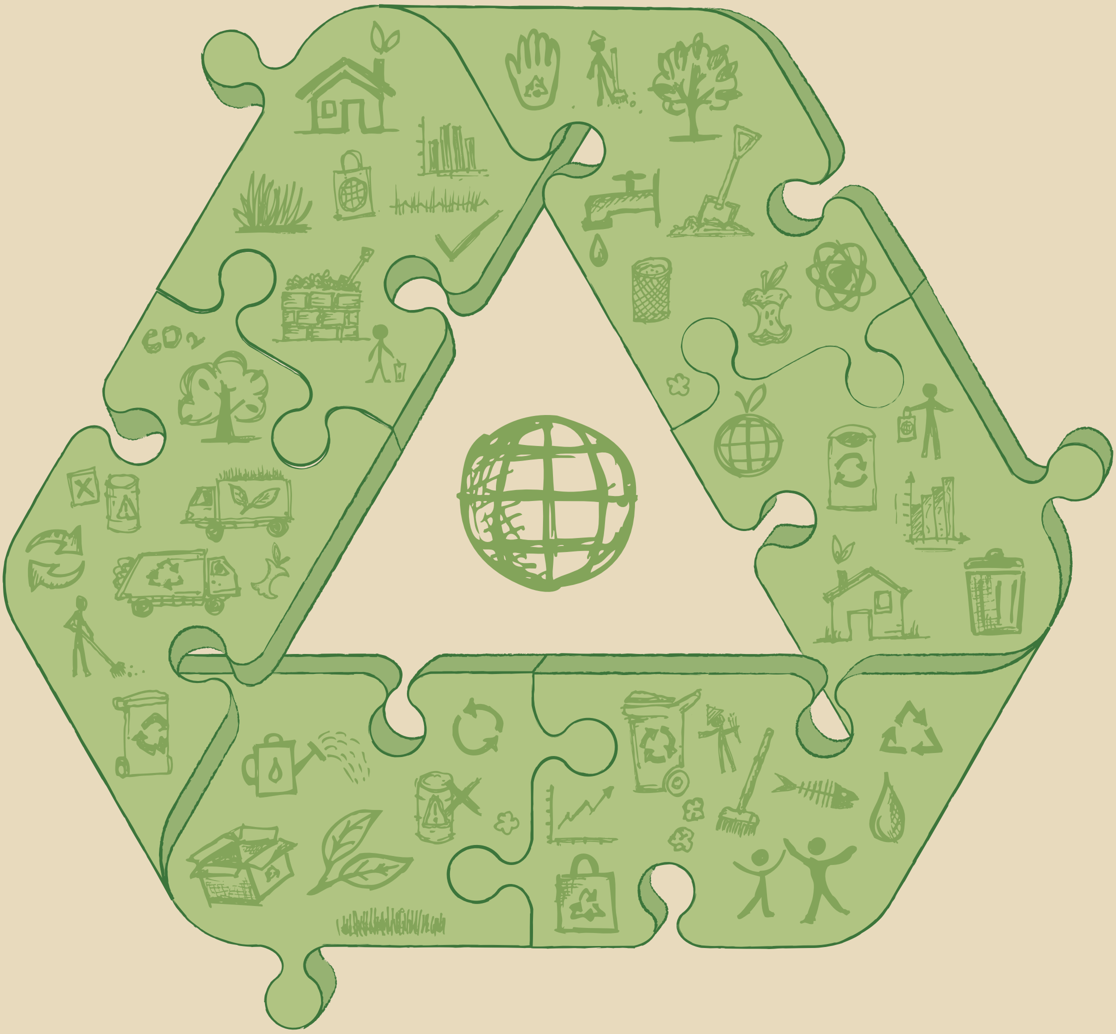
Valuing the sustainable development co-benefits of climate change mitigation actions

The case of the waste sector and recommendations for the design of nationally appropriate mitigation actions (NAMAs)



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The aim of this paper is to provide guidance to policy-makers and practitioners in the quantification and monetization of co-benefits of climate change mitigation, using the waste sector as a case study, and recommendations for the design of effective nationally appropriate mitigation actions (NAMAs). As a next step, we would like to see a take-up of key concepts expressed in the paper in actual NAMA design activities. The authors believe that the guidance provided in this paper is relevant for NAMA designers as well as supporters as the recognition of co-benefits in the design effort is likely to create financial leverage.

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List of abbreviations

3R	reduce, reuse, recycle
BUR	biennial update report
CDM	clean development mechanism
CER	certified emission reduction
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COP	conference of the parties
DALY	disability-adjusted life-year
DFID	Department for International Development, UK
DNA	designated national authority
GHG	greenhouse gas
ICA	international consultation and analysis
ICROA	International Carbon Reduction and Offset Alliance
IGES	Institute for Global Environmental Strategies
ILO	International Labour Organization
IMF	International Monetary Fund
INDC	intended nationally determined contribution
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
IRRC	integrated resource recovery centre
LCA	life-cycle assessment
MDG	millennium development goal
MRV	monitoring, reporting and verification
NAMA	nationally appropriate mitigation action
OECD	Organization for Economic Co-operation and Development
REN21	Renewable Energy Policy Network for the 21st Century
SDG	sustainable development goal
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UN ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UNU	United Nations University

EXECUTIVE SUMMARY

Nationally appropriate mitigation actions (NAMAs) have gained increasing interest as a tool for countries to promote climate change mitigation actions in the context of national sustainable development strategies. NAMAs have the potential to be a meaningful and powerful driver of sustainable development in developing countries. In order to do so, NAMAs should maintain or improve what has worked within the clean development mechanism (CDM) and address its limitations.

The CDM has been particularly successful with projects with high relative greenhouse gas (GHG) emission reductions (such as large scale industrial projects), but did not work for projects with high "co-benefits" (such as small-scale community-based projects). One of the reasons for this is that the CDM only monetizes GHG emission reductions. However, this is just one source of "value to society". Good projects have many other sources of value that should be unlocked, recognized, quantified and, if possible, monetized.

In this context, we believe that a meaningful framework for the promotion of projects with a high degree of co-benefits, via valuing co-benefits and getting the incentives right, ought to be at the centre of NAMA design. Such an approach holds considerable relevance in the context of both the United Nation Framework Convention on Climate Change (UNFCCC) and the global sustainability agenda, including the post-2015 development agenda.

What drives mitigation actions and the reporting of the impacts or effects of these actions in national communications under the UNFCCC is the sustainable development benefits. For most developing countries and to a large extent donor communities as well as the private sector, the potential of projects, programmes and/or policies to deliver tangible co-benefits forms the basis of investment decision making. Co-benefits serve to strengthen the political case for NAMAs, drive intended nationally determined contributions (INDCs) and the desire to obtain international support to design and finance mitigation actions that deliver mitigation and development benefits.

Moreover, the implementation of the Rio+20 outcomes and the post-2015 development agenda will require decision-making processes and policy formulation to highlight the contribution of policies towards the achievement of various development goals, rather than focusing on sector-specific goals. A framework for identifying and quantifying co-benefits can therefore play an important role in this respect.

One of the sectors with the greatest opportunities for co-benefits is waste management, which is a major problem in developing countries. Prevailing solid waste management practices typically consist of end-of-pipe solutions, such as open dumping and uncontrolled landfilling, which not only lead to methane emissions from untreated waste streams, but also to significant environmental, social and economic impacts in the local context. These negative impacts include, for example, environmental degradation around disposal sites, the spread of disease vectors, and the high costs incurred by municipal governments in collecting and disposing of waste.

While the share of the waste sector in terms of greenhouse gas emissions is relatively small compared to other sectors such as energy supply, the sustainable development co-benefits associated with certain reduce, reuse and recycle (3R) approaches are potentially very large. Experiences in implementing small-scale, decentralized and pro-poor solid waste management in developing countries have shown that they can generate a broad number of co-benefits, such as green job creation, improved health, improved waste collection, cost savings from reduced need for landfilling, and improved crop yields through the use of compost, among others. In the case of composting projects in selected developing countries in Asia-Pacific it was calculated that these **co-benefits can be as high as US$ 184.21 per ton of CO_2e reduced**. The promotion of such projects calls for the need to value and quantify the associated co-benefits in order to give greater substantiation to decision-making and policy design, including NAMAs.

Based on the observations above, the paper proposes four key principles for the design of NAMAs.

NAMA Design Principle No 1: A successful NAMA is driven by the value it generates towards domestic policy priorities

We argue that a successful NAMA is one that is driven by domestic public and private interests unrelated to climate mitigation. From the perspective of the public sector, such interests are related to the creation of valued “social assets”, public goods which the public sector is interested in or would have funded (at a higher cost) anyhow. From the perspective of the private sector, such interests are related to strategic business objectives, such as profits, increased market share or innovation/product differentiation opportunities.

