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# Establishing a Sound Material-Cycle Society in Sri Lanka

## Opportunities and Challenges

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IGES – Kitakyushu Urban Centre
International Village Center 2F, 1-1-1, Hirano,
Yahata-Higashi-Ku, Kitakyushu City, Japan
Phone: 81-93-681-1563 Facsimile: 81-93-681-1564
URL: http://www.iges.or.jp

スリランカにおける循環型社会の構築：機会と課題
報告書要旨

## １．はじめに

スリランカの特に都市部の大部分において、都市ごみ管理は重要な環境問題となっている。人々の消費パターンの変化に伴い、固形廃棄物量が年々増加傾向にある。過去 20 年間にわたり、よりリベラルな産業拡大に向けた成長政策がとられてきたが、それに見合うだけの都市インフラの整備が追い付いておらず、特に都市ごみ管理の分野においてこの傾向が顕著である。そのため、都市部ではごみのポイ捨てが散見される。また、廃棄物の処分に適した土地や、中心となる廃棄物処理・管理施設の建設のための土地の確保も難しくなっている。

廃棄物管理の問題は、人口密度が最も高い西部州で最も深刻な状況にある。スリランカにおける循環型社会の 構築を目指して、環境・天然資源省は「廃棄物管理国家戦略」を策定している。この戦略は廃棄物の発生回避・抑制、発生源での分別、リサイクルの促進に重点を置いている。一方、地方自治体の中には都市ごみの収集システムの近代化を進め、急増する都市ごみを衛生的に処理するためにイニシアティブをとり、ステークホルダーとも連携して取り組みを進めているところもある。

## ２．目的と手法

このような背景の中、本報告書はスリランカにおける都市ごみ管理の現状を把握し、循環型社会を構築する上で鍵となる機会と課題を明確にすることを目的としている。都市ごみ管理について組織面と実際面からより的確に把握するため、２０１０年９月２２日から１０月３日にかけて聞き取り調査と現地調査を行った。国家レベルでの.政策、法律、規制、責任、制度的枠組みについて情報を収集するため、 中央環境局(CEA)、都市開発局(UDA)、ピリサルプログラム(Pilisaru Programme)、全国廃棄物管理支援センター(NSWMSC)の高官に対して 聞き取り調査を実施した。地方自治体の責任および活動に関する情報は、マタレ市、カルムナイ市、デヒワラ・マウント・ラビニア市、クルネーガラ市、カドゥウェラ郡の担当職員に対する聞き取り調査を通じて収集した。また、廃棄物管理関連の活動を行っている地域 NGO の SEVANATHA （セワナタ都市リソースセンター）、**HELP-O (**Human **&** Environment Links Progressive Organization) 、Practical Action-Sri Lanka （プラクティカル・アクション・スリランカ）などからも資料を入手した。さらに、コミュニティによる廃棄物管理への参加について調査するため、バドウィタ地区の資源回収施設の視察も行った。（聞き取り調査の内容については付属書１を参照。）これに加え、２０１１年１月２１日にクルネーガラ市のブルースカイホテルにおいて、全国廃棄物管理支援センター(NSWMSC)の協力のもと、ワークショップ（１日）をクルネーガラ市役所との共催で開催した。このワークショップのねらいは、クルネーガラ市における循環型社会構築に向けた行動計画の立案であり、国、州、市、民間セクター、市民社会団体などの代表２０名以上の参加を得た。（ワークショップのコンセプトノートについては付属書２を参照。）

## ３．調査結果

本研究により明らかになった、スリランカにおける都市ごみ管理の根本的問題は次のとおり。

- 廃棄物の発生、量、特徴、将来動向について、正確で信頼性のある最新のデータが不足しており、その原因として体系的な研究・調査に対する優先度の低さが挙げられる。
- 国・州・地域レベルでの短・中・長期の戦略的計画の策定および実施が行われておらず、そのためローカルイニシアティブは孤立したままの状態で広がりを見せず、全体的な廃棄物管理問題の改善に向けて大きな効果が得られていない。

□　　ごみ収集サービスが不十分なため、都市部ではごみのポイ捨てが散見される。地方自治体によるごみ収集サービスが行き届かない主な要因としては、適切な収集車の配備および予算配分に必要な財源の不足、人材および技術的知識の欠如などが挙げられる。
□　　スリランカで最も広く採用されている廃棄物処理方法はオープンダンピングである。また、高コストが理由で、どの処分場でも環境汚染を最小限に抑えるための工夫はなされていない。
□　　現在の廃棄物管理体制と不適正処分は、深刻な社会・健康・環境問題を引き起こしている。例えば美観の損失、不快臭、蚊やハエの発生、雨季における洪水の増加、公衆衛生や動物への脅威、自然の水流の汚染および妨害、温室効果ガスの排出、オープンダンピング式処分場付近の土地の価値下落などである。

現行の廃棄物処理システムを改善するために、最近スリランカでは以下のような国、州、市による革新的な取り組みが行われている。

□　　２００２年の廃棄物管理国家戦略の策定。これは廃棄物の発生抑制(Reduction)、再使用(Reuse)、再生利用(Recycle)、コンポスト化、バイオガス利用、環境上適正な最終処分という必須事項に重点を置いた戦略となっている。
□　　中央環境局によるピリサルプログラムの策定。これにより廃棄物管理国家戦略の実施のために予算が追加配分され、地方自治体が民間セクター、学術研究機関、市民社会団体などのステークホルダーと多部門間のパートナーシップを結び、実施に向けて取り組みを強化できるようになった。
□　　２００７年、内務省は JICA からの技術協力および資金協力を受けて全国廃棄物管理支援センターを設立した。これは、地方自治体が廃棄物管理国家戦略に沿って都市ごみ処理に関する技術的能力を向上させることを目的としたものである。また、同センターは循環型社会、シンハラ語で言う”Aparade Society”の推進にも従事している。
□　　州レベルでは、西部州政府が廃棄物管理局を設置した。これにより、西部州内の地方自治体が持続可能な廃棄物管理プログラムを計画、実行する上で必要となる技術・資金援助の提供が可能となった。
□　　地方自治体の中には、自らイニシアティブを取りごみの収集・運搬システムの一部を民間セクターに民営化することでサービスの改善に努めているところもある。その狙いは、収集サービスの効率化および範囲拡大、パイロット事業のモデル地区における分別収集システムの実施結果を受けて設定された新たなごみ出しルールの導入、事前に決められたスケジュール（時間およびルート）に沿ってベルを鳴らしながら収集するシステムの採用、共用のごみ入れおよび中継地の削減を目的とした戸別収集サービスの拡大などである。
□　　生ごみを処理する手法としてよく用いられるコンポスト化およびバイオガス化を試験的に実施。
□　　生ごみのコンポスト化を家庭およびコミュニティレベルで実施。地方自治体や NGO により約７０，０００個の家庭用コンポスト容器が配布された。しかし、家庭用コンポスト容器の使用に際しては、社会的な問題（利用についての周知不足、不適切な分別による無機ごみの投入）や設計上の欠陥（通気用の傾斜の不足、臭気の発生、浸出水集排水装置の不備、生ごみを分解するバクテリアの欠如）など、よくある問題が起きている。そのため、コンポスト化に時間がかかっている（最低でも３～４か月）。
□　　多くの地方自治体において、コミュニティおよび市のレベルでのコンポスト化が一般的になってきている。スリランカには５６か所のコンポスト化施設があり、最も広く採用されている手法はウィンドローであるが、ミミズたい肥化および密閉式も組み合わせて試験的に行われている。しかし、コンポスト化事業の成功例は限られており、その理由には次のようなものがある。技術的な問題（コンポスト化施設を低地に建設していること、ウィンドロー式は分解に３～４か月かかり臭気と浸出水が発生すること）、自宅周辺にコンポスト化施設が建設されることに対する住民の反対、排出源分別に対する協力不足、コンポスト製品の品質の低さ、販売能力の欠如、事業の持続可能性に関する課題など。

□　国立工学研究開発センターなどの政府系機関によるバイオガス化の実験は、ガス発生量の不足が原因で失敗に終わっているが、ゴール市による実験の結果から、技術面の向上、集中的な管理、地域コミュニティによる熱心な取り組みなどが実施されれば、バイオガス化の手法は有効に利用できることが分かった。
□　資源のリサイクルおよび回収は、家庭レベル、収集運搬時、最終処分場など、ごみの流れの中の様々な地点においてインフォーマルセクターの人々が行っている。ガラス、金属、紙、プラスチックに関してはリサイクルビジネスが存在する。地方自治体の中にはごみの分別収集や資源回収施設の設立を推進しているところもある。しかし、このような活動に対するインセンティブは、高所得者層よりも低所得者層 に対して支援や参加促進の効果があることは明らかである。また、学校におけるリサイクル事業は、リサイクルの推進だけでなく、生徒たちに環境に優しいライフスタイルについて学ばせる上で成功を収めている。
□　ここ数年、地方自治体は廃棄物管理、特にごみの収集・運搬における民間部門の参加を推進してきた。しかしそれだけにとどまらず 、リサイクル産業や廃棄物処理施設のインフラ整備にも民間部門の参加を促す必要がある。
□　市民による廃棄物管理への協力と参加が３Ｒ活動の成功には不可欠であるという認識が高まっている。そのため、教育・意識高揚プログラムの継続的な実施が必要である。

## ４．今後の方向性

本研究により、北九州市が専門知識・技術を提供し、協力できる分野が明らかになった。

□　循環型社会構築に向けて、総合的に廃棄物管理戦略を策定、実施するための技術支援。そのために専門家の派遣を行い、中央および地方政府の関係職員を JICA の研修に参加させる。
□　都市ごみの発生状況および今後の動向に関するデータベース、新たな廃棄物管理技術、リサイクル手法、物質および資源の再利用法、学術研究機関および中央・地方政府関連機関との連携のもと低炭素社会を実現するための技術革新について、研究開発を行う。
□　問題点の多かった従来のウィンドロー式に代わるコンポスト化手法として、北九州方式（高倉式）生ごみコンポスト化技術を推進するための技術支援を行う。そのために、まずモデル都市（クルネーガラ市、マタレ市、キャンディ市）の選定から開始し、その後徐々に都市間協力に拡大していく。また、その実施に際しては、国レベルのピリサルプログラムおよび全国廃棄物管理支援センターの協力を得ることが必要となる。そうすることで、後にコンポスト化事業促進のための効果的な政策を策定する上で、国からのサポートを得やすくなる。また、これらの都市に派遣されている青年海外協力隊のメンバーと協調して、フォローアップの実施を行うことも可能である。
既存のコンポスト化手法と、その技術・社会・環境・政策・販売面における成功と失敗に関する研究と開発を行い、また全国的なワークショップの開催、優良事例の共有、研究結果の発表などを通じて、都市ごみ管理のためのコンポスト化事業支援の国家戦略の策定を推進する。コンポスト化事業を CDM プロジェクトとして実施する可能性についてもまた、調査を開始する必要がある。

# Establishing a Sound Material-Cycle Society in Sri Lanka: Opportunities and Challenges

## Summary of the Report

## 1. Introduction

Management of municipal solid waste has become a critical environmental issue, particularly in the most urbanised parts of Sri Lanka. With changing consumption patterns, the quality of solid waste has increased over the years. A rapid economic growth, due to the introduction of more liberal, industrial and expansive growth policies during the last two decades, has not been balanced by necessary investments in urban infrastructure facilities, especially in the areas of urban solid waste management. Urban areas are often littered with garbage as a consequence. Finding suitable land for disposal or central waste treatment/ management facilities in the urban areas has become difficult.

The problem of solid waste management is most severe in the densely populated areas of the Western Province (WP). In order to establish a Sound Material-Cycle (SMC) Society in the country, the Ministry of Environment and Natural Resources (MoENR) has developed a National Strategy for Solid Waste Management, which emphasises the need for waste avoidance/reduction, waste segregation at source and promoting recycling. Meanwhile, some Local Authorities (LAs) have taken initiatives to modernise municipal solid waste collection system and to treat the rapidly increasing amount of municipal waste in a sanitary manner in partnership with the relevant stakeholders.

