Climate action in Peru

Nordic support for
waste sector management
yields results

Nordic Council
of Ministers

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Glossary and abbreviations

BAU	Business-as-usual	MRV	Monitoring, reporting and verification
CDM	Clean Development Mechanism; project based mechanism for sustainable development and emission reductions under the Kyoto Protocol	MSW	Municipal solid waste
CEPLAN	National Strategic Planning Centre of Peru	NAMAs	Nationally Appropriate Mitigation Actions, as defined by the UNFCCC
CO2(e)	Carbon dioxide (equivalent). Equivalent figures are used when emissions of various GHGs are considered together, weighted according to their greenhouse effect.	NCM	Nordic Council of Ministers
COP	Annual Conferences of Parties to the UNFCCC	NDCs	Nationally Determined Contributions towards global efforts to mitigate climate change
GDSWM	General Directorate for Solid Waste Management	NDF	Nordic Development Fund
GHG	Greenhouse gas	NEFCO	Nordic Environment Finance Corporation
ITMO	Internationally Transferred Mitigation Outcome	NGO	Non-Governmental Organizations
LFGE	Landfill gas to electricity	NOAK	The Nordic working group for global climate negotiations (operating under the NCM)
LULUCF	Land-use, land-use change and forestry	NPI	Nordic Partnership Initiative
MBT	Mechanical Biological Treatment	PET	Polyethylene terephthalate
MINAM	Ministry of the Environment of Peru	SIGERSOL	Information System for the Management of Solid Waste
		SWIDS	Solid Waste Informal Disposal Sites
		UNFCCC	United Nations Framework Conference on Climate Change

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Foreword

The Nordic Partnership Initiative on Upscaled Mitigation Action (NPI) started in 2011 in cooperation with Peru's Ministry of the Environment (MINAM). NEFCO has served as implementing agency from the Nordic side. The purpose of the cooperation has been to support preparations for Peru to take advantage of the international finance and carbon market in implementing measures to reduce greenhouse gas emissions from the solid waste sector. During the cooperation, a number of studies have been carried out to improve market readiness.

With its experience of collecting methane from landfills, Peru is familiar with financing from the market through the Clean Development Mechanism (CDM). However, there is mitigation potential also by focusing on reuse and recycling, and the recycling study carried out under the NPI estimates opportunities for these areas. The new Solid Waste Law of 2016 includes the principle of extended producer responsibility, which might be a suitable instrument to increase the recycling rate.

The cooperation with Peru has shown the high competence of the MINAM staff. We believe that Peru is very well positioned to take the next steps to get financing for the identified mitigation measures and develop its waste management policy.

Terje Kronen
NPI Chair

Photo: Tim Bird

The Nordic Partnership Initiative on Upscaled Mitigation Action (NPI)

The Nordic Partnership Initiative (NPI) was established in 2011 by the Nordic Council of Ministers' working group for global climate negotiations (NOAK) to support developing countries in scaling up their efforts to mitigate climate change.

The NPI aimed to demonstrate how developing countries can scale up emission reductions in key sectors by designing and implementing Nationally Appropriate Mitigation Actions (NAMAs) that can attract funding from international climate finance and carbon markets. NAMAs are voluntary, country-driven mitigation actions taken in the context of sustainable development. They can serve as valuable building blocks for Nationally Determined Contributions (NDCs) under the Paris Agreement.

Under the NPI, two NAMA Readiness Programmes were implemented: one for the solid waste sector in Peru and one for the cement sector in Vietnam. These sectors were selected together with the host countries based on their potential for emission reductions and sustainable development co-benefits, and insights for international climate negotiations through a feasibility study in 2011. Funding was provided by Denmark, Finland, Norway, Sweden, the Nordic Environment Finance Corporation (NEFCO) and the Nordic Development Fund

(NDF), as well as contributions from host countries. NEFCO managed the programme in Peru (2013-2018) and NDF ran a parallel programme in Vietnam (2014-2016).

This report reviews the NAMA Readiness Programme in Peru to support upscaled mitigation actions within the solid waste management sector. To ensure the sustainability and relevance of the programme's results, the design and implementation of the NAMA Readiness Programme were led by the relevant ministries and authorities in Peru itself.

Phase I developed a NAMA Proposal and addressed general data and capacity gaps in the solid waste sector while Phase II focused on specific issues that emerged during the course of the programme. This country-driven, dynamic, bottom-up approach resulted in concrete and financeable proposals that are integrated into Peru's national planning and policies for sustainable development, climate change and solid waste management.

How NAMAs transform into Nationally Determined Contributions

The NAMA concept was devised in 2007 to invite developing countries to scale up mitigation action with the support of technology transfer, capacity building and financing. NAMAs are part of the international mitigation framework for mapping out voluntary mitigation action for developing countries. Their definition is broad, including various sets of policies and actions for enhanced climate action. NAMAs may contain proposals for regulation, standards or incentives.

Besides climate benefits, alignment with the national sustainable development goals is an essential element of a successful NAMA. Many countries have already developed and started to realise NAMAs as climate change negotiations globally have geared up with increasing ambition.