NAMA Design Principle No 2: A successful NAMA has a mechanism to transfer value from those that benefit to those that create the benefit

Barriers to the implementation of projects that are high on co-benefits are related to a failure to monetize the value (in terms of willingness to pay) of such co-benefits/social assets. A successful NAMA therefore must provide mechanisms that:

a) Assess and quantify the co-benefits associated with mitigation actions identified;
b) Establish who is willing to pay for the provision of such co-benefits/social assets;
c) Determine their willingness to pay per “unit” of created co-benefit/social asset, and
d) Facilitate a transaction of this willingness to pay to the producer of these co-benefits.

A common approach to assessing the possible willingness to pay for co-benefits is to identify existing spending for the generation of such co-benefits within the current public budget, or, to the extent that the generation of such co-benefits is privately funded, via private spending. In relation to private interests, private sector entities will take action as soon as an investment-enabling environment has been created by the NAMA. This includes the provision of direct monetary incentives as well as indirect incentives, including removal of investment barriers.

What is therefore required is a mechanism that transforms society's valuation (willingness to pay) for those benefits to project implementers. We have identified a number of existing mechanisms that could be used to implement such transfers in the waste sector:

- **Tipping fees**: a payment by waste producers to a waste management company.
- **Feed-in-tariffs**: a payment by electricity utilities to reward production of electricity from waste.
- **Tax exemptions**: a waiver of taxes or fees on profits, income or imports of equipment for low carbon waste management investment projects.
- **Subsidies**: a grant or low interest loan to co-finance the implementation of low carbon waste management projects.
- **Carbon credit payments**: a financial payment against the delivery of certified emission reduction credits from waste management projects, with a premium on co-benefits created by the project.
- **Pay for performance schemes**: a different kind of results-based payments to reward the production of co-benefits from waste-sector mitigation actions.

NAMA Design Principle No 3: A successful NAMA requires cooperation between the agencies that are expected to benefit from the generation of impacts which are within their jurisdiction and the NAMA designing agency that coordinates the transfer of incentives to implementers of mitigation actions

In almost all cases, control over existing spending for the generation of these co-benefits will reside in a government institution different from the one that is in charge of NAMA implementation (or in case of international support within a development budget not related to climate). This implies that the design of a successful NAMA requires cooperation between those agencies that are expected to benefit from it via the generation of co-benefits whose provision falls under their jurisdiction.

At the same time, it will be critical to provide adequate financial support to leverage the role of sub-national actors in the design and implementation of NAMA activities. In the waste sector, in particular, the responsibility of waste management lies with local governments but no or little resources are transferred to local governments, while the ability of local governments to raise revenues is very limited.

NAMA Design Principle No 4: NAMA designers in government need to ensure that NAMA incentives are tangible, accessible and substantial enough to grab the attention of decision-makers

NAMA incentives must be “easier to get” (fast, simple process) and more “bankable” than CDM carbon credits. Related to this is the requirement that the institutional framework in charge of delivering incentives to investors is predictable, transparent and accessible. Institutional arrangements should facilitate rapid start-up, be integrated into domestic policy, local objectives and international climate finance. Eligibility criteria should go beyond project-level additionality; they should be accessible for every action that contributes to achieving the voluntary targets defined within the NAMA. Incentive payments to investors should be accounted for with simplified (compared to CDM) monitoring, reporting and verification (MRV) as leakage risks within the larger NAMA system are inherently lower.

In conclusion, we argue for a more systematic evaluation of co-benefits, and their monetization and integration into decision-making, in order to promote mitigation actions high in co-benefits, such as pro-poor and community-based waste-to-resource projects. Climate financing could play a catalytic role in incentivizing investments into such projects and properly-designed NAMAs should remove the barriers that currently hamper their up-take. A framework for quantifying and monetizing co-benefits would also hold considerable relevance in the context of both the UNFCCC and the global sustainability agenda, including the post-2015 development agenda. The methodological approach presented in this paper has been developed with the aim to provide a useful tool for policy-makers in developing countries and in the hope that it will be adopted in the design and implementation of current and future NAMAs.

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1. Terminology

Various terms are used in the literature to describe the benefits associated with climate mitigation policies including co-benefits, ancillary benefits, side benefits, secondary benefits, collateral benefits, and associated benefits. The IPCC first offered a definition in its third Assessment Report on Mitigation, as follows: *"Co-benefits" are the benefits from policy options implemented for various reasons at the same time, acknowledging that most policies resulting in GHG mitigation also have other, often at least equally important, rationales. "Ancillary benefits" are the monetized secondary, or side benefits of mitigation policies on problems such as reductions in local air pollution associated with the reduction of fossil fuels, and possibly indirect effects on congestion, land quality, employment, and fuel security*.[1] In other words, it distinguished between "co-benefits", as the intended positive side effects of a policy, from "ancillary benefits" or the unintended positive side effects.

This paper does not attempt to provide a definition of co-benefits. The term co-benefits in this paper shall refer to all the potential developmental benefits of climate change mitigation actions in areas other than GHG mitigation (i.e. both "co-benefits" and "ancillary benefits" in the IPCC definition).

2. Incentivizing climate change mitigation action in developing countries: The case for valuing co-benefits

2.1 Introduction

Anthropogenic GHG emissions are intricately linked to the structure of consumption patterns and levels of activity, which themselves are driven by a wide range of non-climate-related policy interests, including air quality, public health, energy security, poverty reduction, urban and rural development, etc.[2] Therefore, there are common drivers behind GHG mitigation policies and several developmental policies, and multiple benefits associated with them.

In most cases, however, and in particular in developing countries, climate change mitigation may not be the overarching goal. Other sustainable development priorities, such as poverty reduction, local economic development, health or basic service provision, constitute key development goals. Therefore, the success of climate change mitigation efforts in developing countries may to a great extent lie in their ability to capitalize on the synergies between climate protection and developmental priorities, and to advance sustainable development goals.

The clean development mechanism (CDM) was established as a flexibility mechanism under the Kyoto Protocol with two primary objectives: on the one hand, assist Annex I parties (developed countries) achieve their reduction commitments, and, on the other hand, assist non-Annex I parties (developing countries) achieve sustainable development while contributing to the objectives of the United Nations Framework Convention on Climate Change (UNFCCC).

The CDM has been extremely successful in mobilizing thousands of climate change mitigation projects in developing countries and promoting cost-effective GHG abatement. In this context, an often-overlooked fact is that the vast majority of the capital expenditure of CDM projects was financed with private capital, originating from developing countries. The "international support payment" in the form of carbon credits was an incremental addition to the cash flow of a project that catalyzed the redirection of these funds into low carbon investments.

However, the CDM has also attracted some criticism, including on its limitations in delivering the "sustainable development dividend", particularly in relation to controversial large-scale industrial gas abatement projects and large hydropower generation schemes.[3] Due to high transaction costs under the CDM, stand-alone and small-scale projects with very high social and environmental benefits have been unable to take advantage of the opportunities offered by the compliance market. The CDM, hence, has worked well for projects with large GHG emission reduction potential, but not necessarily for those with a high degree of co-benefits.

Recently, there has been growing interest in nationally appropriate mitigation actions (NAMAs) as a tool for countries to promote climate change mitigation actions in the context of national sustainable development strategies. NAMAs have the potential to be a meaningful and powerful driver of sustainable development in developing countries. In order to do so, NAMAs should maintain or improve what has worked within the CDM and address its limitations. In this context, we believe that a meaningful framework for the promotion of projects with a high degree of co-benefits via valuing co-benefits and getting the incentives right ought to be at the center of NAMA design.

One of the sectors with the greatest opportunities for co-benefits in the short-term is waste management. Urban waste is a major problem in developing countries. Prevailing solid waste management practices typically consist of end-of-pipe solutions, such as open dumping and uncontrolled landfilling, which not only lead to methane emissions from untreated waste streams, but also to significant environmental, social and economic impacts in the local context. These negative impacts include, for example, the environmental degradation around disposal sites, the spread of disease vectors that may spill over to local populations, and the high costs incurred by municipal governments in collecting and disposing of waste.

While the share of the waste sector in terms of greenhouse gas emissions is relatively small compared to other sectors such as energy supply, the sustainable development co-benefits associated with certain reduce, reuse and recycle (3R) approaches are potentially very large.

Community-based and pro-poor approaches to waste management can bring multiple benefits in a cost effective manner. Proper disposal is still very expensive for most cities in developing countries, but such high costs coupled with low labour costs open up considerable opportunities for 3R solutions at the community level.[4]

This paper uses the case of the waste sector to illustrate the co-benefits associated with certain typologies of projects, provide suggestions for their quantification and monetization and draw recommendations for the design of NAMAs, including the role of government.

