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ADDRESSING ISSUES OF CHEMICAL AND HAZARDOUS SUBSTANCES IN MUNICIPAL WASTE MANAGEMENT – COORDINATED ROLE OF MUNICIPALITIES, NATIONAL GOVERNMENTS, AND PRIVATE AND INDUSTRY SECTORS

(Background Paper for Plenary Session 4(a) of the Provisional Programme)

Final Draft

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Introduction

The life cycle of chemicals consists of the use of natural resources for production of chemicals that are inputs into industrial and consumer products of many varieties which are in turn consumed and used, and, at the end of their useful life, become waste. If hazardous chemicals, such as Persistent Organic Pollutants (POPs), Mercury, etc, are used or part of products, the waste resulting post-consumption of these products can become hazardous.

The linkage between chemicals and hazardous waste is well-recognized; to the extent that UNEP has included "harmful substances and hazardous waste" in its medium term strategy (2010-2013) as one of its 6 subprogrammes. The subprogramme includes the implementation of the Strategic Approach to International Chemicals Management (SAICM).

The overall objective of SAICM is to achieve the sound management of chemicals throughout its lifecycle so that, in accordance with the World Summit on Sustainable Development (WSSD) goal for chemicals management, by 2020, chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment.

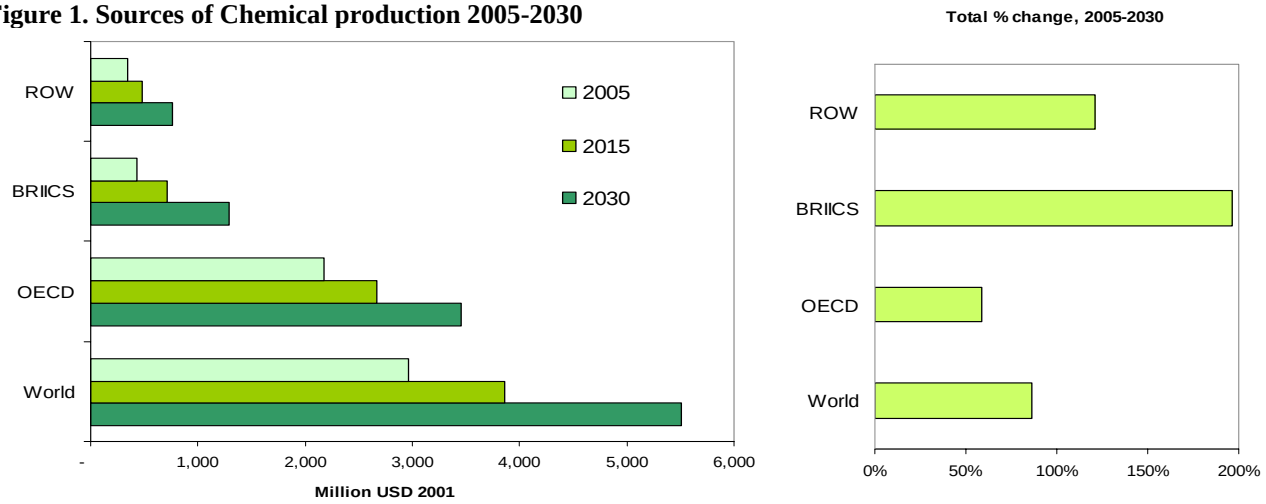
The implementation of the Strategic Approach to International Chemicals Management and its objectives and the relevant work areas of the Global Plan of Action are based upon a life-cycle approach to the sound management of chemicals, including waste management. SAICM includes as objectives to reduce the generation of hazardous waste, both in quantity and toxicity, and to ensure environmentally sound management of hazardous waste, including its storage, treatment and disposal and to promote the environmentally sound recovery and recycling of hazardous materials and waste.

Trends in chemicals production/use and hazardous waste

Chemicals are a major contributor to national economies, and the sound management of them throughout their life cycle is essential not only to avoid significant risks to human health and ecosystems (along with their associated economic and social costs), but also to maximize the full benefits of their contribution to human well-being.

By 2030, developing countries are expected to have the highest growth rate for the production of high-volume industrial chemicals, increasing their global share to 37 per cent. Developing countries are now consuming chemicals at a rate faster than in developed countries, and could account for a third of global consumption by 2030. Since 1987 the chemicals sector in China has been growing at an annual rate of around 16.5 per cent, which is several times the rate of most OECD countries (around 1 to 4 percent over the past 10 years). As a result, China has surpassed Germany as the third largest producer of chemicals.