"A country-driven, dynamic, bottom-up approach resulted in concrete proposals integrated into Peru's national planning."

FACTS ON PERU

- A population of 30.4 million, growing by 1%/year. 1/3 live in the Lima-Cal-lao Metropolitan Area
- 8% of Peruvians live on less than USD 2 per day
- Municipal solid waste (MSW) genera-tion equals to 17,000 tonnes/day
- Waste sector's share of national GHG emissions is 6% and rising
- Peru has the largest area of Amazon rainforest after Brazil
- Around half of Peru's emissions are from land-use, land-use change and forestry

International climate policy moved forward with the 2015 Paris Agreement requiring all countries to prepare, implement and regularly update their Nationally Determined Contributions (NDCs) as part of global efforts to limit greenhouse gas emissions. The existence of comprehensive NAMAs based on national circumstances and capacities for key sectors helps countries to shape and realise their NDCs, with sector-specific NAMAs serving now as building blocks for wider NDCs. Detailed NAMA plans could also help developing countries to access funding for mitigation action from international climate finance and carbon markets.

Solid waste challenges and opportunities in Peru

Sustainable municipal solid waste (MSW) management is a challenge for Peru. Peru is an upper middle-income country that has enjoyed a high economic growth rate for more than a decade (despite a slowdown in 2017). As a result, there is a growing middle class, increasing urbanization and increasing consumption that lead to increasing amounts of waste. Municipalities lack the resources and capacity to address their growing MSW volumes in a sustainable and integrated manner and to invest in recycling infrastructure. The private sector lacks the enabling environment and incentives to seize waste-related business opportunities.

Currently, only 42% of unrecoverable waste ends up in the country's landfills, and less than 15% of recyclable waste is recycled (the total recycling rate is less than 4%). Over half of the MSW is organic but less than 1% of it is composted. The majority of solid waste is being dumped in unmanaged dumpsites without adequate treatment, leading to health and environmental problems.

In Peru, population growth and economic development have led to an average growth of total greenhouse gas (GHG) emissions from all sectors of 2.1% per year since 1980. The waste sector's share of Peru's total GHG emissions is 6%, and

rising. Emissions from municipal solid waste have more than tripled between 1980 and 2010, and are projected to increase further by almost 40% between 2010 and 2030. Almost half of all MSW-related emissions are generated in the Lima-Callao metropolitan area.

Transforming the waste sector has been a long-standing priority for Peru. In 2010, Peru identified reductions in emis-

NDC OF PERU

Peru was one of the first countries to submit their Nationally Determined Contribution (NDC) to the UNFCCC in July 2016, less than a year after the Paris Agreement was approved. Peru has set an unconditional target of reducing its emissions by 20% compared to business-as-usual (BAU) by 2030 with its own resources, and a conditional target of a 30% reduction, subject to international support. The NDC covers carbon dioxide, methane and nitrous oxide

emissions economy-wide, including the land use, land-use change and forestry (LULUCF) sector which is responsible for approximately half of Peru's emissions. According to its NDC, Peru may consider utilising international carbon markets, provided that it does not undermine compliance with the national commitment. The NDC also includes adaptation objectives for 2030, to be implemented under the National Adaptation Plan process.

FUNDING THE NPI

The budget for Phases I and II of NPI's NAMA Readiness Programme for Peru totalled EUR 2.2 million, with funding structured between all partners. NEFCO has acted as an implementation agency for activities in Peru.

NEFCO	€ 1 100 151
Norway	€ 268 709
Sweden	€ 332 090
Finland	€ 100 000
Denmark	€ 405 405
+10% in kind contribution from MINAM

sions relating to inadequate solid waste management as one of three priority areas for NAMAs requiring international support. The lack of reliable waste sector data undermined the design of effective waste management policy, which in turn hindered investment in the sector.

At that strategic moment, the Nordic countries partnered with Peru to design and implement a NAMA Readiness Programme to support Peru in its efforts to transform its solid waste sector. The Readiness Programme provided valuable inputs and capacity to inform national planning processes, including the new Solid Waste Law of December 2016, and the implementation process of Peru's NDC.

Municipal solid waste was chosen for this NAMA because of the importance of the waste sector in Peru and because it is a field that affects health, social status and quality of the environment, creating emissions that have not yet been measured with sufficient clarity.

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Developing and realising a waste sector NAMA in Peru

The NAMA Readiness Programme in Peru had two phases, the first from 2013 to 2015 and the second from 2016 to 2018. A feasibility study was conducted before the start of the programme to select the target sector and design a NAMA pilot programme. The ultimate goal of the programme was to support Peru in scaling up mitigation action in the waste sector.

Phase I focused on building a knowledge base on waste-related emissions and mitigation options and developing a NAMA Proposal with a robust Monitoring, Reporting and Verification (MRV) system, capable of attracting international climate finance and facilitating access to carbon markets. For the NAMA Proposal, the most promising mitigation actions were selected, based on an analysis of mitigation options and their costs. Greenhouse gas inventories and projections were also developed further and key stakeholders were engaged throughout the phase.

