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Policy options and actions for expediting progress in implementation: Waste Management

Report of the Secretary-General

[1] E/CN.17/2010/1.

Summary

Waste management and waste minimization represent challenges for all countries, but developing countries face mounting challenges with growing economies, rising incomes and rapid urbanization, all leading to rising waste volumes. For dynamic, urbanizing economies, defining a long-term waste management strategy for the coming decades is critical to fostering sustainable waste management. An effective long-term strategy should include the operationalization of integrated sustainable waste management systems.

Understanding the scale of generation of various categories of waste is fundamental to formulating appropriate policies. A number of new waste streams have emerged or assumed greater importance, especially e-waste and hazardous waste. In many cases, conventional waste management systems were not designed for either of these trends and need to be modified and upgraded.

Implementation of waste management strategies requires coordinated efforts by international agencies, local governments (within their jurisdictions), national governments, civil society, informal waste sector and the private sector. Reducing waste production, recycling waste and reusing materials form the basis of sustainable waste management. Municipal solid waste (MSW) in many developing countries requires strengthening, and in this regard the availability of financial resources for building waste management infrastructure and of technical and managerial skills for system management need to be enhanced. Public-private partnerships could be further explored to increase availability of and access to financial resources.

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I. INTRODUCTION

1. The present report is a contribution to the discussions to be held at the Intergovernmental preparatory meeting on policy options and possible actions to expedite progress in waste management. It responds to the challenges and obstacles highlighted in the report of the Commission at its eighteenth session (E/CN.17/2010/15). The report was jointly prepared by the Department of Economic and Social Affairs of the United Nations Secretariat (UN-DESA) and the United Nations Environment Programme (UNEP). It draws on inputs provided by the United Nations system, in particular the Basel Convention on the Control of the Trans-boundary Movements of Hazardous Wastes and their Disposal, World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO), United Nations Industrial Development Organization (UNIDO), and International Atomic Energy (IAEA). The report should be read in conjunction with the report of the Secretary-General on Sustainable Consumption and Production which will also be before the intergovernmental preparatory meeting of the Commission.

II. STRATEGY AND POLICIES FOR WASTE MANAGEMNT

A. Defining a Long Term Waste Management Strategy within the context of sustainable development and poverty eradication

2. Waste management and waste minimization are challenges everywhere, but developing countries face mounting challenges with growing economies, rising incomes and rapid urbanization, all leading to rising waste volumes. The barriers to effective management and minimization include lack of data, information, and knowledge on waste scenarios, lack of comprehensive regulations and weak enforcement of existing legislation, weak technical and organizational capacities, poor public awareness and cooperation, and lack of funds. The institutional framework has generally been weak, with very few or no national associations or city champions in waste management.

3. Priorities, policy and regulatory frameworks, institutional capacities and "maturity" of the waste business are at different levels across the world. While some countries have positioned waste as a resource in the national economy, many countries in the developing world and especially low-income countries are still struggling to provide basic infrastructure and services for waste collection and disposal. It is important therefore that the right enabling framework is established on a timely and comprehensive basis to address local circumstances. At the same time, all countries could benefit from an approach which aims at waste minimization as well as the recovery, recycling and reuse of various waste types as productive resources.

4. Coping with waste management would benefit from a shift to sustainable consumption and production (SCP) and a de-linking of economic growth and environmental degradation. Governments at all levels, businesses and consumers need to make significant changes in their policies, activities and choices to achieve the shift to SCP. The waste strategy should ideally address the whole life cycle, beginning with minimization of waste – including through eco-efficient product design – and continuing through to recycling and reuse (the other two Rs of the 3Rs), with disposal only of those residuals not recyclable and reusable at acceptable cost and then only in an environmentally and socially sound manner. Closed loop systems based on industrial ecology – where one firm's or industry's waste becomes other firms' or industries' raw materials – are a useful model to which to aspire. Japan is one example of a country which has implemented successful policies towards waste minimization and effective recycling, resulting in relatively low quantities of waste disposed per capita (430 kg per capita, which is only about two-thirds of the OECD average and on a par with South Africa[2]). All countries, even those which have progressed farthest, need to achieve much greater progress if there is to be any possibility of realizing the ultimate objective of "zero waste" economies and societies.

National policies and strategies

5. Traditionally, national waste management policies and strategies have been largely an end-of-life activity, though recycling rates have risen in many countries and, with respect to some materials in some countries, already attained high rates. Recycling in developing countries is frequently organized in the informal sector, where livelihoods of poor people are directly dependent on the recycling economy.

6. Approaches have evolved over time to look at product management over the life cycle; hence the term "cradle-to-grave". Yet, the "grave" still implies disposal as the default option for dealing with waste. More recently, this has begun to be supplanted by a "cradle-to-cradle" approach which stresses much more centrally the recovery of economically useful materials to feed back into production processes. At the same time, waste minimization has come to occupy a more central place in waste policies. That shift in emphasis has gone hand-in-hand with a focus on de-materialization, whereby the goods and services which people value are delivered using fewer materials (along with less energy). With this evolution in waste management philosophy and approach has come an evolution in waste management policies and practices.