2.2 Quantifying co-benefits

Ample literature exists on the co-benefits of climate change mitigation and low-emission development strategies. Not many studies, however, have attempted to quantify co-benefits, and very few have done so in a systematic way.

The co-benefits that have been more extensively discussed are those at the interface between climate change mitigation and local air pollution policies, and in particular in terms of improved human health and avoided costs resulting from synergies between policies.[5]

A study conducted by the Netherlands Environmental Assessment Agency for the Organization of Economic Co-operation and Development (OECD), for example, found that measures to reduce emissions of greenhouse gases to 50 per cent of 2005 levels, by 2050, can reduce the number of premature deaths from the chronic exposure to air pollution by 20 to 40 per cent.[6]

The International Monetary Fund (IMF) has calculated, for the top twenty emitting countries, how much pricing of carbon dioxide emissions is in their own national interests considering domestic co-benefits, showing that nationally efficient prices are substantial (US$57.5 per ton of CO_2 on average) reflecting primarily co-benefits from reduced air pollution.[7] The study also showed that pricing co-benefits would reduce CO_2 emissions from the top twenty emitters by 13.5 per cent.[8]

Some studies have focused primarily on the health co-benefits. A study conducted by *The Lancet*, a leading medical journal, for the 2009 COP-15 in Copenhagen highlighted the health benefits of tackling climate change, in particular in areas such as household energy emissions, urban land transport, or low-carbon electricity generation.[9] In India, for example, replacing inefficient cookstoves with improved and low-carbon technologies would reduce the risk of acute respiratory tract infections, chronic respiratory and heart disease by one sixth by 2020.[10] Similarly, cutting emissions through non-motorized transport would bring a 10-25 per cent cut in heart disease and stroke, and a 6-17 per cent reduction in diabetes in Delhi. Reduction in car travel would also reduce road traffic injuries by a third.[11]

Other studies have focused on the job creation potential of climate change mitigation. The United Nations Environment Programme (UNEP) and the International Labour Organization (ILO) have analyzed the employment dimensions of a shift towards a green economy through their work on green jobs.[12] It is estimated that in Bangladesh there is a potential of 212,753 jobs associated with core environment related or green jobs in the waste management and recycling sector.[13] Other organizations, notably the Renewable Energy Policy Network for the 21st Century (REN21) and the International Renewable Energy Agency (IRENA), regularly review developments in the world of renewable energy, including in terms of employment generation.

Very few studies exist, however, attempting to quantify co-benefits associated with climate change mitigation in a comprehensive and systematic manner.

A study conducted by Ecofys and financed by the UK Department for International Development (DFID), for example, has analyzed and quantified the co-benefits of private investment in climate change mitigation and adaptation in developing countries, focusing on job creation, health improvements, rural electrification, energy security and gender equality, through a number of case studies.[14]

A study conducted by Net Balance for the Gold Standard Foundation examined 109 projects certified by the standard and estimated the value of the economic, environmental and social co-benefits generated, which amounted to an estimated US$686 million.[15] These co-benefits are highly valued in voluntary carbon markets and have allowed many of the projects certified by the standard to fetch premium prices.

Similarly, a study conducted by Imperial College London and the International Carbon Reduction and Offset Alliance (ICROA) estimated, on the basis of 59 projects surveyed, that carbon-reduction projects generate additional economic, social and environmental benefits beyond climate protection of about US$664 per metric ton of emissions.[16] The lion’s share of this estimate came from environmental benefits, including ecosystem services, valued at US$609 per metric ton of emissions.[17]

A number of tools have been proposed for the assessment of co-benefits in various sectors, including the waste sector.

The United Nations University (UNU), for example, has developed co-benefits evaluation tools for the transport, urban energy and urban waste management sectors. The “Co-benefits Evaluation Tool for Municipal Solid Waste”, allows evaluating the co-benefits of municipal solid waste management technologies using a life-cycle assessment (LCA) approach.[18] The tool considers the environmental impacts associated with climate change, air pollution and wastewater. The analysis is also accompanied by the energy recovery implications of the various scenarios and a cost-benefit analysis assessment.

Similarly, the United Nations Development Programme (UNDP) has released the "Nationally Appropriate Mitigation Action (NAMA) Sustainable Development Evaluation" tool, which allows users to evaluate the sustainable development performance indicators and sustainable development results achieved over the lifetime of the NAMA. NAMA sustainable development benefits are quantified using nationally appropriate improvements and are calculated for each indicator to evaluate the co-benefits of each intervention for a specific monitoring period.[19]

Some national governments have also developed their own methodologies. The Ministry of Environment of Japan, for example, has prepared a "Manual for the Quantitative Evaluation of the Co-benefits Approach to Climate Change", which identified three tiers of evaluation methodologies, based on the availability of data, ranging from a qualitative evaluation (tier 1) to a quantitative evaluation based on measured data (tier 3).[20] The tool allows assessing a number of co-benefits in the waste sector, such as improvements in waste collection, reduction in waste going to landfill, and decreases in water pollution or offensive odours.

In addition, the Ministry of Environment and Sustainable Development of Colombia has developed a methodology to assess the co-benefits of climate change mitigation actions as part of their Low Carbon Development Strategy, under which ten mitigation measures had been identified, including two in the waste sector (reduction of organic waste going to landfill and wastewater treatment). In the case of the reduction of organic waste going to landfill, for example, the methodology estimates the increase in the lifespan of the landfill as well as avoided costs for the treatment of leachate.[21]

All the studies and tools reviewed are useful in identifying, and in some instances quantifying, specific sets of co-benefits associated with climate change mitigation actions. However, very few have attempted to provide a comprehensive and systematic evaluation of co-benefits and their potential monetization. Moreover, the majority of the methodologies are top-down, and this may be a limitation for sectors, such as waste, where considerable data gaps exist in many developing countries.

This paper complements existing literature by adopting a bottom-up approach and using the case of the waste sector and empirical data from community-based and pro-poor solid waste management projects in a number of countries in Asia-Pacific to highlight a broad set of co-benefits associated with such projects. The paper argues for a more systematic evaluation of co-benefits and their integration into decision-making. Such an approach holds considerable relevance in the context of both the UNFCCC and the global sustainability agenda, including the post-2015 development agenda.

2.3 Co-benefits and the UNFCCC framework

Of late the Parties to the United Nation Framework Convention on Climate Change (UNFCCC) have recognized the need to enhance reporting on the effects of mitigation actions taken by them, even though Article 12 and Article 4 paragraph 1(a) of the Convention continue to form the basis for the current system of reporting of information related to implementation of the Convention by Parties. Information on greenhouse gas emissions and removals by sinks, as well as on the actions that Parties are taking to tackle climate change and to implement the Convention, is key in determining progress in implementing the Convention both at the international and national levels.

To ensure transparency, consistency and comparability of information reported by Parties, reporting guidelines have been developed. The first of such reporting guidelines for developing countries was adopted at the second Conference of Parties (COP) in 1996[22] for the preparation of national communications. These guidelines were subsequently revised in 2002 at the eight session of the COP[23].

The Bali Action Plan, an outcome of the thirteenth COP, brought in an additional dimension beyond just reporting of information. Parties agreed that nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity building shall be measured, reported and verified. This decision by the Parties[24] triggered discussions and subsequent elaboration of an enhanced framework for measurement, reporting and verification of information by developing country Parties. The outcomes of the Conference of Parties from COP16 through COP19[25] include the agreement by Parties that:

- Developing country Parties shall take nationally appropriate mitigation actions in the context of sustainable development, supported and enabled by technology, financing, and capacity building, aimed at achieving a deviation in emissions relative to 'business as usual' emissions in 2020;
- Developing countries shall submit national communications every four years;
- Developing countries shall prepare and submit biennial update reports (BURs) every two years, with the first BUR due by December 2014;
- Reports from developing countries shall be subjected to international consultation and analysis which aims to increase transparency of mitigation actions and their effects;
- Mitigation actions undertaking by developing countries that are domestically supported shall be subjected to domestic measurement, reporting and verification.

These important outcomes were accompanied by the elaboration of guidelines for BURs, modalities and guidelines for international consultation and analysis, composition, modalities and procedures for the team of technical experts that will conduct the analysis of BURs, and the general guidelines for domestic measurement, reporting and verification (MRV).

What drives mitigation actions and the reporting of the impacts or effects of these actions in national communications, and eventually BURs, is the sustainable development benefits. Invariably these development benefits beyond greenhouse gas emission reductions are what is referred to as co-benefits. For most developing countries and to a large extent the donor communities as well as the private sector, the potential of projects, programmes and/or policies to deliver tangible co-benefits forms the basis of investment decision making. Co-benefits serve to strengthen the political case for nationally appropriate mitigation actions (NAMAs) and to obtain international support to design and finance them, since they could contribute significantly to the transformational aspects of NAMAs. It is hard in many developing countries to achieve political alignment with mitigation measures based solely on the greenhouse gas emission reduction potential of the mitigation action(s).