Phase II focused on fine-tuning various NAMA-linked activities, exploring potential sources for finance, and estimating mitigation options, potential and costs for dumpsites. In addition, studies were conducted on recycling, composting and a proposal for engaging in carbon market cooperation under Article 6 of the Paris Agreement.

The NPI in Peru was shaped together with local stakeholders applying a bottom-up approach by helping the national au-

NAMA READINESS PROGRAMME OUTPUTS

2011

- Feasibility study on upscaling mitigation action in Peru and Vietnam

Phase I (2013-2015)

- Report: Diagnosis of solid waste in Peru
- Report on most relevant types and amounts of solid waste
- GHG inventory for municipal solid waste
- BAU scenario 2010 to 2030 for municipal solid waste
- NAMA performance metrics and MRV system
- Monitoring report format
- Verification format
- Peru Solid Waste NAMA Concept Note ("NAMA Proposal")

Phase II (2016-2018)

- Strengthening of the information system for the solid waste management (SIGERSOL) as a mechanism for monitoring, reporting and verification of the solid waste NAMA
- Analysis of enabling conditions to create supply and demand of compost
- Evaluation of public, private and public-private financial mechanisms and policy instruments for selected cities linked to Solid Waste NAMA
- Assessment of the potential of mitigation of greenhouse gases by the implementation of final disposal infrastructure for solid waste in prioritized territorial areas
- Evaluation of the mitigation potential of greenhouse gases as a result of recycling of plastic, glass, paper and cardboard
- Study on opportunities for the implementation of Article 6 of the Paris Agreement in the solid waste sector in Peru

Photo: Tim Bird

thorities to integrate the programme's actions with national development plans and policies. In Peru, the key national implementing partner is the Ministry of the Environment (MINAM). The key objective was to improve Peru's capacity to design waste sector mitigation policies and actions capable of attracting funding from international climate finance and the carbon markets.

Sustainable development was also an integral part of the programme, and the UN Sustainable Development Goal 12 on ensuring sustainable consumption and production patterns are especially relevant to the waste sector. The cooperation with Peru is particularly relevant for Peru's efforts to contribute to the Sustainable Development Target 12.5 to substantially reduce waste generation through prevention, reduction, recycling and reuse by 2030.

Phase I:

Building towards a NAMA

Phase I built on a feasibility study which was conducted in Peru in 2011 to explore a range of mitigation options in the waste sector, applying criteria including mitigation potential, the host country's priorities, practical implementability, data accounting requirements, replicability and overall usefulness in terms of national and international climate policies and goals.

Phase I preparatory work consisted of:

- realising a national solid waste inventory for Peru
- examining mitigation options in the waste sector, and related barriers
- formulating a national solid waste strategy incorporating the NAMA Proposal
- setting up an effective system for monitoring, reporting and verifying emissions from waste
- carrying out stakeholder consultations and initiating capacity building and related training

This contributed to a comprehensive NAMA Proposal for Peru's waste sector, consisting of three chief components. Regulatory and policy change recommendations were made to inform the new Solid Waste Law which passed in December

→ There are a total of 22 legal landfills in Peru. Phase I of NPI (2013-2015) demonstrated that better management of landfills has a great potential to mitigate greenhouse gases.

Photo: Tim Bird

2016 at the end of Phase I. These included guidelines for setting quantitative objectives, advancing higher technical standards and simplifying investment procedures. Moving from policy to practice, the second key component of the NAMA Proposal was recommending key waste management and mitigation options for implementation. As means of implementation, the third component proposed a NAMA Fund for channelling finance towards public or private sector operators to commence the use of improved technologies.

Defining emissions

The waste sector business-as-usual (BAU) scenario for Peru forecasts an almost 40% increase of emissions by the year 2030 compared to 2010. All NAMA mitigation actions are calculated relative to BAU emissions, so in Phase I, a BAU scenario was developed to reflect the development of GHG emissions in the absence of the NAMA. BAU scenarios contain projections for economic factors, MSW policies and disposal trends in addition to GHG emissions. The national BAU for Peru consists of compiled projections for groups of municipalities. These have been separated in ten areas, based on population and the type of waste management practices.

The metropolitan area of Lima-Callao was identified as its own group, and others divided by their climatic zone (coast, highlands, rain forest) and then by population size. Different mitigation options suit certain population densities and climatic conditions better, so it is important to include localised projections in the BAU.

Better management of landfills has great potential

A set of possible and effective mitigation actions were assessed for landfill management. The three key mitigation action areas, with relevant mitigation potential, measurable

cost-effectiveness, and consistency with Peru's sustainable development goals, were:

- ✓ Landfill gas to electricity (LGFE)
- ✓ Landfill gas flaring
- ✓ Composting of organic waste separated at the source

Landfills provide two options for mitigation. LGFE has the mitigation potential of 6.6 million tonnes of carbon dioxide equivalent (CO₂e) during 2015-2030 and landfill gas flaring 1.5 million tonnes of CO₂e during 2015-2030. The size of the landfill determines which option is economically more viable - the larger landfills serving over 400,000 people are best suited for LGFE and medium-sized landfills serving 200,000 to 400,000 are preferred for flaring.