7. For dynamic, urbanizing economies, defining a long-term waste management strategy for the coming decades is critical to fostering sustainable waste management. An effective long-term strategy must include the operationalization of integrated sustainable waste management systems. Such systems consist of a variety of activities,

[2] UN-DESA (2010), Trends in Sustainable Development: Chemicals, Mining, Transport and Waste Management, p.30.

including reduction, reuse, recycling and composting, operated by a variety of stakeholders at various scales. Not only technical and operational aspects, but also financial, training, legal, institutional and economic aspects and linkages must be addressed in an integrated manner in order for the system to function sustainably.[3]

8. A key challenge is to devise integrated waste management systems which effectively incorporate the informal sector and communities, upgrading both their skills and their working and living conditions. The informal sector's contribution normally includes the collection, recycling and disposal of solid wastes, while communities can also be involved in decentralized composting. The lack of such integrated strategies hinders environmental improvement and perpetuates the extreme poverty of the informal sector waste-pickers.

9. Implementation of new strategies on waste management, including hazardous waste, requires coordinated efforts by international agencies, local governments (within their jurisdictions), national governments, civil society and the private sector. Privatization contracts and legislation should be flexible enough to permit the participation of small-scale service providers.

10. To manage waste effectively, a long-term strategy should also include the development of a public awareness program, waste management infrastructure planning, as well as economic instruments such as household user fees, landfill taxes, and deposit-refund schemes to encourage consumers to reduce waste and increase recycling. The strategy should consider programs and legislation on Extended Producer Responsibility that encourage recycling and discourage the production of goods that are difficult to recycle. Economic returns from resource saving measures should be considered in overall policy and planning. Additionally, policy decisions must be sustained despite changes in leaderships.

[3] UNDESA, "Innovative Approaches and Strategies for Integrated Waste Management", 2010

Box 1

Incentives for Waste Reduction

Volume Based Collection Fees System: Korea

Prior to 1995, all municipalities in Korea levied waste fees on households through property tax or monthly lump-sum fee. Under this fixed-fee system, cost per residence remained constant regardless of the amount of waste generated, hence there were no incentives for households to reduce the waste they produce. Introduced in 1995, the ***Volume Based Waste Fee System*** of Korea is a pay-per-sack scheme under which households are required to place residual waste in pre-paid sacks, whilst recyclables are collected free of charge. Different municipalities levy different charges for their bags under the VBWF scheme. For example in Yongsan-gu, the price of a bag ranges from 100 Won for a 5 litre bag up to 1,780 Won for a 100 litre bag for general waste.
In Korea, quantity of municipal solid waste has been reduced by 15.95% from 1994 to 2006. Meanwhile, the recycling rate has increased from 15.4% to 57.2% over the same period.

Source: Adapted from Kim, K.Y. (2008). Performance of Waste Management Policy in Korea-Volume-based Waste Fee System and Packaging Waste EPR.

Box 2

Economic Instrument in Brazil

Latin America has wide variations in the practice of recycling across countries, owing largely to the systems of rewards and punishments that are in place. According to the Brazilian Aluminium Association, about 80 per cent of the 9.5 billion aluminium cans sold in 2000 are recycled. This would put Brazil right among the ranks of world's recycling leaders such as Japan. Whereas Japan's system is based upon responsible citizenship, Brazil uses economic incentives. In the major metropolitan areas, there are many recycling centres that buy back recyclable materials for cash or discount foods.

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Source: Review of the Implementation of Agenda 21 and the Johanesburg Plan of Implementation: Waste Management, 2010; Report of the Secretary General – CSD 18th session.

B. Improving Waste Management Systems, Infrastructure and Technology

1. Improving informal systems of waste management

11. The recycling segment of the waste industry in developing countries is predominantly controlled by the informal sector. Typically 1 per cent of the urban population in developing countries is involved in informal scavenging and a major fraction of the scavengers includes women and children. A recent estimate reveals that up to 15 million people engage in waste collection for their livelihood. Over half a million waste pickers have been reported in Brazil and the country has close to 2400 companies and cooperatives involved in recycling and scrap trading. In the city of Buenos Aires, waste scavenging has been estimated to have an economic impact of US$170 million per year. India is estimated to have at least a million waste scavengers. Estimates from several cities and towns of developing countries of Asia and the Pacific show that as much as 20 to 30 percent of the waste generated in cities is recycled by the informal sector[4].

Addressing issues of informal waste pickers in Brazil

In Brazil organized waste pickers are seen as legitimate stakeholders and exercise formal contracts with businesses. The cash transfer program called Bolsa Familia compensates families to shift their children from waste picking to school attendance. This has helped at least 40,000 children to have access to education and good health. Brazil houses at least 500 waste picker cooperatives, with about 60,000 members. Some of them earn their members US$300 a month, twice the minimum wage.

Source: Medina 2008

Addressing issues of informal waste pickers in Egypt

The minority community in Cairo, called the Zabbaleen, has been engaged in informal waste picking since the 1930s. After establishment of associations in 1970s, and the beginning of a Zabbaleen Environment and Development Program in 1981 with support from the Ford Foundation, the World Bank, Oxfam and others, the working conditions and basic infrastructure for waste collection and sorting has been improved considerably. A primary school as well as a paper recycling project, weaving school, health centre and small industries project have been established to support the waste pickers.

Source: Wilson and others 2006.

[4] UNEP report on "Waste Management as a sector of Green Economy", p.8.

2. Strengthening capacities to manage growing and increasingly diversified waste streams

12. Industrialization, urbanization, growing population and consumptive lifestyles have led to an exceptional increase in the quantum and type of waste generated around the globe. Per capita waste generation rates in many developing countries have now crossed the one-kilogram per day mark. Industrial waste generation rates are also very high, as many industries are primary industries producing raw materials for further processing. Understanding the scale of generation of various categories of waste is fundamental to establish the appropriate policies. A number of new waste streams have emerged, especially e-waste and hazardous waste.