## 2. Objective and Methodology

This report therefore, aims to understand the current practices in municipal solid waste management and identify key opportunities and challenges in establishing a SMC Society in Sri Lanka. In order to get more insight into the organisational and practical aspects of solid waste management, a number of interviews and field visits were conducted during the period of 22 September to 3 October 2010. For gathering information on policy, laws, regulations, responsibilities and institutional framework at the national level, the senior officers in the Central Environmental Authority (CEA), Urban Development Authority (UDA), Pilisaru Programme, and the National Solid Waste Management Support Centre (NSWMSC) were interviewed. In order to obtain information on the responsibilities and activities of the LAs, interviews were conducted with responsible officers in the Matale Municipal Council, Kalmune Municipal Council, Dehiwala, Mt-Lavania Municipal Council, Kurunegala Municipal Council, and Kaduwela Urban Council. The data were also obtained from the local Non-Governmental Organisations (NGOs) involved in solid waste management activities, such as SEVANATHA, HELP-O and Practical Action-Sri Lanka. To get an idea of the community participation in solid waste management, a community-managed material recovery facility in Badowita was observed. (Transcript of the interviews can be found in Appendix 1) In addition, a one day workshop was organised by the Kurunegala Municipal Council in cooperation with the NSWMSC on 21 January 2011 at the Blue Sky Hotel, Kurunegala, attending over 20 participants from national, provincial, local representatives, private sector and civil society, aiming to draft an action plan for the Kurunegala City to establish a SMC Society. (The concept note of the workshop in Appendix 2)

## 3. Research Findings

The study identified that a fundamental problem associated with municipal solid waste management in Sri Lanka are:

- A lack of accurate, reliable and up-to-date data on waste generation, quantities, characteristics and future trends due to giving a little priority for systematic research and survey,
- A failure to prepare and implement short, medium and long term strategic plans at the national, provincial and local levels, thus, local initiatives are remained isolated and no significant effects have been made in improving the overall waste management issues.
- Urban areas are often littered with garbage due to absent of sufficient waste collection services. The key factors for a poor waste collection performance in LAs are the lack of resources in respect to providing adequate collection vehicles, allocating adequate budget, shortage of manpower and technical expertise.
- The most widespread method of disposal of solid waste in Sri Lanka is open dumping. None of them are engineered to minimise environmental pollution due to high costs involved.
- Management of solid waste and its improper disposal results to serious social, health and environmental problems, such as a damage to aesthetic value, unpleasant of odour, breeding of mosquitoes and flies, increase in floods during the rainy seasons, threat to public health and animals, pollution and disrupt to the natural water flows, contributes to the global greenhouse gases, loss in property values of the lands near the open dumping, etc.

To improve the present system of solid waste management, a several innovative attempts are taken by the national, provincial and local governments in Sri Lanka in the recent past.

- Established the National Solid Waste Management Strategy in 2002, which emphasises the essential of waste reduction, reuse, recycling, composting, biogas utilisation and final disposal in an environmentally sound manner.
- The Pilisaru Programme of the CEA was established with additional budget for implementation of the National Solid Waste Management Strategy with LAs building multi-sectoral partnership with other stakeholders, including private sector, academic institutions and civil societies.
- The Ministry of Local Governments and Provincial Councils has established the National Solid waste Management Support Centre with the technical and financial support of the JICA in 2007 to improve the technical capacity of LAs in handling municipal solid waste in line with the National Solid Waste Management Strategy. It has been involved in promoting the Sound Material-Cycle Society in the name of Aparade Society in Sinhala Language.
- At the provincial level, the Western Provincial Council has established the Solid Waste Management Authority to provide the technical and financial support for the LAs in the western province for planning and implementing the sustainable solid waste management programmes.
- Some LAs have taken initiatives to improve the waste collection and transport system through privatisation of the part of the service to the private sector aiming to improve the service efficiency and coverage rate, the introduction of new waste discharge rules based on separated waste collection system in pilot neighbourhoods, a bell collection system with scheduled time and routes, expand the house to house collection service aiming to reduce the common waste bins and transfer stations.
- Two common methods that have been experimented to treat organic waste are composting and biogas.
- Composting of municipal solid waste is implemented at both household and community levels. About 70,000 household composters are distributed by LAs and NGOs. However, there are some common problems in using the home composter, such as social issues (lack of awareness in using the bin, dispose inorganic waste to bin without proper waste separation) and design defects (poor aeration gradient, odour generation, no leachate collection system, absence of bacteria to decompose organic waste). As a result, it takes long time to compost (at least 3-4 months).
- Making compost at community or city level has become popular in many LAs. There are 56 composting facilities are available in Sri Lanka. Most widely used method is windrow

composting. The vermin and in-vessel methods are also experimenting with mix of results. However, success of the composting projects are limited due to some technical weakness (selecting site for building compost plants in low-lying areas, usually windrow method takes long time (3-4 months) to decompose waste and make odour and leachate), public opposition in building composting plants near their neighbourhoods and also lack of cooperation in waste separation at source, low quality of the products, inability to market the compost and challenged to the sustainability of the project.

- Though experiment of biogas by the government agencies such as the National Engineering Research and Development Centre has failed due to insufficient gas generation, however, lessons learned from Galle Municipal Council shows that this method can be used effectively with improving the technology and concentrating more on management and the commitment of the local community.
- Recycling and resource recovery is carried out by the informal sector at various points of the waste stream, at household level, collection and transport or at the final dump site. The recycling business is available for glass, metal, paper and plastic. Some LAs are involved in promoting the separated waste collection and establishing a material recovery facility. However, it is visible that low income groups extend their support and participation in these activities than higher income groups, because of its economic incentive. In addition, the school recycling projects are shown success, not only in promoting recycling, but also in educating them about the eco-friendly lifestyles.
- Over the past years, private sector participation in solid waste management is encouraged by LAs, especially in waste collection and transportation. However, it needs to be encouraged to participate in the development of infrastructure for recycling industries, and waste treatment plants.
- Cooperation and participation of the public in solid waste management is recognised as an essential component in achieving success of the 3R programmes. Thus, education and awareness programmes need to launch and should be a continuous activity.

## 4. The Way Forwards

The study has identified some areas where Kitakyushu City can provide its expertise and cooperation.

- Technical assistance to develop and implement of solid waste management strategies in an integrated manner for establishing a Sound Material-Cycle Society. This can be done through dispatching experts or inviting relevant officials from national and local governments for JICA training programmes.
- Research and development of database on municipal waste generation and future trends, new waste management techniques, recycling methods, reusing of materials and resources, innovations of new technology for achieving a low carbon society in partnership with academic and research institutions, national and local government institutions.
- Technical assistance for promotion of Kitakyu Composting Method (Takakura Composting Method) as an alternative to the current windrow composting method and overcome its common issues in practice. This can be started in selected cities (Kurunegala, Matale, Kandy) and gradually expand through city to city cooperation. In doing this, it needs to be cooperated with Pilisaru Programme and the NSWMC at national level. It will be helpful for getting national support in making effective policies in promoting compost practices in later. The follow-up activities can be carried out with the coordination of the JOCV volunteers who are dispatched in these cities.
- Research and development of existing composting methods and its success and failures in terms of technical, social, environmental, policy, and marketing and facilitate for national strategies for supporting compost for municipal solid waste management through organising national workshops, sharing best practices, and research findings. The possibility of CDM projects on composting also needs to study and commenced.

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# 1. Institutional and Legal Framework for Solid Waste Management

## 1.1. Administrative Hierarchy in Sri Lanka

Sri Lanka is an island located in the southeastern tip of the Indian sub-continent, between longitudes E 79.39 and 81.53 and Latitudes N 5.54 and 9.52. The country can be divided into two broad climatic regions, such as the Wet Zone being approximately one third of the land area and the balance is in the Dry Zone. The total land area of the country is 65,000 sq. km. and a population of 18.7 million people in 2001 with an average population density of 295 persons per sq. km. The shift of the economic policy from the agricultural to an industrial economy has resulted in increasing urbanization and rural-urban population shift. The current urban population is about five million and out of them 1.5 million is located in Colombo Metropolitan Area. The country's urban population has been steadily increasing over the past years to its present level and the rate of urbanization at 6% far exceeds the annual population growth rate of about 1%. The degree of urbanisation is projected to reach 45% by 2015.[1]

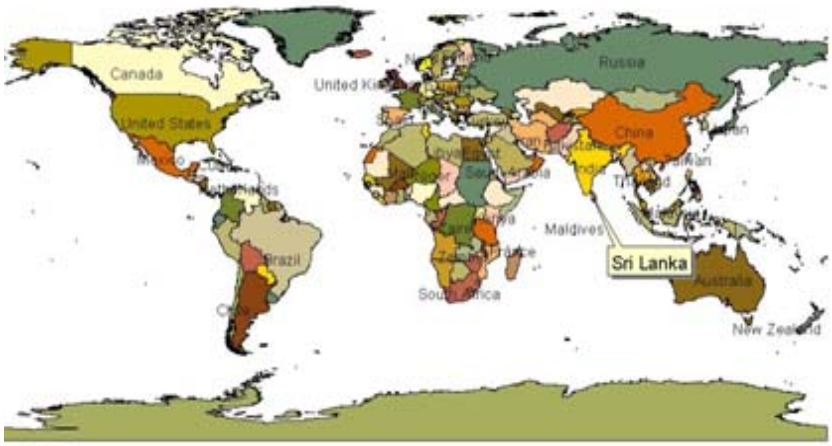


**Figure 1: Location of Sri Lanka in the World Map**
Source: Google Map

Sri Lanka is a Socialist Democratic Republic and is governed under a unitary system of Constitution. The highest level of Government is the President appointed by the citizen in the presidential election for each five years, who has the executive powers. The President appoints the Ministers and then, forms the Cabinet including those Minsters. Any legislations or regulations made by the ministries have to be approved by the Parliament, before it will be gazetted. In 1987, the country underwent decentralization of its government structure with the 13th Amendment to the Constitution and the promulgation of the Provincial Council Act No.42. Under the Provincial Council Act, provinces were established as the administrative units. The main reason for moving to establish the Provincial Councils (PCs) was to give the greater autonomy and resources to the provincial level, rather than keeping centralised the administrative powers. For this purpose, Article 154 in the Constitution contains three lists of competencies, such as the responsibilities of the centre (Reserved List), the provinces (Provincial List) and an area of overlapping responsibilities (Concurrent List). However, the powers of operation and administration of LAs were assigned to the Provincial Councils (PCs), the Central Government retains powers over LAs, providing technical support for planning, appraisal, procurement and management.

There are nine Provincial Councils in Sri Lanka.[2] The Governor who is appointed by the President is responsible for execution of policies and the status of the PCs appointed by five provincial ministers who comprise the Board of Ministers. One of them is elected as the Chief Minister and he/she is the political head of the PC. The Chief Secretary is also appointed by the President and is the chief accounting officer responsible for all interdepartmental matters such as finance, planning and personnel.

There are three types of LAs under the Provincial Government, such as Municipal Councils (MCs) for areas with a population of over 30,000, Urban Councils (UCs) for areas of between 10,000 and 30,000, and Pradeshiya Sabhas (PSs) for smaller towns and rural areas. All three types of LAs are created, regulated and operated by different ordinance. The PCs are responsible for supervising the functioning of LAs, which focus on environmental management, providing social services, maintaining roads, thoroughfares, sanitation, health, water supply, solid waste management and sewerage.

### 1.2. Solid Waste Management Regulatory Framework

The regulatory framework related to solid waste management in Sri Lanka can be distinguished at National, Provincial and Local Government Levels. At the national level, the MoENR is the policy planning agency for solid waste management. It is responsible in the development of the national policy strategy and actions, allocation of resources, including budget through the national budget, and providing technical expertise in solid waste management. The main environmental regulations for solid waste management are set out in The National Environment Act (NEA) No.47 of 1980, as amended by Act No.56 of 1988. Under section 12 of the NEA, the Central Environmental Authority (CEA) was established to develop laws and regulations related to environment and enforcement of environmental regulatory framework. It gives directives to LAs and monitors the progress. An environmental officer is appointed to each LA by the CEA to monitor the work. If any LA does not follow its directives, the CEA has the power to take legal action against it. The CEA has prepared technical guidelines for various components of solid waste management, such as collection, transfer, recovery of materials, incineration, composting, biogas and sanitary land filing and shares them with LAs. Further, The Environmental Impact Assessment Regulations (Gazette Extraordinary No 772/22 on 24 June 1993, and Gazette Extraordinary No.859/14 of 23 February 1995) states that the development of any waste disposal facility with a capacity exceeding 100 tons per day is considered to be a

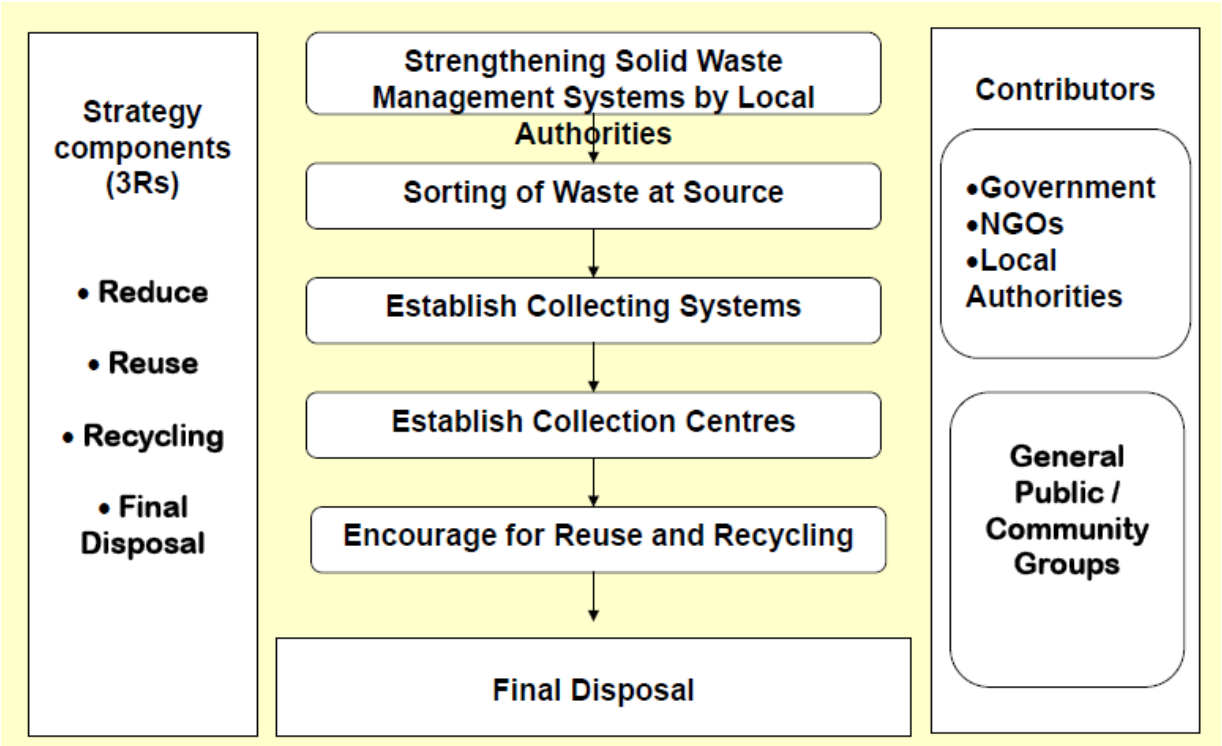


**Figure 2: National Strategy for Solid Waste Management**
Source: MoENR, 2002

prescribed project. In such situation, the developer should obtain an environmental clearance and should conduct an Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) as required by law.