How to create enabling conditions

One of the issues regarding action in the waste sector is the scope of current regulation and policy. Regulation is essential to protect public health and the environment, especially with respect to combatting marine pollution, as inadequate waste treatment may cause health issues and environmental damage. There may often be barriers to advancing new business models based on a circular economy and recycling or piloting small-scale projects. On the other hand, regulation and standards can facilitate enhanced action. Part of the programme was therefore to address policy and regulation in Peru and identify possible reforms for implementing mitigation action.

"Regulation is essential to protect public health and the environment as inadequate waste treatment can cause health issues."

One of the policy reforms is to allow municipalities to sell waste materials to industry, which was not allowed under the previous waste law. In addition to policy reform, economic incentives were considered. A certification programme for high quality compost was suggested as an example of

Photo: Kal Loftus
/Unsplash

a market incentive for waste-based commodities. The NAMA Proposal was developed parallel to the national solid waste strategy, partly helping to avoid double effort and to exploit potential synergies. A new Solid Waste Law was passed in 2016, informed and supported by the NAMA.

Key role of monitoring, reporting and verification

A key feature of NAMAs is to develop sustainable MRV systems for NAMA activities. They are necessary to inform policy-making and to reassure financiers, markets and the public that the NAMAs will deliver credible and measurable emission reductions. It will also help countries like Peru to meet new requirements on accountability and transparency set out in the Paris Agreement, while also enhancing their national GHG inventories.

MRV systems for sectoral NAMAs can be building blocks for national MRV (i.e. economy-wide GHG inventory) and can enhance them by introducing tailored national emission factors and values in place of imprecise default factors.

The MRV system was designed for the three most viable mitigation options: Landfill gas capture with flaring, landfill gas capture with energy generation (LFGE) and source separated organic composting. A MRV system was also designed for Mechanical Biological Treatment (MBT), though it is not included in the NAMA. Different metrics and indicators were developed and a combined approach of three different analyses utilised. These were an analysis for mitigation and sustainable development impact assessment; a sustainable development co-benefits analysis; and an analysis of the mitigation methodologies and standards available for the technologies for selected mitigation options. As part of creating this new, improved MRV system, templates for monitoring and verification were developed, making it easy for plant operators to take part in new and improved MSW management.

Phase II: Advancing mitigation actions in the waste sector

The NAMA Readiness Programme for Peru initially had an implementation period of two years (2013-2015), but the successful partnership and availability of funds enabled a second stage of collaboration (2016-2018) to build further on its initial achievements. The goal of Phase II of the NPI in Peru was to fine-tune the NAMA activities. The NPI collaboration was concluded in summer 2018 after a final visit to Lima.

Six different consultancy assignments were commissioned under Phase II covering financing landfill mitigation, creating a market for compost, further developing the SIGERSOL information system, recycling and possibilities for international cooperation under Article 6 of the Paris Agreement.

Financing mitigation of landfill emissions

Phase II took further the work started on landfills in Phase I. There are a total of 22 legal landfills in Peru, of which five are private and 17 public. A study identified possible operators of solid waste services who would be eligible for funding to initiate the mitigation options highlighted in Phase I. Various

→ Peru has low recycling rates. In Phase II of NPI the mitigation potential of recycling was evaluated.

socio-economic and technical criteria were used to narrow down the potential operators to two eligible ones: a private company, Innova, and a public one of the Arequipa region.

Staff of the Ministry of the Environment of Peru, consultants and financial institutions then worked together to determine sources of finance for these operators. Naturally, the funding source would depend on the type of company and the planned timeframe for implementation. The study resulted in a list of funding scenarios for private operators:

- ✓ International soft financing
- ✓ Government funding (direct financial support)
- ✓ International market mechanism
- ✓ Partial funding through RER (Renewable Energy Resources) auction

For public operators, the possibility of the national mechanism Works for taxes - *Obras por Impuesto* - was added as a funding scenario.

As a result, funding applications were completed. For the public operator Arequipa, the most suitable funding source was determined to be the *Obras por Impuesto* mechanism, and for the private operator Innova, the Green Climate Fund, a UNFCCC fund specializing in investing in low-emission and climate-resilient development. Guidelines describing specific Peruvian requirements to approve the projects before submitting the application were included in the assignment. In addition, virtual training was provided to the operators on waste management in general and financial analysis.

Creating a market for compost

A feasibility study was conducted during Phase II for proposals for enabling conditions to create compost supply and demand in Peru, including a proposal of a compost standard. Part of the study was to identify current cases and relevant stakeholders for high quality compost use.

Photo: Tim Bird

In general, there was no great interest in compost production projects on the part of municipalities. However, considering that organic waste currently represents more than 50% of the total solid waste at the country level, it was useful to establish strategies to promote compost production with municipal organic waste and implement national policies to develop compost supply and demand, for example by preparing a quality standard for compost. Household organic waste accounts for 85.5% and market waste 14.5% of the total. From the selected districts in Phase II, 36% of the total quantity of municipal solid waste generated in Peru could be directed for compost production.