13. Complexity, costs and coordination of waste management require multi-stakeholder involvement at every stage of the waste stream and intensive capacity building of all stakeholders including, but not limited to, technical personnel in local governments, municipalities, and other related institutions who are usually responsible for development and implementation of Waste Management Plans.

14. Comprehensive efforts need to be put in place to strengthen capacity including development and dissemination of training packages, manuals and guidelines on various aspects of waste management, technology compendiums, awareness raising materials, case-studies and best practice. A comprehensive on-line information clearing-house could be developed for easy accessibility by different users. Series of workshops and training programmes need to be conducted in all regions. Efforts should also be made to provide hands-on experience through demonstration projects. A network of capacity building institutions could help to institutionalize the effort.

3. Improving access to appropriate technologies and infrastructure

15. In achieving national waste management goals, Governments need to identify the best infrastructure as well as technology that are appropriate and possible to be applied. Such identification and choice would depend on resource requirements and local applicability.

16. While the success of developed countries is, to a certain extent, due to the adoption of modern technologies at every stage of waste management from waste collection through segregation, recovery/recycle, transport, treatment and disposal, infusion of modern technologies in developing countries has been rather limited and needs to be intensified to realise effective waste management. Many cities in developing countries have not been able to set up adequate systems for the collection of municipal and industrial waste due to a poor infrastructure base; in rural areas, waste management infrastructure is largely non-existent. Economic and financial limitations have forced

many developing countries to adopt technologies mostly on the basis of cost rather than sustainability criteria.

17. The organic waste which is still a sizeable portion of waste in many developing nations should be suitable for reduction through composting. In the case of incineration, the high start-up and operational costs are a major barrier to successful adoption of this technology in many developing countries.

18. Developing countries need information exchange and dissemination of waste treatment technology from developed countries, particularly for innovative 3R technology. For western Asia region, a high priority is strengthening waste management capacities of local authorities. Meanwhile in Africa, the application of advanced small-scale digesters to produce biogas as well as composting of fertilizer and/or animal feed from organic waste need to be implemented more widely. In some developing countries in Africa, South America and Asia, large scale waste-to-energy plants could be feasible and would benefit from the involvement of private companies.

19. To determine appropriate technologies, assessment methodologies such as SWOT analysis, GAP analysis, PEST (Political, Economic, Social, Technological) analysis as well as technology assessment methodologies such as Sustainability Assessment of Technologies (SAT), Life Cycle Assessment (LCA), Cleaner Production – Energy Efficiency (CP-EE) assessment, and Cost Benefit Analysis (CBA) could be applied.

20. There is equally a need to develop and disseminate technology data bases and create platforms where technology suppliers and technology acquirers can interact and establish partnerships.

Box 3

Biogas Digester: China Case Study

In Shipai Village in Jianshi County of Hubei Province, China, more than 90% of a total of 227 households have installed a 10 m3 biogas unit. The gas produced per household on a daily basis amounts to 1.0–1.2 m3, which is used for both lighting and cooking. This has saved electricity and coal (RMB 136 per year). Use of digested slurry has saved on chemical fertilizer. The annual labour savings are substantial. In addition, social benefits have been realized, such as employment for technicians, improvement of health, and increased participation in social work by women.

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Source: Report from Netherlands Development Organization (SMV), 2006; Wim J. van Nes, Biogas Practice Team Coordinator of the SMV

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4. Increasing research on and development of region- and country-specific technologies

21. Waste quantities and characteristics are location specific and require technologies to be adapted to suit local conditions. In the area of research and development of region and country specific technologies, countries should:

- Strengthen research and development institutions by building indigenous capacity to undertake targeted work on development and adaptation of waste management technologies. This should not be limited to disposal technologies but also include other aspects of waste management such as: segregation systems, treatment of waste, recycling technologies.
- Test the application of such technologies in the context of developing countries through pilot demonstration projects to build confidence. This in turn requires extensive data collection on waste characterisation and quantification to facilitate design/development of technologies.
- Strengthen capacity of decision-makers in technology assessment and selection.
- Develop information systems and/or technology data bases, including new and cutting-edge recycling technologies
- Develop locally relevant technologies.

5. Improving data collection analysis and monitoring

22. Availability of reliable and representative data is a crucial requirement for designing waste management systems and formulating appropriate policies. However, getting such data is a difficult undertaking in many countries. Definitions vary across countries; so do reporting disciplines. Despite efforts by international organizations to facilitate comparison by providing standardised methods for reporting waste related data, quite often caution is required while using the data.

23. There is an urgent need to improve the data collection and reporting process. This could be achieved by:
    - Developing internationally agreed upon procedures for data collection and analysis and reporting formats;
    - Persuading governments, both national and local, to collect reliable and representative data which in most cases will require intensive field work, monitoring and analysis. The data needs to be periodically updated as the waste quantity and characteristics are rapidly changing;
    - Developing an international waste data base which should be quite comprehensive and include all types of data such as: waste quantification and characterization (local level aggregated to national level); collection and recycling; policies and regulations; monitoring and analytical capacities.