The MoENR has developed the National Strategy for Solid Waste Management (See Figure 2), which will be followed by the drafting of national regulations on waste management and disposal in 2002. It has also prepared an implementation plan and an investment plan for seeking funds for the strategy. The National Solid Waste Management Strategy addressed the following activities, waste avoidance/reduction, composting, and reuse of waste, energy recovery, recycling of waste, biogas utilization, and final disposal (sanitary land filling and incineration). It recommends that the LAs needs to be given more resources to develop and implement sustainable solid waste management practices. The Strategy also sets out that there are roles and contributions to be made through collaboration between the local government, private sector and the civil society and highlights the need for multi-sectoral partnerships and interactions in solid waste management and institutional building. Whilst the CEA is responsible for overall management of the strategy, LAs are required to play a leading role in its implementation.

The legal framework for waste management at the local government level comes within the Local Government Ordinances, such as the Municipal Councils Ordinance of 1980, the Urban Councils Ordinance and the Pradeshiya Sabha Act No.15 of 1987. These ordinance and acts state that all refuse collected by the LAs shall be the property of the council and it has the full power to sell or dispose of such matters in an environmentally sensitive manner. Further, LAs have the power to make bylaws necessary for the control and regulation of industrial waste and to impose a penalty for the disposal of such materials. It also states that LAs are required to collect waste from all residents living in the administrative area and need to establish proper infrastructure in place to dispose of solid waste in an environmental friendly manner.

The solid waste management responsibilities within the LAs are generally assigned to the Public Health Department under the supervision of the Chief Public Health Inspector (CPHI) or Public Health Inspector (PHI). A very few Municipal Councils (for an example Colombo Municipal Council) have established a separate municipal department called solid waste management department to perform duties of waste collection, transport and disposal. The CPHI and PHI are responsible for conducting any other duties such as public health and sanitation in the LA and solid waste management is not only their prime duty.

In addition, the NSWMSC was established by the Ministry of Local Governments and Provincial Councils with the technical and financial assistance of the Japan International Cooperative Agency (JICA) in 2007 aiming to improve the technical capacity of LAs in handling municipal solid waste in line with the National Solid Waste Management Strategy. It has established the provincial solid waste management committees in Sabaragauwa, Central and Northern Provincial Councils and assisted them in preparing provincial solid waste management action plans. Further, the NSWMSC assisted LAs in making solid waste management action plans at city level, project support for encouraging public participation in home composting, bell collection, school recycling programme, public and private partnership, low cost night soil treatment facility, training for PCs and LAs staff, collection, analysis and sharing of information related to solid waste management and coordinate donor funded external resources in solid waste management in the country. Several manuals and technical guidelines have been prepared for the benefits of LAs in order to facilitate the proper management of solid waste.[3]

The Western Provincial Council has passed a Statute No. 9 of 1999 and established the Solid Waste Management Authority for the province with the objective of keeping the environment of urban and rural areas clean for the well being of the people as well as for the flora and fauna. It has involved in implementing provisions of the Statute, introduction of waste

management regulations for municipal solid waste, hazardous waste, clinical and infections wastes, implementation of guidelines with the LAs and private sector involved in waste management activities, dissemination of technical know-how and best practices among the LAs, maintain a waste management database and reporting system, promotion of 3R activities, and coordination of the external funded projects in solid waste management in the province.[4]

The Cleaner Production Centre has been established under the technical and financial support of the Norwegian Government, and the centre aims to promote awareness and develop capacities for preparation and promotion of cleaner production techniques, incorporating waste minimization technology and provide training and awareness among industrialists. The centre engages in developing policy initiatives and conduct policy dialogues with stakeholders.

The Pilisaru Programme of the CEA is one of the newest initiatives of the MoENR in Sri Lanka, which provides both technical and financial assistant to the LAs in the planning and implementation of solid waste management programmes. It was established in 2008 with the financial provisions about SLR 6 billion from the annual national budget allocation and the revenues generated by imposing the Green Tax which was introduced at the 2008 budget speech. The Pilisaru Programme is aimed to collect of particulars regarding disposal of solid waste by LAs, evaluation of project proposals, establishment of waste collecting centres, technical support, institutional strengthening and capacity building needs of special emphasis on LAs will be addressed to promote waste management practices, arrangements will be made for devising and adopting instruments to encourage or enforce prevention and reduction of waste, establish proper recycle mechanism and collection network for metal, plastic or glass, cardboard and paper recycle and reuses of the above waste, establishment of compost plants at LAs, construction of low cost sanitary landfills for the LAs for disposing residual waste, promoting home composting and monitoring and taking legal action for LAs that do not carry out proper solid waste management.[5]

## 2. Overview of Municipal Solid Waste in Sri Lanka

### 2.1. Generation and Characteristics of Municipal Solid Waste in Sri Lanka

In Sri Lanka, Municipal Solid Waste is described as non liquid waste material arising from domestic, trade, commercial, industrial, and agricultural activities as well as waste arising from the public and private sectors. MSW comprises different materials such as food waste, discarded clothing, garden waste, factory and process waste, and packaging in the form of paper, metal, plastic, glass etc.[6]

**Table 1: Sources and Types of Municipal Solid Waste in Sri Lanka**

| Source | Description |
|---|---|
| **Household** | Waste generated from domestic activities, including food preparation, cleaning, fuel burning, yard sweeping, gardening, and other miscellaneous household waste (e.g. Old cloths, appliances etc) |
| **Commercial** | Waste generated by trade, service, processing, and some production enterprises |
| **Markets** | Waste from markets selling a high proportion of vegetables, fruits, meats and/or fish |
| **Institutions** | Waste from schools, other education centres, hospitals, central and provincial government offices and religious institutions |
| **Industries** | Waste from various industries, including light and heavy manufacturing, fabrication, construction sites, power and chemical plants. |
| **Municipal Services** | Waste from street cleaning, landscaping, parks, beaches, other recreational areas, road and drain cleaning waste. |

| | |
|---|---|
| **Construction and demolition** | Waste originating from construction, rehabilitation and demolition activities etc. Typically they are used as clean fill at other sites or in low-lying areas |
| **Hazardous** | Hazardous waste originating from various sources, including household items (batteries, spray cans etc.). The management of sharps, clinical waste, body parts and highly infectious waste from hospitals is a major concern in the country. |

Source: Adopted from Abeysuriya, T.D, 2007; NSWMSC, 2008

Although, a clear understanding of the quantities and characteristics of the waste generated in the LAs is a key component in the development of the sustainable solid waste management system, a finding of the accurate, reliable and up to date data on the total quantity of municipal solid waste generated in the country is hardly difficult. A little priority is given to the systematic surveying of waste generated and the quantities, characteristics, seasonal variations and future trends of waste generation are poorly understood.

However, at the national level, some broad trends and common elements are identified. It was estimated that total waste generation in Sri Lanka is about 6,400 tons per day.[7] An analysis of the data reveals that the average per capita per day waste generation was 0.65-0.85 kg in Municipal Councils, 0.45-0.65 kg in Urban Councils, and 0.20-0.45 kg in Pradeshiya Sabhas in 1998. (See Table 2)

**Table 2: Waste Generation Rates in Sri Lanka**

| Local Authority | Total Nos. in Sri Lanka | Per Capita Waste Generation (kg/per day) | Per Capita Waste Collection (kg/per day) in WP |
|---|---|---|---|
| **Municipal Councils** | 12 | 0.65-0.85 | 0.69 |
| **Urban Councils** | 37 | 0.45-0.65 | 0.34 |
| **Pradeshiya Sabhas** | 255 | 0.20-0.45 | 0.13 |

Source: Ministry of Forestry and Environment, 1999

When compared to the national figures, the composition of municipal solid waste varies across the LAs. However, looking at the composition of the waste generated in the selected cities, it can be concluded that the organic component dominates the total amount of municipal solid waste. (See Table 3) The quantities of recyclable materials, such as paper, plastics, metals and glass are minute in comparison to the organic waste component.

**Table 3: Municipal Waste Composition in Selected Cities in Sri Lanka**

| Local Authority | Waste Component (%) | | | | | |
|---|---|---|---|---|---|---|
| | Organic | Paper | Plastic | Metal | Glass | Other |
| **Colombo MC** | 83 | 7 | 6 | 2 | 1 | 1 |
| **Matale MC** | 84 | 8 | 4 | 1 | 1 | 2 |
| **Jaffna MC** | 79 | 11 | 2 | 1 | 1 | 6 |
| **Moratuwa MC** | 90 | 5 | 3 | 1 | 1 | 1 |
| **Kandy MC** | 82 | 7 | 5 | 1 | 1 | 4 |
| **National Figures** | 81 | 6 | 6 | 3 | 2 | 2 |

Source: Premachandra, 2006; Bandara and Hettiaratchi, 2010; Sevanatha, 2010; Kannan et al., 2011; Abesuriya, 2007, JICA, 2002

## 2.2. Hazardous Waste

With rapid development in agriculture, industry, commerce, hospital and health care facilities, the LAs produced a large amount of hazardous waste. Although, municipal solid waste collected from domestic and commercial sources are also included small quantities of hazardous waste (such as lead batteries), the waste generated from industrial and hospital premises comprises hazardous materials. The availability of precise quantities and characteristics of hazardous waste is limited in the country. However, in a preliminary survey carried out on 34 industries by ERM in 1996 estimated that 40,617 tons of hazardous waste was generated from the following categories:[8]

- **Inorganic Wastes:** inorganic acids, inorganic alkalis, zinc bearing wastes, heavy metal wastes, and waste treatment sludge.
- **Organic Wastes:** oil wastes, including those derived from motor vehicles, solvent wastes, waste paints, lacquers, varnish, agro chemicals, pharmaceuticals, wood preservative, PCB (polychlorinated biphenyl), PBB (polybrominated biphenyl) and PCT (polychlorinated thianthranes)
- **Other Wastes:** asbestos wastes, plastic/resin wastes.

Although, a reliable data is not available for clinical waste generated in Sri Lanka, a survey limited to Colombo estimated a total waste generation of three tons per day and around 50 percent of the clinical waste consists of the followings:[9]

- Human tissue, sharps, pathology and laboratory wastes
- Pharmaceutical waste
- Disposable equipment and containers that have been in contact with body fluids
- Special treatment waste such as cytotoxic wastes related to chemotherapy
- Low-level radioactive wastes

In the absence of the secure disposal facilities, hazardous waste is generally buried on site without adequate management. Alternatively, some industries and hospitals dispose of their hazardous waste together with other municipal waste, or just dump to the nearby vacant lands. Some hazardous waste sells for reuse. For example, waste oil is sold for treating timber and as a fuel for the burners. Placenta is sold to private vendors.

## 2.3. Municipal Waste Collection and Transport

The waste collection and transportation has become a widely discussed issue in the subject of the solid waste management in Sri Lanka in the recent past among the public, local politicians, and academic groups, particularly in the urban areas. The accumulation of a large volume of waste and its haphazard disposal along the roads and other public places have led to a number of problems such as crude dumping, environmental pollution, water contamination, an increase in epidemic diseases frequent complaints reported to respective local authorities, disputes among dwellers, blocked drainage systems, and a lack of financial and human resources within the government to deal with this issue.