Besides creating enabling conditions for a waste-based commodity market, the study developed a parallel education and awareness programme to promote compost production and use. There is a potentially large demand for compost from farmers, who could use it as soil improver. The transportation costs of compost to agricultural areas represent a challenge, since most of it is produced in more populated areas in and around the capital Lima.

Standards for ensuring high quality increase the viability of compost as a tradable product. To ensure the robustness of the standard, certain laboratories were identified as accredited certifiers. Categories were established for the suitable uses of various compost products, such as agriculture, green areas and afforestation, to increase the commercial utility of compost. These correspond with the potential buyers, who would be farmers, private sector garden centres and state organisations among others. The result of all this work was the Peruvian Technical Standard "Requirements for Organic Solid Waste Compost Production" proposal and its enabling

ATTRACTING THE PRIVATE SECTOR

Private sector participation in the market for mitigation is a key component for success. During Phase II, the following barriers to private sector engagement were identified:

- Lack of efficient institutional organization to manage funds
- Lack of interest of relevant political actors to participate and of

regulatory support to continue the implementation of the mitigation measure across political cycles

- Permission procedure to determine fees
- Poor collection and quality of solid waste data and statistics
- Inadequate urban infrastructure, lack of economic solvency and access to funds

activities. In 2018, this draft standard has been submitted to the public quality control institution for certification.

From data to action

The Ministry of the Environment of Peru created the so-called SIGERSOL system in 2008 to collect information on waste management and management at the municipal level. Under the NAMA programme, SIGERSOL was developed further to provide data on greenhouse gas emissions and actions for NDC reporting.

SIGERSOL benefits many stakeholder groups. For the municipalities, SIGERSOL serves as a tool for entering information on the management of solid waste more effectively and quickly. It allows citizens to get basic information about the management of solid waste at the local and national levels. Also, companies can access the information reported by each local government to identify business opportunities in the solid waste sector. Thanks to SIGERSOL, the Ministry of the Environment of Peru, as the governing body, can obtain statistical data on management of solid waste nationally, thereby informing relevant strategies and actions.

Recycling for a sustainable economy

Peru has currently very low recycling. The emission reduction potential of recycling for the period 2016-2030 has been estimated at an annual average of 258,500 tCO₂e/a indicating great potential for enhanced action in recycling. Such action can also contribute to the achievement of the United Nations Sustainable Development Goal number 12 of responsible consumption and production. One of its targets is to substantially reduce waste generation through prevention, reduction, recycling and reuse by 2030. In Phase II, factors that would most advance recycling were assessed.

In the Lima metropolitan area, where most recycling activities are concentrated, waste pickers supply more than 90%

Photo: Tim Bird

↑ A considerable amount of recyclable material is supplied by waste pickers.

of the recyclable waste delivered to collection centres. Waste pickers work outside of taxes and legal norms, meaning they have limited access to public sector services. Formalization of the waste picker's trade would help both them and their families and Peru on the whole, as recycling of usable waste could be significantly higher and provide a more sustainable living to those who depend on it. There have been credit programmes and funds for recyclers organised by the National

Environmental Fund of Peru, but the informality problem of the sector has hindered the success.

The informality of the sector also leads to gaps in information. Over 400 personal interviews were conducted to collect data on how the recycling sector functions at the moment, as there are no official records that are sufficiently comprehensive. Having better data would help with understanding the type of solid waste management system required. The formalisation of the sector would bring tax revenues for enabling government investments to create such a system.

In Peru, there are markets for recyclable plastic, glass, paper and cardboard. The study identified key recycling solutions for these materials alongside the need for formalization in the sector. Transportation costs to the most active recycling hub of Lima from other cities lead to less recycling in these cities. By expanding recycling hubs also in other cities than Lima, recycling rates can be increased. Greater regulation would ensure the efficient location of centres to commercial and industrial areas and help to develop a technical standard for collection centres. Clear guidelines for consumers on what to recycle would help in the formalization. Identification of possible areas for temporary collection centres could promote immediate action.

These solutions pave the way for increased formalisation, which would benefit many of the waste pickers in Peru. Over 200,000 families in Peru's growing cities struggle to earn a living by collecting various recyclable materials from informal landfill sites. In more effectively managed landfill sites, or other collection points, these people could be officially employed in waste collection and recycling. This would bring them into the formal economy, and greatly improve their social security, working conditions and well-being.

"Clear guidelines and identification of possible areas for temporary collection centres could promote immediate action."

BLANKETS FROM BOTTLES

Mauro Gelmi Candusso is Operations Director of the Gexim recycling company, whose plant is in the Ate suburb of Lima. The company receives and recycles polyethylene terephthalate (PET) bottles, producing Polyester Staple Fibre, and is a good example of private sector solid waste management.