Both the guidelines for BURs and for international consultation and analysis (ICA) call on developing countries to report on mitigation actions and their associated impacts/effects using progress indicators or performance matrixes. There is an expectation that developing countries are able to measure and report on the effects of mitigation actions using progressive indicators or performance matrixes. Therefore a proven methodological approach (including robust data collection methods and assessments) for quantifying, tracking and where possible monetizing the co-benefits over time is required. This will allow developing countries to measure and report in a consistent, transparent and comparable manner the effects of their mitigation actions and thereby facilitate the analysis by the team of technical experts of the countries' BURs, and eventually also facilitates the verification process through the facilitative sharing of views as part of the international consultation and analysis process.

Another dimension of the need to have this technical guidance arises from the decision taken by the Parties at the seventeenth session of the Conference of Parties[26], to launch a process to develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties, through the Ad Hoc Working Group on the Durban Platform for Enhanced Action, a subsidiary body that was established under the Convention. It is expectation of Parties that the Ad Hoc Working Group on the Durban Platform for Enhanced Action shall complete its work as early as possible but no later than 2015, in order to adopt this protocol, another legal instrument or an agreed outcome with legal force at the twenty first session of the Conference of the Parties and for it to come into effect and be implemented from 2020.

As a consequence, the COP at its nineteenth session decided[27] to invite all Parties to initiate or intensify domestic preparations for their intended nationally determined contributions (INDC), in the context of adopting a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties towards achieving the objective of the Convention as set out in its Article 2 of the Convention and to communicate them well in advance of the twenty-first session of the COP (by the first quarter of 2015 by those Parties ready to do so) in a manner that facilitates the clarity, transparency and understanding of the intended contributions, without prejudice to the legal nature of the contributions.

In pursuant to this decision, Parties are to communicate their INDCs to the secretariat by providing information on the type of contribution, time frames and periods, scope and coverage, expected outcomes and, if relevant, any references, methodologies and accounting approaches used, in accordance with their national circumstances. The information communicated by Parties on their INDCs should enhance the understanding of whether the aggregate effect of the efforts of all Parties brings global emissions on a pathway consistent with achieving the objective of the Convention, as set out in its Article 2, and in light of the goal of holding the increase in global average temperature below 2 °C or 1.5 °C above preindustrial levels, consistent with the scientific findings assessed in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

The Secretary-General of the United Nations organized in September 2014 a Climate Summit[28] with the purpose of raising political momentum for a meaningful universal climate agreement in Paris in 2015 and to galvanize transformative action in all countries to reduce greenhouse gas emissions and build resilience to the adverse impacts of climate change. The summit achieved its goal with affirmation by governments and non-state actors to reach a new 2015 climate agreement, and work towards the target of holding the increase in global average temperature below 2 °C or 1.5 °C above preindustrial levels. Many at the summit advocated for emissions peaking by 2020 and carbon neutrality by the second half of the 21st century. Several coalitions were announced including coalitions on forests, energy efficiency, transport, methane emissions, green bonds, finance mobilization, insurance and carbon pricing. The United Nations Climate Summit has been used by some countries, in particular developing countries, to create political momentum and raise awareness to commit to communicating INDCs in accordance with the timelines set in decision 1/CP.19.

The Conference of Parties at its twentieth session (COP 20) reiterated its invitation[29] to each Party to communicate to the secretariat its intended nationally determined contribution towards achieving the objective of the Convention as set out in its Article 2. The COP also decided to continue the technical examination of opportunities with high mitigation potential, including those with adaptation, health and sustainable development co-benefits, in the period 2015–2020, and requested the secretariat to update the technical paper on the mitigation benefits of actions, and on initiatives and options to enhance mitigation ambition, compiling information provided in submissions from Parties and observer organizations and the discussions held at the technical expert meetings and drawing on other relevant information on the implementation of policy options at all levels, including through multilateral cooperation, and to disseminate the information, including by publishing a summary for policymakers.

We believe that the recognition of contributions by those who benefit from the co-creation of co-benefits associated with mitigation actions could be an important part of a country's INDCs.

2.4 Co-benefits and the global sustainable development agenda

The discourse on co-benefits and their integration into decision-making and policy formulation is not only relevant in the context of the UNFCCC, but it may also be instrumental in the promotion of the global sustainability agenda, including the outcomes of the Rio+20 Conference and the post-2015 development agenda.

The 2012 United Nations Conference on Sustainable Development (Rio+20) acknowledged that since 1992 there have been areas of insufficient progress and setbacks in the integration of the three dimensions of sustainable development (economic, social and environmental), aggravated by multiple financial, economic, food and energy crises, which have threatened the ability of all countries, in particular developing countries, to achieve sustainable development, and called for a strengthened institutional framework focused on the balanced integration of the three dimensions of sustainable development.[30] The Conference also called for the establishment of sustainable development goals (SDGs), to build upon the millennium development goals (MDGs) and converge with the post 2015 development agenda. These goals should address and incorporate in a balanced way all three dimensions of sustainable development and their interlinkages.[31]

It is clear, therefore, that the implementation of the Rio+20 outcomes will require decision-making processes and policy formulation to highlight the contribution of policies towards the achievement of various development goals, along the three dimensions of sustainable development, rather than focusing on sector-specific goals. A framework for identifying and quantifying co-benefits can, therefore, play an important role in shaping the broader framework required to implement the sustainable development agenda.

The Open Working Group on Sustainable Development Goals in its report to the General Assembly at its sixty-eight session identified seventeen goals that have been the basis for the negotiations. While acknowledging that the UNFCCC is the primary international intergovernmental forum for negotiating the global response to climate change, the Open Working Group included a specific goal dedicated to climate change (goal 13 “Take urgent action to combat climate change”). Climate change is also mentioned as a cross-cutting issue in goals 1 (poverty eradication), 2 (food security), and 11 (sustainable urban development).[32]

At the time of writing the sustainable development goals were still being negotiated and it would be premature to say what shape they may take. However, there have been calls from different quarters for the post-2015 development agenda to account for the synergies and interlinkages between goals, something that the MDG framework was not able to adequately capture. A systematic identification and evaluation of the co-benefits associated with climate change mitigation policies could help highlighting such synergies and interlinkages.

3. Assessing the co-benefits of climate change mitigation projects: The example of the waste sector

3.1 Challenges of urban waste management in developing countries

Waste management is one of the key sustainable development challenges faced by local governments in developing countries and a sector where mitigation measures can generate considerable co-benefits.

In spite of spending 20 to 50 per cent of their annual budgets on solid waste management, municipal authorities are unable to provide full collection services and to dispose of solid waste in an environmentally acceptable manner.[33] Traditional approaches to solid waste management focus on end-of-pipe solutions and on collection and disposal and not on 3R principles. Open dumping is the most common method for final disposal of waste as it offers a quick and easy solution in the short run. However this option is not sustainable in the long run as landfills reach capacity resulting from rapid waste generation rates and due to a scarcity of land. Finding space for new landfills within municipal boundaries is becoming increasingly difficult.

Moreover, unmanaged waste is source of environmental and health hazards, especially in densely populated urban areas. Normally collected waste is disposed off in a very crude and unhygienic manner. Waste piles up mostly in the streets and in unmanaged landfill sites, creating several serious health and environmental threats, including diseases, odour, leakage of pollutants into water sources, release of methane gas, and exposing the actors directly involved with the handling of waste (waste-pickers, cleaners, collection crews) to toxic and otherwise hazardous substances.

Typical landfill sites are designed for mixed waste, with no system of treating and recycling different types of waste, missing out on the opportunity to recover valuable resources from waste. Separation of waste at source enables to adopt a wide range of treatment options for recovering resources from waste. However, source separation is seldom practiced in developing countries, and a large portion of waste with value becomes soiled and polluted and ends up in the landfill.

Recycling is mainly done by the informal sector. Due to a lack of job opportunities, a large group of urban poor is involved in the recovery of inorganic recyclable materials from waste with economic value. Waste pickers remove a considerable quantum of daily waste from the city streets and dustbins. Together, they make an enormous contribution to urban solid waste management in the city. Thus informal actors are crucial to the waste management chain in urban areas in developing countries. Yet the services provided by this sector are poorly understood and acknowledged and end up being projected as illegal and illicit and being looked down upon.