C. Sustaining the Implementation of Environmentally Sound Waste Reduction, Reuse and Recycling

24. Experience has shown that waste management needs to be addressed through integrated approaches and requires the involvement of various stakeholders. Reducing waste production, recycling waste and reusing materials should form the basis for sustainable waste management. An ideal framework for Sound Waste Management (SWM) could be the 3Rs (Reduce, Reuse, and Recycle). However, there is no set model for establishing SWM in a particular area. Instead, it requires outside-the-box thinking and an assessment of potential stakeholders' involvement that is dependent on the specific scenario of a town, community, city or country (IGES, 2010).

25. In developing countries, oftentimes the public sector is ill-equipped to take on the task of waste management, despite its size as a share of local government resource allocation. In many cases, between 20-50% of a municipality's budget is spent on solid waste management alone. Success requires cooperation and partnerships, including greater involvement of the private sector, to relieve the burden on government budgets. Some governments have already outsourced to the private sector certain waste management functions.

26. One of the main reasons for current unsustainable waste management is that waste is traditionally thought of as having no value. Creating incentives which make waste minimization financially rewarding can change that. So can promoting awareness among key stakeholders on the related benefits and the know-how of SWM, through a variety of approaches, including education—formal, non-formal, and informal—as well as public awareness campaigns and demonstrations to showcase techniques and cost saving opportunities associated with resource efficiency and SWM. Other measures that effectively raise awareness include environmental accounting systems that factor in the waste costs of a product and Corporate Environmental Information Disclosure (CEID) which reveals information about a firm's environmental performance to its consumers, its investors, the government, and the community at large.

D. Strengthening the implementation of effective e-waste and hazardous waste policies and strategies

27. Electrical and electronic waste (E-waste) generation is steadily increasing owing to large-scale use of electronic and electrical equipment. E-waste is one of the fastest growing segments of the waste stream: it is estimated that 315 million personal computers became obsolete in 2004, and 130 million mobile phones were disposed of in 2005. In 2008, more than one in three people worldwide – 2.5 billion in total – used a mobile phone. That figure is expected to rise by up to 400 million new subscribers each year. While this trend is responsible for immeasurable advances worldwide, discarded mobile phones are posing a growing and potentially alarming environmental threat.

28. Next to MSW, hazardous waste (including industrial, healthcare, and domestically produced hazardous wastes) constitutes a major component of global waste statistics. The Basel Convention has estimated the amount of global hazardous waste at 338 million metric tonnes a year and trans-border movements at close to 9 million tonnes.

29. Although some countries are taking steps into the right direction, still many developing countries and countries with economies in transition do not have the necessary expertise and infrastructure to handle and manage e-waste and hazardous waste in an environmentally sound manner. Collection, treatment and disposal of hazardous waste are beyond the traditional capacity of local governments that manage municipal waste. Numerous obstacles have been identified by developing countries in regard to their ability to manage these waste streams in an environmentally sound way. These include: lack of easily accessible information (on flows, quantities, available technology, legislative/trade requirements of countries importing new products, which increasingly require strict standards for minimization and re-use, recycling and recovery); lack of trained personnel; inadequate legislation; inadequate infrastructure for collection, recycling and recovery; lack of public awareness; and lack of economic alternatives to activities carried out by the informal sector and small family repair shops.

30. A comprehensive e-waste management should address technical and financial capacity requirements and create an enabling environment focusing on policies and financial incentives to attract the private sector.

31. Projects should also be in place to develop a comprehensive inventory of sources, quantities and composition of e-waste and hazardous waste. To abandon unsound practices, both end-of-the-pipe as well as prevention at source strategies should be devised. Local as well as national Governments should renew their efforts to raise awareness, mobilise all stakeholders, encourage and facilitate ESM of e-wastes in their collection, storage and transportation to repair or refurbishment workshops. Capacity building and training, particularly of small businesses, will contribute to the improvement of the quality control in the repair or refurbishment workshops, i.e. accomplishing both environmental benefits and benefits to worker’s health, without compromising the economic returns.

32. Large quantities of e-waste are being exported to developing countries for the purpose of re-use, repair, refurbishment, recycling and recovery of non-ferrous and precious metals at facilities that do not always operate under sound environmental conditions. Some end-of life equipment is exported under the guise of donations and for charitable purposes.

33. Significant quantities of hazardous waste are transported to developing countries in Africa, Asia, and the Caribbean and, increasingly, to East and Central Europe. The United States exports more than 50 per cent of its e-waste to countries such as India and

China. The average cost to recycle a single personal computer in the U.S is $20, while in India the same activity would cost just $2 per machine. According to Greenpeace, in the UK alone, at least 23,000 metric tonnes of undeclared or 'grey' market electronic waste was illegally shipped in 2003 to the Far East, India, Africa and China (Wankhade 2004). Import and export statistics provided by Parties to the Basel Convention for the year 2000 illustrate that there were imports of more than 17.5 million tonnes designated as used electrical and electronic assemblies or scrap.

34. In this context, international cooperation is crucial, the market should be regulated and strict control on the import and export of hazardous wastes enforced. There is equally a need to enhance the ability of countries, specially developing nations, to implement and enforce the Basel Convention provisions. This requires the strengthening of national and regional mechanisms to support multilateral agreements, including the promotion of information sharing and sanction of illegal traffic.