"Bottles are mostly recollected before arriving at landfills," says Candusso. "They come from recycling programmes from the Peruvian Ministry of Environment, and Non-Governmental Organizations (NGOs) that trade bottles with blankets made by ourselves from the Polyester Staple Fibre. They later donate these blankets to those who don't have enough economic resources to face cold weather. Some supermarkets have campaigns with the same purpose as the NGOs. Bottles from restaurants and other institutions arrive through the NGOs. We also buy bottles directly from people who collect them from the streets and bring them personally as a source of income."

Gexim collects about 250 metric tonnes of bottles monthly. "Polyester Staple Fibre is used in the production of blankets, woven and non-woven products such as Geotextile for road construction, inner liners for mattress production and whiteboard erasers. It is also mixed with low-melt fibres to produce an insulation fabric for walls and roofs to replace glass fibre wool in construction. We are

Photo: Tim Bird

↑ The private sector has an important role in waste management, for example, by recycling PET bottles.

currently the only Polyester Staple Fibre producer in the Lima region. We also sell directly to our clients locally and internationally, to Mexico, Colombia, Chile, Bolivia and Italy. Other PET bottles and laminated products (such as packaging) will become waste again in a short period of time, while our products have a much longer life cycle, after which the vast majority can be recycled again."

One of the criteria for a NAMA is to enhance sustainable economic growth - businesses like Gexim benefit from waste sector mitigation action, providing work and stability. Businesses such as Gexim also pay tax for their purchase of waste material. This creates an important link between the informal and formal actors in the waste sector.

Photo: Willian Justen de Vasconcellos/Unsplash

Dumpsites and emissions

Greenhouse gas emissions from the decomposition of organic matter were also estimated under NPI Phase II. MINAM groups cities territorially according to their characteristics of population, location and conurbation, which also influence the generation and composition of solid waste. The grouping of cities can generate economies of scale in solid waste management, decrease environmental impacts such as soil loss, landslide deterioration and disseminated generation of leachates, and optimize the mitigation of greenhouse gases.

This study determined the potential for mitigating greenhouse gas emissions in Solid Waste Informal Disposal Sites (SWIDS) located in cities in the territorial areas prioritized by MINAM.

The results confirmed that a large number of people practice informal recycling in dumpsites, in some cases with the permission of the municipality, and in others illegally. Plastic is prioritized in the recovery of material and this is sold on to retailers. There is an established informal chain of recycling of plastics.

MINAM defined 22 SWIDS in Peru's climate zones to estimate GHG emission generation in the base year 2016 and calculate the baseline and emission reductions in 2016-2030. Two mitigation options were identified: landfills with semi-aerobic technology, and landfills with decentralized capture and methane combustion technology.

Semi-aerobic technology uses the construction of systems for the aeration of gases, drainage of leachate and natural aeration by convection, to accelerate the decomposition of waste. In decentralized capture and combust methane technology, residues are deposited in cells that have a piping system to capture the methane produced and to burn it at the exit of each pipe.

Cooperative approaches under the Paris Agreement - Article 6 study

Article 6 of the Paris Agreements provides options for parties to voluntarily cooperate in implementing their NDCs "to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity." Article 6 enables market-based cooperation through the use of Internationally Transferred Mitigation Outcomes (ITMOs) towards NDCs and an international mechanism for promoting mitigation and sustainable development.

Under the NAMA Readiness Programme, an innovative proposal was developed for a conceptual Pilot Cooperative Arrangement to enable Peru and a partner country to voluntarily engage in transactions of ITMOs from the solid waste NAMA. The proposed Pilot Cooperative Arrangement is designed as a government-to-government transaction, but adjustments could be made to accommodate also private sector buyers.

The Article 6 study explored design aspects for safeguarding the achievement of Peru's NDC, ensuring environmental integrity and robust MRV and accounting, incentivising participation and mobilising finance. The suggested Pilot Cooperative Arrangement is one possible way of structuring a cooperative approach and provides an initial concept only. The scope of the study was to examine, under the current understanding of Article 6, how arrangements for trading ITMOs could be arranged in the case of Peru.

The suggested Pilot Cooperative Arrangement proposes the application of a call option structure in which the partner country has the right, but not the obligation, to purchase available ITMOs from the NAMA at an agreed future date and ITMO strike price. In exchange for the right granted by Peru, the partner country would pay the host country a call option premium in successive tranches in accordance with specific outputs or Pre-Agreed Payment Milestones to be met by Peru. To mitigate the risk that Peru sells emission reductions that may be needed for its own NDC achievement, the exercise of the call option would be conditional upon (i) Peru

being on course to over-achieve its NDC or, alternatively, to over-achieve a sectoral target for the waste sector; and (ii) the generation of additional emission reductions from pre-selected activities of the NAMA.

The study also discussed how the NAMA Fund - one of the elements of the NAMA Proposal - could be utilised for financing the Pilot Cooperative Arrangement. The NAMA Fund could become responsible for receiving, managing and disbursing international (and possibly also domestic public) climate finance through a variety of financing instruments. It would therefore co-finance a large portfolio of solid waste sector projects willing to tap into climate finance and carbon market opportunities.

The study identified several aspects that need further development and elaboration, ranging from technical issues such as multi-year emissions trajectory development to financial vehicles and contractual arrangements.

