Environmental impact of immunization supply systems

Tenet 3: The environmental impact of energy, materials, and processes used in immunization supply systems from the international to local levels is assessed and minimized.

The visioning process

Over the course of 2010 and 2011, partners have joined forces to develop a shared, long-term vision for immunization supply and logistics systems and technologies. The goal of this vision is to guide key stakeholders at country, regional, and global levels in their work to strengthen supply and logistics systems. This process is being facilitated by project Optimize, a collaborative project of the World Health Organization and PATH.

The following proposed characteristics serve as working hypotheses to help characterize the vision, or desired state, of an environmentally rational supply chain:

- Vaccine thermal stability is increased and true stability utilized in order to raise storage temperatures where permitted, reduce cooling capacity requirements, and enable alternatives to air transport.
- Packaging requirements are minimized to reduce natural resources consumed and minimize storage space requirements.
- The reduction of distances and time for shipping are considered a critical criterion for determining where vaccine and related products are sourced.
- Distribution vehicles are carefully selected, driven, and maintained for journeys that have been optimally planned to minimize energy requirements while maximizing service life.
- Energy efficiency strategies, beginning with informed product selection and continuing through ongoing maintenance, are implemented to reduce energy requirements.
- Renewable energy sources are used to replace fossil fuels to reduce resource depletion and decrease pollution.
- Innovative product development in the field of refrigeration and transportation provide purchasers with more efficient,


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Landscape analysis focus areas

- **Energy and resource efficiency**
  - Green energy and cold storage
  - High-efficiency cold storage
  - Product volume reduction & improved packaging
  - System-wide energy management
  - Transportation efficiency
  - Vaccine stabilization
- **Waste reduction and management**
  - Harm reduction in waste management
  - Improved waste management
  - Non-incineration disposal
  - Recycling or value reclamation waste management

The vision

By 2020, state-of-the-art supply systems meet the changing needs of a changing world in order to enable the right vaccines to be in the right place, at the right time, in the right quantities, in the right condition, at the right cost.

For more information

PATH
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reliable, and durable equipment choices for vaccine cold chain.

- Countries have clear policies, strategies, and funded plans for waste management that include disposal of immunization and daily medical wastes as well as repair, reuse, and recycle provisions for packaging and equipment.

Landscape analysis

The landscape analysis of environmental impact of immunization supply systems was conducted to better understand the work under way by all global stakeholders in this area.

We looked at the immunization system as a continuum and considered the environmental impacts along the way. For example, we included considerations of packaging and shipping modes at the manufacturer's level; in-country transport, cold chain, and health system energy use; and waste management at the end of the process.

Preliminary gaps

The goal of the landscape analysis was to identify gaps that need to be addressed to realize the vision of future immunization supply systems. The gaps identified to date are as follows:

- There is a lack of concrete information about the economic value of making environmentally sound decisions in logistics system design. To address this, economic research that quantifies the intangibles, shows the balance between up-front investment and savings in running costs, and possibly takes into account the carbon credit value could be useful.
- A number of innovative software tools utilize newly digitized global location information to optimize logistics transport legs. However, up to now, these tools have been used primarily in the private sector and multinational companies. There are likely to be costs in developing-country immunization logistics that could be removed by optimizing delivery routes while at the same time reducing the environmental impact of these programs. More work is needed to utilize available, innovative geographic information system tools to increase the efficiency of developing-country logistics systems.
- Much of the global work on medical waste in developing countries has been focused on general medical waste. There may be opportunities to apply lessons learned about managing medical waste in the curative health sector to immunization logistics.
- A holistic approach to reducing waste in logistics systems can start with making sure that the right quantity and quality of product is accepted into the system in the first place. Excess waste can result from over-ordering, moving product to locations where it cannot be stored or used properly, and accepting product with inadequate remaining shelf life. Work on product optimization through raising capacity for accurate quantification, product redistribution, and proper acceptance procedures can strengthen logistics systems and ultimately reduce the amount of waste for disposal.
- Globally, there have been recent advances in low-emission, hybrid, and electric vehicles. Knowledge is needed about how these new classes of vehicles could help increase the overall efficiency of logistics systems, and if favorable, understanding the steps toward opening procurement mechanisms.
- Also related to transportation efficiency, there is a lack of work on light-weighting loads that are carried in the immunization logistics system. Reducing weight and volume of vaccine loads could result in overall cost savings and reduced environmental impacts. Two approaches for accomplishing

this are streamlining packaging to reduce volumes and redesigning vaccine carriers and cold boxes to reduce the refrigerant-to-vaccine ratio by increasing insulation efficiency.

