activities from various LDCs.

New Mechanism Information Platform. The Government of Japan, under the Ministry of the Environment, has initiatives to support the CDM and other new mechanism projects by providing support for feasibility studies. Information on support programs is available at www.mmechanisms.org/e/index.html

Financing Low-Carbon Urban Development in South Asia
A Post-2012 Context

The cities of South Asia are growing at an unprecedented rate, and there is potential to steer this development onto a sustainable and green path. Carbon financing serves as a valuable revenue source to help cities earn additional income to support low-carbon development. With the end of the first commitment period of the Kyoto Protocol on 31 December 2012, a fragmented international carbon market now exists with various approaches to reducing greenhouse gas emissions outside the national borders of Annex I (industrialized) countries. Considering the potential for low-carbon development in South Asia, there is a need to help countries understand and navigate this new international carbon market. This guidance note (i) provides an overview of the carbon financing market in the post-2012 context, (ii) guides readers on how to access carbon finance, and (iii) highlights good practices in low-carbon urban development. It is aimed at government officials and project developers throughout South Asia, and is structured in a question-and-answer format for quick and easy reference.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor: 1.7 billion people who live on less than $2 a day, with 828 million struggling on less than $1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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