Box 4

In 2002 the Mobile Phone Partnership Initiative (MPPI) was launched, during the sixth meeting of the Conference of the Parties to the Basel Convention, when 12 manufacturers signed a Declaration entering into a partnership with the Basel Convention and in cooperation with other stakeholders to develop and promote the environmentally sound management of end-of-life mobile phones.
Following the success of the MPPI, PACE (Partnership for Action on Computing Equipment) was launched at the ninth meeting of the Conference of the Parties to the Basel Convention, which took place in Bali in June 2008. PACE is a multi-stakeholder partnership that provides a forum for governments, industry, non-governmental organisations and academia to tackle the environmentally sound management, refurbishment, recycling and disposal of used and end-of-life computing equipment.

E. Management of specific wastes

Radioactive waste

35. Practically all countries generate radioactive waste, be it from production of nuclear energy, from the use of radioisotopes for medical diagnosis and treatment, from the use of nuclear methods for improving crops and food safety, or from various research and industrial applications. National Governments should ensure that appropriate safety measures are applied to the management of the radioactive waste that their economies generate. National strategies, plans and corresponding actions for managing radioactive waste must be developed. The establishment of a proper legal framework, regulatory infrastructure, policies and strategies is a prerequisite for these purposes.

36. Internationally, the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management is the only legal instrument directly addressing these issues on a global scale and thus an important tool to advance the safe management of radioactive waste and spent nuclear fuel. The Joint Convention, a treaty under the auspices of the IAEA, aims to achieve and maintain a high level of safety worldwide. Every three years the Contracting Parties (57 as of August 2010) prepare national reports for a review meeting of Contracting Parties. The radioactive waste managed by Contracting Parties to the Joint Convention covers 90-95% of all radioactive waste that is generated globally; for spent nuclear fuel the percentage is even larger. The Joint Convention is useful not only for countries having nuclear power programmes but also for countries that use radioactive material only in medical and industrial applications.

37. In addition to its responsibilities under the Joint Convention, the IAEA contributes to the safe management of radioactive waste by publishing Safety Standards and assisting Member States in their application, which includes e.g. technical cooperation, training, and peer reviews and advisory missions on regulatory framework and national infrastructure.

Health care waste

38. Inadequate and inappropriate handling of health care waste may have serious public health consequences and a significant impact on the environment. Sound management of health care waste is thus a crucial component of environmental health protection.

39. Epidemiological studies indicate that a person who experiences one needle-stick injury from a needle used on an infected source patient has risks of 30%, 1.8% and 0.3% respectively to become infected with HBV, HCV and HIV. In both the short term and the long term, the actions involved in implementing effective health care waste management programmes require multi-sectoral cooperation and interaction at all levels. Policies should be generated and coordinated globally, with the management practices implemented locally. Establishment of a national policy and a legal framework, training of personnel, and raising public awareness are essential elements of successful health care waste management.

40. Key priorities are to ensure that appropriate resources are allocated to support the implementation of national HCW national plans; to ensure when planning for mass immunization campaigns that the necessary facilities to treat safely and dispose of large amounts of waste produced in a short period of time are made available well ahead of time; and to ensure that appropriate and affordable technologies for HCW treatment are developed and implemented locally.

Box 5

Bir Hospital, Kathmandu, Nepal

Nepal has no medical waste management infrastructure, so many hospitals simply dispose of infectious waste with municipal waste which piles up on the city streets. Bir Hospital, Kathmandu, with about 400 beds, is Nepal's oldest hospital and the National Academy of Medical Sciences. It has recently installed two 175 litre autoclaves in a dedicated waste treatment facility to combat this public health threat and practices are being expanded from model wards. Health Care Foundation Nepal, Health Care Without Harm and the World Health Organisation are supporting the effort.

A Waste Management Committee has been established and hospital staff have helped develop segregation procedures and adapt trolleys to segregate waste at the bedside. Syringes are destroyed immediately after use by needle cutters and destroyers. Mercury thermometers and sphygmomanometers are being replaced. Infectious waste is transported to the treatment centre separately and dealt with in different parts of the building. Non-infectious plastic, paper, glass and metal are sold to recyclers. Infectious waste is disinfected in autoclaves that have been validated using chemical and biological indicators and will be regularly tested to check if they continue to work effectively. (Source: WHO)

Marine waste

41. The influx of litter into the world's oceans is estimated to exceed 6.4 million tonnes annually and the diversity, distribution and volume of litter is increasing. While there are regional variations, approximately 80 percent of marine litter comes from land-based sources. It is a global issue, affecting many coastal areas, enclosed or semi-enclosed seas, and all the oceans – both on and below the water's surface. This solid waste can negatively impact humans, wildlife, habitats, and the economic health and stability of coastal communities. As the international community has just concluded celebrating the International Year of Biodiversity, it is important to highlight that litter can lead to loss of marine biodiversity (e.g., accidental catch by 'ghost' nets), loss of ecosystem functions and services, loss of revenue (e.g., from reduced catch and reduced tourism revenue), loss of livelihoods of community groups, and increased costs (e.g., beach cleanups). Modest estimates indicate that the cost of marine litter to the 21 APEC countries alone is US$1.3 billion per year. In Australia, close to $6.5 million is spent annually on clean-up activities.

42. It is essential to improve awareness amongst governments, communities and industry of the economic and environmental implications of marine litter and provide guidance and practical advice on targeting resources to mitigate the impacts of marine debris. There

are three stages for the policy maker to consider: prevention of litter generation and entry to the sea; observations of the ambient marine litter stock levels at sea; and cleaning up litter once it is in the ocean or on the coasts. A diverse strategy of regulations, market-based instruments and community initiatives is required to address the marine litter problem.