Figure 1. Sources of Chemical production 2005-2030



Note: BRIICS include Brazil, Russia, India, Indonesia, China and South Africa; ROW is the rest of the world
Source: OECD Environmental Outlook to 2030, 2008

The increase of consumption and production of chemicals in developing countries will increase the potential for negative impacts on human health and the environment in those countries that are least able to deal with the complex challenge posed by the sound management of chemicals. This trend will further widen the gap between countries in terms of capacities to maximize the benefits of chemicals for human well-being.

UNEP, in close collaboration with OECD, WHO and other organizations of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), is developing a Global Chemicals Outlook to frame current understanding of trends in chemicals production, use and disposal, economic implications of these trends, and policy options.

Changing trends in chemicals production and use, combined with the increasing volume of waste and waste stream complexity coupled to economic growth are posing serious risks to ecosystems and human health. Every year, 11.2 billion metric tons of solid waste is estimated to be generated globally. Yet, waste treatment facilities appropriately equipped to treat and safely reuse, recycle or dispose of hazardous waste are not yet available in developing countries. Landfill sites and older incinerators in developing countries are either absent or ill-equipped in terms of pollution control systems. Uncontrolled dumpsites have already been linked to many harmful health effects such as cancer incidence, mortality, birth defects and low birth weight; the underlying cause of which is likely to be toxic substances, heavy metals and open-burning of waste that is a typical sight in such 'wildcat' landfills. Waste pickers, typically poor men, women and even children, are most vulnerable to the negative effects of uncontrolled exposure to municipal waste containing hazardous elements. Efforts on decoupling economic growth from increased waste generation have not been sufficient, and if poorly managed these growing waste streams will impose ever more serious liabilities to economic and social welfare.

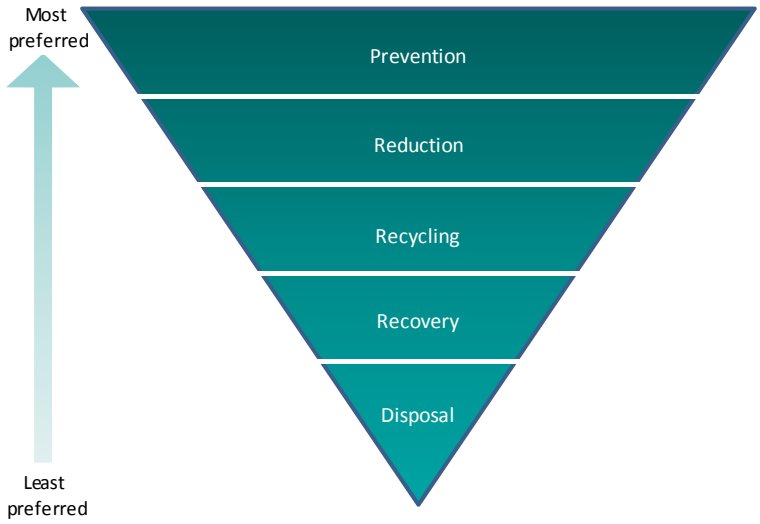
Of all the waste streams, waste from electrical and electronic equipment containing new and complex hazardous substances presents the fastest growing challenge in both developed and developing countries. Some 20 to 50 million metric tones of e-waste are generated worldwide every year. Already in 2005 it was estimated that the waste electrical and electronic equipment (WEEE) constitutes about 8 percent of municipal waste in developed countries and is one of the fastest growing waste components. More than 90 percent of discarded computers from the developed world are to developing countries for recycling.

The International Conference on Chemicals Management decided at its 2nd session in 2009 that e-waste is an emerging issue to be considered under SAICM. The conference recognized that near-end-of-life and end-of-life electrical and electronic products are a growing concern as a result of trade of second hand items and import of waste for dumping in developing countries. This trade can also result in illegal transboundary movements of hazardous constituents of this waste such as heavy metals (i.e. mercury) and brominated flame retardants. ICCM2 furthermore stressed that here is a lack of capacity to handle electronic waste in an environmentally sound manner in almost all developing countries and countries with economies in transition, leading to the release of hazardous substances causing harm to human health and the environment.

Another source for harmful substances in municipal waste is chemicals in products. Hazardous chemicals in products have in particular cases shown to cause significant adverse effects on human health and the environment, for example, from lead in children's toys and jewellery and on the environment through the release to water of nonylphenol ethoxylates (NPEs), for example. Chemicals in products may pose future risks to human health and the environment at different stages of the life cycle of a product: during production, use, recycling or disposal. Chemicals in products have been introduced as an emerging issue under SAICM.