- The difficulty of collecting the highly distributed waste in the logistics system is a huge barrier to being able to efficiently treat and dispose of it. How can the exhaustive infrastructure for vaccine delivery be better used for waste management collection? Further work on reverse logistics for waste collection and centralized treatment could be valuable to improving the environmental impact of immunization.
- To facilitate the movement to reduce and optimize packaging of vaccines and supplies, it would be helpful to ensure there is a feedback loop about cold chain conditions all the way back to manufacturers. Generating better information about product conditions during shipping and upon arrival and sharing this information with manufacturers could result in improved packaging by reducing manufacturers' tendency to over pack.
- Advocacy is needed to ensure that environmentally responsible technologies have a path into the developing-country immunization marketplace. Consideration of other factors beyond purchasing cost should be encouraged. The current quality regulation and purchasing mechanism systems should be examined to see what opportunities exist to broaden decision-making in this area. This applies to different categories of technologies including cooling technologies, vehicles, and power systems.

Landscape analysis summary table

By 2012, the vision statement will reflect evidence found through the following landscape analysis and other analyses. For more information on this landscape analysis, please contact optimize.who@path.org.

Vision of future immunization supply and logistics systems: Core tenets

1. Vaccine products and their packaging are designed with characteristics that best suit the needs and constraints of countries.
2. Immunization supply systems are designed to maximize effectiveness, agility, and integration with other supply systems, and to support continuous system improvement through learning, innovation, and leveraging synergies with other sectors.
3. The environmental impact of energy, materials, and processes used in immunization supply systems from the international to local levels is assessed and minimized.
4. Immunization information systems help staff plan and manage immunization activities and resources while ensuring that adequate quantities of vaccines are always available to meet demand.
5. Human resources policies provide immunization supply systems with adequate numbers of competent, motivated, and empowered personnel at all levels of the health system to overcome existing and emerging immunization supply challenges.

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	Focus area	Project/concept	Partners involved	Description	Locations	Keywords
Energy and resource efficiency	Green energy	**Decrease dependence on diesel-generated electricity at clinic/hospital level by using renewable energy** www.haitilibre.com/en/news-1254-haiti-energy-1-million-in-solar-energy-for-the-commune-of-boucan-carre.html	Partners in Health, Solar Electric Light Fund, Clinton Bush Haiti Fund, NRG Energy, SolarWorld, 11th Hour Project	Boucan Carre, Haiti health facilities relied 100% upon diesel fuel to generate electricity until a 10,000 watt solar electric power system was installed by the NGO Solar Electric Light Fund. Fuel costs have now been cut by 64%. Diesel generators are subject to high costs, high maintenance, unexpected breakdowns, and produce a variety of environmental impacts. A solar-diesel hybrid can reduce cost, increase reliability, and reduce environmental impact.	Haiti, Lesotho, and Rwanda have all employed solar diesel hybrids designed and installed by the Solar Electric Light Fund for facilities operated by Partners in Health	environmental impact, power systems, solar power, solar-diesel hybrid
	Green energy and cold storage	**Project Optimize battery-free solar vaccine refrigeration challenge and field demonstrations**	PATH, Dyna-Tek, Inc., Vestfrost, Sunfrost, Sundanzer, True Energy	Solar-powered vaccine refrigeration has been used to extend immunization to remote areas for nearly 30 years. Field experience indicates that the majority of equipment failures have involved the battery system, which is often expensive and difficult to replace. Battery-free solar refrigerators provide green cold storage without problematic battteries.	Senegal, Vietnam	cooling technology, environmental impact, solar power
	Green energy and cold storage	**SolarChill Consortium**	World Bank, PATH, Greenpeace, others	The consortium is working on advancing the technology of battery-free solar refrigerators for developing-country vaccine storage.	Various	cooling technology, environmental impact, solar power
	High efficiency cold storage	**Improved refrigerator for vaccine storage**	PATH, Global Cooling/ Twinbird	A battery-free solar powered stirling cooler refrigerator is being developed to further improve and expand vaccine storage in remote health clinics with no grid power.	Japan, United States	cooling technology, environmental impact, solar power
	High efficiency cold storage	**SEEDR L3C/CDC passive cold chain equipment**	CDC, CDC SEEDR L3C bilaterals	Three passively cooled vaccine transport carriers of different sizes. The carriers are made using recycled materials and designed to be fully recyclable. Engineering models demonstrate improved temperature stability, increased cold life, and no freezing. Carbon-negative insulation reduces the overall CO_2 footprint. Boxes are lighter, requiring less fuel for transport.	United States	cold boxes, cooling technology, environmental impact, freeze prevention, passive cooling, supply systems, vaccine carriers
	Product volume reduction and improved packaging	**Global Packaging Project**	Consumer Goods Forum, ECR Europe, EUROPEN, Grocery Manufacturers Association, Sustainable Packaging Coalition, AIM (the European Brands Association)	This project delivers to the consumer-products industry a language and simple metrics to enable more informed dialogue between trading partners about the relationship between packaging and sustainability.	Global view	environmental impact, packaging
	Product volume reduction and improved packaging	**Intradermal adapter for standard needles**	PATH, West Pharmaceuticals, SID Technologies	Intradermal delivery of vaccines could decrease the volume of vaccines needed to confer immunogenicity.	India, United States	environmental impact, intradermal delivery, reduced vaccine dose, vaccines and delivery devices
	Product volume reduction and improved packaging	**New plastics for packaging**	Various	New packaging materials are being developed; for example, plastics for secondary packaging that include recycled content and plastics designed for safer burning disposal to replace glass syringes.	Global view	environmental impact, packaging