Plastic waste

43. The world's annual consumption of plastic materials has increased from around 5 million tons in the 1950s to nearly 100 million tons; thus, 20 times more plastic is produced today than 50 years ago. Waste plastics are becoming a major stream in solid waste. It is estimated that plastics constitutes 15%-40% of municipal waste depending upon economic profile, lifestyle, and consumption patterns. Large quantities can be found as litter spread on land as well as at sea, and it being burned, buried or open dumped. Where ever possible, plastic should be replaced with bio-degradable materials. Production of bio-degradable plastics should be considered.

44. The negatives impacts of unavoidable waste plastics can be addressed or minimized by recycling and converting into a valuable resource. In most situations, plastic waste recycling could be economically viable, as it generates resources which are in high demand. Plastic waste recycling also offers GHG emission reduction potential on two accounts: (a) making fuel from waste plastic can obviate an equivalent amount of fossil fuels, (b) co-disposal of waste plastic in landfills causes formation of pockets of anaerobic decomposition of organic waste which can be avoided.

45. Plastic waste recycling is feasible through mechanical recycling (also called material recycling) which refers to the technologies that reprocess waste plastics into similar or different plastic products without modifying its initial chemical structure. These technologies have the potential for making cheaper products, as in most cases, recycled plastic costs less than virgin plastic.

46. Feed stock recycling (or chemical recycling) is a viable alternative: plastic waste is recycled as raw materials, fuel oil and industrial feedstock by altering the chemical structure. These products reduce the dependence on scarce materials – e.g. partial replacement of metallurgical coke with plastics in steel production. Combustion of plastic waste can be used for energy recovery (or thermal recycling).

Metal waste

47. Metals possess the advantage that they are inherently recyclable and can, in principle, be used over and over again, thus saving energy and minimizing negative environmental impacts in contrast to the mining of virgin material. UNEP's Resource Panel states in a recent report that for only a limited number of metals, such as iron and

platinum, the end of life recycling rate is above 50%. Despite the often low recycling rates, there is significant potential for improvement.

48. Globally, the growing metal stock can serve as huge mines above ground. Exploiting this potential can contribute to the reduction of the extraction of metals from primary sources. This would also contribute to decoupling of resource use from economic growth and result in considerable energy savings.

F. Improving agricultural waste management

1. Developing national laws on agricultural waste management.

49. There is an urgent need to develop national waste management strategies and national laws on agricultural waste management including disposal of pesticide containers. Currently, agricultural legislation primarily focuses on agricultural production and worker and consumer protection. Waste related provisions in agricultural legislation most frequently consist of references to specific waste or wider environmental legislation. Provisions that are directly or indirectly related to waste treatment and disposal should be included in national legislations.

50. FAO advises that national pesticide law should address disposal of empty pesticide containers and other pesticide-related waste as well as disposal of unwanted, unusable or obsolete stocks of pesticides, in order to avoid harmful consequences for human health and the environment. A pesticide law should follow international guidelines for disposal of empty pesticide containers, related waste and unused or obsolete pesticide stocks.

2. Recovering energy from biomass waste

51. The use of agricultural residues as a source of material/energy can offer developing countries the twin benefits of properly managing their waste as well generating renewable energy and/or materials. Additionally, biomass is an indigenous energy source available in most countries which can diversify and enable a more secure fuel supply in many situations. Apart from direct sources, huge amounts of biomass are generated as by-products of agricultural (and wood) harvesting and processing activity.

52. To promote the use of biomass waste as a source of energy, governments should frame and implement cross-cutting policies which underscore the importance and potential of biomass waste as a source of energy, and establish suitable financing schemes to provide funds for implementing waste to energy technologies. Governments with the assistance of development partners should develop capacity building programs on various aspects of waste agricultural biomass including assessment of quantity and characterization, assessing appropriate technologies, selecting and implementing

technologies, and developing a business case for converting waste agricultural biomass into an energy source.

3. Utilizing biomass waste for soil quality enhancement

53. Biomass produced as a byproduct of cropping systems is often disposed of by burning or landfilling. Using such material for soil improvement has in some sectors, such as organic agriculture, been widely practiced for many years, and is increasingly being taken up by mainstream farmers. In Conservation Agriculture (CA), instead of burning crop residues after the harvest, or ploughing biomass into the ground, they are left in place as soil cover. Besides reducing mineralization, erosion and water loss, the surface cover inhibits the germination of weeds, protects soil micro organisms and helps build up organic matter. As a result, less time and labour are spent on land preparation, and there is lower fuel consumption and less air pollution, reduced need for chemical inputs, and increasing yields and farm income. Recent studies estimate that CA is practised on about 100 million ha of farm land, mainly in North and South America, but also increasingly in Africa and Asia. Developing countries, in particular, should use biomass as a low-cost alternative for soil quality enhancement.

54. Composting is another affordable technology that enhances the suitability of raw organic materials such as crop residues and animal waste for application to the soil as a fertilizing resource. Compost is a rich source of organic matter. Soil organic matter plays an important role in sustaining soil fertility and sustainable agricultural production. In addition to being a source of plant nutrients, it improves the physico-chemical and biological properties of the soil.

III. Strengthening an enabling environment for implementation

A. Providing capacity building and technology transfer for effective waste management

55. Capacity building at all levels is a key success factor for strengthening the enabling environment for implementation of Reduce, Reuse and recycle (3R), waste prevention and waste management projects and programmes including successful technology transfer. To achieve environmentally sound management and minimization of wastes in a sustainable and effective manner, programmes must go beyond purely technical considerations to formulate specific objectives and implement appropriate measures with regard to political, institutional, social, financial, economic and technical aspects.