An analysis of waste composition in developing countries reveals a great potential for the valorisation of waste, beyond what currently handled by the informal sector. In particular, the high percentage of organic waste in municipal solid waste streams in developing countries – averaging 50-80 per cent of total solid waste – presents a considerable opportunity for turning waste into a resource.[34]

Several 3R and waste-to-resource initiatives have been tried in developing countries. Some have been successful but many have failed. For many of these initiatives failure was due to the inability to achieve financial sustainability, in addition to political, institutional and behavioural barriers. Resources that can be derived from waste, such as compost or biogas, often fetch very low market prices in developing countries, due in part to competition from heavily subsidized chemical fertilizer and energy industries. Moreover, no tipping (gate) fees are paid to waste-to-resource facilities. This has resulted in limited private sector investment, mainly confined to large-scale plants where economies of scale can be achieved.

Climate financing can, therefore, play a key role in improving the business case for waste-to-resource facilities and in catalyzing private sector investments.

3.2 The CDM and the waste sector

An analysis of the CDM database of the Institute for Global Environmental Studies (IGES)[35] shows that the CDM has lead to the implementation of a large waste-sector project portfolio. There are some 1,089 registered CDM projects in the waste sector, 452 of which have been issued certified emission reductions (CER) that deliver a total of 42.67 million tons of average emission reductions per year. This represents 16.4 per cent of all registered CDM projects and 8.7 per cent of the CDM's mitigation impact. Compared to the contribution of the waste sector of 4 per cent to global GHG emissions, we conclude that the CDM contributes over-proportionally to mitigating waste's climate footprint.

At the same time, the database also accounts for some 1,200 non-active/candidate waste CDM projects. These are projects for which the CDM application was never completed or that have stopped issuing carbon credits because they are too small to justify CDM related costs at current carbon prices.

An analysis of the performance of various typologies of projects reveals that those that have benefited from the CDM are mainly large-scale landfill gas management and biomass projects and waste water treatment plants. Tables 1 and 2 show the number of registered projects, those for which CERs have been issued and the total impact in terms of average annual emission reductions for different typologies of waste projects, classified according to their methodology.

Among large-scale projects (table 1), landfill gas management projects exhibit the best performance, with 80 per cent of registered projects having been issued CERs and accounting for 63.8 per cent of the total mitigation impact of large scale waste projects. On the other hand, only 17.4 of registered composting projects have been issued CERs, accounting for a mere 1.35 per cent of the total mitigation impact. Large-scale waste to energy projects have also performed relatively well and in particular biomass projects.

Table 1: Large CDM in waste management (avg. annual 140 kt emission reductions)

Type of project	Methodology number	Methodology name	No. of registered projects	No. of projects with CER issuance	Average annual emission reductions
Landfill	AM0003	Simplified financial analysis for landfill gas capture projects	4	3	1,194,645
	AM0010	Landfill gas capture and electricity generation projects where landfill gas capture is not mandated by law	1	1	342,571
	AM0011	Landfill gas recovery with electricity generation and no capture or destruction of methane in the baseline scenario	6	6	1,364,628
	AM0083	Avoidance of landfill gas emissions by in-situ aeration of landfills	1	0	0
	AM0093	Avoidance of landfill gas emissions by passive aeration of landfills	0	0	0
	ACM0001	Flaring or use of landfill gas	140	111	19,391,364
Waste water	AM0013	Avoided methane emissions from organic waste-water treatment	0	0	0
	AM0039	Methane emissions reduction from organic waste water and bioorganic solid waste using co-composting	6	0	0
	AM0080	Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater treatment plants	1	0	0
	ACM0014	Treatment of wastewater	27	6	551,186
Waste to energy	AM0069	Biogenic methane use as feedstock and fuel for town gas production	0	0	0
	ACM0024	Natural gas substitution by biogenic methane produced from the anaerobic digestion of organic waste	0	0	0
	AM0073	GHG emission reductions through multi-site manure collection and treatment in a central plant	2	0	0
	ACM0010	GHG emissions reductions from manure management systems	17	10	902,720
	AM0112	Less carbon intensive power generation through continuous reductive distillation of waste	0	0	0
	ACM0002	Consolidated methodology for grid connected renewable electricity generation (biomass, methane)	40	28	6,192,796
	ACM0006	Consolidated methodology for electricity and heat generation from biomass	115	44	3,890,195
	AM0025	Alternative waste treatment processes (incineration)	37	6	624,385
Composting	AM0025	Alternative waste treatment processes (composting)	23	4	471,108
Other	ACM0022	Alternative waste treatment processes	8	0	0
	AM0057	Avoided emissions from biomass wastes through use as feed stock in pulp and paper, cardboard, fibreboard or bio-oil production	1	0	0
	Total		**429**	**219**	**34,925,598**

Source: IGES CDM database, based on UNFCCC data – updated as of 31 March 2015

Among small-scale projects (table 2), waste to energy projects, and in particular biomass and manure management, show the best performance, contributing 67.3 of the total mitigation impact. Composting projects, on the other hand, have not benefited in this category either, with only 20 per cent of registered projects being able to claim CERs, contributing to a narrow 3.58 per cent of the total mitigation impact.

Table 2: Small CDM in waste management (avg. annual 70kt emission reductions)

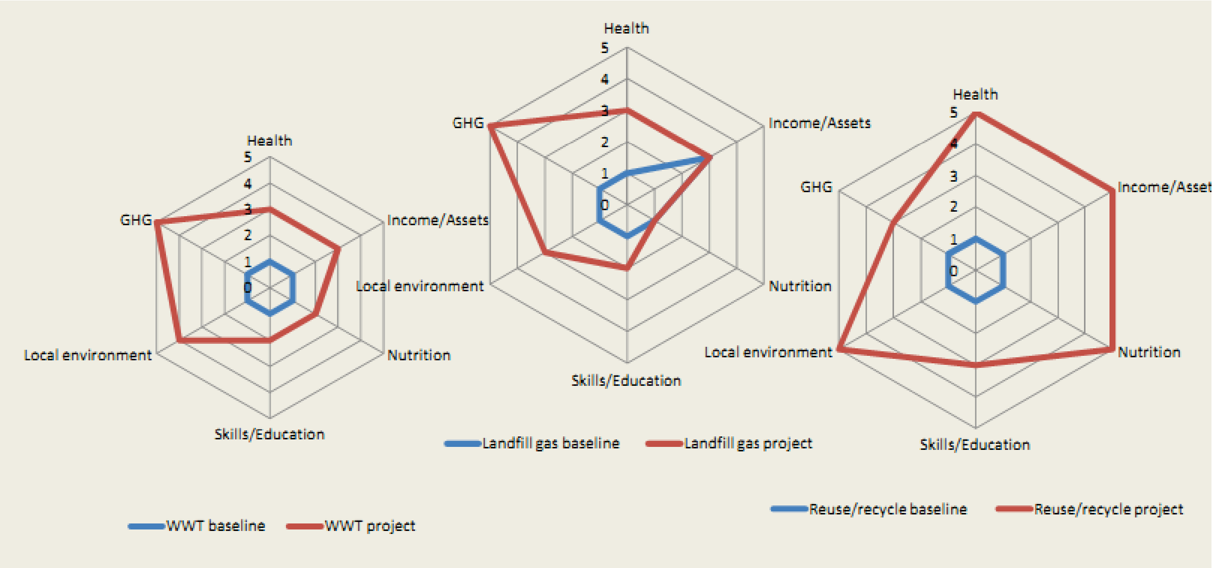
Type of project	Methodology number	Methodology name	No. of registered projects	No. of projects with CER issuance	Average annual emission reductions
Landfill	AMS-III.G	Landfill methane recovery	33	9	306,526
Waste water	AMS-III.H	Methane recovery in wastewater treatment	177	51	1,848,741
	AMS-III.I	Avoidance of methane production in wastewater treatment through replacement of anaerobic systems by aerobic systems	5	2	99,194
	AMS-III.Y	Methane avoidance through separation of solids from wastewater or manure treatment systems	2	0	0
Waste to energy	AMS-III.AO	Methane recovery through controlled anaerobic digestion	4	0	0
	AMS-III.D	Methane recovery in animal manure management systems (biogas, methane avoidance)	117	50	1,219,914
	AMS-I.D	Grid connected renewable electricity generation (biogas, biomass, methane)	268	110	3,991,784
	AMS-III.L	Avoidance of methane production from biomass decay through controlled pyrolysis	0	0	0
Composting	AMS-III.F	Avoidance of methane through composting	54	11	277,420
	AMS-III.AF	Avoidance of methane emissions through excavating and composting of partially decayed municipal solid waste (MSW)	0	0	0
Recycling	AMS-III.AJ	Recovery and recycling of materials from solid wastes	0	0	0
	Total		**660**	**233**	**7,743,579**

Source: IGES CDM database, based on UNFCCC data – updated as of 31 March 2015

The analysis shows that the CDM has transformed – on a sector-basis – best practice for large landfill gas and animal manure management projects, as well as small-scale waste water management, driven by financial reward from methane destruction. We can also conclude that the CDM has not delivered for thousands of smaller waste projects, and in particular composting, in places without central waste management planning capacity and projects without a big methane baseline.