	Focus area	Project/concept	Partners involved	Description	Locations	Keywords
Energy and resource efficiency	Product volume reduction and improved packaging	**Repackaging of Zithromax**	Pfizer Pharmaceuticals, International Trachoma Initiative of the Task Force for Global Health, JSI Logistics Services	This group is repackaging donated Zithromax to reduce shipment volume. The most significant change is a move from bottles containing 30 tablets to 500 tablets. The change has not yet been rolled out; they are finalizing production and anticipate shipping the newly configured bottles and cartons in spring 2011.	Global view	environmental impact, packaging, shipping
	Product volume reduction and improved packaging	**Tools for minimizing or optimizing packaging**	Sustainability Packaging Alliance, Sustainable Packaging Coalition, Greener Package	Various tools are being developed to help industry make sustainable choices in packaging. Examples are Sustainable Packaging Coalition's COMPASS web application, Greener Packaging's database, and Sustainability Packaging Alliance's Packaging Impact Quick Evaluation Tool. These tools may be used by vaccine and injection device manufacturers to improve their packaging choices with regard to environmental impact.	Global view	environmental impact, packaging
	Product volume reduction and improved packaging	**Uniject™ injection system projects (Uniject is a trademark of BD)**	PATH, the Bill & Melinda Gates Foundation, USAID, FHI, Marie Stopes International, IPPF, UNFPA, WHO, Pfizer	Working to advance the availability of Uniject presentations of Depo-Provera® for contraception and oxytocin for management of bleeding in the third stage of labor. This project involves a reduction of materials, lowering shipment, storage, and waste disposal costs.	Honduras, India, Indonesia	environmental impact, packaging, vaccines and delivery devices
	Product volume reduction and improved packaging	**Pentavalent vaccine in Uniject**	Crucell, BD, PATH	Crucell is working toward using Uniject as the primary packaging and optimizing secondary packaging for Uniject to reduce shipment, storage, and waste costs through the cold chain and distribution channels.	Global view	environmental impact, packaging, vaccines and delivery devices
	Product volume reduction and improved packaging	**Reusable pallet shippers**	Technical University of Denmark, UNICEF	This project is examining air-freight pallet packaging (e.g., insulation, coolants, cladding, pallet base) used by vaccine manufacturers to develop ideas for how pallet shippers could be used to take products beyond the traditional termination point at the national level. One idea involves creating low-impact materials with highly desirable characteristics to encourage reuse at the final destination.	Global view	environmental impact, packaging, shipping
	System-wide energy management	**Health in the Green Economy**	WHO	WHO's *Health in the Green Economy* series is reviewing the evidence about expected health impacts of greenhouse gas mitigation strategies in light of options considered in the Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.	Global view	environmental health, environmental impact
	System-wide energy management	***Powering Health:* A USAID resource**	USAID	*Powering Health* is a 30-page resource for health centers in low-resource settings, including guidance on how to assess energy needs, determine and select from available options, and find sustaining resources. Though not focused exclusively on reducing environmental impact, it enables and facilitates selection of cleaner energy sources.	Global view	environmental impact, power systems
	System-wide energy management	**Project Optimize: Zero energy cold chain**	PATH and Tunisian government partners in immunization, electric power, product testing, solar industry, and electric vehicle industry	This holistic approach starts with an energy audit, and reducing energy consumption through program streamlining/integration, energy efficiency retrofit measures, and the switchover to using all electric vehicles for vaccine distribution/outreach. New refrigerators with lower energy consumption will replace older, less reliable models. Electric power will be produced on each site with a grid-connected photovoltaic solar electric power system.	Tunisia	electric vehicles, energy efficiency, environmental impact, integration, power systems, solar power, supply systems
	System-wide energy management	**Training courses in renewable energy**	Solar Energy International, the Pan American Health Organization, NGOs, governments, universities	Through the Renewable Energy Education Program, Solar Energy International offers hands-on workshops and online courses in solar photovoltaics, wind, micro-hydro, solar hot water, and natural home building. Though not specific to logistics, governments could tap into this resource to benefit their logistics systems.	Africa, Americas, Caribbean, Micronesia	environmental impact, power systems, renewable energy