The municipal waste collection rativariableses among the LAs and the systems are either inadequate or inefficient. As Figure 3 shows, a daily municipal solid waste collection by LAs is about 2,900 tons. Among this total collection, about 57 percent of the municipal solid waste

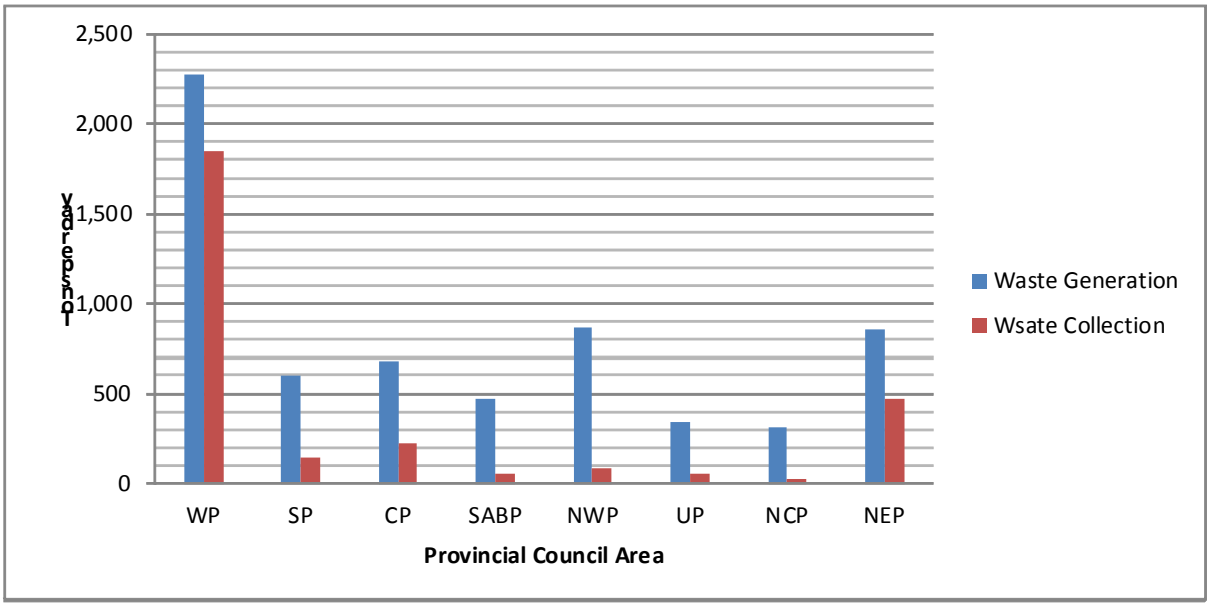


**Figure 3: Generation and Collection of Municipal Solid Waste Quantities by Province, 1999**
Source: Ministry of Forest and Environment, 1999

collection is from WP in Sri Lanka. Further, the data reveal that there is significantly low-level solid waste collection service coverage in Urban Councils and Pradeshiya Sabhas, when compared to the Municipal Councils. For example, the per capita waste collection by the LAs in the WP is 0.69 kg in the Municipal Councils, 0.34 kg in Urban Councils, and 0.13 kg in Pradeshiya Sabhas.

A sample study, which covered the solid waste collection systems in the Municipal Councils in Sri Lanka, reveals that there are a several methods of waste collection system is used by these LAs, such as door-to-door, communal, kerbside, and others. (See Table 5) A door-to-door waste collection method is used by all Municipal Councils, particularly to collect waste from the high-income residential areas, commercial and institutional premises. A community collection and kerbside collection methods are utilized for collecting waste frothe restst of other areas. However, a heap of waste remains uncollected in many parts of the city

**Figure 4: Uncollected waste in the road side of Colombo**
Source: Premakumara, IGES

can be a popular feature of all of these Municipal Councils, especially in the poor neighbourhoods which are frequently located in relatively low

lying areas and have narrow alleys through which municipal trucks cannot pass. The key factors for a poor collection performance is the lack of resources, primarily in respect to suitable collection vehicles, adequate of finance, shortage of manpower and technical expertise.

**Table 5: Method of Collection Used by Municipal Councils**

| Municipal council | Population | Method of collection | | | |
|---|---|---|---|---|---|
| | | Door-to-door | Communal | Kerbside | Other |
| **Colombo** | 1,042,000 | Yes | Yes | | |
| **Dehiwala-Mt. Lavania** | 209,787 | Yes | Yes | Yes | |
| **Moratuwa** | 177,190 | Yes | Yes | Yes | |
| **Kandy** | 145,000 | Yes | Yes | Yes | Yes |
| **Negambo** | 144,551 | Yes | Yes | Yes | |
| **Sri jayawardena pura kotte** | 115,826 | Yes | Yes | Yes | |
| **Anuradhapura** | 84,171 | Yes | Yes | Yes | |
| **Galle** | 84,099 | Yes | Yes | Yes | |
| **Batticaloa** | 83,101 | Yes | Yes | | |
| **Matara** | 75,875 | Yes | Yes | Yes | |
| **Badulla** | 60,204 | Yes | | | |
| **Gampha** | 58,577 | Yes | Yes | Yes | |
| **Rathnapura** | 51,380 | Yes | | Yes | |
| **Nuwara Eliya** | 49,000 | Yes | Yes | | |
| **Matale** | 36,532 | Yes | Yes | Yes | Yes |
| **kurunegala** | 30,000 | Yes | Yes | Yes | |

Source: Abeysuriya, T.D, 2007

## 2.4. Treatment and Disposal of Municipal Solid Waste

The most widespread method of disposal of solid waste in Sri Lanka is open dumping. This involves the uncontrolled disposal of waste without measures to control leachate, dust, odour, landfill gas or vermin. A majority of open dumps is in low lying areas such as marshes and abandoned paddy fields ifillinged with solid waste primarily as a means of land reclamation. A review of dumpsites of the Greater Colombo Area (GCA) was carried out by the Colombo Environmental Improvement Project in 1999/2000 identified that about 41 existing disposal sites in the GCA were all open dumps.[10] This study was further identified that more than 60 percent of the sites were on privately owned lands, while the remainder

**Figure 5: Open dump site in Colombo Municipal Council**
Source: Premakumara, IGES

being state lands. Private lands are released as dump sites largely for reclamation of the land for purposes of building construction. Most of the disposal sits in GCA are small in extent, with around 70 percent being less than 1 ha., and 46 percent of them have a remaining life time of less than 3 years. Due to the urban sprawl and severe public opposition to the siting of such facilities (Not In My Back Yard – NIMBY syndrome), finding suitable lands for disposal sites in urban areas is increasingly difficult. Most of dumping sites in the urban areas are overloaded and led to the dumping of waste to very high levels. [11]

None of the open dumpsites are engineered to minimize or control pollutants released from the decomposition of waste, except the Moon Plain landfill site in Nuwara Eliya Municipal Council. Due to high costs involved, most of LAs have little or no basic operations such as levelling and covering of waste. Most often, the soil cover is applied only at the final stage if and when there is a projected use for the land, or due to serious public pressure. Further, haphazard dumping takes place along the streets, marshes, and abandoned paddy fields by private individuals. Though, LAs have equipped with regulatory responsibility to control over these practices, it's less an exercise owing to a lack of resources. It was identified that a new waste treatment and disposal methods are employed by the MCs in the recent days, such as promotion of composting practices at the household and community level, and the biogas generation. However, most of these initiatives are still in the pilot scale and up-scaling and replication of them need to be considered in the future.

### 2.5. Impacts of Municipal Solid Waste Disposal

Mismanagement of solid waste and its improper disposal results to health and environmental problems in many LAs. Most obvious environmental problems that have more public concern is damage to aesthetic value. The uncollected garbage scattered along the roadsides and some naturally and culturally important areas made ugly picture and generate a rather offensive smell. These open dumps attract many kinds of animals, such as dogs, crows, cattle, goats, pigs etc. and can damage their health and pose a threat to public health too.

**Figure 6: Leachate from the open dump site in Colombo running to the nearest canal**
Source: Premakumara, IGES

Scattered or dumped garbage in open areas often ends up in drainage, channels and other waterways, where it may cause pollution and disrupt the natural water flow. As a result, it causes flooding during periods of rainfall and cause stagnant pools to be formed afterward, which again form a perfect habitat for various diseases-vectors. Insect/mosquito breeding in stagnant water pools at waste sites and in canals and waterways blocked or constricted with waste resulting in the spread of disease. A sample survey carried out in the Colombo MC identified that there are significant health risks due to the existence of vermin, insects, flies and scavenging animals particularly to workers on site, waste pickers and public who are living near these open dumping sites, such as skin diseases, respiratory problems, malaria, filariasis, and dengue.[12]

Another serious environmental damage occurs due to the uncontrolled open dumping is surface and ground water pollution. The leachate generated from decomposing garbage is entered to ground water and surface waters. Due to the high organic content of municipal solid waste, the leachate has a high Biochemical Oxygen Demand (BOD), which is range from 2,000 - 30,000 mg/1 in near the open dump sites. Further, anaerobic decomposition of organic matters inside the open dump will produce significant amounts of methane gas, which contributes to the global greenhouse effects.[13]

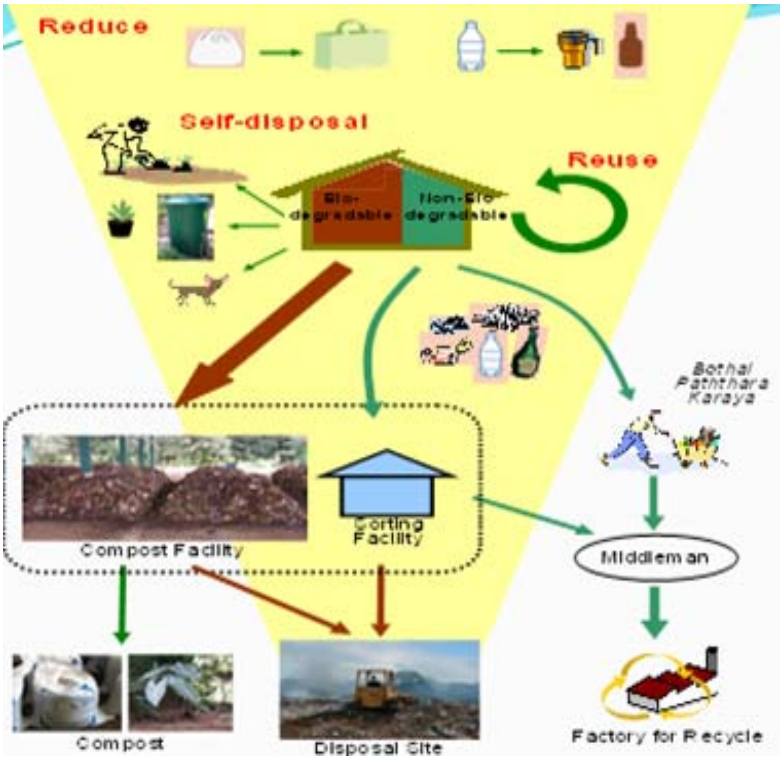


**Figure 7: Aparade Society in Sri Lanka**
Source: NSWMSC, 2008

Further, a sample survey carried outbyh the residents living near the area ofthe Dandeniyawatta landfill sitee in Moratuwa Municipal Council identifies the following issues: unpleasant of odour, breeding of mosquito and flies, loss in property values, deterioration of road conditions caused by garbage trucks in the area, release of smoke and toxic gases, increase in floods during the rainy season, children affected by various diseases and breeding grounds for worms and insects.[14]

## 3. Recent Trends towards Establishing a Sound Material-Cycle Society

### 3.1. Promoting the Concept of Aparade Society

**Figure 8: Separated waste collection system in Badowita**
Source: Premakumara, IGES

The NSWMSC promotes the concept of Aparade Society for achieving the National Solid Waste Management Strategy in Sri Lanka. Aparade is wisdom in Sinhala Language and expresses not only the wastefulness, but also feeling of care towards the environment and achieving the sustainable development. The Aparade Society is based on the following strategic policy activities; waste minimisation, maximum resource recovery through segregation of waste at generation source for resource recovery, home composting of biodegradable waste by households, de-centralised composting of biodegradable waste by an LA, strengthening the social capital to support a recycling system, sanitary landfill in order to minimise negative environmental and health impacts. (See Figure 7)

### 3.2. Introduction of Bell Collection and Transportation System

The present waste collection system in most LAs involves collecting waste from wherever it is discharged, including on the road sides, in drains, public bins etc. The introduction of new waste discharge rules for waste separation and bell collection system is considered the most innovative and widely popular means of addressing the issue of inefficient and unreliable waste collection and transportation in the cities. This is a music based waste collection system, where garbage collection vehicles play a special music as they collect garbage. The music is usually provided by a special speaker/amplifier unit powered by the vehicle battery. In areas of the town/city that have narrow or congested roads, handcarts are often used for waste collection. In that case, the handcarts may also play special horn or bell may be a manual or battery powered device.

The bell collection system requires people to separate their waste at least in three categories, such as wet waste, dry waste and yard waste and advises them to put their waste in some form of container (bags,dustbinss,poly sackssetc.c) in accordance with certain waste discharge rules and a specified collection schedule. The new waste discharge rules are based on the concept of minimizing the collecting time and frequent between when garbage is put out and when it is collected. Under these rules, people are strictly controlled in leaving their garbage on the road side, in public bins, in drains, public spaces, and water bodies. Instead they should keep their garbage within their premises until the specified collection days and giving their household waste directly out to the collection vehicle when they hear special music being played. If they are not going to be at home in the specific time and day, people can keep their separated waste at the kerbside in a closed container before the specified collection time. This method was first piloted in the Negombo Municipal Council and gradually expanded to other cities. Currently, NSWMSC has distributed 400 bell collection instruments and capacity building programmes for about 110 LAs.[15]

### 3.3. Promotion of Composting for Organic Waste Treatment

Composting of municipal solid waste is implemented at both household and city level and operated by the LAs or NGOs.

#### 3.3.1. Household Composting

There are three types compost methods commonly used at the household level, such as Compost Pit system, Geewa Kotu system and Home Composter.