A qualitative analysis of the co-benefits associated with different waste-sector project types reveals also that the CDM worked for projects with high relative GHG impacts (methane avoidance) but did not work for projects with high co-benefits. As shown in Figure 1, which plots co-benefits across six development domains for three project types -waste water treatment, landfill gas collection and reuse/recycle- the latter generates considerably more co-benefits compared to the other two.

Figure 1: Qualitative analysis of co-benefits associated with waste water treatment, landfill gas collection and use and reuse/recycle projects



Source: the south pole group

3.3 Quantifying and monetizing the co-benefits of composting municipal organic waste

A major portion (50-80 per cent) of municipal waste in developing countries is organic. This organic portion contains plant nutrient and energy if utilized properly, but mainly ends up in landfills, unutilized and unmanaged, leading to the generation of methane. Based on the physical and chemical composition of waste in developing countries, there is a tremendous potential for treatment and recycling of this bulk organic portion of the waste through biological processes, such as composting and anaerobic digestion (biogas).

Applying compost to the soil can bring many positive benefits to farmers, such as: (i) increase nutrients and reduce the need for artificial fertilizers; (ii) improve moisture retention of soil (resulting in lower irrigation requirements); (iii) prevent root disease; (iv) reduce nutrient losses; and (v) improve plant quality. Research conducted by the Bangladesh Rice Research Institute has shown that using compost reduces the need for chemical fertilizer while increasing crop yields.

Since 2007, the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP), in partnership with Waste Concern, has been promoting decentralized and integrated resource recovery centers (IRRCs) in secondary cities and small towns in Asia-Pacific with the objective to recover value from waste and provide livelihood opportunities to the urban poor. The IRRC model, developed by Waste Concern, uses simple technology, is low-cost and aims at financial viability by converting organic waste into compost and/or biogas and valorising recyclable waste, made possible through the separation of waste at source. The project has established pilot IRRCs in a number of countries in the region, namely Bangladesh, Cambodia, Pakistan, Sri Lanka and Viet Nam.

Experience in implementing such decentralized, pro-poor and community-based waste-to-resource projects has shown that they can generate a broad number of co-benefits, such as green job creation, improved health, improved waste collection, cost savings from reduced need for landfilling, and improved crop yields through the use of compost, among others. An overview of the co-benefits associated with the recycling of organic waste in a decentralized and pro-poor manner is presented in table 3.

Table 3: The co-benefits of recycling one ton of organic waste in a decentralized and pro-poor manner

	Problem	Co-benefits per ton of recycled waste	Comment
1.	Lack of formal job opportunities for the urban poor in cities in developing countries	Create 2 new jobs for the urban poor, including waste pickers	Provides better and more stable income and safer working conditions to waste pickers
2.	Unmanaged organic waste full of nutrients remains unutilized and creates pollution	Produce 0.20-0.25 tons of good quality compost	High-quality compost can replenish organic matter in the soil
3.	Unmanaged organic waste generates methane under anaerobic conditions	Reduce 0.5 tons of GHG emissions	Aerobic treatment of waste avoids methane generation
4.	Slow degrading organic waste (fish waste, meat waste, leachate water, cow dung etc.) is difficult to treat	Produce 40-80 cubic meters of biogas (clean energy which can be used for cooking purposes or electricity generation)	Anaerobic digestion of organic matter can produce biogas.
5.	Land for landfill sites is becoming scarce in most developing countries due to increase in land prices and opposition to landfills	Save 1.1 cubic meter of landfill area	City authorities can save considerable resources by diverting waste away from landfill
6.	Lack of regular waste collection from communities creates pollution and health hazards for the citizens	Between 2,000-3,000 citizens benefit from improved waste collection	Decentralized waste treatment can help extend waste collection to underserved communities, especially low income ones
7.	Mixed municipal waste discharges toxic leachate water which can pollute both surface and ground water	Avoid the production of between 0.2-0.3 cubic meters of polluting waste water	Waste water from source separated organic waste has high nutrient value which can be used during composting process to control moisture
8.	Unmanaged waste can create more than 40 diseases [36]	Reduce the risk of diseases directly or indirectly linked with unmanaged municipal solid waste	Waste borne diseases can be responsible for high incidence of absence from work
9.	Due to heavy use of chemical fertilizer, lack of crop rotation, high cropping intensity and drought, the soil is losing its fertility thus causing threat to food security	The use of compost can increase crop production between 25-30% and reduce use of chemical fertilizer by 25-40%	By using compost, farmers can manage their production in a more sustainable manner, reduce costs and increase revenues

Source: Waste Concern

Based on this framework, the co-benefits that can be derived through the composting of organic waste in Bangladesh, Sri Lanka and Viet Nam were quantified and monetized. The results are presented in table 4.

Calculations show that for every ton of CO_2e reduced **composting projects in developing countries can generate co-benefits in a range between US$ 93.82 and US$ 184.21**. This figure is a conservative one as the analysis quantified some, but not all, of the co-benefits identified in table 3 above. The actual value of the co-benefits may be considerably higher once other benefits are monetized, such as those related to public health arising from avoided pollution and spread of diseases.

In order to calculate the co-benefits we have identified quantifiable impact indicators for composting projects, collected primary data for these indicators before and after the project and then calculated the net co-benefits. The methodology employed and sample calculations for the case of Bangladesh are provided in Annex I.

Table 4: Value of co-benefits generated by composting projects in Bangaldesh, Sri Lanka and Viet Nam for every ton of CO_2e reduced

Co-benefit	Type	Value (US$)		
		Bangladesh	Sri Lanka	Viet Nam
Job creation: additional income for waste pickers employed in compost plants	Social/Economic – Public & Private	7.53	6.00	N/A (*)
Cost savings for the municipality for avoided landfilling of waste	Economic – Public	23.36	57.50	69.70
Savings in chemical fertilizer use (25% reduction)	Economic/Environmental – Private & Public	9.71	2.26	21.09
Savings in subsidy to chemical fertilizers	Economic – Public	4.13	5.48	N/A (**)
Increase in crop yields (***)	Economic – Private & Public	49.09	43.05	93.42
Total		**93.82**	**114.29**	**184.21**

Source: UN ESCAP and Waste Concern

(*) In the case of projects in Viet Nam, workers were not previously employed in the informal sector or had lower salaries that those they have now. Hence it was not possible to calculate this co-benefit.

(**) In Viet Nam there is no direct subsidy provided to farmers for chemical fertilizer

(***) The study used rice as reference crop to calculate the increase in crop yields

In analysing the co-benefits generated, it is important to understand to whom these co-benefits are accrued. In table 4 we have indicated the type of benefit, whether economic, social or environmental and also its nature, whether public or private. Some co-benefits directly support individuals, but they also contribute to the larger public good. Improving working conditions and providing higher income for the urban poor, in particular waste pickers, directly benefits those employed but also fulfils public policy objectives related to employment creation and poverty reduction. Similarly, reducing the use of chemical fertilizer and increasing crop yields benefit farmers directly through cost savings and additional revenues, but has also a beneficial impact on the environment and on food security.

It is important to note that the co-benefits identified, whether of private or public nature, are accrued outside the boundaries of the projects themselves. While they may generate co-benefits in the order of US$ 100-200 per ton of CO_2e reduced, composting projects in developing countries struggle financially as a result of low compost prices, and absence of tipping fees or other fiscal incentives. This calls for the need to establish a transfer mechanism from those entities that benefit from these results (at a level that is at or below their current cost of creating such beneficial results) to those that create these benefits, thus improving the business case for waste-to-resource projects in developing countries.

In this specific case of composting it is also important to note the urban-rural linkages and their policy implications. While municipal solid waste management is the responsibility of municipal administrations, considerable benefits from the production and use of compost are accrued to rural areas. Conversely, urban areas benefit from integrated natural resource management in rural areas. Policies often tend to be compartmentalized and labelled as “urban” or “rural”, but in reality urban and rural represent a continuum and research and policy responses should recognize this and take into account their important interlinkages.

4. Valuing co-benefits: Recommendations for the design of NAMAs

In the previous sections we have highlighted the importance of the co-benefits associated with certain typologies of climate change mitigation projects, using the waste sector as an example, and noted that the CDM worked for projects with high relative GHG impacts but did not work as well for projects with high “co-benefits”. Nationally appropriate mitigation actions (NAMAs) are seen as a new tool for countries to promote climate change mitigation actions in the context of their respective national sustainable development strategies. As such, NAMAs should address the limitations of the CDM and provide a framework for the promotion of mitigation actions high in co-benefits.