	Focus area	Project/concept	Partners involved	Description	Locations	Keywords
Energy and resource efficiency	Transportation efficiency	**Distance reduction or route optimization for vaccine delivery routes**	JSI, CDC, ESRI, Llamasoft	These are geographic information system software tools that can assist with route optimization. For example, ESRI's ArcGIS software has the capacity to develop optimized "static" routes. Supply Chain Guru from Llamasoft is another example of such a tool that includes a carbon footprint analysis module. ESRI and Llamasoft recently announced plans to join their tools.	Global view	environmental impact, GIS, route optimization, supply systems, transport
	Vaccine stabilization (decrease cooling needs)	**Vaccine stabilization**	PATH, various government and private-sector, industrial and developing-country agencies, vaccine manufacturers, and technology companies	PATH is advancing technologies that help ensure vaccine performance and effectiveness under the toughest temperature conditions. Using advanced vaccine formulation designs and stabilization technologies, PATH is researching methods to improve the thermostability of both new and existing vaccines.	India, United States	environmental impact, thermostability, vaccine technology
	Vaccine stabilization (decrease cooling needs)	**Vaccine stabilization grand challenge grants**	Bill & Melinda Gates Foundation, Tufts University School of Medicine, TransForm Pharmaceuticals, Endo Pharmaceuticals	In 2005 the Bill & Melinda Gates Foundation launched the first Grand Challenge grants, with one category being the development of heat-stable vaccine. Three current projects at three different organizations are focusing on three different approaches to stabilization: the use of bacterial spores to protect antigens, high throughput formulation screening method, and polymerization.	United States	environmental impact, thermostability, vaccine technology
Waste reduction and management	Harm reduction in waste management	**Needle hub cutter**	BD	The hub cutter reduces the volume of environmental waste resulting from multiple safety boxes or injection waste that is improperly disposed. One hub cutter will hold the injection waste of five safety boxes or 400 to 600 needles.	India, United States	environmental impact, health care waste management, needle remover
	Harm reduction in waste management	**Needle-free vaccine administration**	PATH, various private-sector technology companies	Several companies are developing alternative vaccine delivery technologies that offer alternatives to sharps, such as jet injectors, intranasal delivery, and sublingual gel.	Dominican Republic, India, United States	environmental impact, needle-free delivery, vaccines and delivery devices
	Harm reduction in waste management	**Proper approach to disposal of sharps**	Government of Rwanda, USAID Maternal and Child Health Integrated Program	These collaborators provided the principal technical assistance to help Rwanda become the first country in Africa to introduce the new vaccine against pneumonia (in 2009). They provided support on proper approaches to manage and dispose of sharps, especially important since the vaccine was supplied in practically indestructible glass single-dose prefilled syringes.	Rwanda	environmental impact, health care waste management
	Improved waste management	**Transporting, Storing, and Handling Malaria Rapid Diagnostic Tests at the Peripheral Storage Facilities, 2009; and in Health Clinics, 2009.** www.finddiagnostics.org/export/sites/default/resource-centre/reports_brochures/docs/malaria_rdt_central_manual_may09.pdf (pages 21-30) deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/TranStorRDT_Clinic.pdf (pages 20-29)	USAID | DELIVER PROJECT, WHO, WHO-WPRO, Foundation for Innovated Diagnostics, Roll Back Malaria Partnership, President's Malaria Initiative, and UNICEF	These publications are intended for staff at health clinics that use malaria RDTs. They describe the basic principles for management and storage of RDT stock, and they outline practical solutions for protecting RDTs against high temperatures during storage and transport. They also describe how to manage waste generated from RDT use.	USAID | DELIVER countries: Angola, Benin, Ghana, Liberia, Madagascar, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, Tanzania, Uganda, Zambia	environmental impact, health care waste management, malaria diagnostics