**Figure 9: Home Composter in Kurunegala Municipal Council**

Source: Premakumara, IGES

***(i). Compost Pit System***

This is one of the traditional methods used by the households, particularly in rural villages to make compost. It is very simple, and households just put their organic waste into the pit which is dug in the backyard.

***(ii). Geewa Kotu System***

Geewa Kotu is another traditional method used by the households who have a larger space in their garden. It is made by using the plant sticks and can put organic waste for composting.

***(iii). Home Composter***

A home composter is a popular method in urban areas to make compost from organic waste. People can put leftover food scraps into the home composter every day and it could produce compost after a few months. There are different types of home composters such as galvanize bins, plastic bins and concrete bins.

**Figure 10: A different types of home composters at the market**

Source: Premakumara, IGES

For example, Sevanatha, a local NGO has started promoting the use of the compost bin for household garbage disposal as an environmentally friendly, cost effective, resource recovery method since 1996. First, it is used the 200 litre capacity galvanized iron drum or barrel. The main features of the bin are, the bottom face of the bin is removed and ventilation holes are provided on the top half of the bin, one half of the top face of the bin is removed to provide a wide opening through which garbage can easily be disposed into the bin, both the interior and exterior of the bin are painted with a green colour anticorrosive paint for visual beauty and protection from the weather, a cement sand ring has been introduced to fix the bin on the ground so that the bin does not come into contact with the ground, and a galvanized iron lid is provided to cover the top of the bin to protect it from rainwater and to prevent animals and birds entering into the bin. Families were motivated to separate their waste into biodegradable and non-biodegradable components at the source and dispose the biodegradable waste into the bin. The community was asked to hand over the non-biodegradable waste to recyclable waste collectors who visit the area once a week. After some experiments, Sevanatha has introduced a concrete bin of the same size since early 2002 in order to provide the families with more durable compost bin instead of the GI bin of which the lifetime is usually 2-3 years. The cost of the GI bin is about Rs.950, while the concrete bin is Rs. 1,300.

**Table 6: Distribution of Home Composters in Sri Lanka in 2005**

| Organisation | Number |
|---|---|
| **Central Environmental Authority** | 18,000 |
| **Sevanath (a local NGO)** | 30,000 |
| **Wyamba Polymers Ltd** | 5,000 |
| **CIC Ltd** | 6,000 |
| **Arpico Plastics Ltd** | 11,000 |
| **Total** | 70,000 |

Source: Premachandra, 2006

The compost bin programme has gained better recognition for Sevanatha, and became one of its main projects to work with communities and LAs on a continuous basis. Later, its campaign for the promotion of household waste reduction by using the compost bin has influenced the attitudes of individual families' right up to the top policy makers of the LAs and in the national institutions. As a result, this method is now promoted by both LAs and the NGOs as one of the strategy in reducing municipal waste at household level. The Table 6 highlights the distribution of home composter by different agencies in Sri Lanka by 2005.

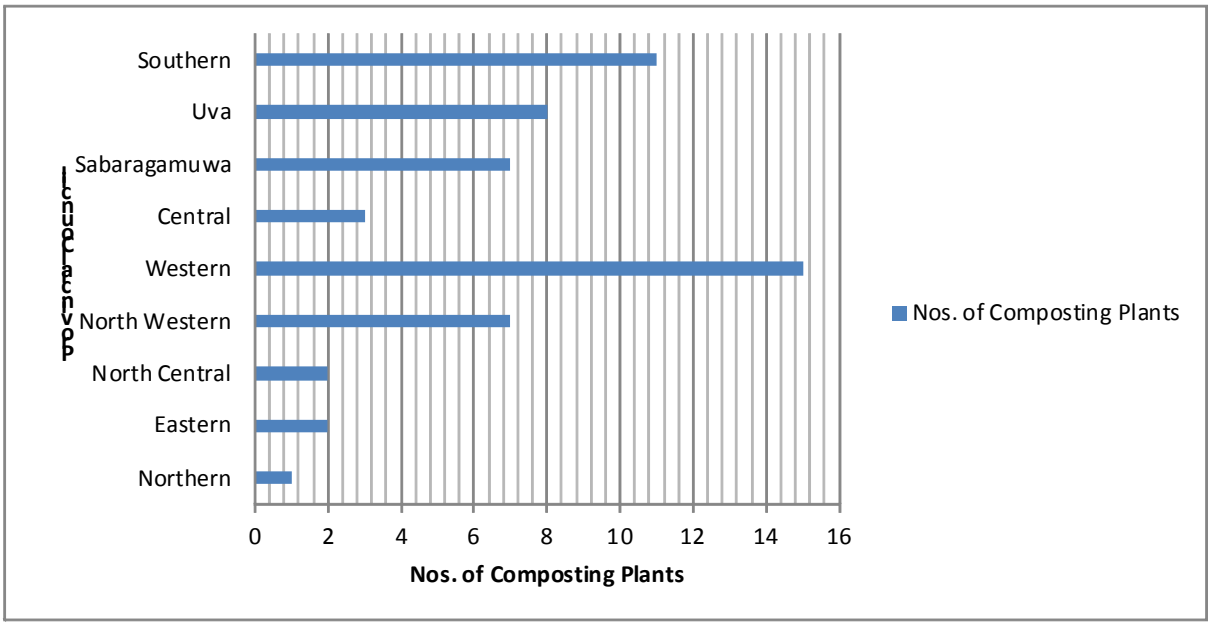


**Figure 11: Distribution of composting centres by province**
Source: NSWMSC, 2008

However, there are some common problems in using the home composter, such as lack of awareness in using the composter, people attempt to dispose of inorganic waste into the home computer without proper waste separation at source, people put organic materials which take time to decompose such as coconut shell, leaves etc., and generation of maggots, moisture control, and absence of bacteria to decompose organic waste. This resulted in taking a long time (at least 3-4 months) for making compost and also produces bad smell.

### 3.3.2. Decentralised Composting Plants

Even though, a number of technological methods of producing compost from municipal solid waste have been piloted in Sri Lanka, the method widely used is windrow composting. Other methods such as vermin composting, box and in-vessel composting are also being tested at in small scale with mixed of success. According to the Figure 11, a number of composting plants operated in Sri Lanka have been increased during the last two to three years and presently, 56 composting plants in Sri Lanka. The data reveal that most of the compost plants are located in the Western Province area. However, it is estimated that only about 0.2 percent of the current waste collected by the LAs is composted in the Western Province.[16]

**Sevanatha Composting Plant in Matale Municipal Council.**

Matale is a secondary town with nearly 37,000 people and located about 150 km northeast of Colombo in Sri Lanka's hill country. Matale City generates about 30 tons of waste per day, of which 84 percent is organic. As many other secondary towns in Sri Lanka, the Metal City has also faced a crisis in managing municipal solid waste. The city's landfill site was full and no proper municipal waste collection and disposal system exit in citywide. In 2005, Sevanatha, a local NGO partnered with UNESCAP and Waste Concern in Bangladesh started to implement the community-based composting programme in line with finding solutions for the city's waste management issue.

**Figure 12: A final dump site in Matale**
Source: Premakumara, IGES

As part of the programme, Matale Municipal Council introduced house-to-house waste collection method ithe pilot areaea (covering 600 households, 90 street vendors, 6 offices and 180 commercial and institutional premises) in Dole Road Area, encouraged waste separation, particularlinto wet and dry at source, and the construction of a composting plant. The plant

**Figure 13: Sevanatha Composting Centre in Matale**
Source: Sevanatha, Colombo

treats three tons of waste per day (10 percent of the municipal waste in Matale City) adopting a box composting method and employing six local staff members. Currently, meets 70 percent of its operating cost through the sale of compost, recyclable materials collected from separately, and household waste collection fee.

However, it was identified that, the success of the composting projects has been limited due to some technical weaknesses in selecting sites for building compost plants (low-lying areas near to the water body), usually window method takes in three to four months to decompose the waste, make some bad smell and residents near the composting plants protests over malodour and contamination of water bodies. For example, due to public opposition to build the composting facility owing to odour from the facility in Panadura Urban Council had to be abandoned. Other issues are the inconsistency of the feedstock used even with market waste as the source, owing to the existence of small quantities of plastics and other low or non biodegradable constituents such as coconut husks and banana stalks results in poor final quality compost. Further, inability to market the compost is one of the serious constraints in promoting compost practices in Sri Lanka. At present none of the compost producers are in a position to sell all compost they produced. Even though, they are successful in selling the all products, only 50 percent of the entire expenses of the centre could be met. Therefore, it is the responsibility of the LAs to formulate some methodology for supporting the sale of compost. For this purpose either subsidy should be granted for compost just in same as the chemical fertiliser or the LAs should by the compost and distribute it among the farmers in order to familiarise farmers in the use of compost or use for its greening.

### 3.4. Promotion of Biogas

Biogas is also being tested as a means of waste management with the dual aim of energy recovery in the form of methane generation and the production of a digested organic residue that could be marketed as compost at pilot scale. The National Engineering Research and Development Centre (NERD) in Sri Lanka has developed a dry batch reactor system, using source separated green and market waste as a pilot project in Kirulapone, within the Colombo Municipal Council. Sevanatha, a local NGO has also constructed one bio-gas unit in Sri Jayawardenapura Kotte Municipal Council using market waste from the municipal market and gas is provided for daily cooking of one of the children's orphanage in the city. However, in these trail projects, the gas generation has been insufficient and trails are being conducted using only water hyacinths to compare the quantities of gas generated. It is unlikely that this method would be widely adopted. The reactor, once in a batch system cannot be used again until the digestion cycle is complete. A number of reactors would therefore be required to treat large quantities of waste and is therefore not a viable proposition. The limited success of this technology is also due to management failures and a lack of commitment on the part of the community.

**HELP-O Biogas Programme in Galle Municipal Council**

HELP-O, a local NGO in Galle Municipal Council has been successfully improved the technology and implemented a biogas programme in the city. It first started with the construction of the biogas in Karapitiya Teaching Hospital in 2004. At that time the hospital had a huge problem of waste. That hospital is the third main hospital of the country. With the massive waste problem hospital authority decided to close some wards. Galle MC didn't accept the hospital waste because there is no proper waste separation inside of the hospital and one of labour injured because of hospital waste. So Hospital had to go to court for getting a sustain solution for this problem. But all efforts didn't work. As a result, HELP-O with the financial assistance from the USAEP ASIA FOUNDATION built the biogas unit, which is 22.5m3 capacities and that can dump 500 KG waste per day. This biogas unit still running without any problem and now hospital could able to earn Rs.47, 000 monthly. After this success, HELP-O introduced a new concept for the society. That is "Community Biogas". They started to construct one biogas unit for a few families of the village and the rest of other members agreed to provide the food waste for biogas unit. For its construction and operation cost, a fund was established within the neighbourhoods. In general, each beneficiary had to pay Rs.500 every month for the village people's movement that established by HELP-O. Through using this environment fund, the

community can implement many programmes for achieving sustainable development in their local neighbourhoods, in addition to promoting biogas as renewable energy. Currently, nine

**Figure 14: HELP-O biogas programme in Galle**
Source: HELP-O, Galle

biogas plants operate in the Galle City, which are accepted 25 tons of municipal waste per day, out of 55 tons of waste generated in the city per day.

### 3.5. Recycling and Resource Recovery

Recycling and resource recovery of materials in Sri Lanka is carried out through an informal market driven system. The informal recycling sector is largely comprised of the waste recycling activities of junk dealers including junk shops and their network of junk collectors locally called *Botal Pattaray*. Junk dealers have been very common features in the chain of waste recycling for several decades, though they were hardly noticed by the society, in general, or the government and business sector, in particular. They provide primary collection and processing of collecting materials into intermediate or final products, using creativity and innovation to respond cost effectively to market needs. They are involved at the very first point of collection from households, before the formal (private or municipal) system collects waste from them. *Botal Pattaray* often goes from door to door, collecting sorted recyclable materials from householders or domestic servants, which they buy or barter and then transport to the junk shops.

Each junk shop has a network of about 15-20 *Botal Pattaray* who operate in a particular area. The junk shops then add value to them by sorting, cleaning, altering the physical shape to facilitate transport or by aggregating materials into a commercially viable quantity, and sell to larger recycling firms. This system represents a win- win situation for households and junk shop dealers; household receives payment for goods sold to junk shop dealers and junk shop dealers then receive payment for those recyclable when they sold out. From households and junk shop dealers point of view, this is preferable to the separated waste being collected by formal sector collectors, for which no payment would be received. Citizens therefore regard inorganic recyclable waste as valuable materials and usually separate these items at home. In addition to Botal Pattaray, valuable items are recovered by at various points of the waste stream, at household level, collection and transport or at the final disposal site by the staff of the LAs and the waste pickers. The retrieved materials are then sold to collection shops or junk shops where they are cleaned and sold for recycling by local industrialists or exported overseas.
The following materials have demand in recycling business industry:[17]

- The Ceylon Glass Company recycles the white and amber cullet whereas green cullet is recycled on a small scale by private glass manufactures. At present, Ceylon Glass Company uses 40 percent of cullet in its production process, though it has the capacity to go up to 60 percent, if waste glass is available.