This section translates the key observations above into four concrete policy recommendations for NAMA design.

NAMA Design Principle No 1: A successful NAMA is driven by the value it generates towards domestic policy priorities

We argue that a successful NAMA is one that is driven by domestic public and private interests unrelated to climate mitigation but that incentives related to climate mitigation have a catalysing impact. From the perspective of the public sector, such interests are related to the creation of valued "social assets ", public goods (or "co-benefits" using the terminology from NAMA), which the public sector is interested in or would have funded – at a higher cost – anyhow. From the perspective of the private sector, such interests are related to strategic business objectives, such as profits, increased market share or innovation/product differentiation opportunities.

The CDM was mainly driven by emission reductions (because of the monetary value of carbon credits) while sustainable development benefits were secondary and considered only during the project's approval phase by the designated national authorities (DNAs). In the case of NAMAs instead, sustainable development benefits are the primary driving force linked with mitigation projects.

NAMA Design Principle No 2: A successful NAMA has a mechanism to transfer value from those that benefit to those that create the benefit

Barriers to the implementation of projects that are high on co-benefits are related to a failure to monetize the value (in terms of willingness to pay) of such co-benefits/social assets. A successful NAMA therefore must provide mechanisms that:

a) Assess and quantify the co-benefits associated with mitigation actions identified;
b) Establish who is willing to pay for the provision of such co-benefits/social assets;
c) Determine their willingness to pay per "unit" of created co-benefit/social asset, and
d) Facilitate a transaction of this willingness to pay to the producer of these co-benefits.

A common approach to assessing the possible willingness to pay for co-benefits is to identify existing spending for the generation of such co-benefits within the current public budget, or, to the extent that the generation of such co-benefits is privately funded, via private spending. For instance, in the case of health-related co-benefits, one could determine a country's current spending per disability-adjusted life-year (DALY) averted, a common unit to measure comparable health impacts, and use this figure as a benchmark, with the understanding that the willingness to pay for a health related co-benefit (expressed in DALY averted) must be below this benchmark figure.

In many least developed countries, a substantial share of spending on "social assets" will be co-financed by international development partners. It would therefore make sense to differentiate the overall spending on co-benefits/social assets into a domestic and an international share. In any case, climate finance classified as aid should be additional (over and above) official development assistance.

In relation to private interests, it is reasonable to assume that private sector entities will take action as soon as an investment-enabling environment has been created by the NAMA. This includes the provision of direct monetary incentives as well as indirect incentives, including removal of investment barriers.

Importantly, the willingness to pay for the co-benefits generated needs to translate into incentives for investors that are tangible and accessible, or, in other words "bankable". This means, for example, that an investor would be able to take an agreement that awards the provision of incentives to his investment project to the bank as collateral.

What is therefore required is a mechanism that transforms society's valuation (willingness to pay) for those benefits to project implementers. Such structures are nothing new. We have identified a number of existing mechanisms that could be used to implement such transfers in the waste sector:

- **Tipping fees**: a payment by waste producers to a waste management company; the payment could be structured in a way that rewards low carbon waste management options.
- **Feed-in-tariffs**: a payment by electricity utilities (acting in their capacity as off-takers) to reward production of electricity from waste.
- **Tax exemptions**: a waiver of taxes or fees on profits, income or imports of equipment for low carbon waste management investment projects.
- **Subsidies**: a grant or low interest loan to co-finance the implementation of low carbon waste management projects. Fiscal instruments can also be used to create a level playing field for resources recovered from waste: composting projects, for example, struggle financially in many developing countries due to low market prices of compost as a result of highly-subsidized chemical fertilizer prices.
- **Carbon credit payments**: a financial payment against the delivery of certified emission reduction credits from waste management projects, a premium on the market price for carbon could be added to integrate the value related to co-benefits created by the project.
- **Pay for performance schemes**: a different kind of results-based payments (modelled on carbon credits but operating under a different administrative scheme) to reward the production of co-benefits from waste sector mitigation actions.

One of the key roles of government within the context of NAMA design and operation is to create a simple and accessible incentive structure that manages the transfer of financial value from those that benefit from the co-benefit to those that invest to create it.

NAMA Design Principle No 3: A successful NAMA requires cooperation between the agencies that are expected to benefit from the generation of impacts which are within their jurisdiction and the NAMA designing agency that coordinates the transfer of incentives to implementers of mitigation actions

In almost all cases, the control over the existing spending for the generation of these co-benefits will reside with a government institution other than the one that is in charge of NAMA implementation (or in case of international support within a development budget not related to climate). This means that an inter-entity financial transfer is required in order to bring financial resources from the entity that is usually in charge of funding the generation of these social assets to the entity that is in charge of providing incentives for the implementation of NAMA related actions. Alternatively, the entity that is in charge of funding co-benefits could make a direct payment to NAMA action implementers, under a pay-for-performance scheme.

Looking at it from the perspective of the entity that is in charge of funding the production of such co-benefits (or public goods/social assets), a NAMA provides the opportunity to leverage existing funding for increased impact. This implies that the design of a successful NAMA requires cooperation between those agencies that are expected to benefit from it via the generation of co-benefits (public goods/social assets) whose provision falls under their jurisdiction.

Cooperation would be required not just between line ministries, but also among different sub-national actors, including various departments of local governments. For example, in Cambodia the implementation of the pro-poor and decentralized solid waste management project led by UN ESCAP and Waste Concern garnered support and resources from various provincial departments, including environment, health, agriculture and tourism, as they all had a stake in one or more of the co-benefits generated. Considering that developing countries face considerable challenges in harmonizing local development and environmental issues, NAMAs based on a strong co-benefits framework can improve policy coordination and governance.

Co-benefits not only cut across sectors horizontally, but also vertically along different levels of government. However, it will be critical to provide adequate financial support to leverage the role of sub-national actors in the design and implementation of NAMA activities. In the waste sector, in particular, the responsibility of waste management lies with local governments but no or little resources are transferred to local governments for this purpose. The ability of local governments to raise revenues in this regard is also limited; waste collection fees in developing countries are in general extremely low, and far from allowing full cost recovery of solid waste management operations (which generally cover only collection and disposal and not treatment). This is a clear barrier for the implementation of 3R activities.

The validity of the above stipulations has been demonstrated by the CDM: in many developing countries, the CDM approval process is based on inter-ministerial cooperation (though not financial transfers) and the direct financial incentive provided by the CDM has redirected substantial private sector funding into mitigation actions.

NAMA Design Principle No 4: NAMA designers in government need to ensure that NAMA incentives are tangible, accessible and substantial enough to grab the attention of decision-makers

Based on the experience of the CDM, incentives must be simple to access so that mitigation actions the CDM did not reach can be reached under NAMA incentive schemes. NAMA incentives must be "easier to get" (fast, simple process) and more "bankable" than CDM carbon credits (carbon credits take three years to issue, prices are volatile, some red-tape, many banks in developing countries never recognized them as collateral). As mentioned, the value of the NAMA incentive needs to be based not only on the value of the mitigation benefit but also on the value of local benefits and avoided costs. After all, it is still project-level investors that create all of these benefits. Government is the enabler.

Related to this is the requirement that the institutional framework in charge of delivering incentives to investors is predictable, transparent and accessible. Institutional arrangements should facilitate rapid start-up, and be integrated into domestic policy, local objectives and international climate finance. Eligibility criteria should go beyond project-level additionality; they should be accessible for every action that contributes to achieving the voluntary targets defined within the NAMA. Incentive payments to investors should be accounted for with simplified (compared to the CDM) monitoring, reporting and verification (MRV) as leakage risks within the larger NAMA system are inherently lower. One could argue that NAMA design should in fact be driven by domestic development priorities; mitigation actions are a co-benefit.

To summarize, the role of government in good NAMA design is to be the catalyst that creates a business case and measureable impacts that contribute to achieving a set of valued development objectives. Governments' priority objective is to create very tangible and accessible (bankable) incentives that transfer value from those who benefit from the impacts created by waste projects to the operators of those projects. Carbon credits - under the CDM or other governance mechanisms, including domestic schemes - are just one type of "accounting unit" to manage performance payments in relation to the climate mitigation value. However, the existing carbon market infrastructure, with its focus on verification and pay-for-performance can be used to deliver account and transfer value related to other benefits.