56. Experience shows that integrated approaches linking awareness raising, training, promotion of enabling framework conditions and policies, and, when appropriate, technology transfer are effective at creating local capacity for waste prevention and management. To ensure sustainability and replication, the establishment of systems for quantifying, monitoring and disseminating results is crucial. Private sector involvement

in waste management systems requires a shift in the role of government institutions from service provision to regulation, which may require the development of new institutional capacities to ensure conditions necessary for successful private sector involvement (e.g. competitive bidding, technical and organizational capacity, regulatory instruments and monitoring and control systems).

57. A key success factor is the establishment of institutional mechanisms that facilitate co-operation across traditional institutional structures in ways that stimulate increased waste prevention. Multi-level, national/regional/local government partnerships are useful in ensuring that waste prevention activities at various levels are mutually reinforcing. Government and municipal efforts in waste prevention can be promoted by seeking out perspectives from stakeholders (e.g. input during target setting, instrument choice and application, and performance evaluation).

58. Successful technology transfer does not only involve the selection and shipping of equipment, but also the adaptation of that equipment to local circumstances, the training of local technicians, and the long-term upkeep and use of the equipment, and thus requires both capacity building and the promotion of an enabling environment for technology uptake, development and diffusion. The successful transfer of environmentally sound technologies necessitates that recipient countries have the requisite institutional resources and competencies. If these are not in place, projects need to incorporate strategies to address this e.g. through capacity building measures or activities aimed to improve access to resources. Existing market conditions and market forces need to be considered in the design of technology transfer projects and barriers need to be identified and addressed e.g. through the creation of policy instruments, awareness raising or other measures.

59. Technology transfer should help strengthen research and development systems and promote the capacity to develop new technologies and solutions. Accurate, timely, and authoritative information is critical to project success, including explicit information about government policies, cost and performance of new technologies, opportunities for international support, or the long-term nature of the necessary technological change Effective strategies include developing niche research areas, particularly in institutions with limited funding, as well as creating research centres and strengthening research infrastructure.

Transfer of EST for cleaner management of municipal solid waste (MSW) in Havana City

The main emphasis of the project was to enable ministerial, provincial and municipal staff to design and implement MSW strategies that suit the needs of the country and are in accordance with the requirements of ecologically sound natural resources management. The project aim was to improve the capability of the targeted region in MSWM through capacity building at municipal, provincial and central levels. This was achieved by theoretical training on one side and through the practical experience acquired by the implementation of selected demonstration projects on the other side. The project was based on an integrated approach including awareness raising, local capacity building and training, transfer of Environmentally Sound Technologies and transfer of know-how. A central part of the project was capacity building of all persons involved.

Key project results include the establishment of an integrated system for separate collection of different municipal waste streams and subsequent management (including a laboratory for waste analysis, biogas plant and compost production). Furthermore, the Cuban Ministry of Economy and Planning, has instructed other municipalities to study the introduction and application of separate collection of MSW in their municipalities, adjusting the activities to the local conditions with the locally available resources.

B. Financing and investing in sustainable waste management

60. Waste management costs are increasing. Developing countries spend 60 to 70 percent of their waste budget in collection, with complete MSW related services consuming 1 to 2 percent of a country's GDP. Cost of waste segregation ranges from $107/ton for mixed collection to $1320/ton for segregated collection in developed regions. Capital cost of incinerators may range from $100,000 to $ 200,000 per daily metric tonne of capacity, compelling the owner to invest at least $30 to 600 million initially. The annual cost per metric tonne of waste burned comes to $30 on an average. The additional cost of treatment of residual ash in a special landfill can range from $ 200 to 500 per metric tonne. In a typical city with population of 50,000, the costs of landfilling and incineration are $95 and $147, respectively (Porter 2002).

61. Government investments in waste management services have increased over recent years. Energy recovery projects have been the recent focus of Government investments in developed countries. UK has allocated US$16.5 million for anaerobic WtE projects. China is planning to allocate 862.9 billion RMB (US$126 billion) to promote provision and construction of MSW management infrastructure.

62. Often government funding has been insufficient, however, to meet the growing demand for waste management services in both developed and developing countries. Private participation has addressed many investment barriers successfully through flexible financing options. The growing number of waste related Private Finance Initiatives (PFI) in the UK indicates the emerging interest of the public sector in private involvement in the industry. Engaging the private sector has reduced the waste service cost by at least 25 per cent in countries such as UK, USA and Canada and at least 20 per cent in Malaysia. Developing countries should create an environment that encourages the creation of public private partnerships (PPPs).

Location	**Cases and benefits of PPP arrangement**
Latin America	• Higher labour and vehicle productivity through PPP arrangement has reduced the service cost by about 50%.
Philippines	• A privately built special high temperature incinerator for infectious healthcare wastes is being used by more than 200 medical centres and hospitals.
Dakar, Senegal	• A public/private joint venture initially monopolised the sector but later competitive privatization arrangements were introduced for multiple service contracts.

63. Financing options such as micro financing and hybrid financing have been successful in meeting project costs in quite a few regions of the world. One example is the participatory sustainable waste management project established in 2006 in Brazil which created micro credit funds through donations (Hogarth 2009). These funds were used as a source of working capital for financing transportation and for emergency. The funds were also used to extend loans for waste-pickers who repaid their loans after receipt of payment from recycling depots.