Managing the introduction of harmful substances due to chemicals into Municipal Wastestreams
To limit the effects of the chemicals in hazardous waste a number of measures can be used at the different layers of the waste management hierarchy representing integrated solid waste management. The waste management hierarchy in Figure 2 illustrates an ordering of waste management options progressing from 'most preferred' options of waste minimization, viewing waste as a resource (recovery and recycling) to the least preferred option of waste storage (disposal).

Figure 2. The waste management hierarchy



The implementation of different layers in the waste hierarchy requires different activities which include the involvement of governments, private sector and civil society. Some of the activities require the establishment of legislation, use of economic instruments while others allow for voluntary approaches.

The below table present a non-exhaustive list of some of the activities – ranging from national policy options to firm-level investments- that can help to limit the amount of waste, some of these activities but not all will be applicable to harmful substances..

Waste management hierarchy	**Activities**
Prevention: a.) volume of waste production b.) use of hazardous chemicals in production of consumer products c.) entry of hazardous substances into waste streams	1. Legislation to limit marketing of harmful chemicals including harmful chemicals in products 2. Conventions on specific chemicals such as POPs, Mercury 3. Controls on waste trade i.e. Basel Convention
Reduction	1. Economic instruments, i.e.: - Environmental taxes to create demand for products containing lower amounts or less harmful chemical (substitution question 2. Cleaner production - Design for Environment/ Life Cycle Approach - Product stewardship by industry (Extended Producer Responsibility)

	3. Chemicals leasing 4. Environmental, Health and Safety product standards 5. Product stewardship by industry (Extended Producer Responsibility) - Reverse logistics/reverse supply chain management 6. Retailer take-back responsibilities 7. Investment in waste management infrastructure –drop off points for electrical and electronic equipment
Recycling	1. "Necessity being the mother of invention" – government role in creating necessity, i.e. Rare earth metal example . 2. Policy targets for recycling activities, use of recycled materials in production. 3. Government as consumer: sustainable procurement policies 4. Economic instruments: - market creation mechanisms (i.e. eco labels, legislated environmental standards, substitutes) - Subsidies/removal of perverse subsidies. (i.e. market support subsidies for recycled materials markets) - Packaging recovery note trading 5. Industrial land use planning, i.e. by-product synergies and industrial ecology 6. Facilitating technology transfer 7. Recycling as livelihood/job creation (nb. In developing countries – trick is to make it safer)
Recovery a.) organic/biodegradable materials b.) energy c.) other types of materials	1. Diversion targets for waste going to landfill 2. Public Private Partnerships on infrastructure for composting or incineration 3. Environmental Management: Firm-level waste-to-energy technology as cost saving 4. Economic instruments: - Feed-in tariffs for waste-to-energy facilities (biomass or mixed waste) - Subsidies to compost producers - Landfill taxes - Packaging recovery notes trading
Disposal	1. Landfill siting and construction standards and requirements 2. Land use planning / zoning regulations 3. EIA/SEA requirements 4. Economic instruments: - Infrastructure charges as cost recovery measures - Development planning charges to positively influence development patterns

For hazardous waste the ultimate long term goal will be the prevention of harmful substances in the different waste streams. This can to some degree be achieved through national legislation to limit or prevent the marketing of harmful chemicals. At the international level, the Convention on Persistent Organic Polutants, the Montreal Protocol on Ozone Depleting Substances and the coming convention on mercury are examples of legally binding instrument to ensure that the production and use of the chemicals will cease and no longer be found in hazardous waste.

However, due to the number of potential harmful chemicals detailed regulation might not be possible in the very near future even in developed countries. Furthermore many chemicals such as household chemicals, pesticides, metals in electronic will still be needed and end up in the waste and they might have negative effects on environment and human health.

Reduction of harmful substances in hazardous waste can be achieved through a number of different activities, some of which are use of economic instruments such as tax on harmful substances in order to promote the use of less harmful alternatives, others are voluntary measures such as cleaner production to limit the use of harmful substances, chemicals leasing and product stewardship by industry. An important legislative option available to developed and developing countries to reduce the amount of e-waste is the extended producer responsibility, which makes the manufactures responsible for recovery and recycling of safe disposal of their products at the end of their useful life. This might however be difficult in developing countries where the industries as small to medium sized.