In conclusion, we argue for a more systematic evaluation of co-benefits, their monetization and integration into decision-making, in order to promote mitigation actions high in co-benefits, such as pro-poor and community-based waste-to-resource projects. Climate financing could play a catalytic role in incentivizing investments into such projects and properly-designed NAMAs should remove the barriers that currently hamper their up-take. A framework for quantifying and monetizing co-benefits would also hold considerable relevance in the context of both the UNFCCC and the global sustainability agenda, including the post-2015 development agenda.

Annex I:
How to quantify and monetize co-benefits

In order to quantify and monetize the co-benefits of composting projects in Bangladesh, Sri Lanka and Viet Nam, as presented in section 3.3, the following methodology has been used. The calculations and data reported here refer to a registered CDM composting project operated by Waste Concern in Dhaka, Bangladesh. The project was approved in July 2006 as a registered CDM project. Verification of CERs was completed by DNV in June 2011 and December 2013, and CERs have been issued from 2009 to 2012.

The process used for composting is forced aeration using the box method. The entire composting operation is done with an overhead cover, and a leachate collection system. The project has created jobs mainly for the waste pickers and unskilled workers for collection and composting. The compost produced by Waste Concern has been approved and certified by the Government of Bangladesh. Research conducted by Bangladesh Rice Research Institute has shown that by using compost produced by Waste Concern, the use of chemical fertilizer can be lowered, while at the same time increasing the production of rice.

The business plan of the project is based on the sale of compost and of CERs. The project is not getting any support from the national government or the local government. While there is no problem in terms of marketing of the compost produced, the low market value of CERs presents a considerable challenge for the financial sustainability of the project.

Step 1: Quantify emission reduction from composting of municipal organic waste

The UNFCCC-approved methodologies ACM 0022 or AMS III can be used to calculate emission reductions from composting of municipal organic waste. Based on ACM 0022, 0.5 ton of CO_2e can be reduced by diverting 1 ton of municipal organic waste from landfill to composting. In other words, 1 ton of CO_2e can be reduced by composting 2 tons of municipal organic waste.

Step 2: Identify quantifiable impact indicators for the project apart from GHG emission reduction

After identifying areas in which co-benefits can be generated, identify measurable impact indicators. It is useful also at this stage to classify the typology of benefit, in particular whether it's public or private.

Problem	Co-benefits	Co-benefit indicators	Type of benefit
Lack of job opportunities for the poor in cities and towns	Creation of jobs that provide higher income and safer working conditions for waste pickers engaged in recycling of mixed waste without any protection	Number of safe jobs created for low-income groups, including waste pickers Increase in income of workers by having safe jobs	Public and private
Unmanaged organic waste full of nutrients remains unutilized and creates pollution	If waste is segregated properly and appropriate technology is used, compost can be produced and used in the agriculture	Amount of compost produced	Public and private
Landfill sites reach capacity and new land for landfilling is becoming scarce due to increase in land price and environmental regulations	Composting can save landfill areas as well as landfilling costs for local governments	Amount of waste diverted Cost saved for the municipality from disposal of waste	Public
Due to heavy use of chemical fertilizer, lack of crop rotation, high cropping intensity, drought, and other reasons, the soil is losing its fertility thus causing threat to food security	Use of compost can lower the use of chemical fertilizer at the same time increase crop yield	Increase in crop yield per hectare Amount of chemical fertilizer avoided by use of compost Amount of subsidy avoided	Public and Private

Step 3: Collect baseline data for the co-benefit indicators identified

In order to calculate the net co-benefits, it is important to collect baseline data for the indicators before implementation of the project. Baseline data can be collected through a primary survey during design the phase of the project. In case the baseline survey data is not available, secondary data from published reports or journals can be used. In the present case, data has been collected mainly through a primary survey.

Problem	Co-benefit indicators	Baseline data
Lack of job opportunities for the poor in cities and towns	Number of safe jobs created for low income groups and waste pickers Increase in income of workers by having safe jobs	Average income of a waste picker in Dhaka is Taka 2,600 per month out of which 15% is spent on medical expenses. Average disposable income is Taka 2,210 per month
Unmanaged organic waste full of nutrients remains unutilized and creates pollution	Amount of compost produced	No compost plant was operational in Dhaka using market waste
Landfill sites reach capacity and new land for landfilling is becoming scarce due to increase in land price and environmental regulations	Amount of waste diverted Cost saved for the municipality from disposal of waste	In the baseline scenario, no waste is diverted towards composting The city of Dhaka spends Taka 600/ton for transportation of waste and Taka 300/ton for landfilling of waste
Due to heavy use of chemical fertilizer, lack of crop rotation, high cropping intensity, drought, and other reasons, the soil is losing its fertility thus causing threat to food security	Crop yield per hectare (rice) Amount of chemical fertilizer used Cost of the chemical fertilizer Amount of subsidy on chemical fertilizer	4.16 tons/ha (BRRI Rice 46) NPKS (@80-35-40-10 kg/ha) + no compost Taka 19,676 /ha (excluding fertilizer application and labor cost) Taka 7,793.17/ton

Step 4: Collect data for quantifiable indicators after implementation of the project

After implementation of the project, data regarding quantifiable indicators has been collected, mainly from primary sources. The following data has been collected by Waste Concern as part of social and environmental compliance reporting for the shareholders and financers of the project.

Problem	Co-benefit indicators	Condition after implementation of the project
Lack of job opportunities for the poor in cities and towns	Number of safe jobs created for low income groups and waste pickers Increase in income of workers by having safe jobs	2 jobs per ton Average income of waste pickers working in the plant is Taka 7,000 per month
Unmanaged organic waste full of nutrients remains unutilized and creates pollution	Amount of compost produced	250 kg per ton of organic waste treated
Landfill sites reach capacity and new land for landfilling is becoming scarce due to increase in land price and environmental regulations	Amount of waste diverted and landfill area saved Cost saved for the municipality from disposal of waste	1.1 cubic meter of landfill area per ton of organic waste composted Taka 900/ton (transportation and landfilling cost)
Due to heavy use of chemical fertilizer, lack of crop rotation, high cropping intensity, drought, and other reasons, the soil is losing its fertility thus causing threat to food security	Increase in crop yield per hectare Amount of chemical fertilizer avoided by use of compost Cost of chemical fertilizer and compost Amount of subsidy on chemical fertilizer	4.58 tons/ha (BRRI Rice 46) 75% NPKS @80-35-40-10 kg/ha) + 1 ton/ha compost Taka 18,161/ha (excluding fertilizer application and labor cost) 25% savings on subsidy for chemical fertilizer

Step 5: Calculate the net co-benefits of the project

The net co-benefits of the project are calculated by subtracting the benefits after implementation of the project from the benefits before implementation of the project. This net benefit is calculated for each indicator separately.

Problem	Co-benefit indicators	Net co-benefit
Lack of job opportunities for the poor in cities and towns	Number of safe jobs created for low income groups and waste pickers Increase in income of workers by having safe jobs	2 jobs per ton Average increase in income of waste pickers by working in the compost plant is Taka 4,400 per month
Unmanaged organic waste full of nutrients remains unutilized and creates pollution	Amount of compost produced	250 kg per ton of organic waste treated
Landfill sites reach capacity and new land for landfilling is becoming scarce due to increase in land price and environmental regulations	Amount of waste diverted and landfill area saved Cost saved for the municipality from disposal of waste	1.1 cubic meter of landfill area per ton of organic waste composted Taka 900/ton (transportation and landfilling cost)
Due to heavy use of chemical fertilizer, lack of crop rotation, high cropping intensity, drought, and other reasons, the soil is losing its fertility thus causing threat to food security	Increase in crop yield per hectare Amount of chemical fertilizer avoided by use of one ton compost Amount of subsidy on chemical fertilizer	0.42 tons/ha (BRRI Rice 46) which has a value of Taka 7,560 25% savings in use of chemical fertilizer resulting in savings of Taka 1,515/ha

Step 6: Convert the value of co-benefits per ton of emission reduction

Based on the calculations in step 1, the reduction of 1 ton of CO_2e can be achieved through composting of 2 tons of municipal organic waste. As such, the co-benefits of recycling two tons of municipal organic waste are shown below.

Co-benefit	**Value in US$**	**Type**
Additional income for 4 waste pickers employed in the compost plant	US$ 7.53	Private and Public
Cost saved by the municipality from avoiding the landfilling of 2 tons of waste	US$ 23.36	Public
Saving of 25% of chemical fertilizer applied to 0.5 ha	US$ 9.71	Private and Public
Savings of 25% in subsidies for chemical fertilizer (which would otherwise been applied to 0.5 ha)	US$ 4.13	Public
Increase in crop yield of 0.21 ton of rice per 0.5 ha through the use of 0.5 tons of compost (derived from processing 2 tons of waste)	US$ 49.09	Private and Public
Total	**US $ 93.82**	

The currency conversion rate used is 1 USD = 77.05 Taka.

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