64. Another example is that of micro-financing for micro-enterprises managing a 40 year old, 2 million metric tonnes garbage heap called Smokey Mountain in Metro Manila, Philippines. The micro-enterprises are involved in collection, sorting and sale of waste through a Material Recycling Facility (MRF). Micro-financing enabled these enterprises to borrow loans and increase their capacity to generate revenue.

65. Hybrid financing models are being increasingly explored to rekindle and/or close economically challenged waste management projects. In the UK prudential borrowing is an innovative financing option that has been introduced by the British Government in 2003. The Department of Environmental, Food and Rural Affairs of the Government of UK recommends applying the option for low-risk investments such as recycling centres or land acquisitions. In one case at West Sussex Council, UK, the low-risk element of a

MBT (mechanical biological treatment) process (about 60 per cent) was funded through prudential borrowing.

66. The Clean Development Mechanism (CDM) introduced under Kyoto Protocol helps to improve the financial viability of waste management projects. This market mechanism should be strengthened further. It is important to note that CDM only improves the Internal Rate of Return (IRR) of projects by a margin of approximately 5 per cent and hence identification of other sources of financing is critical to the project.

C. Building partnerships

67. Various national governments and international institutions have launched activities supporting capacity development for policy frameworks, financing mechanisms (including public-private partnerships) and technology for waste management. However, efforts have thus far been scattered, uncoordinated and insufficient to address the needs of developing countries. The complexity, costs and coordination required for effective waste management demands multistakeholder involvement at every stage of the waste stream. There is a clear need to identify and engage all stakeholders in waste management and strengthen cooperation conducive to the creation of strong innovative partnerships at international, regional and local levels. These partnerships are particularly needed to strengthen cooperation in areas of institutional and human capacity, research and information-sharing and technology transfer. They should also be actively engaged in advocacy, education, building awareness.

68. In this context, UNEP proposes to establish a Global Partnership on Waste Management to provide coordination, increase the exchange of best practices across countries and pool resources for the replication and scaling up of successful practices. UN-DESA is also planning to launch an International Partnership to address the needs of public waste utilities and municipalities and support local action plans and strategies for sustainable waste management.

IV. The way forward

69. The magnitude and gravity of the problem of adequate waste management has been amply highlighted in CSD18. The rapid increase in volume and type of both solid and hazardous waste as a result of economic growth, urbanization and industrialization is becoming a major issue for national and local governments, particularly in developing countries, which are constrained both in terms of resources and capacity. The negative impacts on the health of surrounding communities, as well as on local environment, in terms of pollution of land, water and air, are becoming more acute. Ineffective and inefficient waste management results in greenhouse gas and toxic emissions and loss of precious materials and resources.

70. Waste management and resource recovery from waste are still low in the priorities of many countries, particularly developing countries, and national and local policies on waste management are not yet comprehensive enough to cover all types of wastes and all aspects of waste management. In many developed countries, policy frameworks to support resource recovery from waste remain inadequate.

71. The priority objectives in the field of policy options for waste management are to formulate and implement policies that promote waste prevention and minimization and support effective and efficient management of the remaining solid and hazardous wastes, focusing on reuse and recycling and on the recovery of useful materials and energy. Countries need to set time bound targets especially regarding aspects like minimization and segregation, recycling and recovery, collection efficiency, treatment and environmentally sound disposal.

72. An important step should be to improve the quality and reliability of waste related data so that the problem can be defined accurately. The data should not only include the current amount of different types of waste generated, but also the expected future amounts, in order to develop projections that will allow adequate planning for resource recovery and substitution of virgin materials. Governments may like to create 'waste cells' charged with the responsibility of collection, refinement and updating of waste data from all sources of waste generation and establishing an aggregation process from local data to national level data.

73. In addition to policy development and implementation, waste management systems require technology and financing to build required infrastructure. Countries need to launch intensive capacity building programmes so as to enable concerned personnel to select, implement and operate the required technologies. Capacity of research and development institutions needs to be enhanced to undertake development and adaptation of technologies to suit local conditions. The role of international organizations in capacity building and enhancing access to technology is crucial. The availability of financial resources for building waste management infrastructure 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 availability of and access to financial resources.

74. The social aspects of waste management can not be overlooked. An important element of this in the context of developing countries is the role and status of scavengers/ragpickers. Programmes need to be developed to mainstream this section of society into modernized, safe and environmentally sound waste management systems where they can earn a decent income.

75. Special attention needs to be paid to some specific waste streams such as E-Waste, waste plastics, waste agricultural biomass, healthcare wastes, industrial hazardous wastes, radioactive wastes, etc.

76. Effective implementation of waste-related multilateral agreements and guidelines is needed at the national level. Corresponding laws, regulations and standards need to be developed and their enforcement strengthened both at the national and local levels. Economic incentives for waste minimization and recycling need to be more extensively employed.

77. Finally, it is increasingly being realised that issues related to waste management can best be tackled by promoting partnerships among and between different governments, the private sector, development partners and other stakeholders.

78. In the future, waste has to be valued as a resource and waste management needs to be carried out with a life-cycle perspective. This goes hand-in-hand with an increasing application by governments of extended producer responsibility, use of economic instruments and other sustainable consumption and production policy instruments, particularly in developed countries.

79. On the whole, these efforts would contribute to sustainable development with the associated benefits of improved public health, poverty alleviation, creation of decent jobs, improvements in living standards, reduction of GHG emissions and other pollutants, and the extended life of resources.