WHAT IS ARTICLE 6?

Article 6 of the Paris Agreement recognises that "some Parties choose to pursue voluntary cooperation in the implementation of their nationally determined contributions to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity". Article 6 has three components: provisions for Internationally Transferred Mitigation Outcomes (ITMOs) between Parties, a new internationally governed

mechanism for promoting mitigation and sustainable development, and a framework for non-market-based approaches. The rulebook for the implementation of the Paris Agreement, including for Article 6, was still under negotiation as the NAMA Readiness Programme was concluded, with the aim to finalise the rulebook at the international climate conference (COP24) in Katowice, Poland, in December 2018.

Photo: Cesar Carlevariono
Aragon/Unsplash

Looking to the future

In parallel to NPI Phases I and II, the Peruvian government developed and passed important legislation enshrining climate change and waste management into national legislation. The new Solid Waste Law, which came into force in December 2016, contains rights, obligations, powers and responsibilities of society in regard to solid waste management. It applies the integrated solid waste management approach and the principles of circular economy, recovery and recycling of waste, extended producer responsibility and protection of the environment and human health. The key paradigm shift is that solid waste is now considered as a resource. The producers' extended responsibility represents a valuable opportunity to engage the private sector.

The goal of the law is to maximize material use efficiency to ensure the economic and sanitary management of solid waste. Life-cycle management of waste is highlighted alongside the inclusion of all society into the combined effort of clever waste management and prevention. This new waste law supports the realization of many of the outcomes from Phases I and II by putting into practice the groundwork required to implement the planned NAMA activities under the NDC.

The Framework Law on Climate Change of Peru was established in April 2018. It provides for a High-level Commission on Climate Change and a mandate for sectoral and local level National Planning Instruments. The law also aims to increase the sustainability of public investment by incorporating risk management analysis into all decision-making.

"The NPI has created enabling conditions needed for the implementation of mitigation measures in the waste sector," says **Laura Sacada Daly**, the Greenhouse Gas Mitigation Director of MINAM.

In February 2017, Peru established a Multisectoral Working Group on NDC, consisting of 13 ministries and the National Strategic Planning Centre (CEPLAN), to facilitate the implementation process of the Peruvian NDC. The working group will generate technical information required for the successful implementation of the NDC. The guidelines and roadmap for the waste sector's contribution to NDC implementation will be supported and informed by, and aligned with, the NAMA Readiness Programme's recommendations and outputs.

Rosa Morales Saravia of the Vice-Ministry for Strategic Development of Natural Resources, the focal point for climate change in Peru, says: "In the last few years we have been devoted to the implementation of the Paris Agreement. In this context, our work involves the facilitating of actions that are not our direct responsibility. That includes solid waste management, which can help to reduce greenhouse gases."

It is important to understand the local and visible effects of waste sector actions and communicate them to increase support and acceptability for enhanced action: reductions in environmental degradation and toxic leachates improve people's everyday surroundings. **Katherine Riquero**, Director of

"One of the most important added value from this NPI cooperation is that it has helped us to see as a country the importance to close the gaps in waste management and that facilities for correct waste management can also draw on technologies that reduce greenhouse gases."

↑ Laura Sacada Daly, the Greenhouse Gas Mitigation Director of MINAM, concludes that the NPI cooperation has helped Peru as a country to see the importance of closing the gaps in waste management, and that facilities for correct waste management can draw on technologies that also reduce greenhouse gases.

→ Rosa Morales Saravia of the Vice-Ministry for Strategic Development of Natural Resources, the focal point for climate change in Peru, says: "In the last few years we have been devoted to the implementation of the Paris Agreement."

the General Directorate of Solid Waste Management, states: "As a nation, we all need to push the cart. My function in the Ministry and as General Directorate Director is to motivate the citizenry, the business sector and corporations. It is part of the plan to provide more information sessions to the public."

She continues: "We have already taken the first step with the introduction of guidelines, but now we need to follow through with implementation of waste management actions, to see the results more tangibly. I believe that our population wants to see changes."

Marcos Alegre Chang, Vice Minister of Environmental Management at MINAM, is also thinking of the future for Peru.

↑ Katherine Riquero, Director of the General Directorate of Solid Waste Management, states that it is necessary to motivate the citizenry, the business sector and corporations to take action. She believes that the people of Peru want to see changes.

↑ Marcos Alegre Chang, Vice Minister of Environmental Management at MINAM, welcomes the results of the NPI's NAMA project and says that MINAM intends to carry on with this kind of relationship leading to information and technical exchange.

← Kari Hämekoski, NEFCO Manager, observes that the NPI, originally focused on the NAMA concept, has been able to manoeuvre through the development of international climate policy very well. He concludes that the original objective of NPI was to attract market financing, and Article 6 is offering exactly that.