	Focus area	Project/concept	Partners involved	Description	Locations	Keywords
Waste reduction and management	Improved waste management	**Booklet for the community health worker on health care waste management**	USAID | DELIVER PROJECT	The project has produced a *Guide for Health Care Waste Management* for use at the facility level. With recent increases in community-based distribution of injectable contraceptives and other products with potentially hazardous waste material, waste management for community-based health workers will become a more important issue. The project plans to produce an illustrated booklet for community-based health workers on safe handling and disposal of hazardous waste.	USAID | DELIVER countries: Angola, Benin, Ghana, Liberia, Madagascar, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, Tanzania, Uganda, Zambia	environmental impact, health care waste management
	Improved waste management	**Global Healthcare Waste Project** www.gefmedwaste.org/article.php?list=type&type=3	UNDP, WHO, Health Care Without Harm	This project is assisting seven countries in developing and sustaining best health care waste management practices in a way that is both locally appropriate and globally replicable. In one country, the project is testing and disseminating non-incineration health care waste treatment technologies.	Argentina, India, Latvia, Lebanon, Philippines, Senegal, Tanzania, Vietnam	health care waste management, environmental impact
	Improved waste management	**Guidelines for the Storage of Essential Medicines and Other Health Commodities. 2003.** apps.who.int/medicinedocs/en/d/Js4885e/ pages: 81-86; available in English, Spanish, French, Urdu, Bangla, Arabic, and Russian	JSI/DELIVER, WHO	*Guidelines for the Storage of Essential Medicines and Other Health Commodities* is a practical reference for setup and management of a storeroom or warehouse. The guide contains written directions and illustrations on receiving and arranging commodities, special storage conditions, tracking commodities, maintaining the quality of the products, constructing and designing a medical store, waste management, and resources. It was written to meet the needs of district-level facilities; however, it applies to any storage facility, of any size or setting.	USAID | DELIVER countries: Angola, Benin, Ghana, Liberia, Madagascar, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, Tanzania, Uganda, Zambia	environmental impact, health care waste management, medicines storage
	Improved waste management	**Internal standard operating procedures**	SCMS, JSI, Management Sciences for Health	SCMS has developed a number of internal standard operating practices for the disposal of unusable medical items; disposal of unusable pharmaceutical products; and disposal of damaged, refused, or unusable pharmaceutical products.	USAID | DELIVER countries: Angola, Benin, Ghana, Liberia, Madagascar, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, Tanzania, Uganda, Zambia	environmental impact, health care waste management
	Improved waste management	**Landscape of non-incineration disposal methods**	UNDP—Global Environment Facility, JSI, Health Care without Harm, various others	UNDP and the Global Environment Facility facilitated technology visits for stakeholders of eight facilities in the New York and Washington, DC, areas using innovative non-incineration medical waste disposal technologies.	United States	environmental impact, health care waste management, non-incineration waste disposal
	Improved waste management	**Logistics of Health Care Waste Management: Information and Approaches for Developing Country Settings. 2009.** deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/LogiHealtWastMgmt.pdf	USAID | DELIVER PROJECT	Medical or health care waste refers to all waste generated by health care facilities, research facilities, and laboratories. Health care waste management is a major health and environmental concern. Hazardous waste, including sharps and other infectious waste, pose a serious risk to human health and the general environment. In many developing countries, disposing of this waste is complicated by limited financial and human resources. This document considers the reality of health care waste management practices in resource-limited settings. Solutions offered are based on developing-country experience and presented as practical solutions to logistics problems in health care waste managment.	USAID | DELIVER countries: Angola, Benin, Ghana, Liberia, Madagascar, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, Tanzania, Uganda, Zambia	environmental impact, health care waste management