- The ferrous and non ferrous metal is recycled locally and exported in bales, after sorting and cleaning. The price of scrap metals is high due to the export demand.
- A technology exists for the use of waste paper in Sri Lanka. The Vallachchannai paper factory of the National Paper Corporation runs wholly on recycled paper. A small quantity of corrugated cardboard is exported after shredding and baling. Newspapers cannot be recycled in the absence of de-inking facilities in the country. Newspapers are re-used mainly as packaging materials.
- It can be observed that plastic recycling businesses are active in Sri Lanka to some extent. HDPE, LDPE, PET and PP are recycled locally. However, the demand for plastic waste is seasonal as it's dependent on the international price of the virgin material. The high cost of collection of clean plastic reduces demand. Research is being carried out by various individuals and organizations on fuel recovery from plastics and production of items such as fence posts using unclean plastics.

**Table 7: Characteristics of Two Plastic Recyclers in Sri Lanka**

| Description | Saru Recycling Centre | Viridis Ltd |
|---|---|---|
| **Location** | Colombo | Colombo |
| **Output per day in tons** | 1-1.5 | 2-3 |
| **Number of employees** | 80 | 50 |
| **Year of started** | 2005 | 2005 |
| **Capital investment of Rs.** | 8,500,000 | |
| **Monthly salary range** | 1,000-15,000 | |
| **Buying price of reused plastic, kg in Rs.** | 20-80 | 50-120 |
| **Collection of plastics** | Directly from industries and collection from individuals, collection centres | Collection of industries, LAs and community groups |
| **Identification of plastics** | Manual segregation, based on visual observation | Manual segregation based on visual observation and burning the plastics with a hot needle and then smell the smoke of burning |
| **Processing of plastics** | Segregation, removing labels, washing and crushing | There are two processes;<br>1. Crushing, washing, drying, crushing<br>2. Washing, crushing, drying, crushing |
| **Outputs** | Pellets | Pellets |
| **Selling price, kg in Rs.** | 120 | 50-120 |

Source: WASTE, 2007

Some LAs through the intervention of NGOs have established collection points where residents are requested to bring recyclable materials for purchase. However, this method has not proved to be effective owing to a lack of public response. Low income groups extend their cooperation to these activities more readily than high income groups. For example, community-managed waste recycling centre in Badowita.

**Community-Managed Waste Recycling Centre in Badowita**

Badowitaa is the largest low income settlement in the Dehiwala Mt. Lavania Municipal Council, which accommodates 1,200 households (over 4,500 people). The settlement was originated by relocating the shanty dwellers lived along the canal reservations adjoining to the municipal limits, to the newly filled marshy area. The resettlement activities were entrusted by the Sri Lanka Land Reclamation and Development Cooperation (SLLRDC) with the National Housing Development Authority (NHDA) in the early 1990s as part of its Greater Colombo Flood Control and Environmental Improvement Project. The families were provided a 50 sq. m. plot of land; very limited common infrastructure (water tanks, toilet blocks, and few garbage collection bins); loans for housing (up to Rs. 20,000 to be paid back in instalments); about Rs. 1000 as relocation support money; transport facilities for carrying their belongings; the foundation of the houses; and compensation for permanent buildings that were demolished. According to the experience of the first re-settlers in Badowita, the area was not suited for living due to the absence of basic infrastructure facilities.


However, since 1997, the settlement has been selected as a pilot project under the two major low income settlements upgrading projects (the Clean Settlement Project and the Urban Settlements Improvement Project) implemented by the Ministry of Housing and Urban Development with the financial assistance of the World Bank and Japanese Bank for International Development (JBIC). The explicit objective of the both projects was to build local community capacity to improve the basic services in the settlement. By the end of these projects, most of basic services were improved. People improved their own houses. Each of households got access to individual water connections; electricity; and private toilets, which were linked to common septic tanks. The internal road system has been gradually improved and it opened up the new interaction with outside neighbourhoods and improved the accessibility for informal businesses. As a result, Badowita received a larger number of social infrastructures including a community centre, a children's play area, public transportation system and a health clinic that is staffed and managed by the municipality.

**Figure 15: Community-managed wsate recycling centre in Badowita**
Source: Premakumara, IGES

Though this initial improvement made a big difference between Badowita and most of other communities in the city in terms of quality of life, the absence of effective solid waste management system in the settlement created a set of other environmental problems. This environmental degradation attracted the attention of the community leaders of Badowita to approach Sevanatha, a local NGO to find out a mechanism to tackle this situation. The method of operating a pilot project required that each household within the community is responsible for separating waste at source (home) primarily into two categories,

biodegradable and non-biodegradable. Two different colours of polythene bags were distributed among the households to keep the separated waste until the collectors visit their houses. Each type of waste is picked up on different days of the week, which was informed to the community in advanced. Biodegradable waste is removed by the municipal council. The Community Based Organization (CBO) of Badowita has played a key role in raising residents' awareness of the benefits of waste sorting and recycling. Initially, a group of community members was trained by Sevanatha, following which members of CBO along with municipal field staff visited each and every household in the area to brief community members about the proposed project. CBO also used street banners, voluntary cleaning programmes, and material dissemination to introduce the idea of recycling. They then organized small group discussions as well as community forums, meetings and discussions explore the idea further and to prepare their strategic plan for Badowita's solid waste management. Members of CBO constructed the collection centre building, and operate the collection centre. CBO has also been active in organizing residents of the area not only in activities such as, service maintenance and improvement, but also activities that have become integral to the solid waste management system such as income generation activities and environmental protection. With Sevanatha roles as a facilitator, the CBO has also able to develop an effective working partnership with DMMC and other stakeholders.

Further, NSWMSC implemented the school recycling projects with the participation of school children. The school children contributed to this activity by handing over recyclable waste materials collected from their school and house in this centre. School children who bring recyclables to the recyclable centre can get eco-points which can be exchanged for money after reaching a certain number of points. These projects encourage not only the collection of recyclable but also education of the importance of recycling materials. A school recycling programme can impart valuable hands-on experience that encourages students to make recycling a part of their life, not only at school but also at home and in the future. In addition, recycling programme can benefit the community and also generate funds for schools. As a result, local recyclers will receive an increased flow of recyclable materials.

## 3.6. Incineration

The term incineration is broadly used by the LAs in Sri Lanka if the waste is burnt in any form of enclosure. There is no any incineration facility for municipal solid waste. However, few incinerators are operated in hospitals and industries. These incinerators have no emissions control devices. It is unlikely that incineration would be adopted as a means of treating municipal waste, as the waste is mainly organic in nature has high moisture content and a low calorific value. For example, the moisture content of the municipal solid waste in Colombo Municipal Council is between 55 to 65 percent and the calorific value is between 600 kcal/kg – 1,200 kcal/kg.[18] Therefore, if incineration is going to be applied in Sri Lanka, there will be a need for supplementary fuel.

## 3.7. Public Private Partnership for Municipal Solid Waste Management

### 3.7.1. Privatization of waste collection

Over the past years, some LAs have privatised waste collection services aiming to achieve an effective waste collection service. Colombo Municipal Council was the first LA in Sri Lanka which started to privatise the waste collection services in 1998. At present, 50 percent of solid waste collection and transportation is carried out by the private sector. These contracts included waste collection, road sweeping, removing weeds, maintaining verges, removal of tree cuttings, removal of building debris, and removal of all decorations such as banners, strings and posters, and given for four years. After four years, the tenders were again called for

technical and financial bids. According to the municipal staff, a marked improvement in the street cleansing and door-to-door waste collection is evident. The smaller LAs view privatisation as a means to increase the coverage area and collection efficiency. With the move towards privatization of waste collection it is anticipated that the waste quantities requiring disposal will also increase rapidly.

In addition, some LAs, including Colombo and Dehiwal-Mount Lavania and Kandy Municipal councils have tried to privatise the waste disposal to overcome problems faced in finding disposal sites, though such arrangements have been unsuccessful. However, Wattala Pradeshiya Sabha has privatised collection and disposal for part of the waste stream. But, private contractor, which was expected to find a site to dispose the waste in an environmentally sound manner, continued the practice of open dumping, breaking the conditions of enforcement.

### 3.7.2. Community Participation and Public awareness

Cooperation and participation of the general public in solid waste management is essential. However, the public looks at solid waste management as a function of the LAs and lack of attitudes to take part in waste separation activities at the source. Therefore, it is necessary to carry out awareness programmes to encourage the minimization of waste generation at source. These programmes should include waste minimization and recycling possibilities as well as emphasise health impacts of haphazard waste disposal. Such programmes have commenced in some schools and the scheme should be encouraged and promoted. In addition, LAs have taken some initiatives to involve community participation in solid waste management activities in many ways.

#### (i) Animator system

Chilaw and Negombo LAs have introduced some innovative methods for improving communication between the LAs and the public as part of the bell collection system, such as community animator and street committee system. The Chilaw's animator system is based on individual communities selecting someone from their community to act as a voluntary animator, who will responsible for informing the council of the community's SWM related complaints while in turn the council may ask them to pass on information to their communities. The Negombo's system involves the formation of street committees who select 1-2 people on the committee to be their representatives. These people play a similar role as the Chilaw animators.

#### (ii) Public monitoring of SWM facility operation

Some LAs such as Nuwara Eliya, Matara, Kuliyapitiya UC and Badulla has established an effective monitoring system with relevant stakeholders, especially including community members and the elected politicians in the area to monitor the waste collection services, operation and maintenance of the composting facilities, and environmental conditions in the final landfill sites.

## 4. Preparation of Strategic Action Plan for Municipal Solid Waste Management in Kurunegala City

Kurunegalala is an ancient capital of Sri Lanka (1272-1341). The city is located at the centre of the country (94 km from Colombo and 42 km from Kandy) and served as the commercial and administrative hub of Wayamba Province. The estimated population of the Kurunegala city in

the year 2001 was 28,401people and the floating population coming into the city each day for getting services is approximately 100,000 people. The city generates about 50 tones of solid waste per day. Although most of waste generated in the city is collected by the municipal council of Kurunegala, it is dumped at Sundarapola landfill without prior treatment.

To find some alternatives to the growing issue of SWM, Kurunegala city has taken several initiatives cooperation with different stakeholders, including public, private and civil society. The city undertakes a small composting programme (distribution of household composting bins to its residents), source separation at source and collection, and proposals have been prepared by the National Solid waste Management Support Center (NSWMSC) and the Pilisaru Programme of the Central Environmental Authority (CEA) for establishing a decentralized composting facility and sanitary landfill. In addition, a number of community-based programmes are implemented by the local non-governmental organizations (NGOs) to improve waste collection, recycling and ecological sanitation, particularly in low-income areas of the city.

However, in most of the cases, an integrated approach is still missing and those initiatives have remained isolated and no significant programmes have been made in improving the overall waste management issue. To this extent, the workshop was organised on 21 January 2011 at the Blue Sky Hotel in Kurunegala to design and implement of the strategic action plan for Kurunegala city, based on the 3Rs principle and incorporate formal, informal and community-based approach which will be jointly implemented by the municipal council, civil society organizations, and private sector.

It was organised by the Kurunegala Municipal Council with the NSWMSC and IGES-Kitakyushu Urban Center. The participants are included national, provincial, local government representatives and private sector and civil society organisations in the city.

The participants discussed the key issues in managing municipal solid waste in the city and identified the following strategic actions for overcoming them.

### 4.1. Waste Separation and Collection

The Kurunegala Municipal Council has already started a new waste separation and collection system as a pilot project in 1,500 households. The pilot households were educated to separate their waste into organic and non-organic at source. Home composters are distributed to households to put their organic waste. Non-organic waste is collected by the staff of the municipal council once a week. The date is decided in consultation with the households and they are requested to keep waste outside only in designated days. The participants identified that the pilot project is working well and it needs to be replicated in other areas. For the successful replication of the experience, the following activities are identified.

**Figure 16: Waste separation at source and use of home composter for organic waste in Kurunegala**
Source: Premakumara, IGES

**Promotion of Apardaya Society**

- Education and awareness programme will be carried out as a continuous activity through

schools, community organisations, women's societies etc. to encourage reduce, reuse and recycling of waste, sorting of waste at household level and disposing waste in an environmentally sound manner based on the Aparadaya Society.

**In residential areas**

- Educates households to separate waste at source into organic and non organic matters.
- Municipal council distributes home compost containers to residents to put their organic waste.
- Promotion of home gardening giving some incentives such as technical expertise, organising home gardening exhibitions and giving awards for best home garden in the city.
- Municipal council only collects non-biodegradable waste once a week.

**In commercial areas**

- Introduces the separate collection, such as general waste, recyclable materials, hazardous waste, and yard waste.

**Waste collection fee**

- Introduce waste collection fee for yard waste and to the discharge of large amount waste.

**Figure 17: A temporary waste collection point in Kurunegala city**
Source: Premakumara, IGES

### 4.2. Waste Transportation

- Improve the efficiency ofthe transport sectorr in preparing time table (route, number ofjourneysy, staff etc.)
- Introduction of bell collection system
- Reduce the temporary waste collection points.