Recycling and recovery of harmful substances is in particular relevant for metals due to the increased scarcity in availability of such resources. There are a number of activities beside the market driven

aspects that can be used to increase the recycling of waste. In most countries, the main sources for the recycling of metal are electronic equipment, cars etc. However, a number of the recycled metals are toxic to the human health and the environment. In most developing countries the recycling is being carried out by the informal sector and there are numerous examples of waste scrapers and children having experienced severe health effects or dead from hazardous waste.

Disposal through incineration of harmful substances are for a number of banned harmful substances the only solution. However, a number of developing countries do not have the necessary equipment to carry out such operations. The disposal of harmful substances in landfills requires extensive precautions including standards for landfill siting and requirements to avoid the pollution of the environment. Economic instruments for cost recovery of the waste deposits are used in particular the developed countries. The development of such landfills for hazardous waste in developing countries requires extensive financial resources.

CASE STUDY

In Dhaka, Bangladesh, a project for generating compost from organic waste helped create 400 new jobs in collection activities and 800 new jobs in the process of composting. Workers collect 700 tons/day of organic waste to obtain 50,000 tons/year of compost. As per some of the characteristics of these jobs, workers had access to health insurance, a daycare center and a free meal. Among the benefits of the project, compost is cheaper as a fertilizer, it decreases the need for irrigation and the soil quality is improved. The local population engaged in composting activities has a higher income (Waste Concern, 2008).

From an employment/social perspective, it would be critical to address the need for progressive formalization of the sector at the same time that environmental and economic objectives are being pursued. This can be tackled through the transformation of jobs and the reorganization of economic segments. Typical examples include the introduction of door to door services for collection of MSW, up-stream sorting of municipal and industrial waste, industry to industry waste exchanges, segmentation of waste collection and waste recovery services (e.g. used lead acid batteries, oily waste), the emergence of contracting services, collective organizations, skills development programs to come to terms with the type of material that is handled by workers and enterprises and the use of environmentally sound technologies for waste management, and the introduction of targeted Occupational Health and Safety (OHS) programs.

The application of national labor laws and OHS legislation to the informal economy is one of the most important challenges facing many countries. At the same time, OHS provides possibly the easiest entry point for the extension of basic labor protection including basic OHS measures. The work of the ILO and its recommendations regarding the informal economy should be considered in the context of the formalization of the waste management sector (workers, skills, OHS, co-operatives, etc) (ILO 2010).

Partnerships at national level

Chemicals are used in all sectors of the society and the approach to sound management of chemicals and also hazardous waste requires a multi-sectoral participatory approach. This underlines the complicated nature of dealing with hazardous waste in the municipalities in cities of developing countries.

The cost of waste handling in developing countries which in many cases only covers the collection and dumping of the waste at dumpsite is already an enormous burden for municipalities and the separation of hazardous waste part of the solid waste stream is only to a limited extents being done. Both public and private sectors are active in handling waste in developing countries. The public sector is usually the municipalities or city cooperation’s, whereas the private sector involved in waste management in developing countries is diverse and usually contains a large informal sector. Examples of private sector

operators are waste pickers, waste buyers, small-scale recycling industries and larger-scale recycling industries.

Most developed countries systems have system in place to separate the hazardous waste from non-hazardous waste categories at the individual household level and to collect the hazardous waste and handle it in special facilities. This might not be feasible in the big cities of the developing countries in the very near future which need to look for other solutions.

The use of private-public partnership to handle solid waste might be a part of the solution in cities of the developing countries. An example of such a public-private sector involvement has been described from New Delhi.. (See below case study)

CASE STUDY

Delhi has opted to maintain a community container infrastructure, and most residents and other waste generators bring their waste to temporary storage points. In a service organized by non-governmental organizations and the New Delhi Municipal Committee in coordination with resident welfare associations, private door-to-door waste collection service is provided by waste pickers at a fixed monthly fee to 80 per cent of high-, middle- and low income households in New Delhi municipality. The service providers take the waste to the temporary storage points, extracting the valuable materials before discharge. Since 2005, four private companies have been servicing these secondary collection points under a public-private partnership agreement with the city authorities….
At least 150,000 waste pickers throughout the Delhi waste management system divert over 25 percent of all waste generated in Delhi from disposal into recycling of materials, thus saving very substantial funds for the municipal authorities. They upgrade the materials and sell them into the recycling supply chain, a pyramid going from the pickers to the small junk dealers on the boundaries of formal and informal recycling. The small junk dealers sell to specialized dealers and end-users, and some material is also exported.