	Focus area	Project/concept	Partners involved	Description	Locations	Keywords
Waste reduction and management	Improved waste management	**Medical Waste Improvement Implementation** www.noharm.org/global/issues/waste/	Health Care Without Harm, World Bank, JSI, CDC, WHO	Health Care Without Harm helps countries implement health care waste management guidelines developed with other funding.	proposed or active in Nepal, Vietnam, Tanzania, Argentina, Philippines, Bangladesh	environmental impact, health care waste management
	Improved waste management	**Making Medical Injections Safer**	JSI, URC, PATH, others, USAID, CDC	This PEPFAR project aimed to improve injection safety in initial PEPFAR countries from 2004 to 2009. It included work to improve waste management practices, including waste segregation practice and safe disposal of sharps. Lessons learned and materials developed during these projects could be applied to immunization programs.	Botswana, Cote d'Ivoire, Ethiopia, Guyana, Haiti, Kenya, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Vietnam, Zambia	environmental impact, health care waste management
	Improved waste management	**Support Establishment and Sustainability of Medical Waste Management Systems in Kenya**	PATH, Kenya government agencies, PEPFAR partners, local NGOs, and other donors	This project will support improved and sustainable medical waste management systems in Kenya by implementing a three-pronged approach. PATH will work to strengthen the health care waste management system, increase capacity in procurement and commodity management systems, and encourage healthy behaviors among health workers and the community.	Kenya	environmental impact, health care waste management
	Non-incineration disposal	**Encapsulation**	Management Sciences for Health	Management Sciences for Health is working on encapsulation or inertization for products that are dangerous to burn, such as pharmaceuticals that may contain sulphurous or mercuric compounds.	Global view	environmental impact, expired drug disposal, health care waste management
	Non-incineration disposal	**Syringe melters**	Past projects by PATH, others, IT Power, New Paradigm Automation, Los Alamos Technical Associations, Sigma-K Corp, PATH	Syringe melters melt syringes to encapsulate needles and reduce volume for safer disposal.	India	environmental impact, health care waste management
	Non-incineration disposal	**Performance, quality, and safety (PQS) specifications for medical waste autoclaves**	WHO	WHO is working to create specifications and test protocols for medical waste autoclaves. This would be a new category in the WHO PQS Program.	Global view	autoclave, environmental impact, health care waste management, PQS
	Non-incineration disposal	**Sustainable Waste Management** www.noharm.org/global/issues/waste/resources.php	Health Care Without Harm	Tools and resources for program managers interested in environmentally responsible health care waste management, with an emphasis on non-incineration methods. Tools include catalogs of technologies, recommendations for improving health care waste managment, and tools to aid evaluation of waste management technology choices.	Global view	environmental impact, health care waste management
	Non-incineration disposal, recycling, or value reclamation waste management	**Medical Waste Processing and Value Recovery**	SEEDR L3C, CDC	Custom-built medical waste processing machines use microwave technology for disinfecting waste, and then allow for municipal treatment and/or recycling of plastic content enabling some value recovery from the waste stream.	United States	environmental impact, health care waste management

Focus area	Project/concept	Partners involved	Description	Locations	Keywords
Non-incineration disposal, recycling, or value reclamation waste management	**BD ecoFinity system for recycling plastic from sharps waste** www.bd.com/ecofinity	BD, Waste Management Company	The BD ecoFinity Life Cycle Solution provides a system for processing used sharps and reusing the resulting raw plastic material to make new sharps boxes. They expect to enable recycling of 70% of the sharps waste stream where it is employed.	United States	environmental impact, health care waste management, recycling
Recycling or value reclamation waste management	**Mosquito net recycling pilot project**	USAID | DELIVER, WHO, UNEP	This first-of-its-kind recycling pilot project was carried out in six districts in southern Madagascar in November 2010. Over 13 tons of expired mosquito nets were collected and are currently being shipped to Baltimore where they will be tested and processed by Trex in Winchester, Virginia.	Madagascar, United States	environmental impact, malaria nets, recycling, reverse logistics

Abbreviations used: AIM, European Brands Association; CDC, US Centers for Disease Control and Prevention; ECR, Efficient Consumer Response; EUROPEN, European Organization for Packaging and the Environment; GIS, geographic information system; IPPF, International Planned Parenthood Federation; JSI, John Snow Inc.; NGO, nongovernmental organization; PQS, performance, quality, and safety; RDT, rapid diagnostic tests; SCMS, Supply Chain Management System; UNDP, United Nations Development Programme; UNFPA, United Nations Population Fund; UNICEF, United Nations Children's Fund; URC, University Research Corporation; USAID, US Agency for International Development; WHO, World Health Organization; WPRO, WHO Western Pacific Regional Office.