### 4.3. Treatment and Disposal

- All organic waste collected from markets, commercial and institutional premisesneeds to be utilised for makingcompostg. Currently, a small composting plant is established at the site of a Sundarapola landfill area. This plant uses a windrow method for composting three tons per day and operated by the municipal staff. The Sundarapola landfill site receives the waste from the Kurunegala Pradeshiya Sabaha as well. Therefore, it is planned to make a large compost plant with the capacity of 30 – 40 tons per day to handle the all organic waste coming to the Sundarapola site.
- Development ofa markett for compost product within and outside the city, and utilise them to city parks andgardensg.
- The residual waste, following after the recycling and composting, is appropriately disposed in an environmentally sound manner.

**Figure 18: Windrow compost method in Kurunegala city**
Source: Premakumara, IGES

### 4.4. Outputs of the Workshop

- The participants are commonly agreed to implement the strategic action plan and achieve the following targets set by the NSWMSC in consultation with the Kurunegala Municipal Council. (See Table 8)
- A monitoring team will be appointed under the leadership of Municipal Commissioner to evaluate and monitor the progress. For this team, a representative of civil society, NGO, academic and private sector are invited.

### 4.5. Follow-up Actions

As a follow-up action, IGES-Kitakyushu Urban Center is requested to provide technical assistance in the following matters:

- Technical assistance for study and development of the database on municipal solid waste in Kurunegala city.
- Technical assistance in planning and implementation of the education and training programmes on establishing an Aparade Society based on Japanese experience in establishing a Sound Material-Cycle Society.
- Technical assistance for improving the composting technology based on the Kitakyu Composting Method.
- Training, experience sharing and networking with good practices cities in Asia.

**Table 8: Target Decided by the Kurunegala Municipal Council on Municipal Solid Waste Management**

| Items | Index | Original Situation in 2007 | Target | |
|---|---|---|---|---|
| | | | 2010 | 2014 |
| Waste Minimization | Discharge rate (g/person.d) | 1660 | Less than 1660 | Less than 1160 |
| Resource Recovery | % of Inorganic recyclables in waste disposed | 28% | Less than 5% | Less than 5% |
| Sanitation | Scattered waste | Some places | None | None |
| Waste Disposal | Beauty | Ugly | Beauty | Beauty |
| | Smell | Strong | Acceptable | Acceptable |
| | Fly, Rats, etc. | Many | Few | Few |
| | Smoke | Sometimes | None | None |
| | Leachate control | No control | Controlled | Controlled |
| Waste Amount | Collection Amount (T/d) | 36 | Less than 36 | Less than 36 |
| | Collection Amount ($m^3$/d) | 165 | Less than 165 | Less than 165 |
| | Final Disposal Amount (T/d) | 36 | Less than 36 | Less than 36 |
| | Final Disposal Amount ($m^3$/d) | 165 | Less than 22 | Less than 165 |

Source: NSWMSC, 2008

## Appendix 1

**Mission Report**
**22nd September to 3rd October, 2010**

| | |
|---|---|
| 22 September | 10:50 Fukuoka – 15:00 Hong Kong (CX 511)<br>16:15 Hong Kong – 22:40 Colombo (CX 711) |
| 23 September | 9:00 – 12:00 *Meeting at Sevanatha – Urban Resource Center*<br>Mr. K.A.Jayaratne, President<br>Mr. H.M.U.Chularathne, Executive Director<br>Sevanatha-Urban Resource Center is a leading NGO has been involved in urban housing, poverty, slum upgrading and environmental planning and management in primary and secondary cities in Sri Lanka since its inauguration in 1989.<br>Solid Waste Management (SWM) is one of its main areas of concern under the environmental planning and management section.<br>They are pioneers of introducing household composting bin (Sevanatha Compost Barrel), community-managed waste material facility, decentralized composting facility (box system that used by the Waste Concern in Bangladesh), bio-gas facility and awareness raising programmes for waste reduction in Sri Lanka.<br>Currently, a decentralized composting facility is built and operated in Matale city with ESCAP funding, which covers 2 tons of waste.<br>They have a plan to up-scale this experience within the city for achieving 20 tons per day and also to replicate in two other cities such as Kaduwela (20 tons per day) and Dambulla (10 tons per day).<br>A proposal is in preparation to apply for ESCAP funding for up-scaling and replication of Matale experience in other cities.<br>Shown a great interest to be a part of future collaboration with the IGES-Kitakyushu city<br>Requested some technical support for documents their experience in SWM, making an integrated solid waste management (ISWM) plan for Matale and Kaduwela cities based on Japanese experience in building sustainable material-cycle society, some experiment on carbon credit from composting, and sharing experience with other cities organizing workshops and seminars.<br>15:00 – 17:00 *Meeting at World Bank Country Office*<br>Ms. Rosanna Nitti, Senior Urban Specialist<br>Dr. Sumit Pilapitiya, Lead Environmental Specialist, Climate Change Group<br>Discussed the essential of integrated planning approach for SWM in Sri Lanka.<br>Shown interest for the proposed programme by IGES-Kitakyushu city and agreed to work collaboratively for achieving the national strategy for SWM in Sri Lanka.<br>Identified the essential to work with the PILISARU Programme of the Central Environmental Authority (CEA) (national programme that make funds available for implementation of SWM programmes at local government level) and JICA supported National Solid Waste Management Support Center (NSWMSC) (provides technical expertise and capacity building support for local governments) for influencing national policies for SWM<br>Fixed a meeting inviting both PILISARU and NSWMSC on 30 September at 15:30 to discuss the future plans/ programmes and identify a pilot city where all resources are available for implementation.<br>Work together in providing technical assistance for making an ISWM plan in the pilot city and carryout the monitoring and documentation of |

| | |
|---|---|
| | experience.<br>Work together to replicate the experience with other cities and making a proposal for supporting the national policy for SWM. |
| 24 September | 10:00 – 12:00 *Meeting at Kaduwela City Office*<br>▪ Municipal Officer of Health (MOH) and the Public Health Inspectors (PHI)<br>▪ Programme Coordinator, Sevanatha-Urban Resource Center<br>➢ Kaduwela is one of the fast growing cities in the Western Province, located next to Sri Jayawardenapura Kotte, a capital of Sri Lanka.<br>➢ Issue of SWM is identified as a key environmental issue in the city.<br>➢ Sevanatha-Urban Resource Center has been working with the city office to start a new waste reduction programme aiming to introduce a decentralized composting facility targeting to reduce 20% of waste generation within two years.<br>➢ The site is already selected to construct the first composting facility for 20 tons of waste per day generated in the city.<br>➢ A field study visit will be organized to composting facility in Matale city on 2 October for giving the training to the city officials.<br>➢ The funding for the construction of the composting facility is looking from the ESCAP.<br>o Recognized the essential of having an ISWM plan for reducing waste generation in the city in next two or three years.<br>o Lack of reliable data about the SWM is identified as one of the key issues in planning and decided to gather basic data by Sevanatha-Urban Resource Center with the city officials before end of October.<br>o Work together in preparing a proposal for ESCAP for financial assistance for implementation of the ISWM plan<br>14:00-17:00 *Site Visit*<br>• *Pilot project of household composting programme*<br>• *Clean and green programme in Parliament Ground area*<br>• *Existing landfill site (open dumping)* |
| 25 September | 9:00 – 12:30 *Workshop on ISWM for NGO and CBO leaders in Colombo at Sevanatha Office*<br>▪ About 15 NGO and CBO leaders were attend the workshop.<br>➢ Workshop included both lectures and discussions.<br>➢ It has found that NGOs and CBOs are carried out several pilot scale activities such as household composting, biogas, decentralized compost facility using window and box method, community recycling material facility, small-scale plastic recycling factories and community awareness programme with city authorities.<br>➢ However, most of them limited only to pilot projects and no any systematic approach to up-scale or find solution for overall waste management issue in the cities.<br>o Participants identified the need for ISWM plan for the cities and the involvement of different stakeholders for achieving those targets.<br>o Need some financial, institutional and policy support from both national and local governments for effective implementation of plans.<br>o Need some research and information on sustainable consumption and production flow.<br>15:00-17:45 *Visit to the Community-based Waste Recycling Facility at Badowita Settlement*<br>▪ Chairman and Secretary of the Community Development Council (CDC) |

| | |
|---|---|
| | of Badowita<br>➢ Badowita is a largest relocated low-income settlement in Dehiwala and Mt.lavania city, located next to Colombo city.<br>➢ The settlement was established by relocating over 1,500 illegal houses from the canal reservations in Colombo city under its canal improvement programme in 1990s.<br>➢ Though, people have improved their houses and basic amenities, waste collection was not available for long time. People used to throw their garbage into nearby canal that resulted for various health issues in the neighborhood.<br>➢ In 2001, people initiated a community-based SWM programme with assistance from Sevanatha-Urban Resource Center, JICA/JOCV programme and city office that included awareness rising about the environmental health and sanitary conditions, waste separation at source into bio-degradable and non bio-degradable, separated waste collection system, and material recycling programme.<br>➢ The CDC is responsible for managing the programe hiring two women from the community to collect and sort the waste at the material facility center that build with the assistance of the UN-Habitat.<br>o Currently, they are separated waste into 5-7 categories at the center and sales them to middle businessman. Average monthly income is about 100 USD.<br>o Since, non-degradable waste has a good system for collection, separation and marketing, the community leaders are identified that it is essential to handle the bio-degradable waste also that goes to landfill site without proper treatment.<br>o Requested support for starting a community-based composting facility. |
| 26 September | 06:30 – 14:00 *Moving to Kalmune city*<br>15:00 – 17:45 *Site Visit*<br>• *Final dumping site of the city (open dumping)*<br>• *A pilot household composting programme*<br>• *A pilot plastic recycling center* |
| 27 September | 09:00 – 11:00 *Meeting at the Kalmune Municipal Council*<br>▪ Mr. Saleem, Municipal Commissioner<br>▪ Municipal Officer of Health (MOH)<br>➢ Kalmune city is one of the fast growing cities in the Eastern Province.<br>➢ Population has grown rapidly by the migrants from the North during the civil war.<br>➢ SWM is one of the environmental issues in the city.<br>➢ The city has taken some steps to introduce household composting bins for identified areas with the assistance of the local NGOs. However, due to lack of follow-up actions, some of them have already given up in using the bins.<br>➢ A plastic recycling factory is operated by a citizen as a micro enterprise.<br>o Shown some interest about having an ISWM plan for the city.<br>o However, difficult in finding a financial assistance for any implementation activities.<br>12:00 – 17:00 *Moving to Matale city* |
| 28 September | 09:30 – 12:00 *Meeting at the Matale Municipal Council*<br>▪ Municipal Officer of Health (MOH) and the Public Health Inspectors (PHIs)<br>➢ Matale city is located in the Central Province.<br>➢ City has taken some initiatives to tackle the SWM issue. |

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| | ➢ A compost bins are distributed in selected residential areas for household waste reduction. However, most of them are not used by the residents.<br>➢ A comprehensive survey on SWM is carried out under the assistance of the UNEP and a strategic action plan is prepared for the city. Few locations were identified for the construction of biogas plants.<br>➢ A composting facility is designed and operated by Sevanatha-Urban Resource Center with the cooperation of the city office. This project is funded by the ESCAP.<br>➢ It is planning to up-scale the experience of composting within the city covering more than 20 tons per day.<br>o City has shown some interest to having an ISWM plan for reducing waste generation.<br>o Decided to use the database and the action plan prepared by the UNEP for making an ISWM plan for the city.<br>o Working together with Sevanatha-Urban Resource Center for making a proposal to ESCAP for financial assistance to up-scale the composting practices within the city.<br>o Working together with the Women's Group for establishing a material recycling facility for collecting the recyclable materials and rising awareness on the environmentally friendly life styles.<br>o Identified the essential to work with business sector to promote production with less waste generation.<br>o Follow-up the UNEP proposal for making biogas plants in the city.<br>12:30 – 15:00 *Site Visit*<br>• *A final dumping site*<br>• *A composting facility at Dola road*<br>• *A junk shop in the city*<br>15:45 – 21:00 *Moving to Colombo* |
| 29 September | 10:00 – 11:00 *Meeting at the Environmental and Landscape Division, Urban Development Authority (UDA)*<br>▪ Mr. Hettiarachchi, Director<br>▪ Mrs. Kanchana, Landscape Planner<br>➢ The UDA is responsible to prepare the development plans for the urban and secondary cities in the country.<br>➢ Environmental and landscape aspects of those urban development plans are prepared by the Environmental and Landscape Division.<br>➢ Key activities are focused on designing greening areas, parks and play grounds.<br>➢ After the Tsunami, protection of beach areas got high priority.<br>➢ No direct involvement in SWM, however, assists cities to find suitable lands for landfill.<br>14:00 – 16:00 *Meeting with Women's Bank*<br>▪ Mr. Nandasiri Gamage, General Manager<br>▪ Mrs. Rupa Manel, President<br>➢ Women's Bank is the largest community network in urban low-income areas in Sri Lanka. It has over 7,000 members and covers 22 out of 25 administrative districts in Sri Lanka.<br>➢ They have started as a small group saving and credit programme in 1989 and currently, expanded for several other areas including organic agriculture.<br>➢ The organic agriculture division is involved in encouraging members |