"We intend to carry on with this kind of relationship leading to information and technical exchange. It's important to think beyond only doing business. The Ministry needs to work on raising awareness among the public. There are options for further development in isolated rural areas and we would like to promote that, but it would require a strong change in culture. The possibility of using manure for biogas is not out of the question, for example, but our practices in cattle-raising do not take into account this use of organic material. We are also carrying out work with the Ministry of Culture. Coffee, cocoa and rice chains should be greener and there is the possibility of bio waste from coffee production. Our Ministry wants to promote this kind of solution. But we lag behind other countries in some respects and are lacking knowledge. That's why the NPI's NAMA project has been welcome."

"NEFCO has been pleased to evidence the good progress in waste sector in Peru partially supported by the NPI," says Kari Hämekoski, NEFCO Manager. "While the programme originally focused on the NAMA concept, we have been able to manoeuvre through the development of international climate policy well. All work done over the years is still relevant - the key evidence of the NAMA Proposal being part of NDC. The final NPI assignment - the Article 6 study - closes the circle nicely. The original objective was to attract financing from the markets, and Article 6 is offering exactly that potential for Peru. When also taking into account the comprehensive experience of Clean Development Mechanism (CDM) projects in Peru, the country should be well-equipped to interest private financiers."

The way forward and the lessons learned

The final result of the NAMA Readiness Programme was a waste sector NAMA concept for Peru, complemented by numerous studies on specific issues, as well as enhanced knowledge and capacity among key stakeholders for implementing

mitigation action in Peru's solid waste sector. The key lessons learned from the NPI Phases I and II in Peru highlighted the complexity, and value, of early action and effective cooperation.

For Peru, the NAMA Proposal has the potential to create economic activity by means of waste-based commodities such as recyclables, compost and to some extent refuse-derived fuel. Peru has already taken important steps towards creating value for waste, thereby promoting markets and business opportunities for sustainable waste minimisation, recycling and management. Barriers to action need to be further addressed to improve the viability of waste sector action for municipalities and the private sector and move towards an increasingly circular, sustainable economy. This is a key issue for all stakeholders, from the institutional to the informal.

The various direct and indirect benefits of mitigation action are not always fully recognized and considered in decision-making, and highlighting and monitoring these co-benefits can raise awareness and increase sustainable support for mitigation action. Public awareness of the benefits of waste sector improvements is key for social acceptability. It is clear that the formalization of informal sector actions, such as in the Peruvian case of waste pickers, brings socio-economic benefits. Mitigation issues can be incorporated into sector strategies to mainstream mitigation action. Timing is important in imbedding mitigation aspects and the process is supported by taking due account of parallel technology or legislation updates.

Meanwhile, it is clear that reliable data and robust analysis are the backbone of policy-making. Their availability can support the breaking down of barriers to tangible action. Only policies and measures that address real barriers, including those of a cultural and behavioural nature, can mobilise real action. Policies must have *teeth*. It is also important to

"Public awareness of the socio-economic and other benefits of waste sector improvements is crucial for achieving social acceptability."

Photo: Pedro Lastra/Unsplash

understand that mitigation is cross-sectoral, just as waste is cross-sectoral, spanning different industries and sources.

A robust MRV is the key to finance, improvement and trust. The ability to measure, report and verify the results of actions, such as mitigation outcomes, in a robust and transparent manner promotes accountability. This unlocks many opportunities in terms of financial sources, tracking and improving policy effectiveness, international trust and recognition.

Early action and pilots in real-life contexts are valuable and effective ways to develop capacity, identify and address barriers to climate action, and inform national and global climate policy. Pilot programmes should be guided by clear goals and designed to be flexible and responsive to the evolving global and national contexts, as well as to information and insights emerging during the course of the programme. The continued and renewed commitment, ownership and engagement of the host country and its key stakeholders are essential for success, in terms of identifying and promoting mitigation action that is realistic, effective and sustainable, and in line with national priorities. Securing and maintaining a strong host country role can take time and cause delays, especially in the event of frequent changes in government and contact persons.

MRV, together with comprehensive NDC implementation plans and policies, are cornerstones of market readiness, that is, the ability to utilise international climate finance and carbon markets to fund mitigation action. The NAMA Readiness Programme has supported Peru's market readiness, especially in the context of market-based cooperative approaches under Article 6 of the Paris Agreement.

In conclusion, cooperation is complex and time-consuming but worthwhile. NAMA Readiness Programmes can support the journey from data to finance and action. Both the challenge and added value of NAMA Readiness Programmes lie in their aim of helping host countries to utilise up-to-date data and scenarios in the design of effective and concerted policy toolkits.

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The Nordic Partnership Initiative on Upscaled Mitigation Action (NPI) supported developing countries in designing and implementing mitigation action and attracting funding from international climate finance and carbon markets. In Peru, the initiative focused on building readiness for mitigating greenhouse gas emissions in the solid waste sector. It generated comprehensive information on the sector's status and trends in terms of waste and emissions, mitigation potential and costs, and barriers to action. Mitigation plans for landfills were prepared, a robust information system developed, and policy reforms introduced for recognising waste as a valuable raw material. The NPI results have been integrated into national and local development plans and serve as valuable building blocks in the design and implementation of Peru's mitigation pledges under the Paris Agreement.

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