Un-Habitat (2010). Solid Waste Management in the World's Cities: Water and Sanitation in the Word's Cities 2010, Earthscan, London

The case study describes the situation as it relates to solid waste, which will include hazardous waste from chemicals in products such as batteries, light bulbs, electronic equipment together with paints, biocides and medicine. The waste pickers will most probably take out the products that can be recycled which constitutes a separation and is probably more efficient in doing so than individual household. However, the fraction of the hazardous waste that is not recyclable does not present and incentive for the waste picker and that limits the approach for these specific types of waste. However, a training of the waste pickers to also separate these specific types of waste together with some economic incentives for separation could provide a way forward.

Another partnership is the private-private partnership where a supplier of chemicals goes into a partnership with a customer. An example of this is chemicals leasing described in the below Case study. The concept has been developed by UNIDO in cooperation with Austria and Germany. Chemicals leasing is being tested in a number of developed and developing countries, such as Austria, Mexico, Egypt, Russia, Colombia, Germany, Morocco, Serbia and Sri Lanka.

CASE STUDY

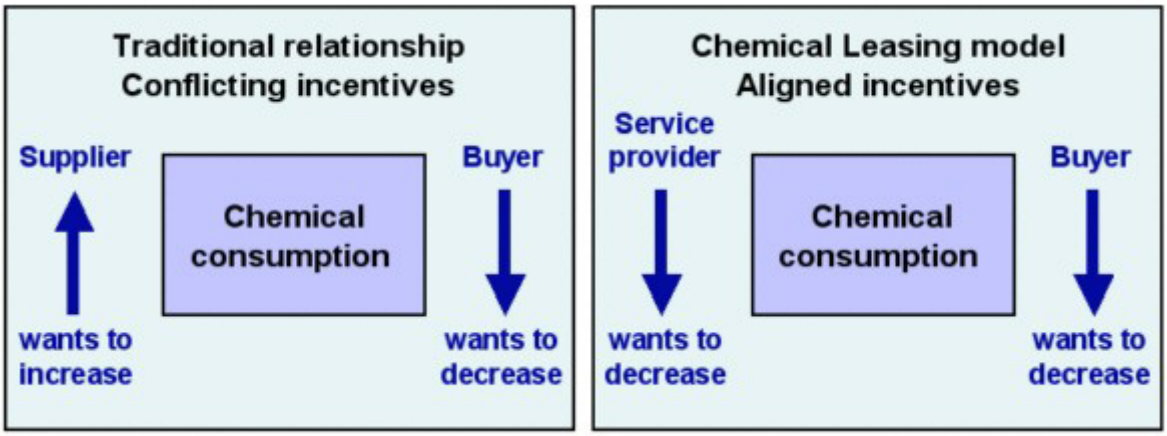
Traditionally, chemicals are sold to customers, who become owners of the substances and therefore responsible for its use and disposal. Their suppliers have a clear economic interest in increasing the amount of chemicals sold, which is usually related to negative releases to the environment.

Compared to this approach, the concept of Chemical Leasing (ChL) is much more service-oriented. In this business model the customer pays for the benefits obtained from the chemical, not for the substance itself. Consequently the economic success of the supplier is not linked with product turnover anymore. The chemical consumption becomes a cost rather than a revenue factor for the chemicals supplier. He will try to optimise the use of the chemical and improve the conditions for

recycling in order to reduce the amount consumed, which again reduces the environmental pollution.

Against this background ChL can be seen as a key element of sustainable chemicals management systems.

The application of ChL models brings economic advantages for all partners involved, provides concrete solutions for efficient chemicals management and ways to reduce negative releases to the environment. Since chemical products provide a broad variety of services such as "cleaning", "coating", "colouring" and "greasing" the ChL model is applicable in a multitude of industry sectors.



When applying ChL business models, the producer does not just provide the chemical, but also his know-how on how to reduce the consumption of chemicals and how to optimise the conditions of use. While in the traditional model the responsibility of the producer ends with the selling of the chemical, in ChL business models the producer remains responsible for the chemical during its whole life cycle, including its use and disposal.