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| | for making composting and home gardening at household and community level.<br>o Identified as a potential partner for any activities will be implemented at grassroots level, especially in urban areas.<br>o Shares the relevant information and experiences in other countries on urban agriculture and composting as a livelihood options.<br>o Considered to start a pilot programme for making such a system of organic agriculture society.<br>16:30 – 18:30 *Meeting at the Institute of Policy Studies (IPS)*<br>➢ Ms. Asha Gunawardena, Researcher<br>➢ The IPS is a leading research institute in Sri Lanka focused on policy oriented research.<br>➢ Discussed about the ADB research proposal on Solid Waste Management through Composting.<br>➢ IPS shown great interest to be part of the research team and identified national policy analysis about the composting is timely needed, because, most of cities are now involved in promoting composting as a strategy for reducing waste generation. However, most of them ended with bad experience without any sustainability.<br>➢ In this, it is essential to identify the key factors and policy instruments for supporting the sustainable composting practices in Sri Lanka.<br>o It was agreed to send a TOR and research proposal to Dr. Saman Kelagama, Executive Director for official consideration and copy to Ms. Asha.<br>o In the meantime, Ms. Asha will start to contact the relevant institutions and collection of the basic information. |
| 30 September | 11:30 – 12:30 *Meeting at the Secretary of Defense and Urban Development*<br>▪ Mr. Gotabaya Rajapakshe, Secretary, Ministry of Defense and Urban Development<br>▪ Ms. Rosanna Nitti, Senior Urban Specialist, World Bank<br>▪ Dr. Sumit Pilapitiya, Lead Environmental Specialist, World Bank<br>➢ After officially ended the 20 years old civil war in the country, a top priority of the Government of Sri Lanka is now to rebuild the economic and physical development of the country.<br>➢ Though, new development strategies are focused on to develop the secondary cities, Colombo Metropolitan Region was still identified as an economic center, because of its strategic location near to Colombo port and international airport.<br>➢ Integrated vision for future city development is identified as a top priority and the World Bank has involved in supporting its assistance for country assistance study.<br>➢ Housing for low income groups, flood and drainage management, historic and cultural area development, transport planning and solid waste management is identified as key sectors that need immediate strategic interventions.<br>➢ SWM should have different strategies for different size of cities and solutions need to be applicable to the situations in Sri Lanka. For example, incineration is identified too expensive for the cities and final treatment facility can be a sanitary landfill site.<br>o Identified the immediate interventions to the issue of SWM in the city of Colombo, which has 700 tons per day.<br>o The government is looking for a suitable land for building a sanitary landfill site for Colombo. |

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| | o Though, World Bank has done a study for planning a landfill site to Colombo in 1990s, it was failed due to political issues in finding suitable land.<br>o For other cities, it is essential to have a solution based on integrated approach with promoting 3R concepts.<br>o Shown great interest about the IGES-Kitakyushu city activities and promised to give his support for future interventions.<br>15:30-17:00 *Meeting at the Central Environmental Authority (CEA)*<br>▪ Mr. Jayavilal Fernando, Project Director, PILISARU<br>▪ Mr. Gunawardena, Senior Engineer, PILISARU<br>▪ Ms. Mangalika, Director, NSWMSC/JICA<br>▪ Ms. Rosanna Nitti, World Bank<br>▪ Mr. Sumith Pilapitia, World Bank<br>➢ PILISARU is a national solid waste management project initiated by the Ministry of Environmental to provide financial assistance to start composting programmes at local government level. Currently, they have supported for establishing 51 composting facilities throughout the country. It will be also considered for supporting waste recycling activities too.<br>➢ NSWMSC is established under the cooperation of JICA and the Ministry of Local Government. It has been involved in providing technical support for cities to plan and implement the SWM programmes and also provide capacity building on SWM. Currently, they are working with 13 local governments in Sri Lanka.<br>➢ Shown interest about the integrated approach for SWM and identified the need of city strategies and action plan for reducing the waste generation.<br>➢ The NSWMSC supports its partner cities to prepare the action plans. However, these action plans are more focused on implementing composting programmes without much intervention on holistic waste reduction approach at city level.<br>o All groups are agreed to work in one city using ISWM approach based on 3R principles for reducing waste generation as a case study.<br>o Based on some criteria such as political leadership, official commitment, resource availability and priority of the issue, Kurunegala was selected for this study.<br>o IGES-Kitakyushu will provide the technical assistance for planning, research and development with the World Bank, while PILISARU and NSWMSC provided assistance for the financial, policy, legal and capacity building. |
| 1 October | 06:30 – 10:30 *Moving to Kurunegagal City*<br>11:00 – 12:30 *Meeting at the Public Health Office*<br>▪ Ms. Gayani, MOH and the PHIs<br>➢ Kurunegala is a most urbanized city in the province. SWM is identified as one of the key environmental issues in the city.<br>➢ The Public Health Office is responsible for collecting and transportation of waste to the landfill site which is an open dump.<br>➢ The city has implemented some awareness programme and distribution of compost bins for household level as a pilot scale with the assistance of the local NGO. But it was failed after NGO involvement was finished.<br>o Shown interest in starting an ISWM programme for reducing the waste generation in the city. |

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| | o The basic data of the SWM is already collected by the NSWMSC and it can be used for initial planning.<br>o IGES-Kitakyushu will coordinate in making a waste reduction plan with other partners and follow-up monitoring in the implementation with World Bank.<br>o Organize a workshop in early March inviting all partners to discuss the progress and future actions.<br>14:00 – 17:30 *Site Visit*<br>• *A pilot composting bin programme*<br>• *Junk shops in the city*<br>• *Final dumping site* |
| 2 October | 09:00 – 12:30 *Moving to Colombo*<br>14:00 – 16:00 *Rap-up Meeting at Sevanatha-Urban Resource Center*<br>00:50 – 12:55 Colombo – Hong Kong (CX710) |
| 3 October | 14:55 – 20:45 Hong Kong – Fukuoka (CX510) |

## Appendix 2

**Workshop for Planning and Implementation of Integrated Solid Waste Management (ISWM) Programme in Kurunegala City, Sri Lanka**
**21 January 2011**
**Blue Sky Hotel, Kurunegala, Sri Lanka**

**Concept Note**
(Draft for discussion)

### Introduction

Since the early 1990s, solid waste management (SWM) has become a serious issue in many cities in Sri Lanka, particularly with the increase of urban population, rapid economic growth resulting from the introduction of more liberal, industrial and expansive growth policies and changing lifestyles of the people. It has perceived not only as an environmental issue, but also a socio-politically sensitive problem. The management of solid waste is primarily the responsibility of the local authorities (LAs) as empowered by the relevant acts and ordinances. It is very common that LAs spend about 20-50% of their available budget on SWM, even though the service is neither efficient nor effective. Many argue that institutional weakness, inadequate financial resources, lack of technical competency, improper choice of technologies, lack of proper integrated strategy and social responsibility has made SWM far from satisfactory.

It is not exceptional in Kurunegala, an ancient capital of Sri Lanka (1272-1341). The city is located at the center of the country (94 km from Colombo and 42 km from Kandy) and served as the commercial and administrative hub of Wayamba Province. The estimated population of Kurunegala city in the year 2001 was 28,401people and the floating population coming into the city each day for getting services is approximately 100,000 people. The city generates about 50 tones of solid waste per day. Although most of waste generated in the city is collected by the municipal council of Kurunegala, it is dumped at Sundarapola landfill without prior treatment.

To find some alternatives to the growing issue of SWM, Kurunegala city has taken several initiatives cooperation with different stakeholders, including public, private and civil society. The city undertakes a small composting programme (distribution of household composting bins to its residents), source separation at source and collection, and proposals have been prepared with the National Solid waste Management Support Center (NSWMSC) and the Pilisaru Programme of the Central Environmental Authority (CEA) for establishing a decentralized composting facility and sanitary landfill. In addition, a number of community-based programmes are implemented with the local non-governmental organizations (NGOs) to improve waste collection, recycling and ecological sanitation, particularly in low-income areas of the city. However, in most of case, an integrated approach is still missing and those initiatives have remained isolated and no significant programmes have been made in improving the overall waste management issue. In this extent, there is an urgent need for the ISWM approach based on the 3Rs principle to handle the solid waste generated in the city as a whole.

### Objectives

The overall objective of the workshop is to design and implement of the ISWM programme in Kurunegala city, based on the 3Rs principle and incorporate formal, informal and community-based approach which will be jointly implemented by the municipal council, civil society organizations, and private sector.

- To make ISWM action plan for the city of Kurunegala that provides a comprehensive road map on how to manage the solid waste in the city including achievable waste reduction targets.
- To identify key challenges and possibilities to implement the action plan.
- To draw the supportive institutional framework for implementation of the action plan.

**Expected Outputs**

The following key outputs are expected from the workshop.

- A draft ISWM action plan for Kurunegala city with achievable waste reduction targets, which will be jointly implemented by the municipal council and other stakeholders.
- A supportive institutional framework and monitoring mechanism at city level for the implementation of the ISWM action plan.

**Follow-up Actions**

The following actions will be taken as a follow-up of the workshop making possible collaboration with the NSWMSC/ JICA and the Pilisaru Programme of the CEA.

- Monitoring the implementation of action plan developed by the Kurunegal City.
- Carryout detailed action research to identify, analyse and extract lessons learned in Kurunegala City and its applicability in other cities in Wayamba Province and country as a whole.
- Establish of supportive institutional and policy framework at national level in collaboration with the NSWMSC and Pilisaru for promoting a Sound Material-Cycle Society in Sri Lanka.

**Date and Venue**

The workshop will be held on 21 Friday, January, 2011 at the Blue Sky Hotel, Kurunegala.

**Participants**

The participants are included national, provincial, local representatives, private sector and civil society.

**Kurunegala Municipal Council**

- Hon. Nimal Chandrasiri de Silva, Mayor of Kurunegala Municipal Council
- Hon. Gaminie Peramunage, Deputy Mayer of Kurunegala Municipal Council
- Mr. Kamal Gunasinha, Chairman of Health Committee of Kurunegala Municipal Council
- Mrs. Kanthi Wehalla, Commissioner of the Kurunegala Municipal Council
- Mr. Pradeep Thilakarathna, Deputy Commissioner of Kurunegala Municipal Council
- Dr. Gayani Dassanayake, Chief Medical Officer of Health
- Mr. S.M.B.Dissanayake, Chief Engineer
- Mr. Gunadasa, Chief Accountant
- Mr. U. Weerasooriya, Chief Public Health Inspector
- Mr. R.D.D.Rajapaksha, Public Health Inspector
- Mr Megasooriya, Public Health Inspector
- Mr Gunawardana, Public Health Inspector
- Mr. Weththasinghe, Health Overseers
- Mr Wilson, Health Overseers

**Provincial Council**

- Mr. Weerasekara, Commissioner of Local Government

- Provincial Director of Education
- Provincial Director of Health services

**National Institutions**

- Ms. Mangalika, Director of the National Solid Waste Management Supporting Center
- Mr. senarathna, Director, Urban Development Authority

**Civil Society**

- Mr. Ranga Pallawela, Practical Action-Sri Lanka, NGO
- Community Based Organizations

**IGES**

- Mr. D.G.J.Premakumara, Policy Researcher
- Ms. Miwa Abe, Assistant Researcher

**Organisation**

**Local Organisers:** Kurunegala Municipal Council

**Supportive Organisations:** NSWMSC and Pilisaru Programme of CEA (local), Kitakyushu City and the Institute for Global Environmental Strategies (IGES)- Kitakyushu Urban Center (international).

**Workshop Programme (tentative)**

***8:30 – 8:45: Registration by participants***

***8:45 – 9:15: Session 1 - Inaugural session***

- Welcoming remarks by Hon. Nimal Chandrasiry de Silva, Mayor of Kurunegala City
- Remark by Hon. Gamine Peramunage, Deputy Mayor of Kurunegala City
- Remark by representatives from JICA/ World Bank (tbc)

***9:15 – 10:00: Session 2 - Introduction***

- Introduction to workshop by D.G.J.Premakumara, Researcher, IGES
- Overview of solid waste management in Kurunegala City by Kanthi Wehalla, Commissioner of Kurunegala City

***10:00 – 10:30: Tea Break***

***10:30 – 12:00: Session 3 - Setting the stage***

- Involvement of government institutions (brief presentations)
  - ✓ Action plan prepared by the NSWMSC
  - ✓ Action plan prepared by the Pilisaru, CEA
  - ✓ Action plan prepared by the Provincial Council
  - ✓ Action plan prepared by the UDA
- Involvement of civil society and private sector
  - ✓ Experience of NGOs
  - ✓ Experience of CBOs
  - ✓ Private sector participation

***12:00 – 13:00: Lunch Break***

***13:00 – 14:00: Session 4 - Successful experience from other countries***

- Experience from Japanese cities (Kitakyushu, Oki, Minamata) by Miwa Abe, Associate Researcher, IGES
- Experience from Indonesia (Surabaya) by D.G.J.Premakumara, Researcher, IGES

***14:00 – 15:00: Session 5 - Identify challenges and possibilities in implementing sustainable solid waste management in Kurunegal city***

- Discussion 1: separation, collection and transport
- Dissuasion 2: reduce, recycle and composting

***15:00 – 15:30: Tea Break***

***15:30 – 16:30: Session 6 - Identify challenges and possibilities in implementing sustainable solid waste management in Kurunegal city***

- Discussion 3: final landfill/sanitary landfill
- Discussion 4: supportive institutional framework

***16:30 – 17:00: Session 7: Wrap-up and closing***

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