Based on the experience obtained to date, ChL business models have the greatest success when applied to processes that allow good recycling rates. This includes cleaning, greasing/degreasing and cooling/heating. Where the focus lies on service oriented payments, painting operations are also suitable for ChL

Source: http://www.unido.org/index.php?id=o4460

Partnerships at the international level

International and non-governmental organizations have engaged in extensive cooperation at both the international and regional levels. Since 2008, the Chemicals Branch of the UNEP Division of Technology, Industry and Economics has been working closely with the secretariat of the Basel Convention to develop draft technical guidelines for the environmentally sound UNEP has carried out intensive consultations to establish the Global Partnership on Waste Management. The Global Partnership will be a partnership for international agencies, Governments and civil society, including intergovernmental, public-private and non-governmental forums. It will support the development and implementation of action plans to implement integrated solid-waste management at national and local levels and to overcome immediate environmental, economic and public health challenges caused by the rapid increase of waste. It will also support policy dialogues at sub regional, regional and global levels to exchange experiences and practices. The Global Partnership will facilitate partnerships in various areas, prominent among which are the management of integrated solid waste, industrial waste, hazardous waste, health-care waste, e-waste; waste agricultural biomass; the implementation of various requirements of multilateral environmental agreements regarding mercury waste management, marine litter, and the role of the 3Rs in waste management.

The Global Partnership's main functional areas are: policy level dialogues and a policy framework for waste management; financing mechanisms for waste management; technologies for waste management; community participation in waste management; waste management for the Millennium Development Goals; environmental education in waste management; waste management for economic development; and waste management and climate change.

Management of mercury waste. The Chemicals Branch has assisted five countries: Burkina Faso, Cambodia, Chile, Pakistan and the Philippines, in compiling inventories using the mercury inventory toolkit and in preparing national mercury waste management plans. A final results workshop for all participating countries was hosted by Aberdeen University in the United Kingdom of Great Britain and Northern Ireland, to provide technical support for the project. These pilot projects complement a similar project in Latin America managed by the Secretariat of the Basel Convention. In addition, UNEP commissioned a report on the technical and economic criteria for processing mercury-containing tailings, to provide guidance on how to assess the feasibility of reprocessing mine wastes containing mercury.

Several partnership areas of the Global Mercury Partnership are concerned with the disposal of products containing mercury and aspects of the management of wastes containing mercury. The waste management partnership area, led by the Government of Japan, has the objective to minimize and, where feasible, eliminate unintentional mercury releases to air, water, and land from mercury waste by following a life-cycle approach. Part of the overall approach is to strengthen the capacity of developing countries and countries with economies in transition to deal effectively with mercury waste

Public-private partnerships are a priority under the Basel Convention, identified by parties as a means of tackling important challenges and issues associated with the environmentally sound management of wastes and their transboundary movements. The Conference of the Parties to the Basel Convention adopted the Basel Convention Partnership Programme as part of its 10-year strategic plan, convinced that the active involvement and support of industry and business organizations and non-governmental organizations was necessary to achieve the aims of the Basel Convention. The Partnership Programme to date has included two initiatives in its framework: the Mobile Phone Partnership Initiative and the Partnership for Action on Computing Equipment.

Conclusions

The handling of hazardous waste is an important element of sustainable development and requires a number of different activities ranging from legislation, economic instruments, voluntary industrial initiatives, partnerships, etc.

The developed countries have developed a number of activities for handling of hazardous waste. The handling of hazardous waste provides numerous problems for developing countries and to some degree also the developed countries and is of great relevance for the sustainable development of these countries. However, many of the activities require allocation of economic resources from government which are not available.

UNEPs activities on waste management at the national level has shown that while upfront political commitment is essential to ensure the serious engagement of partners, it is often difficult to gain national interest in local levels problems which adversely affects the replication of the concept within the country. A way to do that would be to show the national economic cost of the human health and environmental effects caused by not having systems in place for handling of waste.

The availability of financial resources for developing, implementing and operating waste management systems in developing countries needs to be enhanced. There is a need to develop and implement innovative financial instruments to raise funds for waste management. Public-private partnerships could be further explored to increase efficient use of sparse financial resources for the collection, separation and collecting hazardous waste..

The industry producing or using hazardous chemicals also have an important role to play in minimizing the use and disposal of hazardous waste and awareness raising on this need to promote in developing countries, where the industries are small and medium size.

The international organization has a big role in collecting information on national/local systems for handling of hazardous waste and to develop that information into non prescriptive guidance that can be used for decision on management of hazardous waste in developing countries. The international organizations should also be recognized as a vehicle for creation of the needed partnership.

However, it has to be recognized that there are many different ways to achieve the sound management of chemicals and that decisions on handling of hazardous waste have to taken into account differences in the social and economic setting at the national/local level.

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